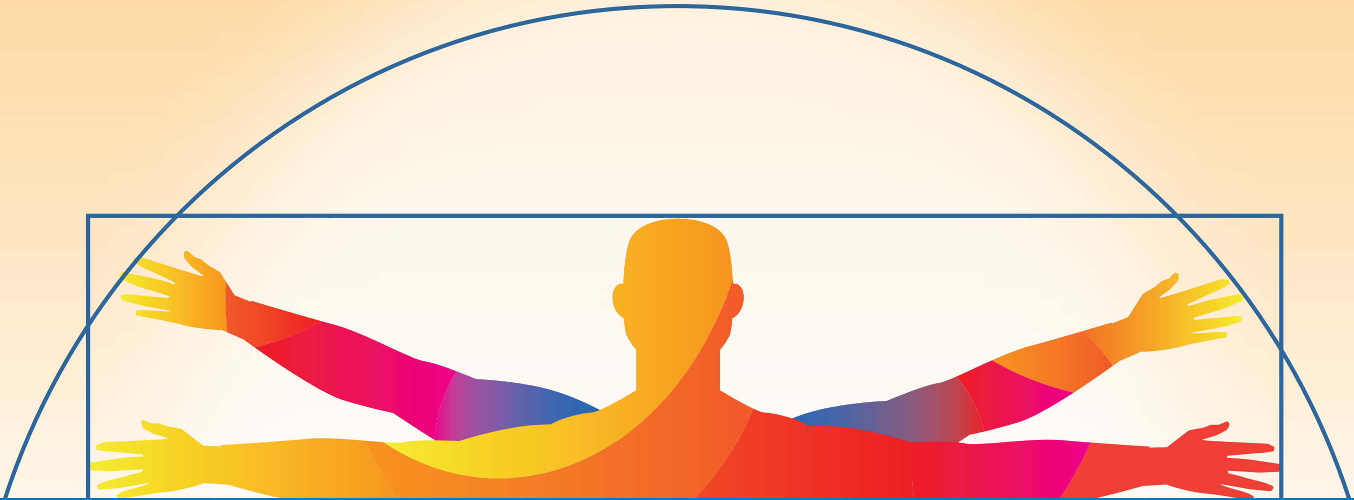
2015



The Burden of Musculoskeletal Diseases in the United States

Prevalence, Societal and Economic Cost

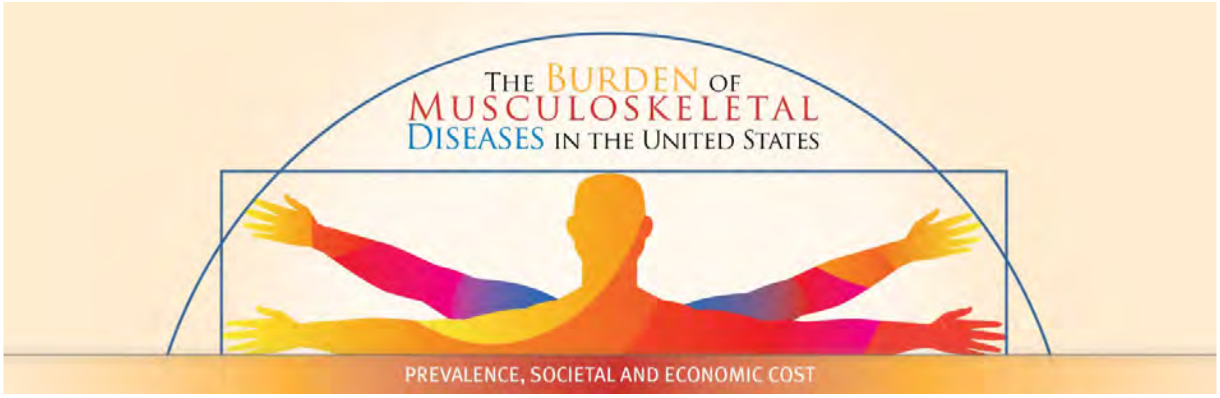
Bone and Joint Initiative USA

The Bone and Joint Decade • Joint Motion 2010 – 2020

www.boneandjointburden.org

3rd Edition

Table of Contents



Musculoskeletal Diseases

And the Burden They Cause in the United States

Musculoskeletal diseases affect more than one out of every two persons in the United States age 18 and over, and nearly three out of four age 65 and over. Trauma, back pain, and arthritis are the three most common musculoskeletal conditions reported, and for which health care visits to physicians' offices, emergency departments, and hospitals occur each year. The rate of musculoskeletal diseases far outstrips that of circulatory diseases and respiratory diseases, which affect about one in three persons, with the majority reporting relatively easily treatable conditions such as chronic hypertension or hay fever and bronchitis.

The cost of treating major musculoskeletal diseases, which often includes long-term pain and disability, is also greater than for treatment of many other common health conditions. Yet research dollars to identify causes, create new treatments, and reduce pain and disability remain much lower than that of other health conditions.

With the aging of the US population, musculoskeletal diseases are becoming a greater burden every year. The pages of this site illustrate the magnitude of musculoskeletal diseases on the US population, and provide a small slice of the cost and impact on the US economy.

About Us

The Burden of Musculoskeletal Diseases in the United States: Prevalence, Societal and Economic Costs (BMUS), 3rd edition, is produced by the [United States Bone and Joint Initiative](#) (USBJI) in collaboration with a number of organizations, mostly professional societies.

The USBJI is the U.S. national action network of the [Global Alliance for Musculoskeletal Health/Bone and Joint Decade](#) (GAMH/BJD), an international collaborative movement sanctioned by the United Nations/World Health Organization. The mission of the GAMH/BJD is to raise the priority afforded to bone and joint disorders by world health organizations and national governments in line with the level of prevalence and impact on lives and economies. The mission of the USBJI is to advocate for and promote multidisciplinary, coordinated, and patient-centered care to improve the prevention, diagnosis, and treatment of musculoskeletal conditions. BMUS underpins the activities of the GAMH/BJD and USBJI, its member organizations, and healthcare professionals, researchers, patients and many others addressing musculoskeletal health issues.

The first publication detailing prevalence of musculoskeletal conditions was published in 1984 by the American Academy of Orthopaedic Surgeons, and was followed with updates in 1992 and 1999. At the outset of the Bone and Joint Decade and formation of its national action network in the US, the Academy proposed the next edition become a joint project involving interested member organizations, and the 1st edition of BMUS was published in 2008. This was updated in 2011.

BMUS was originally conceived as a publication designed to meet the needs of researchers, who lacked an accessible, reliable source of data on the health prevalence and economic burden of musculoskeletal diseases. With the advent of the Decade, BMUS became a useful advocacy tool helping to make a stronger case for investing in research on these costly, disabling, and common diseases, as well as addressing legislative, business, professional and patient issues as they arise and making the case for necessary changes in health care. It is a key resource in the development of briefing papers, presentations, and communications of almost any kind on bone and joint disorders.

The 3rd edition seeks to preserve its value for researchers and its reputation for accurate, objective data, while also presenting the burden of musculoskeletal conditions in lay language for policy makers and the general public.

Many of the key contributors to previous versions of BMUS remain the same, and much of the data presented is consistent with previous versions. However, changes in chapters and content are incorporated to meet these broader audience needs, as well as contribute additional knowledge to the burden of musculoskeletal conditions.

Foreword

I am pleased to introduce the 3rd edition of The Burden of Musculoskeletal Diseases in the United States, a landmark publication that has become emblematic of the presidentially declared United States Bone and Joint Decade (2002–2011), which is being continued after 2011 as the United States Bone and Joint Initiative.

A collaborative effort of several Initiative supporters, The Burden of Musculoskeletal Diseases in the United States shows the current musculoskeletal landscape as reflected in solid data from the National Center for Health Statistics' 2012 National Health Interview Survey. It provides a fresh look at conditions of the musculoskeletal system that continue to be the leading cause of physical disability in this country.

As the Initiative continues the mission of the Decade, The Burden of Musculoskeletal Diseases in the United States becomes an increasingly important vehicle for assessing our present position relative to the health challenges that lie ahead. Although the musculoskeletal community is advancing its goals, much still remains to be accomplished. We continue to face such issues as the increase in our elderly population; challenges in the economics, resources, management, and utilization of health care; and the high expectations of patients and families in what is arguably the world's most advanced medical environment. Musculoskeletal conditions remain common, chronic, and costly. Arthritis and joint and back pain, spinal problems, osteoporosis, and injuries are just a few of the conditions that affect millions of Americans, not only physically and financially, but emotionally.

The Burden of Musculoskeletal Diseases in the United States provides a springboard to continue the momentum of success the Initiative has afforded us. As you read and digest the information that lies within these pages, I encourage you to consider especially those sections that address your specific areas of interest or expertise.

Stephen I. Katz, MD, PhD
Director
National Institute of Arthritis and Musculoskeletal and Skin Diseases
National Institutes of Health
Bethesda, Maryland

Introduction

Musculoskeletal disorders and diseases are the leading cause of disability in the United States and account for more than one-half of all chronic conditions in people older than age 50 years in developed countries. The economic impact in the United States of these conditions is also staggering: in 2011, the estimated sum of the direct expenditures in healthcare costs and the indirect expenditures in lost wages is $874 billion, or 5.7% of the 2011 GDP (national gross domestic product).

Beyond these statistics, the human toll in terms of the diminished quality of life is immeasurable. This situation is unlikely to improve in the foreseeable future and will likely be intensified by current demographic trends, including the graying of the baby boomer population, the epidemic of morbid obesity, and the higher recreational activity levels of our elderly population.

Despite these compelling facts, the investment in musculoskeletal research in the United States lags behind other chronic conditions. While musculoskeletal diseases are common, disabling, and costly, they remain under-appreciated, under-recognized, and under-resourced by our national policy makers.

The mission of the U.S. Bone and Joint Initiative, publisher of this publication, is to advocate for and promote multidisciplinary, coordinated, and patient-centered care to improve the prevention, diagnosis, and treatment of musculoskeletal conditions.

This volume serves the mission of the Initiative in that several professional organizations concerned with musculoskeletal health have collaborated to tabulate up-to-date data on the burden of musculoskeletal diseases to educate healthcare professionals, policy makers, and the public. In this third edition of The Burden of Musculoskeletal Diseases in the United States (BMUS), information presented has been updated to reflect the most current data available. This book represents a true collaboration of a coalition of professional organizations committed to the mission of the U.S. Bone and Joint Initiative.

The content in this edition has been expanded to include new chapters on specific populations: children and adolescents, aging, and the military. Where available, there is increased attention to sex/gender differences, and race/ethnicity. The website has been completely revamped with new features and functionality included to facilitate use of the data. Graphs can now be downloaded for use in presentations. Tables are linked directly from the text content, and can be downloaded as PDF files or as CSV/Excel files. All the graphs and tables under each topic can be viewed together, and downloaded if desired. Search functionality has been improved. A Report Builder tool has been added allowing users to produce tailored reports on the latest available data provided by some of the original data sources used to produce the edition.

These data should stimulate increased investment in basic, translational, clinical and health policy research to delineate the underlying mechanisms of these diseases and their response to treatment. Through such research, novel preventive and therapeutic approaches with potential to mitigate the societal and personal impact of musculoskeletal disease will emerge.

We thank the authors and reviewers of the chapters, Sylvia Watkins-Castillo who undertook and coordinated development of the content and is so dedicated to this publication, the BMUS Steering Committee members who have guided the publication, and to the organizations which have provided support to make this edition possible.

Stuart Weinstein, MD
Edward Yelin, PhD, MCP
Co-Chairs, Steering Committee, Burden of Musculoskeletal Diseases in the United States (BMUS)
United States Bone and Joint Initiative

Rights, Copyright, Citation

Suggested citation:

United States Bone and Joint Initiative: The Burden of Musculoskeletal Diseases in the United States (BMUS), Third Edition, 2014. Rosemont, IL. Available at http://www.boneandjointburden.org. Accessed on (date).

ISBN: 978-0-9963091-0-3

The Burden of Musculoskeletal Diseases in the United States (BMUS)
9400 West Higgins Road, Suite 500
Rosemont, IL 60018-4976
United States of America
847-430-5054/5053
www.usbji.org

Supporting Organizations

American Academy of Orthopaedic Surgeons

American Academy of Physical Medicine and Rehabilitation

AO North America

American Orthopaedic Society for Sports Medicine

American Society for Bone and Mineral Research

Biomet

Genentech

Medtronic

National University of Health Sciences

Orthopaedic Trauma Association

Pediatric Orthopaedic Society of North America

Sanofi Biosurgery

Scoliosis Research Society

Zimmer

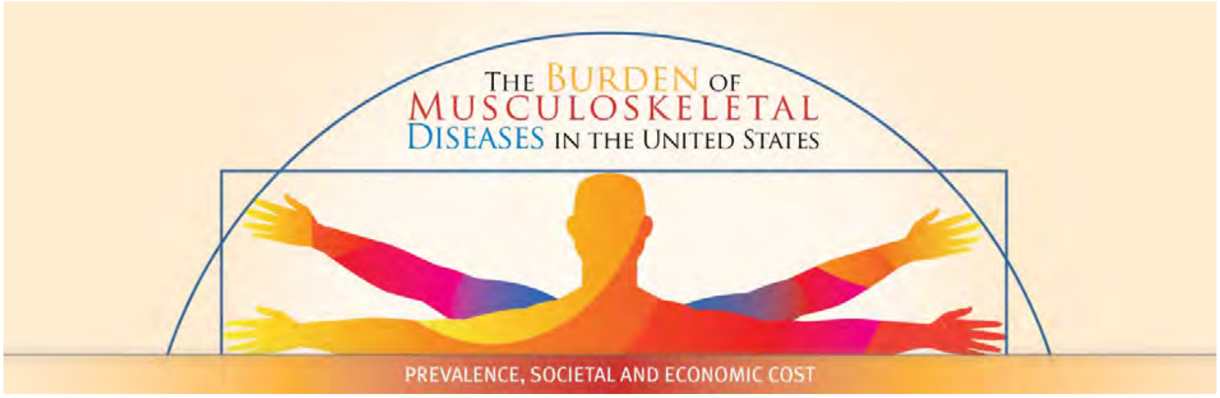
United States Bone and Joint Initiative

The United States Bone and Joint Initiative (USBJI) is the U.S. National Action Network of the worldwide Global Alliance for Musculoskeletal Health/Bone and Joint Decade, an international collaborative movement sanctioned by the United Nations/World Health Organization. Its mission is to improve the quality of life for people with musculoskeletal conditions and to advance the understanding, prevention, and treatment of these conditions—in short, to reduce the burden of musculoskeletal conditions.

The USBJI is a unique, interdisciplinary coalition of organizations. It connects thought leaders, healthcare professionals, educators, researchers, industry professionals, patients, and patient advocates. It develops collaborative programs and activities and creates forums to exchange information, build partnerships, and develop consensus on issues of common concern to its members and society at large. The USBJI raises the profile and priority of bone and joint health and disease prevention; in addition, it supports the advancement and expansion of musculoskeletal care and research through data dissemination, awareness-building programs, education initiatives, and advocacy.

United States Bone and Joint Initiative
9400 West Higgins Road, Suite 500
Rosemont, IL 60018
United States of America
847-430-5054/5053
usbji@usbji.org
www.usbji.org

United States Bone and Joint Initiative: The Burden of Musculoskeletal Diseases in the United States (BMUS), Third Edition, 2014. Rosemont, IL. Available at http://www.boneandjointburden.org. Accessed on April 27, 2015.



Credits

BMUS Steering Committee

Stuart L. Weinstein, MD, Co-Chair
Ignacio V. Ponseti Professor of Orthopaedic Surgery
Pediatric Orthopaedic Surgery and Spinal Deformity
Department of Orthopaedics and Rehabilitation
University of Iowa
Iowa City, IA
American Academy of Orthopaedic Surgeons

Edward H. Yelin, PhD, Co-Chair
Professor of Medicine and Health Policy
Department of Medicine and Institute for Health Policy Studies
University of California - San Francisco, School of Medicine
San Francisco, CA

Gunnar B.J. Andersson, MD, PhD
The Ronald L. DeWald, MD Professor and Chairman Emeritus
Department of Orthopaedic Surgery
Rush University Medical Center
Chicago, IL
American Academy of Orthopaedic Surgeons

Sigurd Berven, MD
Associate Professor in Residence
University of California San Francisco
Department of Orthopaedic Surgery
San Francisco, CA
Scoliosis Research Society

Leigh Callahan, PhD
Professor, Medical and Social Medicine
Thurston Arthritis Research Center
University of North Carolina
Chapel Hill, NC

Paul Dougherty, DC
Staff Chiropractor, Canandaigua VA Medical Center
Chair, Pain Oversight Committee
Professor, New York Chiropractic College
Department Of Chiropractic Clinical Sciences
Newark, NY
American Chiropractic Association

Paul W. Esposito, MD
Professor, Orthopaedic Surgery
Pediatric Orthopaedics
University of Nebraska College of Medicine
Omaha, NE
American Academy of Pediatrics

Julie M. Fritz, PhD, ATC
Professor
Department of Physical Therapy
University of Utah School of Medicine
Salt Lake City, UT
American Physical Therapy Association

Michael B. Furman, MD
Physician – Director of Fellowship Program
(Pain Management and Rehabilitation Specialist)
OSS Health
York, PA
American Academy of Physical Medicine and Rehabilitation

Marian T. Hannan DSc, MPH
Senior Scientist
Harvard Medical School
Musculoskeletal Research Institute for Aging Research
Hebrew SeniorLife
Boston, MA

Michael Henrickson, MD, MPH
Director of Telehealth
Cincinnati Children's Hospital Medical Center
Division of Rheumatology
Cincinnati, OH
American Academy of Pediatrics

Matthew Hepler, MD
Orthopaedic Surgeon-Spine Specialist
Orthopaedic Surgery Associates, Inc.
Boynton Beach, FL, FL
Scoliosis Research Society

Marc C. Hochberg, MD, MPH
Professor of Medicine
Head, Division of Rheum. & Clinical Immunology
University of Maryland School of Medicine
Baltimore, MD
American Society for Bone and Mineral Research

Anne C. Looker, PhD
Senior Research Scientist/Distinguished Consultant
Division of Health and Nutrition Examination Statistics
National Center Health Statistics
Centers for Disease Control and Prevention
Hyattsville, MD

Alexis Ogdie, MD
Assistant Professor of Medicine and Epidemiology
Perelman School of Medicine
University of Pennsylvania
Philadelphia, PA

Angela Oliver
Public Health Analysis
Centers for Disease Control and Prevention
Atlanta, GA

Joseph P. O'Brien, MBA
President & CEO
National Scoliosis Foundation
Stoughton, MA

J. Edward Puzas, PhD
Senior Associate Dean, Research
Department of Orthopaedics
University of Rochester
Rochester, NY

Patricia Quinlan, DNSc, MPA, CPHQ
Director of Nursing Education and Research
Hospital for Special Surgery
New York, NY
National Association of Orthopaedic Nurses

Scott B. Rosenfeld, MD (AAOS)
Assistant Professor
Department of Orthopedic Surgery
Baylor College of Medicine
Pediatric Orthopedic Surgery and Scoliosis
Texas Children's Hospital
Houston, TX
Pediatric Orthopaedic Society of North America

Paul A. Ullucci, Jr., PT, PhD, DPT, ATC, SCS, CSCS
Assistant Professor
Musculoskeletal Care Clinic Director
Department of Physical Therapy
California State University, Fresno
Fresno, CA
National Athletic Trainers' Association

John Ventura, DC
Rochester Chiropractic Group, LLP
Rochester, NY
American Chiropractic Association

Content Contributors

BIG PICTURE

Primary Author(s)

Stuart L. Weinstein, MD
Ignacio V. Ponseti Professor of Orthopaedic Surgery
Pediatric Orthopaedic Surgery and Spinal Deformity
Department of Orthopaedics and Rehabilitation
University of Iowa
Iowa City, Iowa

Edward H. Yelin, PhD
Professor of Medicine and Health Policy
Department of Medicine and Institute for Health Policy Studies
University of California - San Francisco, School. of Medicine
San Francisco, CA

Reviewers

Marian T. Hannan, DSc, MPH
Co-director of Musculoskeletal Research Center; Senior Scientist, Institute for Aging Research, HSL
Associate Professor of Medicine, HMS
Associate Professor of Public Health, HSPH
Institute for Aging Research
Harvard Medical School Affiliate

Jeremy I. Simon, MD
Board Certified, Physical Medicine & Rehabilitation
Subspecialty Certificate in Pain Medicine
Rothman Institute Orthopedics

SPINE: LOW BACK AND NECK PAIN

Primary Author(s)

Gunnar B. J. Andersson, MD, PhD
Professor, Midwest Orthopaedics at Rush
Department of Orthaepedic Surgery
Rush University Medical Center
Chicago, IL

Reviewers

Paul A. Ullucci, Jr., PT, PhD
Director, NATA Board of Directors, District 1
Ullucci Sports Medicine & Physical Therapy, Inc.
1235 Wampanoag Trail
East Providence, RI

Mary E. Hardwick, MSN
Shiley Center for Orthopaedic Research & Education
11025 N. Torrey Pines Rd., Ste 200
La Jolla, CA

SPINAL DEFORMITY

Primary Author(s)

Sigurd H. Berven, MD
Director of Spine Fellowship and Resident Education
Department of Orthopaedic Surgery
University of California San Francisco
San Francisco, CA

Adolfo Correa, MD, PhD
University of Mississippi Medical Center
School of Medicine-JHS
2500 North State Street
Jackson, MS

Matthew D. Hepler, MD
Specialist Comprehensive Spine Care
Vero Orthopaedics, Vero Neurology
Staff, Children's Memorial Hospital, Speciality Scoliosis
Vero Beach, FL

Reviewers

Michael B. Furman, MD, MS
Orthopaedic and Spine Specialists
1855 Powder Mill Rd
York, PA

Nicola Hawkinson, DNP, RN, RNFA
CEO and Founder
SpineSearch LLC
Recruitment and education source for Spine Professionals
Carle Place, NY

ARTHRITIS AND OTHER RHEUMATIC CONDITIONS (AORC)

Primary Author(s)

Charles G. (Chad) Helmick, MD
Captain, U.S. Public Service
Medical Epidemiologist, Arthritis Program
National Center for Chronic Disease Prevention
Centers for Disease Control and Prevention (CDC)
Atlanta, GA

Supporting Author(s)

Aimee O. Hersh, MD
Pediatric Rheumatologist
100 Mario Capecchi Dr
Box 0107 Room U126
Salt Lake City, UT 84113

Reviewers

David S. Pisetsky, MD, PhD
Professor Medicine/Immunology
Duke University, Medicine-Rheumatoloty and Immunology
Durham, NC

Edward H. Yelin, PhD, Co-Chair
Professor of Medicine and Health Policy
Department of Medicine and Institute for Health Policy Studies
University of California - San Francisco, School of Medicine
San Francisco, CA

OSTEOPOROSIS

Primary Author(s)

Kenneth S. Saag, MD, MSc, Lead
Professor of Medicine
Director, Center for Education & Research on Therapeutics of Musculoskeletal Disorders (CERTS)
Director, Center for Outcomes and Effectiveness Research and Education (COERE)
Director, Center of Research Translation (CoRT)
University Alabama Birmingham
School of Medicine
Division of Clinical Immunology and Rheumatology
Birmingham, AL

Jeffrey R. Curtis, MD, MS, MPH
Associate Professor of Medicine
Director, Arthritis Clinical Intervention Program (ACIP)
Associate Director, Center for Education and Research on Therapeutics of Musculoskeletal Disorders (CERTS)
University of Alabama School of Medicine
Birmingham, AL

Anne C. Looker, PhD
Senior Research Scientist/Distinguished Consultant
Division of Health and Nutrition Examination Statistics
National Center Health Statistics
Centers for Disease Control and Prevention
Hyattsville, MD

Nichole C. Wright, PhD, MPH
Asst Professor Epidemiologgy
Ryals School for Public Health
University of Alabama
Birmingham, AL

Reviewers

Joan McGowan
Division Director
Division of Musculoskeletal Diseases
National Institute of Arthritis and Musculoskeletal and Skin Diseases
National Institutes of Health
Bethesda, MD

Jeff A. Gehret, DO
Rothman Institute Orthopedics
King of Prussia, PA

Deb Sietsema, PhD, RN
Clinical Research Director
Orthopaedic Associates of Michigan
Grand Rapids, MI

MUSCULOSKELETAL INJURIES:

Primary Author(s)

UNINTENTIONAL, FALLS, AND WORKPLACE

Andrew N. Pollak, MD
Professor of Orthopaedics
Department of Orthopaedics
University of Maryland Medical Center
Baltimore, MD

SPORTS INJURIES

Brett D. Owens, MD
LTC MC USA
Professor, USUHS
John A. Feagin, Jr. Sports Medicine Fellowship
Chief, Orthopaedic Surgery
Keller Army Hospital
West Point, NY

Kenneth L. Cameron, PhD, MPH, ATC
Director, Orthopaedic Research
John A. Feagin, Jr. Sports Medicine Fellowship
Keller Army Hospital
West Point, NY

MILITARY INJURIES

Stephen Marshall, PhD
Professor, Dept of Epidemiology
Director, Injury Prevention Research Center
University of North Carolina at Chapel Hill
Chapel Hill, NC

Michelle Canham-Chervak, PhD, MPH
SMRC Program Manager/Senior Epidemiologist
Injury Prevention Program
Army Institute of Public Health
U.S. Army Public Health Command
Aberdeen Proving Ground, MD

Bruce H. Jones, MD, MPH
Manager, Injury Prevention Program
Injury Prevention Program
Army Institute of Public Health
U.S. Army Public Health Command
Aberdeen Proving Ground, MD

Esther O. Dada, MPH
Epidemiologist
Injury Prevention Program
Army Institute of Public Health
U.S. Army Public Health Command
Aberdeen Proving Ground, MD

Reviewers

David N. Cowan, PhD, MPH
Program Manager
Accession Medical Standards Research
Preventive Medicine Branch
Walter Reed Army Institute of Research
Silver Spring, MD

Deb Sietsema, PhD, RN
Clinical Research Director
Orthopaedic Associates of Michigan
Grand Rapids, MI

Gene Tekmyster, DO
The Orthopaedic & Sports Medicine Center
Trumbull, CT

CHILDREN AND ADOLESCENT MUSCULOSKELETAL CONDITIONS

Primary Author(s)

Scott B. Rosenfeld, MD
Assistant Professor
Department of Orthopedic Surgery
Baylor College of Medicine
Pediatric Orthopedic Surgery and Scoliosis
Texas Children's Hospital
Houston, TX

Aimee O. Hersh, MD
Pediatric Rheumatologist
Salt Lake City, UT

Reviewers

Sharon M. Bout-Tabaku, MD
Nationwide Children's
Columbus, OH

Ellen Raney, MD
Children Orthopaedics
Shriners Hospital for Children
Portland, OR

Richard M. Schwend, MD
Children's Mercy Hospital
Kansas City, MO

Catherine Smrcina, PhD, RN, ONC

Laura L. Tosi, MD
Director
Bone Health Program
Children's National Health System
Washington, District of Columbia

MUSCULOSKELETAL TUMORS

Primary Author(s)

William G. Ward Sr., MD
Chief -Musculoskeletal Service Line
Novant Health, Greater Winston Salem Market
Lead Physician Novant Health Orthopedics & Sports Medicine
Winston Salem, North Carolina 27106
Professor Emeritus, Wake Forest University School of Medicine, Department of Orthopedic Surgery
Former Chief of Orthopedics, Guthrie Clinic, Sayre, Pennsylvania

Robert M. Corey, MD
Saint Louis University
Department of Orthopedic Surgery
> Saint Louis, MO

Reviewer(s)

Matthew G. Cable, MD
Sarcoma Research Fellow
Huntsman Cancer Institute
University of Utah
Salt Lake City, UT

R. Lor Randall, MD, FACS
Director of Sarcoma Services
Huntsman Cancer Institute<
University of Utah
Salt Lake City, UT

ECONOMIC BURDEN

Primary Author(s)

Edward H. Yelin, PhD
Professor of Medicine and Health Policy
Department of Medicine and Institute for Health Policy Studies
University of California - San Francisco, Sch. of Med.
San Francisco, CA

Miriam Cisternas, MA
Owner
MGC Data Services
Carlsbad, CA

Reviewers

David S. Jevsevar, MD MBA
Vice Chair of Orthopaedics
Director, Arthritis Center
Dartmouth-Hitchcock
Lebanon, NH

SEX and GENDER

Primary Author(s)

Kimberly J. Templeton MD
Professor of Orthopaedic Surgery
University of Kansas Medical Center
Kansas City, KS

Reviewers

Amy L. Ladd, MD
Professor of Orthopaedic Surgery
Stanford University Medical Center
Stanford, CA

Janice L. Werbinski, MD
Associate Clinical Professor of ObGyn
Western Michigan University Homer R. Stryker MD School of Medicine
Portage, MI

Project Managers

Toby King, CAE
Executive Director
United States Bone and Joint Initiative
Rosemont, IL

Sylvia I. Watkins-Castillo, PhD
Proprietor
TriIntel Consulting
Sequim, WA

PROOFREADER

Debi Schepers
Chicago, IL

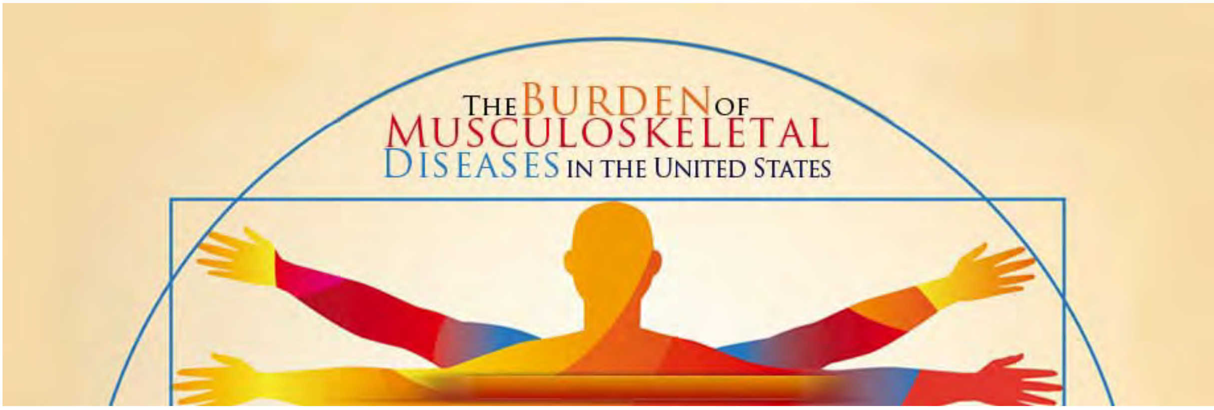
Special Consultants

Joan McGowan, PhD
Division Director
Division of Musculoskeletal Diseases
National Institute of Arthritis and Musculoskeletal and Skin Diseases
National Institutes of Health
Bethesda, MD

Deborah S. Cummins, PhD
Director
Research & Scientific Affairs
American Academy of Orthopaedic Surgeons
Rosemont, IL

Jayson Murray, MA
Manager
Evidence Based Medicine Unit
Research & Scientific Affairs
American Academy of Orthopaedic Surgeons
Rosemont, IL

Ryan Pezold, MA
Research Analyst
Evidence Based Medicine Unit
Research & Scientific Affairs
American Academy of Orthopaedic Surgeons
Rosemont, IL



Published on *BMUS: The Burden of Musculoskeletal Diseases in the United States*

(http://www.boneandjointburden.org)

Musculoskeletal Diseases

And the Burden They Cause in the United States

Musculoskeletal diseases affect more than one out of every two persons in the United States age 18 and over, and nearly three out of four age 65 and over. Trauma, back pain, and arthritis are the three most common musculoskeletal conditions reported, and for which health care visits to physicians' offices, emergency departments, and hospitals occur each year. The rate of musculoskeletal diseases far outstrips that of circulatory diseases and respiratory diseases, which affect about one in three persons, with the majority reporting relatively easily treatable conditions such as chronic hypertension or hay fever and bronchitis.

The cost of treating major musculoskeletal diseases, which often includes long-term pain and disability, is also greater than for treatment of many other common health conditions. Yet research dollars to identify causes, create new treatments, and reduce pain and disability remain much lower than that of other health conditions. With the aging of the US population, musculoskeletal diseases are becoming a greater burden every year. The pages of this site illustrate the magnitude of musculoskeletal diseases on the US population, and provide a small slice of the cost and impact on the US economy.

The Big Picture

Burden of Musculoskeletal Diseases (BMUS)

Lead Author(s):

Stuart I. Weinstein, MD
Edward H. Yelin, PhD

Supporting Author(s):

Sylvia I. Watkins-Castillo, PhD

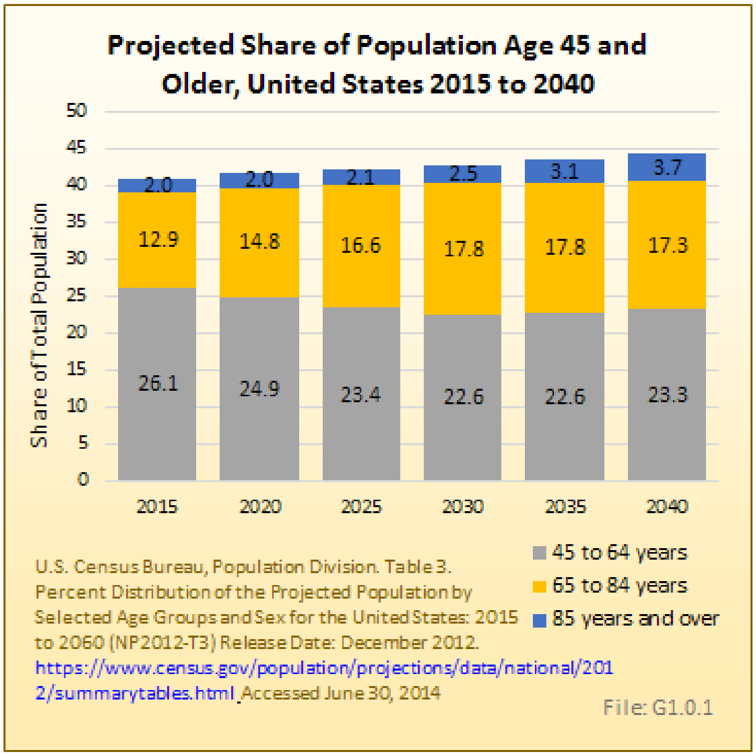
Musculoskeletal conditions are among the most disabling and costly conditions suffered by Americans. In March 2002, President George W. Bush proclaimed the years 2002–2011 as the United States Bone and Joint Decade, providing national recognition to the fact that musculoskeletal disorders and diseases are the leading cause of physical disability in this country.[1,2] At the end of the decade, the multiple associations of health providers treating musculoskeletal diseases realized the work had only begun, and the United States Bone and Joint Initiative (USBJI), a part of the Global Alliance for Musculoskeletal Health, was created.

In December 2012, a study on the Global Burden of Disease and the worldwide impact of all diseases and risk factors (http://www.usbjd.org/projects/project_op.cfm?dirID=348) found musculoskeletal conditions such as arthritis and back pain affect more than 1.7 billion people worldwide, are the second greatest cause of disability, and have the 4th greatest impact on the overall health of the world population when considering both death and disability. Professor Christopher Murray, lead investigator, and the authors of the study underline the need to address the rising numbers of individuals with a range of conditions such as musculoskeletal disorders that largely address disability, not mortality, in the future.[3]

The goal of USBJI is to improve the quality of life for people with musculoskeletal conditions and to advance understanding and treatment of these conditions through research, prevention, and education. The cornerstone of USBJI is the burden of musculoskeletal disease, defined as the incidence and prevalence of musculoskeletal conditions; the resources used to prevent, care, and cure them; and the impact on individuals, families, and society. Direct costs of the burden of musculoskeletal disease include hospital inpatient, hospital emergency and outpatient services, physician outpatient services, other practitioner services, home health care, prescription drugs, nursing home cost, prepayment, and administration and non–health-sector costs. Indirect cost relates to morbidity and mortality, including the value of productivity losses due to disability or premature death due to a disease and the value of lifetime earnings as well as the impact on quality of life.

The current update of *The Burden of Musculoskeletal Conditions in the United States,* ed. 3, (BMUS) which is available in the following pages on this website, provides new, updated numbers to support members engaged in research, education programs, and healthcare policy that will bring about significant advances in the knowledge, diagnosis, and treatment of musculoskeletal conditions, and increase the number of resources at the disposal of the healthcare profession and the public at large.

As the US population continues to age in the next 25 years, musculoskeletal impairments will increase because they are most prevalent in the older segments of the population. By the year 2040, the number of individuals in the United States older than the age of 65 years is projected to grow from the current 15% of the population to 21%. Persons age 85 years and older will double from the current <2% to 4%. Health care services worldwide will be facing severe financial pressures in the next 10 to 20 years due to the escalation in the number of people affected by musculoskeletal diseases. Bone and joint disorders account for more than one-half of all chronic conditions in people older than 50 years of age in developed countries, and are the most common cause of severe, long-term pain and disability.4



1. Weinstein S: 2000–2010: The Bone and Joint Decade. *J Bone Joint Surg Am* 2000;82:1-3.

2. A Proclamation by the President of the United States of America: National Bone and Joint Decade Proclamation: National Bone and Joint Decade, 2002–2011. Office of the Press Secretary, 2002.

3. Global Burden of Diseases, Injuries and Risk Factors Study 2013. *The Lancet*, July 22, 2014. Available at: http://www.thelancet.com/themed/global-burden-of-disease Accessed June 30, 2014.

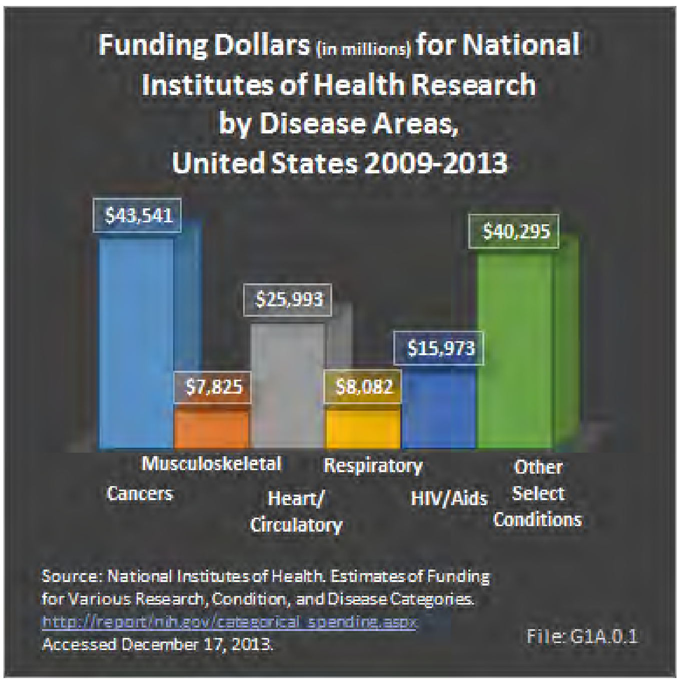
4. The Bone and Joint Decade 2000–2010 for prevention and treatment of musculoskeletal disorders. Lund, Sweden, April 17–18, 1998. Conference proceedings. *Acta Orthop Scand Suppl* 1998;:218:1-86.

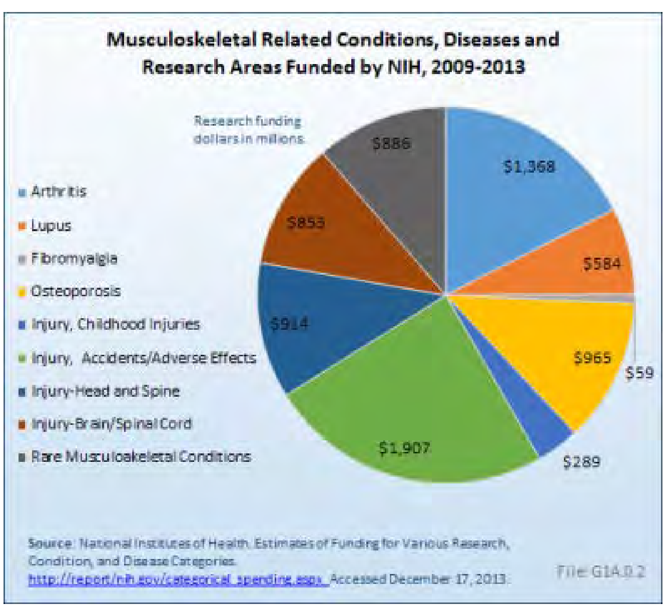
Funding

In spite of the widespread prevalence of musculoskeletal conditions and three of the most costly healthcare conditions—trauma, back pain, and arthritis—being musculoskeletal, musculoskeletal conditions are not among the top ten health conditions receiving research funding,1 primarily due to the low mortality from musculoskeletal conditions in comparison with other health conditions. However, the morbidity cost of musculoskeletal conditions is tremendous because musculoskeletal conditions often restrict activities of daily living, cause lost work days, and are a source of lifelong pain.

In 1998, the Institute of Medicine wrote “In setting national priorities NIH should strengthen its analysis in the use of health data, such as burdens of disease, and of data on the impact of research and the health of the public."2 National health data in several countries show that musculoskeletal conditions rank among the top health concerns for citizens in the United States and worldwide. By current US estimates, more than 50% of the disabling conditions reported by of persons age 18 years and older are related to musculoskeletal disorders, yet research funding to alleviate these major health conditions remains substantially below that of other major health conditions such as cancer and respiratory and circulatory (eg, heart) diseases. (Reference Table 1.5.1 PDF CSV)

The National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) was formed in 1987. In subsequent years, research funding for these conditions has declined in relative terms, and since 2000, less than 2% of the annual National Institutes of Health (NIH) budget has been appropriated to musculoskeletal disease research. In fact, the annual average rate of funding continues to decline. Over the last five years (2009 to 2013), funding for musculoskeletal conditions from NIH totaled $7.8 billion, while that of cancers and heart/circulatory disorders totaled $43.5 billion and $25.9 billion, respectively. (Reference Table 1.1.1 PDF CSV, and Table 1.1.2 PDF CSV)





In spite of the major health care burden presented by musculoskeletal conditions, research funding falls well below that of most other conditions. Injury research commands half of the musculoskeletal condition research dollars ($4 billion) from NIH for the years 2009 to 2013. Funding for arthritis research is second, at $1.4 billion, followed by osteoporosis ($965 million). These numbers are well below the $8.6 to $55.2 billion in funding for the top 25 NIH research areas. (Reference Table 1.1.3 PDF CSV)

Since 1998, NIAMS has received 2.2% of research project grants, with funding at less than 2% of total grant dollars. Career development awards during this period have risen from 2.9% in 1998 to 4.5% in 2013. (Reference table 1.1.4 PDF CSV)

"Time and again, when the global burdens of disease are enumerated, musculoskeletal conditions rank high. Now we see that that rank is increasing. Although research funding reflects a long-term bias towards diseases with high mortality rates, the Global Burden of Disease project indicates that much of the growth in disease burdens has occurred for conditions that cause high disability rates. Redressing the funding disparity should become a high priority," (Edward H. Yelin, PhD, MCP, co-chair, BMUS3)

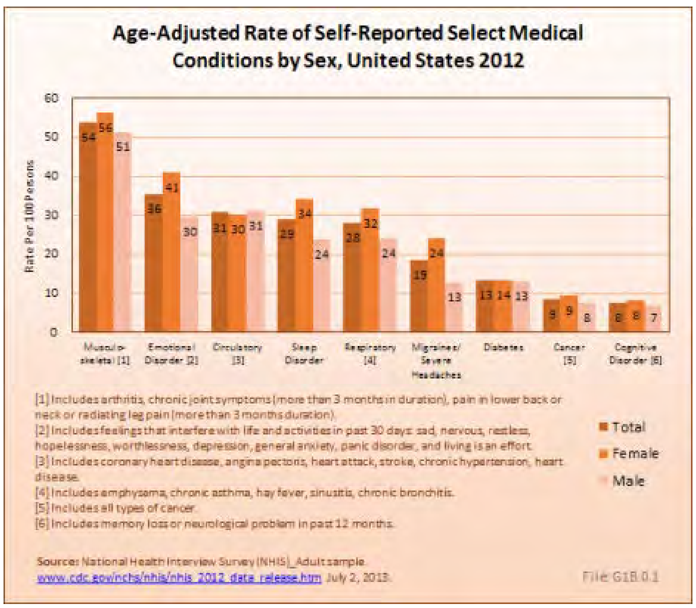
Although musculoskeletal conditions are common, disabling, and costly, they remain under-recognized, under-appreciated, and under-resourced. This book provides a strong case for the immediate and ongoing need to understand and support musculoskeletal conditions and reduce the burden it brings to our people.

1. Michaud CM, Murray CJL, Bloom BR: Burden of disease: Implications for future research. *JAMA* 2001;285:535-539.

2. Committee on the NIH Research Priority-Setting Process; Institute of Medicine: *Scientific Opportunities and Public Needs: Improving Setting and Public Input.* Washington, DC, National Academies Press, 1998.

Prevalence of Select Medical Conditions

In the National Health Interview Survey (NHIS) in 2012, musculoskeletal medical conditions were reported by 126.6 million adults in the United States, representing more than one in two persons age 18 and over of the estimated 2012 population. The rate of chronic musculoskeletal conditions found in the adult population is 76% greater than that of chronic circulatory conditions, which include coronary and heart conditions, and nearly twice that of all chronic respiratory conditions. On an age-adjusted basis, musculoskeletal conditions are reported by 54 persons per every 100 in the population. This compares to a rate of 31 and 28 persons per every 100 in the population for circulatory and respiratory conditions, respectively. The NHIS annual survey of self-reported health conditions is used throughout this chapter to highlight chronic health conditions of the US population. (Reference Table 1.2.1 PDF CSV)



On an age-adjusted basis, females report a higher rate of occurrence than males for most major medical conditions. Among females, 56 out of every 100 females in the population report musculoskeletal conditions; among males the rate is only slightly lower at 51 per 100, a slight increase in recent years. (Reference Table 1.2.1 PDF CSV)

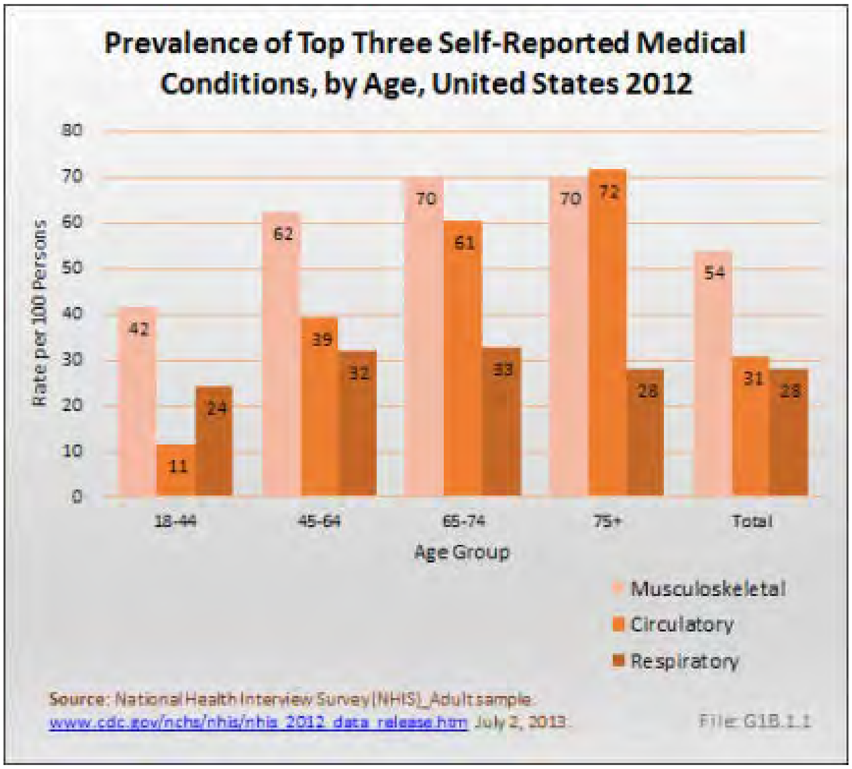
Musculoskeletal conditions are found among all age groups, with the proportion of persons reporting these conditions increasing with age. Musculoskeletal conditions are reported by nearly three of four (70%) persons age 65 years and over. This compares to the 61% of persons age 65 to 74 years, and only slightly less than the 72% of those aged 75 years and older, reporting circulatory conditions, the majority of whom report chronic hypertension. (Reference Table 1.2.2 PDF CSV and Table 1.3.2 PDF CSV)

Musculoskeletal conditions were reported at a higher rate among whites and persons of mixed or other races, with 56 and 57 persons, respectively, in every 100 person in the population reporting a musculoskeletal condition. Among persons of the black/African American race, 48 in 100 reported a musculoskeletal condition. Persons of Asian descent reported the lowest level of musculoskeletal conditions, at a rate of 40 persons in every 100 persons in the population. (Reference Table 1.2.3 PDF CSV) The rate of musculoskeletal conditions among black/African Americans and those of Asian descent increased by several percentage points from those reported in 2008.1

1. *The Burden of Musculoskeletal Diseases in the United States*, Second Edition, American Academy of Orthopaedic Surgeons, Rosemont, IL. 2008

Musculoskeletal, Circulatory, and Respiratory Conditions: Prevalence

On an age-adjusted basis, musculoskeletal conditions are reported equally or more frequently than other common chronic or serious medical conditions related to the circulatory or respiratory systems by persons age 18 and older. Three of the four most common medical conditions reported in 2012 were musculoskeletal conditions: low back pain, chronic joint pain, and arthritis. The other most commonly reported medical condition is chronic hypertension. (Reference Table 1.3.1 PDF CSV)

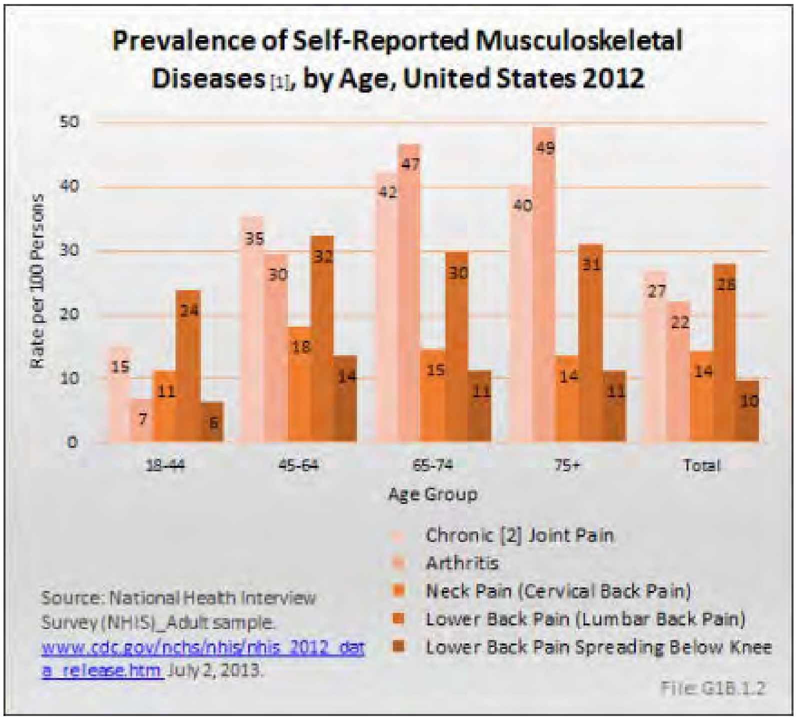


Nearly 66 million adults reported low back pain, the most frequently reported musculoskeletal condition, with an age-adjusted rate of 28 in 100 persons age 18 or older reporting this condition. Among persons reporting low back pain, nearly 23 million, or more than one-third, also reported pain radiating down the leg below the knee. Cervical/neck pain is also a commonly reported musculoskeletal disease, reported by 33.5 million adults in 2012.

In recent years, chronic joint pain, defined as joint pain lasting three months or longer, has approached the level of low back pain as a common musculoskeletal condition. Chronic joint pain, was reported by 63.1 million adults age 18 and older (27 of 100 persons), while 51.8 million (22 in 100) reported having been diagnosed with arthritis. Chronic joint pain and arthritis are not mutually exclusive and may be reported by the same individual. Although age is a general predictor of chronic joint pain and arthritis, with more than 4 in 10 persons age 65 years and older reporting one or both of these conditions, the rate of reported chronic joint pain in younger persons is rapidly increasing. In 2012, nearly one in five persons age 18 to 44 reported they experienced chronic joint pain, while one-third (35%) age 45 to 64 reported chronic joint pain. Active lifestyles will continue to be a major cause of joint pain in the coming years. (Reference Table 1.3.2 PDF CSV)

Chronic hypertension, defined as hypertension diagnosed at two or more physician visits, is the only other medical condition that approaches the rate of chronic musculoskeletal conditions. Among adults age 18 and older, 59.8 million persons reported chronic hypertension in 2012, an age-adjusted rate of 25 in 100 persons. Coronary or heart conditions, which increase with age, were reported by 26.6 million, a rate of 11 per 100 persons. Chronic respiratory ailments, while common, are reported in significantly lower numbers, with sinusitis, reported by 28.5 million (12 per 100) persons, the most common condition.

Sex is a greater predictor of chronic musculoskeletal and respiratory conditions than of chronic circulatory conditions. Among all musculoskeletal and respiratory conditions, females are more likely to report a specific condition than are males. Similar proportions of males and females reported chronic circulatory conditions in 2012. (Reference Table 1.3.1 PDF CSV)



Chronic circulatory and respiratory conditions do not show the racial variation seen in musculoskeletal conditions, with the exception of the Asian population reporting nearly all conditions at lower rates than other races. Musculoskeletal conditions, overall, are reported in higher proportions by persons of the white race than by persons of the black/African American or Asia races. Persons of other or mixed race as well as persons of white race report slightly higher rates of musculoskeletal conditions that those of the black/African American and Asian race. Chronic hypertension is highest among those of black/African American races. (Reference Table 1.3.3 PDF CSV)

Chronic Joint Pain: Prevalence

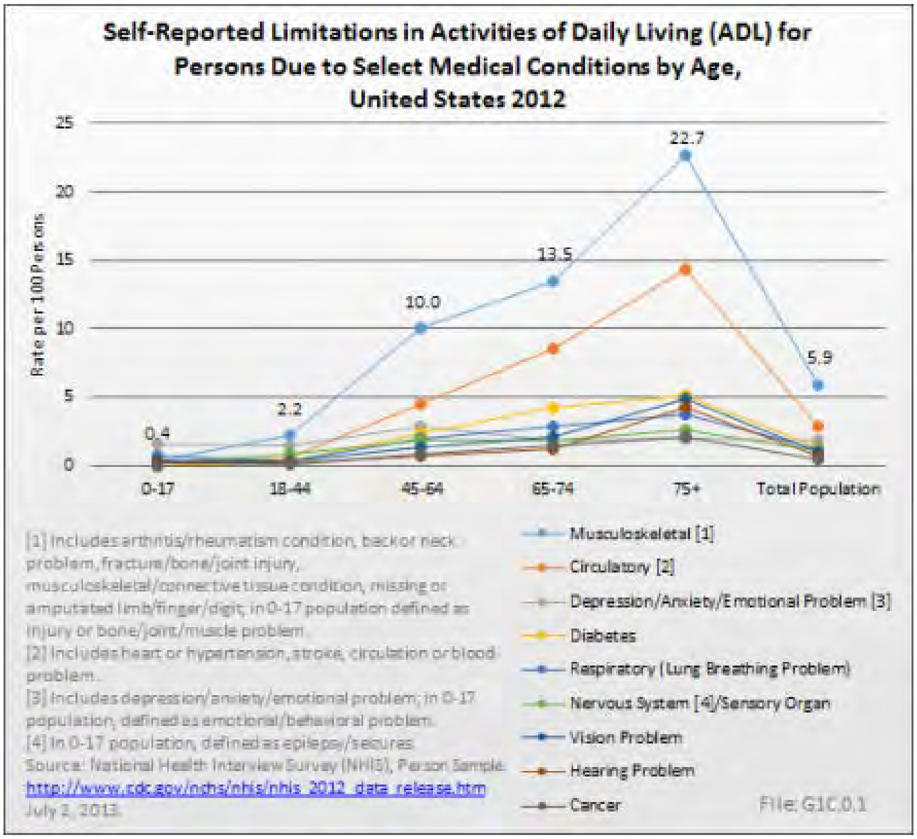
Chronic joint pain increases with age, but peaks in the 65- to 74-year age group. Among the 63.1 million persons reporting chronic joint pain in 2012, knee pain is the most frequently cited, with 40 million people reporting knee pain. Chronic knee pain is reported by all ages older than 18 years, with more than one in four aged 65 and older reporting knee pain. Shoulder pain, reported by 18.7 million of those age 18 and older, is the second most common joint for chronic pain, with rates fairly equal for those age 45 and older. Hip pain was reported by 15.3 million persons age 18 and older.

While multiple joints can be the source of chronic joint pain, overall, one in four people over the age of 18 report chronic joint pain. The ratio jumps to more than two in five after the age of 65 years. However, even among younger adults age 18 to 44, about one in six report chronic joint pain. (Reference Table 1.4.2 PDF CSV)

Females report higher rates of chronic joint pain than do males, with the exception of shoulder pain. Race is not a variable in the rate of chronic joint pain, with the exception of those of Asian race, who report lower joint pain rates than other racial groups. (Reference Table 1.4.1 PDF CSV and Table 1.4.3 PDF CSV

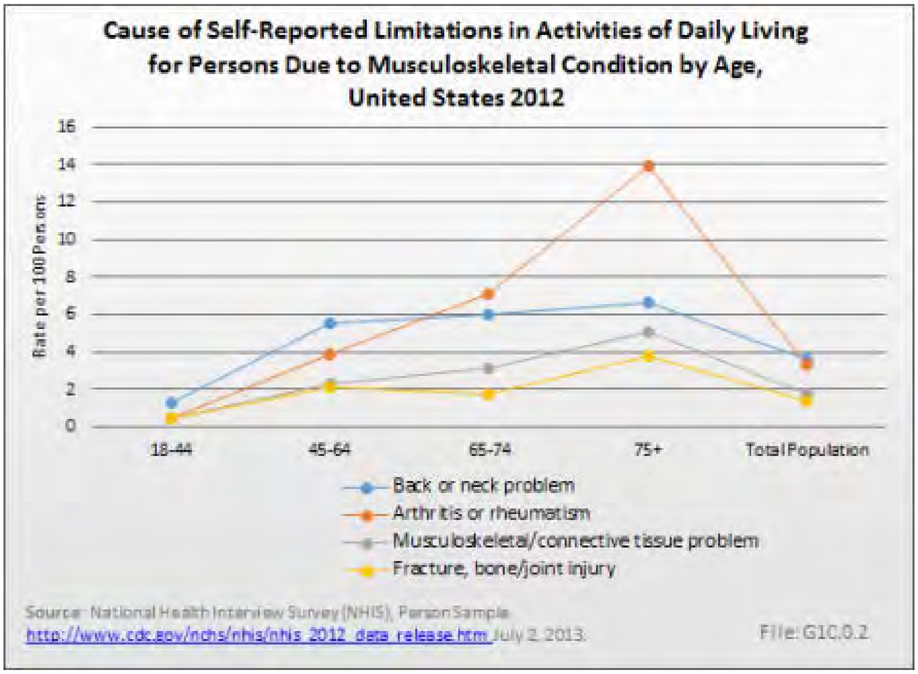
Activity Limitation Due to Select Medical Conditions

Participants in the 2012 NHIS survey were asked about limitations they experience in activities of daily living (ADL) because of medical conditions. More than 34.5 million adults age 18 years and older, or 13% of the population, report they have difficulty performing routine ADL without assistance because of medical conditions. An additional 6.3 million children between the ages of 1 and 17 years are reported by their parents as needing more assistance in daily activities than would be expected for their age because of to a medical condition. While more than one medical condition could be reported, and often was, approximately one-half of both adults and children with ADL had a musculoskeletal condition that limits their activities. As the population ages, the prevalence rate in the population reporting limitations in ADL increases, and approaches one in four persons older than 75 years of age. (Reference Table 1.5.2 PDF CSV)



Back and neck problems are the most common musculoskeletal condition to cause limitations in ADL. However, as the population ages, arthritis or rheumatism is a more common cause. The mean years of duration reported for all musculoskeletal conditions is 12 to 17 years. Although there is an increase in years of duration as the population ages, even among young adults age 18 to 44, the duration of musculoskeletal conditions causing limitations is 8 to 10 years. (Reference Table 1.6.2 PDF CSV)

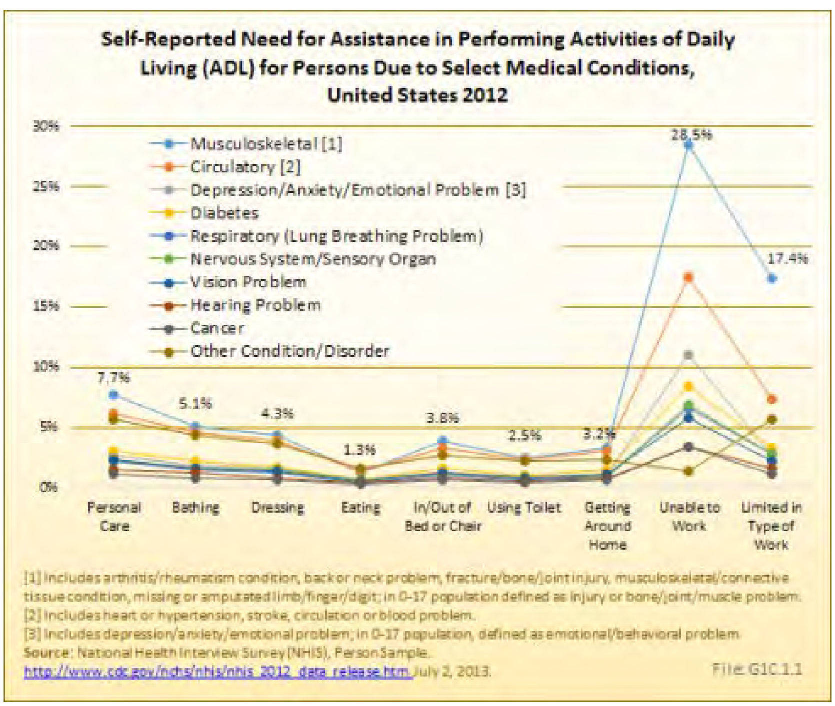
Reflecting the overall prevalence of medical conditions in females, they are also more likely to report impairment in ADL than are males. This is particularly true for musculoskeletal conditions. Females account for 52% of all persons reporting they are limited in activities of daily living; they account for 59% of those reporting a musculoskeletal condition impairment. Two of three adults age 18 and older (67%) reporting arthritis as a cause for ADL limitations are female, while 72% report connective tissue problems, including fibromyalgia, as the cause. (Reference Table 1.5.1 PDF CSV and Table 1.6.1 PDF CSV)



Members of the white and black/African American populations report limitations because of medical conditions in approximately the same proportions. Members of the Asian population are significantly less likely to report ADL limitations because of a medical condition. Members of other or mixed race are slightly more likely to report a limitation than found in other races. (Reference Table 1.5.3 PDF CSV and Table 1.6.3 PDF CSV)

ADL Unable to Perform: Activity Limitations

While most major medical conditions have a higher proportion of persons age 18 years and older who are unable to perform ADL or to work, the much higher incidence of musculoskeletal conditions results in the highest limitation rates. For example, 60% of persons with a circulatory condition report they are unable to work because of the condition, while 48% of persons with a musculoskeletal condition report this. However, the rate per 1,000 persons in the general population unable to work is 28.5 for a musculoskeletal condition, compared to 17.4 for persons with a circulatory condition. (Reference Table 1.7 PDF CSV)



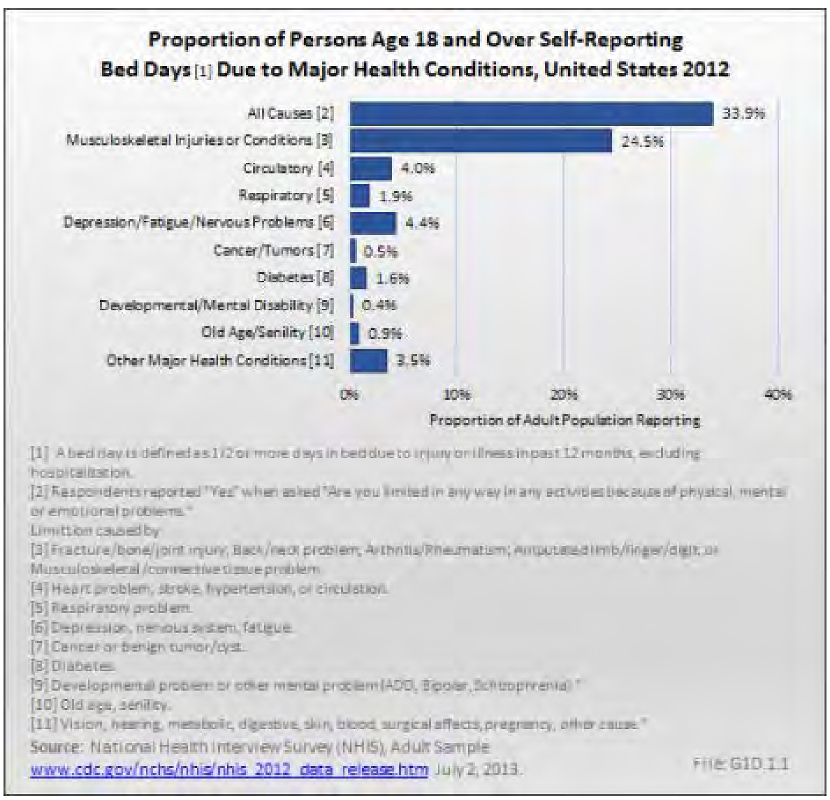
Lost Work Days and Bed Days

Respondents to the 2012 NHIS self-reported the number of bed days and lost work days they experienced in the previous 12 months due to a variety of medical conditions. A bed day is defined as one-half or more days in bed because of injury or illness in past 12 months, excluding hospitalization. A missed, or lost, work day is defined as absence from work because of illness or injury in the past 12 months, excluding maternity or family leave.

Although the exact cause of these bed and lost work days cannot be determined because some respondents reported multiple health conditions, 70% of persons reporting bed and lost work days reported having a musculoskeletal condition. This is more than twice the proportion reporting depression, the second most common medical condition listed for causing lost work days, and five or more times the proportion for other major health conditions. Overall, the high proportion of workers reporting lost work days or bed days as a result of a musculoskeletal condition results in an economic burden on the economy—much higher than that reported for chronic circulatory or chronic respiratory conditions. (Reference Table 1.8.3 PDF CSV)

Bed Days: Lost Days

More than one in three persons (34%) reported at least one bed day in the previous 12 months because of a medical condition. One in four (24.5%) reported having a musculoskeletal condition, six times the rate reported for depression and circulatory conditions, the second and third most common conditions reported.



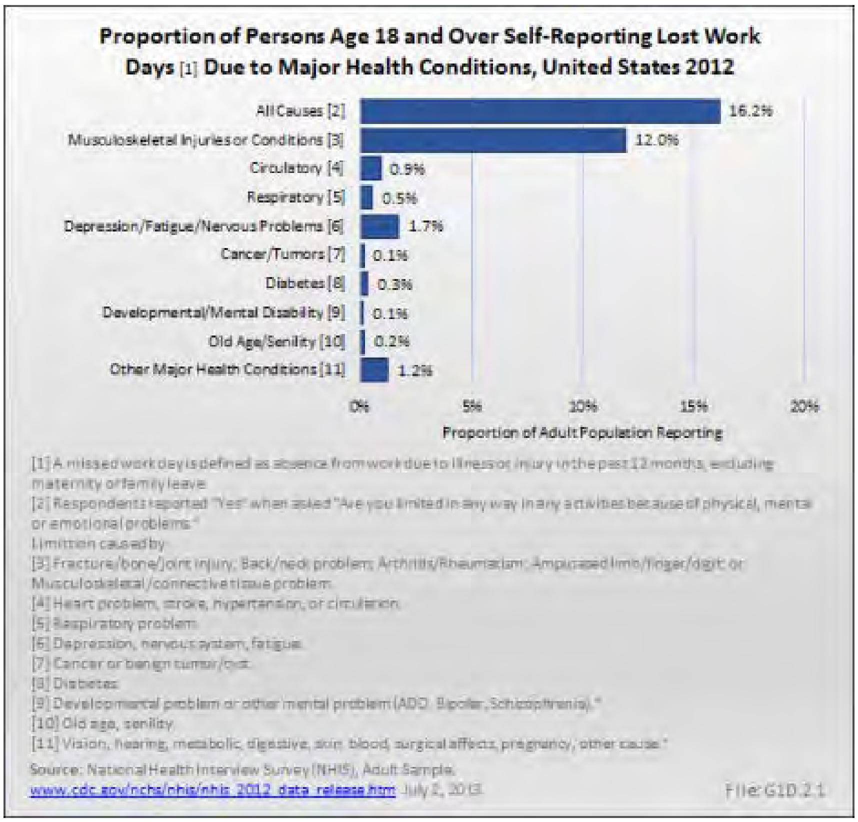
The average number of bed days reported by persons with musculoskeletal conditions was 9, for a total of more than 752 million bed days among persons with these conditions. Although the average number of bed days reported for other major health conditions was greater than for musculoskeletal conditions, the much higher proportion of the population with bed days because of musculoskeletal conditions resulted in the much higher number of total days. (Reference Table 1.8.1 PDF CSV and Table 1.8.3 PDF CSV)

Females and persons age 45 to 64 report higher rates of bed days because of musculoskeletal conditions than do males and adults age 18 to 44 or over 65. (Reference Table 1.8.4 PDF CSV and Table 1.8.5 PDF CSV)

Lost Work Days: Lost Days

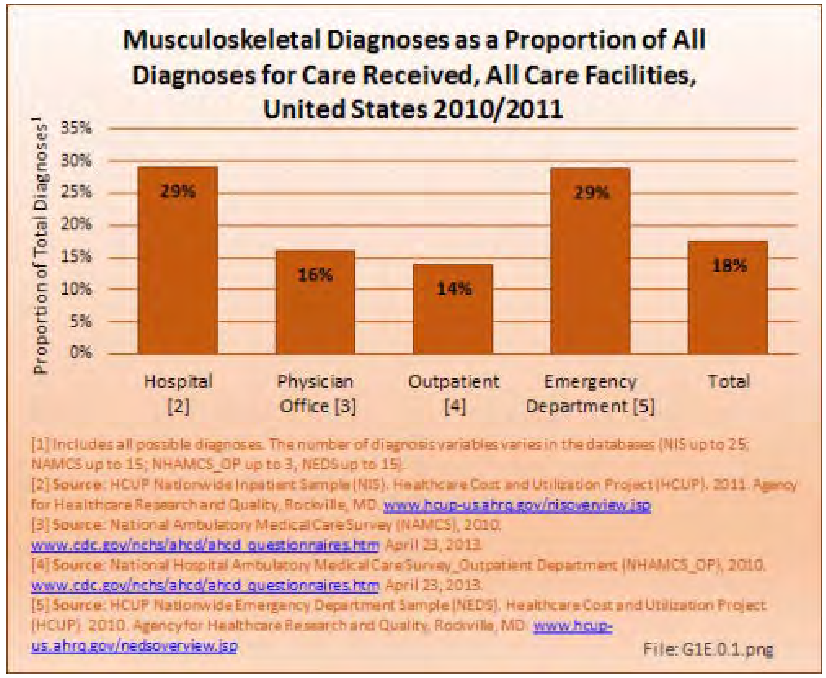
Twenty-eight million persons with a musculoskeletal condition, or roughly one in eight people in the prime working ages between 18 and 64 in the United States in 2012, reported lost work days in the previous 12 months, totaling more than 216 million days. Lost work days for persons with a musculoskeletal conditions accounted for more than four times as many days as the second highest condition, which was depression. Chronic circulatory conditions, including high blood pressure and heart conditions, accounted for 32.3 million lost work days, and were reported by only 1% of the working age population. Chronic respiratory conditions accounted for 16.5 million lost work days. On average, workers lost nearly 8 days in a 12-month period because of musculoskeletal conditions. Workers lost an average of 15 days because of circulatory conditions, but with a much smaller prevalence than musculoskeletal conditions. (Reference Table 1.8.2 PDF CSV, and Table 1.8.3 PDF CSV)

As with bed days, females and persons age 45 to 64 report higher rates of lost work days because of musculoskeletal conditions than do males and adults age 18 to 44 or over 65. (Reference Table 1.8.4 PDF CSV, and Table 1.8.5 PDF CSV)



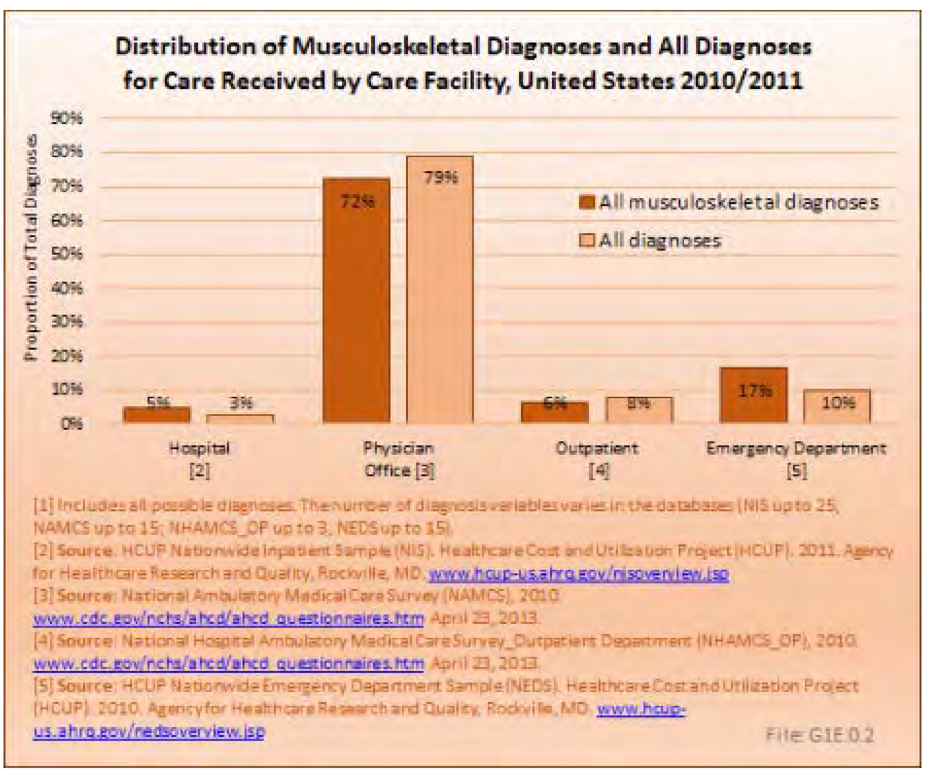
Musculoskeletal Diagnoses

Musculoskeletal diagnoses accounted for 18%, or 223.6 million, of the 1.3 billion medical diagnoses, included in hospital discharge records, emergency department and outpatient clinic visits, and physician office visits in the United States in 2010 and 2011. (Reference Table 1.10.1 PDF CSV and Table 1.10.2 PDF CSV)



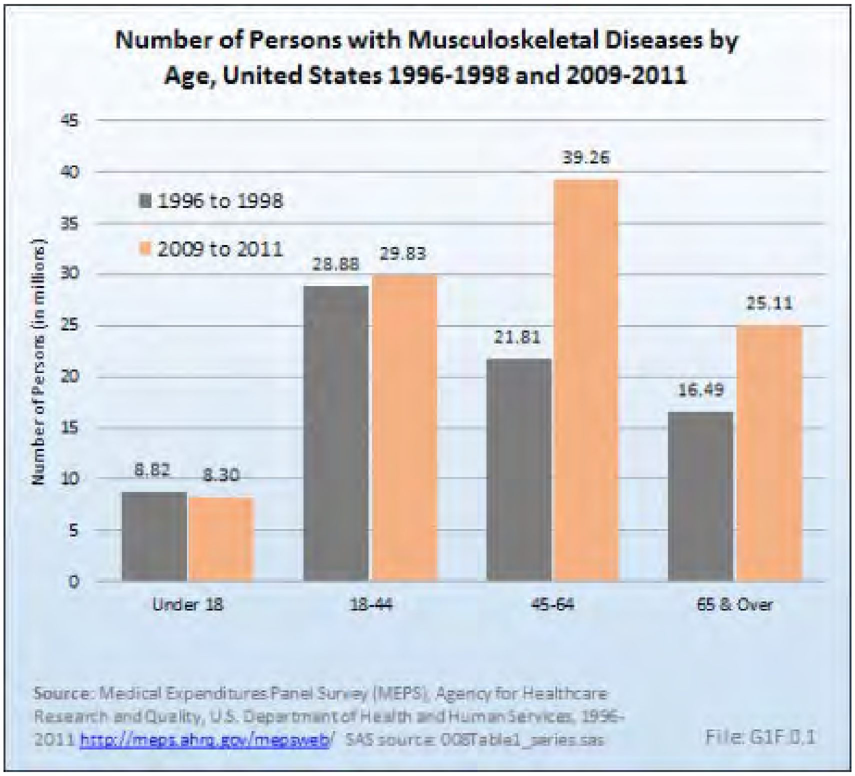
On average, each person in the United States received medical care for four diagnoses over the year, or 4,128 diagnoses per a population of 1,000. Of these, 723 diagnoses were for musculoskeletal conditions. The most common musculoskeletal diagnoses are "other and unspecified disorders of the back" and "other and unspecified disorders of joints," with 127.2 and 86.6 diagnoses per 1,000 persons, respectively. (Reference Table 1.10.3 PDF CSV)

The majority of all diagnoses and musculoskeletal diagnoses are made in a physician office. However, hospital discharges and emergency department visits are seen more frequently for musculoskeletal conditions than for health care visits for all conditions overall. (Reference Table 1.10.2 PDF CSV)



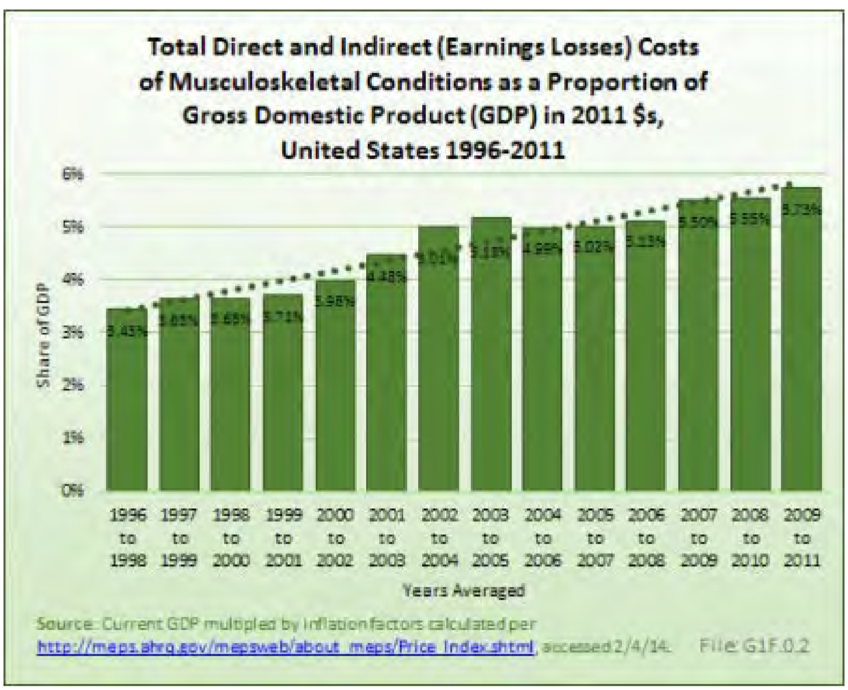
Health Care Utilization and Economic Cost

The annual average proportion of the US population with a musculoskeletal condition requiring medical care has increased by more than five percentage points over the past decade and now constitutes more than 33% of the population. This is an overall rate of increase of 19%. The majority of growth in both the proportion of the population, and in the number of people, with a musculoskeletal condition is in the 45 to 64-year age bracket, with persons age 65 years and older with musculoskeletal conditions also rising. (Reference Table 10.1 PDF CSV and Table 10.1.1 PDF CSV)



The annual estimated direct and indirect cost attributable to persons with a musculoskeletal disease is $213 billion. Taking into account all costs for persons with a musculoskeletal disease including other comorbid conditions, the cost of treating these individuals and the cost to society in the form of decreased wages is estimated to currently be nearly $874 billion per year. Over the last 15 years, costs associated with musculoskeletal conditions have risen from 3.43% of the GDP to 5.73%. (Reference Table 10.10 PDF CSV and Table 10.14 PDF CSV)

Treatments that mitigate the long-term impacts of musculoskeletal conditions and return persons to full and active lives are needed.



Direct Costs: Economic Cost

The increasing prevalence of musculoskeletal conditions, along with a growing and aging population, has resulted in more than a 50% increase in total aggregate direct cost to treat persons with a musculoskeletal condition over the past decade, in constant 2011 dollars. For the years between 2009 and 2011, the annual average direct cost in 2011 dollars for musculoskeletal health care—both as a direct result of a musculoskeletal disease and for patients with a musculoskeletal disease in addition to other health issues—is estimated to be $796.3 billion, the equivalent of 5.2% of the national gross domestic product (GDP).

Total medical care costs are the costs for all of an individual's conditions, including musculoskeletal conditions. Incremental medical care costs are that part of total medical care costs attributable solely to the musculoskeletal conditions. Incremental medical costs for musculoskeletal conditions for the years between 2009 and 2011 are estimated to be $212.7 billion, in 2011 dollars. (Reference Table 10.6 PDF CSV, and Table 10.14 PDF CSV)

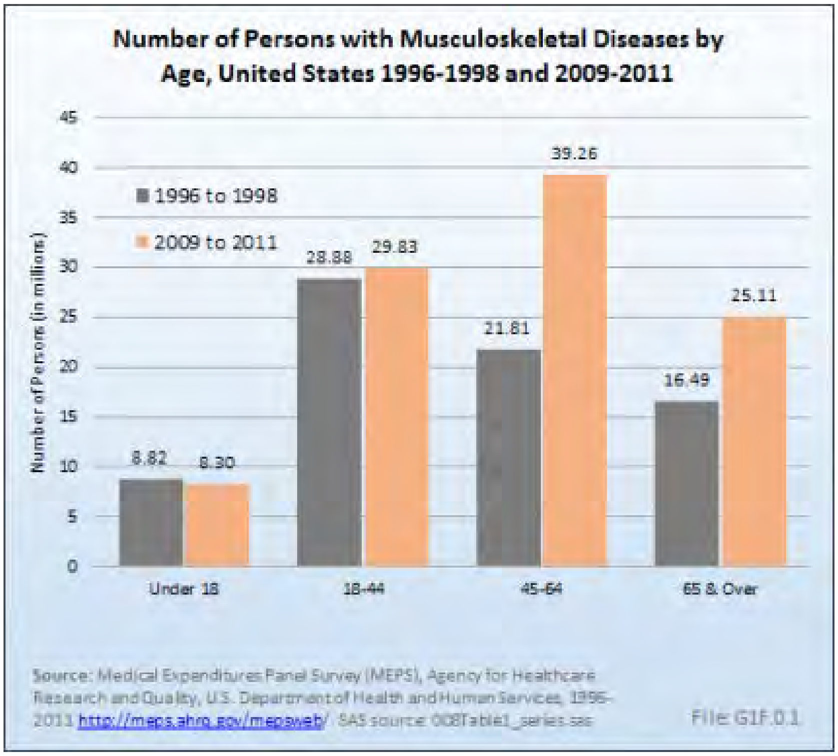
Indirect Costs: Economic Cost

Indirect costs measure disease impact in terms of lost wages due to disability or death. Indirect costs, like medical care costs, can be estimated and calculated in total for all the medical conditions an individual has, and as the increment attributable solely to musculoskeletal conditions.

Indirect cost for persons age 18 to 64 with a work history add another $77.5 billion, or 0.5% of the GDP in between 2009 and 2011, to the cost for all persons with a musculoskeletal disease, either treated as a primary condition or in addition to another condition. Annual indirect costs attributable to musculoskeletal disease alone (incremental cost) account for an estimated $130.7 billion. Indirect costs attributable to musculoskeletal disease are greater than total indirect costs because of a 4% gap in the probability of working between persons with and without a musculoskeletal condition and a lower mean income. (Reference Table 10.12 PDF CSV)

Impacts of Aging

The importance of musculoskeletal conditions in society necessarily increases with an aging population since the prevalence and impact increase with age. An aging population puts increased numbers of persons in the age range of greatest risk for onset and worsened severity. However, it is not only among the elderly, or persons age 65 or older, that the impacts of aging are felt. Because the prevalence of musculoskeletal conditions is substantial among those 45 to 64 years of age, the proportion of all cases of musculoskeletal disease in this age range increased by one-third over a 15-year time frame, from about 29% (21.8 million persons) in between 1996 and 1998 to about 38% (39.3 million persons) between 2009 and 2011. During the same time periods, the proportion of cases among the elderly increased by 13%, from about 22% (16.5 million persons) in the earlier three-year period to about 25% (25.1 million persons) in the later one. (Reference Table 10.1 PDF CSV and Table 10.1.1 PDF CSV) Because conditions that exist among persons age 45 to 64 are likely to last for a long time, the increased proportion of cases in this age range may lead to protracted high medical care costs in the years to come.



The relative importance of this age range in costs of care is already clear. Between 1996 and 1998 and 2009 and 2011, the proportion of all medical care costs experienced by persons with musculoskeletal conditions who are 45-64 increased by 40%, from about 30% of all such costs to 42%. The proportion of incremental musculoskeletal medical care costs among persons 45 to 64 years of age increased by an even more, 67%, rising from 28% in the 1996 to 1998 period to 47% between 2009 and 2011. (Reference Table 10.9 PDF CSV

Key Challenges To Future

The aging of the US population puts an increased proportion of the population at the ages of highest risk of the onset of musculoskeletal conditions and, among those with these conditions, at the ages of highest severity levels. The problem of aging is made more severe by the fact that many major chronic diseases are more prevalent in late middle age and among the elderly. In fact, most of the latter group has two or more chronic diseases. The impact of comorbidity is reflected in the cost data presented in this volume. Not only are the incremental costs, that is, those attributable to the musculoskeletal conditions, high among those age 45 and older, but the total medical costs they experience are also higher in these age ranges. The problems of an aging population are exacerbated by the co-occurrence of multiple chronic diseases. (Reference Table 10.9 PDF CSV).

Unmet Needs

The increased prevalence of musculoskeletal conditions associated with the aging population will necessarily place increased demands on the health care system. However, the growth in the health manpower pool is not keeping pace with the growing prevalence of musculoskeletal conditions. In fact, two medical specialties focused on the care of persons with these diseases, rheumatology and geriatrics, are having a difficult time recruiting new physicians because they are not among the most highly remunerated specialties.

It is also the case, as documented in Section I.A.O: Funding above, that research funding for musculoskeletal conditions, relatively small to begin with, is not keeping up with the growing importance of this disease group. Prior research has led to dramatically improved treatments for inflammatory conditions, such as rheumatoid arthritis (principally because of the development of biological treatments) and to mechanical ones such as osteoarthritis (principally because of the improvement in total joint replacement rates). However, in order to deal with the increased numbers of patients associated with the aging population, research funding must be expanded in sheer dollars and in scope to encompass the cause, treatment, and organization of care.

Summary and Conclusions

More than one in two persons age 18 years and older in the US population reports a chronic musculoskeletal condition. This compares to a rate of 31 and 28 persons per every 100 in the population for circulatory (including treatment for high blood pressure) and respiratory conditions, respectively.

Chronic low back pain, joint pain, and disability from arthritis comprise three of the top four most commonly reported medical conditions. The fourth common condition is chronic hypertension. All four conditions were reported by 60 million or more persons in 2012. This compares to less than 30 million with other common conditions such as coronary or respiratory conditions. The number of persons suffering from musculoskeletal conditions is expected to continue to increase as once active individuals move into their older years.

The cost to treat the pain and disability resulting from musculoskeletal diseases is rising rapidly. The annual average direct and indirect (because of lost work) costs attributable to persons with a musculoskeletal disease were $213 billion between 2009 and 2011. Over the last 15 years, costs associated with musculoskeletal conditions have risen from 3.43% of the GDP to 5.73%.

In spite of this, research funding for musculoskeletal-related conditions remains substantially below that of other major health conditions, such as cancer and respiratory and circulatory diseases. If health care costs in the future are to be contained, musculoskeletal diseases must come to the forefront of research.

ICD-9-CM Codes for Musculoskeletal Diseases

135 : Sarcoidosis
170 : Malignant neoplasm of bone and articular cartilage
171 : Malignant neoplasm of connective and other soft tissue
198 : Secondary malignant neoplasm of bone and bone marrow
203 : Multiple myeloma and immunoproliferative neoplasms
213 : Benign neoplasm of bone and articular cartilage
215 : Other benign neoplasm of connective and other soft tissue
238 : Neoplasm of uncertain behavior of other and unspecified sites and tissues; Connective and other soft tissue; Bone soft tissue and skin
239.2 : Neoplasms of unspecified nature; Bone soft tissue and skin
274 : Gout; Gouty arthroplathy
354 : Mononeuritis of upper limb and mononeuritis multiplex
710 : Diffuse diseases of connective tissue
711 : Arthropathy associated with infections
712 : Crystal arthropathies
713 : Arthropathy associated with other disorders classified elsewhere
714 : Rheumatoid arthritis and other inflammatory polyarthropathies

715 : Osteoarthrosis and allied disorders
716 : Other and unspecified arthroplasties
717 : Internal derangement of knee
718 : Other derangement of joint
719 : Other and unspecified disorders of joint
720 : Ankylosing spondylitis and other inflammatory spondylopathies
721 : Spondylosis and allied disorders
722 : Intervertebral disc disorders
723 : Other disorder of cervical region
724 : Other and unspecified disorders of back
725 : Polymyalgia rheumatica
726 : Peripheral enthesopathies and allied syndromes
727 : Synovitis and tenosynovitis
728 : Disorders of muscle, ligament, and fascia
729 : Other disorders of soft tissue
730 : Acute osteomyelitis
731 : Osteitis deformans and osteopathies associated with other disorders classified elsewhere
732 : Osteochondropathies
733 : Other disorders of bone and cartilage (Osteoporosis; pathologic fracture, cyst, necrosis of bone, malunion and nonunion of fracture)
734 : Flat foot
735 : Acquired deformities of toe
736 : Acquired deformities of forearm
737 : Curvature of spine
738 : Other acquired deformity (of musculoskeletal system), spondylolisthesis
739 : Nonallopathic lesions, not elsewhere classified
741 : Spina bifida
754 : Certain congenital musculoskeletal deformities
755 : Other congenital anomalies of limbs (Polydactyly)
756 : Other congenital musculoskeletal anomalies
805 : Fracture of vertebral column without mention of spinal cord injury
806 : Fracture of vertebral column with mention of spinal cord injury
807 : Fracture of vertebral column with mention of spinal cord injury
808 : Fracture of pelvis (Acetabulum, closed)
809 : Ill-defined fractures of bones and trunk
810 : Fracture of clavicle (closed)
811 : Fracture of scapula (closed)
812 : Fracture of humerus (Upper end, closed)
813 : Fracture of radius and ulna (Upper end, closed)
814 : Fracture of carpal bone(s) (Closed)
815 : Fracture of metacarpal bone(s) (Closed)
816 : Fracture of one or more phalanges of hand (Closed)
817 : Multiple fractures of hand bones
818 : Ill-defined fractures of upper limb
819 : Multiple fractures involving both upper limbs, and upper limb with rib(s) and sternum

820 : Fracture of neck of femur (transcervical fracture, closed)
821 : Fracture of other and unspecified parts of femur (Shaft or unspecified part, closed)
822 : Fracture of patella
823 : Fracture of tibia and fibula, upper end (closed)
824 : Fracture of ankle
825 : Fracture of one or more tarsal and metatarsal bones
826 : Fracture of one or more phalanges of foot
827 : Other, multiple, and ill-defined fractures of lower limb
829 : Fractures of unspecified bones
831 : Dislocation of shoulder
832 : Dislocation of elbow
833 : Dislocation of wrist
834 : Dislocation of finger
835 : Dislocation of hip
836 : Dislocation of knee
837 : Dislocation of ankle
838 : Dislocation of foot
839 : Other, multiple, and ill-defined dislocations
840 : Sprains and strains of shoulder and upper arm
841 : Sprains and strains of elbow and forearm
842 : Sprains and strains of wrist and hand
843 : Sprains and strains of hip and thigh
844 : Sprains and strains of knee and leg
845 : Sprains and strains of ankle and foot
846 : Sprains and strains of sacroiliac region
847 : Sprains and strains of other and unspecified parts of back
848 : Other and ill-defined sprains and strains
875 : Open wound of chest (wall)
876 : Open wound of back
877 : Open wound of buttock
879 : Open wound of other and unspecified sites (except limbs)
880 : Open wound of shoulder and upper arm
881 : Open wound of elbow, forearm, and wrist
882 : Open wound of hand except finger(s) alone
883 : Open wound of finger(s)
884 : Multiple and unspecified open wound of upper limb
885 : Traumatic amputation of thumb
886 : Traumatic amputation of other finger(s)
887 : Traumatic amputation of arm and hand (complete) (partial)
890 : Open wound of hip and thigh
891 : Open wound of knee, leg [except thigh], and ankle
892 : Open wound of foot except toe(s) alone
893 : Open wound of toe(s)
894 : Multiple and unspecified open wound of lower limb
895 : Traumatic amputation of toe(s)

896 : Traumatic amputation of foot (complete) (partial)
897 : Traumatic amputation of leg(s) (complete) (partial)
922 : Contusion of trunk
923 : Contusion of upper limb
924 : Contusion of lower limb and of other and unspecified sites
926 : Crushing injury of trunk
927 : Crushing injury of upper limb
928 : Crushing injury of lower limb
929 : Crushing injury of multiple and unspecified sites
954 : Injury to other nerve(s) of trunk, excluding shoulder and pelvic girdles
955 : Injury to peripheral nerve(s) of shoulder girdle and upper limb
956 : Injury to peripheral nerve(s) of pelvic girdle and lower limb
959 : Injury, other and unspecified (to musculoskeletal system)
996 : Complications peculiar to certain specified procedures
V43.6 : Organ or tissue replaced by other means (joint)
V54 : Other orthopaedic aftercare
V67 : Follow-up examination, following surgery

Table 1.1.1: National Institutes of Health (NIH) Funding by Institute, 1987-2012

		Mean % of Total NIH Funding			**Mean % Funding Variance 1987 to 2013**
National Institutes of Health (NIH) Organizations		**1987-1999 [1]**	**2000-2008**	**2009-2013**	
NCI	National Cancer Institute	20.1%	17.3%	16.4%	-3.7%
NIAID	National Institute of Allergy and Infectious Diseases	9.6%	13.1%	15.1%	5.5%
NHLBI	National Heart, Lung, and Blood Institute	12.7%	10.3%	9.9%	-2.8%
NIGMS	National Institute of General Medical Sciences	8.5%	7.0%	7.1%	-1.4%
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases	7.1%	6.5%	6.3%	-0.8%
NINDS	National Institute of Neurological Disorders and Stroke	6.3%	5.5%	5.2%	-1.1%
NIMH	National Institute of Mental Health	2.9%	5.1%	4.8%	1.9%
NICHD	National Institute of Child Health and Human Development	5.4%	4.5%	4.3%	-1.1%
NIA	National Institute on Aging	3.6%	3.7%	3.6%	0.0%
NIDA	National Institute on Drug Abuse	2.0%	3.6%	3.4%	1.4%
NCRR	National Center for Research Resources	3.8%	4.0%	2.5%	-1.3%
NIEHS	National Institute of Environmental Health Sciences	2.7%	2.6%	2.5%	-0.2%
NEI	National Eye Institute	2.9%	2.4%	2.3%	-0.6%
NIAMS	**National Institute of Arthritis and Musculoskeletal and Skin Diseases**	**2.1%**	**1.8%**	**1.7%**	**-0.4%**
NHGRI	National Human Genome Research Institute	1.0%	1.8%	1.7%	0.7%
NIAAA	National Institute on Alcohol Abuse and Alcoholism	0.9%	1.6%	1.5%	0.6%
NIDCR	National Institute of Dental and Craniofacial Research	1.7%	1.4%	1.3%	-0.4%
NIDCD	National Institute on Deafness and Other Communication Disorders	1.3%	1.4%	1.3%	0.0%
NLM	National Library of Medicine	1.1%	1.1%	1.1%	0.0%
NIBIB	National Institute of Biomedical Imaging and Bioengineering	0.0%	0.7%	1.0%	1.0%
NIMHD	National Center on Minority Health and Health Disparities	0.0%	0.6%	0.8%	0.8%
NCATS	National Center for Advancing Translational Sciences	0.0%	0.0%	0.7%	0.7%
NINR	National Institute of Nursing Research	0.4%	0.5%	0.5%	0.1%
NCCAM	National Center for Complementary and Alternative Medicine	0.0%	0.4%	0.4%	0.4%
FIC	John E. Fogarty International Center for Advanced Study in the Health Sciences	0.2%	0.2%	0.2%	0.0%
OD	Office of the Director	1.7%	1.8%	4.3%	2.6%
B&F	Building and Facilities Fund	1.1%	0.7%	0.3%	-0.8%
OAR	Office of AIDS Research	0.9%	0.0%	0.0%	-0.9%
Total NIH Average Annual Funding (in 000 $s) per time frame		$ 10,100,450	$ 25,758,700	$ 30,890,100	

[1] 1987 was the first year of NIH funding for NIAMS (National Institute of Arthritis and Musculoskeletal and Skin Diseases).

Source: National Institutes of Health, The NIH Almanac: Appropriations. http://www.nih.gov/about/almanac/appropriations/index.htm#five . Accessed June 27, 2014.

Table 1.1.2: Funding Ranking and Dollars for NIH Research by Disease Areas, 2009-2013

CANCERS	Funding Ranking 2013 [1]	Total 2009-2013 (in millions $s)	
Cancers (general)	6	$ 30,093	
Breast	45	$ 3,977	
Colo-rectal	78	$ 1,564	
Brain	81	$ 1,430	
Prostate	86	$ 1,518	
Lung	92	$ 1,125	
Lymphoma	99	$ 1,041	
Ovarian	114	$ 680	
Pancreatic	117	$ 367	
Cervical	121	$ 655	
Childhood Leukemia	137	$ 339	
Liver	142	$ 439	
Uterine	156	$ 183	
HPV/Cervical	176	$ 130	
TOTAL			$ 43,541

OTHER SELECT MEDICAL CONDITIONS	Funding Ranking 2013 [1]	Total 2009-2013 (in millions $s)	
HIV/AIDS	15	$ 15,973	
Digestive Diseases	25	$ 8,812	
Diabetes	37	$ 5,553	
Obesity	42	$ 4,340	
Eye Diseases	41	$ 4,436	
Liver Disease	47	$ 3,254	
Kidney Disease	50	$ 2,977	
Mind and Body	53	$ 2,816	
Alzheimer's Disease	59	$ 2,687	
Depression	68	$ 2,207	
Parkinson's Disease	109	$ 818	
Multiple Sclerosis	119	$ 666	
Macular Degeneration	125	$ 513	
Cystic Fibrosis	129	$ 449	
Chron's Disease	139	$ 366	
ALS	152	$ 247	
Cerebral Palsy	154	$ 154	
TOTAL SELECT DISEASES			$ 56,268

MUSCULOSKELETAL	Funding Ranking 2013 [1]	Total 2009-2013 (in millions $s)	
Injuries			
Injury Accidents/Adverse Effects	72	$ 1,907	
Injury - Trauma (head and spine)	104	$ 914	
Injury - Traumatic brain injury	133	$ 420	
Spinal Cord Injury	134	$ 433	
Injury - Childhood	162	$ 182	
Injury-Unintentional Childhood	184	$ 107	$ 3,963
Arthritis Conditions			
Arthritis	84	$ 1,368	
Lupus	123	$ 584	$ 1,952
Osteoporosis	103	$ 965	$ 965
Fibromyalgia	203	$ 59	$ 59
Rare Musculoskeletal Conditions			
Muscular Dystrophy	140	$ 394	
Duchenne/Becker Muscular Dystrophy	164	$ 172	
Scleroderma	180	$ 117	
Spinal Muscular Atrophy	198	$ 82	
Spina Bifida	205	$ 70	
Osteogenesis Imperfecta	214	$ 45	
Paget's Disease	234	$ 6	$ 886
TOTAL			$ 7,825

HEART/CIRCULATORY	Funding Ranking 2013 [1]	Total 2009-2013 (in millions $s)	
Cardiovascular	22	$ 11,086	
Heart Disease	32	$ 6,793	
Atherosclerosis	61	$ 2,687	
Coronary Heart Disease	62	$ 2,436	
Stroke	77	$ 1,713	
Hypertension	97	$ 1,278	
TOTAL		$ 25,993	$ 25,993

RESPIRATORY	Funding Ranking 2013 [1]	Total 2009-2013 (in millions $s)	
Lung	31	$ 6,833	
Tuberculosis	96	$ 1,086	
Emphysema	192	$ 133	
Allergic Rhinitis (Hay Fever)	219	$ 30	
TOTAL			$ 8,082

[1] Total condition, diseases, and research areas in ranking was 234

Source: National Institutes of Health. Estimates of Funding for Various Research, Condition, and Disease Categories. http://report/nih.gov/categorical_spending.aspx Accessed December 17, 2013.

Table 1.1.3: Top 25 and Musculoskeletal Related Conditions, Diseases and Research Areas Funded by NIH, 2010-2014

Research Dollars (in millions/ rounded)

	FY 2010 Actual (Non-ARRA)	FY 2010 Actual (ARRA) [1]	FY 2011 Actual	FY 2012 Actual	FY 2013 Actual	FY 2014 Estimated	Total 2010-2014	Funding Ranking 2010-2014 [2]	FY 2015 Estimated
Clinical Research	$10,720	$1,540	$10,503	$10,951	$10,604	$10,928	$55,246	1	$10,928
Genetics	$7,473	$1,440	$7,223	$7,632	$7,144	$7,328	$38,240	2	$7,330
Prevention	$5,983	$849	$5,929	$5,924	$6,686	$6,853	$32,224	3	$6,853
Biotechnology	$5,682	$1,203	$5,823	$6,089	$5,698	$5,845	$30,340	4	$5,845
Cancer	$5,823	$803	$5,448	$5,621	$5,274	$5,418	$28,387	5	$5,418
Neurosciences	$5,515	$794	$5,548	$5,618	$5,340	$5,474	$28,289	6	$5,477
Infectious Diseases	$3,890	$568	$3,883	$3,867	$4,887	$5,015	$22,110	7	$5,015
Brain Disorders	$3,847	$619	$3,864	$3,968	$3,708	$3,796	$19,802	8	$3,799
Women's Health [3]	$3,691	$449	$3,891	$3,833	$3,745	$3,845	$19,454	9	$3,845
Behavioral and Social Science	$3,526	$603	$3,573	$3,682	$3,535	$3,616	$18,535	10	$3,616
Bioengineering	$3,166	$760	$3,303	$3,498	$3,234	$3,318	$17,279	11	$3,318
Pediatric	$3,286	$479	$3,277	$3,612	$3,266	$3,339	$17,259	12	$3,339
Clinical Trials	$3,286	$356	$3,093	$3,208	$3,155	$3,237	$16,335	13	$3,237
HIV/AIDS [4]	$3,085	$322	$3,059	$3,074	$2,898	$2,978	$15,416	14	$3,005
Rare Diseases	+	+	$3,527	$3,623	$3,456	$3,553	$14,159	15	$3,553
Health Disparities [3]	$2,728	$351	$2,718	$2,740	$2,722	$2,794	$14,053	16	$2,794
Aging	$2,517	$443	$2,572	$2,593	$2,429	$2,494	$13,048	17	$2,494
Minority Health [3]	$2,526	$312	$2,504	$2,487	$2,428	$2,493	$12,750	18	$2,493
Human Genome	$1,904	$598	$1,907	$2,271	$2,473	$2,538	$11,691	19	$2,538
Mental Health	$2,246	$334	$2,275	$2,287	$2,174	$2,215	$11,531	20	$2,215
Cardiovascular	$2,144	$398	$2,049	$2,040	$1,964	$2,015	$10,610	21	$2,015
Emerging Infectious Diseases	$2,118	$350	$2,190	$2,153	$1,804	$1,853	$10,468	22	$1,853
Biodefense [5]	$1,794	$221	$1,803	$1,791	$1,692	$1,741	$9,042	23	$1,768
Immunization	$1,798	$231	$1,756	$1,733	$1,656	$1,699	$8,873	24	$1,699
Vaccine Related	$1,737	$222	$1,717	$1,691	$1,608	$1,649	$8,624	25	$1,649

Table 1.1.3: Top 25 and Musculoskeletal Related Conditions, Diseases and Research Areas Funded by NIH, 2010-2014

	Research Dollars (in millions/ rounded)								
Musculoskeletal Related Conditions									
Arthritis	$249	$59	$231	$258	$231	$237	$1,265	89	$237
Fibromyalgia	$9	$0	$11	$13	$11	$11	$55	211	$11
Injury - Childhood Injuries	$36	$3	$33	$37	$37	$38	$184	162	$38
Injury - Unintentional Childhood Injury	$22	$1	$20	$22	$20	$21	$106	189	$21
Injury (total) Accidents/Adverse Effects	$372	$46	$356	$366	$367	$376	$1,883	70	$376
Lupus	$112	$15	$106	$108	$92	$95	$528	124	$95
Osteogenesis Imperfecta	$8	$4	$9	$9	$8	$8	$46	216	$8
Osteoporosis	$181	$23	$179	$181	$164	$168	$896	105	$168
Paget's Disease	$1	$0	$1	$1	$0	-	$3	236	-
Scleroderma	$19	$2	$25	$24	$21	$21	$112	185	$21
Spina Bifida	$12	$6	$11	$12	$10	$10	$61	206	$10
Temporomandibular Muscle/Joint Disorder (TMJD)	$16	$1	$18	$21	$19	$19	$94	195	$19

[1] Separate columns are used to distinguish FY 2009 and FY 2010 actual support funded from American Recovery & Reinvestment Act (ARRA) accounts from projects funded by regular annual NIH appropriations.

[2] Total condition, diseases, and research areas in ranking was 237

[3] Reporting for this category does not follow the standard RCDC process. This category assigns project funding according to populations tracked by gender or ethnicity. The databases used to track gender/ethnicity are complex and not currently compatible with the RCDC system.

[4] The total for AIDS research includes both extramural and intramural research (including research management and support, Management Fund, and Service & Supply Fund), buildings and facilities, research training, and program evaluation, as well as research on the many HIV-associated co-infections and co-morbidities, including TB, hepatitis C, and HIV-associated cancers. It also includes all of the basic science underlying this research. Other RCDC categories are not reported this way; thus the total for AIDS-related research is not comparable to spending reported for other RCDC diseases.

[5] Reporting for this category does not follow the standard RCDC process. The total amount reported is consistent with reporting requirements for this category to the U.S. Office of Management & Budget (OMB). The project listing does not include non-project or other support costs associated with the annual total for this category. Additional information on this category is available at http://www.niaid.nih.gov/topics/biodefenserelated/pages/default.aspx.

Source: National Institutes of Health. Estimates of Funding for Various Research, Condition, and Disease Categories (RCDC). http://report.nih.gov/categorical_spending.aspx Accessed June 25, 2014

Table 1.1.4: NIAMS Share of National Institutes of Health Research and Development Funding, 1998-2013

	Research Grants (in million $s) [1]			Research Project Grants (in million $s) [2]			Career Development Awards [3]		
	Total NIH	NIAMS	NIAMS % of Total	Total NIH	NIAMS	NIAMS % of Total	Total NIH	NIAMS	NIAMS % of Total
1998	$9,801	$231	2.4%	$7,662	$189	2.5%	2,262	66	2.9%
1999	$11,229	$254	2.3%	$8,626	$207	2.4%	2,413	75	3.1%
2000	$13,003	$283	2.2%	$9,955	$233	2.3%	2,764	91	3.3%
2001	$14,908	$313	2.1%	$11,309	$257	2.3%	3,047	109	3.6%
2002	$16,830	$343	2.0%	$12,624	$286	2.3%	3,401	118	3.5%
2003	$18,462	$370	2.0%	$13,776	$311	2.3%	3,708	126	3.4%
2004	$19,608	$397	2.0%	$14,673	$335	2.3%	3,937	136	3.5%
2005	$20,207	$400	2.0%	$15,030	$337	2.2%	4,082	136	3.3%
2006	$20,154	$400	2.0%	$14,853	$333	2.2%	4,036	142	3.5%
2007	$20,416	$408	2.0%	$15,050	$337	2.2%	4,111	150	3.6%
2008	$20,375	$409	2.0%	$15,013	$337	2.2%	4,125	160	3.9%
2009	$20,851	$427	2.0%	$15,397	$352	2.3%	3,983	154	3.9%
2010	$21,402	$427	2.0%	$15,858	$354	2.2%	3,870	150	3.9%
2011	$21,304	$430	2.0%	$15,815	$354	2.2%	3,757	156	4.2%
2012	$21,461	$440	2.1%	$15,924	$360	2.3%	3,647	154	4.2%
2013	$20,127	$410	2.0%	$14,918	$335	2.2%	3,489	157	4.5%

[1] Source: NIH IMPAC, Pub File. http://report.nih.gov/NIHDatabook/Charts/Default.aspx?showm=Y&chartId=206&catId=2 Accessed June 27, 2014.
[2] Source: NIH IMPAC, Pub File. http://report.nih.gov/NIHDatabook/Charts/Default.aspx?showm=Y&chartId=209&catId=2 Accessed June 27, 2014.
[3] Source: NIH IMPAC, Pub File. http://report.nih.gov/NIHDatabook/Charts/Default.aspx?showm=Y&chartId=215&catId=16 Accessed June 27, 2014.

Table 1.2.1: Prevalence and Age-Adjusted Rate of Self-Reported Select Medical Conditions by Sex, United States 2012

	Total Persons With Condition Aged 18 & Over by Sex (in millions)			Prevalence Per 100 Persons in Sex Group		
Medical Condition	**Male**	**Female**	**Total**	**Male**	**Female**	***Total***
Musculoskeletal [1]	58.023	68.624	126.647	51.3	56.3	53.9
Emotional Disorder [2]	33.519	50.042	83.560	29.6	41.1	35.6
Circulatory [3]	35.106	37.019	72.125	31.0	30.4	30.7
Sleep Disorder	26.815	41.631	68.446	23.7	34.2	29.1
Respiratory [4]	27.390	38.743	66.132	24.2	31.8	28.2
Migraines or Severe Headaches	14.489	29.463	43.952	12.8	24.2	18.7
Mental Health Disorder [5]	16.805	25.210	42.015	14.9	20.7	17.9
Diabetes	14.753	16.481	31.234	13.0	13.5	13.3
Blind or Trouble Seeing w/Glasses	8.255	12.354	20.609	7.3	10.1	8.8
Cancer [6]	8.626	11.447	20.073	7.6	9.4	8.5
Cognitive Disorder [7]	7.767	9.981	17.747	6.9	8.2	7.6
Hearing Trouble [8]	9.332	5.805	15.137	8.3	4.8	6.4
Kidney Disease	1.882	2.000	3.882	1.7	1.6	1.7
Liver Disease	1.350	1.684	3.034	1.2	1.4	1.3

[1] Includes arthritis, chronic joint symptoms (more than 3 months in duration), pain in lower back or neck or radiating leg pain (more than 3 months duration)

[2] Includes feelings that interfere with life and activities in past 30 days: sad, nervous, restless, hopelessness, worthlessness, depression, general anxiety, panic disorder, and living is an effort

[3] Includes coronary heart disease, angina pectoris, heart attack, stroke, chronic hypertension, heart disease

[4] Includes emphysema, chronic asthma, hay fever, sinusitis, chronic bronchitis

[5] Includes ADD/ADHD, bipolar disorder, depression in past 12 months, or other mental health disorder

[6] Includes all types of cancer

[7] Includes memory loss or neurological problem in past 12 months

[8] Includes respondents reporting "moderate trouble," "a lot of trouble'" or "deaf" without a hearing aid or hearing device, or currently uses a hearing aid.

Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.2.2: Prevalence and Age-Adjusted Rate of Self-Reported Select Medical Conditions by Age, United States 2012

	Total Persons With Condition Aged 18 & Over (in millions)					Prevalence Per 100 Persons in Age Group					Age-Adjusted Rate [9] Per 100 Total
Medical Condition	**18-44**	**45-64**	**65-74**	**75+**	**Total**	**18-44**	**45-64**	**65-74**	**75+**	**Total**	
Musculoskeletal [1]	46.188	51.156	16.655	12.648	126.647	41.6	62.4	70.1	69.9	53.9	52.8
Emotional Disorder [2]	41.224	31.177	6.439	4.720	83.560	37.1	38.0	27.1	26.1	35.6	34.8
Circulatory [3]	12.658	32.104	14.376	12.987	72.125	11.4	39.1	60.5	71.8	30.7	30.0
Sleep Disorder	27.849	26.059	7.910	6.628	68.446	25.1	31.8	33.3	36.6	29.1	28.5
Respiratory [4]	26.851	26.355	7.808	5.118	66.132	24.2	32.1	32.9	28.3	28.2	27.6
Migraines or Severe Headaches	24.847	15.181	2.514	1.410	43.952	22.4	18.5	10.6	7.8	18.7	18.3
Mental Health Disorder [5]	20.055	15.823	3.910	2.227	42.015	18.1	19.3	16.5	12.3	17.9	17.5
Diabetes	5.326	14.647	6.827	4.435	31.234	4.8	17.9	28.7	24.5	13.3	13.0
Blind or Trouble Seeing w/Glasses	6.014	9.292	2.607	2.696	20.609	5.4	11.3	11.0	14.9	8.8	8.6
Cancer [6]	2.265	7.629	5.014	5.165	20.073	2.0	9.3	21.1	28.6	8.5	8.4
Cognitive Disorder [7]	4.799	7.185	2.328	3.435	17.747	4.3	8.8	9.8	19.0	7.6	7.4
Hearing Trouble [8]	1.890	5.140	3.108	4.998	15.137	1.7	6.3	13.1	27.6	6.4	6.3
Kidney Disease	0.633	1.548	0.746	0.954	3.882	0.6	1.9	3.1	5.3	1.7	1.6
Liver Disease	0.688	1.662	0.491	0.193	3.034	0.6	2.0	2.1	1.1	1.3	1.3

[1] Includes arthritis, chronic joint symptoms (more than 3 months in duration), pain in lower back or neck or radiating leg pain (more than 3 months duration)

[2] Includes feelings that interfere with life and activities in past 30 days: sad, nervous, restless, hopelessness, worthlessness, depression, general anxiety, panic disorder, and living is an effort

[3] Includes coronary heart disease, angina pectoris, heart attack, stroke, chronic hypertension, heart disease

[4] Includes emphysema, chronic asthma, hay fever, sinusitis, chronic bronchitis

[5] Includes ADD/ADHD, bipolar disorder, depression in past 12 months, or other mental health disorder

[6] Includes all types of cancer

[7] Includes memory loss or neurological problem in past 12 months

[8] Includes respondents reporting "moderate trouble," "a lot of trouble'" or "deaf" without a hearing aid or hearing device, or currently uses a hearing aid.

[9] Age-adjusted by direct method to US Census population estimate for July 1, 2012. Accessed October 26, 2013. NOTE: Due to sample weighting to approximate the age distribution of the U.S. population, the crude (unadjusted) and age-adjusted rates of reported conditions are very close.

Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.2.3: Prevalence and Age-Adjusted Rate of Self-Reported Select Medical Conditions by Race, United States 2012

	Total Persons With Condition Aged 18 & Over by Race (in millions)					Prevalence Per 100 Persons in Racial Group				
Medical Condition	**White**	**Black/ African American**	**Asian**	**Other/ Mixed**	**Total**	**White**	**Black/ African American**	**Asian**	**Other/ Mixed**	**Total**
Musculoskeletal [1]	104.825	13.314	4.997	3.511	126.647	55.7	47.6	39.8	56.9	53.9
Emotional Disorder [2]	68.359	9.330	3.018	2.853	83.560	36.3	33.4	24.1	46.2	35.6
Circulatory [3]	57.804	10.009	2.697	1.615	72.125	30.7	35.8	21.5	26.2	30.7
Sleep Disorder	56.703	7.132	2.272	2.339	68.446	30.1	25.5	18.1	37.9	29.1
Respiratory [4]	54.121	7.497	2.686	1.828	66.132	28.7	26.8	21.4	29.6	28.2
Migraines or Severe Headaches	35.125	5.270	1.944	1.614	43.952	18.7	18.9	15.5	26.1	18.7
Mental Health Disorder [5]	35.981	3.634	0.856	1.545	42.015	19.1	13.0	6.8	25.0	17.9
Diabetes	24.279	4.530	1.522	0.902	31.234	12.9	16.2	12.1	14.6	13.3
Blind or Trouble Seeing w/Glasses	16.561	2.573	0.668	0.807	20.609	8.8	9.2	5.3	13.1	8.8
Cancer [6]	17.897	1.215	0.495	0.466	20.073	9.5	4.3	3.9	7.5	8.5
Cognitive Disorder [7]	14.447	2.023	0.659	0.618	17.747	7.7	7.2	5.3	10.0	7.6
Hearing Trouble [8]	13.575	0.841	0.415	0.306	15.137	7.2	3.0	3.3	5.0	6.4
Kidney Disease	2.960	0.629	0.150	*	3.882	1.6	2.3	1.2	*	1.7
Liver Disease	2.472	0.265	*	*	3.034	1.3	0.9	*	*	1.3

* Does not meet standards for reliability.

[1] Includes arthritis, chronic joint symptoms (more than 3 months in duration), pain in lower back or neck or radiating leg pain (more than 3 months duration)

[2] Includes feelings that interfere with life and activities in past 30 days: sad, nervous, restless, hopelessness, worthlessness, depression, general anxiety, panic disorder, and living is an effort

[3] Includes coronary heart disease, angina pectoris, heart attack, stroke, chronic hypertension, heart disease

[4] Includes emphysema, chronic asthma, hay fever, sinusitis, chronic bronchitis

[5] Includes ADD/ADHD, bipolar disorder, depression in past 12 months, or other mental health disorder

[6] Includes all types of cancer

[7] Includes memory loss or neurological problem in past 12 months

[8] Includes respondents reporting "moderate trouble," "a lot of trouble'" or "deaf" without a hearing aid or hearing device, or currently uses a hearing aid

[9] Age-adjusted by direct method to US Census population estimate for July 1, 2012. Accessed October 26, 2013. NOTE: Due to sample weighting to approximate the age distribution of the U.S. population, the crude (unadjusted) and age-adjusted rates of reported conditions are very close.

Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.3.1: Prevalence of Most Frequently Reported Medical Conditions by Sex, United States 2012

	Total Persons With Condition Aged 18 & Over (in millions)			Prevalence Per 100 Persons in Sex Group		
Medical Condition	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Musculoskeletal [1, 2]	58.023	68.624	126.647	51.3	56.3	53.9
Chronic [2] Joint Pain	28.044	35.041	63.085	24.8	28.8	26.9
Arthritis	20.878	30.951	51.830	18.5	25.4	22.1
Neck Pain (Cervical Back Pain)	13.102	20.414	33.515	11.6	16.8	14.3
Lower Back Pain (Lumbar Back Pain)	29.124	36.699	65.823	25.8	30.1	28.0
Lower Back Pain Spreading Below Knee	9.374	13.516	22.890	8.3	11.1	9.7
Circulatory	35.106	37.019	72.125	31.0	30.4	30.7
Chronic Hypertension	28.940	30.890	59.830	25.6	25.4	25.5
Coronary or Heart Condition [3]	13.820	12.741	26.561	12.2	10.5	11.3
Stroke	2.898	3.472	6.370	2.6	2.8	2.7
Respiratory	27.390	38.743	66.132	24.2	31.8	28.2
Sinusitis	10.302	18.202	28.504	9.1	14.9	12.1
Hay Fever	7.656	9.940	17.596	6.8	8.2	7.5
Chronic [2] Asthma	6.770	11.950	18.719	6.0	9.8	8.0
Chronic [2] Bronchitis	3.199	5.458	8.658	2.8	4.5	3.7
Emphysema	2.293	1.815	4.108	2.0	1.5	1.7

[1] Specific conditions are not mutually exclusive in overall condition category

[2] Symptoms lasting 3 months or longer

[3] Includes heart attack, angina pectoris, and other heart disease

Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.3.2: Prevalence of Most Frequently Reported Medical Conditions by Age, United States 2012

	Total Persons With Condition Aged 18 & Over (in millions)					Prevalence Per 100 Persons in Age Group					Age-Adjusted Rate [4] Per 100 Total Population
Medical Condition	**18-44**	**45-64**	**65-74**	**75+**	**Total**	**18-44**	**45-64**	**65-74**	**75+**	**Total**	
Musculoskeletal [1, 2]	46.188	51.156	16.655	12.648	126.647	41.6	62.4	70.1	69.9	53.9	52.8
Chronic [2] Joint Pain	16.734	28.984	10.076	7.291	63.085	15.1	35.3	42.4	40.3	26.9	26.3
Arthritis	7.582	24.223	11.110	8.914	51.830	6.8	29.5	46.8	49.3	22.1	21.6
Neck Pain (Cervical Back Pain)	12.528	15.053	3.452	2.482	33.515	11.3	18.3	14.5	13.7	14.3	14.0
Lower Back Pain (Lumbar Back Pain)	26.611	26.495	7.104	5.613	65.823	24.0	32.3	29.9	31.0	28.0	27.4
Lower Back Pain Spreading Below Knee	7.023	11.139	2.686	2.042	22.890	6.3	13.6	11.3	11.3	9.7	9.5
Circulatory	12.658	32.104	14.376	12.987	72.125	11.4	39.1	60.5	71.8	30.7	30.0
Chronic Hypertension	9.187	27.578	12.404	10.661	59.830	8.3	33.6	52.2	58.9	25.5	24.9
Coronary or Heart Condition [3]	4.168	9.939	5.792	6.661	26.561	3.8	12.1	24.4	36.8	11.3	11.1
Stroke	0.635	2.293	1.505	1.936	6.370	0.6	2.8	6.3	10.7	2.7	2.7
Respiratory	26.851	26.355	7.808	5.118	66.132	24.2	32.1	32.9	28.3	28.2	27.6
Sinusitis	10.889	12.542	3.291	1.783	28.504	9.8	15.3	13.9	9.9	12.1	11.9
Hay Fever	6.774	7.965	1.882	0.975	17.596	6.1	9.7	7.9	5.4	7.5	7.3
Chronic [2] Asthma	8.943	6.852	1.837	1.088	18.719	8.1	8.4	7.7	6.0	8.0	7.8
Chronic [2] Bronchitis	2.721	3.831	1.165	0.940	8.658	2.5	4.7	4.9	5.2	3.7	3.6
Emphysema	0.292	1.853	1.121	0.843	4.108	0.3	2.3	4.7	4.7	1.7	1.7

[1] Specific conditions are not mutually exclusive in overall condition category

[2] Symptoms lasting 3 months or longer

[3] Includes heart attack, angina pectoris, and other heart disease

[4] Age-adjusted by direct method to US Census population estimate for July 1, 2012. Accessed October 26, 2013. NOTE: Due to sample weighting to approximate the age distribution of the U.S. population, the crude (unadjusted) and age-adjusted rates of reported conditions are very close.

Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.3.3: Prevalence of Most Frequently Reported Medical Conditions by Race, United States 2012

	Total Persons With Condition Aged 18 & Over (in millions)					Prevalence Per 100 Persons in Racial Group				
Medical Condition	**White**	**Black/ African American**	**Asian**	**Other/ Mixed**	**Total**	**White**	**Black/ African American**	**Asian**	**Other/ Mixed**	**Total**
Musculoskeletal [1, 2]	104.825	13.314	4.997	3.511	126.647	55.7	47.6	39.8	56.9	53.9
Chronic [2] Joint Pain	52.649	6.731	2.015	1.690	63.085	28.0	24.1	16.1	27.4	26.9
Arthritis	43.586	5.777	1.377	1.090	51.830	23.2	20.7	11.0	17.7	22.1
Neck Pain (Cervical Back Pain)	27.925	3.003	1.384	1.203	33.515	14.8	10.7	11.0	19.5	14.3
Lower Back Pain (Lumbar Back Pain)	54.218	6.996	2.412	2.197	65.823	28.8	25.0	19.2	35.6	28.0
Lower Back Pain Spreading Below Knee	18.596	2.580	0.889	0.825	22.890	9.9	9.2	7.1	13.4	9.7
Circulatory	57.804	10.009	2.697	1.615	72.125	30.7	35.8	21.5	26.2	30.7
Chronic Hypertension	47.158	8.964	2.391	1.317	59.830	25.0	32.1	19.1	21.3	25.5
Coronary or Heart Condition [3]	22.218	2.897	0.743	0.703	26.561	11.8	10.4	5.9	11.4	11.3
Stroke	4.918	1.031	0.198	*	6.370	2.6	3.7	1.6	*	2.7
Respiratory	54.121	7.497	2.686	1.828	66.132	28.7	26.8	21.4	29.6	28.2
Sinusitis	23.351	3.393	1.045	0.715	28.504	12.4	12.1	8.3	11.6	12.1
Hay Fever	14.559	1.636	0.903	0.799	17.596	7.7	5.9	7.2	12.9	7.5
Chronic [2] Asthma	14.562	2.855	0.591	0.712	18.719	7.7	10.2	4.7	11.5	8.0
Chronic [2] Bronchitis	7.151	1.038	*	0.313	8.658	3.8	3.7	*	5.1	3.7
Emphysema	3.662	0.339	*	*	4.108	1.9	1.2	*	*	1.7

* Does not meet standards for reliability.

[1] Specific conditions are not mutually exclusive in overall condition category

[2] Symptoms lasting 3 months or longer

[3] Includes heart attack, angina pectoris, and other heart disease

Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.4.1: Prevalence of Chronic Joint Pain [1] by Joint by Sex, United States 2012

	Total Persons With Condition Aged 18 & Over (in millions)			**Prevalence Per 100 Persons in Sex Group**		
Joint Pain Site	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Knee	17.552	22.442	39.994	15.5	18.4	17.0
Shoulder	9.057	9.685	18.742	8.0	7.9	8.0
Hip	5.577	9.726	15.303	4.9	8.0	6.5
Fingers	5.224	9.169	14.393	4.6	7.5	6.1
Ankle	5.413	7.683	13.096	4.8	6.3	5.6
Wrist	4.529	6.842	11.370	4.0	5.6	4.8
Elbow	4.558	5.103	9.661	4.0	4.2	4.1
Toes	2.221	3.804	6.026	2.0	3.1	2.6
Other Joint	1.225	2.114	3.339	1.1	1.7	1.4
All Chronic Joint [2]	28.044	35.041	63.085	24.8	28.8	26.9

[1] Symptoms lasting 3 months or longer

[2] Chronic pain in multiple joints may be reported

Source: National Health Interview Survey (NHIS)_Adult sample.
www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.4.2: Prevalence of Chronic Joint Pain [1] by Joint by Age, United States 2012

	tal Persons With Condition Aged 18 & Over (in millio					in Age Group					Age-Adjusted Rate [2] Per 100 Total
Joint Pain Site	**18-44**	**45-64**	**65-74**	**75+**	**Total**	**18-44**	**45-64**	**65-74**	**75+**	**Total**	**Population**
Knee	10.678	18.363	6.223	4.730	39.994	9.6	22.4	26.2	26.1	17.0	16.7
Shoulder	4.248	9.133	3.209	2.152	18.742	3.8	11.1	13.5	11.9	8.0	7.8
Hip	3.190	7.241	2.812	2.050	15.303	2.9	8.8	11.8	11.3	6.5	6.4
Fingers	2.368	7.161	3.001	1.864	14.393	2.1	8.7	12.6	10.3	6.1	6.0
Ankle	3.802	6.389	1.723	1.182	13.096	3.4	7.8	7.3	6.5	5.6	5.4
Wrist	3.316	5.386	1.674	0.994	11.370	3.0	6.6	7.0	5.5	4.8	4.7
Elbow	2.558	5.066	1.315	0.723	9.661	2.3	6.2	5.5	4.0	4.1	4.0
Toes	1.137	3.224	1.016	0.649	6.026	1.0	3.9	4.3	3.6	2.6	2.5
Other Joint	0.812	1.610	0.594	0.323	3.339	0.7	2.0	2.5	1.8	1.4	1.4
All Chronic Joint [3]	16.734	28.984	10.076	7.291	63.085	15.1	35.3	42.4	40.3	26.9	26.3

[1] Symptoms lasting 3 months or longer

[2] Age-adjusted by direct method to US Census population estimate for July 1, 2012. Accessed October 26, 2013. NOTE: Due to sample weighting to approximate the age distribution of the U.S. population, the crude (unadjusted) and age-adjusted rates of reported conditions are very close.

[3] Chronic pain in multiple joints may be reported

Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.4.3: Prevalence of Chronic Joint Pain [1] by Joint by Race, United States 2012

	Total Persons With Condition Aged 18 & Over (in millions)					Prevalence Per 100 Persons in Racial Group				
Joint Pain Site	**White**	**Black/ African American**	**Asian**	**Other/ Mixed**	**Total**	**White**	**Black/ African American**	**Asian**	**Other/ Mixed**	**Total**
Knee	32.520	4.651	1.137	1.254	39.994	17.3	16.6	9.1	20.3	17.0
Shoulder	15.740	1.816	0.545	0.641	18.742	8.4	6.5	4.3	10.4	8.0
Hip	12.989	1.468	0.346	0.500	15.303	6.9	5.3	2.8	8.1	6.5
Fingers	12.430	1.132	0.397	0.431	14.393	6.6	4.1	3.2	7.0	6.1
Ankle	10.782	1.410	0.434	0.469	13.096	5.7	5.0	3.5	7.6	5.6
Wrist	9.733	1.039	0.267	0.356	11.370	5.2	3.7	2.1	5.8	4.8
Elbow	8.054	0.956	0.302	0.349	9.661	4.3	3.4	2.4	5.7	4.1
Toes	5.119	0.543	*	0.238	6.026	2.7	1.9	*	3.9	2.6
Other Joint	2.809	0.382	*	*	3.339	1.5	1.4	*	*	1.4
All Chronic Joint [2]	52.649	6.731	2.015	1.690	63.085	28.0	24.1	16.1	27.4	26.9

* Does not meet standards for reliability.

[1] Symptoms lasting 3 months or longer

[2] Chronic pain in multiple joints may be reported

Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.5.1: Self-Reported Limitations in Activities of Daily Living for Persons Due to Select Medical Conditions by Sex, United States 2012

	Total Persons With Limitation (in 000s)			
Condition	**Male**	**Female**	**Total All Ages**	**Total Aged 18 & Over**
Musculoskeletal [1]	7,521	10,690	18,211	17,929
Circulatory [2]	4,137	4,876	9,014	9,014
Depression/Anxiety/Emotional Problem [3]	2,749	3,108	5,857	4,716
Diabetes	1,888	2,330	4,218	4,218
Respiratory (Lung Breathing Problem)	1,844	2,073	3,917	3,435
Nervous System [4]/Sensory Organ	1,473	2,019	3,492	3,350
Vision Problem	1,444	1,668	3,111	2,868
Hearing Problem	1,109	964	2,072	1,874
Cancer	718	878	1,597	1,597
Birth Defect/Mental Retardation/Developmental Problem	1,183	1,015	2,198	1,460
Other Condition/Disorder	5,881	5,669	11,550	7,576
Total All Conditions	19,741	21,084	40,825	34,550
	Prevalence of Limitation Due to Select Medical Cause Per 100 Persons in Sex Group			
Musculoskeletal [1]	5.0	6.8	5.9	5.8
Circulatory [2]	2.7	3.1	2.9	2.9
Depression/Anxiety/Emotional Problem [3]	1.8	2.0	1.9	1.5
Diabetes	1.3	1.5	1.4	1.4
Respiratory (Lung Breathing Problem)	1.2	1.3	1.3	1.1
Nervous System [4]/Sensory Organ	1.0	1.3	1.1	1.1
Vision Problem	1.0	1.1	1.0	0.9
Hearing Problem	0.7	0.6	0.7	0.6
Cancer	0.5	0.6	0.5	0.5
Birth Defect/Mental Retardation/Developmental Problem	0.8	0.6	0.7	0.5
Other Condition/Disorder	3.9	3.6	3.7	2.5
Total All Conditions	13.1	13.4	13.2	11.2

[1] Includes arthritis/rheumatism condition, back or neck problem, fracture/bone/joint injury, musculoskeletal/connective tissue condition, missing or amputated limb/finger/digit; in 0-17 population defined as injury or bone/joint/muscle problem.

[2] Includes heart or hypertension, stroke, circulation or blood problem.

[3] Includes depression/anxiety/emotional problem; in 0-17 population, defined as emotional/behavioral problem.

[4] In 0-17 population, defined as epilepsy/seizures.

Source: National Health Interview Survey (NHIS), Person Sample. http://www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.5.2: Self-Reported Limitations in Activities of Daily Living for Persons Due to Select Medical Conditions by Age, United States 2012

Condition	0-17	18-44	45-64	65-74	75+	Total All Ages	Total Aged 18 & Over
	Total Persons With Limitation (in 000s)						
Musculoskeletal [1]	282	2,424	8,196	3,213	4,096	18,211	17,929
Circulatory [2]	*	657	3,735	2,031	2,591	9,014	9,014
Depression/Anxiety/Emotional Problem [3]	1,142	1,568	2,342	446	360	5,857	4,716
Diabetes	*	318	1,972	1,010	919	4,218	4,218
Respiratory (Lung Breathing Problem)	482	420	1,651	694	670	3,917	3,435
Nervous System [4]/Sensory Organ	115	878	1,563	440	469	3,492	3,350
Vision Problem	244	361	1,134	492	881	3,111	2,868
Hearing Problem	199	229	592	288	765	2,072	1,874
Cancer	*	132	724	353	387	1,597	1,597
Birth Defect/Mental Retardation/ Developmental Problem	583	1,045	415	*	*	2,198	1,460
Other Condition/Disorder	3,974	1,458	2,710	1,102	2,306	11,550	7,576
Total All Conditions	6,274	6,649	14,240	5,859	7,802	40,825	34,550
	Prevalence of Limitation Due to Select Medical Cause Per 100 Persons in Age Group						
Musculoskeletal [1]	0.4	2.2	10.0	13.5	22.7	5.9	5.8
Circulatory [2]	*	0.6	4.6	8.5	14.3	2.9	2.9
Depression/Anxiety/Emotional Problem [3]	1.6	1.4	2.9	1.9	2.0	1.9	1.5
Diabetes	*	0.3	2.4	4.2	5.1	1.4	1.4
Respiratory (Lung Breathing Problem)	0.7	0.4	2.0	2.9	3.7	1.3	1.1
Nervous System [4]/Sensory Organ	0.2	0.8	1.9	1.9	2.6	1.1	1.1
Vision Problem	0.3	0.3	1.4	2.1	4.9	1.0	0.9
Hearing Problem	0.3	0.2	0.7	1.2	4.2	0.7	0.6
Cancer	*	0.1	0.9	1.5	2.1	0.5	0.5
Birth Defect/Mental Retardation/ Developmental Problem	0.8	0.9	0.5	*	*	0.7	0.5
Other Condition/Disorder	5.4	1.3	3.3	4.6	12.8	3.7	2.5
Total All Conditions	8.5	6.0	17.4	24.6	43.2	13.2	11.2

* Does not meet standards for reliability.

[1] Includes arthritis/rheumatism condition, back or neck problem, fracture/bone/joint injury, musculoskeletal/connective tissue condition, missing or amputated limb/finger/digit; in 0-17 population defined as injury or bone/joint/muscle problem.

[2] Includes heart or hypertension, stroke, circulation or blood problem.

[3] Includes depression/anxiety/emotional problem; in 0-17 population, defined as emotional/behavioral problem.

[4] In 0-17 population, defined as epilepsy/seizures.

Source: National Health Interview Survey (NHIS), Person Sample. http://www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.5.3: Self-Reported Limitations in Activities of Daily Living for Persons Due to Select Medical Conditions by Race, United States 2012

Condition	White	Black/ African American	Asian	Other/ Mixed Race	Total All Ages	Total Aged 18 & Over
	Total Persons With Limitation (in 000s)					
Musculoskeletal [1]	14,914	2,629	381	287	18,211	17,929
Circulatory [2]	6,962	1,635	290	127	9,014	9,014
Depression/Anxiety/Emotional Problem [3]	4,684	924	118	131	5,857	4,716
Diabetes	3,168	783	184	*	4,218	4,218
Respiratory (Lung Breathing Problem)	3,114	691	*	*	3,917	3,435
Nervous System [4]/Sensory Organ	2,909	44	77	*	3,492	3,350
Vision Problem	2,460	493	97	*	3,111	2,868
Hearing Problem	1,788	180	77	*	2,072	1,874
Cancer	1,322	207	*	*	1,597	1,597
Birth Defect/Mental Retardation/Developmental Problem	1,732	343	*	*	2,198	1,460
Other Condition/Disorder	9,326	1,646	351	227	11,550	7,576
Total All Conditions	32,988	6,017	1,107	713	40,825	34,550
	Prevalence of Limitation Due to Select Medical Cause Per 100 Persons in Racial Group					
Musculoskeletal [1]	6.0	6.4	2.3	6.8	5.9	5.8
Circulatory [2]	2.8	4.0	1.7	3.0	2.9	2.9
Depression/Anxiety/Emotional Problem [3]	1.9	2.3	0.7	3.1	1.9	1.5
Diabetes	1.3	1.9	1.1	*	1.4	1.4
Respiratory (Lung Breathing Problem)	1.3	1.7	*	*	1.3	1.1
Nervous System [4]/Sensory Organ	1.2	0.1	0.5	*	1.1	1.1
Vision Problem	1.0	1.2	0.6	*	1.0	0.9
Hearing Problem	0.7	0.4	0.5	*	0.7	0.6
Cancer	0.5	0.5	*	*	0.5	0.5
Birth Defect/Mental Retardation/Developmental Problem	0.7	0.8	*	*	0.7	0.5
Other Condition/Disorder	3.8	4.0	2.1	5.4	3.7	2.5
Total All Conditions	13.4	14.8	6.6	16.9	13.2	11.2

* Does not meet standards for reliability.

[1] Includes arthritis/rheumatism condition, back or neck problem, fracture/bone/joint injury, musculoskeletal/connective tissue condition, missing or amputated limb/finger/digit; in 0-17 population defined as injury or bone/joint/muscle problem.

[2] Includes heart or hypertension, stroke, circulation or blood problem.

[3] Includes depression/anxiety/emotional problem; in 0-17 population, defined as emotional/behavioral problem.

[4] In 0-17 population, defined as epilepsy/seizures.

Source: National Health Interview Survey (NHIS), Person Sample. http://www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.6.1: Cause of Self-Reported Limitations in Activities of Daily Living for Persons Due to Musculoskeletal Condition by Sex, United States 2012

	Total Persons With Condition (in millions)		
Condition	Male	Female	All
Back or neck problem [1]	3,999	4,555	8,554
Arthritis or rheumatism [1]	2,553	5,297	7,850
Musculoskeletal/connective tissue problem [1]	1,178	2,972	4,150
Fracture, bone/joint injury [1]	1,627	1,692	3,319
Missing or amputated limb/finger/digit [1]	276	98	374
Bone, joint, or muscle problem [2]	134	*	217
Total All Musculoskeletal Conditions	7,521	10,690	18,211
	Prevalence of Limitation Due to Musculoskeletal Cause within Sex Group per 100 Persons		
Back or neck problem [1]	3.5	3.7	3.6
Arthritis or rheumatism [1]	2.3	4.3	3.3
Musculoskeletal/connective tissue problem [1]	1.0	2.4	1.8
Fracture, bone/joint injury [1]	1.4	1.4	1.4
Missing or amputated limb/finger/digit [1]	0.2	0.1	0.2
Bone, joint, or muscle problem [2]	0.4	*	0.3
Total All Musculoskeletal Conditions	5.0	6.8	5.9

* Does not meet standards for reliability.

[1] Question asked for persons aged 18 years and older.

[2] Question asked for persons aged 0 thru 17 years.

Source: National Health Interview Survey (NHIS), Person Sample.
http://www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.6.2: Cause of Self-Reported Limitations in Activities of Daily Living for Persons Due to Musculoskeletal Condition by Age, United States 2012

Condition	0-17	18-44	45-64	65-74	75+	All
	Total Persons With Condition (in millions)					
Back or neck problem	NA	1,415	4,509	1,435	1,194	8,554
Arthritis or rheumatism	NA	466	3,169	1,693	2,522	7,850
Musculoskeletal/connective tissue problem	NA	556	1,924	752	918	4,150
Fracture, bone/joint injury	NA	487	1,716	425	690	3,319
Missing or amputated limb/finger/digit	NA	*	213	*	*	374
Bone, joint, or muscle problem	217	NA	NA	NA	NA	217
Total All Musculoskeletal Conditions	282	2,424	8,196	3,213	4,096	18,211
	Prevalence of Limitation Due to Musculoskeletal Cause within Age Group per 100 Persons					
Back or neck problem	NA	1.3	5.5	6.0	6.6	3.6
Arthritis or rheumatism	NA	0.4	3.9	7.1	14.0	3.3
Musculoskeletal/connective tissue problem	NA	0.5	2.3	3.2	5.1	1.8
Fracture, bone/joint injury	NA	0.4	2.1	1.8	3.8	1.4
Missing or amputated limb/finger/digit	NA	*	0.3	*	*	0.2
Bone, joint, or muscle problem	0.3	NA	NA	NA	NA	0.3
Total All Musculoskeletal Conditions	0.4	2.2	10.0	13.5	22.7	5.9
	Mean Years Duration of Musculoskeletal Condition Causing Limitations					
Back or neck problem	NA	9.6	16.0	20.0	21.0	16.3
Arthritis or rheumatism	NA	10.4	14.4	17.7	21.2	17.1
Musculoskeletal/connective tissue problem	NA	8.9	14.3	13.9	13.1	13.2
Fracture, bone/joint injury	NA	7.5	12.5	14.1	12.4	12.0
Missing or amputated limb/finger/digit	NA	*	14.9	*	*	16.9

* Does not meet standards for reliability.

NA Question not applicable to age group.

Source: National Health Interview Survey (NHIS), Person Sample. http://www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.6.3: Cause of Self-Reported Limitations in Activities of Daily Living for Persons Due to Musculoskeletal Condition by Race, United States 2012

Condition	White	Black/African American	Asian	Other or Mixed Race	Total All Races
	Total Persons With Condition (in millions)				
Back or neck problem [1]	7,136	1,159	130	128	8,554
Arthritis or rheumatism [1]	6,194	1,341	195	121	7,850
Musculoskeletal/connective tissue problem [1]	3,494	501	98	*	4,150
Fracture, bone/joint injury [1]	2,853	361	57	*	3,319
Missing or amputated limb/finger/digit [1]	276	*	*	*	374
Bone, joint, or muscle problem [2]	176	*	*	*	217
Total All Musculoskeletal Conditions	14,914	2,629	381	287	18,211
	Prevalence of Limitation Due to Musculoskeletal Cause within Racial Group per 100 Persons				
Back or neck problem [1]	3.8	4.0	1.0	4.1	3.6
Arthritis or rheumatism [1]	3.3	4.6	1.5	4.1	3.3
Musculoskeletal/connective tissue problem [1]	1.8	1.7	0.8	*	1.8
Fracture, bone/joint injury [1]	1.5	1.2	0.4	*	1.4
Missing or amputated limb/finger/digit [1]	0.1	*	*	*	0.2
Bone, joint, or muscle problem [2]	0.3	*	*	*	0.3
Total All Musculoskeletal Conditions	6.0	6.4	2.3	6.8	5.9

* Does not meet standards for reliability.

[1] Question asked for persons aged 18 years and older.

[2] Question asked for persons aged 0 thru 17 years.

Source: National Health Interview Survey (NHIS), Person Sample. http://www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.7: Self-Reported Need for Assistance in Performing Activities of Daily Living (ADL) for Persons Due to Select Medical Conditions, United States 2012

	Proportion of Persons with Select Medical Conditions Needing Assistance with ADL									
Condition	Personal Care	Bathing	Dressing	Eating	In/Out of Bed or Chair	Using Toilet	Getting Around Home	Unable to Work	Limited in Type of Work	Prevalence (N) of Condition
Musculoskeletal [1]	13.1%	8.6%	7.3%	2.2%	6.5%	4.2%	5.5%	48.3%	29.4%	18,211
Circulatory [2]	21.1%	15.7%	13.1%	4.6%	11.3%	7.9%	10.2%	59.9%	25.3%	9,014
Depression/Anxiety/Emotional Problem [3]	13.9%	9.7%	8.3%	3.2%	6.4%	4.4%	5.2%	57.9%	14.3%	5,857
Diabetes	22.3%	15.7%	12.6%	4.4%	12.0%	7.5%	10.5%	61.4%	23.6%	4,218
Respiratory (Lung Breathing Problem)	17.2%	11.5%	9.8%	2.9%	7.6%	4.7%	7.2%	52.6%	22.4%	3,917
Nervous System [4]/Sensory Organ	20.5%	14.0%	12.6%	5.9%	9.9%	7.9%	8.3%	60.4%	24.8%	3,492
Vision Problem	23.3%	15.4%	13.3%	5.8%	11.9%	8.1%	11.3%	56.9%	22.2%	3,111
Birth Defect/Mental Retardation/ Developmental Problem	26.7%	21.1%	18.0%	11.4%	9.5%	13.3%	8.4%	47.5%	19.0%	2,198
Hearing Problem	22.6%	17.9%	12.1%	6.3%	10.6%	7.5%	10.7%	51.4%	23.8%	2,072
Cancer	22.0%	14.5%	12.8%	5.5%	11.4%	7.9%	12.5%	65.1%	22.2%	1,597
Other Condition/Disorder	15.2%	11.7%	9.7%	4.4%	7.0%	6.0%	6.3%	3.8%	15.2%	11,550
Total All Conditions	13.3%	9.1%	7.8%	3.2%	6.1%	4.8%	5.4%	43.8%	24.0%	34,030
	Prevalence of Need for Assistance in Persons Reporting Select Medical Conditions per 1000 Population									
Musculoskeletal [1]	7.7	5.1	4.3	1.3	3.8	2.5	3.2	28.5	17.4	59.0
Circulatory [2]	6.2	4.6	3.8	1.3	3.3	2.3	3.0	17.5	7.4	29.2
Depression/Anxiety/Emotional Problem [3]	2.6	1.8	1.6	0.6	1.2	0.8	1.0	11.0	2.7	19.0
Diabetes	3.0	2.1	1.7	0.6	1.6	1.0	1.4	8.4	3.2	13.7
Respiratory (Lung Breathing Problem)	2.2	1.5	1.2	0.4	1.0	0.6	0.9	6.7	2.8	12.7
Nervous System [4]/Sensory Organ	2.3	1.6	1.4	0.7	1.1	0.9	0.9	6.8	2.8	11.3
Vision Problem	2.3	1.6	1.3	0.6	1.2	0.8	1.1	5.7	2.2	10.1
Birth Defect/Mental Retardation/ Developmental Problem	1.9	1.5	1.3	0.8	0.7	0.9	0.6	3.4	1.4	7.1
Hearing Problem	1.5	1.2	0.8	0.4	0.7	0.5	0.7	3.5	1.6	6.7
Cancer	1.1	0.8	0.7	0.3	0.6	0.4	0.6	3.4	1.1	5.2
Other Condition/Disorder	5.7	4.4	3.6	1.6	2.6	2.2	2.4	1.4	5.7	37.4
Total All Conditions	14.7	10.0	8.6	3.5	6.7	5.3	6.0	48.3	26.5	110.3

[1] Includes arthritis/rheumatism condition, back or neck problem, fracture/bone/joint injury, musculoskeletal/connective tissue condition, missing or amputated limb/finger/digit; in 0-17 population defined as injury or bone/joint/muscle problem.

[2] Includes heart or hypertension, stroke, circulation or blood problem.

[3] Includes depression/anxiety/emotional problem; in 0-17 population, defined as emotional/behavioral problem.

[4] In 0-17 population, defined as epilepsy/seizures.

Source: National Health Interview Survey (NHIS), Person Sample. http://www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.8.1: Bed Days Due to Major Health Conditions by Gender and Age for Persons Aged 18 and Over, United States 2012

	Bed Days [1]		
	Persons Reporting Bed Days (in 000s)	Mean Bed Days	Total Bed Days (in millions)
All Causes [2]			
Total Population	79,720	9.4	751.8
Male	33,175	8.0	264.7
Female	46,546	10.5	486.9
18 to 44 Years	20,949	10.3	216.4
45 to 64 Years	32,766	10.9	355.5
65 Years & Over	26,005	6.9	179.4
Other Major Health Conditions			
Circulatory [4]			
Total Population	9,343	20.3	189.7
Male	4,045	16.5	66.7
Female	5,298	23.2	122.9
18 to 44 Years	1,101	26.2	28.8
45 to 64 Years	4,137	20.8	86.1
65 Years & Over	4,105	18.1	74.3
Respiratory [5]			
Total Population	4,502	19.2	86.4
Male	1,683	14.7	24.7
Female	2,819	21.8	61.4
18 to 44 Years	690	17.8	12.3
45 to 64 Years	2,083	27.9	58.1
65 Years & Over	1,729	9.2	15.9
Depression/Fatigue/Nervous Problems [6]			
Total Population	10,375	22.7	235.5
Male	4,072	19.0	77.5
Female	6,303	25.1	158.0
18 to 44 Years	4,146	19.5	80.7
45 to 64 Years	4,387	29.4	128.8
65 Years & Over	1,842	14.1	26.0
Cancer/Tumors [7]			
Total Population	1,275	27.4	34.9
Male	614	16.9	10.4
Female	661	37.1	24.5
18 to 44 Years	128	30.4	3.9
45 to 64 Years	511	35.5	18.1
65 Years & Over	637	20.3	12.9

	Bed Days [1]		
	Persons Reporting Bed Days (in 000s)	Mean Bed Days	Total Bed Days (in millions)
All Musculoskeletal Injuries or Conditions [3]			
Total Population	57,554	9.2	528.3
Male	23,477	8.2	192.0
Female	34,077	9.9	336.3
18 to 44 Years	13,623	10.4	141.4
45 to 64 Years	25,226	10.4	261.8
65 Years & Over	18,705	6.7	125.1
Diabetes [8]			
Total Population	3,642	20.1	73.3
Male	1,551	17.9	27.7
Female	2,091	21.8	45.6
18 to 44 Years	292	31.6	9.2
45 to 64 Years	1,867	21.8	40.7
65 Years & Over	1,482	15.8	23.4
Developmental/Mental Disability [9]			
Total Population	891	12.1	10.8
Male	516	3.1	1.6
Female	375	24.4	9.2
18 to 44 Years	708	13.0	9.2
45 to 64 Years	125	11.7	1.5
65 Years & Over	58	2.5	0.1
Old Age/Senility [10]			
Total Population	2,074	13.5	27.9
Male	828	10.0	8.3
Female	1,246	15.8	19.7
18 to 44 Years	37	1.6	0.1
45 to 64 Years	324	1.5	0.5
65 Years & Over	1,714	16.0	27.4
Other Major Health Conditions [11]			
Total Population	8,262	18.2	150.5
Male	3,561	19.6	69.6
Female	4,701	17.2	80.9
18 to 44 Years	2,064	20.8	42.8
45 to 64 Years	3,366	23.1	77.8
65 Years & Over	2,831	10.6	29.9

[1] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[2] Respondents reported "Yes" when asked "Are you limited in any way in any activities because of physical, mental or emotional problems."

[3] Limitation caused by: "Fracture/bone/joint injury; Back/neck problem; Arthritis/Rheumatism; Amputated limb/finger/digit; or Musculoskeletal /connective tissue problem."

[4] Limitation caused by: "Heart problem, stroke, hypertension, or circulation."

[5] Limitation caused by: "Respiratory problem."

[6] Limitation caused by: "Depression, nervous system, fatigue."

[7] Limitation caused by: "Cancer or benign tumor/cyst."

[8] Limitation caused by: "Diabetes."

[9] Limitation caused by: "Developmental problem or other mental problem (ADD, Bipolar, Schizophrenia)."

[10] Limitation caused by: "Old age, senility."

[11] Limitation caused by: "Vision, hearing, metabolic, digestive, skin, blood, surgical affects, pregnancy, other cause."

Source: National Health Interview Survey (NHIS), Adult Sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.8.2: Lost Work Days Due to Major Health Conditions by Gender and Age for Persons Aged 18 and Over, United States 2012

	Work Days Lost [1]		
	Persons Reporting Lost Work Days (in 000s)	Mean Work Days Lost	Total Work Days Lost (in millions)
All Causes [2]			
Total Population	38,014	8.2	309.8
Male	17,050	8.7	148.2
Female	20,964	7.7	161.6
18 to 44 Years	14,709	8.6	126.1
45 to 64 Years	19,307	8.6	166.6
65 Years & Over	3,998	4.3	17.1
Other Major Health Conditions			
Circulatory [4]			
Total Population	2,139	15.1	32.3
Male	946	21.7	20.5
Female	1,193	9.9	11.8
18 to 44 Years	547	24.8	13.6
45 to 64 Years	1,292	13.4	17.3
65 Years & Over	300	5.1	1.5
Respiratory [5]			
Total Population	1,270	13.0	16.5
Male	440	12.2	5.4
Female	830	11.9	9.9
18 to 44 Years	449	7.5	3.4
45 to 64 Years	679	17.2	11.7
65 Years & Over	142	1.5	0.2
Depression/Fatigue/Nervous Problems [6]			
Total Population	4,079	13.6	55.6
Male	1,714	15.0	25.7
Female	2,366	12.6	29.9
18 to 44 Years	2,192	14.4	31.6
45 to 64 Years	1,589	14.5	23.0
65 Years & Over	298	3.2	1.0
Cancer/Tumors [7]			
Total Population	344	24.4	8.4
Male	180	26.5	4.8
Female	164	22.1	3.6
18 to 44 Years	72	21.9	1.6
45 to 64 Years	220	25.4	5.6
65 Years & Over	52	23.5	1.2

	Work Days Lost [1]		
	Persons Reporting Lost Work Days (in 000s)	Mean Work Days Lost	Total Work Days Lost (in millions)
All Musculoskeletal Injuries or Conditions [3]			
Total Population	28,076	7.7	216.5
Male	12,698	8.0	102.0
Female	15,378	7.5	114.6
18 to 44 Years	9,984	8.5	85.2
45 to 64 Years	15,087	8.1	121.5
65 Years & Over	3,005	3.4	10.1
Diabetes [8]			
Total Population	756	6.4	4.8
Male	356	4.2	1.5
Female	400	8.4	3.4
18 to 44 Years	117	5.3	0.6
45 to 64 Years	540	7.3	3.9
65 Years & Over	*	*	*
Developmental/Mental Disability [9]			
Total Population	280	7.4	2.1
Male	193	8.0	1.5
Female	87	6.2	0.5
18 to 44 Years	250	7.9	2.0
45 to 64 Years	24	4.4	0.1
65 Years & Over	*	*	*
Old Age/Senility [10]			
Total Population	479	2.2	1.0
Male	240	0.6	0.1
Female	239	3.8	0.9
18 to 44 Years	26	0.6	0.0
45 to 64 Years	285	1.9	0.5
65 Years & Over	168	2.9	0.5
Other Major Health Conditions [11]			
Total Population	2,863	11.7	33.4
Male	1,156	11.9	13.8
Female	1,707	11.5	19.6
18 to 44 Years	1,173	12.4	14.6
45 to 64 Years	1,433	11.1	16.0
65 Years & Over	257	11.3	2.9

* Does not meet standards for reliability.

[1] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

[2] Respondents reported "Yes" when asked "Are you limited in any way in any activities because of physical, mental or emotional problems."

[3] Limitation caused by: "Fracture/bone/joint injury; Back/neck problem; Arthritis/Rheumatism; Amputated limb/finger/digit; or Musculoskeletal /connective tissue problem."

[4] Limitation caused by: "Heart problem, stroke, hypertension, or circulation."

[5] Limitation caused by: "Respiratory problem."

[6] Limitation caused by: "Depression, nervous system, fatigue."

[7] Limitation caused by: "Cancer or benign tumor/cyst."

[8] Limitation caused by: "Diabetes."

[9] Limitation caused by: "Developmental problem or other mental problem (ADD, Bipolar, Schizophrenia)."

[10] Limitation caused by: "Old age, senility."

[11] Limitation caused by: "Vision, hearing, metabolic, digestive, skin, blood, surgical affects, pregnancy, other cause."

Source: National Health Interview Survey (NHIS), Adult Sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.8.3: Summary of Bed and Lost Work Days Due to Health Problems for Persons Age 18 and Over, United States 2012

	Bed Days [2]		Lost Work Days [3]	
Cause of Bed/Lost Work Days [1]	**Total** (in millions)	**% of Total** [4]	**Total** (in millions)	**% of Total** [4]
Musculoskeletal Injury or Condition [5]	528.3	70%	216.5	70%
Depression/Fatigue/Nervous Problems [6]	235.5	31%	55.6	18%
Circulatory [7]	189.7	25%	32.3	10%
Respiratory [8]	86.4	11%	16.5	5%
Diabetes [9]	73.3	10%	4.8	2%
Cancer/Tumors [10]	34.9	5%	8.4	3%
Old Age/Senility [11]	27.9	4%	1.0	0%
Developmental/Mental Disability [12]	10.8	1%	2.1	1%
Other Major Health Conditions [13]	150.5	20%	33.4	11%
All Causes	751.8	178%	309.8	120%

[1] Respondents reported "Yes" when asked "Are you limited in any way in any activities because of physical, mental or emotional problems."

[2] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[3] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

[4] Total greater than 100% due to persons reporting more than one condition

[5] Limitation caused by: "Fracture/bone/joint injury; Back/neck problem; Arthritis/Rheumatism; Amputated limb/finger/digit; or Musculoskeletal/connective tissue problem."

[6] Limitation caused by: "Depression, nervous system, fatigue."

[7] Limitation caused by: "Heart problem, stroke, hypertension, or circulation."

[8] Limitation caused by: "Respiratory problem."

[9] Limitation caused by: "Diabetes."

[10] Limitation caused by: "Cancer or benign tumor/cyst."

[11] Limitation caused by: "Old age, senility."

[12] Limitation caused by: "Developmental problem or other mental problem (ADD, Bipolar, Schizophrenia)."

[13]Limitation caused by: "Vision, hearing, metabolic, digestive, skin, blood, surgical affects, pregnancy, other cause."

Source: National Health Interview Survey (NHIS), Adult Sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.8.4: Summary of Bed and Lost Work Days Due to Health Problems for Persons Age 18 and Over by Sex, United States 2012

	Bed Days [2]						Lost Work Days [3]					
Cause of Bed/Lost Work Days [1]	**Male**	*% for Males [4]*	**Female**	*% for Females [4]*	**Total (in millions)**	*% of Total [4]*	**Male**	*% for Males [4]*	**Female**	*% for Females [4]*	**Total (in millions)**	*% of Total [4]*
Musculoskeletal Injury or Condition [5]	192.0	*73%*	336.3	*69%*	528.3	*70%*	102.0	*69%*	114.6	*71%*	216.5	*70%*
Depression/Fatigue/Nervous Problems [6]	77.5	*29%*	158.0	*32%*	235.5	*31%*	25.7	*17%*	29.9	*19%*	55.6	*18%*
Circulatory [7]	66.7	*25%*	122.9	*25%*	189.7	*25%*	20.5	*14%*	11.8	*7%*	32.3	*10%*
Respiratory [8]	24.7	*9%*	61.4	*13%*	86.4	*11%*	5.4	*4%*	9.9	*6%*	16.5	*5%*
Diabetes [9]	27.7	*10%*	45.6	*9%*	73.3	*10%*	1.5	*1%*	3.4	*2%*	4.8	*2%*
Cancer/Tumors [10]	10.4	*4%*	24.5	*5%*	34.9	*5%*	4.8	*3%*	3.6	*2%*	8.4	*3%*
Old Age/Senility [11]	8.3	*3%*	19.7	*4%*	27.9	*4%*	0.1	*0%*	0.9	*1%*	1.0	*0%*
Developmental/Mental Disability [12]	1.6	*1%*	9.2	*2%*	10.8	*1%*	1.5	*1%*	0.5	*0%*	2.1	*1%*
Other Major Health Conditions [13]	69.6	*26%*	80.9	*17%*	150.5	*20%*	13.8	*9%*	19.6	*12%*	33.4	*11%*
All Causes	264.7	*181%*	486.9	*176%*	751.8	*178%*	148.2	*118%*	161.6	*120%*	309.8	*120%*

[1] Respondents reported "Yes" when asked "Are you limited in any way in any activities because of physical, mental or emotional problems."
[2] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.
[3] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.
[4] Total greater than 100% due to persons reporting more than one condition

[5] Limitation caused by: "Fracture/bone/joint injury; Back/neck problem; Arthritis/Rheumatism; Amputated limb/finger/digit; or Musculoskeletal/connective tissue problem."

[6] Limitation caused by: "Depression, nervous system, fatigue."
[7] Limitation caused by: "Heart problem, stroke, hypertension, or circulation."
[8] Limitation caused by: "Respiratory problem."
[9] Limitation caused by: "Diabetes."
[10] Limitation caused by: "Cancer or benign tumor/cyst."
[11] Limitation caused by: "Old age, senility."
[12] Limitation caused by: "Developmental problem or other mental problem (ADD, Bipolar, Schizophrenia)."
[13]Limitation caused by: "Vision, hearing, metabolic, digestive, skin, blood, surgical affects, pregnancy, other cause."
Source: National Health Interview Survey (NHIS), Adult Sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.8.5: Summary of Bed and Lost Work Days Due to Health Problems for Persons Age 18 and Over by Age, United States 2012

Cause of Bed Days [1]	Bed Days [2] 18-44 Years	% for 0-44 Yrs [4]	45-64 Years	% for 45-64 Yrs [4]	65 & Over	% for 65 & Over [4]	Total (in millions)	% of Total [4]
Musculoskeletal Injury or Condition [5]	141.4	65%	261.8	74%	125.1	70%	528.3	70%
Depression/Fatigue/Nervous Problems [6]	80.7	37%	128.8	36%	26.0	14%	235.5	31%
Circulatory [7]	28.8	13%	86.1	24%	74.3	41%	189.7	25%
Respiratory [8]	12.3	6%	58.1	16%	15.9	9%	86.4	11%
Diabetes [9]	9.2	4%	40.7	11%	23.4	13%	73.3	10%
Cancer/Tumors [10]	3.9	2%	18.1	5%	12.9	7%	34.9	5%
Old Age/Senility [11]	0.1	0%	0.5	0%	27.4	15%	27.9	4%
Developmental/Mental Disability [12]	9.2	4%	1.5	0%	0.1	0%	10.8	1%
Other Major Health Conditions [13]	42.8	20%	77.8	22%	29.9	17%	150.5	20%
All Causes	216.4	152%	355.5	189%	179.4	187%	751.8	178%

Cause of Lost Work Days [1]	Lost Work Days [3] 18-44 Years	% for 0-44 Yrs [4]	45-64 Years	% for 45-64 Yrs [4]	65 & Over	% for 65 & Over [4]	Total (in millions)	% of Total [4]
Musculoskeletal Injury or Condition [5]	85.2	68%	121.5	73%	10.1	59%	216.5	70%
Depression/Fatigue/Nervous Problems [6]	31.6	25%	23.0	14%	1.0	6%	55.6	18%
Circulatory [7]	13.6	11%	17.3	10%	1.5	9%	32.3	10%
Respiratory [8]	3.4	3%	11.7	7%	*	*	16.5	5%
Diabetes [9]	0.6	0%	3.9	2%	*	*	4.8	2%
Cancer/Tumors [10]	1.6	1%	5.6	3%	1.2	7%	8.4	3%
Old Age/Senility [11]	0.0	0%	0.5	0%	0.5	3%	1.0	0%
Developmental/Mental Disability [12]	2.0	2%	0.1	0%	*	*	2.1	1%
Other Major Health Conditions [13]	14.6	12%	16.0	10%	2.9	17%	33.4	11%
All Causes	126.1	121%	166.6	120%	17.1	103%	309.8	120%

* Does not meet standards for reliability.
[1] Respondents reported "Yes" when asked "Are you limited in any way in any activities because of physical, mental or emotional problems."
[2] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.
[3] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.
[4] Total greater than 100% due to persons reporting more than one condition

[5] Limitation caused by: "Fracture/bone/joint injury; Back/neck problem; Arthritis/Rheumatism; Amputated limb/finger/digit; or Musculoskeletal/connective tissue problem."

[6] Limitation caused by: "Depression, nervous system, fatigue."
[7] Limitation caused by: "Heart problem, stroke, hypertension, or circulation."
[8] Limitation caused by: "Respiratory problem."
[9] Limitation caused by: "Diabetes."
[10] Limitation caused by: "Cancer or benign tumor/cyst."
[11] Limitation caused by: "Old age, senility."
[12] Limitation caused by: "Developmental problem or other mental problem (ADD, Bipolar, Schizophrenia)."
[13]Limitation caused by: "Vision, hearing, metabolic, digestive, skin, blood, surgical affects, pregnancy, other cause."
Source: National Health Interview Survey (NHIS), Adult Sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.9.1: Self-Reported Health Status for Select Medical Conditions by Sex, United States 2012

	Proportion Reporting Condition BETTER Than 12 Months Ago			Proportion Reporting Condition WORSE Than 12 Months Ago			Total Persons with Condition (in millions)
Medical Condition	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	
Musculoskeletal [1]	19.4%	21.0%	20.3%	10.9%	12.5%	11.8%	126.6
Emotional Disorder [2]	21.3%	23.0%	22.3%	13.4%	14.4%	14.0%	83.6
Circulatory [3]	19.4%	11.4%	19.5%	19.6%	14.3%	12.9%	72.1
Sleep Disorder	20.7%	21.3%	21.1%	16.5%	17.3%	17.0%	68.4
Respiratory [4]	19.8%	21.2%	20.6%	11.7%	12.7%	12.3%	66.1
Migraines or Severe Headaches	21.5%	22.0%	21.8%	14.1%	14.9%	14.7%	44.0
Mental Health Disorder [5]	22.2%	24.7%	23.7%	14.5%	17.5%	16.3%	42.0
Diabetes	21.3%	21.0%	21.1%	11.9%	16.1%	14.1%	31.2
Blind or Trouble Seeing w/Glasses	19.0%	20.3%	19.8%	16.2%	18.2%	17.4%	20.6
Cancer [6]	17.5%	20.5%	19.2%	13.3%	14.3%	13.8%	20.1
Cognitive Disorder [7]	19.0%	19.6%	19.4%	27.2%	27.4%	27.3%	17.7

[1] Includes arthritis, chronic joint symptoms (more than 3 months in duration), pain in lower back or neck or radiating leg pain (more than 3 months duration)

[2] Includes feelings that interfere with life and activities in past 30 days: sad, nervous, restless, hopelessness, worthlessness, depression, general anxiety, panic disorder, and living is an effort

[3] Includes coronary heart disease, angina pectoris, heart attack, stroke, chronic hypertension, heart disease

[4] Includes emphysema, chronic asthma, hay fever, sinusitis, chronic bronchitis

[5] Includes ADD/ADHD, bipolar disorder, depression in past 12 months, or other mental health disorder

[6] Includes all types of cancer

[7] Includes memory loss or neurological problem in past 12 months

[8] Includes respondents reporting "moderate trouble," "a lot of trouble'" or "deaf" without a hearing aid or hearing device, or currently uses a hearing aid.

[9] Age-adjusted by direct method to US Census population estimate for July 1, 2012. Accessed October 26, 2013. NOTE: Due to sample weighting to approximate the age distribution of the U.S. population, the crude (unadjusted) and age-adjusted rates of reported conditions are very close.

Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 1.10.1: Number of Musculoskeletal Diagnoses for Care Received, All Care Facilities, United States 2010/2011

3-Digit ICD-9-CM	Description	Number of Diagnoses (in 000s) [1] Hospital [2]	Physician Office [3]	Outpatient [4]	Emergency Department [5]	Total
724	Other and unspecified disorders of back	1,579.8	28,975.1	2,485.0	6,306.2	39,346.1
719	Other and unspecified disorders of joint	504.6	20,727.4	1,843.4	3,715.7	26,791.1
729	Other disorders of soft tissue	1,001.3	13,586.1	1,630.9	4,480.8	20,699.1
715	Osteoarthrosis and allied disorders	2,815.3	8,860.4	502.3	1,661.1	13,839.1
722	Intervertebral disc disorders	852.0	11,110.4	479.3	812.9	13,254.6
733	Other disorders of bone and cartilage (Osteoporosis; pathologic fracture, cyst, necrosis of bone, malunion and nonunion of fracture)	1,701.6	7,960.4	635.7	1,701.9	11,999.6
726	Peripheral enthesopathies and allied syndromes	148.5	10,294.5	485.0	394.4	11,322.4
723	Other disorder of cervical region	230.6	8,030.9	536.7	1,591.8	10,390.0
727	Synovitis & tenosynovitis	117.1	6,677.9	424.4	271.1	7,490.5
716	Other and unspecified arthroplasties	457.5	5,011.0	257.5	788.4	6,514.4
354	Mononeuritis of upper limb and mononeuritis multiplex	39.4	5,886.1	208.3	88.3	6,222.1
714	Rheumatoid arthritis and other inflammatory polyarthropathies	553.7	4,544.8	217.2	557.0	5,872.7
847	Sprains and strains of other and unspecified parts of back	12.3	3,369.1	88.5	1,740.1	5,210.0
836	Dislocation of knee	15.0	4,938.1	121.1	91.8	5,166.0
959	Injury, other and unspecified (to musculoskeletal system)	45.6	3,282.8	336.6	1,361.1	5,026.1
924	Contusion of lower limb and of other and unspecified sites	122.2	2,211.6	194.7	2,291.2	4,819.7
728	Disorders of muscle, ligament, and fascia	458.2	3,238.6	337.7	752.8	4,787.3
845	Sprains and strains of ankle and foot	27.9	2,666.9	281.1	1,604.0	4,579.9
840	Sprains and strains of shoulder and upper arm	28.7	3,721.0	151.1	666.6	4,567.4
721	Spondylosis and allied disorders	489.9	3,147.8	275.8	535.2	4,448.7
813	Fracture of radius and ulna (Upper end, closed)	98.9	2,622.6	258.7	766.4	3,746.6
844	Sprains and strains of knee and leg	23.0	2,244.2	162.8	802.4	3,232.4
737	Curvature of spine	235.1	1,773.3	311.3	248.9	2,568.6
842	Sprains and strains of wrist and hand	6.2	1,439.1	111.3	748.2	2,304.8
824	Fracture of ankle	125.2	1,469.4	134.9	431.0	2,160.5
923	Contusion of upper limb	58.2	*	135.9	1,819.6	2,013.7
V43.6	Organ or tissue replaced by other means (joint)	1,218.5	*	*	794.0	2,012.5
922	Contusion of trunk	74.7	*	*	1,368.0	1,442.7
883	Open wound of finger(s)	24.9	*	*	1,375.6	1,400.5
203	Multiple myeloma and immunoproliferative neoplasms	100.8	968.1	123.0	79.7	1,271.6
739	Nonallopathic lesions, not elsewhere classified	5.8	741.8	*	4.0	751.6
891	Open wound of knee, leg [except thigh], and ankle	51.2	*	168.6	508.3	728.1
812	Fracture of humerus (Upper end, closed)	106.6	*	226.8	355.3	688.7
882	Open wound of hand except finger(s) alone	27.9	*	*	641.3	669.2
820	Fracture of neck of femur (transcervical fracture, closed)	340.5	*	*	328.4	668.9
881	Open wound of elbow, forearm, and wrist	66.1	*	*	586.5	652.6
807	Fracture of vertebral column with mention of spinal cord injury	176.5	*	*	412.7	589.2
816	Fracture of one or more phalanges of hand (Closed)	20.4	*	97.9	431.1	549.4
710	Diffuse diseases of connective tissue	195.8	*	*	307.4	503.2
198	Secondary malignant neoplasm of bone and bone marrow	285.1	*	*	211.0	496.1
730	Acute osteomyelitis	297.3	*	*	175.7	473.0
805	Fracture of vertebral column without mention of spinal cord injury	170.6	*	*	281.8	452.4
825	Fracture of one or more tarsal and metatarsal bones	42.0	*	91.5	282.3	415.8
892	Open wound of foot except toe(s) alone	15.9	*	85.5	292.2	393.6
V54	Other orthopaedic aftercare	220.9	*	*	161.2	382.1
848	Other and ill-defined sprains and strains	6.5	*	*	375.5	382.0
823	Fracture of tibia & fibula, upper end (closed)	94.9	*	63.8	204.7	363.4
815	Fracture of metacarpal bone(s) (Closed)	16.2	*	55.9	288.0	360.1
274	Gout; Gouty arthroplathy	140.1	*	*	205.2	345.3

Table 1.10.1: Number of Musculoskeletal Diagnoses for Care Received, All Care Facilities, United States 2010/2011

3-Digit ICD-9-CM	Description	Number of Diagnoses (in 000s) [1] Hospital [2]	Physician Office [3]	Outpatient [4]	Emergency Department [5]	Total
846	Sprains and strains of sacroiliac region	2.6	*	*	337.3	339.9
736	Acquired deformities of forearm	128.6	*	111.6	60.0	300.2
996	Complications peculiar to certain specified procedures	183.6	*	*	67.4	251.0
808	Fracture of pelvis (Acetabulum, closed)	105.3	*	*	141.5	246.8
810	Fracture of clavicle (closed)	34.8	*	*	190.5	225.3
831	Dislocation of shoulder	12.3	*	*	208.4	220.7
826	Fracture of one or more phalanges of foot	12.8	*	*	200.4	213.2
755	Other congenital anomalies of limbs (Polydactyly)	44.2	*	142.3	12.6	199.1
718	Other derangement of joint	79.4	*	56.7	61.0	197.1
135	Sarcoidosis	84.3	*	*	104.6	188.9
843	Sprains and strains of hip and thigh	7.9	*	*	166.7	174.6
893	Open wound of toe(s)	7.8	*	26.1	140.6	174.5
731	Osteitis deformans and osteopathies associated with other disorders classified elsewhere	113.0	*	*	60.2	173.2
725	Polymyalgia rheumatica	94.3	*	*	77.5	171.8
754	Certain congenital musculoskeletal deformities	37.1	*	116.7	12.2	166.0
821	Fracture of other and unspecified parts of femur (Shaft or unspecified part, closed)	69.9	*	*	91.1	161.0
741	Spina bifida	31.2	*	81.2	45.3	157.7
738	Other acquired deformity (of musculoskeletal system), spondylolisthesis	117.8	*	*	29.7	147.5
841	Sprains and strains of elbow and forearm	2.2	*	*	124.1	126.3
890	Open wound of hip and thigh	13.0	*	*	104.6	117.6
756	Other congenital musculoskeletal anomalies	71.6	*	*	44.1	115.7
814	Fracture of carpal bone(s) (Closed)	8.9	*	*	105.7	114.6
711	Arthropathy associated with infections	69.5	*	*	43.6	113.1
880	Open wound of shoulder and upper arm	12.3	*	*	89.1	101.4
879	Open wound of other and unspecified sites (except limbs)	17.5	*	*	81.5	99.0
927	Crushing injury of upper limb	3.7	*	*	92.4	96.1
717	Internal derangement of knee	24.1	*	*	58.8	82.9
834	Dislocation of finger	3.2	*	*	66.4	69.6
822	Fracture of patella	17.2	*	*	51.3	68.5
720	Ankylosing spondylitis and other inflammatory spondylopathies	25.0	*	*	32.5	57.5
811	Fracture of scapula (closed)	19.1	*	*	36.2	55.3
886	Traumatic amputation of other finger(s)	4.3	*	*	46.1	50.4
713	Arthropathy associated with other disorders classified elsewhere	33.8	*	*	16.4	50.2
884	Multiple and unspecified open wound of upper limb	7.9	*	*	42.2	50.1
171	Malignant neoplasm of connective and other soft tissue	30.0	*	*	13.3	43.3
875	Open wound of chest (wall)	6.5	*	*	33.6	40.1
170	Malignant neoplasm of bone and articular cartilage	24.4	*	*	10.7	35.1
712	Crystal arthropathies	17.7	*	*	17.3	35.0
832	Dislocation of elbow	2.4	*	*	32.0	34.4
928	Crushing injury of lower limb	4.0	*	*	29.6	33.6
876	Open wound of back	4.9	*	*	28.5	33.4
955	Injury to peripheral nerve(s) of shoulder girdle and upper limb	9.5	*	*	22.6	32.1
735	Acquired deformities of toe	17.0	*	*	13.3	30.3
732	Osteochondropathies	9.8	*	*	15.7	25.5
877	Open wound of buttock	6.0	*	*	19.5	25.5
839	Other, multiple, and ill-defined dislocations	10.0	*	*	15.1	25.1
806	Fracture of vertebral column with mention of spinal cord injury	11.1	*	*	12.8	23.9
835	Dislocation of hip	4.0	*	*	13.9	17.9
894	Multiple and unspecified open wound of lower limb	4.0	*	*	12.9	16.9
838	Dislocation of foot	2.7	*	*	13.5	16.2
215	Other benign neoplasm of connective and other soft tissue	7.5	*	*	6.9	14.4

Table 1.10.1: Number of Musculoskeletal Diagnoses for Care Received, All Care Facilities, United States 2010/2011

		Number of Diagnoses (in 000s) [1]				
3-Digit ICD-9-CM	Description	Hospital [2]	Physician Office [3]	Outpatient [4]	Emergency Department [5]	Total
238	Neoplasm of uncertain behavior of other and unspecified sites and tissues; Connective and other soft tissue, Bone soft tissue and skin	8.4	*	*	4.0	12.4
213	Benign neoplasm of bone and articular cartilage	6.4	*	*	5.5	11.9
833	Dislocation of wrist	2.1	*	*	8.4	10.5
837	Dislocation of ankle	2.4	*	*	7.8	10.2
885	Traumatic amputation of thumb	1.4	*	*	8.0	9.4
734	Flat foot	5.4	*	*	3.6	9.0
956	Injury to peripheral nerve(s) of pelvic girdle and lower limb	3.9	*	*	4.6	8.5
817	Multiple fractures of hand bones	1.3	*	*	6.1	7.4
239.2	Neoplasms of unspecified nature; Bone soft tissue and skin	2.8	*	*	4.0	6.8
829	Fractures of unspecified bones	0.9	*	*	3.0	3.9
926	Crushing injury of trunk	1.1	*	*	2.6	3.7
895	Traumatic amputation of toe(s)	0.9	*	*	2.1	3.0
827	Other, multiple, and ill-defined fractures of lower limb	*	*	*	1.9	1.9
818	Ill-defined fractures of upper limb	*	*	*	1.6	1.6
897	Traumatic amputation of leg(s) (complete) (partial)	0.6	*	*	0.9	1.5
V67	Follow-up examination, following surgery	0.2	*	*	1.3	1.5
887	Traumatic amputation of arm and hand (complete) (partial)	0.5	*	*	0.9	1.4
929	Crushing injury of multiple and unspecified sites	*	*	*	0.9	0.9
954	Injury to other nerve(s) of trunk, excluding shoulder and pelvic girdles	0.3	*	*	0.4	0.7
809	Ill-defined fractures of bones and trunk	0.4	*	*	*	0.4
896	Traumatic amputation of foot (complete) (partial)	*	*	*	0.4	0.4
819	Multiple fractures involving both upper limbs, and upper limb with rib(s) and sternum	*	*	*	0.2	0.2
	All Musculoskeletal diagnoses	11,198.8	161,352.5	13,968.4	37,063.7	223,583.4
	All diagnoses	38,560.8	1,008,802.0	100,742.1	128,961.4	1,277,066.3
	Musculoskeletal diagnoses as proportion of all diagnoses	29.0%	16.0%	13.9%	28.7%	17.5%

* Does not meet standards for reliability.

[1] Includes all possible diagnoses. The number of diagnosis variables varies in the databases (NIS up to 25; NAMCS up to 15; NHAMCS_OP up to 3, NEDS up to 15).

[2] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[3] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

H [4] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 1.10.2: Musculoskeletal Diagnoses as a Proportion of All Diagnoses for Care Received, All Care Facilities, United States 2010/2011

		Proportion of Disgnoses by Site [1]				
3-Digit ICD-9-CM	Description	Hospital [2]	Physician Office [3]	Outpatient [4]	Emergency Department [5]	% Total Diagnoses
724	Other and unspecified disorders of back	4%	74%	6%	16%	3.1%
719	Other and unspecified disorders of joint	2%	77%	7%	14%	2.1%
729	Other disorders of soft tissue	5%	66%	8%	22%	1.6%
715	Osteoarthrosis and allied disorders	20%	64%	4%	12%	1.1%
722	Intervertebral disc disorders	6%	84%	4%	6%	1.0%
733	Other disorders of bone and cartilage (Osteoporosis; pathologic fracture, cyst, necrosis of bone, malunion and nonunion of fracture)	14%	66%	5%	14%	0.9%
726	Peripheral enthesopathies and allied syndromes	1%	91%	4%	3%	0.9%
723	Other disorder of cervical region	2%	77%	5%	15%	0.8%
727	Synovitis & tenosynovitis	2%	89%	6%	4%	0.6%
716	Other and unspecified arthroplasties	7%	77%	4%	12%	0.5%
354	Mononeuritis of upper limb and mononeuritis multiplex	1%	95%	3%	1%	0.5%
714	Rheumatoid arthritis and other inflammatory polyarthropathies	9%	77%	4%	9%	0.5%
847	Sprains and strains of other and unspecified parts of back	0%	65%	2%	33%	0.4%
836	Dislocation of knee	0%	96%	2%	2%	0.4%
959	Injury, other and unspecified (to musculoskeletal system)	1%	65%	7%	27%	0.4%
924	Contusion of lower limb and of other and unspecified sites	3%	46%	4%	48%	0.4%
728	Disorders of muscle, ligament, and fascia	10%	68%	7%	16%	0.4%
845	Sprains and strains of ankle and foot	1%	58%	6%	35%	0.4%
840	Sprains and strains of shoulder and upper arm	1%	81%	3%	15%	0.4%
721	Spondylosis and allied disorders	11%	71%	6%	12%	0.3%
813	Fracture of radius and ulna (Upper end, closed)	3%	70%	7%	20%	0.3%
844	Sprains and strains of knee and leg	1%	69%	5%	25%	0.3%
737	Curvature of spine	9%	69%	12%	10%	0.2%
842	Sprains and strains of wrist and hand	0%	62%	5%	32%	0.2%
824	Fracture of ankle	6%	68%	6%	20%	0.2%
923	Contusion of upper limb	3%	*	7%	90%	0.2%
V43.6	Organ or tissue replaced by other means (joint)	61%	*	*	39%	0.2%
922	Contusion of trunk	5%	*	*	95%	0.1%
883	Open wound of finger(s)	2%	*	*	98%	0.1%
203	Multiple myeloma and immunoproliferative neoplasms	8%	76%	10%	6%	0.1%
739	Nonallopathic lesions, not elsewhere classified	1%	99%	*	1%	0.1%
891	Open wound of knee, leg [except thigh], and ankle	7%	*	23%	70%	0.1%
812	Fracture of humerus (Upper end, closed)	15%	*	33%	52%	0.1%
882	Open wound of hand except finger(s) alone	4%	*	*	96%	0.1%
820	Fracture of neck of femur (transcervical fracture, closed)	51%	*	*	49%	0.1%
881	Open wound of elbow, forearm, and wrist	10%	*	*	90%	0.1%
807	Fracture of vertebral column with mention of spinal cord injury	30%	*	*	70%	0.0%
816	Fracture of one or more phalanges of hand (Closed)	4%	*	18%	78%	0.0%
710	Diffuse diseases of connective tissue	39%	*	*	61%	0.0%
198	Secondary malignant neoplasm of bone and bone marrow	57%	*	*	43%	0.0%
730	Acute osteomyelitis	63%	*	*	37%	0.0%
805	Fracture of vertebral column without mention of spinal cord injury	38%	*	*	62%	0.0%
825	Fracture of one or more tarsal and metatarsal bones	10%	*	22%	68%	0.0%
892	Open wound of foot except toe(s) alone	4%	*	22%	74%	0.0%
V54	Other orthopaedic aftercare	58%	*	*	42%	0.0%
848	Other and ill-defined sprains and strains	2%	*	*	98%	0.0%
823	Fracture of tibia & fibula, upper end (closed)	26%	*	18%	56%	0.0%
815	Fracture of metacarpal bone(s) (Closed)	4%	*	16%	80%	0.0%
274	Gout; Gouty arthroplathy	41%	*	*	59%	0.0%
846	Sprains and strains of sacroiliac region	1%	*	*	99%	0.0%
736	Acquired deformities of forearm	43%	*	37%	20%	0.0%
996	Complications peculiar to certain specified procedures	73%	*	*	27%	0.0%
808	Fracture of pelvis (Acetabulum, closed)	43%	*	*	57%	0.0%
810	Fracture of clavicle (closed)	15%	*	*	85%	0.0%

Table 1.10.2: Musculoskeletal Diagnoses as a Proportion of All Diagnoses for Care Received, All Care Facilities, United States 2010/2011

		Proportion of Disgnoses by Site [1]				
3-Digit ICD-9-CM	Description	Hospital [2]	Physician Office [3]	Outpatient [4]	Emergency Department [5]	% Total Diagnoses
831	Dislocation of shoulder	6%	*	*	94%	0.0%
826	Fracture of one or more phalanges of foot	6%	*	*	94%	0.0%
755	Other congenital anomalies of limbs (Polydactyly)	22%	*	71%	6%	0.0%
718	Other derangement of joint	40%	*	29%	31%	0.0%
135	Sarcoidosis	45%	*	*	55%	0.0%
843	Sprains and strains of hip and thigh	5%	*	*	95%	0.0%
893	Open wound of toe(s)	4%	*	15%	81%	0.0%
731	Osteitis deformans and osteopathies associated with other disorders classified elsewhere	65%	*	*	35%	0.0%
725	Polymyalgia rheumatica	55%	*	*	45%	0.0%
754	Certain congenital musculoskeletal deformities	22%	*	70%	7%	0.0%
821	Fracture of other and unspecified parts of femur (Shaft or unspecified part, closed)	43%	*	*	57%	0.0%
741	Spina bifida	20%	*	51%	29%	0.0%
738	Other acquired deformity (of musculoskeletal system), spondylolisthesis	80%	*	*	20%	0.0%
841	Sprains and strains of elbow and forearm	2%	*	*	98%	0.0%
890	Open wound of hip and thigh	11%	*	*	89%	0.0%
756	Other congenital musculoskeletal anomalies	62%	*	*	38%	0.0%
814	Fracture of carpal bone(s) (Closed)	8%	*	*	92%	0.0%
711	Arthropathy associated with infections	61%	*	*	39%	0.0%
880	Open wound of shoulder and upper arm	12%	*	*	88%	0.0%
879	Open wound of other and unspecified sites (except limbs)	18%	*	*	82%	0.0%
927	Crushing injury of upper limb	4%	*	*	96%	0.0%
717	Internal derangement of knee	29%	*	*	71%	0.0%
834	Dislocation of finger	5%	*	*	95%	0.0%
822	Fracture of patella	25%	*	*	75%	0.0%
720	Ankylosing spondylitis and other inflammatory spondylopathies	43%	*	*	57%	0.0%
811	Fracture of scapula (closed)	35%	*	*	65%	0.0%
886	Traumatic amputation of other finger(s)	9%	*	*	91%	0.0%
713	Arthropathy associated with other disorders classified elsewhere	67%	*	*	33%	0.0%
884	Multiple and unspecified open wound of upper limb	16%	*	*	84%	0.0%
171	Malignant neoplasm of connective and other soft tissue	69%	*	*	31%	0.0%
875	Open wound of chest (wall)	16%	*	*	84%	0.0%
170	Malignant neoplasm of bone and articular cartilage	70%	*	*	30%	0.0%
712	Crystal arthropathies	51%	*	*	49%	0.0%
832	Dislocation of elbow	7%	*	*	93%	0.0%
928	Crushing injury of lower limb	12%	*	*	88%	0.0%
876	Open wound of back	15%	*	*	85%	0.0%
955	Injury to peripheral nerve(s) of shoulder girdle and upper limb	30%	*	*	70%	0.0%
735	Acquired deformities of toe	56%	*	*	44%	0.0%
732	Osteochondropathies	38%	*	*	62%	0.0%
877	Open wound of buttock	24%	*	*	76%	0.0%
839	Other, multiple, and ill-defined dislocations	40%	*	*	60%	0.0%
806	Fracture of vertebral column with mention of spinal cord injury	46%	*	*	54%	0.0%
835	Dislocation of hip	22%	*	*	78%	0.0%
894	Multiple and unspecified open wound of lower limb	24%	*	*	76%	0.0%
838	Dislocation of foot	17%	*	*	83%	0.0%
215	Other benign neoplasm of connective and other soft tissue	52%	*	*	48%	0.0%
238	Neoplasm of uncertain behavior of other and unspecified sites and tissues; Connective and other soft tissue, Bone soft tissue and skin	68%	*	*	32%	0.0%
213	Benign neoplasm of bone and articular cartilage	54%	*	*	46%	0.0%
833	Dislocation of wrist	20%	*	*	80%	0.0%
837	Dislocation of ankle	24%	*	*	76%	0.0%

Table 1.10.2: Musculoskeletal Diagnoses as a Proportion of All Diagnoses for Care Received, All Care Facilities, United States 2010/2011

		Proportion of Disgnoses by Site [1]				
3-Digit ICD-9-CM	Description	Hospital [2]	Physician Office [3]	Outpatient [4]	Emergency Department [5]	% Total Diagnoses
885	Traumatic amputation of thumb	15%	*	*	85%	0.0%
734	Flat foot	60%	*	*	40%	0.0%
956	Injury to peripheral nerve(s) of pelvic girdle and lower limb	46%	*	*	54%	0.0%
817	Multiple fractures of hand bones	18%	*	*	82%	0.0%
239.2	Neoplasms of unspecified nature; Bone soft tissue and skin	41%	*	*	59%	0.0%
829	Fractures of unspecified bones	23%	*	*	77%	0.0%
926	Crushing injury of trunk	30%	*	*	70%	0.0%
895	Traumatic amputation of toe(s)	30%	*	*	70%	0.0%
827	Other, multiple, and ill-defined fractures of lower limb	*	*	*	100%	0.0%
818	Ill-defined fractures of upper limb	*	*	*	100%	0.0%
897	Traumatic amputation of leg(s) (complete) (partial)	40%	*	*	60%	0.0%
V67	Follow-up examination, following surgery	13%	*	*	87%	0.0%
887	Traumatic amputation of arm and hand (complete) (partial)	36%	*	*	64%	0.0%
929	Crushing injury of multiple and unspecified sites	*	*	*	100%	0.0%
954	Injury to other nerve(s) of trunk, excluding shoulder and pelvic girdles	43%	*	*	57%	0.0%
809	Ill-defined fractures of bones and trunk	100%	*	*	*	0.0%
896	Traumatic amputation of foot (complete) (partial)	*	*	*	100%	0.0%
819	Multiple fractures involving both upper limbs, and upper limb with rib(s) and sternum	*	*	*	100%	0.0%
	All Musculoskeletal diagnoses	5%	72%	6%	17%	18%
	All diagnoses	3%	79%	8%	10%	1,277,066.3
	Musculoskeletal diagnoses as proportion of all diagnoses	29%	16%	14%	29%	

* Does not meet standards for reliability.

[1] Includes all possible diagnoses. The number of diagnosis variables varies in the databases (NIS up to 25; NAMCS up to 15; NHAMCS_OP up to 3, NEDS up to 15).

[2] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[3] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 1.10.3: Musculoskeletal Diagnoses Prevalence for Care Received, All Care Facilities, United States 2010/2011

		Prevalence per 1000 Persons				
3-Digit ICD-9-CM	Description	Hospital [2]	Physician Office [3]	Outpatient [4]	Emergency Department [5]	Total
724	Other and unspecified disorders of back	5.1	93.7	8.0	20.4	127.2
719	Other and unspecified disorders of joint	1.6	67.0	6.0	12.0	86.6
729	Other disorders of soft tissue	3.2	43.9	5.3	14.5	66.9
715	Osteoarthrosis and allied disorders	9.1	28.6	1.6	5.4	44.7
722	Intervertebral disc disorders	2.8	35.9	1.5	2.6	42.8
733	Other disorders of bone and cartilage (Osteoporosis; pathologic fracture, cyst, necrosis of bone, malunion and nonunion of fracture)	5.5	25.7	2.1	5.5	38.8
726	Peripheral enthesopathies and allied syndromes	0.5	33.3	1.6	1.3	36.6
723	Other disorder of cervical region	0.7	26.0	1.7	5.1	33.6
727	Synovitis & tenosynovitis	0.4	21.6	1.4	0.9	24.2
716	Other and unspecified arthroplasties	1.5	16.2	0.8	2.5	21.1
354	Mononeuritis of upper limb and mononeuritis multiplex	0.1	19.0	0.7	0.3	20.1
714	Rheumatoid arthritis and other inflammatory polyarthropathies	1.8	14.7	0.7	1.8	19.0
847	Sprains and strains of other and unspecified parts of back	0.0	10.9	0.3	5.6	16.8
836	Dislocation of knee	0.0	16.0	0.4	0.3	16.7
959	Injury, other and unspecified (to musculoskeletal system)	0.1	10.6	1.1	4.4	16.2
924	Contusion of lower limb and of other and unspecified sites	0.4	7.1	0.6	7.4	15.6
728	Disorders of muscle, ligament, and fascia	1.5	10.5	1.1	2.4	15.5
845	Sprains and strains of ankle and foot	0.1	8.6	0.9	5.2	14.8
840	Sprains and strains of shoulder and upper arm	0.1	12.0	0.5	2.2	14.8
721	Spondylosis and allied disorders	1.6	10.2	0.9	1.7	14.4
813	Fracture of radius and ulna (Upper end, closed)	0.3	8.5	0.8	2.5	12.1
844	Sprains and strains of knee and leg	0.1	7.3	0.5	2.6	10.4
737	Curvature of spine	0.8	5.7	1.0	0.8	8.3
842	Sprains and strains of wrist and hand	0.0	4.7	0.4	2.4	7.5
824	Fracture of ankle	0.4	4.8	0.4	1.4	7.0
923	Contusion of upper limb	0.2	*	0.4	5.9	6.5
V43.6	Organ or tissue replaced by other means (joint)	3.9	*	*	2.6	6.5
922	Contusion of trunk	0.2	*	*	4.4	4.7
883	Open wound of finger(s)	0.1	*	*	4.4	4.5
203	Multiple myeloma and immunoproliferative neoplasms	0.3	3.1	0.4	0.3	4.1
739	Nonallopathic lesions, not elsewhere classified	0.0	2.4	*	0.0	2.4
891	Open wound of knee, leg [except thigh], and ankle	0.2	*	0.5	1.6	2.4
812	Fracture of humerus (Upper end, closed)	0.3	*	0.7	1.1	2.2
882	Open wound of hand except finger(s) alone	0.1	*	*	2.1	2.2
820	Fracture of neck of femur (transcervical fracture, closed)	1.1	*	*	1.1	2.2
881	Open wound of elbow, forearm, and wrist	0.2	*	*	1.9	2.1
807	Fracture of vertebral column with mention of spinal cord injury	0.6	*	*	1.3	1.9
816	Fracture of one or more phalanges of hand (Closed)	0.1	*	0.3	1.4	1.8
710	Diffuse diseases of connective tissue	0.6	*	*	1.0	1.6
198	Secondary malignant neoplasm of bone and bone marrow	0.9	*	*	0.7	1.6
730	Acute osteomyelitis	1.0	*	*	0.6	1.5
805	Fracture of vertebral column without mention of spinal cord injury	0.6	*	*	0.9	1.5
825	Fracture of one or more tarsal and metatarsal bones	0.1	*	0.3	0.9	1.3
892	Open wound of foot except toe(s) alone	0.1	*	0.3	0.9	1.3
V54	Other orthopaedic aftercare	0.7	*	*	0.5	1.2
848	Other and ill-defined sprains and strains	0.0	*	*	1.2	1.2
823	Fracture of tibia & fibula, upper end (closed)	0.3	*	0.2	0.7	1.2
815	Fracture of metacarpal bone(s) (Closed)	0.1	*	0.2	0.9	1.2
274	Gout; Gouty arthroplathy	0.5	*	*	0.7	1.1
846	Sprains and strains of sacroiliac region	0.0	*	*	1.1	1.1
736	Acquired deformities of forearm	0.4	*	0.4	0.2	1.0
996	Complications peculiar to certain specified procedures	0.6	*	*	0.2	0.8

Table 1.10.3: Musculoskeletal Diagnoses Prevalence for Care Received, All Care Facilities, United States 2010/2011

3-Digit ICD-9-CM	Description	Prevalence per 1000 Persons: Hospital [2]	Physician Office [3]	Outpatient [4]	Emergency Department [5]	Total
808	Fracture of pelvis (Acetabulum, closed)	0.3	*	*	0.5	0.8
810	Fracture of clavicle (closed)	0.1	*	*	0.6	0.7
831	Dislocation of shoulder	0.0	*	*	0.7	0.7
826	Fracture of one or more phalanges of foot	0.0	*	*	0.6	0.7
755	Other congenital anomalies of limbs (Polydactyly)	0.1	*	0.5	0.0	0.6
718	Other derangement of joint	0.3	*	0.2	0.2	0.6
135	Sarcoidosis	0.3	*	*	0.3	0.6
843	Sprains and strains of hip and thigh	0.0	*	*	0.5	0.6
893	Open wound of toe(s)	0.0	*	0.1	0.5	0.6
731	Osteitis deformans and osteopathies associated with other disorders classified elsewhere	0.4	*	*	0.2	0.6
725	Polymyalgia rheumatica	0.3	*	*	0.3	0.6
754	Certain congenital musculoskeletal deformities	0.1	*	0.4	0.0	0.5
821	Fracture of other and unspecified parts of femur (Shaft or unspecified part, closed)	0.2	*	*	0.3	0.5
741	Spina bifida	0.1	*	0.3	0.1	0.5
738	Other acquired deformity (of musculoskeletal system), spondylolisthesis	0.4	*	*	0.1	0.5
841	Sprains and strains of elbow and forearm	0.0	*	*	0.4	0.4
890	Open wound of hip and thigh	0.0	*	*	0.3	0.4
756	Other congenital musculoskeletal anomalies	0.2	*	*	0.1	0.4
814	Fracture of carpal bone(s) (Closed)	0.0	*	*	0.3	0.4
711	Arthropathy associated with infections	0.2	*	*	0.1	0.4
880	Open wound of shoulder and upper arm	0.0	*	*	0.3	0.3
879	Open wound of other and unspecified sites (except limbs)	0.1	*	*	0.3	0.3
927	Crushing injury of upper limb	0.0	*	*	0.3	0.3
717	Internal derangement of knee	0.1	*	*	0.2	0.3
834	Dislocation of finger	0.0	*	*	0.2	0.2
822	Fracture of patella	0.1	*	*	0.2	0.2
720	Ankylosing spondylitis and other inflammatory spondylopathies	0.1	*	*	0.1	0.2
811	Fracture of scapula (closed)	0.1	*	*	0.1	0.2
886	Traumatic amputation of other finger(s)	0.0	*	*	0.1	0.2
713	Arthropathy associated with other disorders classified elsewhere	0.1	*	*	0.1	0.2
884	Multiple and unspecified open wound of upper limb	0.0	*	*	0.1	0.2
171	Malignant neoplasm of connective and other soft tissue	0.1	*	*	0.0	0.1
875	Open wound of chest (wall)	0.0	*	*	0.1	0.1
170	Malignant neoplasm of bone and articular cartilage	0.1	*	*	0.0	0.1
712	Crystal arthropathies	0.1	*	*	0.1	0.1
832	Dislocation of elbow	0.0	*	*	0.1	0.1
928	Crushing injury of lower limb	0.0	*	*	0.1	0.1
876	Open wound of back	0.0	*	*	0.1	0.1
955	Injury to peripheral nerve(s) of shoulder girdle and upper limb	0.0	*	*	0.1	0.1
735	Acquired deformities of toe	0.1	*	*	0.0	0.1
732	Osteochondropathies	0.0	*	*	0.1	0.1
877	Open wound of buttock	0.0	*	*	0.1	0.1
839	Other, multiple, and ill-defined dislocations	0.0	*	*	0.0	0.1
806	Fracture of vertebral column with mention of spinal cord injury	0.0	*	*	0.0	0.1
835	Dislocation of hip	0.0	*	*	0.0	0.1
894	Multiple and unspecified open wound of lower limb	0.0	*	*	0.0	0.1
838	Dislocation of foot	0.0	*	*	0.0	0.1
215	Other benign neoplasm of connective and other soft tissue	0.0	*	*	0.0	0.0
238	Neoplasm of uncertain behavior of other and unspecified sites and tissues; Connective and other soft tissue, Bone soft tissue and skin	0.0	*	*	0.0	0.0
213	Benign neoplasm of bone and articular cartilage	0.0	*	*	0.0	0.0

Table 1.10.3: Musculoskeletal Diagnoses Prevalence for Care Received, All Care Facilities, United States 2010/2011

3-Digit ICD-9-CM	Description	Prevalence per 1000 Persons: Hospital [2]	Physician Office [3]	Outpatient [4]	Emergency Department [5]	Total
833	Dislocation of wrist	0.0	*	*	0.0	0.0
837	Dislocation of ankle	0.0	*	*	0.0	0.0
885	Traumatic amputation of thumb	0.0	*	*	0.0	0.0
734	Flat foot	0.0	*	*	0.0	0.0
956	Injury to peripheral nerve(s) of pelvic girdle and lower limb	0.0	*	*	0.0	0.0
817	Multiple fractures of hand bones	0.0	*	*	0.0	0.0
239.2	Neoplasms of unspecified nature; Bone soft tissue and skin	0.0	*	*	0.0	0.0
829	Fractures of unspecified bones	0.0	*	*	0.0	0.0
926	Crushing injury of trunk	0.0	*	*	0.0	0.0
895	Traumatic amputation of toe(s)	0.0	*	*	0.0	0.0
827	Other, multiple, and ill-defined fractures of lower limb	*	*	*	0.0	0.0
818	Ill-defined fractures of upper limb	*	*	*	0.0	0.0
897	Traumatic amputation of leg(s) (complete) (partial)	0.0	*	*	0.0	0.0
V67	Follow-up examination, following surgery	0.0	*	*	0.0	0.0
887	Traumatic amputation of arm and hand (complete) (partial)	0.0	*	*	0.0	0.0
929	Crushing injury of multiple and unspecified sites	*	*	*	0.0	0.0
954	Injury to other nerve(s) of trunk, excluding shoulder and pelvic girdles	0.0	*	*	0.0	0.0
809	Ill-defined fractures of bones and trunk	0.0	*	*	*	0.0
896	Traumatic amputation of foot (complete) (partial)	*	*	*	0.0	0.0
819	Multiple fractures involving both upper limbs, and upper limb with rib(s) and sternum	*	*	*	0.0	0.0
	All Musculoskeletal diagnoses	36.2	521.6	45.2	119.8	722.8
	All diagnoses	124.7	3,261.3	325.7	416.9	4,128.5

* Does not meet standards for reliability.

[1] Includes all possible diagnoses. The number of diagnosis variables varies in the databases (NIS up to 25; NAMCS up to 15; NHAMCS_OP up to 3, NEDS up to 15).

[2] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[3] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 1.10.4: Musculoskeletal System Procedures Performed More than 12,000 Times, United States 2011

ICD-9-CM Code	Description	Number of Procedures (Subgroup)	Total Number of Procedures
81.54	Total knee replacement		645,062
81.62	Fusion or refusion of 2-3 vertebrae		378,844
80.51	Excision of intervertebral disc (diskectomy)		368,240
81.51	Total hip replacement		306,600
84.51	Insertion of interbody spinal fusion device (coded with spinal fusion or refusion)		279,323
77.79	Excision of bone for graft, Other (pelvic bones, phalanges, vertebrae)		214,105
81.07	Lumbar and lumbosacral fusion of the posterior column, lateral transverse process technique		165,665
81.02	Other cervical fusion, anterior technique (arthrodesis of C2 level or below)		159,781
79.35	Open reduction of fracture with internal fixation, Femur		146,022
79.36	Open reduction of fracture with internal fixation, Tibia and fibula		139,197
81.52	Partial hip replacement		105,509
84.52	Insertion of recombinant bone morphogenetic protein		103,260
81.63	Fusion or refusion of 4-8 vertebrae		86,169
79.15	Closed reduction of fracture with internal fixation, Femur		82,565
81.91	Arthrocentesis (joint aspiration)		82,050
All codes	Revision of knee replacement		73,365
00.80	Revision of knee replacement, total (all components)	25,853	
00.81	Revision of knee replacement, tibial component	15,494	
00.82	Revision of knee replacement, femoral component	11,358	
00.83	Revision of knee replacement, patellar component	5,235	
00.84	Revision of total knee replacement, tibial insert (linear)	11,222	
81.55	Revision of knee replacement, not otherwise specified	4,203	
81.08	Lumbar and lumbosacral fusion of the anterior column, posterior technique		70,119
84.11	Amputation of toe		67,130
78.69	Removal of implanted devices from bone, Other (pelvic bones, phalanges, vertebrae)		55,852
All codes	Revision of hip replacement		50,839
00.70	Revision of hip replacement, both acetabular and femoral components	23,685	
00.71	Revision of hip replacement, acetabular component	8,685	
00.72	Revision of hip replacement, femoral component	8,040	
00.73	Revision of hip replacement, acetabular liner and/or femoral head only	7,916	
81.53	Revision hip replacement, not otherwise specified	2,513	
79.32	Open reduction of fracture with internal fixation, Radius and ulna		49,155
81.06	Lumbar and lumbosacral fusion, anterior technique		48,138
83.45	Other excision of muscle, tendon, and fascia, other myectomy (debridement of muscle NOS)		47,975
81.92	Injection of therapeutic substance into joint or ligament		47,879
78.55	Internal fixation of bone without fracture reduction, Femur		40,428
78.65	Removal of implanted devices from bone, Tibia and Fibula		40,428
79.31	Open reduction of fracture with internal fixation, Humerus		40,238
84.15	Other amputations below knee		34,071
77.49	Biopsy of bone (other)		33,599
81.05	Dorsal and dorsolumbar fusion, posterior technique		32,585
79.06	Closed reduction of fracture without internal fixation, Tibia and Fibula (Leg NOS)		29,983
78.67	Removal of implanted devices from bone, Femur		29,674
81.80	Total shoulder replacement		29,414
81.03	Other cervical fusion of the posterior column		29,089
77.69	Local excision of tissue or bone, Other (pelvic, phalanges of foot or hand, vertebrae)		28,042
81.66	Percutaneous vertebral augmentation (Vertebroplasty, Kyphoplasty)		27,213

Table 1.10.4: Musculoskeletal System Procedures Performed More than 12,000 Times, United States 2011

ICD-9-CM Code	Description	Number of Procedures (Subgroup)	Total Number of Procedures
84.17	Amputation above knee		25,537
83.09	Other incision of soft tissue		25,103
79.66	Debridement of open fracture site, Tibia and Fibula (Leg NOS)		21,359
78.17	Application of external fixation device, Tibia and Fibulas		18,331
79.39	Open reduction of fracture with internal fixation, Other Specified Bone		17,788
79.02	Closed reduction of fracture without internal fixation, Radius and Ulna (Arm NOS)		17,340
79.37	Open reduction of fracture with internal fixation, Tarsals and Metatarsals		13,330
83.63	Rotator cuff repair		12,908

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Spine: Low Back and Neck Pain

Lead Author(s):

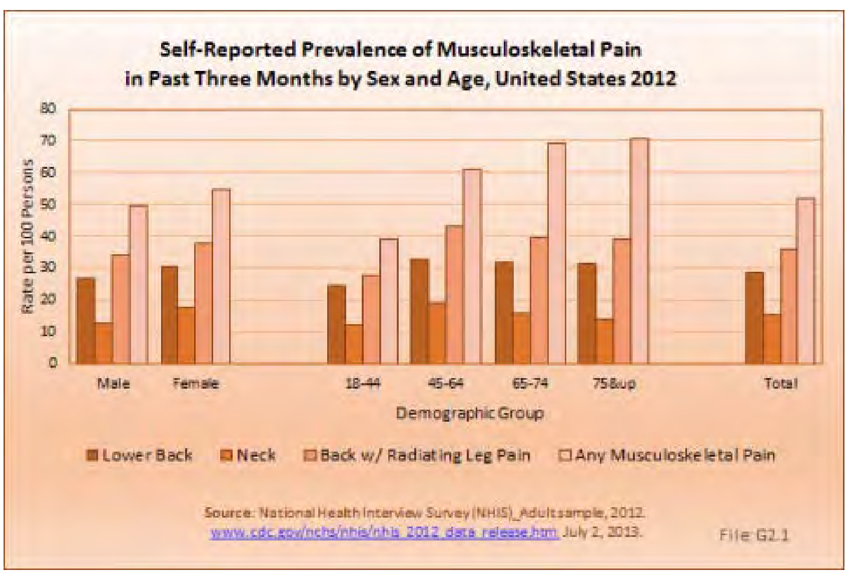
Gunnar Andersson, MD, PhD

Supporting Author(s):

Sylvia I. Watkins-Castillo, PhD

Lumbar/low back pain and cervical/neck pain are among the most common medical conditions requiring medical care and affecting an individual's ability to work and manage the daily activities of life. Back pain is the most common physical condition for which patients visit their doctor. In any given year, between 12% and 14.0% of the United States' adult population (above 18 years of age) will visit their physician with complaints of back pain. In addition, an unknown, but very high number will visit a chiropractor or physical therapist for these complaints. The number of physician visits has increased steadily over the years. In 2012, more than 52.3 million patients visited a physician with a complaint of back pain, compared to 44.6 million in 2004.[1]

A large annual health care survey is conducted in the United States by the National Center for Health Statistics for the purpose of identifying the incidence and prevalence of select health conditions. Pain from any muscle, joint, or bone (musculoskeletal pain) was reported by 52.1% of persons aged 18 years and older in 2012. Low back pain was the most common, affecting 28.6%; neck pain was the third most common at 15.2%. (Knee pain was second at 18.1%.) The prevalence of back pain has remained stable since 2005, and is measured in response to the question of whether the individual "had low back pain or neck pain during the past three months." Females report musculoskeletal pain more frequently than males (54.6% vs. 49.5%). The prevalence of low back pain and neck pain is highest for persons age 45 to 64 years, while overall, joint paint is highest among persons age 65 years and older, where 7 in 10 report joint pain. (Reference Table 2.1 PDF CSV)



About 1 in 13 persons (7.5%) in the population age 18 or older report they have a physical, mental, or emotional problem or illness that precludes work. Among these persons, 27%, or nearly 4 of the 13, are unable to work due to chronic back or neck problems. Another 1 out of 25 persons is limited in the type and duration of work they can do because of back and neck pain. Three in four persons with pain in multiple areas of the back and neck report work limitations. (Reference Table 2.10.1 PDF CSV)

The estimated annual direct medical cost for all back related conditions was $253 billion in 2012. This is further discussed under the Economic Burden topic in this Spine section, and in the Economic Cost topic at this site. As discussed elsewhere, this is not the true cost because chiropractic care, physical therapy, massage therapy, and other types of alternative care are not included in the analysis. Also, outpatient treatment cost from outpatient clinics is currently not collected; hence, this data is missing or incomplete.

Back pain often originates from sources that are not readily identifiable. Many causes of back pain are likely related to degeneration, but the actual underlying cause of a given back pain episode is often uncertain. In reviewing administrative data for prevalence, it is important to realize that the diagnostic categories may be inaccurate because they reflect differing interpretations about the source of the back problem rather than an absolute diagnosis. This will be discussed further in later sections.

1. United States Bone and Joint Decade: *The Burden of Musculoskeletal Diseases in the United States, First Edition*. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2008, p. 42.

Definitions

For purposes of further analysis, we decided to divide the diagnostic codes defining the burden of spine problems into three groups: back disorders, disc disorders, and back injuries. This approach allows comparison to earlier editions of the text. We are aware there may be substantial overlap, and that some of the back disorders may be related to degenerative disc changes and some of the disc disorders may have another origin. The role of disc degeneration in the causation of back pain remains uncertain. Intervertebral disc degeneration and associated facet joint osteoarthritis seem to be a natural process of aging, but can alter the biomechanics and function of the spine. Studies have identified a strong genetic predisposition, but there are modifying influences including age, obesity, activity level, and smoking.

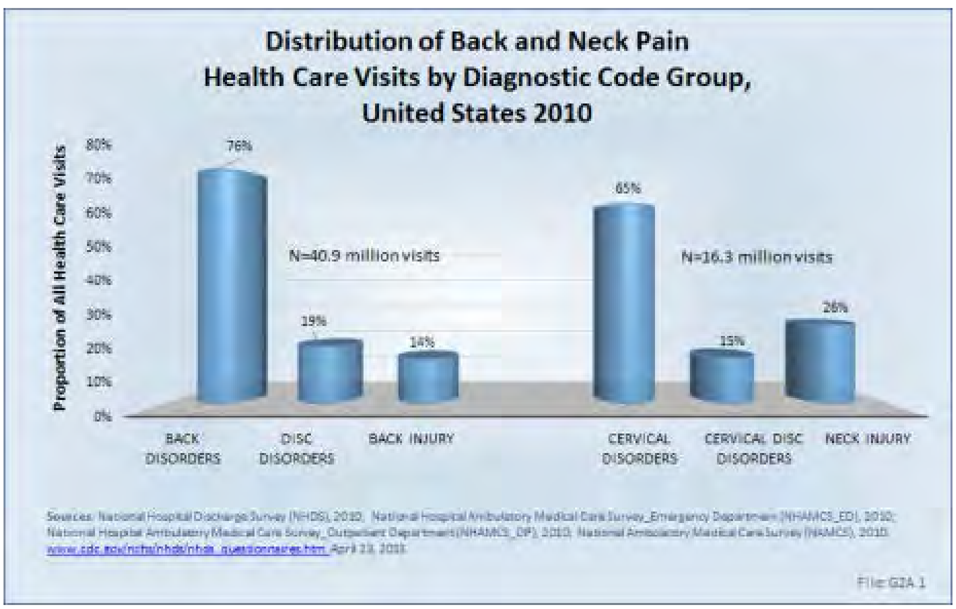
In the tables and text, we define back disorders by diagnostic ICD-9-CM Codes 720, 721, and 724. These codes include inflammatory spine conditions, spondylosis, spinal stenosis, lumbago, sciatica, backache, and disorders of the sacrum. Disc disorders include herniations, disc degeneration, and post-laminectomy syndromes (ICD-9-CM Code 722). Back injuries include fractures, dislocations, and sprains (ICD-9-CM Codes 805, 806, 839, 846, and 847). The same classifications are used for both lumbar/low back pain and cervical/neck pain.

Unfortunately, the databases do not permit diagnostic verification. Sometimes diagnoses are provided primarily for reimbursement purposes, with little emphasis on accuracy. Further, there is considerable overlap. For example, a patient with back pain of unknown origin could be given the diagnosis of lumbago, placing him or her in the back disorder category. He or she may also have disc degeneration with a diagnosis of degenerative disc disease and, therefore be placed in the disc disorder category. Or, if his or her problem developed after a lift or twist, it could be diagnosed as a back strain, falling into the back injury category.

In the tables and graphs, total health care visits include hospital discharges obtained from the National Hospital Discharge Survey (NHDS) in 2010, emergency department visits obtained from the National Hospital Ambulatory Medical Care Survey Emergency Departments (NHAMCS-ED) in 2010, hospital outpatient visits obtained from the National Hospital Ambulatory Medical Care Survey Outpatients (NHAMCS-OP) 2010, and physician office visits obtained from the National Ambulatory Medical Care Survey (NAMCS) in 2010, all part of the National Health Care Surveys (NHCS) compiled annually by the Centers for Disease Control and Prevention (CDC) .

For comparative purposes, data are also analyzed for the Health Care Cost and Utilization Project (HCUP) Nationwide Inpatient Sample (NIS) and the Nationwide Emergency Department Sample (NEDS), created annually by the Agency for Health Care Research and Quality (AHRQ). These databases are much larger than the NHCS databases, but do not include outpatient and physician office visits. When the weighted analysis is compared, the two sets of databases produce very similar results. The advantage of the HCUP databases is the reliability of data for conditions that are rare, and often have a very small number of records.

Using the diagnostic code grouping discussed above, back disorders accounted for 76% of low back pain health care resource utilization in 2010. Back disorders accounted for 7 in 10 or more visits to all health care sites. (Reference Table 2.2.1 PDF CSV).



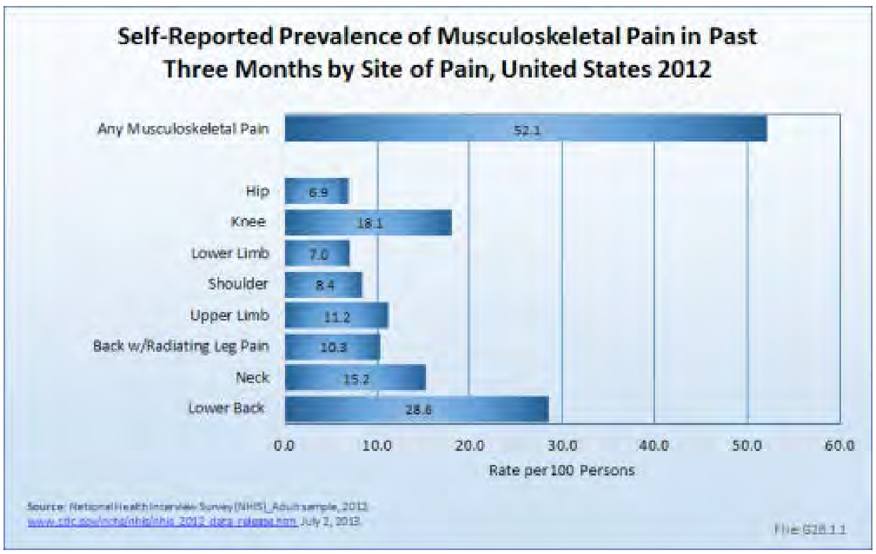
Disc disorders accounted for 19% of low back pain resource visits, and approximately 27% of hospitalizations. Emergency department visits for disc disorders were rare, comprising only 2% of all visits to the ED.

Back injuries, which include fractures, sprains, and strains, are often reported as caused by overexertion or overuse. They accounted for the remaining 14% of 2010 low back pain resource visits. Back injuries were most commonly seen in the emergency room (35%), but constituted only 9% of hospitalizations, indicating that most were manageable in an outpatient setting, and were most likely soft tissue injuries.

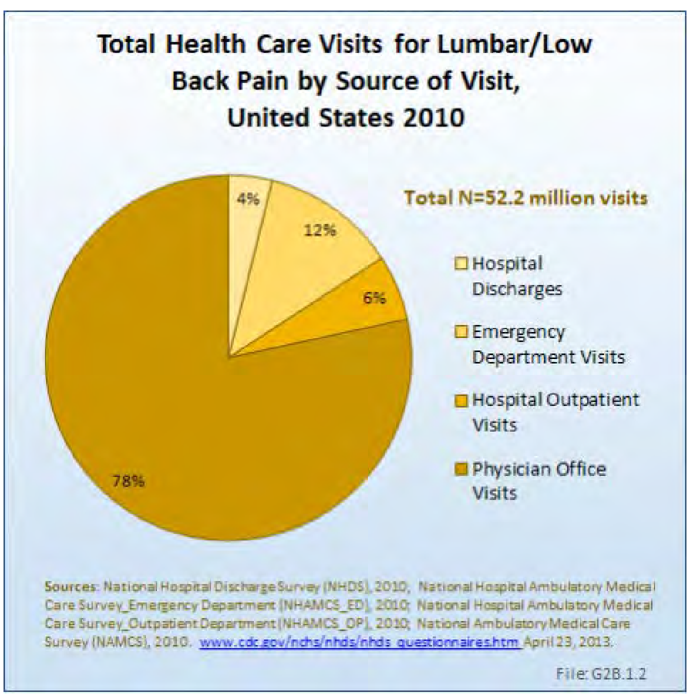
Comparative data for the HCUP databases can be found in the data tables. (Reference Table 2.7.1 PDF CSV)

Low Back Pain

In 2012, nearly 29% of the US population age 18 years and older self-reported having had low back pain during the past three months. Among persons reporting low back pain, one in three (36%) suffered from back pain radiating into the leg. This is a greater percentage of pain than is reported for the upper limbs (shoulder, arm, elbow, wrist, and hands) and the lower limbs (hip, knees, ankles, and feet). Approximately one-third of persons reporting low back pain also experience neck pain. Among person reporting neck pain, the proportion experiencing back pain is as high as 71%. Both lower back and neck pain are reported in higher rates by females (30.5%; 17.6%) than males (26.6%; 12.6%). The highest rates for back and neck pain reported for both genders occur in the 45- to 64-year age group; there is a slight decrease in back and neck pain complaints in subsequent years (65 years and older), unlike that which occurs with pain reported in other joints. (Reference Table 2.1 PDF CSV)

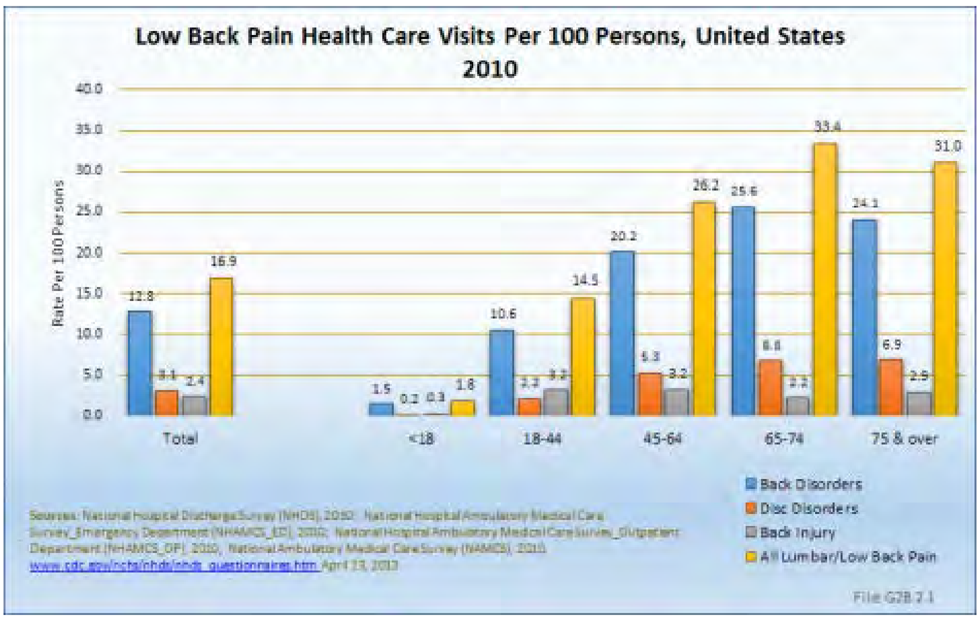


As discussed previously, the health care utilization by people with low back pain is only in part understood because of lack of information about visits to chiropractors, physical therapists, and others involved in the care of back pain. Even so, the reported numbers in the databases are very high. Data from the NCHS reports more than 52 million visits to hospitals, emergency departments, outpatient clinics, and physician offices with a diagnosis of low back pain. Four of five visits were to physician offices, but more than 2 million patients were hospitalized. (Reference Table 2.2.1 PDF CSV, and Table 2.4.1 PDF CSV)

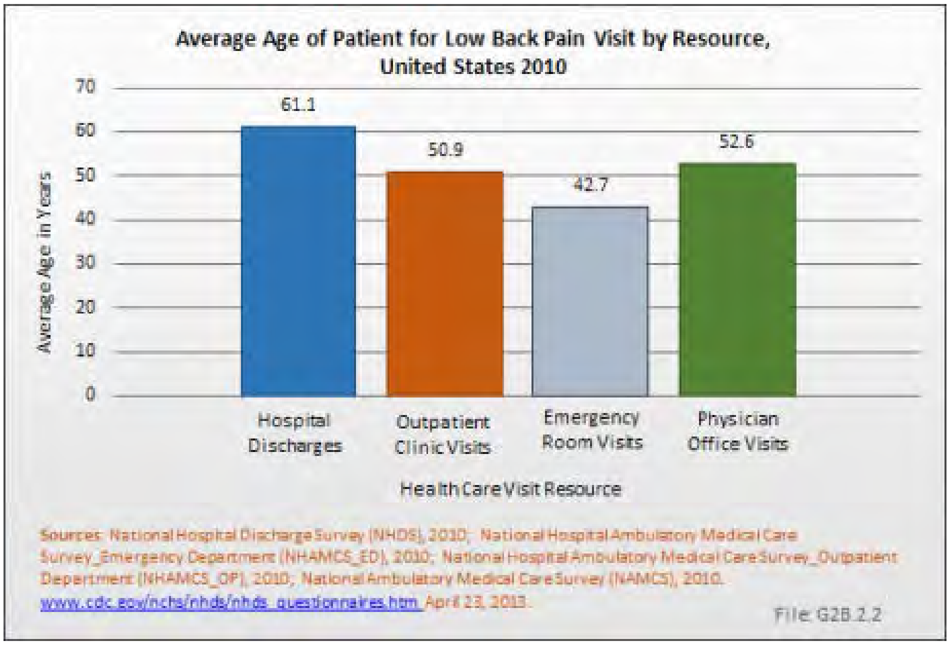


Demographics: Low Back Pain

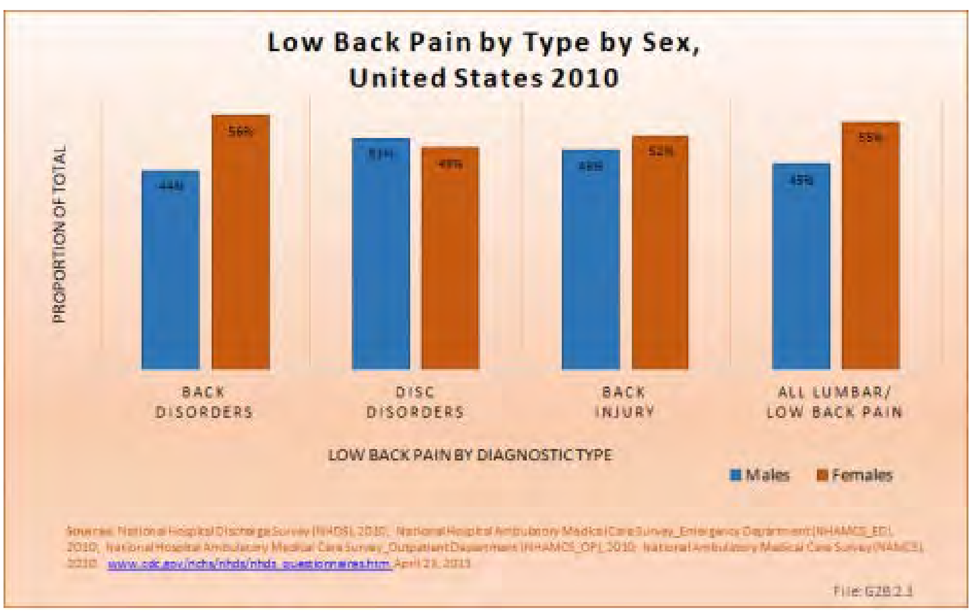
The prevalence of low back pain health care visits is greatest in the 45- to 64-year age group, which comprises 26% of the US population; it is followed by the 18- to 44-year age group, comprising 37% of the population. Together, the 18- to 64-year group represents 63% of the population, but is responsible for 72% of all low back pain health care visits. However, when adjusting for the 2010 US census population estimates, the frequency of health care visits for low back pain per 100 US populations is highest in the 65- to 74-year age group, where it is 33.4%. In reviewing the three diagnostic categories, back disorders dominate in all age groups. Disc disorders are uncommon in the below-18-years age group, but increase in frequency as the population ages. Back injuries are more common under the age of 44 years (22%), and declines to only 7% to 9% in those 65 years and older. (Reference Table 2.2.2 PDF CSV and Table 2.4.2 PDF CSV)



The average age of persons hospitalized in 2010 for low back pain was 61.1 years. This compares to an average age of 42.7 years for persons visiting an emergency department, 50.9 years for visits to outpatient departments, and 52.6 years for visits to a physician. These numbers are essentially unchanged since 2004. (Reference Table 2.2.2 PDF CSV)



Low back pain is found more frequently among females than males, with females representing 55% of health care resource visits. Back disorders, in particular, are more frequent in females, while disc disorders are slightly more common in males. Nearly 8 in 10 (78%) female health care visits in 2010 for low back pain were classified as back disorders, compared to 73% for males. This is probably a reflection of the prevalence of spinal stenosis and degenerative spondylolisthesis in both sexes. (Reference Table 2.2.1 PDF CSV)

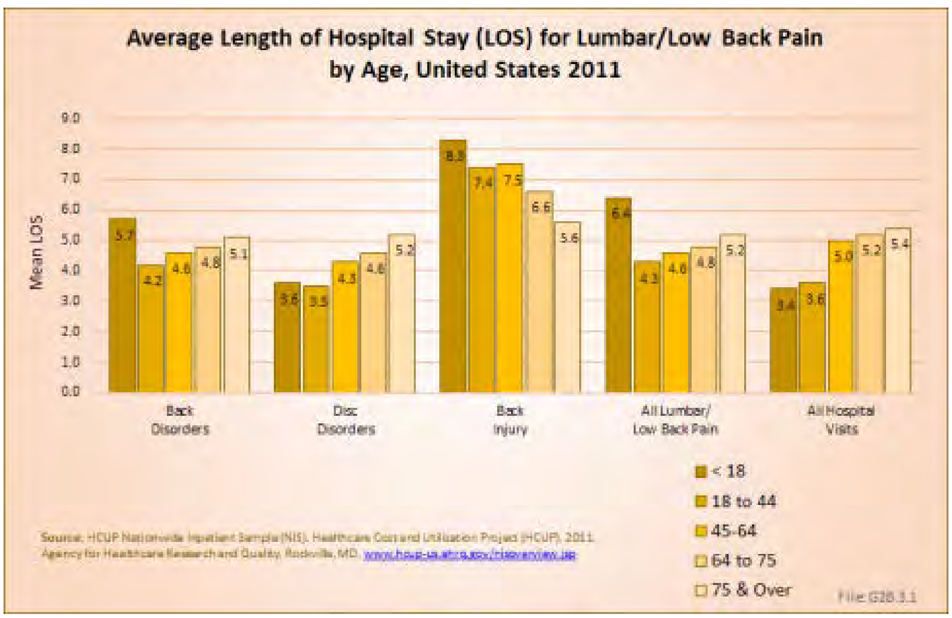


Hospitalization: Low Back Pain

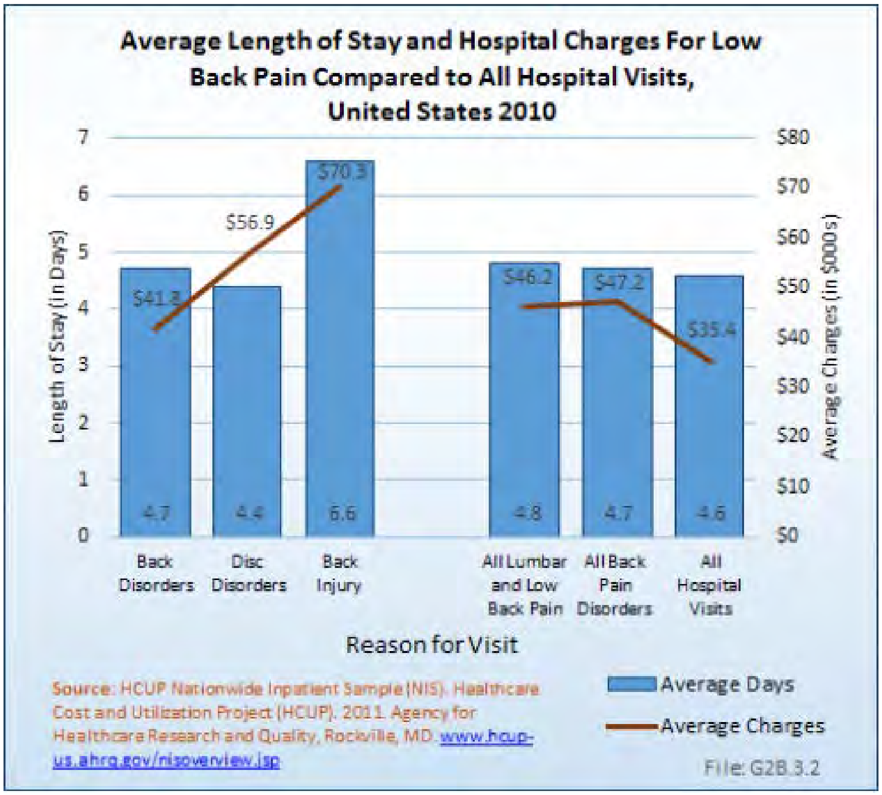
Persons hospitalized for lumbar/low back pain in 2010 spent on average nearly 5 days in the hospital. Persons hospitalized for lumbar/low back injuries were hospitalized for the longest period of time, on average 7.6 days. When comparing the total days of hospitalization for all causes to those for lumbar/low back pain, back pain constitutes 5% to 7% of the discharges and of total hospital days, indicating hospital stays are, on average, similar to those for other causes. The length of hospital stays has remained relatively stable since 2004. (Reference Table 2.9.1 PDF CSV)

Although females are likely to have slightly shorter hospital stays for all causes of back pain, it is only for lumbar back injuries that there is a real difference between the sexes in length of stay.

Age is an important factor influencing length of stay. Although they constitute a small proportion of back pain hospitalizations, young persons under the age of 18 years have longer stays for back pain, in particular when compared to the average length of stay for persons in this age group; here the average length of stay is 1.5 to 2 times as long as for other diagnoses. After the age of 18 years, hospital stays for back pain tend to increase as the population ages. (Reference Table 2.9.2 PDF CSV)

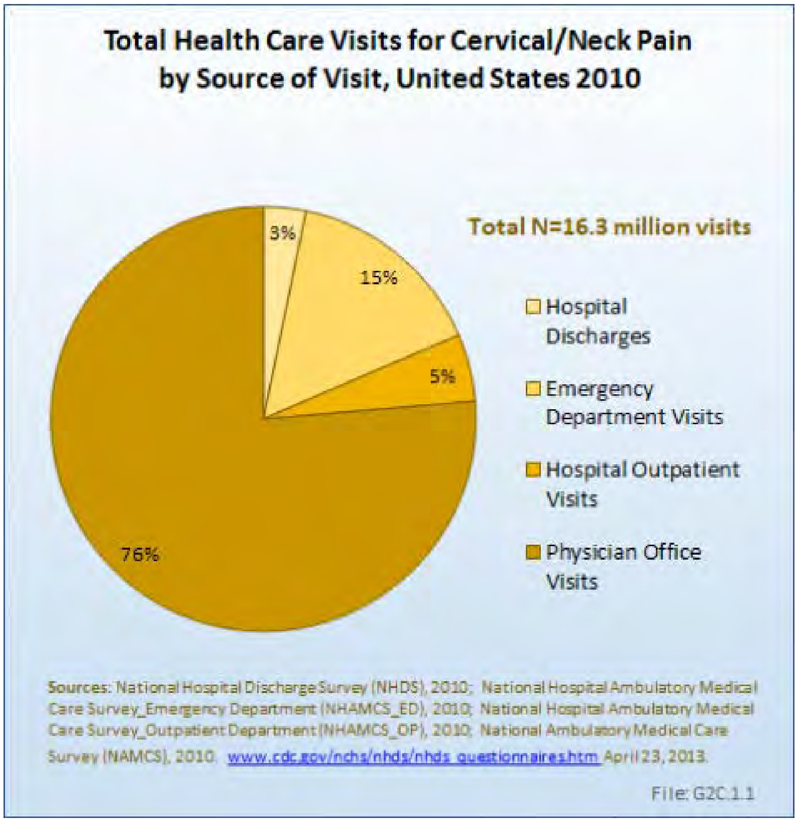


Average hospital charges are provided along with length of stay in the HCUP NIS database. On average, hospital charges for a lumbar/low back pain inpatient visit were 131% that of the average inpatient visit for any cause. In 2011, an estimated $117 million in charges were assessed against the 2.53 million inpatient stays for lumbar/low back pain, 9% of the estimated total $1.37 billion in hospital charges for that year. Mean charges of $70,300 were highest for lumbar injuries and, at $41,800, lowest for lumbar back disorders. (Reference Table 2.9.2 PDF CSV)



Cervical/Neck Pain

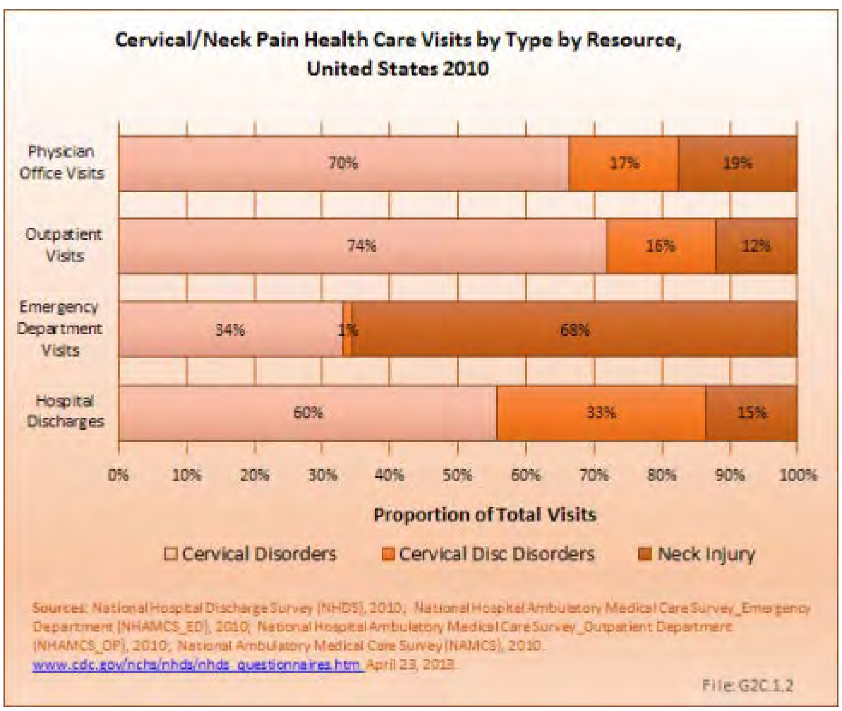
Cervical/neck pain is another common reason for visiting a doctor. In 2010, 16.3 million patient visits, or 1.3% of all health care visits to hospitals and physician offices, were for neck pain. Three out of four (76%) of these were physician visits, while only a very small number (3%) of patients with cervical/neck pain were hospitalized. (Reference Table 2.4.1 PDF CSV)



Cervical disorders accounted for the majority (65%) of health care visits for upper back pain in 2010. Neck disorders are primarily treated in outpatient clinics or physician offices, but are also responsible for the highest percentage of hospital discharges (60%) for upper back pain.

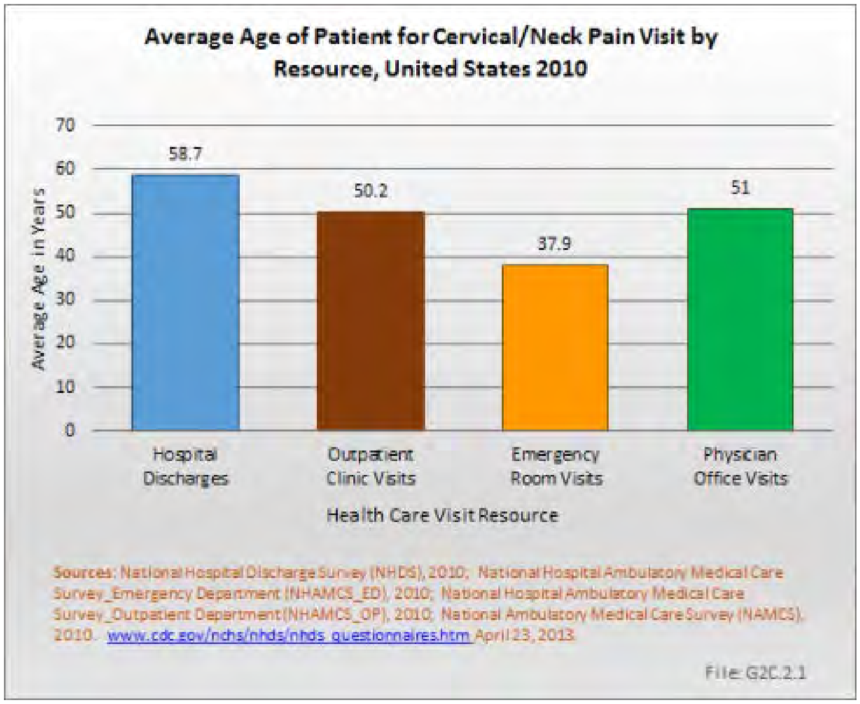
Cervical disc disorders accounted for only 15% of all neck pain health care visits in 2010, but were responsible for one-third of hospitalizations (33%).

Neck injuries accounted for 26% of all neck pain health care visits. This is a much higher percentage than that reported for low back injuries. Patients with neck injuries were primarily treated in an outpatient setting and, not urprisingly, represented 68% of all emergency department visits for neck pain. (Reference Table 2.3.1 PDF CSV)

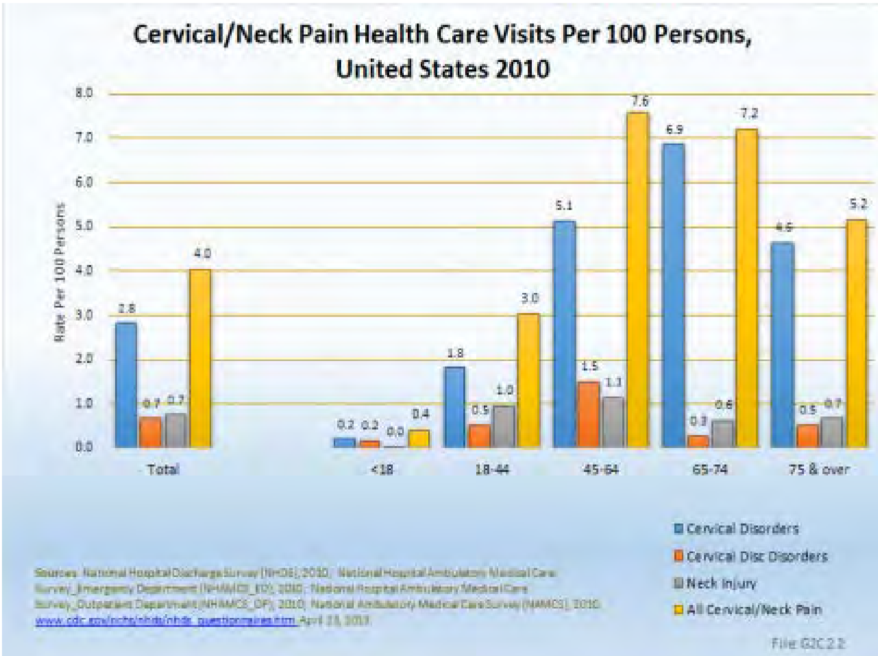


Demographics: Cervical/Neck Pain

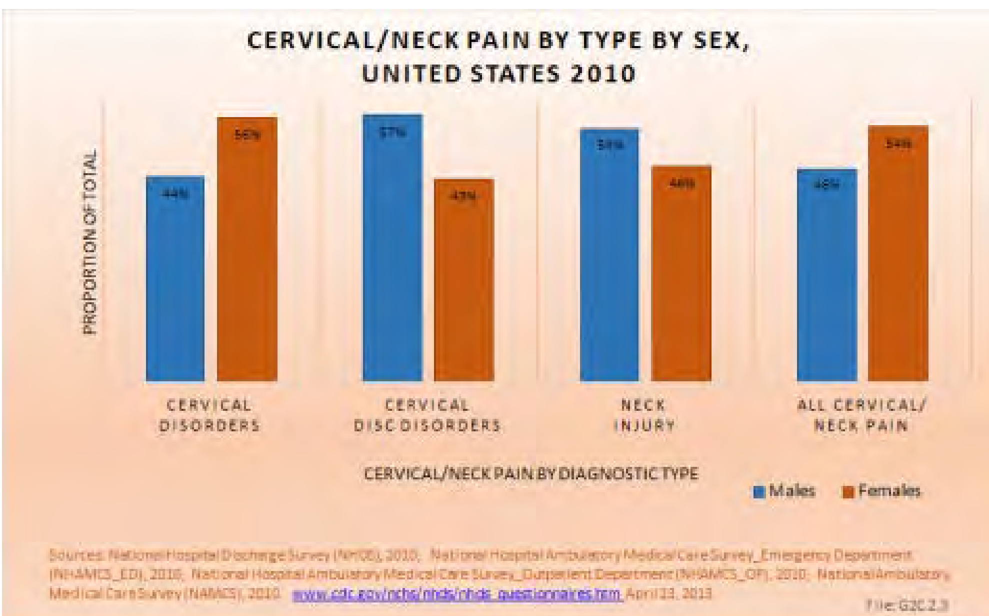
The data on cervical neck pain shows that hospital discharges are rare in people below age 18 years. When adjusted for the US 2010 census population, estimates for hospital discharges are highest in the 75 years and older age group. The average age for persons hospitalized for neck problems was 58.7 years. Emergency Department visits occurred more frequently in those below 44 years with an average age of 37.9 years. Hospital outpatient and physician office patients were on average 50.2 years and 51.0 years old, respectively. (Reference Table 2.3.2 PDF CSV)



Almost four of five neck pain diagnoses (76.5%) in 2010 occurred in persons between ages of 18 and 64 years, the age group representing 63% of the US population. Almost one in five patients (19%) were older than 65 years, and only 4.2% were younger than 18 years of age although this group represents 24% of the US population. Cervical disorders dominated among total health care visits for neck and cervical spine disorders in all age groups, representing from 53% in the 18- to 44-year age group to 90% of all visits in the 65- to 74-year age group. A proportionately larger number of neck injuries (42%) occurred in the below-18-year age group. Adjusted for the population distribution, persons between 45 and 64 years had the highest rate of cervical/neck pain, followed closely by those age 75 years and older. (Reference Table 2.3.2 PDF CSV)



Females accounted for 55% of the health care visits for neck pain in 2010, primarily because 57% of the 315,100 visits for cervical disorders were for females. Males accounted for a greater proportion of visits for the less frequent cervical disc disorder and neck injury visits. (Reference Table 2.3.1 PDF CSV)

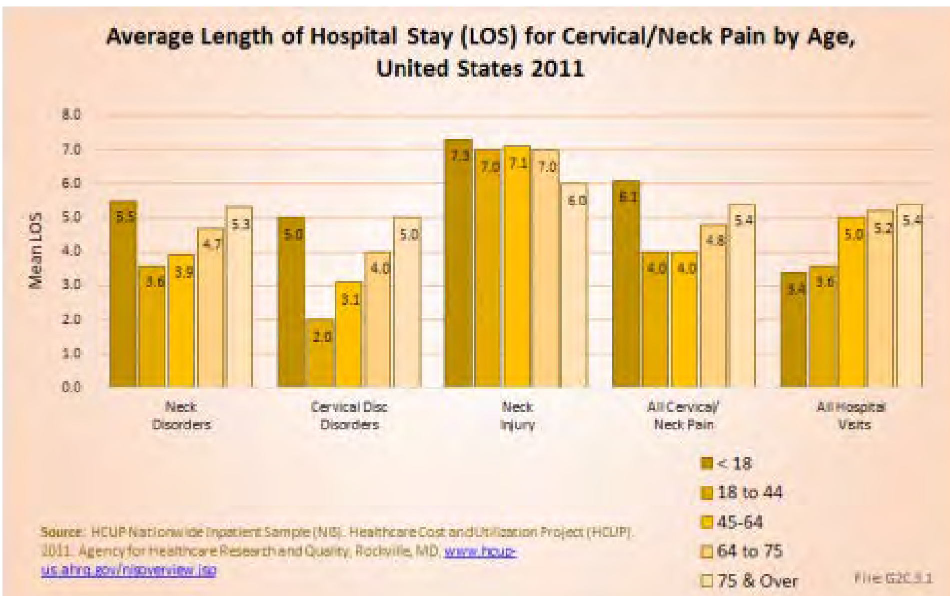


Hospitalization: Cervical/Neck Pain

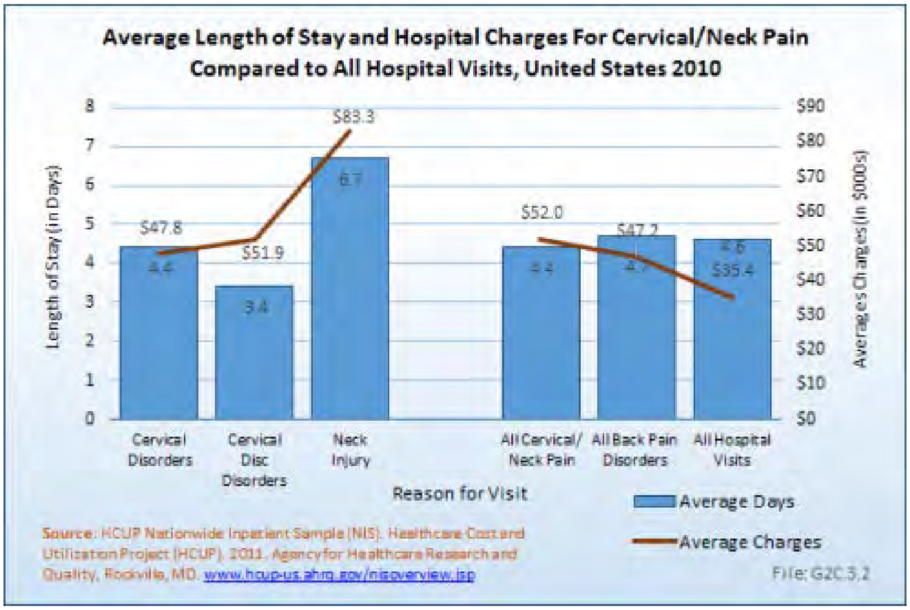
Persons hospitalized for cervical/neck pain in 2010 and 2011 spent an average of 4.5 days in the hospital. Those hospitalized for cervical/neck injuries were hospitalized for the longest period of time, on average 8 to 9 days. When comparing total days of hospitalization for all causes to those for cervical/neck pain, cervical/neck pain constitutes 1% to 2% of the discharges and of total hospital days, indicating hospital stays are, on average, similar to those for all causes. The length of hospital stays has remained relatively stable since 2004. (Reference Table 2.9.1 PDF CSV)

Although females are likely to have slightly shorter hospital stays for all cause of cervical/neck pain, it is only for neck injuries that a real difference is seen in length of stay.

Age is a greater factor in length of stay than gender. Although young persons under the age of 18 years constitute a small proportion of back pain hospitalizations, they have longer stays for cervical/neck pain, in particular when compared to the average length of stay for any reason. While the average length of stay for cervical/neck pain is very similar to that for any health care reason among adults, the average length of stay among the young group under age 18 years is 1.5 to 2 times as long. After the age of 18 years, hospital stays for cervical/neck pain tends to increase as the population ages. (Reference Table 2.9.2 PDF CSV and Table 2.9.3 PDF CSV)

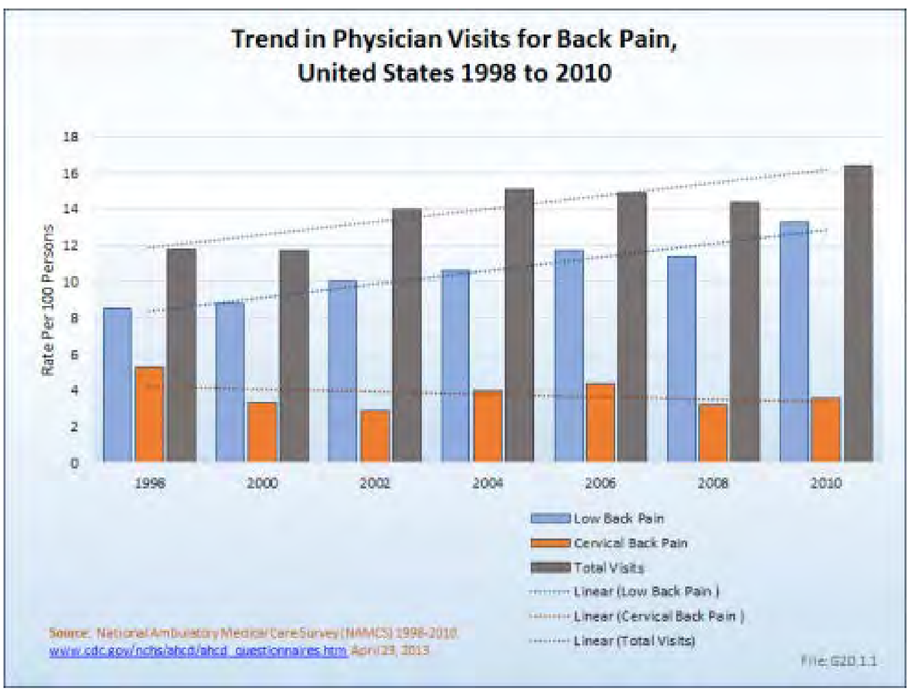


Average hospital charges are provided along with length of stay in the HCUP NIS database. On average, hospital charges for a cervical/neck pain inpatient visit were 147% that of the average inpatient visit for any cause. In 2011, an estimated $34.3 million in charges were assessed against the 660,000 inpatient stays for cervical/neck pain, 3% of the estimated total $1.37 billion in hospital charges for that year. Mean charges of $83,300 were highest for neck injuries and, at $47,800, lowest for cervical/neck disorders. (Reference Table 2.9.2 PDF CSV)



Burden of Back Pain

As mentioned, back pain was the most common reason for health care visits among musculoskeletal disorders in 2010. When combining low back and neck pain, they accounted for 5.1% of health care visits in 2010, or 1 in 20.



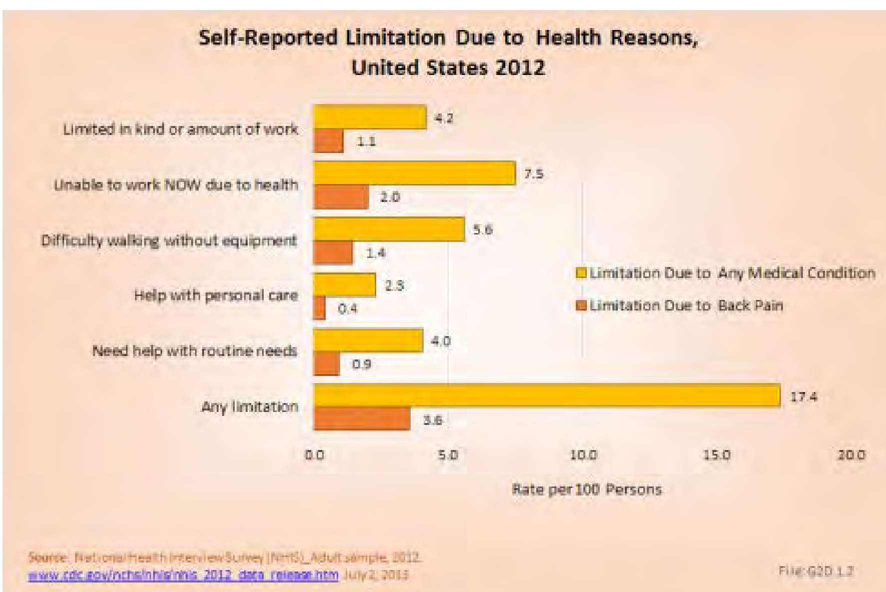
The majority of visits (more than 77%) were physician office visits. The number of physician office visits for back pain continues to increase. In 1998 there were 32 million visits, in 2004 nearly 45 million, and in 2010 more than 50 million. Physician office visits for back pain not only show a rapid increase, but also continue to include a larger share of the population. In 1998, 11.8 in 100 persons visited a physician because of back pain. In 2004, this had increased to 15.1 persons in 100. Although a slight decrease was seen through 2008, by 2010 the ratio had increased to 16.4 in 100. (Reference Table 2.8 PDF CSV)

Overall, lumbar pain accounted for 1 in 25 (4.1%) health care resource visits in 2010. The staggering impact of low back pain on both the health care resources in the United States and the disability inflicted on these individuals is disconcerting and has risen slightly since 2004.

Bed Days/Lost Work Days: Burden of Back Pain

About 8% of the working age population, persons age 18 years and older, reported they are unable to work because of a medical condition. Among this group, 27% (2% of total working-age population) reported they are unable to work due to back or neck problems. Another 4% reported they are limited in the amount or type of work they can perform, with one in four of this group also reporting the cause to be back or neck pain (1% of total work-age population). All together, 1 person among every 30 of working age in the United States is limited or unable to work because of back or neck health care problems.

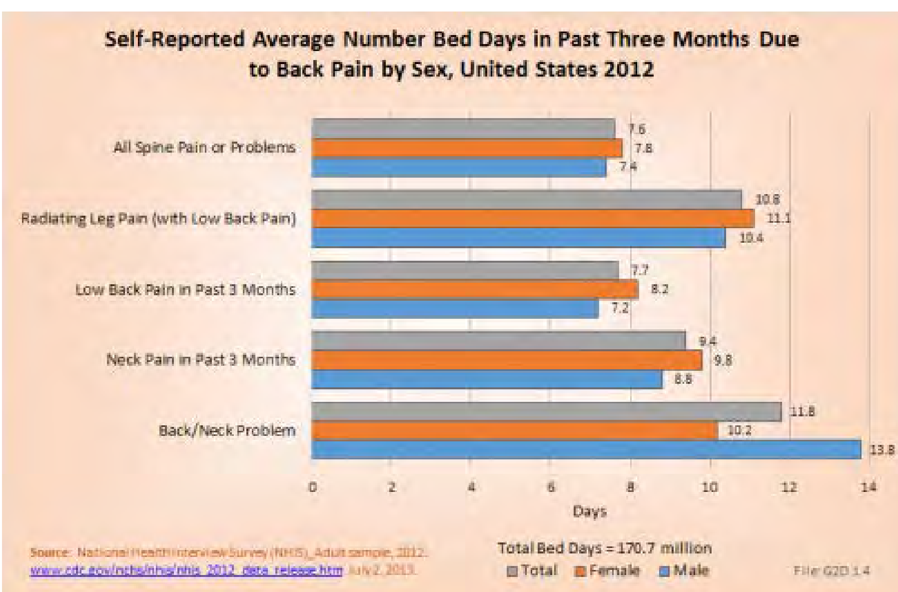
Similar ratios of limitations related to daily living are also found. About 1 in every 18 persons of working age has difficulty walking without equipment due to a medical condition; 26% report that condition to be back or neck pain. Overall, one in six working-age persons report at least one limitation with activities of daily living, which include eating, preparing food, bathing, rising from a chair, walking up steps, etc. For one in five of these persons, the cause of their limitation is back or neck pain. (Reference Table 2.10.1 PDF CSV)



Work limitations due to back pain during 2012 were reported slightly more frequently among women than men. The presence of back pain in more than one site, for example, low back and neck pain or low back and buttocks pain, is more likely to be the cause of work limitations than back pain in one single area of the spine. Although women are represented in the workforce less than men, they represent a larger share of lost work days than do men because they are more likely to report lost work days due to back pain than are men (18.6% vs. 13.8%). However, women, on average, lose one less day of work than do men (11.0 to 11.9, respectively). (Reference Table 2.11.1 PDF CSV)

Back pain severe enough to keep people from working in any occupation is most likely in the 18- to 64-year age group. This is, of course, not surprising since those are the most common years in which people work. Only 8% of the population age 75 years and older is listed as being in the workforce, and those persons of this age that do work are probably not doing work that stresses them physically. Further, the healthy worker effect in that age group is significant. Within the work force population, 16% of the workers age 18 to 44 years and 17.1% of workers between 45 and 64 years of age were off work during 2012 with a diagnosis of neck or low back pain. The average number of workdays lost was 9.5 and 14 days for the two age groups, respectively. The oldest group of workers report more than 14 days off work due to back pain, but they constitute such a small group their impact is less than that of the younger workers. (Reference Table 2.11.2 PDF CSV)

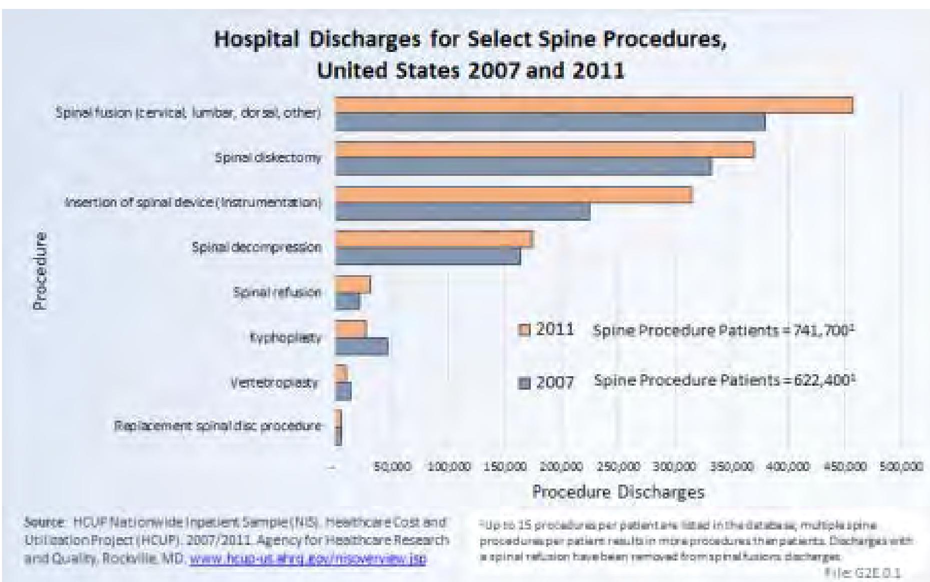
The National Health Care Interview Survey also provides information about the incidence of bed days, days in which a person was in bed for a half day or more due to injury or illness, during 2012. Here the percent of people reporting bed days is highest in the 18- to 44-year and 45- to 64-year age groups (14.2% and 14.6%, respectively). The greatest number of average bed days per worker was 12.7 in the 75-year and older age group, but a smaller proportion (6.3%) of this already small workforce reported having bed days from back or neck pain. In total, workers in the United States spent more than 170,000 million days in bed in 2012 because of back pain, and during the same time period, almost 291 million workdays were lost. The corresponding number of workdays lost in 2004 was 187 million workdays. (Reference Table 2.11.2 PDF CSV and Table 2.11.3 PDF CSV)



The most severe pain resulting in the highest average number of bed days and lost workdays was reported by people with low back pain radiating into one or both legs. This group spent an average of 10.8 days in bed and lost 17.4 workdays. Females were more commonly off work, but spent approximately the same number of days in bed as males. (Reference Table 2.11.1 PDF CSV)

Spine Procedures

While nonsurgical treatment for back pain is the treatment of choice, spine surgery becomes an option when neck and low back pain is disabling and not responding to nonoperative treatment alternatives. Further, in some cases such as certain fractures, infections, tumors, and severe neurologic deficits, surgery is the first treatment choice. As mentioned in earlier sections, the information we have with respect to surgical procedures is limited to that obtained from hospitals using the Nationwide Inpatient Sample and the National Hospital Discharge Survey. Because of the larger sample size, most data in this analysis uses the NIS. Unfortunately, the information is procedure-related and only indirectly patient-related. On average, two of the eight most common procedures were performed on most patients because the sum of the percentage of patients receiving a procedure is nearly twice that of procedures. (Reference Table 2.12 PDF CSV)

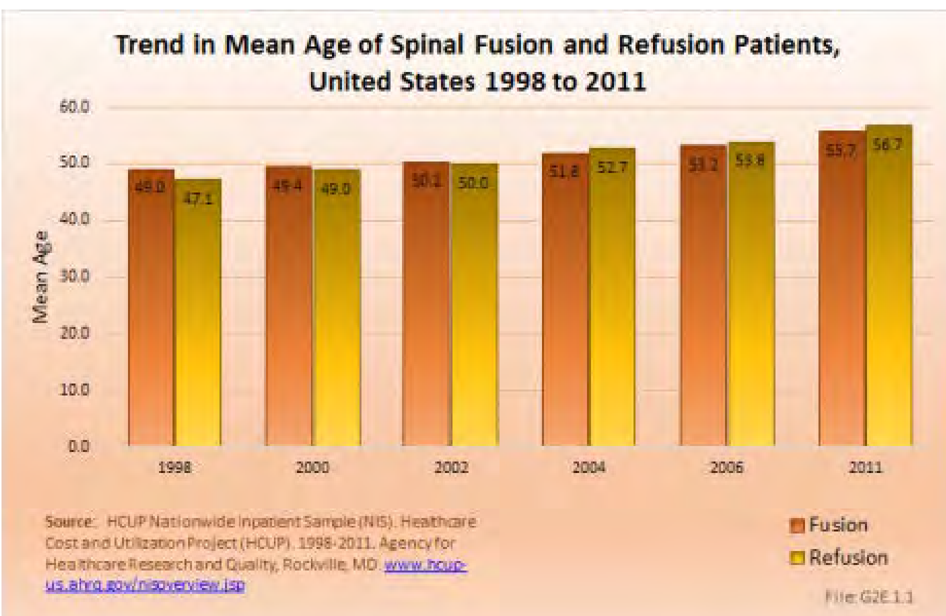


In 2007, just under 1.187 million procedures for the eight most common spine procedures were performed on 662,400 patients. In 2011, the number of patients had increased to 741,700, but total procedures for the same eight common procedures jumped even more to 1.391 million. This is an increase in the number of procedures by 17%, but only a 12% increase in the number of patients.

In 2007, there were 332,500 diskectomies performed compared to 369,900 in 2011. Because of the increase in spinal fusion and other procedures, as subsequently discussed, hospital diskectomies constitute 28% and 25% of all spine procedures in the two years, respectively. Although an absolute larger number of procedures in 2011, diskectomies represent a decreasing share of all procedures in 2011. To what degree this reflects a transfer of procedures to surgicenters is unknown because there is currently no national database. Spinal fusion procedures were listed as the main hospital procedure, being performed on 380,000 patients in 2007 and 457,500 patients in 2011. The majority of insertions of spinal devices, the third most common procedure group, likely occurred in patients with spinal fusions. If we assume that all patients in whom spinal devices were inserted also were fused, only 142,000 patients who were fused did not get a spinal device (18%). Spinal decompression, which may or may not be performed in conjunction with a spinal fusion or in conjunction with a diskectomy, accounted for 14% of all procedures in 2007 and 12.5% in 2011, an decrease of only 7% in the number of procedures. The number of spinal decompression procedures performed, along with other procedures for which inpatient hospitalization is not always required, may not be reflected accurately because an increasing number of these patients are operated on in outpatient surgicenters and facilities,.

Spinal Fusion: Spine Procedures

The rate of spinal fusion procedures has risen rapidly over the past several decades. Spinal fusion is performed either alone or in conjunction with decompression and/or reduction of a spinal deformity. Fusions are performed on all regions of the spine. Between the years 1998 and 2011, the number of spinal fusion procedures has more than doubled, from 204,000 in 1998 to 457,000 in 2011. This is a 14-year increase of 113%. Apart from the period from 2002 to 2004, the increase on a biyearly basis is in the double digits. Relating the number of patients operated on to the estimated population age 18 years and older, the rate has gone from 110 per 100,000 persons in 1998 to 199 per 100,000 in 2011. During the same time period, refusion rates increased by 171%, from 6 to 14 persons per 100,000. Between 1998 and 2011, the average age of patients operated on with a fusion procedure has increased from 49 years to just under 56 years. (Reference Table 2.13 PDF CSV)

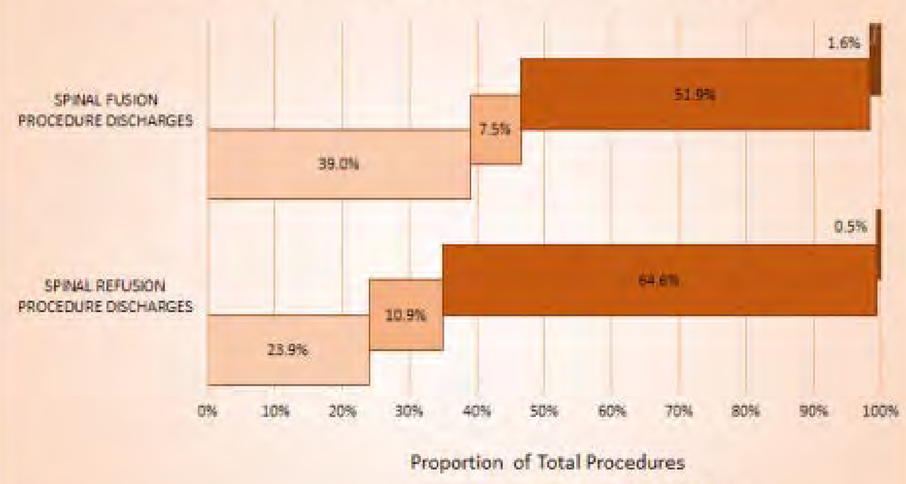


Although the mean length of stay for spinal fusion has decreased from 4.7 days in 1998 to 3.8 in 2011, the hospital charges for these patients have increased significantly. The mean hospitalization charge in 1998 was $26,000 ($36,000 in 2011 dollars); while in 2011 the charge was $102,000. An increased use of instrumentation and biologicals (mainly bone substitutions) contribute to the higher cost. The total increase in hospitalization charges rose from $5.4 billion ($7.4 billion in 2011 dollars) to $46.4 billion over this 14-year period, an increase of more than 750%. Spinal refusions are even more expensive, with an average charge of $123,000 in 2011. However, because spinal refusions are a small proportion of all fusion procedures, they account for only 7.5% of total 2011 charges. This, of course, does not mean that cost or reimbursement was even close to these dollar numbers. These charges are based on what hospitals set as their charges, and do not reflect the contractual agreements they have with the payor community.

Likely explanations for the increase in spinal fusions are advances in technology, including the development of new diagnostic techniques and new implant devices that allow for better surgical management. In addition, there has been increased training in spinal surgery and the population has aged, bringing with it the inherent medical problems that aging incurs. Further, quality of life expectations have increased, making patients less accepting of an ongoing back problem and more likely to look for a surgical solution.

Lumbar fusion rates and cervical fusion rates are both increasing rapidly, while thoracic fusions continue to be less frequent. Lumbar fusions remain the most common, constituting 52% of all spine fusion procedures in 2011. Spinal refusions occur most often to the lumbar region, accounting for 65% of both refusion procedures and refusion patients. (Reference Table 2.14 PDF CSV)

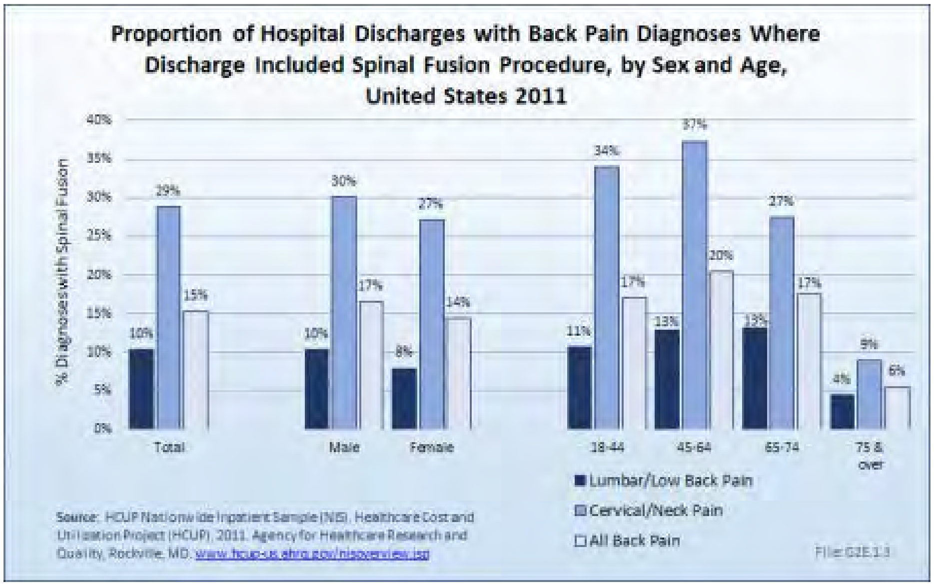
Distribution of Spine Fusion Procedures by Spine Section for Hospital Discharge Patients, United States, 2011

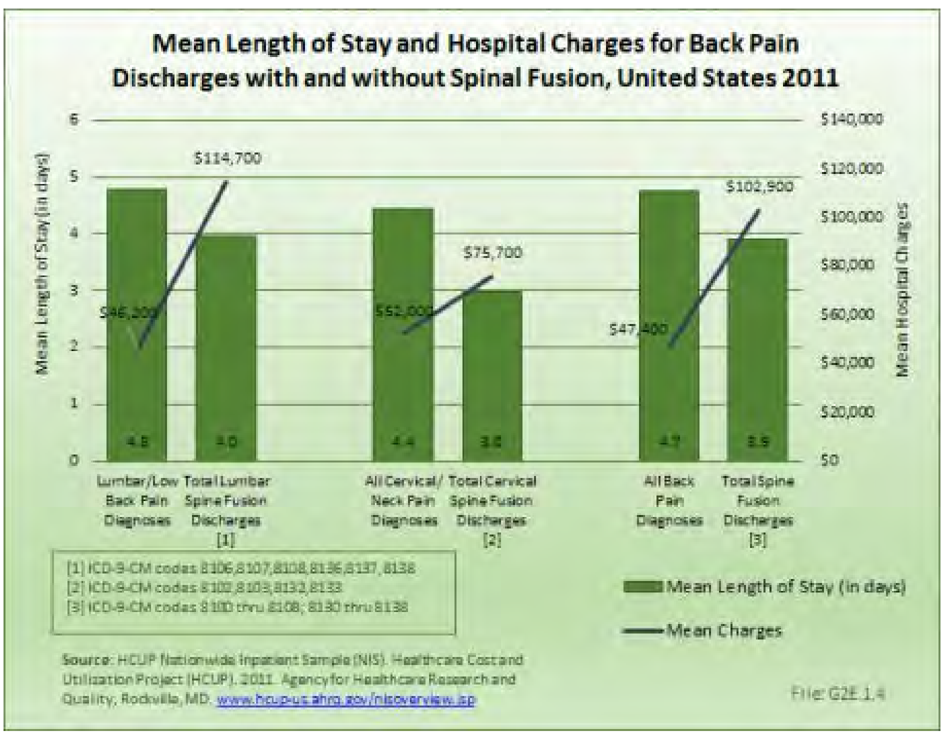


Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2007/2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

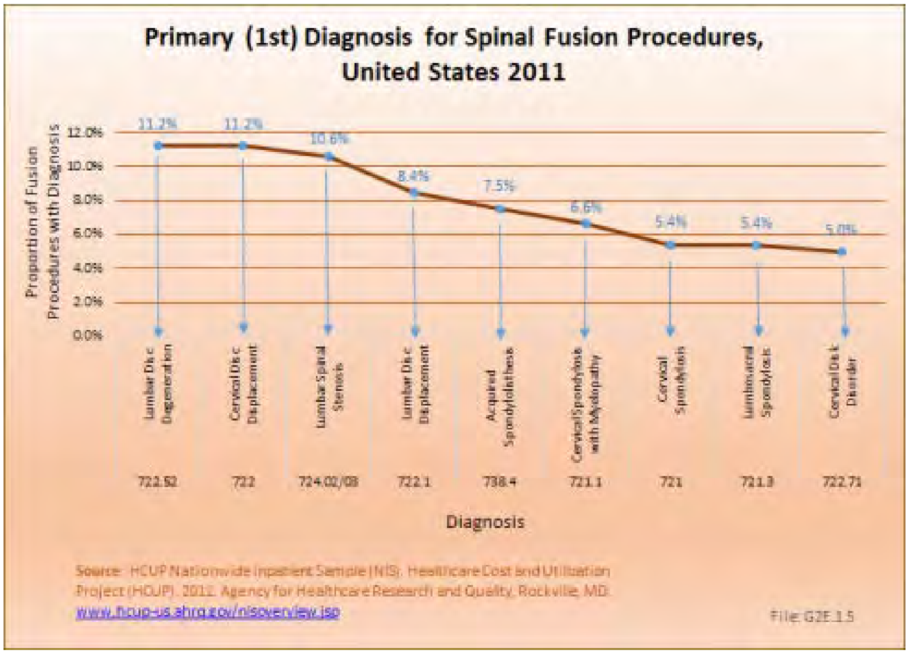
File: G2E.1.2

Using the Nationwide Inpatient Sample in 2011, a broad estimate can be made of fusion procedures as it relates to admissions. In 2011, 10.4% of patients with low back diagnosis were operated on with a fusion. For cervical neck pain diagnoses, the proportion is much higher (28.8%). Males and females are almost equally likely to have a fusion. The total number of males being fused for either neck or low back pain is 16.5% versus 14.4% among females. Patients in the 45- to 64-year age group were slightly more likely to have a fusion procedure than those younger or older. The length of stay was less if a fusion was performed than if no fusion was performed, but the mean charges were more than double when a fusion was performed. (Reference Table 2.15 PDF CSV)



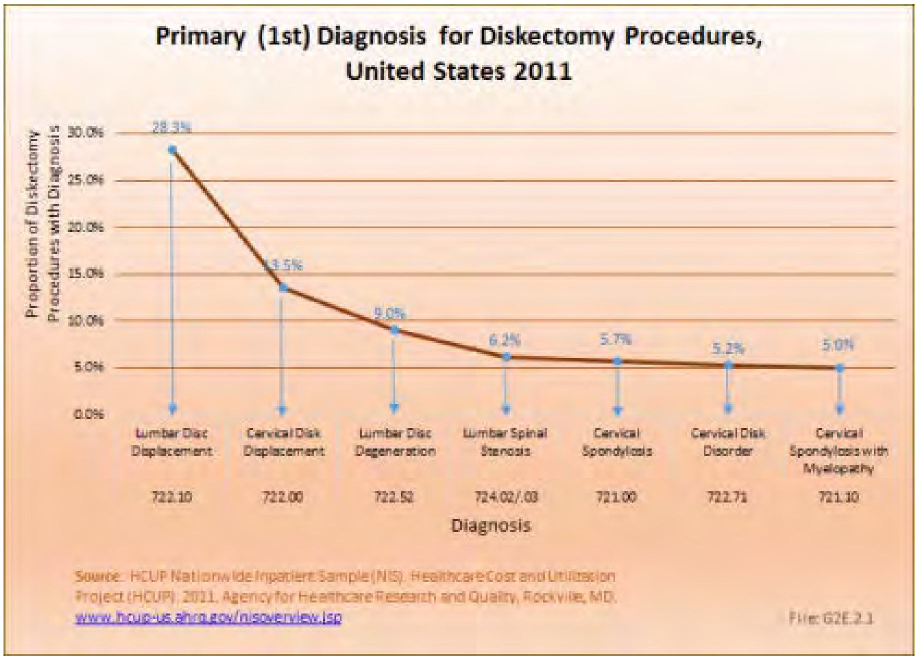


Spinal fusion is most frequently performed in patients with either a primary diagnosis of lumbar disc degeneration or cervical disc displacement, both accounting for 11.2% of fusion procedures. Spinal stenosis accounted for 10.6%. Much smaller numbers of patients had degenerative spondylolisthesis (7.5%), idiopathic spondylolisthesis (2.7%), or idiopathic scoliosis (2.4%). (Reference Table 2.16 PDF CSV)



Disk Displacement and Spinal Diskectomy: Spine Procedures

Diskectomies occurred in approximately 370,000 inpatients, with slightly more females than males undergoing the procedure. This number is likely misleading because many diskectomies now occur in an outpatient setting. Of those undergoing the procedures, 42% had a diagnosis of either lumbar or cervical disc displacement, with more than 12% having a diagnosis of disk degeneration. (Reference Table 2.18 PDF CSV)



The largest number of patients with a diskectomy procedure (almost 50%) was in the 45- to 64-year age group. Patients spent on average 4.6 days in the hospital, although the median is between one and two days. Diskectomy procedures conducted in outpatient clinics are not included as there is no good source for this data at this time. The mean charges for diskectomy procedures were $35,000, for a total of $13 million. The majority of patients with a disc displacement diagnosis are not hospitalized. The most frequent encounters are physician office visits. (Reference Table 2.17 PDF CSV)

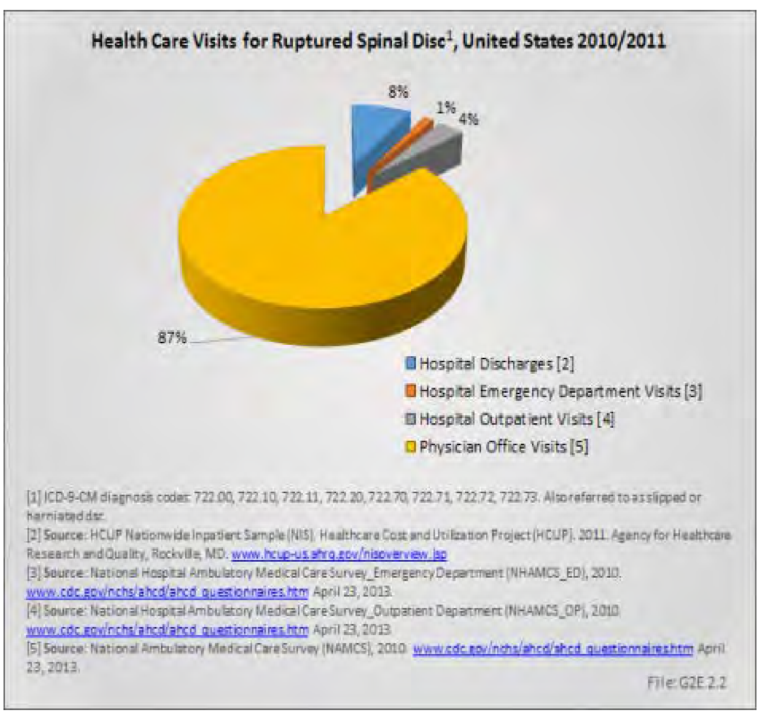
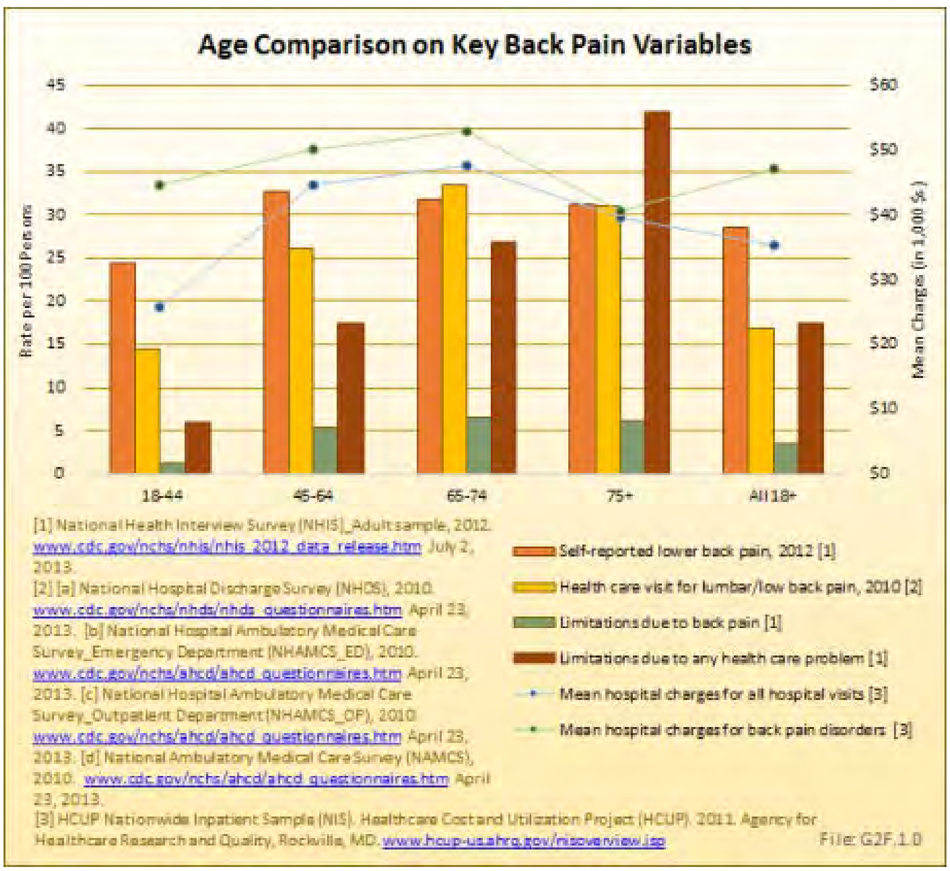


Table 2.19 (PDF CSV) shows the diskectomy procedure trend in the United States from 1996 to 2011. It may seem surprising that the number is fairly stable given the population increase and the change in aging of the population. This is a reflection of the fact that more and more of these procedures are done in the outpatient setting and therefore not captured by the inpatient National Hospital Discharge Survey.

Impact of Aging

The prevalence of back and joint pain increases as the population ages. Persons age 45 to 64 years self-report the presence of back and neck pain during a previous 3-month period in the highest numbers, while joint pain is self-reported by 7 of 10 persons age 65 and over. (Reference Table 2.1 PDF CSV and Table 2.2.2 PDF CSV)

Health care visits for back disorders to doctors, emergency departments, outpatient clinics, and hospital discharges show a steady rise as the population ages up to 75 years. After that, it drops slightly. Older persons with back pain are more likely to be hospitalized that are younger persons, and to stay an average of 1 day longer than younger persons age 18 to 44 years. Average charges for hospital stays with a diagnosis of back pain also rise as age rises, again with a drop after age 75 years. Mean hospital charges are an average of 133% those for all health care hospitalizations in 2011. (Reference Table 2.9.2 PDF CSV) While the prevalence of neck disorders is significantly lower, aging again has a large impact on the number of health care visits for neck pain.



Back pain is listed as a cause of limitations in activities of daily living by 15% to 31% of those persons with limitations. The rate increases up to the age of 65 to 74 years, and again declines after age 75 years. (Reference Table 2.10.2 PDF CSV)

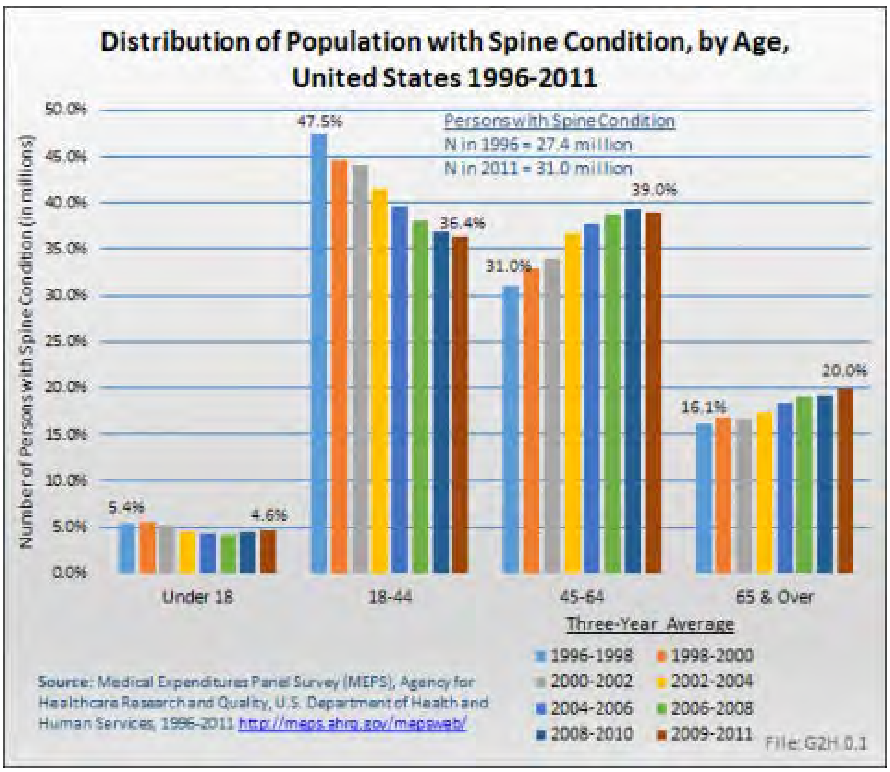
Back pain is a major health concern to older people. As the population continues to age, back pain becomes an increasing larger burden on the health care system.

Neuromuscular Conditions

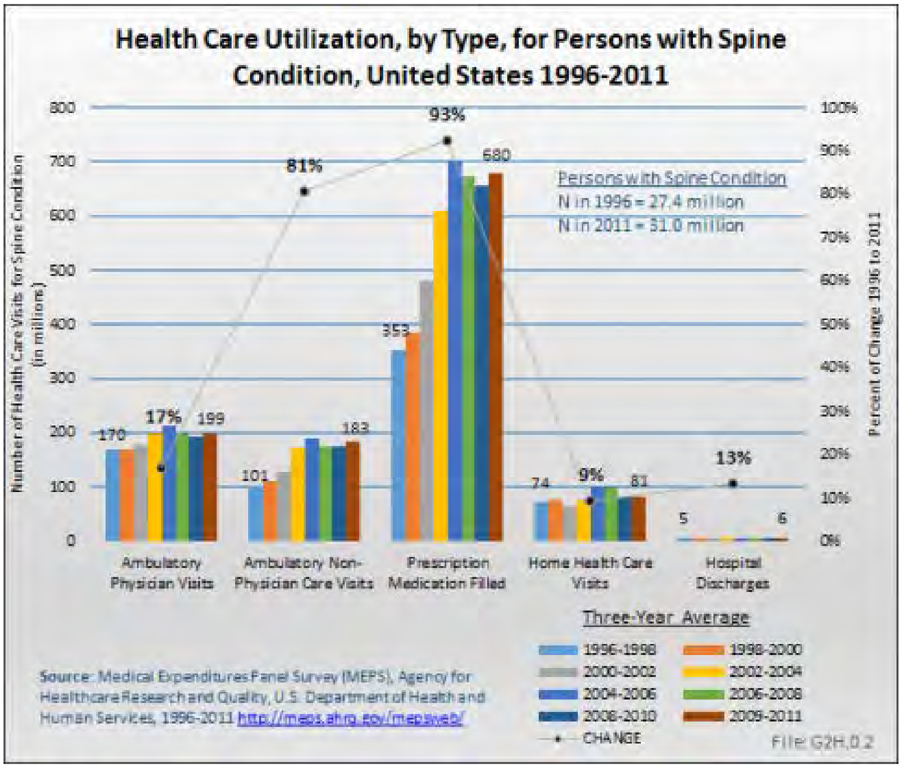
The human spine is an extremely complex biomechanical structure with multiple joints, bones, muscles, and nerves. Functional and structural disorders of the spine often produce symptoms affecting more than one region of the spine and these problems are not captured within the diagnostic groups previously discussed. They include patients with pelvic symptoms, headaches related to the cervical region, and fibromyalgia. While disabling too many patients, the true estimate of health care utilization in these patients is difficult to estimate.

Economic Burden

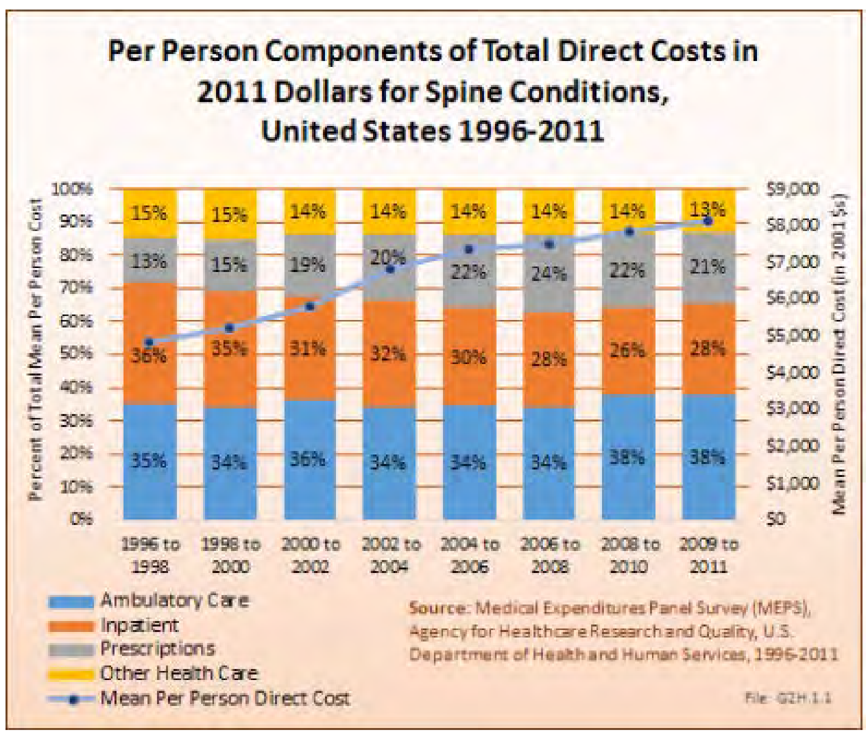
Between the years 1996 to 1998 and 2009 to 2011, the number of persons in the population reporting a spine condition rose from 27.4 million to 31.0 million, but the proportion of total population with a spine condition (10.1%) remained the same in both time periods. However, the distribution of the population with a spine condition, by age group, showed a consistent shift upward as the population ages, reflecting the overall aging of the US population. (Reference Table 10.1 PDF CSV)



Health care treatments and visits contribute to the burden of spine conditions. Ambulatory physician visits, home health care visits, and hospital discharges all rose by 17%, 9%, and 13%, respectively, between the years 1996 to 1998 and 2009 to 2011. While still accounting for a relatively small number of visits, ambulatory nonphysician care visits rose from 101 million in the earlier time frame to 183 million in the most recent years, an increase of 83%. However, prescription medications for spine conditions show the most dramatic rise, jumping from 353 million prescriptions to 680 million over the two time frames, an increase of 93%. (Reference Table 10.2 PDF CSV)

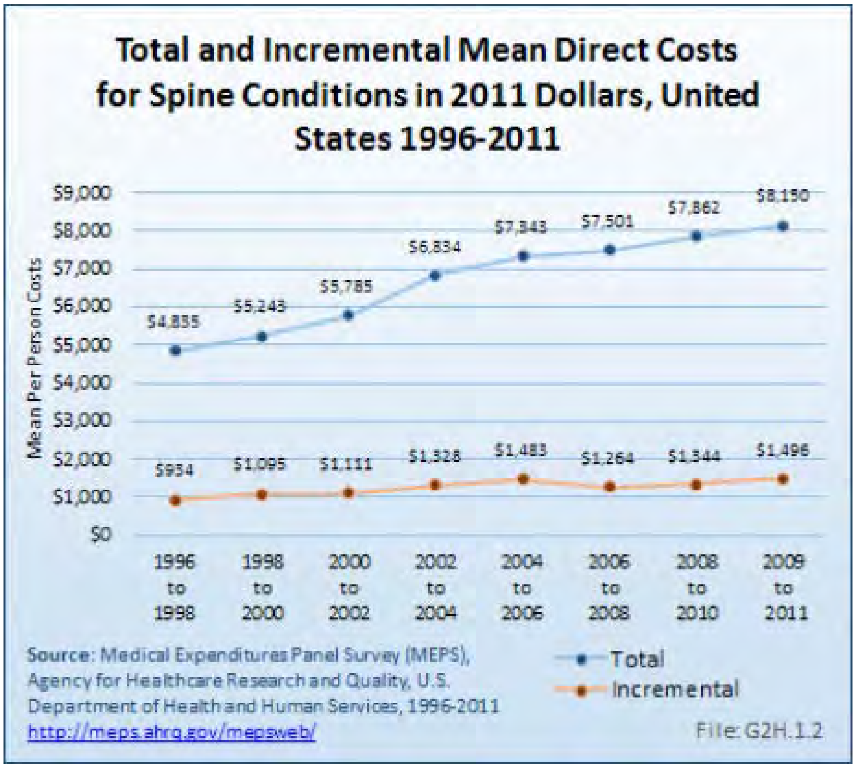


Direct Medical Costs: Economic Burden

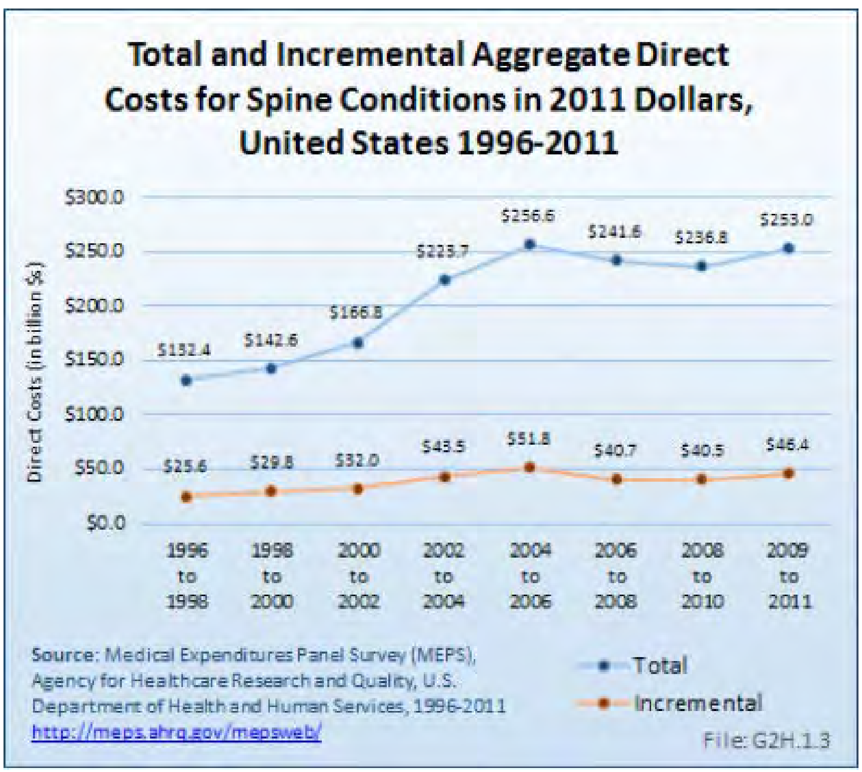


Overall, ambulatory care visits accounted for the largest share of per-person direct cost for persons with a spine condition. At an average cost of $3,077 per-person between 2009 and 2011, an increase of 81% from 1996 to 1998, ambulatory care accounted for 38% of per person direct cost between 2009 and 2011. While the share of mean per-person cost for inpatient care dropped from 36% to 28% between 1996 and 1998 and 2009 to 2011, the mean cost rose from $1,755 to $2,267, an increase of 29%. At the same time, the average per-person cost for prescriptions rose from $650 to $1,736, in 2011 dollars, an increase of 167%. (Reference Table 10.4 PDF CSV)

Total direct per-person health care costs for persons with a spine condition were $8,150, and increase of 69% since 1996 to 1998. Incremental direct per-person costs, those costs most likely attributable to a spine condition, rose from $934 to $1,496, in 2011 dollars, an increase of 60%. (Reference Table 10.6 PDF CSV)



Total aggregate direct costs for persons with a spine condition were $253 billion in 2009 to 2011, a rise of 91% from the $132.4 billion in 1996 to 1998, in 2011 dollars. Incremental aggregate direct costs increased from $25.6 billion in 1996 to 1998 to $46.4 billion in 2009 to 2011, an increase of 82%.



Indirect Costs (Society/Employers): Economic Burden

Indirect costs associated with lost wages for persons ages 18 to 64 years are not calculated for persons with a spine condition However, back pain is often cited as the reason for bed days and lost work days by persons in the labor force. In 2012, 3.6 million persons in the prime working ages of 18 to 64 years reported they were unable to work at the time due to chronic back or neck problems, with another 1.7 million reporting they were limited in the kind or amount of work they can do as a result of chronic back or neck pain. (Reference Table 2.10.2 PDF CSV)

Also, in 2012, 14.2% of the workforce age population reported an average of 7.6 bed days in the previous 12 months, for a total of 170.7 million bed days, due to chronic back or neck pain. In addition, 16.1% of this same population reported an average of 11.4 lost work days in the previous year due to chronic back or neck pain, or more than 290 million work days lost in 2011/2012 due to back pain. (Reference Table 2.11.1 PDF CSV)

Key Challenges to Future

The financial cost associated with back pain is obviously enormous and, unfortunately, rising. Greater understanding of the causes of back pain and what leads to disability is needed to reduce this continually increasing trend. Understanding why disc degeneration causes pain in some yet not in others is needed to address the burden of pain and disability and the significant economic impact low back pain treatments create on health care resources each year.

DATA LIMITATIONS

The two main limitations in obtaining complete and reliable data are (1) the lack of data sources for all treatment locations and treatment providers and (2) the difficulty in verifying the correct diagnosis.

As discussed in the text we have no comprehensive databases covering outpatient procedures, particularly in surgi-centers and practice procedure rooms. With an increasing move toward outpatient procedures, this is a growing weakness in obtaining prevalence and incidence data. In addition, we have no data covering nonphysician treatments, such as treatment by physical therapists, chiropractors, naprapaths, acupuncturists, but we know they take care of large numbers of patients with neck and back disorders. We also have little information about the use of alternative treatment methods.

Verifying the primary diagnosis is seriously affected by our inability to make a diagnosis in patients with chronic back and neck pain, and by the fact that many patients have more than one spinal diagnosis and the primary diagnosis is often not the one listed first in the databases.

PATIENT CO-MORBIDITIES

The neck and back chapters do not cover co-morbidities. We know that obesity and smoking influences the intervertebral discs. Other co-morbidities, such as cardiovascular diseases and diabetes, have been linked to back pain, but conclusions related to their impact on back pain cannot be made based on current data sources.

PATIENT COMPLIANCE

Patient compliance with recommendations, such as weight loss and activity, is an important factor in reducing back pain. As with co-morbidities, this important aspect cannot be addressed using available data sources.

Unmet Needs

As noted in the discussion above (Indirect Costs), back pain was the cause of more than 290 million lost work days in a 12 month period during 2011/2012. In addition, over 6%, or 1 in 16, persons in the prime working ages of 18 to 64 report they are either limited in the type or amount of work they can do or are unable to work at all due to back pain. It is clear that back pain has a substantial impact on he workforce, and that finding ways to reduce or repair causes of back pain is needed. (Reference Table 2.10.2 PDF CSV and Table 2.11.1 PDF CSV)

RESEARCH FUNDING FOR CARE AND PREVENTION

To address the most common cause of chronic pain, back and neck pain, research in prevention, diagnoses, and treatment is essential. While a priority at the National Institutes of Health and identified as one of the most important health problems by the Institute of Medicine, funding is not sufficient to accelerate basic research, compare treatment alternatives, develop new treatments, and evaluate possible prevention approaches.

AVAILABILITY OF HEALTH CARE PROVIDERS

Many patients have difficulty connecting with health care providers who have the appropriate training in back and neck disorders. This leads to delayed appropriate treatment and often unnecessary use of diagnostic resources. Back and neck pain are frequent reasons for acute care in emergency facilities, with associated wait periods and increased cost.

ACCESS TO CARE

As discussed above, access to appropriate care is inadequate. This is true for both nonspecialists and specialists. Better training of primary care physicians and better coordination between physicians and other providers of primary back and neck care, such as physical therapists, chiropractors, and other alternative care givers, would be beneficial. Specialists, both in non-operative and surgical specialties, must become more accessible when required.

ICD-9-CM Codes for Back Pain

Back Pain (Lumbar and Low Back):
- Back Disorders:
  - Ankylosing spondylitis and other inflammatory spondylopathies: 720*
  - Spondylosis and allied disorders: 721.2-721.9
  - Other and unspecified disorders of back: 724
- Disk Disorders:
  - Displacement of intervetebral disc: 722.10, 722.11
  - Schmorl's nodes: 722.30-722.39
  - Degeneration of intervetebral disc: 722.51, 722.52, 722.60
  - Intervertebral disc disorder with myelopathy: 722.72, 722.73
  - Postlaminectomy syndrome: 722.80, 722.82, 722.83
  - Other and unspecified disc disorder: 722.90, 722.92, 722.93
- Back Injury:
  - Closed fracture of vertebra without mention of spinal cord injury: 805.20-805.80
  - Closed fracture of vertebra with spinal cord injury: 806.20-806.90
  - Closed dislocation, vertebra: 839.20-839.49
  - Sprains and strains of sacroiliac region: 846
  - Other sprains and strains of back: 847.10-749.90

Cervical (Neck) Pain:
- Neck Disorders:
  - Cervical spondylosis: 721.00, 721.11
  - Disorders of cervical region: 723.00-723.90
- Disk Disorders:
  - Displacement of cervical intervertebral disc: 722.00
  - Degeneration of cervical intervertebral disc: 722.40
  - Intervertebral disc disorder, with myelopathy: 722.71
  - Postlaminectomy syndrome of cervical region: 722.81
  - Other and unspecified disc disorders of cervical region: 722.91
- Neck Injury:
  - Closed fracture of cervical vertebra without mention of spinal cord injury: 805
  - Closed fracture of cervical vertebra with spinal cord injury: 806
  - Closed dislocation, cervical vertebra: 839
  - Neck sprain: 847.00

Spine Procedures (ICD-9-CM Procedures Code)
- Cervical fusion: 81.02, 81.03
- Thoracic fusion: 81.04, 81.05
- Lumbar fusion: 81.06-81.08
- Other fusion: 81.00, 81.01
- Fusion/refusion multiple vertebrae: 81.62-81.64
- Spine refusion: 81.30-81.39
- Spinal decompression: 03.09
- Spinal diskectomy: 80.50, 80.51

Table 2.1: Self-Reported Prevalence of Joint Pain by Site of Joint and Selected Demographic Characteristics for Persons Age 18 and Over, United States 2012

		Prevalence of Pain by Site (rate per 100 persons)									
		Lower Back [1]	Neck [2]	Back w/ Radiating Leg Pain [3]	Upper Limb [4]	Shoulder [5]	Lower Limb [6]	Knee [7]	Hip [8]	Any Musculoskeletal Pain	% Pain in > 2 Sites
Gender	Male	26.6	12.6	11.4	9.7	8.5	6.3	16.8	5.4	49.5	57%
	Female	30.5	17.6	11.5	12.5	8.4	7.7	19.3	8.4	54.6	62%
Age	18-44 years	24.5	12.2	6.8	5.7	4.3	4.1	10.5	3.1	39.3	52%
	45-64 years	32.7	19.2	14.1	15.6	11.7	9.7	23.6	9.3	60.9	65%
	65-74 years	31.8	15.8	12.6	18.4	13.3	9.9	27.5	12.4	69.2	64%
	75 & over	31.3	14.0	12.2	16.1	13.4	9.4	28.8	12.8	70.8	62%
Race	White	29.3	15.8	10.5	11.8	8.8	7.2	18.5	7.3	53.7	60%
	Black	26.6	12.4	10.1	8.5	7.4	6.4	17.9	5.4	47.7	58%
	Asian	19.1	10.4	6.5	5.9	4.6	3.5	10.0	2.5	36.6	52%
	Other	33.5	18.4	13.5	13.6	10.3	10.7	21.7	8.9	54.4	64%
Total		28.6	15.2	10.3	11.2	8.4	7.0	18.1	6.9	52.1	60%

[1] "During the PAST THREE MONTHS, did you have ...Low back pain?"

[2] "During the PAST THREE MONTHS, did you have ...Neck pain?"

[3] If low back pain, "Did this pain spread down either leg to areas below the knees?" Rate in population is found by multiplying lower back pain rate by radiating leg pain rate.

"DURING THE PAST 30 DAYS, have you had any symptoms of pain, aching, or stiffness in or around a joint?"

[4] Hand, wrist, fingers

[5] Shoulder

[6] Ankle, foot

[7] Knee, right/left

[8] Hip, right/left

Source: National Health Interview Survey (NHIS)_Adult sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 2.2.1: Prevalence of Lumbar/Low Back Disorders [1] by Sex, United States 2010

	Total Discharges/ Visits	% of Total by Type [6]	Discharges/Visits		% of Total	
			Male	Female	Male	Female
Hospital Discharges [2] (in 000s)						
Back Disorders	1,431.5	71%	602.7	828.8	42%	58%
Disc Disorders	545.4	27%	231.3	314.1	42%	58%
Back Injury	182.5	9%	83.5	99.0	46%	54%
All Lumbar/Low Back Pain (6)	2,025.7	107%	861.3	1,164.4	43%	57%
Rate Per 100 Patient Visits	5.2		5.3	5.1		
Diagnoses Per 100 U.S. Population [7]	0.7		0.6	0.7		
Emergency Department Visits [3] (in 000s)						
Back Disorders	4,352.1	70%	1,878.4	2,473.8	43%	57%
Disc Disorders	*	2%	*	*	*	*
Back Injury	2,180.0	35%	1,030.6	1,149.4	47%	53%
All Lumbar/Low Back Pain (6)	6,222.6	107%	2,757.6	3,465.0	44%	56%
Rate Per 100 Patient Visits	4.8		4.7	4.8		
Diagnoses Per 100 U.S. Population [7]	2.0		1.8	2.2		
Hospital Outpatient Visits [4] (in 000s)						
Back Disorders	2,623.9	87%	1,006.3	1,617.6	38%	62%
Disc Disorders	322.2	11%	133.5	188.6	41%	59%
Back Injury	199.9	7%	53.6	146.2	27%	73%
All Lumbar/Low Back Pain (6)	3,026.6	104%	1,133.2	1,893.3	37%	63%
Rate Per 100 Patient Visits	3.0		2.8	3.2		
Diagnoses Per 100 U.S. Population [7]	1.0		0.7	1.2		

Table 2.2.1: Prevalence of Lumbar/Low Back Disorders [1] by Sex, United States 2010

	Total Discharges/ Visits	% of Total by Type [6]	Discharges/Visits		% of Total	
			Male	Female	Male	Female
Physician Office Visits [5] (in 000s)						
Back Disorders	31,196.4	76%	13,907.4	17,289.1	45%	55%
Disc Disorders	8,723.9	21%	4,555.7	4,168.2	52%	48%
Back Injury	4,929.1	12%	2,457.9	2,471.2	50%	50%
All Lumbar/Low Back Pain (6)	40,903.3	110%	18,917.0	21,986.3	46%	54%
Rate Per 100 Patient Visits	4.1		4.5	3.7		
Diagnoses Per 100 U.S. Population [7]	13.2		12.4	14.0		
Total Health Care Visits for Lumbar/Low Back Pain, 2010 (in 000s)						
Back Disorders	39,603.9	76%	17,394.8	22,209.3	44%	56%
Disc Disorders	9,706.4	19%	4,950.5	4,755.8	51%	49%
Back Injury	7,491.5	14%	3,625.6	3,865.8	48%	52%
All Lumbar/Low Back Pain (6)	52,178.2	109%	23,669.1	28,509.0	45%	55%
Rate Per 100 Patient Visits	4.1		4.4	3.8		
Diagnoses Per 100 U.S. Population [7]	16.9		15.6	18.1		

* Estimate does not meet standards for reliability

[1] Back disorders include inflammatory spine conditions, spondylosis, spinal stenosis, lumbago, sciatica, backache, and disorders of the sacrum (ICD-9-CM codes 720, 721, and 724). Disc disorders include herniation, disc degeneration, and post laminectomy syndromes (ICD-9-CM code 722). Back injuries include fractures, dislocation, and sprains (ICD-9-CM codes 805, 806, 839, 846, and 847). This division, while useful in analyzing the databases, may not always accurately reflect the primary diagnosis. Further, there is some overlap.

[2] Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

[3] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[6] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient. Visits also do not include those made to other types of medical care providers, such as chiropractic or physical therapy.

[7] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.2.2: Prevalence of Lumbar/Low Back Disorders [1] by Age, United States 2010

	Total	<18	18-44	45-64	65-74	75 & over	Ave Age for Dx
		Age in Years					
Hospital Discharges [2]	**Total Number of Hospital Discharges for Low Back Disorders (in 000s)**						
Back Disorders	1,431.5	*	235.3	496.3	283.4	411.2	62.3
Disc Disorders	545.4	*	123.2	217.0	95.4	106.1	57.7
Back Injury	182.5	*	38.8	40.3	29.6	69.1	61.9
All Lumbar/Low Back Pain (6)	2,025.7	13.5	371.0	710.9	381.0	549.3	61.1
Rate Per 100 Patient Visits	5.2	0.2	3.9	7.5	7.3	6.5	
Diagnoses Per 100 U.S. Population [7]	0.7	0.0	0.3	0.9	1.7	3.0	
Emergency Department Visits [3]	**Total Number of Emergency Department Visits for Low Back Disorders (in 000s)**						
Back Disorders	4,352.1	116.9	2,301.3	1,418.0	256.3	259.6	43.6
Disc Disorders	*	*	*	*	*	*	*
Back Injury	2,180.0	153.9	1,205.1	553.2	155.3	112.4	40.7
All Lumbar/Low Back Pain (6)	6,222.6	266.3	3,317.9	1,878.4	403.4	356.7	42.7
Rate Per 100 Patient Visits	4.8	0.9	6.3	6.7	4.9	3.2	
Diagnoses Per 100 U.S. Population [7]	2.0	0.4	2.9	2.3	1.8	1.9	
Hospital Outpatient Visits [4]	**Total Number of Outpatient Department Visits for Low Back Disorders (in 000s)**						
Back Disorders	2,623.9	*	721.3	1,184.8	303.6	292.7	51.2
Disc Disorders	322.2	*	84.4	156.0	*	*	53.2
Back Injury	199.9	*	93.8	66.2	*	*	43.0
All Lumbar/Low Back Pain (6)	3,026.6	136.0	864.9	1,342.7	363.7	319.3	50.9
Rate Per 100 Patient Visits	3.0	0.5	3.1	4.8	3.4	3.4	
Diagnoses Per 100 U.S. Population [7]	1.0	0.2	0.8	1.6	1.7	1.7	

Table 2.2.2: Prevalence of Lumbar/Low Back Disorders [1] by Age, United States 2010

	Total	<18	18-44	45-64	65-74	75 & over	Ave Age for Dx
		Age in Years					
Physician Office Visits [5]	**Total Number of Physician Visits for Low Back Disorders (in 000s)**						
Back Disorders	31,196.4	*	8,697.9	13,386.8	4,759.5	3,520.6	52.9
Disc Disorders	8,723.9	*	2,230.2	3,897.3	*	*	54.2
Back Injury	4,929.1	*	2,229.5	1,988.0	*	*	46.1
All Lumbar/Low Back Pain (6)	40,903.3	*	11,800.8	17,498.9	6,141.5	4,551.7	52.6
Rate Per 100 Patient Visits	4.1	0.5	4.5	5.9	4.6	3.6	
Diagnoses Per 100 U.S. Population [7]	13.2	*	10.4	21.4	28.1	24.4	
Total Health Care Visits for Lumbar/Low Back Pain, 2010							
	Total Number of Health Care Visits for Low Back Disorders (in 000s)						
Back Disorders	39,603.9	1,075.5	11,955.8	16,485.9	5,602.8	4,484.1	
Disc Disorders	9,706.4	134.7	2,492.4	4,309.4	1,482.2	1,287.6	
Back Injury	7,491.5	245.7	3,567.2	2,647.7	488.0	542.6	
All Lumbar/Low Back Pain (6)	52,178.2	1,326.2	16,354.6	21,430.9	7,289.6	5,777.0	
Rate Per 100 Patient Visits	4.1	0.5	4.6	5.9	4.7	3.7	
Diagnoses Per 100 U.S. Population [7]	16.9	1.8	14.5	26.2	33.4	31.0	

* Estimate does not meet standards for reliability

[1] Back disorders include inflammatory spine conditions, spondylosis, spinal stenosis, lumbago, sciatica, backache, and disorders of the sacrum (ICD-9-CM codes 720, 721, and 724). Disc disorders include herniation, disc degeneration, and post laminectomy syndromes (ICD-9-CM code 722). Back injuries include fractures, dislocation, and sprains (ICD-9-CM codes 805, 806, 839, 846, and 847). This division, while useful in analyzing the databases, may not always accurately reflect the primary diagnosis. Further, there is some overlap.

[2] Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

[3] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[6] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient. Visits also do not include those made to other types of medical care providers, such as chiropractic or physical therapy.

[7] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.3.1: Prevalence of Neck and Cervical Spine Disorders [1] by Sex, United States 2010

	Total Discharges/ Visits	% of Total by Type [6]	Discharges/Visits		% of Total	
			Male	Female	Male	Female
Hospital Discharges [2] (in 000s)						
Cervical Disorders	315.1	60%	136.8	178.3	43%	57%
Cervical Disc Disorders	173.2	33%	81.4	91.8	47%	53%
Neck Injury	76.2	15%	42.9	33.3	56%	44%
All Cervical/Neck Pain [6]	525.1	108%	244.0	281.1	46%	54%
Rate Per 100 Patient Visits	1.3		1.5	1.2		
Diagnoses Per 100 U.S. Population [7]	0.2		0.2	0.2		
Emergency Department Visits [3] (in 000s)						
Cervical Disorders	853.4	34%	368.9	484.5	43%	57%
Cervical Disc Disorders	*	1%	*	*	*	*
Neck Injury	1,694.4	68%	736.2	958.2	43%	57%
All Cervical/Neck Pain [6]	2,497.4	103%	1,098.4	1,399.0	44%	56%
Rate Per 100 Patient Visits	1.9		1.9	2.0		
Diagnoses Per 100 U.S. Population [7]	0.8		0.7	0.9		
Hospital Outpatient Visits [4] (in 000s)						
Cervical Disorders	621.4	74%	210.7	410.7	34%	66%
Cervical Disc Disorders	137.3	16%	*	*	*	*
Neck Injury	104.6	12%	*	*	*	*
All Cervical/Neck Pain [6]	838.7	103%	306.8	531.8	37%	63%
Rate Per 100 Patient Visits	0.8		0.8	0.9		
Diagnoses Per 100 U.S. Population [7]	0.3		0.2	0.3		

Table 2.3.1: Prevalence of Neck and Cervical Spine Disorders [1] by Sex, United States 2010

	Total Discharges/ Visits	% of Total by Type [6]	Discharges/Visits		% of Total	
			Male	Female	Male	Female
Physician Office Visits [5] (in 000s)						
Cervical Disorders	8,764.9	70%	3,826.2	4,938.7	44%	56%
Cervical Disc Disorders	2,103.1	17%	*	*	*	*
Neck Injury	2,317.7	19%	*	*	*	*
All Cervical/Neck Pain [6]	12,449.3	106%	5,668.3	6,781.0	46%	54%
Rate Per 100 Patient Visits	1.2		1.3	1.2		
Diagnoses Per 100 U.S. Population [7]	4.0		3.7	4.3		
Total Health Care Visits for Neck and Cervical Spine Disorders, 2010 (in 000s)						
Cervical Disorders	10,554.8	65%	4,542.6	6,012.2	43%	57%
Cervical Disc Disorders	2,447.7	15%	1,387.3	1,060.4	57%	43%
Neck Injury	4,192.9	26%	2,051.4	2,141.5	49%	51%
All Cervical/Neck Pain [6]	16,310.5	105%	7,317.5	8,992.9	45%	55%
Rate Per 100 Patient Visits	1.3		1.4	1.2		
Diagnoses Per 100 U.S. Population [7]	5.3		4.8	5.7		

* Estimate does not meet standards for reliability

[1] In presenting health care resource utilization for cervical pain, three categories of cervical pain are addressed. One is labeled cervical disc disorders, and includes disc displacement, herniation, and disc degeneration (ICD-9-CM code 722). A second group is cervical injuries, and includes sprains, strains, and fractures (ICD-9-CM codes 805, 806, 839, and 847). A third group, referred to as cervical disorders, includes pain caused by other disease entities, including cervical spondylosis and stenosis (ICD-9-CM codes 721 and 723).

[2] Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

[3] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[6] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient

[7] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.3.2: Prevalence of Neck and Cervical Spine Disorders [1] by Age, United States 2010

	Total Discharges/ Visits	Age in Years					Ave Age for Dx
		<18	18-44	45-64	65-74	75 & over	
Hospital Discharges [2] (in 000s)							
Cervical Disorders	315.1	*	43.3	139.7	51.1	76.8	60.4
Cervical Disc Disorders	173.2	*	*	97.1	22.2	21.7	55.8
Neck Injury	76.2	*	19.4	19.4	*	27.6	58.3
All Cervical/Neck Pain [6]	525.1	*	92.2	230.5	75.9	119.6	58.7
Rate Per 100 Patient Visits	1.3	0.1	1.0	2.4	1.5	1.4	
Diagnoses Per 100 U.S. Population [7]	0.2	0.0	0.1	0.3	0.3	0.6	
Emergency Department Visits [2] (in 000s)							
Cervical Disorders	853.4	*	415.1	241.0	*	*	43.6
Cervical Disc Disorders	*	*	*	*	*	*	*
Neck Injury	1,694.4	259.1	948.4	365.7	*	*	35.2
All Cervical/Neck Pain [6]	2,497.4	327.4	1,330.1	603.1	140.2	96.6	37.9
Rate Per 100 Patient Visits	1.9	1.1	2.5	2.2	1.7	0.9	
Diagnoses Per 100 U.S. Population [7]	0.8	0.4	1.2	0.7	0.6	0.5	
Hospital Outpatient Visits [4] (in 000s)							
Cervical Disorders	621.4	*	157.6	283.3	66.3	*	49.6
Cervical Disc Disorders	137.3	*	*	*	*	*	*
Neck Injury	104.6	*	*	*	*	*	*
All Cervical/Neck Pain [6]	838.7	*	226.4	386.7	*	*	50.2
Rate Per 100 Patient Visits	0.8	0.2	0.8	1.4	9.0	0.8	
Diagnoses Per 100 U.S. Population [7]	0.3	0.1	0.2	0.5	0.5	0.4	

Table 2.3.2: Prevalence of Neck and Cervical Spine Disorders [1] by Age, United States 2010

	Total Discharges/ Visits	Age in Years					Ave Age for Dx
		<18	18-44	45-64	65-74	75 & over	
Physician Office Visits [5] (in 000s)							
Cervical Disorders	8,764.9	*	2,048.6	4,199.9	1,501.8	*	53.4
Cervical Disc Disorders	2,103.1	*	*	*	*	*	49.2
Neck Injury	2,317.7	*	*	*	*	*	45.0
All Cervical/Neck Pain [6]	12,449.3	*	3,419.8	6,193.2	1,576.0	*	51.0
Rate Per 100 Patient Visits	1.2	0.2	1.3	2.1	1.2	0.8	
Diagnoses Per 100 U.S. Population [7]	4.0	0.4	3.0	7.6	7.2	5.2	
Total Health Care Visits for Neck and Cervical Spine Disorders, 2010 (in 000s)							
Cervical Disorders	10,554.8	270.5	2,664.6	4,863.9	1,701.2	1,054.4	
Cervical Disc Disorders	2,447.7	133.5	651.5	1,420.5	111.9	130.3	
Neck Injury	4,192.9	286.5	2,102.5	1,377.0	217.9	208.9	
All Cervical/Neck Pain [6]	16,310.5	682.3	5,068.5	7,413.5	1,892.9	1,253.2	
Rate Per 100 Patient Visits	1.3	0.3	1.4	2.1	1.2	0.8	
Diagnoses Per 100 U.S. Population [7]	5.3	0.9	4.5	9.1	8.7	6.7	

* Estimate does not meet standards for reliability

[1] In presenting health care resource utilization for cervical pain, three categories of cervical pain are addressed. One is labeled cervical disc disorders, and includes disc displacement, herniation, and disc degeneration (ICD-9-CM code 722). A second group is cervical injuries, and includes sprains, strains, and fractures (ICD-9-CM codes 805, 806, 839, and 847). A third group, referred to as cervical disorders, includes pain caused by other disease entities, including cervical spondylosis and stenosis (ICD-9-CM codes 721 and 723).

[2] Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

[3] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[6] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient

[7] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.4.1: Summary of Resource Allocation of Total Health Care Occurrences for Back Pain and Related Conditions by Sex, United States 2010

	Total Discharges/ Visits	% of Total by Resource [6]	Sex: Male	Sex: Female	% of Total: Male	% of Total: Female	Diagnoses All Conditions (in 000s)	Lumbar/Low Back Pain as % of Total Diagnoses
Lumbar/Low Back Pain	Total Number of Spinal Diagnoses (in 000s)							
Hospital Discharges [1]	2,025.7	4%	861.3	1,164.4	43%	57%	38,919.2	5.2%
Emergency Department Visits [2]	6,222.6	12%	2,757.6	3,465.0	44%	56%	129,843.4	4.8%
Hospital Outpatient Visits [3]	3,026.6	6%	1,133.2	1,893.3	37%	63%	100,742.1	3.0%
Physician Office Visits [4]	40,903.3	78%	18,917.0	21,986.3	46%	54%	1,008,802.0	4.1%
All Lumbar/Low Back Pain Diagnoses [5]	52,178.2	100%	23,669.1	28,509.0	45%	55%	1,278,306.7	4.1%
Rate Per 100 Patient Visits	4.1		4.4	3.8				
Diagnoses Per 100 U.S. Population [6]	16.9		15.6	18.1			413.3	

	Total Discharges/ Visits	% of Total by Resource [6]	Sex: Male	Sex: Female	% of Total: Male	% of Total: Female	Diagnoses All Conditions (in 000s)	Cervical/ Neck Pain as % of Total Diagnoses
Cervical/Neck Pain	Total Number of Spinal Diagnoses (in 000s)							
Hospital Discharges [1]	525.1	3%	244.0	281.1	46%	54%	38,919.2	1.3%
Emergency Department Visits [2]	2,497.4	15%	1,098.4	1,399.0	44%	56%	129,843.4	1.9%
Hospital Outpatient Visits [3]	838.7	5%	306.8	531.8	37%	63%	100,742.1	0.8%
Physician Office Visits [4]	12,449.3	76%	5,668.3	6,781.0	46%	54%	1,008,802.0	1.2%
All Cervical/Neck Pain Diagnoses [5]	16,310.5	100%	7,317.5	8,992.9	45%	55%	1,278,306.7	1.3%
Rate Per 100 Patient Visits	1.3		1.4	1.2				
Diagnoses Per 100 U.S. Population [6]	5.3		4.8	5.7			413.3	

	Total Discharges/ Visits	% of Total by Resource [6]	Sex: Male	Sex: Female	% of Total: Male	% of Total: Female	Diagnoses All Conditions (in 000s)	Spine/Back Pain as % of Total Diagnoses
Total Back Pain (Lumbar and Cervical) Diagnoses	Total Number of Spinal Diagnoses (in 000s)							
Hospital Discharges [1]	2,561.8	4%	1,094.9	1,466.9	43%	57%	38,919.2	6.6%
Emergency Department Visits [2]	8,276.3	13%	3,651.5	4,624.8	44%	56%	129,843.4	6.4%
Hospital Outpatient Visits [3]	3,927.1	6%	1,426.8	2,500.3	36%	64%	100,742.1	3.9%
Physician Office Visits [4]	50,656.9	77%	22,781.1	27,875.8	45%	55%	1,008,802.0	5.0%
All Back Pain Diagnoses [5]	65,422.1	100%	28,954.3	36,467.8	44%	56%	1,278,306.7	5.1%
Rate Per 100 Patient Visits	5.1		5.4	4.9				
Diagnoses Per 100 U.S. Population [6]	21.1		19.0	23.2	49%	51%	413.3	

[1] Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

[2] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[3] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient

[6] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.4.2: Summary of Resource Allocation of Total Health Care Occurrences for Back Pain and Related Conditions by Age, United States 2010

Lumbar/Low Back Pain	Total Discharges/ Visits	Age in Years: <18	18-44	45-64	65-74	75 & over	Ave Age at Dx	Diagnoses All Conditions (in 000s)	Lumbar/Low Back Pain as % of Total Diagnoses
	Total Number of Spinal Diagnoses (in 000s)								
Hospital Discharges [1]	2,025.7	13.5	371.0	711.0	381.0	549.3	60.6	38,919.2	5.2%
Emergency Department Visits [2]	6,222.6	266.3	3,317.9	1,878.4	403.4	356.7	42.7	129,873.4	4.8%
Hospital Outpatient Visits [3]	3,026.6	136.0	864.9	1,342.7	363.7	319.3	50.9	100,742.1	3.0%
Physician Office Visits [4]	40,903.3	*	11,800.8	17,498.9	6,141.5	4,551.7	52.6	1,008,802.0	4.1%
All Lumbar/Low Back Pain Diagnoses [5]	52,178.2	1,326.2	16,354.6	21,431.0	7,289.6	5,777.0		1,278,336.7	4.1%
Rate Per 100 Patient Visits	4.1	0.5	4.6	5.9	4.7	3.7			
Diagnoses Per 100 U.S. Population [6]	16.9	1.8	14.5	26.2	33.4	31.0		413.3	

Cervical/Neck Pain	Total Discharges/ Visits	<18	18-44	45-64	65-74	75 & over	Ave Age at Dx	Diagnoses All Conditions (in 000s)	Cervical/ Neck Pain as % of Total Diagnoses
	Total Number of Spinal Diagnoses (in 000s)								
Hospital Discharges [1]	525.1	6.8	92.2	230.5	75.9	119.5	58.7	38,919.2	1.3%
Emergency Department Visits [2]	2,497.4	327.4	1,330.1	603.1	140.2	96.6	37.9	129,873.4	1.9%
Hospital Outpatient Visits [3]	838.7	*	226.4	386.7	*	*	50.2	100,742.1	0.8%
Physician Office Visits [4]	12,449.3	*	3,419.8	6,193.2	1,576.0	*	51.0	1,008,802.0	1.2%
All Cervical/Neck Pain Diagnoses [5]	16,310.5	682.3	5,068.5	7,413.5	1,892.9	1,253.1		1,278,336.7	1.3%
Rate Per 100 Patient Visits	1.3	0.3	1.4	2.1	1.2	0.8			
Diagnoses Per 100 U.S. Population [6]	5.3	0.9	4.5	9.1	8.7	6.7		413.3	

Total Back Pain (Lumbar and Cervical) Diagnoses	Total Discharges/ Visits	<18	18-44	45-64	65-74	75 & over	Ave Age at Dx	Diagnoses All Conditions (in 000s)	Spine/Back Pain as % of Total Diagnoses
	Total Number of Spinal Diagnoses (in 000s)								
Hospital Discharges [1]	2,561.8	48.2	470.9	910.0	452.6	680.0	60.1	38,919.2	6.6%
Emergency Department Visits [2]	8,276.3	568.2	4,338.4	2,384.5	*	*	41.7	129,873.4	6.4%
Hospital Outpatient Visits [3]	3,927.1	369.8	1,037.6	1,673.8	449.9	395.9	49.0	100,742.1	3.9%
Physician Office Visits [4]	50,656.9	1,305.1	14,265.7	22,298.8	7,472.0	5,315.3	52.4	1,008,802.0	5.0%
All Back Pain Diagnoses [5]	65,422.1	2,291.3	20,112.6	27,267.1	8,907.6	6,843.3		1,278,336.7	5.1%
Rate Per 100 Patient Visits	5.1	0.9	5.7	7.5	5.7	4.4			
Diagnoses Per 100 U.S. Population [6]	21.1	3.1	17.8	33.3	40.8	36.8		413.3	

* Estimate does not meet standards for reliability.

[1] Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

[2] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[3] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient

[6] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.5.1: Prevalence of Lumbar/Low Back Disorders [1] by Sex, United States 2010

	Total	% of Total by Resource [6]	Prevalence Male	Prevalence Female	% of Total Male	% of Total Female
Hospital Discharges [2]	Total Number of Hospital Discharges for Low Back Disorders (in 000s)					
Back Disorders	1,877.7	74%	796.3	1,080.9	42%	58%
Disc Disorders	634.9	25%	286.2	347.2	45%	55%
Back Injury	192.5	8%	85.5	106.9	44%	56%
All Lumbar/Low Back Pain (4)	2,527.6	107%	1,090.0	1,435.5	43%	57%
Rate Per 100 Patient Visits	6.5		6.7	6.4	103%	98%
Diagnoses Per 100 U.S. Population [5]	0.8		0.7	0.9		
Emergency Department Visits [3]	Total Number of Emergency Department Visits for Low Back Disorders (in 000s)					
Back Disorders	6,602.7	75%	2,761.2	3,841.0	42%	58%
Disc Disorders	578.9	7%	250.0	328.8	43%	57%
Back Injury	2,341.0	27%	1,066.7	1,274.3	46%	54%
All Lumbar/Low Back Pain (4)	8,826.6	108%	3,759.6	5,066.4	43%	57%
Rate Per 100 Patient Visits	6.8		6.5	7.1	96%	104%
Diagnoses Per 100 U.S. Population [5]	2.9		2.5	3.2		
Total Health Care Visits for Lumbar/Low Back Pain, 2010/2011						
	Total Number of Health Care Visits for Low Back Disorders (in 000s)					
Back Disorders	8,480.4	75%	3,557.5	4,921.9	42%	58%
Disc Disorders	1,213.8	11%	536.2	676.0	44%	56%
Back Injury	2,533.5	22%	1,152.2	1,381.2	45%	55%
All Lumbar/Low Back Pain (4)	11,354.2	108%	4,849.6	6,501.9	43%	57%
Rate Per 100 Patient Visits	6.8		6.6	6.9	0%	0%
Diagnoses Per 100 U.S. Population [5]	3.7		3.2	4.1		

[1] Back disorders include inflammatory spine conditions, spondylosis, spinal stenosis, lumbago, sciatica, backache, and disorders of the sacrum (ICD-9-CM codes 720, 721, and 724). Disc disorders include herniation, disc degeneration, and post laminectomy syndromes (ICD-9-CM code 722). Back injuries include fractures, dislocation, and sprains (ICD-9-CM codes 805, 806, 839, 846, and 847). This division, while useful in analyzing the databases, may not always accurately reflect the primary diagnosis. Further, there is some overlap.

[2] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[3] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[4] Total visit may be lower than sum of diagnoses due to multiple diagnoses per patient

[5] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.5.2: Prevalence of Lumbar/Low Back Disorders [1] by Age, United States 2010

		Age in Years					Ave Age
	Total	<18	18-44	45-64	65-74	75 & over	for Dx
Hospital Discharges [2]	Total Number of Hospital Discharges for Low Back Disorders (in 000s)						
Back Disorders	1,877.7	9.1	290.9	681.1	361.5	534.9	62.4
Disc Disorders	634.9	1.0	116.4	252.8	124.6	139.5	60.2
Back Injury	192.5	4.6	39.2	43.9	25.8	78.9	63.1
All Lumbar/Low Back Pain (4)	2,527.6	14.4	422.6	915.0	474.1	700.6	61.8
Rate Per 100 Patient Visits	6.5	0.3	4.5	9.4	8.8	8.3	
Diagnoses Per 100 U.S. Population [5]	0.8	0.0	0.4	1.1	2.2	3.8	
Emergency Department Visits [3]	Total Number of Emergency Department Visits for Low Back Disorders (in 000s)						
Back Disorders	6,602.7	168.0	3,065.4	2,177.5	498.7	692.7	46.6
Disc Disorders	578.9	1.7	161.2	219.9	77.1	118.9	56.5
Back Injury	2,341.1	108.8	1,352.3	607.7	105.9	166.2	41.1
All Lumbar/Low Back Pain (4)	8,826.6	263.7	4,235.6	2,789.8	634.4	902.7	45.8
Rate Per 100 Patient Visits	6.8	1.0	8.1	9.6	7.1	6.9	
Diagnoses Per 100 U.S. Population [5]	2.9	0.4	3.7	3.4	2.9	4.8	
Total Health Care Visits for Lumbar/Low Back Pain, 2010/2011	Total Number of Health Care Visits for Low Back Disorders (in 000s)						
Back Disorders	8,480.4	177.1	3,356.3	2,858.6	860.2	1,227.6	
Disc Disorders	1,213.8	2.7	277.6	472.7	201.7	258.4	
Back Injury	2,533.6	113.4	1,391.5	651.6	131.7	245.1	
All Lumbar/Low Back Pain (4)	11,354.2	278.1	4,658.2	3,704.8	1,108.5	1,603.3	
Rate Per 100 Patient Visits	6.8	0.9	7.6	9.6	7.8	7.4	
Diagnoses Per 100 U.S. Population [5]	3.7	0.4	4.1	4.5	5.1	8.6	

[1] Back disorders include inflammatory spine conditions, spondylosis, spinal stenosis, lumbago, sciatica, backache, and disorders of the sacrum (ICD-9-CM codes 720, 721, and 724). Disc disorders include herniation, disc degeneration, and post laminectomy syndromes (ICD-9-CM code 722). Back injuries include fractures, dislocation, and sprains (ICD-9-CM codes 805, 806, 839, 846, and 847). This division, while useful in analyzing the databases, may not always accurately reflect the primary diagnosis. Further, there is some overlap.

[2] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[3] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[4] Total visit may be lower than sum of diagnoses due to multiple diagnoses per patient

[5] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.6.1: Prevalence of Neck and Cervical Spine Disorders [1] by Sex, United States 2010

	Total	% of Total by Resource [6]	Prevalence Male	Prevalence Female	% of Total Male	% of Total Female
Hospital Discharges [2]	Total Number of Hospital Discharges for Cervical Pain Disorders (in 000s)					
Cervical Disorders	421.0	64%	194.4	226.4	46%	54%
Cervical Disc Disorders	229.8	35%	104.7	124.9	46%	54%
Neck Injury	74.9	11%	41.3	33.6	55%	45%
All Cervical/Neck Pain [4]	659.2	110%	308.6	350.3	47%	53%
Rate Per 100 Patient Visits	1.7		1.9	1.6		
Diagnoses Per 100 U.S. Population [5]	0.2		0.2	0.2		
Emergency Department Visits [3]	Total Number of Emergency Department Visits for Cervical Pain Disorders (in 000s)					
Cervical Disorders	1,786.4	52%	732.9	1,053.4	41%	59%
Cervical Disc Disorders	216.0	6%	92.8	123.2	43%	57%
Neck Injury	1,750.5	50%	717.5	1,032.9	41%	59%
All Cervical/Neck Pain [4]	3,467.7	108%	1,424.9	2,042.6	41%	59%
Rate Per 100 Patient Visits	2.7		2.5	2.9		
Diagnoses Per 100 U.S. Population [5]	1.1		0.9	1.3		
Total Health Care Visits for Neck and Cervical Spine Disorders, 2010/2011	Total Number of Health Care Visits for Cervical Pain Disorders (in 000s)					
Cervical Disorders	2,207.4	53%	927.3	1,279.8	42%	58%
Cervical Disc Disorders	445.8	11%	197.5	248.1	44%	56%
Neck Injury	1,825.4	44%	758.8	1,066.5	42%	58%
All Cervical/Neck Pain [4]	4,126.9	109%	1,733.5	2,392.9	42%	58%
Rate Per 100 Patient Visits	2.5		2.4	2.6		
Diagnoses Per 100 U.S. Population [5]	1.3		1.1	1.5		

[1] In presenting health care resource utilization for cervical pain, three categories of cervical pain are addressed. One is labeled cervical disc disorders, and includes disc displacement, herniation, and disc degeneration (ICD-9-CM code 722). A second group is cervical injuries, and includes sprains, strains, and fractures (ICD-9-CM codes 805, 806, 839, and 847). A third group, referred to as cervical disorders, includes pain caused by other disease entities, including cervical spondylosis and stenosis (ICD-9-CM codes 721 and 723).

[2] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[3] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[4] Total visit may be lower than sum of diagnoses due to multiple diagnoses per patient

[5] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.6.2: Prevalence of Neck and Cervical Spine Disorders [1] by Age, United States 2010

	Total	Age in Years <18	18-44	45-64	65-74	75 & over	Ave Age for Dx
Hospital Discharges [2]	Total Number of Hospital Discharges for Cervical Pain Disorders (in 000s)						
Cervical Disorders	421.0	4.7	59.0	179.7	79.2	98.3	60.9
Cervical Disc Disorders	229.8	*	42.8	116.8	36.6	33.3	57.5
Neck Injury	74.9	2.6	20.8	19.4	8.7	23.5	57.5
All Cervical/Neck Pain [4]	659.2	7.3	111.8	281.3	113.1	145.7	59.6
Rate Per 100 Patient Visits	1.7	0.1	1.2	2.9	2.1	1.7	
Diagnoses Per 100 U.S. Population [5]	0.2	0.0	0.1	0.3	0.5	0.8	
Emergency Department Visits [3]	Total Number of Emergency Department Visits for Cervical Pain Disorders s (in 000s)						
Cervical Disorders	1,786.4	115.0	769.4	563.4	140.1	198.4	45.8
Cervical Disc Disorders	216.0	0.3	44.8	90.2	30.3	50.4	59.3
Neck Injury	1,750.5	173.3	973.6	434.3	78.7	90.5	38.4
All Cervical/Neck Pain [4]	3,467.7	272.0	1,660.3	997.0	226.8	311.4	43.0
Rate Per 100 Patient Visits	2.7	1.1	3.2	3.4	2.5	2.4	
Diagnoses Per 100 U.S. Population [5]	1.1	0.4	1.5	1.2	1.0	1.7	
Total Health Care Visits for Neck and Cervical Spine Disorders, 2010/2011	Total Number of Health Care Visits for Cervical Pain Disorders (in 000s)						
Cervical Disorders	2,207.4	119.7	828.4	743.1	219.3	296.7	
Cervical Disc Disorders	445.8	0.5	87.6	207.0	66.9	83.7	
Neck Injury	1,825.4	175.9	994.4	453.7	87.4	114.0	
All Cervical/Neck Pain [4]	4,126.9	279.3	1,772.1	1,278.3	339.9	457.1	
Rate Per 100 Patient Visits	2.5	0.9	2.9	3.3	2.4	2.1	
Diagnoses Per 100 U.S. Population [5]	1.3	0.4	1.6	1.6	1.6	2.5	

* Does not meet standards for reliability.

[1] In presenting health care resource utilization for cervical pain, three categories of cervical pain are addressed. One is labeled cervical disc disorders, and includes disc displacement, herniation, and disc degeneration (ICD-9-CM code 722). A second group is cervical injuries, and includes sprains, strains, and fractures (ICD-9-CM codes 805, 806, 839, and 847). A third group, referred to as cervical disorders, includes pain caused by other disease entities, including cervical spondylosis and stenosis (ICD-9-CM codes 721 and 723).

[2] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[3] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[4] Total visit may be lower than sum of diagnoses due to multiple diagnoses per patient

[5] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.7.1: Summary of Resource Allocation of Total Health Care Occurrences for Back Pain and Related Conditions by Sex, United States 2010

Lumbar/Low Back Pain	Total	% of Total by Resource [6]	Sex: Male	Sex: Female	% of Total: Male	% of Total: Female	Diagnoses All Conditions (in 000s)	Lumbar/Low Back Pain as % of Total Diagnoses
Total Number of Spinal Diagnoses (in 000s)								
Hospital Discharges [1]	2,527.6	22%	1,090.0	1,435.5	43%	57%	38,590.7	6.5%
Emergency Department Visits [2]	8,826.6	78%	3,759.6	5,066.4	43%	57%	128,961.4	6.8%
All Lumbar/Low Back Pain Diagnoses [3]	11,354.2	100%	4,849.6	6,501.9	43%	57%	167,552.1	6.8%
Rate Per 100 Patient Visits	6.8		6.6	6.9				
Diagnoses Per 100 U.S. Population [4]	3.7		3.2	4.1			54.2	

Cervical/Neck Pain	Total	% of Total by Resource [6]	Sex: Male	Sex: Female	% of Total: Male	% of Total: Female	Diagnoses All Conditions (in 000s)	Cervical/ Neck Pain as % of Total Diagnoses
Total Number of Spinal Diagnoses (in 000s)								
Hospital Discharges [1]	659.2	16%	308.6	350.3	47%	53%	38,590.7	1.7%
Emergency Department Visits [2]	3,467.7	84%	1,424.9	2,042.6	41%	59%	128,961.4	2.7%
All Cervical/Neck Pain Diagnoses [3]	4,126.9	100%	1,733.5	2,392.9	42%	58%	167,552.1	2.5%
Rate Per 100 Patient Visits	2.5		2.4	2.6				
Diagnoses Per 100 U.S. Population [4]	1.3		1.1	1.5			54.2	

Total Back Pain (Lumbar and Cervical) Diagnoses	Total	% of Total by Resource [6]	Sex: Male	Sex: Female	% of Total: Male	% of Total: Female	Diagnoses All Conditions (in 000s)	Spine/Back Pain as % of Total Diagnoses
Total Number of Spinal Diagnoses (in 000s)								
Hospital Discharges [1]	3,186.0	22%	1,366.9	1,816.5	43%	57%	38,590.7	8.3%
Emergency Department Visits [2]	11,527.7	78%	4,842.4	6,684.4	42%	58%	128,961.4	8.9%
All Back Pain Diagnoses [3]	14,713.7	100%	6,209.3	8,500.9	42%	58%	167,552.1	8.8%
Rate Per 100 Patient Visits	8.8		8.4	9.1				
Diagnoses Per 100 U.S. Population [4]	4.8		4.1	5.4			54.2	

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[3] Total visit may be lower than sum of diagnoses due to multiple diagnoses per patient

[4] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.7.2: Summary of Resource Allocation of Total Health Care Occurrences for Back Pain and Related Conditions by Age, United States 2010

		Age in Years							
	Total	<18	18-44	45-64	65-74	75 & over			
Lumbar/Low Back Pain	Total Number of Spinal Diagnoses (in 000s)						Ave Age at Dx	Diagnoses All Conditions (in 000s)	Lumbar/Low Back Pain as % of Total Diagnoses
Hospital Discharges [1]	2,527.6	14.4	422.6	915.0	474.1	700.6	61.8	38,590.7	6.5%
Emergency Department Visits [2]	8,826.6	236.7	4,235.6	2,789.8	634.4	902.7	45.8	128,961.4	6.8%
All Lumbar/Low Back Pain Diagnoses [3]	11,354.2	251.1	4,658.2	3,704.8	1,108.5	1,603.3		167,552.1	6.8%
Rate Per 100 Patient Visits	6.8	0.8	7.6	9.6	7.8	7.4			
Diagnoses Per 100 U.S. Population [4]	15.3	0.3	4.1	4.5	5.1	8.6		54.2	
Cervical/Neck Pain	Total Number of Spinal Diagnoses (in 000s)						Ave Age at Dx	Diagnoses All Conditions (in 000s)	Cervical/ Neck Pain as % of Total Diagnoses
Hospital Discharges [1]	659.2	7.3	111.8	281.3	113.1	145.7	59.6	38,590.7	1.7%
Emergency Department Visits [2]	3,467.7	272.0	1,660.3	997.0	226.8	311.4	43.0	128,961.4	2.7%
All Cervical/Neck Pain Diagnoses [3]	4,126.9	279.3	1,772.1	1,278.3	339.9	457.1		167,552.1	2.5%
Rate Per 100 Patient Visits	2.5	0.9	2.9	3.3	2.4	2.1			
Diagnoses Per 100 U.S. Population [4]	1.3	0.4	1.6	1.6	1.6	2.5		54.2	
Total Back Pain (Lumbar and Cervical) Diagnoses	Total Number of Spinal Diagnoses (in 000s)						Ave Age at Dx	Diagnoses All Conditions (in 000s)	Spine/Back Pain as % of Total Diagnoses
Hospital Discharges [1]	3,186.0	40.4	541.8	1,158.1	578.9	865.7	61.2	38,590.7	8.3%
Emergency Department Visits [2]	11,527.7	512.9	5,460.0	3,528.7	824.7	1,200.7	45.3	128,961.4	8.9%
All Back Pain Diagnoses [3]	14,713.7	553.3	6,001.8	4,686.8	1,403.6	2,066.4		167,552.1	8.8%
Rate Per 100 Patient Visits	8.8	1.8	9.7	12.1	9.8	9.6			
Diagnoses Per 100 U.S. Population [4]	4.8	0.7	5.3	5.7	6.4	11.1		54.2	

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[3] Total visit may be lower than sum of diagnoses due to multiple diagnoses per patient

[4] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 2.8: Trends in Physician Visits for Back Pain, United States 1998-2010

Physician Visits for Back Pain

	Total Number of Visits with Diagnoses (in 000s)						
	1998	2000	2002	2004	2006	2008	2010
Physician Visits for Lumbar/Low Back Pain							
Back Disorders	15,855.0	16,151.1	20,040.2	21,813.3	24,067.4	28,248.1	31,196.4
Disc Disorders	3,004.1	3,727.5	4,997.5	6,497.3	6,977.5	5,267.3	8,723.9
Back Injury	5,252.3	6,835.0	7,351.4	5,454.2	6,888.6	2,966.7	4,929.1
Total, Back Pain	23,037.0	25,018.9	29,145.6	31,539.9	34,944.7	34,064.7	40,903.3
Physician Visits for Cervical/Neck Pain							
Neck Disorders	4,337.3	4,806.5	6,691.6	8,637.7	6,221.8	7,419.1	8,764.9
Disk Disorders	567.5	867.9	1,266.0	1,689.6	1,528.7	1,730.5	2,103.1
Neck Injury	4,324.2	2,936.2	4,776.9	3,444.8	2,211.1	10,642.4	2,317.7
Total, Cervical Back Pain	8,922.2	8,266.3	11,726.9	13,104.0	9,513.1	10,642.4	16,310.5
Physician Visits for Back Pain (Lumbar and Cervical) [1]							
Total Visits	31,959.2	33,285.2	40,872.5	44,643.9	44,457.8	43,014.1	50,656.9

Physician Visits for Back Pain as Proportion of Total Population

	Rate of Physician Visits for Back Pain per 100 Persons [2]						
	1998	2000	2002	2004	2006	2008	2010
Physician Visits for Lumbar/Low Back Pain							
Back Disorders	5.9	5.7	6.9	7.4	8.1	9.4	10.1
Disc Disorders	1.1	1.3	1.7	2.2	2.3	1.8	2.8
Back Injury	1.9	2.4	2.5	1.8	2.3	1.0	1.6
Total, Back Pain	8.5	8.8	10.0	10.6	11.7	11.4	13.2
Physician Visits for Cervical/Neck Pain							
Cervical Disorders	1.6	1.7	2.3	2.9	2.1	2.5	2.8
Disk Disorders	0.2	0.3	0.4	0.6	0.5	0.6	0.7
Neck Injury	1.6	1.0	1.6	1.2	0.7	3.6	0.8
Total, Cervical Back Pain	3.3	2.9	4.0	4.4	3.2	3.6	5.3
Physician Visits for Back Pain (Lumbar and Cervical)							
Total Visits	11.8	11.7	14.0	15.1	14.9	14.4	16.4

[1] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient

[2] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Source: National Ambulatory Medical Care Survey (NAMCS) 1998-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

Table 2.9.1: Average Length of Hospital Stay (LOS) for Spine Diagnoses Trends, 2004-2010

	Average LOS (in days), 2004		Average LOS (in days), 2007/2006		Average LOS (in days), 2011/2010	
	NIS [1]	NHDS [2]	NIS [1]	NHDS [2]	NIS [1]	NHDS [2]
Spinal Deformity & Related Conditions	5.5	5.1	5.3	5.3	5.6	4.7
Lumbar/Low Back Pain						
Back Disorders	4.7	4.3	4.5	4.6	4.7	4.8
Disc Disorders	4.1	3.6	4.1	4.0	4.4	4.4
Back Injury	7.3	7.9	7.1	7.8	6.6	7.6
All Lumbar and Low Back Pain	4.8	4.5	4.7	4.8	4.8	4.9
Cervical/Neck Pain						
Neck Disorders	4.3	3.6	4.2	3.9	4.4	4.5
Cervical Disc Disorders	3.1	2.8	3.1	2.7	3.4	3.4
Neck Injury	8.2	10.2	7.7	6.4	6.7	7.8
All Cervical Back Pain	4.7	4.6	4.4	4.0	4.4	4.6
Total	4.8	4.6	4.6	4.7	4.7	4.8

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2004/2007/2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Source: National Hospital Discharge Survey (NHDS), 2004/2006/2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013. Based on days of care.

Table 2.9.2: Average Length of Hospital Stay (LOS) and Mean Hospital Charges for Low Back and Neck Pain Disorders, 2011

Length of Stay (LOS)	Sex		Age					Mean LOS	Number of	
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over	All Discharges	Discharges (in 000s)	Total Hospital Days (in 000s)
Lumbar/Low Back Pain										
Back Disorders	4.7	4.7	5.7	4.2	4.6	4.8	5.1	4.7	1,877.7	8,825.19
Disc Disorders	4.4	4.5	3.6	3.5	4.3	4.6	5.2	4.4	634.9	2,793.56
Back Injury	7.3	6.0	8.3	7.4	7.5	6.6	5.6	6.6	192.5	1,270.50
All Lumbar and Low Back Pain	4.8	4.8	6.4	4.3	4.6	4.8	5.2	4.8	2,527.6	12,132.48
Ratio Lumbar Back Pain to All Visits	0.96	1.09	1.88	1.19	0.92	0.92	0.96	1.04		
Proportion Lumbar/Low Back Pain to Total Discharges									7%	7%
Cervical/Neck Pain										
Neck Disorders	4.6	4.2	5.5	3.6	3.9	4.7	5.3	4.4	421.0	1,852.40
Cervical Disc Disorders	3.5	3.3	5.0	2	3.1	4	5.0	3.4	229.8	781.32
Neck Injury	7.5	5.9	7.3	7.0	7.1	7.0	6.0	6.7	74.9	501.83
All Cervical Back Pain	4.7	4.2	6.1	4.0	4.0	4.8	5.4	4.4	659.2	2,900.48
Ratio Cervical/Neck Pain to All Visits	0.94	0.95	1.79	1.11	0.80	0.92	1.00	0.96		
Proportion Cervical/Neck Pain to Total Discharges									2%	2%
All Back Pain Disorders	4.8	4.7	6.2	4.2	4.5	4.9	5.2	4.7	3,186.0	14,974.20
All Hospital Visits	5.0	4.4	3.4	3.6	5.0	5.2	5.4	4.6	38,590.7	177,517.22
Ratio Back Pain to All Visits	0.96	1.07	1.82	1.17	0.90	0.94	0.96	1.02		
Proportion Back Pain of Total Discharges									8%	8%

Table 2.9.2: Average Length of Hospital Stay (LOS) and Mean Hospital Charges for Low Back and Neck Pain Disorders, 2011

Length of Stay (LOS)	Sex		Age					Mean LOS All Discharges	Number of Discharges (in 000s)	Total Hospital Days (in 000s)
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over			
Mean Charges (in $000s)	Sex		Age					Mean Charges (in 000s)	Number of Discharges (in 000s)	Total Hospital Charges (in millions)
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over			
Lumbar/Low Back Pain										
Back Disorders	$ 43.9	$ 40.3	$ 34.1	$ 33.1	$ 44.2	$ 49.5	$ 38.5	$ 41.8	1,877.7	$ 78,487.9
Disc Disorders	$ 59.2	$ 55.0	$ 48.8	$ 53.4	$ 61.8	$ 63.5	$ 45.1	$ 56.9	634.9	$ 36,125.8
Back Injury	$ 89.0	$ 55.4	$ 98.3	$ 106.1	$ 87.1	$ 66.4	$ 43.0	$ 70.3	192.5	$ 13,532.8
All Lumbar and Low Back Pain	$ 49.8	$ 43.5	$ 55.3	$ 43.7	$ 49.2	$ 52.2	$ 39.7	$ 46.2	2,527.6	$ 116,775.1
Ratio Lumbar Back Pain to All Visits	1.24	1.36	3.16	1.69	1.10	1.10	1.00	1.31		
Proportion Lumbar/Low Back Pain to Total Charges									7%	9%
Cervical/Neck Pain										
Neck Disorders	$ 52.0	$ 44.2	$ 34.0	$ 39.2	$ 49.9	$ 54.8	$ 44.2	$ 47.8	421.0	$ 20,123.8
Cervical Disc Disorders	$ 55.1	$ 49.1	$ 48.8	$ 47.5	$ 53.7	$ 56.4	$ 46.1	$ 51.9	229.8	$ 11,926.6
Neck Injury	$ 97.9	$ 65.3	$ 90.1	$ 101.0	$ 92.1	$ 83.0	$ 59.5	$ 83.3	74.9	$ 6,239.2
All Cervical Back Pain	$ 57.9	$ 46.7	$ 54.0	$ 52.3	$ 53.1	$ 56.3	$ 46.1	$ 52.0	659.2	$ 34,278.4
Ratio Cervical/Neck Pain to All Visits	1.44	1.46	3.09	2.02	1.19	1.18	1.16	1.47		
Proportion Cervical/Neck Pain to Total Charges									2%	3%
All Back Pain Disorders	$ 51.5	$ 44.4	$ 71.3	$ 44.7	$ 50.2	$ 53.0	$ 40.5	$ 47.2	3,186.0	$ 150,379.2
All Hospital Visits	$ 40.3	$ 31.9	$ 17.5	$ 25.9	$ 44.6	$ 47.6	$ 39.6	$ 35.4	38,590.7	$ 1,366,110.8
Ratio Back Pain to All Visits	1.28	1.39	4.07	1.73	1.13	1.11	1.02	1.33		
Proportion Back Pain of Total Discharges									8%	11%

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 2.9.3: Average Length of Hospital Stay (LOS) for Low Back and Neck Pain Disorders, 2010

Length of Stay (LOS)	Sex		Age					Mean LOS	Number of	Total Hospital
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over	All Discharges	Discharges (in 000s)	Days (in 000s)
Lumbar/Low Back Pain										
Back Disorders	4.7	4.8	5.3	4.5	4.5	4.4	5.5	4.8	1,431.5	6,871.20
Disc Disorders	4.4	4.4	8.6	3.4	4.1	5.2	5.3	4.4	545.4	2,399.76
Back Injury	8.8	6.5	11.8	9.7	8.9	5.5	6.2	7.6	182.5	1,387.00
All Lumbar and Low Back Pain	4.9	4.9	8.5	4.7	4.6	4.6	5.5	4.9	2,025.7	9,925.93
Ratio Lumbar Back Pain to All Visits	0.96	1.11	2.18	1.31	0.92	0.85	0.98	1.04		
Proportion Lumbar/Low Back Pain to Total Discharges									5%	5%
Cervical/Neck Pain										
Neck Disorders	4.6	4.4	4.7	4.5	3.9	5.2	5.1	4.5	315.1	1,417.95
Cervical Disc Disorders	3.4	3.3	4.0	2.2	3.3	3.9	4.9	3.4	173.2	588.88
Neck Injury	9.2	6.2	*	8.2	8.4	7.4	7.9	7.8	76.2	594.36
All Cervical Back Pain	5.0	4.3	3.7	4.5	4.1	5.2	5.4	4.6	525.1	2,415.46
Ratio Cervical/Neck Pain to All Visits	0.98	0.98	0.95	1.25	0.82	0.96	0.96	0.98		
Proportion Cervical/Neck Pain to Total Discharges									1%	1%
All Back Pain Disorders	4.8	4.8	5.7	4.6	4.4	4.7	5.5	4.8	2,561.8	12,296.64
All Hospital Visits	5.1	4.4	3.9	3.6	5.0	5.4	5.6	4.7	38,919.2	182,920.24
Ratio Back Pain to All Visits	0.94	1.09	1.46	1.28	0.88	0.87	0.98	1.02		
Proportion Back Pain of Total Discharges									7%	7%

* Does not meet standards for reliability.

Source: National Hospital Discharge Survey (NHDS), 2008 to 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013. Based on days of care.

Table 2.10.1: Limitations Due to Medical Condition for Population Aged 18 and Older, by Sex, United States 2012

	Persons Reporting Limitation Due to Chronic Back or Neck Problems (in 000s)					
	Male	Rate Per 100 Population [1]	Female	Rate Per 100 Population [1]	Total	Rate Per 100 Population [1]
Any limitation	3,953.4	3.5	4,448.3	3.7	8,401.8	3.6
Need help with routine needs	775.4	0.7	1,451.3	1.2	2,226.7	0.9
Help with personal care	377.9	0.3	597.0	0.5	975.0	0.4
Difficulty walking without equipment	1,504.7	1.3	1,897.8	1.6	3,399.5	1.4
Unable to work NOW due to health	2,151.9	1.9	2,527.5	2.1	4,679.4	2.0
Limited in kind or amount of work	1,266.1	1.1	1,341.3	1.1	2,607.4	1.1

	Persons Reporting Limitation Due to Any Medical Condition (in 000s)					
	Male	Rate Per 100 Population [1]	Female	Rate Per 100 Population [1]	Total	Rate Per 100 Population [1]
Any limitation	19,740.8	17.3	21,084.3	17.4	40,825.1	17.4
Need help with routine needs	3,446.1	3.0	6,075.6	5.0	9,521.7	4.0
Help with personal care	2,224.0	1.9	3,167.3	2.6	5,391.3	2.3
Difficulty walking without equipment	5,269.2	4.6	7,867.0	6.5	13,136.2	5.6
Unable to work NOW due to health [2]	8,056.9	7.1	9,561.9	7.9	17,617.8	7.5
Limited in kind or amount of work	4,543.1	4.0	5,219.9	4.3	9,763.0	4.2

	Proportion of All Persons With Limitations Where Limitations Are Due to Chronic Back or Neck Problems		
	Male	Female	Total
Any limitation	20%	21%	21%
Need help with routine needs	23%	24%	23%
Help with personal care	17%	19%	18%
Difficulty walking without equipment	29%	24%	26%
Unable to work NOW due to health [2]	27%	26%	27%
Limited in kind or amount of work	28%	26%	27%

[1] Based on U.S. Census of Population estimate for July 1, 2010, for gender group.

[2] Adjusted to working age population aged 18 and older.

Source: National Health Interview Survey (NHIS)_Adult sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 2.10.2: Limitations Due to Medical Condition for Population Aged 18 and Older by Age, United States 2012

Persons Reporting Limitation Due to Chronic Back or Neck Problems (in 000s)

	18-44	Rate Per 100 Population [1]	45-64	Rate Per 100 Population [1]	65-74	Rate Per 100 Population [1]	75 & over	Rate Per 100 Population [1]	Total	Rate Per 100 Population [1]
Any limitation	1,388.2	1.2	4,452.2	5.4	1,409.9	6.5	1,151.5	6.2	8,401.8	3.6
Need help with routine needs	314.5	0.3	1,072.1	1.3	339.7	1.6	500.4	2.7	2,226.7	0.9
Help with personal care	141.9	0.1	454.4	0.6	145.5	0.7	233.2	1.3	975.0	0.4
Difficulty walking without equipment	402.0	0.4	1,607.5	2.0	619.7	2.8	770.3	4.1	3,399.5	1.4
Unable to work NOW due to health	752.9	0.7	2,838.8	3.5	627.4	2.9	460.4	2.5	4,679.4	2.0
Limited in kind or amount of work	457.2	0.4	1,223.3	1.5	567.3	2.6	359.5	1.9	2,607.4	1.1

Persons Reporting Limitation Due to Any Medical Condition (in 000s)

	18-44	Rate Per 100 Population [1]	45-64	Rate Per 100 Population [1]	65-74	Rate Per 100 Population [1]	75 & over	Rate Per 100 Population [1]	Total	Rate Per 100 Population [1]
Any limitation	6,649.1	5.9	14,240.4	17.4	5,858.7	26.8	7,802.3	41.9	40,825.1	17.4
Need help with routine needs	1,567.1	1.4	2,999.9	3.7	1,422.3	6.5	3,532.4	19.0	9,521.7	4.0
Help with personal care	710.5	0.6	1,548.9	1.9	773.5	3.5	1,893.5	10.2	5,391.3	2.3
Difficulty walking without equipment	1,139.7	1.0	4,498.1	5.5	2,387.6	10.9	4,905.2	26.3	13,136.2	5.6
Unable to work NOW due to health	3,618.8	3.2	8,699.4	10.6	2,510.4	11.5	2,789.2	15.0	17,617.8	7.5
Limited in kind or amount of work	1,967.5	1.7	3,663.5	4.5	1,951.7	8.9	2,180.3	11.7	9,763.0	4.2

Table 2.10.2: Limitations Due to Medical Condition for Population Aged 18 and Older by Age, United States 2012

	Persons Reporting Limitation Due to Chronic Back or Neck Problems (in 000s)									
	18-44	Rate Per 100 Population [1]	45-64	Rate Per 100 Population [1]	65-74	Rate Per 100 Population [1]	75 & over	Rate Per 100 Population [1]	Total	Rate Per 100 Population [1]
	Proportion of All Persons With Limitations Where Limitations Are Due to Chronic Back or Neck Problems									
		18-44		45-64		65-74		75 & over		Total
Any limitation		21%		31%		24%		15%		21%
Need help with routine needs		20%		36%		24%		14%		23%
Help with personal care		20%		29%		19%		12%		18%
Difficulty walking without equipment		35%		36%		26%		16%		26%
Unable to work NOW due to health		21%		33%		25%		17%		27%
Limited in kind or amount of work		23%		33%		29%		16%		27%

[1] Based on U.S. Census of Population estimate for July 1, 2010, for age group. Adjusted to working age population aged 18 and older.

Source: National Health Interview Survey (NHIS)_Adult sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 2.11.1: Bed and Lost Work Days Associated with Back Pain for Persons Aged 18 and Over in Workforce Previous 12 Months, by Sex, United States 2012

	Incidence of Reported Condition (in 000s) [1]	% of Workforce	Incidence of Bed Days (in 000s) [2]	% of Workforce	Average Number of Bed Days in Past 12 Months	Total Bed Days (in 000s)	Incidence of Lost Work Days (in 000s) [3]	% of Workforce	Number of Work Days Lost in Past 12 Months	Total Lost Work Days (in 000s)
Back/Neck Problem Causes Difficulty with Activity										
Male	5,235	6.3%	2,559	3.1%	13.8	35,314	2,772	3.3%	22.9	261,610
Female	5,679	7.5%	3,156	4.2%	10.2	32,191	3,493	4.6%	12.9	181,748
Total	10,915	6.9%	5,715	3.6%	11.8	67,437	6,265	3.9%	17.3	441,375
Neck Pain in Past 3 Months										
Male	8,318	10.0%	3,870	4.7%	8.8	34,056	4,427	5.3%	14.9	65,962
Female	11,641	15.4%	6,345	8.4%	9.8	62,181	6,562	8.7%	13.4	87,931
Total	19,960	12.6%	10,216	6.4%	9.4	96,030	10,989	6.9%	14.0	153,846
Low Back Pain in Past 3 Months										
Male	19,396	23.4%	8,022	9.7%	7.2	57,758	9,670	11.6%	11.3	109,271
Female	20,268	26.8%	10,473	13.8%	8.2	85,879	11,240	14.9%	11.1	124,764
Total	39,664	25.0%	18,495	11.7%	7.7	142,412	20,911	13.2%	11.2	234,203
Radiating Leg Pain (with Low Back Pain)										
Male	5,041	6.1%	2,426	2.9%	10.4	25,230	2,774	3.3%	17.5	48,545
Female	6,074	8.0%	3,322	4.4%	11.1	36,874	3,227	4.3%	17.3	55,827
Total	11,114	7.0%	5,748	3.6%	10.8	62,078	6,001	3.8%	17.4	104,417

Table 2.11.1: Bed and Lost Work Days Associated with Back Pain for Persons Aged 18 and Over in Workforce Previous 12 Months, by Sex, United States 2012

	Incidence of Reported Condition (in 000s) [1]	% of Workforce	Incidence of Bed Days (in 000s) [2]	% of Workforce	Average Number of Bed Days in Past 12 Months	Total Bed Days (in 000s)	Incidence of Lost Work Days (in 000s) [3]	% of Workforce	Number of Work Days Lost in Past 12 Months	Total Lost Work Days (in 000s)
All Spine Pain or Problems										
Male	23,109	27.8%	9,418	11.3%	7.4	69,693	11,424	13.8%	11.9	135,946
Female	25,369	33.5%	13,049	17.2%	7.8	101,782	14,089	18.6%	11.0	154,979
Total	48,477	30.6%	22,467	14.2%	7.6	170,749	25,513	16.1%	11.4	290,848

	TOTAL	Male	Female
Population in Workforce (in 000s)	158,677.6	83,018.2	75,659.4
2010 US Population by Age Group	235,205.7	114,177.3	121,028.0
% Population in Workforce	67%	73%	63%

[1] Replied "yes" when ask "During the PAST THREE MONTHS, did you have ...Low back pain?/ Neck pain?"

[2] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[3] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

Source: National Health Interview Survey (NHIS)_Adult sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 2.11.2: Bed and Lost Work Days Associated with Back Pain for Persons Aged 18 and Over in Workforce Previous 12 Months, by Age, United States 2012

	Incidence of Reported Condition (in 000s) [1]	% of Workforce	Incidence of Bed Days (in 000s) [2]	% of Workforce	Average Number of Bed Days in Past 12 Months	Total Bed Days (in 000s)	Incidence of Lost Work Days (in 000s) [3]	% of Workforce	Number of Work Days Lost in Past 12 Months	Total Lost Work Days (in 000s)
Back/Neck Problem Causes Difficulty with Activity										
18-44	4,659	5.2%	2,768	3.1%	12.8	35,430	2,946	3.3%	17.2	50,671
45-64	5,451	8.9%	2,662	4.4%	10.5	27,951	3,074	5.0%	18.3	56,254
65-74	692	9.8%	267	3.8%	15.3	4,085	231	3.3%	5.5	1,271
75 & Older	113	7.7%	19	1.3%	9.4	179	14	1.0%	4.2	59
Total	10,915	6.9%	5,715	3.6%	11.8	67,437	6,265	3.9%	17.3	108,385
Neck Pain in Past 3 Months										
18-44	9,858	11.0%	5,581	6.3%	9.2	51,345	5,906	6.6%	12.3	72,644
45-64	9,161	15.0%	4,202	6.9%	10.1	42,440	4,736	7.8%	16.3	77,197
65-74	845	12.0%	404	5.7%	6.6	2,666	320	4.5%	11.6	3,712
75 & Older	96	6.5%	29	2.0%	14.7	426	26	1.8%	23.1	601
Total	19,960	12.6%	10,216	6.4%	9.4	96,030	10,989	6.9%	14.0	153,846
Low Back Pain in Past 3 Months										
18-44	20,806	23.3%	10,434	11.7%	7.3	76,168	11,785	13.2%	9.8	115,493
45-64	16,752	27.5%	7,341	12.0%	8.3	60,930	8,454	13.9%	13.3	112,438
65-74	1,753	24.9%	639	9.1%	7.9	5,048	610	8.7%	8.2	5,002
75 & Older	353	24.1%	81	5.5%	11.9	964	62	4.2%	15.0	930
Total	39,664	25.0%	18,495	11.7%	7.7	142,412	20,910	13.2%	11.2	234,192

Table 2.11.2: Bed and Lost Work Days Associated with Back Pain for Persons Aged 18 and Over in Workforce Previous 12 Months, by Age, United States 2012

	Incidence of Reported Condition (in 000s) [1]	% of Workforce	Incidence of Bed Days (in 000s) [2]	% of Workforce	Average Number of Bed Days in Past 12 Months	Total Bed Days (in 000s)	Incidence of Lost Work Days (in 000s) [3]	% of Workforce	Number of Work Days Lost in Past 12 Months	Total Lost Work Days (in 000s)
Radiating Leg Pain (with Low Back Pain)										
18-44	4,767	5.3%	2,714	3.0%	10.4	28,226	2,763	3.1%	15.6	43,103
45-64	5,755	9.4%	2,784	4.6%	11.4	31,738	3,015	4.9%	19.3	58,190
65-74	480	6.8%	212	3.0%	8.9	1,887	185	2.6%	11.9	2,202
75 & Older	112	7.6%	38	2.6%	5.6	213	38	2.6%	17.9	680
Total	11,114	7.0%	5,748	3.6%	10.8	62,078	6,001	3.8%	17.4	104,417
All Spine Pain or Problems										
18-44	25,052	28.1%	12,647	14.2%	7.0	88,529	14,253	16.0%	9.5	135,404
45-64	20,756	34.1%	8,890	14.6%	8.4	74,676	10,422	17.1%	14.0	145,908
65-74	2,258	32.0%	838	11.9%	7.9	6,620	758	10.8%	8.8	6,670
75 & Older	411	28.0%	93	6.3%	12.7	1,181	80	5.5%	14.2	1,136
Total	48,477	30.6%	22,467	14.2%	7.6	170,749	25,513	16.1%	11.4	290,848

	TOTAL	18-44	45-64	65-74	75 & over
Population in Workforce (in 000s)	158,677.6	89,216.5	60,942.5	7,050.8	1,467.8
2010 US Population by Age Group	235,205.7	112,956.5	81,772.3	21,856.6	18,620.2
% Population in Workforce	67%	79%	75%	32%	8%

[1] Replied "yes" when ask "During the PAST THREE MONTHS, did you have ...Low back pain?/ Neck pain?"

[2] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[3] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

Source: National Health Interview Survey (NHIS)_Adult sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 2.11.3: Trends in Self-Reported Bed Days and Work Days Lost Due to Neck or Back Pain, 2004-2012

	2004 [1]	2008 [2,3]	2012 [4]
Total Bed Days (in 000s)	313,540	671,117	170,749
Total Work Days Lost (in 000s)	186,674	385,005	290,848

[1] United States Bone and Joint Decade: The Burden of Musculoskeletal Diseases in the United States, First Edition. Rosemont, IL: American Academy of Orthopaedic Surgeons;2007.

[2] United States Bone and Joint Decade: The Burden of Musculoskeletal Diseases in the United States, Second Edition. Rosemont, IL: American Academy of Orthopaedic Surgeons;2010.

[3] Higher percentage of workers reported bed and lost work days, as well as a higher average of days.

[4] National Health Interview Survey (NHIS)_Adult sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 2.12: Hospital Discharges for Select Spine Procedures as a Proportion of All Spine Procedures, United States, 2007 and 2011

	All Spine Procedures, 2007 [1]			All Spine Procedures, 2011 [1]		
Procedure	Number of Discharges with Procedure	% of Total Select Spine Procedures	% of Total Spine Patients Having Procedure [1]	Number of Discharges with Procedure	% of Total Select Spine Procedures	% of Total Spine Patients Having Procedure [1]
Spinal fusion (cervical, lumbar, dorsal, other)	379,912	32.0%	57.3%	457,442	32.9%	61.7%
Spinal diskectomy	332,525	28.0%	50.2%	369,883	26.6%	49.9%
Insertion of spinal device (Instrumentation)	224,522	18.9%	33.9%	315,393	22.7%	42.5%
Spinal decompression	163,385	13.8%	24.7%	174,168	12.5%	23.5%
Spinal refusion	21,279	1.8%	3.2%	30,889	2.2%	4.2%
Kyphoplasty	45,878	3.9%	6.9%	27,213	2.0%	3.7%
Vertebroplasty	13,646	1.1%	2.1%	10,173	0.7%	1.4%
Replacement spinal disc procedure	5,557	0.5%	0.8%	5,450	0.4%	0.7%
All select spine procedures	1,186,704	100.0%	179.1%	1,390,611	100.0%	187.5%
Total spine procedure patients	662,446			741,727		

[1] Up to 15 procedures per patient are listed in the database; multiple spine procedures per patient can be coded resulting in more procedures than patients. Discharges with a spinal refusion have been removed from spinal fusions discharges.

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2007/2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 2.13: Trends in Spinal Fusion Procedures, United States 1998-2011

ICD-9-CM	Description	Year	Number of Discharges with Procedure [1]	Rate of Year-to-Year Increase in Patients	Estimated Population Aged 18 & Over [2]	Rate Per 100,000 Population Aged 18 & Over [2]	Mean Age of Patient	Mean Length of Stay	Mean Hospitalization Charge [3]	Rate of Year-to-Year Increase in Mean Charge	Total Hospitalization Charges (in Billions)	Rate of Year-to-Year Increase in Total Hospital Charges
81.00-81.08	Spinal Fusion	1998	204,000		200,345,000	109.57	49.0	4.7	$26 ,000		$5.35	
		2000	242,000	18%	209,128,094	125.93	49.4	4.3	$32 ,000	21%	$7.18	34%
		2002	289,000	20%	215,122,788	150.07	50.2	4.4	$42 ,000	29%	$11.87	65%
		2004	307,000	6%	220,398,637	139.29	51.8	4.5	$56 ,000	34%	$16.87	42%
		2006	354,000	15%	224,769,279	169.02	53.2	4.2	$77 ,000	38%	$27.17	61%
		2011	457,442	29%	235,205,323	221.51	55.7	3.8	$102 ,000	32%	$46.43	71%
13-Year Rate of Change				124%						285%		768%
81.30-81.393	Spinal Refusion [4]	1998	12,000		200,345,000	5.90	47.1	4.6	$26 ,000		$0.30	
		2000	13,000	12%	209,128,094	6.36	49.0	5.4	$39 ,000	49%	$0.47	57%
		2002	19,000	43%	215,122,788	9.47	50.0	4.4	$46 ,000	20%	$0.86	83%
		2004	19,000	1%	220,398,637	8.62	52.7	4.8	$63 ,000	37%	$1.18	37%
		2006	20,000	4%	224,769,279	9.47	53.8	5.0	$96 ,000	52%	$1.90	62%
		2011	30,900	57%	235,205,323	14.46	56.7	4.7	$123 ,000	28%	$3.81	100%
13-Year Rate of Change				164%						375%		1169%
81.00-81.08 + 81.30-81.393	Total	1998	214,000		200,345,000	115.48	48.9	4.7	$26 ,000		$5.59	
		2000	253,000	18%	209,128,094	132.28	49.4	4.3	$32 ,000	22%	$7.53	35%
		2002	304,000	20%	215,122,788	159.54	50.2	4.3	$42 ,000	29%	$12.50	66%
		2004	321,000	5%	220,398,637	148.37	51.8	4.5	$56 ,000	34%	$17.87	43%
		2006	373,000	16%	224,769,279	178.49	53.2	4.2	$77 ,000	38%	$28.72	61%
		2011	488,300	31%	235,205,323	235.96	55.8	3.9	$103 ,000	35%	$50.52	76%
13-Year Rate of Change				128%						294%		804%

[1] Up to 15 procedures per patient are included in years 1998 to 2011; multiple spine procedures per patient can be coded. Total procedures reported were greater than 1 million for the 488,300 patient discharges. Discharges with a spinal refusion have been removed from spinal fusions discharges.

[2] Computed from U.S. Census population estimates released July 1st of each year (www.census.gov).

[3] "Charge" refers to hospitalization charges and does not include professional (i.e., physician fees), drugs or non-covered charges. Due to patient discharges with multiple procedures, total charges for combined fusion and refusion patients is the most valid estimate. Mean charges for patients with a spinal refusion procedure were typically higher than for those with spinal fusion only.

[4] Prior to 2002, spinal refusion procedures were coded to the single code, 81.09. In 2002, this code was dropped and multiple codes implemented. Nearly all spinal refusion patient discharges also underwent spinal fusion procedures; however, discharges with a spinal refusion have been removed from spinal fusions discharges to produce a more accurate number of new fusion procedure discharges.

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 1998-2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 2.14: Distribution of Spine Fusion Procedures by Spine Section for Hospital Discharge Patients, United States, 2011

	Total Procedures [1]	% of Total Procedures [1]	% of Total Spine Fusion Discharges [2]	% of Total Spine Patients
SPINAL FUSION PROCEDURE DISCHARGES				
Cervical Fusion	182,536	39.0%	39.9%	5.7%
Thoracic or Dorsal Fusion	35,077	7.5%	7.7%	1.1%
Lumbar Fusion	242,513	51.9%	53.0%	7.6%
Other or Unspecified Fusion	7,372	1.6%	23.9%	0.2%
Total Spinal Fusion Procedures	467,498	100.0%	124.5%	14.4%
Total Spine Fusion Discharges [2]	457,442			
SPINAL REFUSION PROCEDURE DISCHARGES				
Cervical Fusion	7,472	23.9%	24.2%	0.2%
Thoracic or Dorsal Fusion	3,419	10.9%	11.1%	0.1%
Lumbar Fusion	20,192	64.6%	65.4%	0.6%
Other or Unspecified Fusion	164	0.5%	0.5%	0.0%
Total Spine Refusion Procedures	31,247	100.0%	101.2%	1.0%
Total Spine Refusion Discharges [2]	30,889			
TOTAL SPINAL FUSION/REFUSION DISCHARGES				
Cervical Fusion/Refusion	190,008	38.1%	38.9%	6.0%
Thoracic or Dorsal Fusion/Refusion	38,496	7.7%	7.9%	1.2%
Lumbar Fusion/Refusion	262,705	52.7%	53.8%	8.2%
Other or Unspecified Fusion/Refusion	7,536	1.5%	1.5%	0.2%
Total Spine Fusion/Refusion Procedures	498,745	100.0%	102.1%	15.3%
Total Spine Fusion/Refusion Discharges	488,331			
All Spine Diagnosed Discharges	3,186,000			

[1] Up to 15 procedures per patient are listed in the database; multiple spine procedures per patient can be coded resulting in more procedures than patient discharges.

[2] Discharges with a spinal refusion have been removed from spinal fusion discharges to produce a more accurate count of spinal fusion discharges.

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2007/2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 2.15: Proportion of Hospital Discharges with Back Pain Diagnoses Where Discharge Included Spinal Fusion Procedure, by Sex and Age, United States 2011

	Total Number of Spinal Diagnosis (in 000s)								Ave Age for Discharge Patients	Mean Length of Stay (in days)	Mean Charges
		Sex [4]		Age [4]							
	Total	Male	Female	18-44	45-64	65-74	75 & over				
Lumbar/Low Back Pain											
All Lumbar/Low Back Pain Diagnoses	2,528	1,090	1,436	423	915	474	701		61.8	4.8	$ 46,200
Total Lumbar Spine Fusion Discharges [1]	263	113	114	45	117	62	31		57.8	4.0	$ 114,700
% Diagnoses with Spinal Fusion Procedure	10.4%	10.4%	7.9%	10.6%	12.8%	13.1%	4.4%				
Cervical/Neck Pain											
All Cervical/Neck Pain Diagnoses	659	309	350	112	281	113	146		59.6	4.4	$ 52,000
Total Cervical Spine Fusion Discharges [2]	190	93	95	38	105	31	13		54.8	3.0	$ 75,700
% Diagnoses with Spinal Fusion Procedure	28.8%	30.1%	27.1%	34.0%	37.3%	27.4%	8.9%				
All Back Pain											
All Back Pain Diagnoses	3,186	1,367	1,816	542	1,158	579	866		61.2	4.7	$ 47,400
Total Spine Fusion Discharges [3]	488	226	262	92	237	101	48		55.8	3.9	$ 102,900
% Diagnoses with Spinal Fusion Procedure	15.3%	16.5%	14.4%	17.0%	20.5%	17.4%	5.5%				

[1] ICD-9-CM codes 8106,8107,8108,8136,8137,8138

[2] ICD-9-CM codes 8102,8103,8132,8133

[3] ICD-9-CM codes 8100 thru 8108; 8130 thru 8138

[4] Totals for subgroups may not equal total discharges due to missing data of sex or age.

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 2.16: Primary (1st) Diagnosis for Spinal Fusion Procedures, United States 2011

Diagnosis		Number	% of Total Spine 1st Diagnosis w/Fusion Procedure
722.52	Lumbar Disc Degeneration	51,319	11.2%
722.00	Cervical Disc Displacement	51,138	11.2%
724.02/03	Lumbar Spinal Stenosis	48,565	10.6%
722.10	Lumbar Disc Displacement	38,630	8.4%
738.40	Acquired Spondylolisthesis	34,400	7.5%
721.10	Cervical Spondylosis with Myelopathy	30,334	6.6%
721.00	Cervical Spondylosis	24,701	5.4%
721.30	Lumbosacral Spondylosis	24,512	5.4%
722.71	Cervical Disk Disorder	22,739	5.0%
723.00	Cervical Spinal Stenosis	16,265	3.6%
722.40	Cervical Disc Degeneration	14,695	3.2%
756.12	Spondylolisthesis	12,258	2.7%
737.30	Idiopathic Scoliosis	11,183	2.4%
996.49	Complication of Internal Orthopaedic Device	5,202	1.1%
	All Other Diagnoses	71,433	15.6%
All Primary(1^{st}) Diagnosis for Fusion Procedure		457,374	100.0%

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 2.17: Health Care Visits for Ruptured Spine and Spinal Diskectomy Procedures, by Sex and Age, United States 2010/2011

Health Care Visits for Ruptured (Herniated) Spine Diagnosis [1]	Total Number of Spinal Diagnosis (in 000s)									% of Total Visits	Mean Length of Stay (in days)	Mean Charges
		Sex		Age								
	Total	Male	Female	18-44	45-64	65-74	75 & over	Average Age				
Hospital Discharges [2]	378.9	184.4	193.2	105.8	175.6	57.9	38.4	49.6		8.2%	4.6	$ 56,134
Hospital Emergency Department Visits [3]	*	*	*	*	*	*	*	*		*	NA	NA
Hospital Outpatient Visits [4]	175.7	79.4	96.3	60.0	67.9	32.3	11.9	51.7		3.8%	NA	NA
Physician Office Visits [5]	4,042.8	1,809.3	2,333.5	1,790.8	1,483.2	288.8	304.0	45.9		87.9%	NA	NA
All Ruptured Spine Diagnoses	4,597.4	2,073.1	2,623.0	1,956.6	1,726.7	379.0	354.3			100.0%		
Percent of Total		44.1%	55.9%	44.3%	39.1%	8.6%	8.0%					

Spinal Diskectomy Procedure [6]	Total	Male	Female	18-44	45-64	65-74	75 & over	Average Age	% of Total Visits	Mean Length of Stay (in days)	Mean Charges
Hospital Discharges [2]	369.9	179.9	188.8	90.6	183.0	66.2	28.3	49.6		4.6	$ 35,012
Percent of Total Discharges		48.8%	51.2%	24.6%	49.7%	18.0%	7.7%				
Proportion of Inpatient [1] Diskectomy Procedures with Ruptured Spine Diagnosis	59%	60%	55%	62%	59%	56%	37%				Total Procedures Cost
Total Hospital Charges for Diskectomy Procedures (in millions)											$ 12.95

* Estimate does not meet standards for reliability

[1] ICD-9-CM diagnosis codes: 722.00, 722.10, 722.11, 722.20, 722.70, 722.71, 722.72, 722.73

[2] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[3] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[6] ICD-9-CM procedure codes: 805.00, 805.10

Table 2.18: Primary (1st) Diagnosis for Spine Diskectomy Procedures, United States 2011

Diagnosis		Number	% of Total Spine 1st Diagnosis w/Diskectomy Procedure
722.10	Lumbar Disc Displacement	104,389	28.3%
722.00	Cervical Disk Displacement	49,892	13.5%
722.52	Lumbar Disc Degeneration	33,283	9.0%
724.02/.03	Lumbar Spinal Stenosis	22,755	6.2%
721.00	Cervical Spondylosis	21,146	5.7%
722.71	Cervical Disk Disorder	19,310	5.2%
721.10	Cervical Spondylosis with Myelopathy	18,562	5.0%
738.40	Acquired Spondylolisthesis	17,098	4.6%
721.30	Lumbosacral Spondylosis	13,259	3.6%
722.40	Cervical Disc Degeneration	12,546	3.4%
723.00	Cervical Spinal Stenosis	11,052	3.0%
756.12	Spondylolisthesis	5,979	1.6%
722.73	Thoracic Disc Disorder with Myelopathy	3,593	1.0%
	All Other diagnoses	36,602	9.9%
All Primary (1st) Diagnosis for Diskectomy Procedure		369,466	100.0%

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 2.19 Diskectomy Procedure Trends, United States 1996 to 2011

Year	Procedures [1] (to nearest 000)
1996	285,000
1997	281,000
1998	303,000
1999	303,000
2000	279,000
2001	289,000
2002	319,000
2003	317,000
2004	324,000
2005	292,000
2006	276,000
2011	370,000
16 Year Mean	303,000

[1] ICD-9-CM Procedure Code: 805.00 or 805.10

Source: National Hospital Discharge Survey (NHDS), 1996-2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

Spinal Deformity

Lead Author(s):

Sigurd H. Berven, MD
Matthew D. Hepler, MD

Supporting Author(s):

Sylvia Watkins-Castillo, PhD

Deformity of the spine encompasses a broad spectrum of conditions and affects individuals in every age and demographic group. Spinal deformity has a significant and measurable impact on health-related quality of life, including pain, function, self-image, mental health, work status, and disability. Prevalence of disease, utilization of healthcare resources, impact of disease on health-related quality of life, and cost of care are useful tools for measuring the burden of deformity on our population and on our healthcare economy. The purpose of this chapter is to provide information on the burden of spinal deformity on patients and on our healthcare system.

Definitions

Conditions related to the spine and spinal deformity often sound similar, but affect the spine in different ways. Key conditions discussed in this section include the following.

Curvature of the spine: Spine curvature can refer to two distinct conditions. The human spine normally curves, but more commonly the term "spinal curvature" refers to abnormalities from the standard spinal.

- **Idiopathic:** Of unknown cause. Any disease that is of uncertain or unknown origin may be termed idiopathic; usually associated with children who develop an abnormal curvature at a young age.
- **Acquired:** Curvature that develops over many years, usually associated with adults and older persons.
  - **Secondary:** Curvature caused by another condition, such as osteoporosis.
  - **Scoliosis:** Side-to-side abnormal curvature of the spine.

Spondylolisthesis: Forward movement of one vertebra in relationship to a vertebra next to it.

- **Spondylosis:** Degeneration of the disc spaces between the vertebrae. Spondylosis is common with aging and affects virtually everyone to some degree after the age of 60 years. When severe, it can cause local pain and decreased range of spinal motion, requiring pain and/or anti-inflammatory medications.
- **Stenosis:** A narrowing of the open spaces within the spine, which can put pressure on your spinal cord and the nerves that travel through the spine. Spinal stenosis occurs most often in the neck and lower back.
- **Kyphosis:** An abnormal, convex curvature of the spine, with a resultant bulge at the upper back.

Spinal fractures:

- **Traumatic spine fractures (TF):** High-energy fractures resulting from accidents, falls, and sports.
- **Vertebral compression fractures (VCF):** Low-energy fractures in the aging as a result of reduced bone density and strength (osteoporosis and osteopenia).

Spinal infection:

- **Tuberculosis of spine:** An infection that usually occurs in the lungs, but can also occur in the spine, resulting in destruction of the intervertebral disk space and adjacent vertebral bodies. It is more common in children and young adults.
- **Intraspinal abscess:** A collection of pus and infectious material in the spine.
- **Osteomylitis:** Osteomyelitis is a bone infection normally caused by bacteria but sometimes by fungus. The infection can occur in any bone but typically affects the arms, legs, spine, and pelvis. The bacteria usually reach the bone from an injury or wound. It can be either acute, where symptoms of pain, swelling, and fever last only a few months, or chronic.
- **Discitis:** Swelling in the small spaces between these bones (the intervertebral disc spaces), which puts pressure on the discs and causes pain. Discitis is relatively uncommon and mostly affects young children.
- **Postoperative infections:** Infections after surgical procedures (operations) can cause pain, poor wound healing, need for further treatment including antibiotics, longer hospital stays, and increased health care costs.
- **Complications of surgery:** Common surgery complications, including pain, infection, anesthesia effects, blood clots, and more.

Spondylopathies: Any disease of the vertebrae or of the spinal column.

Surgical procedures: Often performed to reduce pain from spinal curvature include fusion and kyphoplasty/vertebroplasty.

- **Spinal fusion:** A surgical procedure in which two or more vertebrae are permanently joined into one solid bone with no space between them.
- **Kyphoplasty/Vertebroplasty:** Similar surgical procedure used to treat painful compression fractures in the spine. In a compression fracture, all or part of a spine bone collapses. Spaces are created between the bones of the spine and filled with cement-like material to make the bone more stable.

Spinal Trauma

Injuries involving the spine represent a relatively small percentage of the overall number of acute musculoskeletal injuries, but have a disproportionate impact on patient impairment, economic cost, and societal burden. These injuries encompass a wide spectrum of spinal trauma, from devastating high-energy spinal cord injuries (SCI) in younger patients that often require complex spinal reconstruction procedures to more benign low-energy osteoporotic vertebral compression fractures (VCF) in the elderly. Yet as many as 40% of patients with low energy VCF will go on to develop chronic disabling pain and deformity.[1] Because spinal trauma has such a large and disproportionate impact on disability and utilization of health care resources, frequently resulting in significant structural abnormalities, we have chosen to include a focused evaluation of spinal fractures in the Deformity Chapter. High- and low-energy fractures are also discussed in the Musculoskeletal Injuries and Osteoporosis chapters, respectively. Data is derived from the various public-use databases using traumatic spine fracture injury and vertebral compression fracture codes listed at the end of this chapter.

1. Venmans A, Klazen CA, Lohle PNM, et al: Natural history of pain in patients with conservatively treated osteoporotic vertebral compression fractures: Results from Vertos II. *AJNR Am J Neuroradiol* 2012 Mar;33(3):519-21.

Vertebral Compression Fractures: Spinal Trauma

Vertebral compression fractures are most commonly low-energy injuries that occur in patients with underlying osteopenia or osteoporosis. They affect between 700,000 and 1,000,000 persons in the US annually, and 25% of woman in their lifetime.[1,2] Many low-energy fractures are treated nonsurgically with a short period of bed rest, pain medications, bracing, and therapy. Approximately 30% to 40% of patients, however, develop disabling pain and/or deformity (kyphosis), resulting in 150,000 hospitalizations annually. Frequently, patients with VCF also have reduced pulmonary function (FVC), increased risk of mortality (compared to age-matched controls), and a lower 5-year survival when compared to hip fracture patients.[3] Treatment of symptomatic VCF with vertebral augmentation (vertebroplasty or kyphoplasty) has been shown in various studies to be a cost-effective intervention that both decreases pain and improves survival.[4,5,6] Various strategies have been employed to prevent and treat the osteoporosis that predisposes to these "fragility fractures" and is further discussed in the Osteoporosis chapter.

1. Edidin AA, Ong KL, Lau E, Kurtz SM: Life expectancy following diagnosis of a vertebral compression fracture. *Osteoporosis Int* 2013 Feb;24(2):451-458.

2. Riggs BL, Melton LJ: The worldwide problem of osteoporosis: Insights afforded by epidemiology. *Bone* 1995;5055–5115.

3. Kado DM, Browner WS, Palermo L, Nevitt MC, Genant HK, Cummings SR: Vertebral fractures and mortality in older women: A prospective study. Study of Osteoporotic Fractures Research Group. *Arch Intern Med* 1999;159,1215–1220.

4. Svedbom, A, et al: Balloon kyphoplasty compared to vertebroplasty and nonsurgical management in patients hospitalized with acute osteoporotic vertebral compression fracture: a UK cost-effectiveness analysis. *Osteoporos Int*, 2012.

5. Garfin SR, Reilley MA: Minimally invasive treatment of osteoporotic vertebral body compression fractures. *The Spine Journal* 2002(2):76-80.

6. Edidin AA, Ong KL, Lau E, Kurtz SM: Mortality risk for operated and non-operated fracture patients in the Medicare population. *JBMR*, 2011 Jul;26(7):1617-1626.

Traumatic Spine Fractures: Spinal Trauma

Traumatic spine fractures are usually high-energy injuries that typically involve young, male patients. Most injuries are the result of high-energy falls (35% to 40%), followed by traffic accidents (20% to 30%), and low-energy falls (20% to 25%).[1,2,3,4] Approximately one-half involve the thoracolumbar spine (T12–L2), while 20% involve the cervical spine. Neurologic injury occurs in 16% to 25% overall, but in as many as 40% of cervical fractures. There are approximately 12,000 spinal cord injuries each year,[2,3] which are associated with a significant mortality rate. Fractures without neurologic injury generally occur three times more frequently, with an estimated 36,000 traumatic spine fractures each year. Most traumatic spine fractures are treated nonsurgically with a one- to three-month period of immobilization and bracing. Unstable fractures and those with neurologic impairment may require surgical treatment, extensive rehabilitative services, and often develop long-term disability.

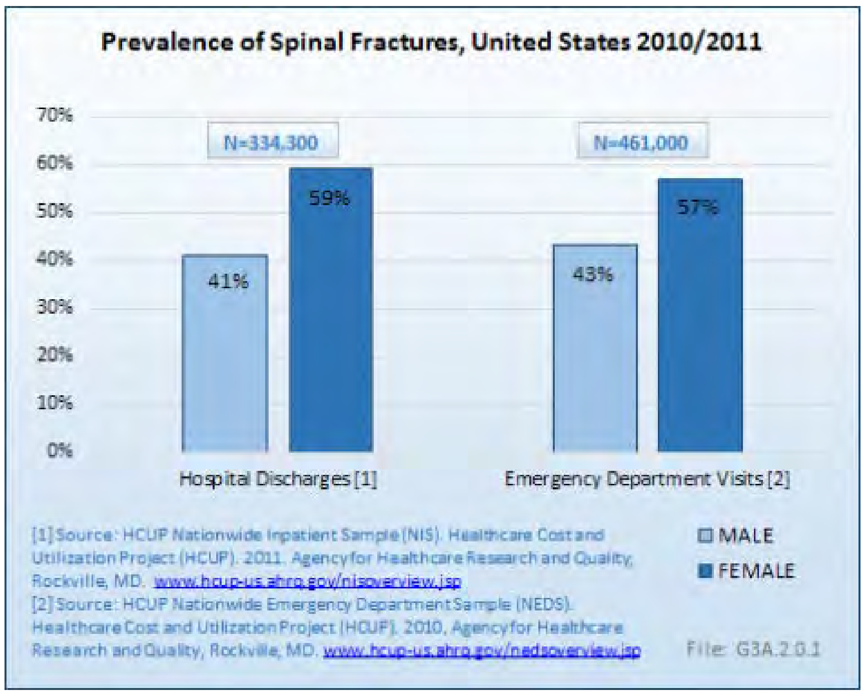
1. P Leucht, K Fischer, G Muhr, EJ Mueller: Epidemiology of traumatic spine fractures *Injury* 2009 Feb;40(2):166-172.

2. a. b. Wang H, Zhang Y Xiang Q, et al: Epidemiology of traumatic spinal fractures: experience from medical university-affiliated hospitals in Chongqing, China 2001–2010. *J NS Spine* 2012 17:459-468.

3. a. b. National Spinal Cord Injury Statistical Center: Spinal Cord injury facts and figures at a glance. http://www.spinalcord.uab.edu.Accessed January 11, 2015.

4. Riggins Rs, Kraus JF: The risk of neurologic damage with fractures of the vertebra. *J Trauma* 1977;17(2):126-133.

Healthcare Utilization: Spinal Trauma

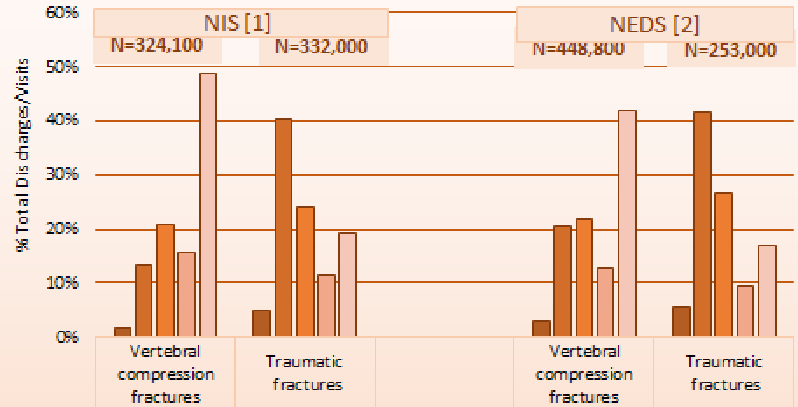


Based on the HCUP Nationwide Inpatient Sample (NIS) and Nationwide Emergency Department Sample (NEDS) databases queried, there were an estimated 795,300 hospital discharges and emergency department visits for spinal fractures in 2010–/2011. Nearly three out of five spinal fractures occurred in women.

The great majority of hospital/ED combine spinal fracture patients (773,000, or 97%) were treated for vertebral compression fractures (VCF), and more than one-half (58%) involved women. Nearly half of discharges and visits for VCFs were for persons age 75 years and older.

Traumatic fractures were far less common, with 27,100 (3%) hospital discharges or outpatient visits reported in the 2010–2011 Heathcare Cost and Utilization (HCUP) databases. Numbers were too small for reliable reporting in the National Center for Health Statistics (NCHS) databases, which include outpatient and physician office visits. Traumatic fractures predominantly involve men (about 60%), and are most likely to involve patients between the ages of 18 and 44 years. These are coarse estimates, as some ED patients are admitted (samples may overlap and overestimate), while outpatient visits are not included. (Reference Table 3.1.1 PDF CSV and Table 3.1.2 PDF CSV)

Prevalence and Distribution of Vertebral Compression Fractures Diagnoses by Age, United States 2011

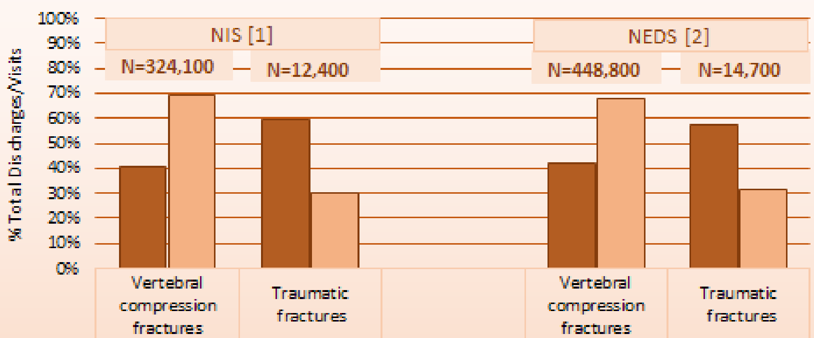


	NIS [1] Vertebral compression fractures	NIS [1] Traumatic fractures	NEDS [2] Vertebral compression fractures	NEDS [2] Traumatic fractures
<18	1.5%	4.8%	2.9%	5.4%
18-44	13.4%	40.3%	20.4%	41.5%
45-64	20.8%	24.2%	21.9%	26.5%
65-74	15.5%	11.3%	12.8%	9.5%
75 & over	48.7%	19.4%	42.1%	17.0%

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp
[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

File: G3A.2.0.2

Prevalence and Distribution of Vertebral Compression Fractures Diagnoses by Age, United States 2011



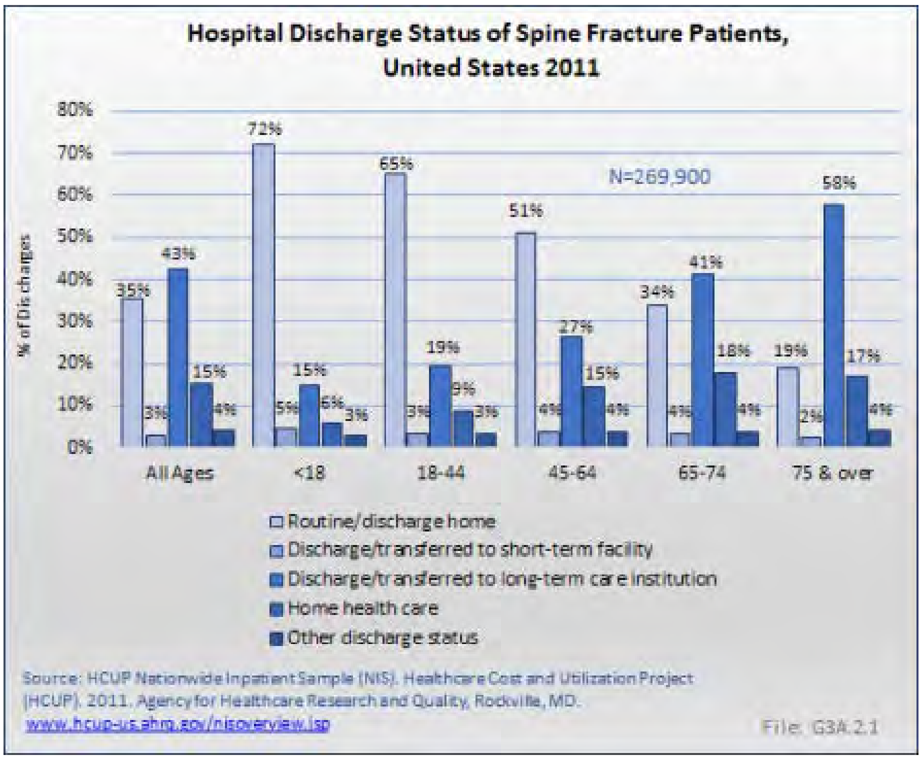
	NIS [1] Vertebral compression fractures	NIS [1] Traumatic fractures	NEDS [2] Vertebral compression fractures	NEDS [2] Traumatic fractures
Male	40%	60%	42%	58%
Female	69%	30%	68%	31%

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp
[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

File: G3A.2.0.3

Discharge Status : Healthcare Utilization, Spinal Trauma

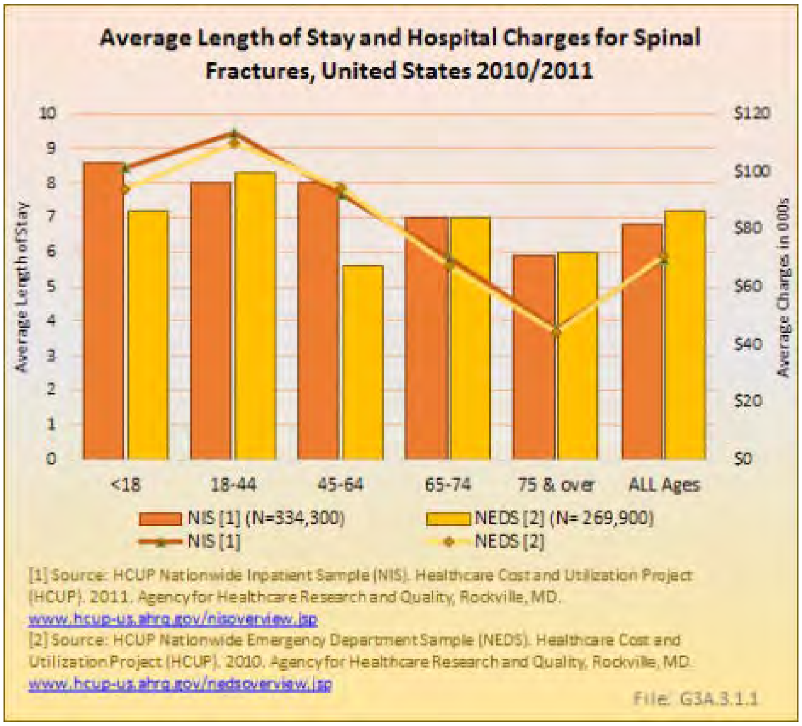
Discharge status from the hospital had a direct and linear correlation with age. For patients under 18 years of age, 72% were discharged home while only 15% were discharged to a long-term facility. The discharge status progressively changed with increasing age so that, for patients age 75 years and older, 19% were discharged home while 58% were discharged to a long-term facility. Although the overall rate of patients discharged to long-term care is slightly higher than for traumatic fractures than for VCF (54% vs. 42%), the age correlation appears to be independent of fracture severity because younger patients likely had more severe fractures. (Reference Table 3.3.1 PDF CSV and Table 3.3.3 PDF CSV) (G3A.2.1)



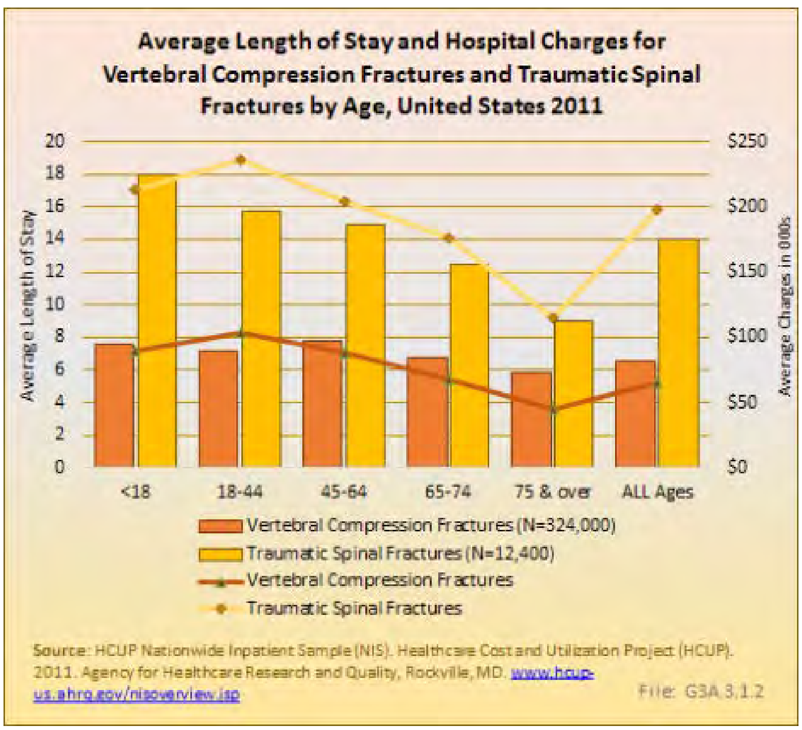
Cost : Spinal Trauma

The average length of stay for those patients discharged from hospitals with a spine fracture diagnosis was 6.8 days, with an average charge of $69,500. The charges for both males and younger patients were 30% to 60% higher than the average. Similarly, the length of stay was higher in younger patients (8 days or more), and gradually decreased with age (6 days for those older than 75 years of age). This correlation most likely reflects the higher association of more complicated traumatic fractures in these younger patient populations. (Reference Table 3.4.1 PDF CSV)

Nearly two in three patients seen in the ED with spinal fractures were transferred to a hospital. Patients admitted to the hospital from an emergency department had slightly longer average length of stay (LOS) (7.2 days) and higher charges ($70,700) than those directly admitted to the hospital. Most patients with a primary diagnosis of spine fracture admitted to the hospital from the ED were discharged to a long-term care facility (42%) and another 37% were discharged to home. The likelihood of discharge to a long-term facility was also directly related to age as noted previously. (Reference Table 3.1.2 PDF CSV; Table 3.4.2 PDF CSV; and Table 3.3.2 PDF CSV)

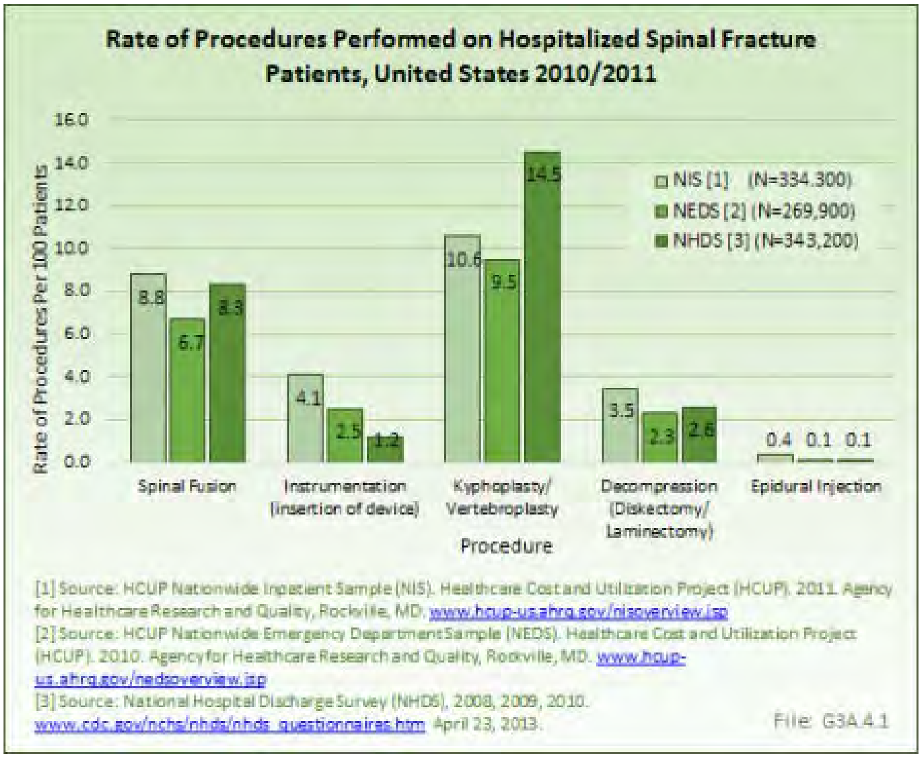


The greater severity of traumatic spinal fractures is dramatically illustrated by average hospital stays more than twice as long as for VCFs (14 days vs. 6.6 days), and average charges three times as high ($197,700 vs. $65,700). Differences in LOS and charges are particularly dramatic for persons under the age of 45 years. (Reference Table 3.4.3 PDF CSV)

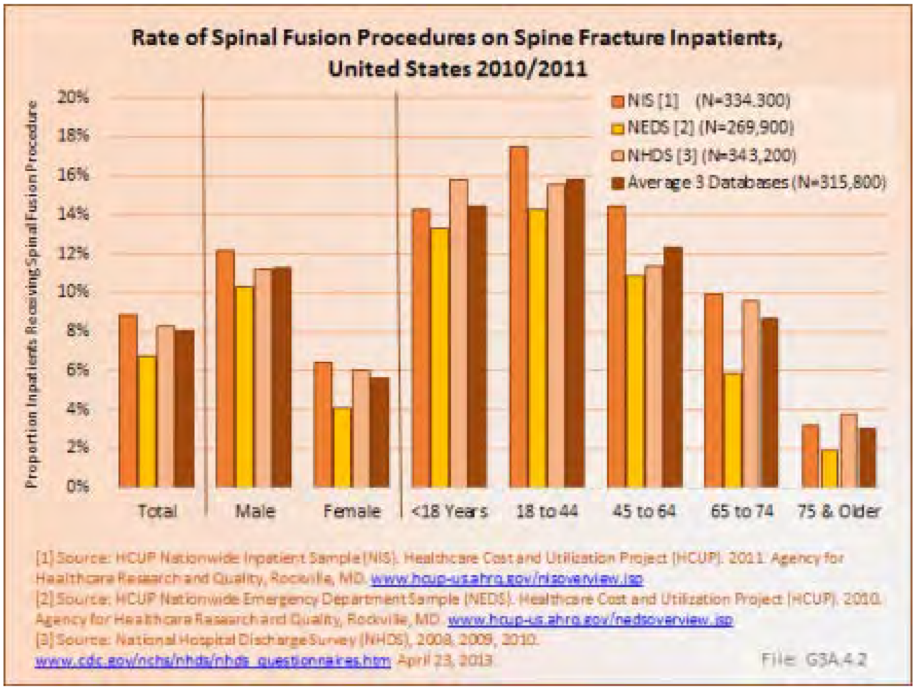


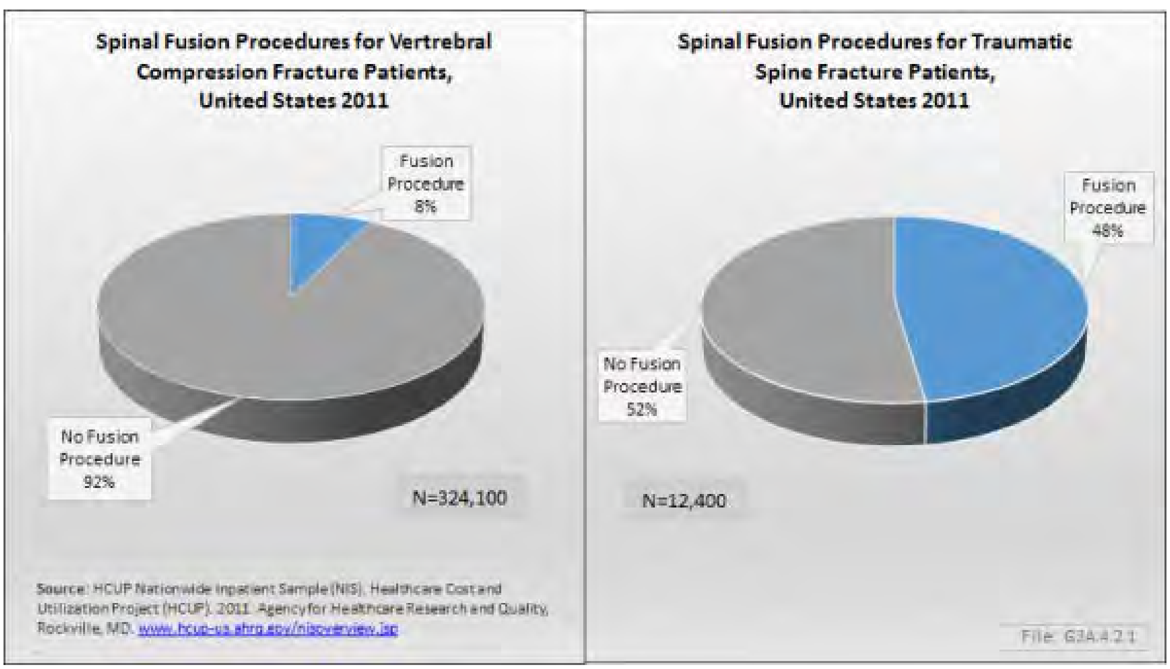
Surgical Procedures : Spinal Trauma

Only a small proportion of patients hospitalized with a spinal fracture undergo surgery. Of the 334,300 hospital admissions in the NIS database, fusion (8.8%) and kyphoplasty/vertebroplasty (10.6%) were the most common procedures performed. Similar rates of procedures were found in the NEDS hospitalized patients and National Hospital Discharge Survey (NHDS) databases. (Reference Table 3.5.1 PDF CSV)

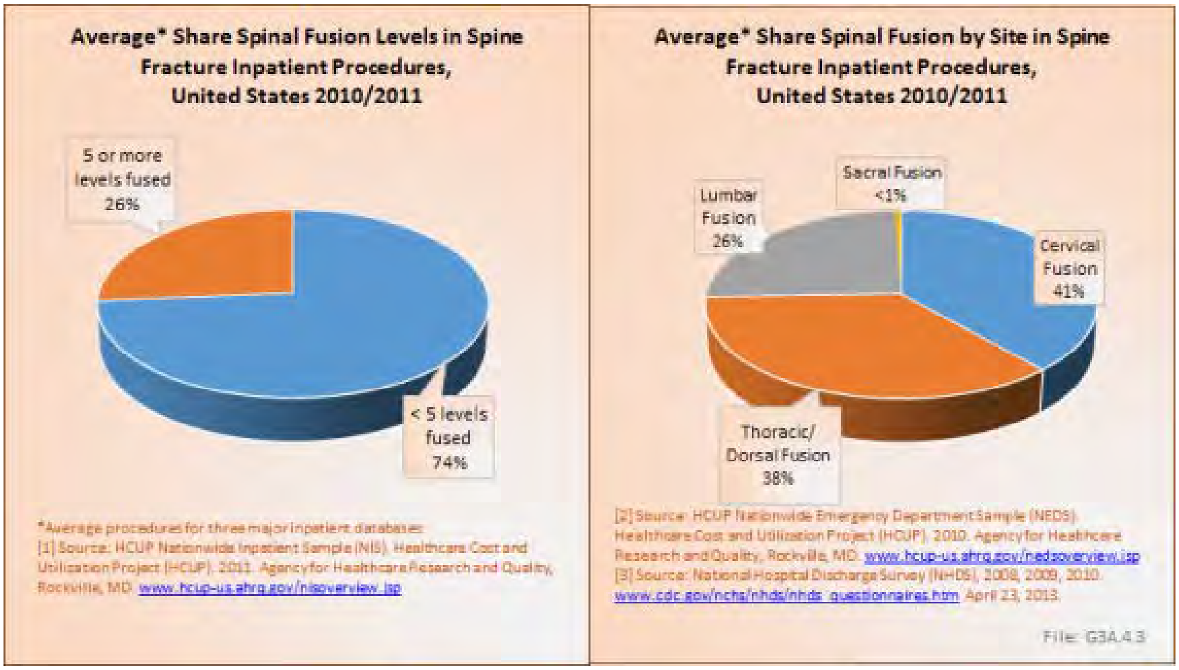


The majority of spinal fusion procedures on spine fractures were performed on patients under the age of 44 years, with patients age 65 years and older rarely undergoing surgery for spinal fractures. This is due to a much higher rate of fusion procedures performed on patients with traumatic fractures than on patients with VCFs. (Reference Table 3.5.2 PDF CSV)

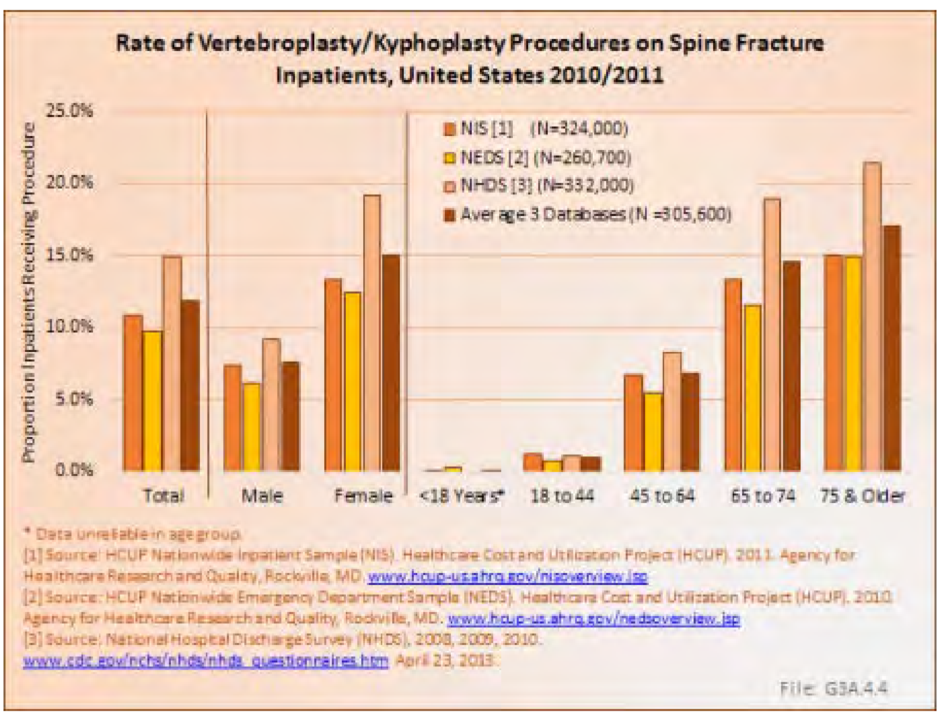




Fusions were performed most frequently in the cervical spine (41%), followed by thoracic spine (38%) and lumbar spine (26%). On average across the three databases included in the analysis, three out of four fusions performed were on four or fewer levels, with the remaining quarter of procedures involving five or more levels. (Table 3.5.3 PDF CSV)



On the average, of 305,600 patients discharged with diagnosis of a vertebral compression fracture, 12% were treated with a kyphoplasty/vertebroplasty procedure. These patients were twice as likely to be female, and were most likely to be 65 or older. (Reference Table 3.5.4 PDF CSV)



Spondylolisthesis

Prevalence : Spondylolisthesis

The prevalence of spondylolisthesis ranges from 6% to 9% of the population, depending on the etiology studied and screening tools employed.[1,2] Spondylolisthesis has not been reported *in utero*, in non-ambulatory patients, or mammals other than humans, implicating weight bearing forces unique to the upright bipedal spine. Spondylolisthesis and spondylolysis (a defect in the posterior arch without slip or translation) are seen in 4% of children at 6 years of age, 6% at maturity, and as many as 47% of athletes in high-risk sports such as gymnastics.[1,2,3] Back pain is the most common complaint, but neurologic involvement may be seen with associated stenosis or progression and deformity. Children diagnosed prior to skeletal maturity or with slips greater than 50% are most likely to progress.[4]

1. a. b. Fredrickson BE, Baker D, McHolick WJ, Yuan HA, Lubicky JP: The natural history of spondylolysis and spondylolisthesis. *J Bone Joint Surg Am* 1984;66:699-707.

2. a. b. Iguchi T, Wakami T, Kurihara A, Kasahara K, Yoshiya S, Nishida K: Lumbar multilevel degenerative spondylolisthesis: Radiological evaluation and factors related to anterolisthesis and retrolisthesis. *J Spinal Disord Tech* 2002;15:93-99.

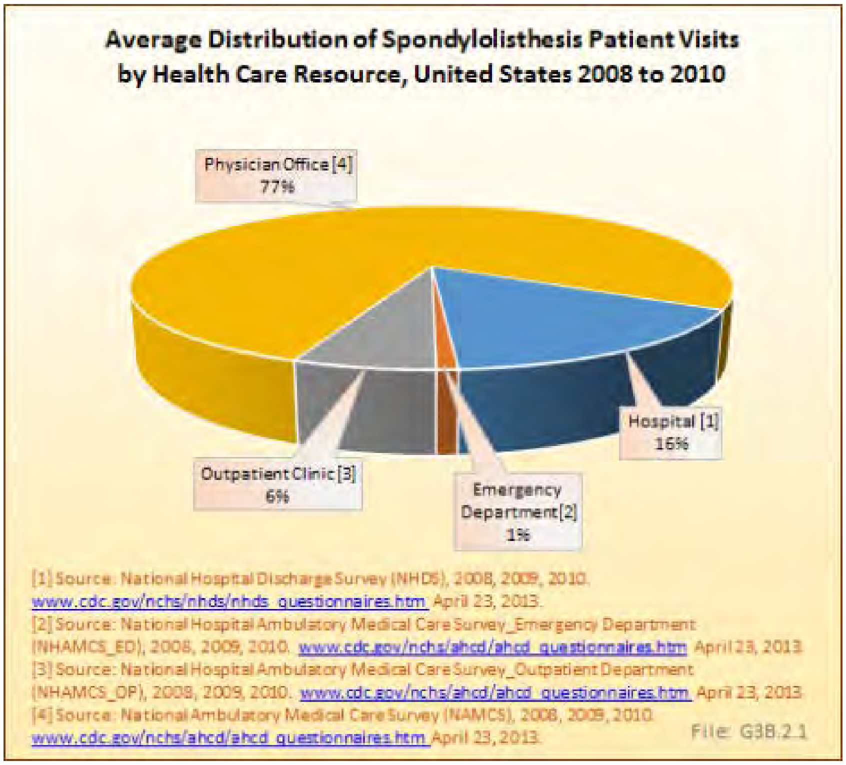
3. Congeni J, McCulloch J, Swanson K: Lumbar spondylolysis: A study of natural progression in athletes. *Am J Sports Med* 1997;25:248-253.

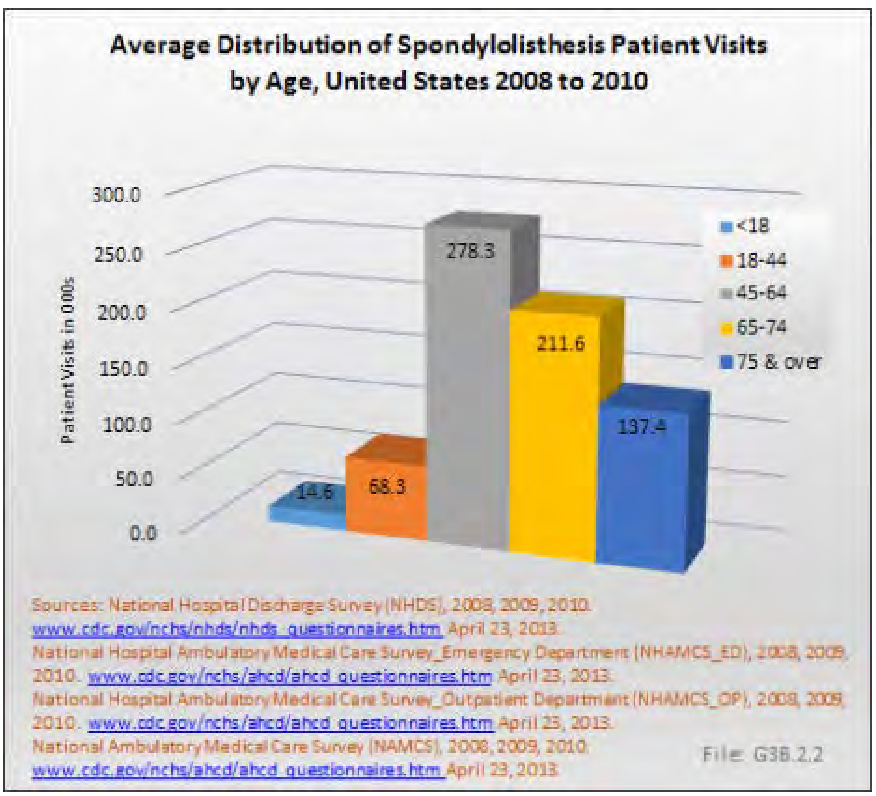
4. Boxall D, Bradford DS, Winter RB, Moe JH: Management of severe spondylolisthesis in children and adolescents. *J Bone Joint Surg Am* 1979; 61:479-495.

Resource Utilization : Spondylolisthesis

Many patients with spondylolisthesis have no symptoms, and most likely do not require any significant treatment or intervention. Symptomatic patients are most frequently treated nonsurgically with NSAIDs, activity modification, physical therapy, and possibly epidural steroid injections. Bracing may be appropriate in some patients, particularly children with acute lesions.[1,2] Surgical treatment is indicated when patients have significant disabling pain despite 6 months of adequate nonsurgical care or, less commonly, a progressive lesion. Treatment typically involves a posterior lumbar fusion. Instrumentation is thought to improve the fusion rate and clinical outcome,[3] and decompression is included for patients with stenosis and associated radicular leg symptoms. Reduction of slips of greater than 50% remains controversial, but is thought to correct kyphosis and global sagittal balance, decrease the length of fusion, and protect against adjacent segment degeneration.[4,5]

Analysis of various inpatient and outpatient databases from 2008–2011 showed 778,700 visits with a diagnosis for spondylolisthesis. The majority of these visits (81%) were outpatient visits, primarily to a physician office. More than two in three (69%) visits for spondylolisthesis were by females with an average age between the late 50s or early 60s. More recent data from 2010–2011 demonstrate 185,400 hospital or emergency department discharges for spondylolisthesis with similar age and sex distribution (Reference Table 3.1.1 PDF CSV and Table 3.1.2 PDF CSV).


Average Distribution of Spondylolisthesis Patient Visits by Health Care Resource, United States 2008 to 2010
Physician Office [4] 77%
Hospital [1] 16%
Outpatient Clinic [3] 6%
Emergency Department [2] 1%
[1] Source: National Hospital Discharge Survey (NHDS), 2008, 2009, 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.
[2] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.
[3] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.
[4] Source: National Ambulatory Medical Care Survey (NAMCS), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.
File: G3B.2.1


Average Distribution of Spondylolisthesis Patient Visits by Age, United States 2008 to 2010
Patient Visits in 000s
300.0
250.0
200.0
150.0
100.0
50.0
0.0
14.6
68.3
278.3
211.6
137.4
<18
18-44
45-64
65-74
75 & over
Sources: National Hospital Discharge Survey (NHDS), 2008, 2009, 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.
National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.
National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.
National Ambulatory Medical Care Survey (NAMCS), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.
File: G3B.2.2

1. Hu SS, Tribus CB, Diab M, et al: Spondylolisthesis and spondylolysis. *J Bone Joint Surg Am* 2008;90(3):656-671.

2. Steiner ME, Micheli LJ: Treatment of symptomatic spondylolysis and spondylolisthesis with the modified Boston brace. *Spine* 1985;10(10):937-943.

3. Zdeblick TA: A prospective, randomized study of lumbar fusion: Preliminary results. *Spine* 1993;18(8):983-991.

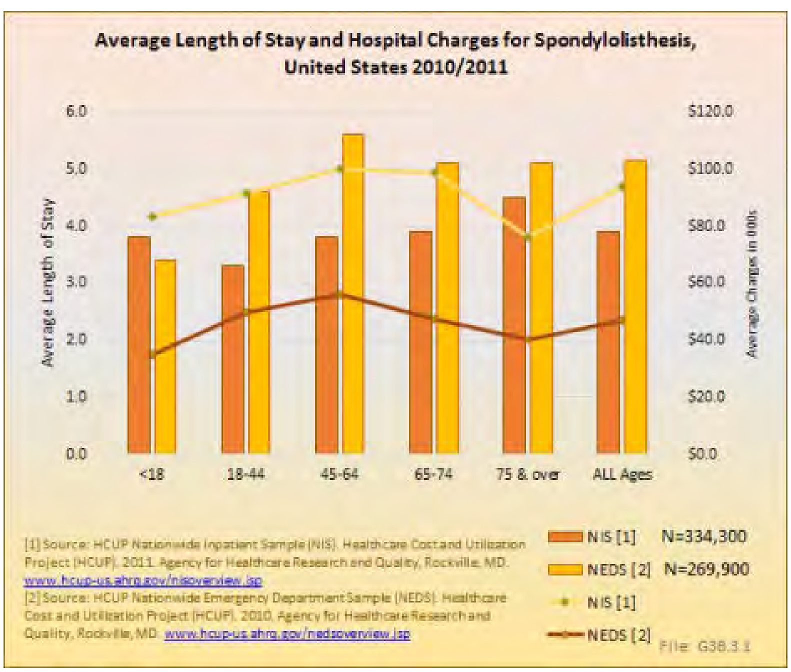
4. Transfeldt EE, et al: Evidenced based medicine analysis of isthmic spondylolisthesis treatment including reduction versus fusion *in situ* for high grade slips. *Spine* 2007;32(19 suppl):S126-S129.

5. Hu SS, Bradford DS, Transfeldt EE, Cohen M: Reduction of high grade spondylolisthesis using Edwards instrumentation. *Spine* 1996;21(3):367-371.

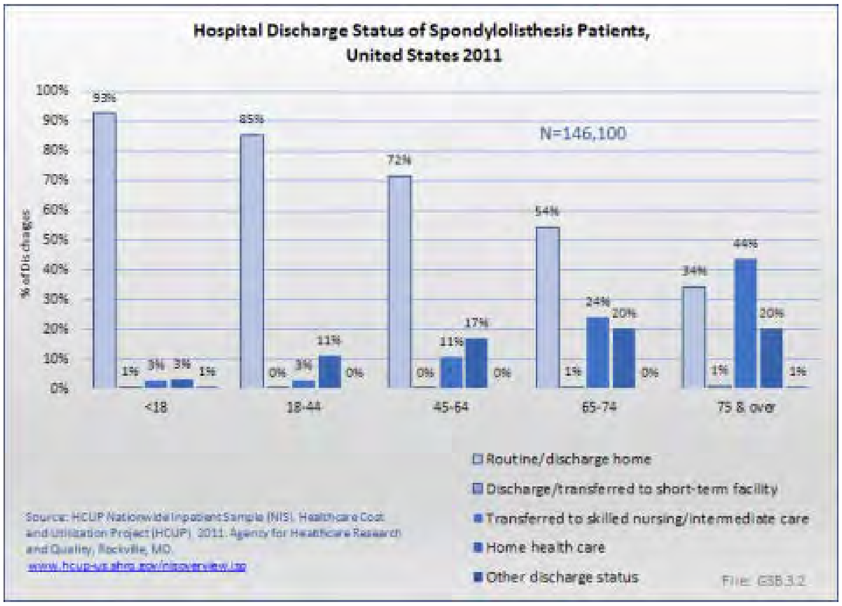
Cost : Spondylolisthesis

In 2011, there were 146,100 hospital discharges for spondylolisthesis reported in the HCUP NIS database. The average length of stay for these patients was 4 days, and tended to trend slightly upwards with age. The mean charges for hospital discharges with a diagnosis of spondylolisthesis was $93,900, which was unexpectedly higher than all other deformity codes evaluated and statistically similar to costs associated with hospital discharges for patients with complications of spine surgery diagnosis.

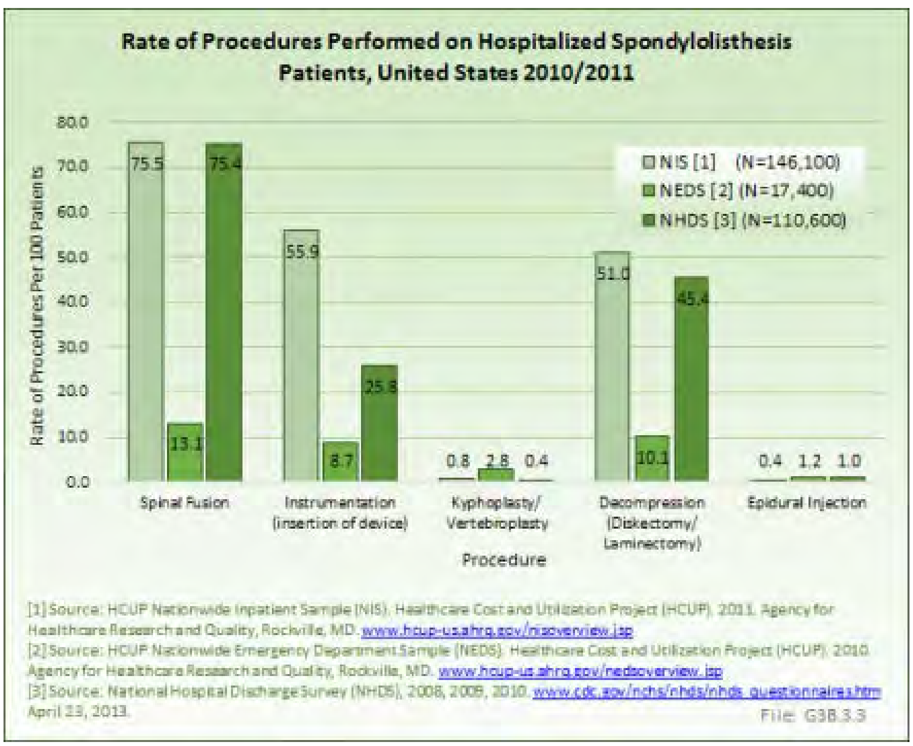
Among the much smaller sample of patients with a diagnosis of spondylolisthesis who were first seen in the emergency department (ED) and transferred to inpatient status, the average length of stay was slightly longer (5.2 days), but with lower average charges of $46,800. The proportion of patients with a spondylolisthesis diagnosis hospitalized after being seen in the ED who had a surgical procedure was much lower than those reported in the inpatient database. (Reference Table 3.4.1 PDF CSV; Table 3.4.2 PDF CSV; and Table 3.5.1 PDF CSV)



Nearly two-thirds (61%) of inpatients with a spondylolisthesis diagnosis were discharged from the hospital to home, although the proportion was lower when hospitalized after visiting the ED. Another 15% to 18% went home with home health care. One in five (21%) were transferred to a skilled nursing facility. Age is a major factor in discharge status, with 44% of patients age 75 years and older discharged to skill nursing/intermediate care. (Reference Table 3.3.1 PDF CSV and Table 3.3.2 PDF CSV)



Three out of four patients (75%) hospitalized with a diagnosis of spondylolisthesis were treated with a spinal fusion. About one-half were treated with instrumentation and decompression. Patients with spondylolisthesis often received more than one procedure in their stay. The overall costs for treatment of spondylolisthesis would be much higher than simply the hospitalization cost. The direct cost of nonsurgical treatments, such as medications, therapy, injections, braces, etc., and the indirect costs associated with treatment of this condition such as lost wages, non-productive time away from work, costs of medical care providers, are not included in these databases although they may be quite substantial. (Reference Table 3.5.1 PDF CSV)



Spinal Infection and Complications

Spinal infections are usually the result of bacterial or fungal infections from other places in the body that spread to the spine though the bloodstream (hematogenously). Less commonly, they occur from local extension of a neighboring infection (eg, psoas abscess). Spinal infections are usually categorized by their location as discitis (infection of the vertebral disc space), vertebral osteomyelitis (infection of the vertebral body), and epidural abscess (infection of the spinal canal space). Vertebral osteomyelitis is the most common, with an estimated prevalence of 2.4 cases per 100,000 persons. The risk increases with age, and accounts for 4% to 6% of all cases of osteomyelitis. Epidural infections are relatively rare (0.2 to 1.2/10,000 hospital admissions), but are more likely to require emergent surgical treatment and are associated with significant morbidity and mortality rates.[1,2,3]

Postoperative wound infections and adverse events are relatively rare but are predictable risks and consequences of surgery. Although the absolute number is small in comparison to the volume of cases overall, they tend to have a disproportionate impact on both patient outcome and societal cost. There are many potential adverse events reported with any procedure, and the frequency and severity of these events varies based upon both patient and disease-specific variables. The codes included for query of the various databases for wound infections and adverse events are 996.2 (mechanical complication of nervous system device/implant), 996.59 (mechanical complication due to other implant/device), 996.63 (infection due to nervous system device/implant), 996.75 (other complications due to nervous system device/implant). Postoperative infections were queried for codes 998.51, 995.59, and 998.60. No differentiation was found in rates of infection between the spine and other areas within the body.

1. Zimmerli W: Vertebral osteomyelitis. *N Engl J Med* 2010;362:1022-1029.

2. Boeglin ER: Vertebral osteomyelitis presenting as lumbar dysfunction: A case study. *JOSPT* 1995;22(8):267-271.

3. Hlavin ML, Kaminski HJ, Ross JS, Ganz E: Spinal epidural abscess: A ten-year perspective. *Neurosurgery* 1990;27:177–84.

Prevalence: Spinal Infection and Complications

The most common adverse events associated with spine surgery include neurologic injury, infection, re-operation, medical complications, and dural tear.[1] Of these, infection is the most frequently studied and reported both in the literature and within healthcare delivery organizations. Infection rates for lumbar spine surgery are frequently reported between 3% to 5% in many studies, but have a wide range depending on the type of procedure performed. Studies have reported an infection rate of 1% or less in single-level micro-discectomy cases (a small decompression procedure for disc herniation with sciatic pain); 3% to 7% in instrumented fusion cases (a stabilization procedure usually involving one to two levels for back pain or instability); 7% to 10% in adult deformity reconstruction (procedures to realign the spine in patients with scoliosis/kyphosis); and greater than 20% in neuromuscular deformity cases.[1,2,3,4]

In 2011, a total 370,000 discectomy and 498,700 fusion/refusion procedures were performed. Based on conservative estimated infection rates of 1% and 5%, for discectomy and fusion/refusion, respectively, we can estimate there were 28,600 postoperative spine infections. It is unknown what proportion of spinal infection diagnosis-related health care visits this represents. (Reference Table 2.14 PDF CSV and Table 2.19 PDF CSV)

1. a. b. Mirza SK, Deyo RA, Heagerty PJ, et al: Towards standardized measurement of adverse events in spine surgery: Conceptual model and pilot evaluation. *BMC Musc. Disorder* 2006;7:53.

2. Bassewitz HL, Fischgrund JS, Herkowitz HN: Postoperative spine infections. *Semin Spine Surg* 2000;12:203-211.

3. Nandyala SV, Marquez-Lara A, Fineberg SJ, et al: Comparison of perioperative outcomes and cost of spinal fusion for cervical trauma: weekday versus weekend admissions. *Spine* 2013;38(25)2178-83

4. Sponseller PD, Laporte DM, Hungerford MW et al: Deep wound infections after neuromuscular scoliosis surgery: multicenter study of risk factors and treatment outcomes. *Spine* 2000;25:2461-2466.

Risk Factors and Symptoms: Prevalence, Spinal Infection and Complications

Risk factors associated with postsurgical complications and infection following spine surgery include obesity, diabetes, steroid and alcohol use, revision surgery, age, and operative time and blood loss. Postsurgical wound infections can arise from direct inoculation of the wound intra-operatively or indirectly by hematogenous seeding from other sources (ie, spread through the bloodstream). The most frequent organism cultured is *Staphylococcus aureus* (Staph infection), while gram-negative organisms are more commonly seen in polymicrobial infections (infections involving multiple types of bacteria).[1]

The most frequently reported symptoms are back pain, fever, and wound drainage, usually within the first 10-20 days of surgery, although latent infections may occur more than one year from surgery.

1. Massie JB, Heller AG, Abittol JJ, et al: Postoperative posterior spinal wound infections. *Clin Orthop Relat Res* 1992;284:99-108.

Treatment and Complications: Prevalence, Spinal Infection and Complications

Superficial infections are frequently managed with oral antibiotics, while deep infections typically require surgical debridement (removal of dead, damaged, or infected tissue) and IV antibiotics. A small percentage of infections may be complicated by large soft tissue defects and compromised host immune systems, requiring extensive and prolonged treatments and surgical procedures.

Although major complications are rare, they are more likely to be seen in patients with complicated cases and have been reported to occur in as many as 28% to 32% of adult deformity cases.[1] These include complications that are device-related (2% to 5%), neurologic (1% to 2%), vascular (3% to 4%), medical (>10%), stroke (2%), and include death (0.8%).[1,2] Sentinel events (relatively infrequent, clear-cut events that occur independently of a patient's condition), including bowel or peritoneal injury, neurovascular injury, wrong site surgery, and retention of a foreign body, occur in 0.8/1,000 cases.3

Both major complications and sentinel events frequently require further medical interventions, resulting in longer hospitalizations, greater costs, and increased mortality.

1. a. b. Cho SK, Bridwell KH, Lenke LG, et al: Comparative analysis of clinical outcome and complications in primary versus revision adult scoliosis surgery. *Spine* 2012;37(5):393-401.

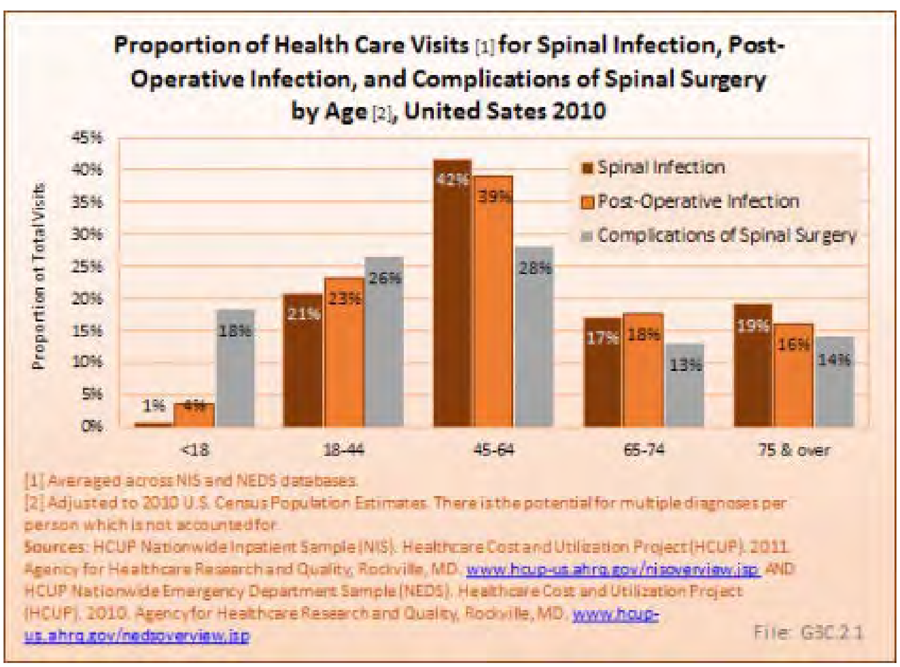
2. Goz V, Weinreb JH, Schwab F, et al: Comparison of complications, costs, and length of stay of three different lumbar interbody fusion techniques: An analysis of the Nationwide Inpatient Sample database. *Spine J* 2014;9:2019-2027.

3. Marquez-Lara A, Nandyala SV, Hassanzadeh H, et al: Sentinel events in lumbar spine surgery. *Spine* 2014;39:900-905.

Resource Utilization: Spinal Infection and Complications

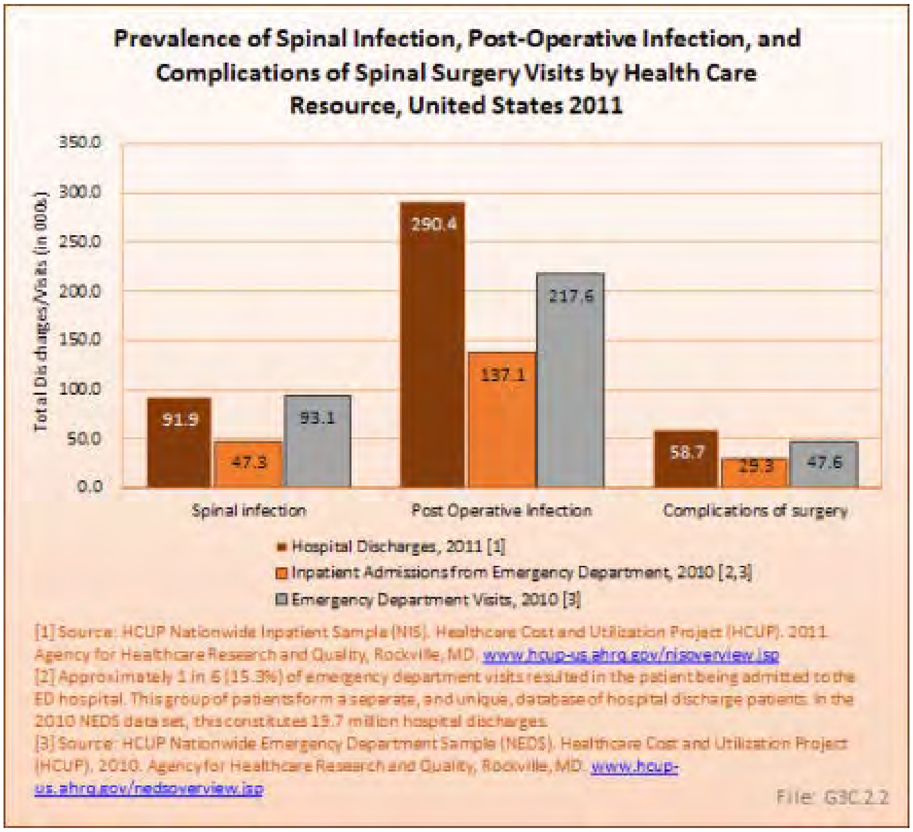
In the summary years of 2008 to 2011, there were 261,900 hospital discharges or outpatient visits for complications related to spine surgery. These were evenly distributed between men and woman, with an average age in the mid- to late 40s. Health care visits occurred most frequently in the population under age 18 years, and least frequently among persons age 65 years and older.

In addition, there were 1.87 million patient visits related to spinal infections. The majority of the spinal infection diagnoses were for discitis, an infection in the small spaces between the vertebrae of the spine. Only 1% of diagnoses treated in 2010 were to those under the age of 18 years. (Reference Table 3.1.1 PDF CSV and Table 3.1.2 PDF CSV)



Postsurgical infections, which are not isolated to spinal surgeries, accounted for 290,400 hospital discharges in 2011, and 217,600 emergency department visits in 2010, of which 63% were admitted to the hospital. Postsurgical infections were most commonly found in persons age 45 to 64 years. (Reference Table 3.2.1 PDF CSV)

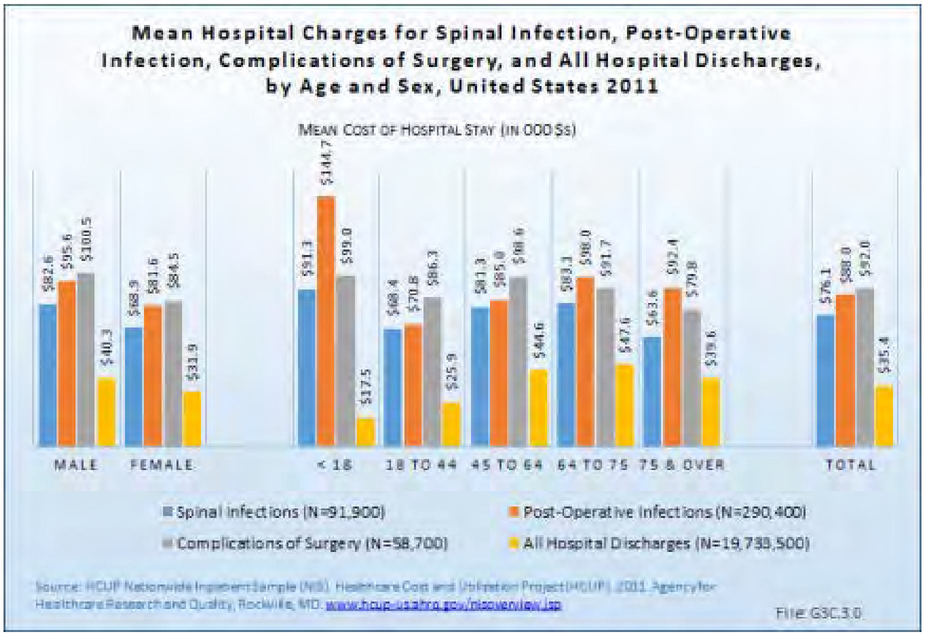
The majority of health care visits for both spinal infection and complications of spinal surgery were to a physician's office, but 22% of cases for complications from spinal surgery resulted in re-hospitalization. (Reference Table 3.1.1 PDF CSV and Table 3.3.2 PDF CSV)



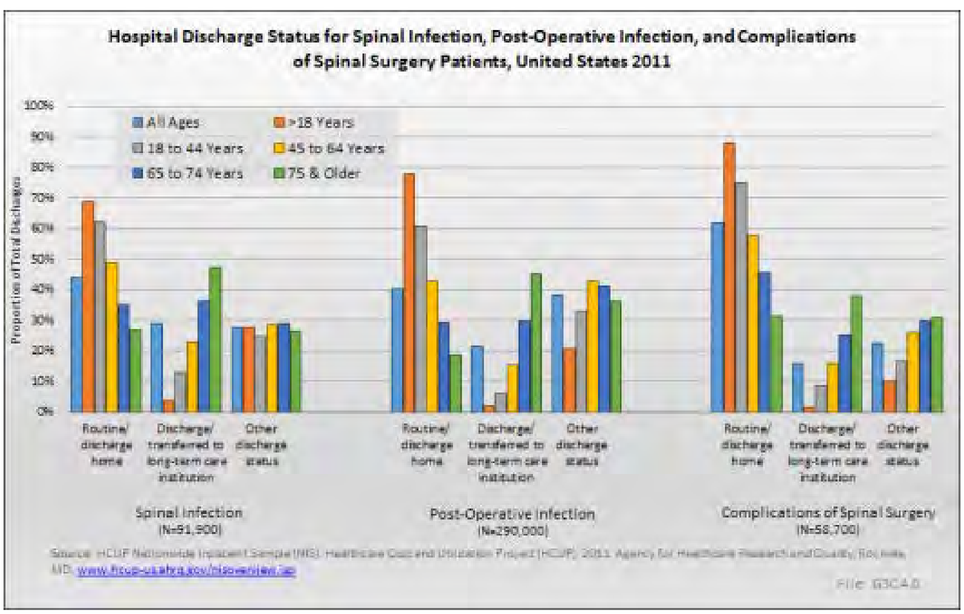
The average length of hospital stay (LOS) for infections and complications were 9.9 days and 8.8 days, respectively. Mean hospital charges for infections and complications were $76,100 and $92,000, respectively. Mean charges for complications of spinal surgery were second highest of all spinal deformity conditions evaluated. Charges related to males were higher than for females for both conditions, and were highest for the youngest patients, those age 17 years and younger. (Reference Table 3.4.1 PDF CSV)

Cost: Spinal Infection and Complications

In 2011, total costs for patients discharged from a hospital with a diagnosis of either spinal infection or complications of spinal surgery were $12.4 billion. Hospital charges related to postsurgical infections were more than $25.5 billion. These estimates encompass hospital charges only; they do not include other direct costs such as physician charges, outpatient ancillary services, physical therapy, injections, or indirect costs including lost workdays and income. (Reference Table 3.4.4 PDF CSV)



About one-half of patients treated for infection and complications were discharged to home (44% and 62%, respectively), but a substantial proportion were transferred to a long-term facility (29% and 16%, respectively), adding to the cost of treatment for spinal infection and complications from spinal surgery. Discharge status for postsurgical infection hospitalizations were similar. The likelihood of being transferred home declined with age for all groups, with a third to half of patients discharged to long-term care. One in four received additional home health care, increasing the cost of treating these conditions. (Reference Table 3.3.4 PDF CSV)



Spinal Curvature

Lead Author(s):

Adolfo Correa, MD, PhD

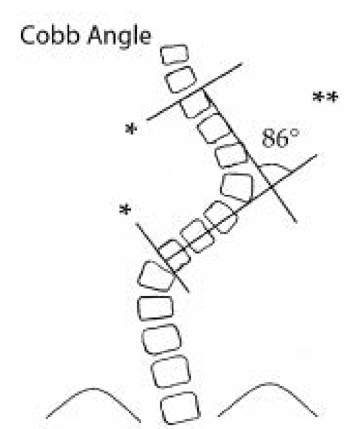
Supporting Author(s):

Sylvia I. Watkins-Castillo, PhD

The normal spine viewed from the side forms a gentle "S" shape. When viewed from the back, the normal spine appears straight. The naturally occurring soft curves of the spine are designed to distribute mechanical stress in the body when at rest and during movement. When the curvature is even slightly abnormal, a person may experience occasional mild or annoying discomfort. If the curve is severely abnormal, the pain is usually severe and accompanied by disability. Abnormal curves are referred to as spinal deformities, and include scoliosis, kyphosis, excess lordosis, and flatback.

Scoliosis and Spinal Deformity in Children: Spinal Curvature

Spinal deformity and scoliosis can be found at birth due to genetic causes, develop during childhood, or develop late in life because of degenerative disc and joint disease. Common signs of scoliosis are a prominent shoulder or shoulder blade, or chest wall asymmetry. Another sign is uneven hips, with one hip seemingly higher than the other hip. It is important not to confuse scoliosis with poor posture and to realize that scoliosis will usually not disappear with age. In spite of the severity of these conditions and the impact they have on the lives of children, the prevalence of spinal deformities in children under the age of 18 years is difficult to determine because of relatively low numbers and the degree to which the condition manifests initially in pain or disability. Estimated prevalence of spinal deformity conditions has been cited in numerous studies, and ranges from 1 in 1,000 for congenital scoliosis to 68 in 100 for adult spinal deformity or scoliosis for persons age 60 years and older. (Reference Table 3.1.3 PDF CSV)



*Both lines are drawn along the end of the vertebrae that are most tilted from the horizontal.
** The Cobb angle is the angle formed by the intersection of these two lines.

There are several different types of scoliosis. The most common type of scoliosis is idiopathic, meaning the cause of is unknown. Approximately 80% to 85% of scoliosis cases are idiopathic.[1] Idiopathic scoliosis can initially occur as early as the first three years of life, which is known as infantile idiopathic scoliosis. If diagnosed between the ages of 4 to 10 years, it is known as juvenile idiopathic scoliosis, and from 10 years of age to skeletal maturity, as adolescent idiopathic scoliosis. Adolescent idiopathic scoliosis is the most common type.

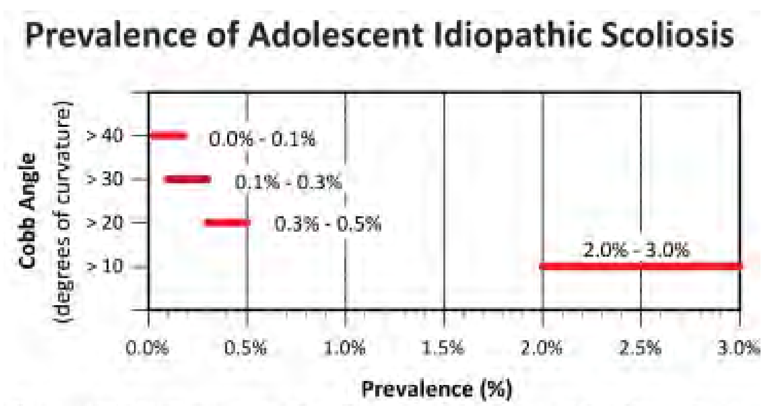
Scoliosis, if severe enough (>25°), is usually treated with bracing if the child is growing, or with surgery if the curvature is more severe (>45° to 50°). The standard radiograph measurement method for all forms of scoliosis is the Cobb angle measurement technique, measured from the end plates of the maximally tilted end vertebral bodies in a standing radiograph.[2] Whether the curve is >25° or >40° to 45°, the treatment is preventative in nature, helping to avoid progression of the curve and more significant future problems that might occur if it was left untreated. While this preventative aspect is hugely valuable and intuitively important, its benefit is difficult to measure from a public health standpoint, especially for rare conditions of childhood such as juvenile and adolescent pediatric scoliosis.

1. National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS): Questions and answers about scoliosis in children and adolescents. National Institutes of Health, U.S. Department of Health and Human Services, 2007. Available at: http://www.niams.nih.gov/Health_Info/Scoliosis/default.asp. Accessed December 20, 2014.

2. Herzenberg JE, Waanders NA, Closkey RF, et al: Cobb angle versus spinous process angle in adolescent idiopathic scoliosis: The relationship of the anterior and posterior deformities. *Spine* 1990;15:874-879.

Adolescent Idiopathic Scoliosis: Spinal Curvature

According to the Scoliosis Research Society (SRS), idiopathic scoliosis is diagnosed when a patient has asymmetry on forward bending combined with a curve of at least 10°.1 By this definition, the prevalence of adolescent idiopathic scoliosis in children from 10 to 16 years of age is 2% to3%. Though the male-to-female ratio for smaller curves is about equal, larger curves seem to be more common in females. Similar results were found in a study conducted in 1985, where 29,195 children were screened for idiopathic scoliosis.2



Data reprinted with permission from Weinstein SL. Adolescent idiopathic scoliosis: Prevalence and natural history. *Instr Course Lect* 1988;38:115–126.

Several studies have investigated the natural history and natural course of curve progression in adolescent idiopathic scoliosis. All report the strongest predictive factors in the development of idiopathic scoliosis are age, magnitude of curve, and gender.3,4,5,6,7 Girls are more likely to have adolescent idiopathic scoliosis than boys, and some studies report the onset is earlier in girls than boys. A factor highly correlated with curve progression is age at diagnosis; patients diagnosed at a younger age have a greater risk of curve progression. However, those diagnosed at a younger age seem to have a more favorable response to milder forms of treatment, which supports the practice of school screening to detect and lead to earlier diagnosis for those children with a smaller degree of curvature.

Treatment decisions for individuals with adolescent idiopathic scoliosis are made based on location, shape, pattern, and cause of the curve. The treatment choice is also a function of the patient's future growth potential. Treatment choices include observation, bracing, and surgery. Observation is usually reserved for patients who have curves ≤25°. Bracing, which is used to stop curve progression (rather than for lasting correction of the curve), is usually used for patients who have curves ≥25° and who are still growing. Surgery is generally used for patients with curves ≥45°.

1. Lonstein J: Scoliosis: Surgical versus nonsurgical treatment. *Clin Ortho Relat Res* 2006;443:248-259.

2. Morais T, Bernier M, Turcotte F: Age- and sex-specific prevalence of scoliosis and the value of school screening programs. *Am J Public Health Nations Health* 1985;75:1377-1380.

3. Bunnell W: Spinal deformity. *Pediatr Clin North Am* 1986;33:1475-1487.

4. Weinstein S: Idiopathic scoliosis: Natural history. *Spine* 1986;11:780-783.

5. Karol LA, Johnston CE 2nd, Browne RH, Madison M: Progression of the curve in boys who have idiopathic scoliosis. *J Bone Joint Surg Am* 1993;75:1804-1810.

6. Porter SB, Blount BW: Pseudotumor of infancy and congenital mascular torticollis. *Am Fam Physician* 1995;52:1731-1736.

7. Willner S: Continuous screening and treatment of teenage scoliosis is recommended. *Lakartidningen* 1994;91:22.

Juvenile Idiopathic Scoliosis: Spinal Curvature

In 12% to 21% of idiopathic scoliosis cases, the diagnosis is made between 4 and 10 years of age. Between the ages of 4 and 6 years, the female-to-male ratio of juvenile idiopathic scoliosis is 1:1. However, the ratio of female to male cases rises to between 2:1 and 4:1 in children between the ages of 4 and 10 years, and to 8:1 in children who are 10 years of age or older.[1] Both right and left curves are found with equal frequency for patients younger than 6 years, but rise to a 3:1 ratio of right versus left thoracic curves after the age of 6.[2]

Observation is the main treatment for patients with a small curve of less than 20° to 25°. Follow-up visits are recommended every 4, 6, 9, or 12 months, depending on the patient's age, the degree of the curve, and the characteristics of the clinical deformity.[1]

Curves between 25° and 50° are usually treated with bracing in this age group. Bracing can be done either on a part-time or full-time basis, depending on the size of the curve as well as the age of the child. A study completed in 1982 evaluating the success of bracing reported an excellent prognosis when part-time bracing was utilized for patients with a curve of ≤35° and rib-vertebra angle difference (RVAD)[3] of ≤20°; however, curves ≥45° and RVAD of ≥20° had a less favorable prognosis for successful treatment with bracing.[1]

Overall, the curve patterns in patients with juvenile idiopathic scoliosis are similar to those with adolescent idiopathic scoliosis. Approximately 70% of patients with juvenile idiopathic scoliosis exhibit curve progression and require some form of treatment. In a study conducted in 1981, 55 of 98 patients (56%) with juvenile idiopathic scoliosis required spinal surgery. The most common and traditional surgery is posterior instrumentation and fusion.[1]

1. a. b. c. d. Lenke LG, Dobbs MB: Management of juvenile idiopathic scoliosis. *J Bone Joint Surg Am* 2007;89:55-63.

2. Warner WC Jr.: Juvenile idiopathic scoliosis, in Weinstein S, ed: *The Pediatric Spine: Principles and Practice*, ed 2. Philadelphia, PA: Lippincott Williams & Wilkins, 2001, p 330.

3. Rib vertical angle difference (RVAD): The rib vertical angle (RVA) is the angle formed by perpendicular line from apical vertebral end plate and a second line from the mid-neck to mid-head of the adjacent rib. The RVAD is the difference between the two RVA on the concave and convex sides of the curve. A curve greater than 20 is considered progressive. Available at: http://www.wheelessonline.com/ortho/congenital_scoliosis_and_vertebral_defects. Accessed October 22, 2014.

Infantile Idiopathic Scoliosis: Spinal Curvature

Infantile scoliosis currently accounts for less than 1% of all cases of idiopathic scoliosis in the United States. Boys are affected by infantile idiopathic scoliosis at a higher rate than girls (3:2 ratio).[1] Infantile scoliosis curves tend to be left-sided (75% to 90%). Past studies have indicated this rare type of scoliosis occurs more frequently in Europe than in North America.[2]

Treatment for patients with infantile idiopathic scoliosis is determined by anticipated or actual curve progression. Several common measurement techniques are used, with angles ≤20° generally considered at low risk for progression. Re-evaluation is recommended every 4 to 6 months.[1]

In addition to measuring the Cobb angle, the RVAD is used as a common predictor of curve progression.[3] Patients with a Cobb angle of ≤25° and a RVAD of ≤20° are at a low risk for progression and should be re-evaluated every 4 to 6 months.[1]

Nonsurgical treatment, such as bracing or casting is initiated if a curve progression of ≥10° occurs. Surgical treatment should be considered when nonsurgical measures, including both bracing and casting, are not successful. Surgical treatment is utilized when a curve is ≥45° and progressive in an immature child.[1] Overall, surgical methods are continually evolving, with the goal of obtaining and maintaining curve correction while simultaneously preserving or encouraging spinal and trunk growth.

Surgical options currently utilized include various types of spinal fusion or hemiepiphysiodesis, a minimally invasive implant procedure to slow progression of curve growth. Additional techniques include growing-rod instrumentation (rods that expand and support the deformed spine) and vertical expandable (telescoping) prosthetic titanium rib (VEPTR) instrumentation.[4]The goal of using surgical methods is to halt the progression of the curve and gain correction of the deformity, allowing maximum growth of the spine, lungs, and thoracic cage.[1]

1. a. b. c. d. e. Akbarnia B: Management themes in early onset scoliosis. *J Bone Joint Surg Am* 2007;89:42-54.

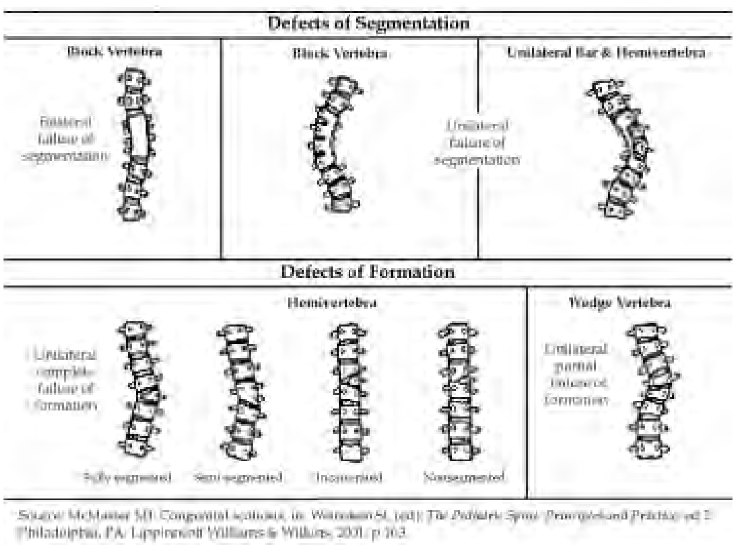
2. Fernandes P, Weinstein SL: Natural history of early onset scoliosis. *J Bone Joint Surg Am* 2007;89:21-33.

3. Mehta M: The rib-vertebra angle in the early diagnosis between resolving and progressive infantile scoliosis. *J Bone Joint Surg Br* 1972;54:230-243.

4. Titanium Rib or VEPTR (Vertical Expandable Prosthetic Titanium Rib): An expandable titanium metal rod placed in a vertical position alongside the spine and attached to the ribs and pelvis or the spine. The VEPTR expands and supports a deformed chest wall cavity giving the lungs room to operate and grow. VEPTR is a new method for the treatment of thoracic insufficiency syndrome (TIS) and congenital spinal deformity (scoliosis) in children. Available at: http://www.ncbi.nlm.nih.gov/pubmed/15931035 . Accessed October 22, 2014.

Congenital Scoliosis: Spinal Curvature

Congenital scoliosis is believed to affect approximately one child for every 1,000 live births.1 The cause is unknown in most cases, but in some cases, it is associated with various syndromes, as shown in the illustration below. Diagnosis occasionally is made during prenatal ultrasound. In cases of congenital scoliosis, additional congenital conditions, such as chest wall malformation or kidney or heart abnormalities, are often present. Treatment options for congenital scoliosis are bracing and/or surgery, and are similar to those discussed for idiopathic scoliosis. Bracing is not as effective for congenital scoliosis as it is for idiopathic scoliosis.



Major abnormal spinal deformity presenting during infancy or early childhood poses a clinical problem because of the anticipated long growth period (at least 10 years), variable presentation and treatment methods, and the length of time that must pass before meaningful outcome results can be assessed in the small number of patients for definitive studies. Curves that result from congenital scoliosis are often not treated as easily as idiopathic curves because the deformity is in the bones rather than the soft tissue, causing the curve to be rigid.2

1. Hedequist D, Emans J: Congenital scoliosis: A review and update. *J Pediatr Orthop* 2007;27:106-116.

2. Lonstein J: Scoliosis, in Lovell WW, Winter RB, Morrissy RT, Weinstein SL, eds: *Lovell and Winter's Pediatric Orthopaedics*, ed 4. Philadelphia, PA: Lippincott Williams Wilkins, 1996, vol II.

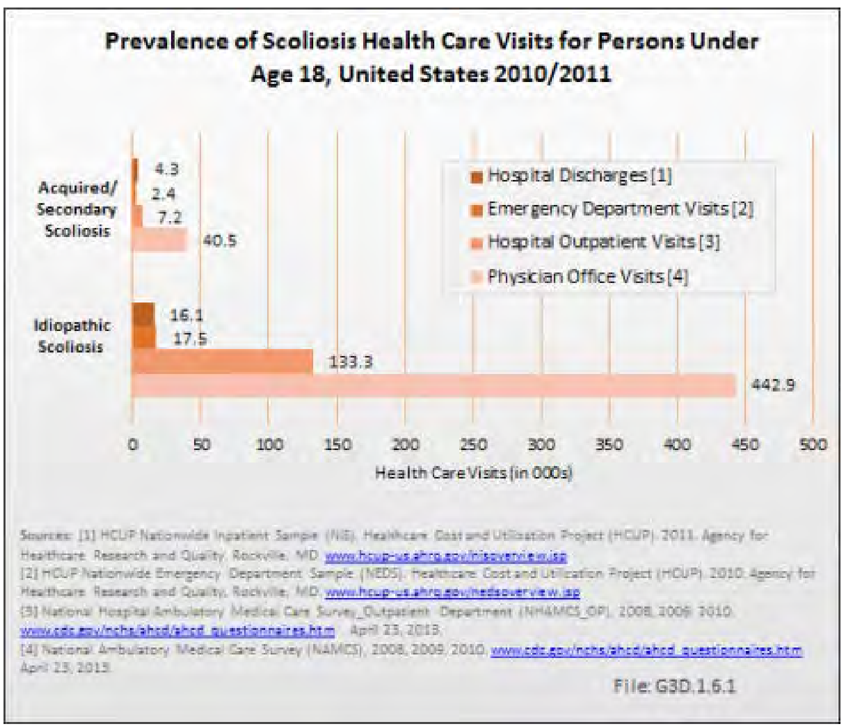
Neuromuscular Scoliosis: Spinal Curvature

Scoliosis also occurs in conjunction with several congenital conditions that occur in infancy or childhood. These include muscular dystrophy, cerebral palsy, spina bifida, and spinal muscular atrophy. Scoliosis associated with these conditions is referred to as neuromuscular scoliosis. Both the likelihood and the severity of the scoliosis generally increases with the severity of the underlying condition. For example, a child with severe cerebral palsy who is unable to walk is more likely to have severe scoliosis than a child with mild cerebral palsy who can walk.

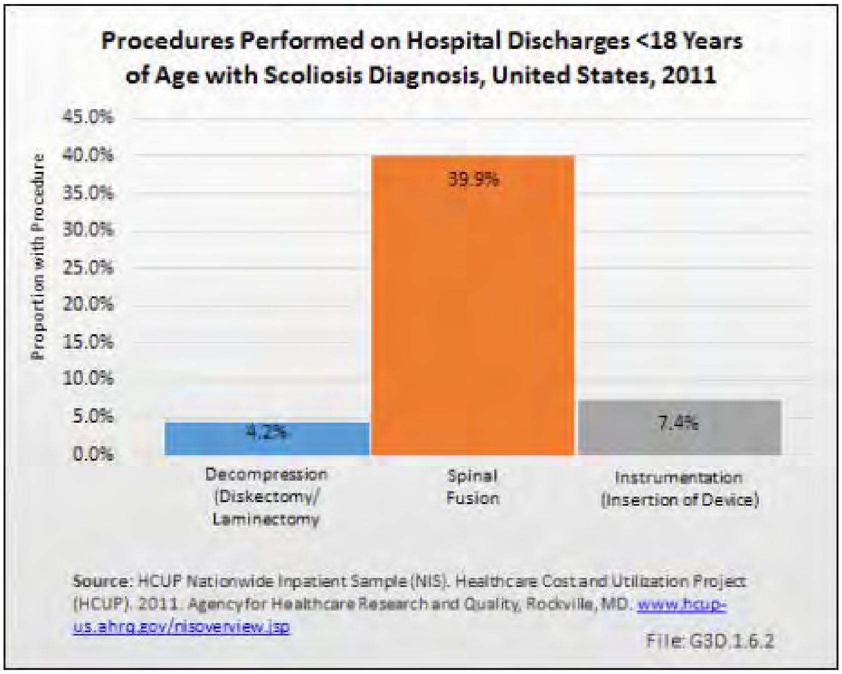
Resource Utilization: Scoliosis in Children, Spinal Curvature

Because of the low prevalence of scoliosis in children and adolescents, analysis of the health care impact this condition causes is difficult. However, the impact of scoliosis over a lifetime in terms of pain, inability to work, and cost to the health care system are substantial.

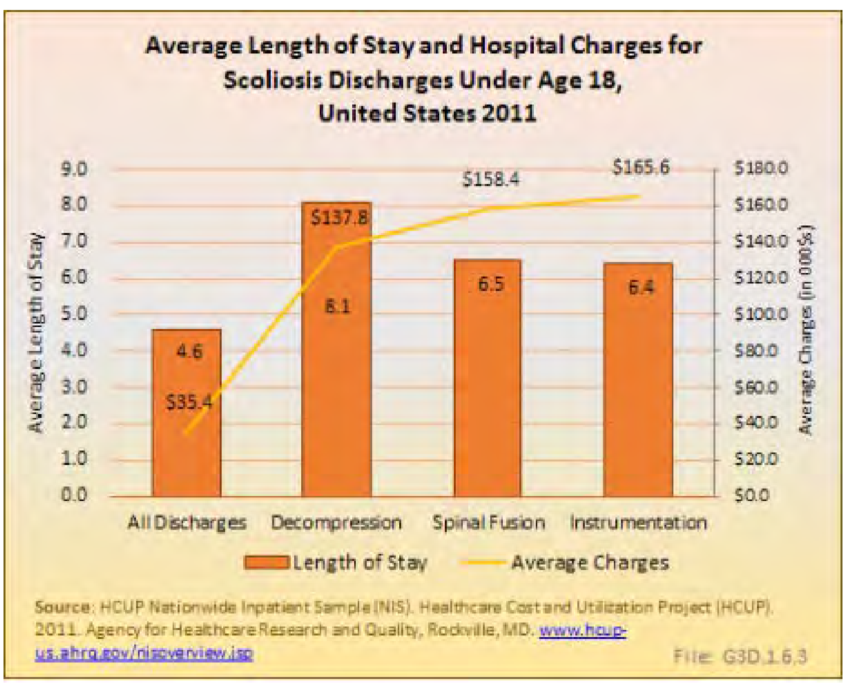
In 2010–2011, 92% of the 663,700 health care visits with a diagnosis of scoliosis for those under the age of 18 years were classified as idiopathic scoliosis. The majority (94%) were outpatient visits to either an outpatient clinic or physician office. Only 3% represented hospital discharges; however, this still accounted for 20,100 discharges for this often painful condition in children and adolescents. (Reference Table 3.1.2 PDF CSV)



In 2011, 42% of children and adolescents under the age of 18 years discharged from the hospital with a diagnosis of scoliosis had surgery. Spinal fusion was the most common surgery performed, followed by instrumentation and decompression. Of those having surgery, three-fourths (78%) had only one type of surgery. However, one in five had two or all three types of surgery. Reference Table 3.5.1 PDF CSV)



Average hospital charges for patients with scoliosis under 18 years of age who had surgery in 2011 were four or more times the average for all scoliosis patients in this age group, even though the length of stay was only about 50% longer. Patients who had an instrumentation procedure had the highest average charges of $165,600, although this may have been in conjunction with another procedure.

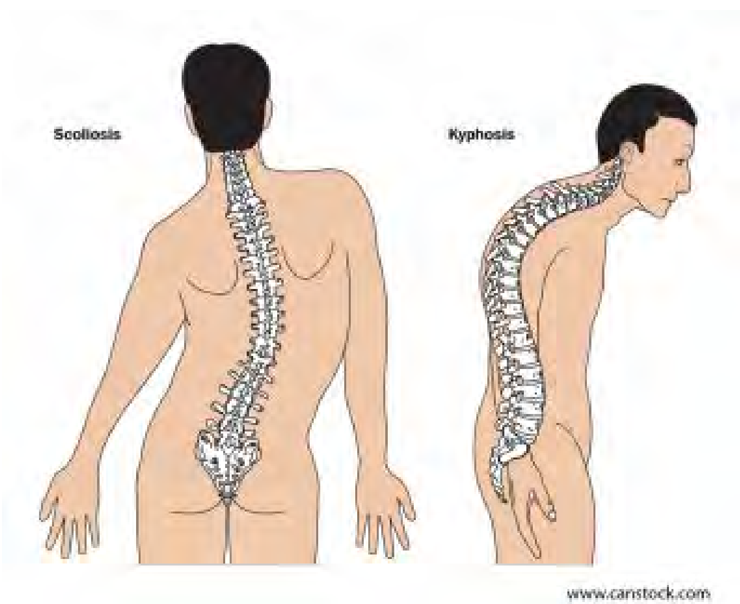


Adult Spinal Deformity and Degenerative Scoliosis: Spinal Curvature

Deformity of the adult spine includes patients with curvature of the spine (scoliosis) of varying degrees caused or impacted by degenerative disc and joint disease. Adult scoliosis may be the result of persistent or progressive deformity since adolescence or a new, *de novo*, onset of deformity resulting from degeneration or aging of the spine. Degenerative scoliosis accounts for the majority of scoliosis cases in older populations aged 65 years and older, as reflected in the low proportion of older patients with a diagnosis of primary idiopathic scoliosis.

Degenerative scoliosis is one of the most challenging spine conditions to treat because of the variability of the condition. Generally, it is thought to originate with the degeneration of the intervertebral discs, which leads to misalignment of the vertebral column. Degenerative scoliosis, particularly in the very elderly, is often associated with other conditions, such as osteoporosis. Treatment outcomes for both nonsurgical and surgical procedures are not well documented; hence, recognition and earlier intervention are important to ward off the more complex problems of adult scoliosis. The role played by undiagnosed, mild idiopathic adolescent scoliosis on the development of degenerative scoliosis in later life is unknown.

While scoliosis is the primary form of spinal curvature, two other spine curvature disorders are included in the data cited here. These are lordosis, also known as swayback, where the spine curves significantly inward at the lower back, and kyphosis, characterized by an abnormally rounded upper back with a curvature of more than 50º.



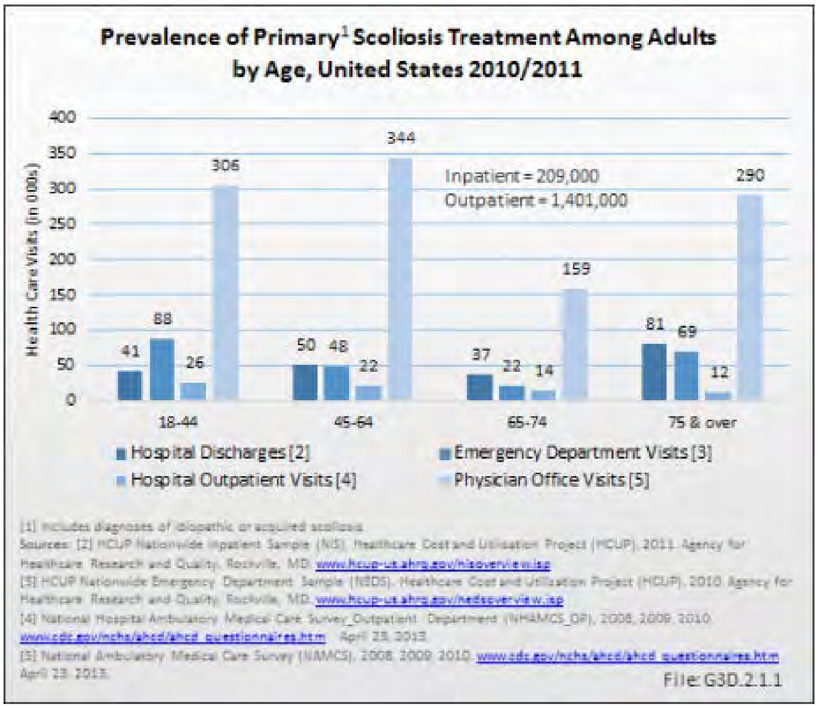
The clinical presentation and management of adults with scoliosis is characterized by a great deal of variability. There is a poor correlation between the magnitude of deformity and the impact of scoliosis on health status, as patients with large spinal curvatures may have limited pain and disability with and patients with relatively mild deformity may be severely impaired. Deformity in the sagittal plane (lateral) is most closely associated with disability.[1] Patients with adult scoliosis seek medical care for symptoms including back pain, neural symptoms, and progression of deformity.

1. Glassman SD, Berven S, Bridwell K, Horton W, Dinar JR: Correlation of radiographic parameters and clinical symptoms in adult scoliosis. *Spine* 2005;30:682-688.

Prevalence of Adult Scoliosis: Spinal Curvature

The prevalence of adult spinal deformity and scoliosis is not well established, with estimates ranging from 2.5% to 25% of the population.[1,2,3,4,5,6] A 2005 study reported mild to severe adult scoliosis prevalence as high as 68% in a healthy (no known scoliosis or spine surgery) population aged 60 years and older.[7] Many cases of degenerative scoliosis are undiagnosed, but elderly patients often seek care because of back and leg pain that may be caused by scoliosis and associated spinal stenosis.

According to 2010 US Census Population Estimate, there were 235,205,658 people in the United States over the age of 18 years. Prevalence of adult scoliosis cited in the literature ranges from 2.5% to 60%, depending on severity. A conservative estimate (2.5%) of the prevalence of adult scoliosis yields an incidence of a minimum of 5.88 million adults in the United States with adult scoliosis. In 2010–2011, an estimated 1.61 million of these adults received treatment either as an inpatient or on an outpatient basis. (Reference Table 3.1.2 PDF CSV)



Estimates for prevalence of lordosis or kyphosis as the primary diagnoses is approximately 17% of spine curvature diagnoses in hospital and emergency departments, with patient hospital discharges higher (23%). (Reference Table 3.2.2 PDF CSV)

1. Nilsonne U, Lundgren KD: Long-term prognosis in idiopathic scoliosis. *Acta Orthop Scand* 1968;39:456-465.

2. Battie MC, Videman T: Lumbar disc degeneration: Epidemiology and genetics. *J Bone Joint Surg Am* 2006;88:3-9.

3. Gupta M: Degenerative scoliosis: Options for surgical management. *Ortho Clin North Am* 2003;34:269-279.

4. Carter OD, Haynes SG: Prevalence rates for scoliosis in U.S. adults: Results from the first National Health and Nutrition Examination Survey. *Int J Epidemiol* 1987;16:537-544.

5. Perennou D, Marcelli C, Herisson C, Simon L: Adult lumbar scoliosis: Epidemiologic aspects in a low-back pain population. *Spine* 1994;19:123-128.

6. Robin GC, Span Y, Steinberg R, et al: Scoliosis in the elderly: A follow-up study. *Spine* 1982;7:355-359.

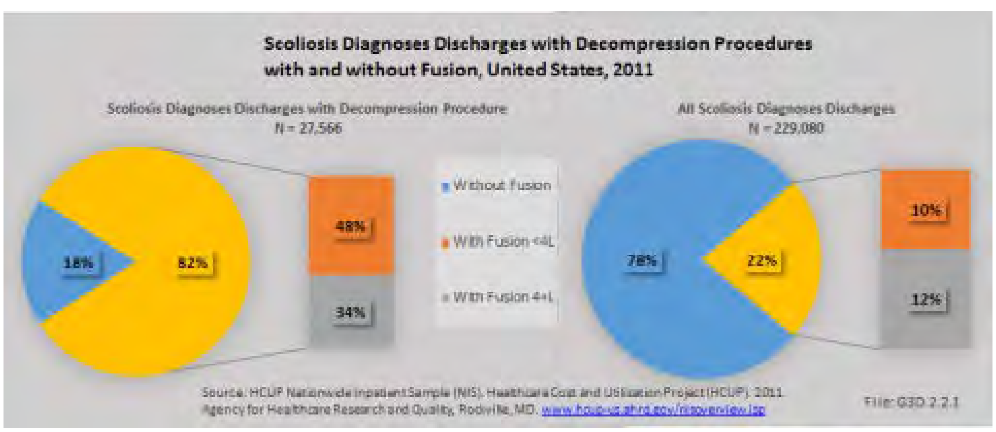
7. Schwab F, Dubey A, Galez L, et al: Adult scoliosis: Prevalence, SF-36, and nutritional parameters in an elderly volunteer population. *Spine* 2005;30:1082-1085.

Resource Utilization: Adult Scoliosis , Spinal Curvature

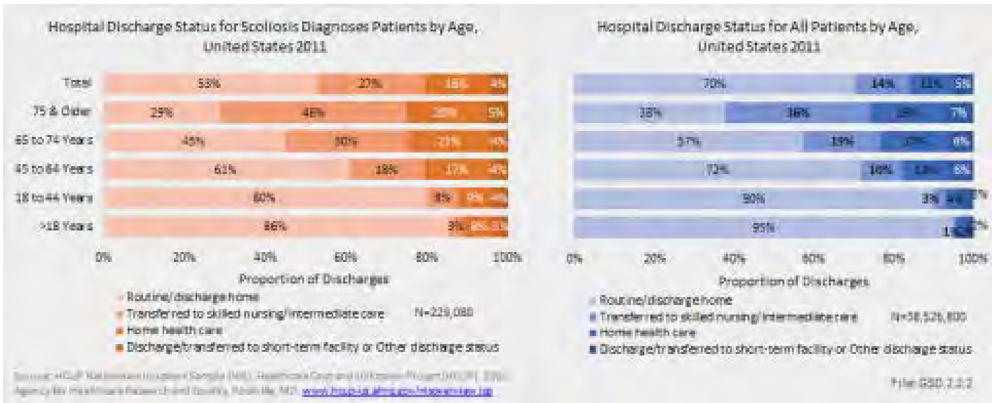
The management of adult scoliosis includes nonsurgical and surgical resources. Nonsurgical treatments of adult scoliosis utilize significant resources, and include interventions such as exercises, physical therapy, injections, pain medications, and manual manipulation.1 Data on nonsurgical treatments is not available; however, a 2010 non-randomized study reported that two years of nonsurgical treatment in adult scoliosis patients resulted in substantial expenditures and yielded no improvement in health status.2

Operative management of scoliosis in the adult encompasses a spectrum of procedures including decompression alone, decompression with limited fusion, and fusion of the deformity. In 2011, a query of the Healthcare Costs and Utilization Project (HCUP) Nationwide Inpatient Survey (NIS) resulted in approximately 229,100 hospitalizations associated with a discharge diagnosis of scoliosis or spinal curvature (ICD-9-CM of 373). The majority of these, or 155,900 patients, were diagnosed as idiopathic scoliosis, or scoliosis of unknown cause. Most of the remaining discharges, 66,000 people, were associated with a primary diagnosis of acquired adult scoliosis, while the remaining 10,500 discharges were associated with adult scoliosis as the secondary diagnosis to another condition. (Reference Table 3.1.1 PDF CSV)

In 2011, nearly 27.6 thousand patients admitted to the hospital with a diagnosis of scoliosis underwent a decompression procedure. Among patients having decompression, 82% also had spinal fusion, with 42% undergoing fusion of one to three levels, while 34% had fusion of four or more levels. Overall, 22% of all scoliosis patients underwent a fusion procedure (N=50,009), with 10% having fusion of one to three levels and 12% fusion of four or more levels.



In 2011, only about one-half (53%) of patients with a scoliosis diagnosis were discharged to home, while 70% of patients discharged for any diagnosis had a routine discharge. Patients with a scoliosis diagnosis are more likely to be transferred to a skilled nursing or intermediate care facility than are patients with all diagnoses. This is particularly true for the elderly population, with 46% of persons age 75 and older with a scoliosis diagnosis moving to a long-term care facility. (Reference Table 3.3.1 PDF CSV)



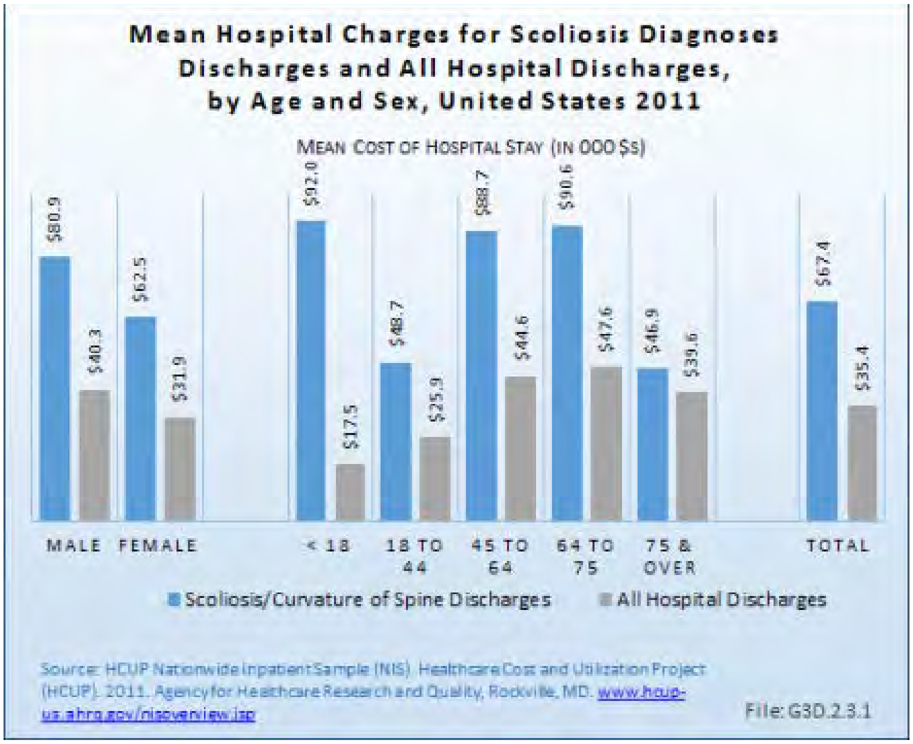
1. Glassman SD, Berven S, Kostuik J, Dimar JR, Horton WC, Bridwell K: Nonsurgical resource utilization in adult spinal deformity. *Spine* 2005;30(4):418-426.
2. Glassman SD, Carreon LY, Shaffrey CI, Polly DW, Ondra SL, et. al: The costs and benefits of nonoperative management for adult scoliosis. *Spine* 2010:35:578-82.

Cost: Adult Scoliosis, Spinal Curvature:

The cost of care for adults with scoliosis includes direct costs and indirect costs including lost wages, time from work, cost of care providers, and opportunity costs. Estimates of the direct costs of nonsurgical care in adult scoliosis are estimated to be as high as $14,000 per year.1

The national mean cost of a hospitalization (presumably for surgical treatment) for patients with a primary diagnosis of idiopathic scoliosis was $67,400 in 2011 for an average hospital stay of 5.6 days. The HCUP NIS database does not provide hospitalization costs associated with secondary discharge diagnoses, and does not include fees to doctors, tests, and other typical charges associated with hospitalization. Therefore, the most conservative estimate of only the hospitalization cost for adult scoliosis in 2011 was an estimated $15.44 million (229,000 hospitalizations). The real cost of the management of adult scoliosis to our healthcare system is significant, and the value of care measured by change in health status remains incompletely defined for both nonsurgical and surgical care. (Reference Table 3.4.1 PDF CSV)

Mean charges for scoliosis diagnosed patients are similar to those for other spinal deformity diagnoses, but significantly higher than for all hospital discharge patients.



1. Glassman SD, Carreon LY, Shaffrey CI, Polly DW, Ondra SL, Berven SH, Bridwell KH: The costs and benefits of non-operative management for adult scoliosis. *Spine* 2010 Mar 1;35(5):578-582.

Long Term Impacts: Spinal Curvature

While technical outcomes of surgery are well known and show obvious benefits for those with significant deformity, long-term health related outcomes have yet to be precisely documented. The lack of quality, long-term studies of sufficient size hampers our understanding of the mortality and morbidity rates for patients with congenital and idiopathic scoliosis, with and without treatment. Fifty years of follow-up studies of children and adolescents with untreated scoliosis have shown conflicting results, with some studies indicating a higher risk of mortality and respiratory compromise.[1,2]

Another study shows compromise only in patients with early reduced lung function and a large curvature.[3] Yet another study has shown no differences in untreated childhood scoliosis and a control group.[4] Several articles from the 1960s and one recent article report that low back pain does not occur more frequently in untreated scoliosis patients than in the general population[4,5,6] unless the curvature is greater than 40°.[7,8] It has also been shown that persons treated with surgery rather than bracing for adolescent idiopathic scoliosis have less pain at 10- to 20-year follow-up, although function remains similar.[9,10] The cosmetic/self-image aspect of scoliosis is obvious and important, and often a major factor affecting the lives of individuals with this condition.

1. Goldberg CJ, Gillic I, Connaughton O, et al: Respiratory function and cosmesis at maturity in infantile-onset scoliosis. *Spine* 2003;28:2397-2406.

2. Pehrsson K, Larsson S, Oden A, Nachemson A: Long-term follow-up of patients with untreated scoliosis: A study of mortality, causes of death, and symptoms. *Spine* 1992;17:1091-1096.

3. Pehrsson K, Bake B, Larsson S, Nachemson A: Lung function in adult idiopathic scoliosis: A 20-year follow-up. *Thorax* 1991;46:474-478.

4. a. b. Weinstein SL, Dolan LA, Spratt KF, et al: Health and function of patients with untreated idiopathic scoliosis: A 50-year natural history study. *JAMA* 2003;289:559-567.

5. Nachemson A: A long-term follow-up study of non-treated scoliosis. *Acta Orthop Scand* 1968;39:466-476.

6. Nilsonne U, Lundgren KD: Long-term prognosis in idiopathic scoliosis. *Acta Orthop Scand* 1968;39:456-465.

7. Kostuik JP, Bentivoglio J: The incidence of low-back pain in adult scoliosis. *Spine* 1981;6:268-273.

8. Haefeli M, Elfering A, Kilian R, et al: Nonoperative treatment for adolescent idiopathic scoliosis: a 10- to 60-year follow-up with special reference to health-related quality of life. *Spine* 2006;31:355-366.

9. Andersen MO, Christensen SB, Thomsen K: Outcome at 10 years treatment for adolescent idiopathic scoliosis. *Spine* 2006;31:350-354.

10. Danielsson AJ, Romberg K, Nachemson AL: Spinal range of motion, muscle endurance, and back pain and function at least 20 years after fusion or brace treatment for adolescent idiopathic scoliosis: A case-control study. *Spine* 2006;31:275-283.

Impacts of Aging

Scoliosis in the adult has an impact that is similar to other common medical conditions including osteoarthritis, coronary artery disease, and chronic obstructive pulmonary disease. Overall, the burden of scoliosis on health-related quality of life is severe relative to other common medical conditions. With the aging demographic profile of the US, the burden of adult scoliosis is increasing and has a significant impact on the health of our population, and on the cost of care for spinal disorders.

Likewise, vertebral compression fractures, which may contribute to adult degenerative scoliosis, are also a growing concern for the aging population, particularly when associated with kyphosis and/or disabling pain.

Economic Burden of Spinal Deformity

The burden of spinal deformity includes health care costs, pain management, therapy, alternative care, and lost work days due to pain. The total cost of spinal deformity is difficult to determine because hospital charges are the only expenditures available in the databases. In addition, not all persons suffering from spinal deformity seek medical care.

In 2011, charges for 1.14 million hospital discharges for spinal deformity were $75.8 billion. Charges due to spinal fractures and trauma were the largest share (31%), followed by spondylopathies (24%) and curvature of the spine (20%). Spinal deformity charges accounted for 6% of all hospital charges in 2011, but only 3% of hospital discharges. (Reference Table 3.4.1 PDF CSV)

In addition to direct and indirect costs, persons afflicted with spinal deformity experience a reduced quality of life, which may include major constraints on mobility and activity for those with the most serious conditions.

ICD-9-CM Spinal Deformity Codes

Curvature of Spine:
- Idiopathic Scoliosis: 737.30-737.32
- Acquired Kyphosis and Lordosis: 737.0, 737.10, 737.12, 737.19, 737.20-737.29, 737.34, 737.39
- Secondary Scoliosis, Kyphosis, and Lordosis: 737.11, 737.33, 737.40-737.43, 737.8, 737.9
- Spondylolisthesis: 737.40, 756.12
- Adolescent Postural Kyphosis: 737.00
- Kyphosis: 737.10-737.19, 737.41
- Lordosis: 737.20-737.29, 737.42
- Scoliosis: 737.30-737.39, 737.40, 737.43, 737.8, 737.9

Trauma: Spinal Fractures Contributing to Deformity:
- Vertebral Compression Fractures: 805.00-805.08, 805.2, 805.4, 805.6, 805.8
- Traumatic Fractures: 805.10-805.18, 805.3, 805.5, 805.7, 805.9, 806.00-806.09, 806.10-806.19, 806.20-806.29, 806.30-806.39, 806.4, 806.5, 806.60-806.02, 806.69, 806.70-806.72, 806.79, 806.8, 806.9

Infection/Complications Codes:
- Tuberculosis of Vertical Column: 015.00 to 015.06
- Tuberculosis Unspecified: 015.90 to 015.96
- Intracranial and Intraspinal Abscess (Epidural abscess): 324.1, 324.9
- Acute Osteomyelitis: 730.00, 730.08, 730.09
- Chronic Osteomyelitis: 730.10, 730.18, 730.19
- Discitis: 722.90 to 722.93

Complications of Surgery: 996.2, 996.59, 996.63, 996.72

Spondylopathies:
- Ankylosing Spondylitis: 720.00
- Spinal Enthesopathy: 720.1
- Sacroiliitis, not elsewhere classified: 720.2
- Other Inflammatory Spondylopathies: 720.81, 820.89
- Unspecified Inflammatory Spondylopathy: 720.9
- Cervical Spondylosis with Myelopathy: 721.1
- Thoracic or Lumbar Spondylosis with Myelopathy: 721.4
- Spondylosis with Myelopathy, Thoracic Region: 721.41
- Spondylosis with Myelopathy, Lumbar Region: 721.42
- Intervertebral Disc Disorder with Myelopathy: 722.70 to 722.73
- Spinal Stenosis in Cervical Region: 723.00
- Cervicalgia: 723.1
- Cervicocranial Syndrome: 723.2
- Cervicobrachial Syndrome (diffuse): 723.3
- Brachial Neuritis or Radiculitis NOS: 723.4
- Torticollis, Unspecified: 723.5
- Panniculitis Specified as Affecting Neck: 723.6
- Ossification of Posterior Longitudinal Ligament in Cervical Region: 723.7

Spinal Deformity Procedures:
- Decompression: 0309, 8050, 8051
- Cervical Fusion: 8102, 8103
- Thoracic/Dorsal or Dorsolumbar Fusion: 8104, 8105
- Lumbar and Lumbosacral Fusion: 8106, 8107, 8108
- Other Fusion: 8100, 8101
- Cervical Refusion: 8132, 8133
- Thoracic, Dorsal or Dorsolumbar Refusion: 8134, 8135
- Lumbar and Lumbosacral Refusion: 8136, 8137, 8138
- Other Refusion: 8130, 8131, 8139
- Fusion/Refusion of Multiple Vertebrae: 8162, 8163, 8164
- Instrumentation/Insertion of Spinal Device: 8451, 8452, 8459
- Vertebraplasty: 8165
- Kyphoplasty [Percutaneous Vertebral Augmentation]: 8166
- Decompression: 0309
- Diskectomy: 8050, 8051
- Epidural injection: 8192, 8396, 8397

Table 3.1.1: Prevalence of Spinal Deformity Disorders by Gender, United States, Summary Years 2008-2011

	Prevalence (in 000s)			% of Total	
	Total	Male	Female	Male	Female
Hospital Discharges, 2011 [1]	Total Number of Hospital Discharges for Spinal Deformity Disorders				
Curvature of spine	229.1	61.3	167.6	27%	73%
Idiopathic	155.9	38.8	116.9	25%	75%
Acquired	66.0	20.6	45.4	31%	69%
Secondary	10.5	*	7.7	27%	73%
Spondylolisthesis	146.1	53.9	92.2	37%	63%
Spinal fractures	334.3	137.8	196.3	41%	59%
Vertebral compression fractures	324.1	130.6	193.4	40%	60%
Traumatic fractures	12.4	8.6	3.7	69%	30%
Spinal infection	91.9	48.1	43.7	52%	48%
Tuberculosis of spine	*	*	*	*	*
Unspecified tuberculosis	0.0	*	*	*	*
Intraspinal abscess	16.6	10.0	6.6	60%	40%
Acute osteomylitis	8.3	4.6	*	55%	45%
Chronic osteomylitis	11.4	6.6	4.8	58%	42%
Discitis	64.8	32.8	32.0	51%	49%
Complications of surgery	58.7	28.0	30.6	48%	52%
Spondylopathies	350.8	171.3	179.2	49%	51%
All Spinal Deformity Disorders (3)	1,141.7	474.5	666.4	42%	58%
Rate Per 100 Patient Visits	3.0	2.9	3.0		
Diagnoses Per 100 U.S. Population [4]	0.4	0.3	0.4		
Emergency Department Visits, 2010 [2]	Total Number of Emergency Department Visits for Spinal Deformity Disorders				
Curvature of spine	247.2	65.2	182.0	26%	74%
Idiopathic	199.8	52.2	147.6	26%	74%
Acquired	41.1	11.4	29.7	28%	72%
Secondary	8.1	2.0	6.1	25%	75%
Spondylolisthesis	39.3	14.1	25.2	36%	64%
Spinal fractures	461.0	198.0	262.9	43%	57%
Vertebral compression fractures	448.8	189.7	259.0	42%	58%
Traumatic fractures	14.7	10.0	4.6	68%	31%
Spinal infection	93.1	45.8	47.3	49%	51%
Tuberculosis of spine	0.6	0.2	0.4	33%	67%
Unspecified tuberculosis	*	*	*	*	*
Intraspinal abscess	9.3	5.7	3.6	61%	39%
Acute osteomylitis	5.0	2.7	2.3	54%	46%
Chronic osteomylitis	7.5	4.6	2.9	61%	39%
Discitis	75.2	35.4	39.8	47%	53%
Complications of surgery	47.6	24.2	23.4	51%	49%
Spondylopathies	1,638.0	674.4	963.5	41%	59%
All Spinal Deformity Disorders (3)	2,476.5	1,003.0	1,473.3	41%	59%
Rate Per 100 Patient Visits	1.9	1.7	2.1		
Diagnoses Per 100 U.S. Population [4]	0.8	0.7	0.9		

Table 3.1.1: Prevalence of Spinal Deformity Disorders by Gender, United States, Summary Years 2008-2011

	Prevalence (in 000s)			% of Total	
	Total	Male	Female	Male	Female
Hospital Outpatient Visits, Annual Average 2008-2010 [3]	Total Number of Outpatient Department Visits for Spinal Deformity Disorders				
Curvature of spine	214.4	54.0	160.4	25%	75%
Idiopathic	186.7	49.5	137.2	27%	73%
Acquired	17.1	*	*	*	*
Secondary	*	*	*	*	*
Spondylolisthesis	42.5	*	*	*	*
Spinal fractures	76.0	35.3	40.7	46%	54%
Vertebral compression fractures	76.0	35.3	40.6	46%	53%
Traumatic fractures	*	*	*	*	*
Spinal infection	93.9	53.4	40.6	57%	43%
Tuberculosis of spine	*	*	*	*	*
Unspecified tuberculosis	0.0	*	*	*	*
Intraspinal abscess	0.0	*	*	*	*
Acute osteomylitis	*	*	*	*	*
Chronic osteomylitis	7.6	*	*	*	*
Discitis	81.5	45.4	36.1	56%	44%
Complications of surgery	10.5	*	*	*	*
Spondylopathies	578.5	224.6	353.9	39%	61%
All Spinal Deformity Disorders (5)	795.7	330.1	465.6	41%	59%
Rate Per 100 Patient Visits	0.8	0.8	0.8		
Diagnoses Per 100 U.S. Population [6]	0.3	0.2	0.3		
Physician Office Visits, Annual Average 2008-2010 [4]	Total Number of Physician Visits for Spinal Deformity Disorders				
Curvature of spine	1,582.8	415.3	1,167.5	26%	74%
Idiopathic	1,268.9	*	950.7	25%	75%
Acquired	*	*	*	26%	74%
Secondary	*	*	*	35%	65%
Spondylolisthesis	550.8	*	*	29%	71%
Spinal fractures	*	*	*	29%	71%
Vertebral compression fractures	*	*	*	13%	87%
Traumatic fractures	*	*	*	76%	24%
Spinal infection	1,592.6	717.0	875.7	45%	55%
Tuberculosis of spine	0.0	0.0	0.0	0%	0%
Unspecified tuberculosis	0.0	0.0	0.0	0%	0%
Intraspinal abscess	0.0	0.0	0.0	0%	0%
Acute osteomylitis	*	*	*	0%	100%
Chronic osteomylitis	*	*	*	71%	28%
Discitis	1,558.1	698.9	859.2	45%	55%
Complications of surgery	*	*	*	50%	50%
Spondylopathies	8,422.8	3,392.4	5,030.4	40%	60%
All Spinal Deformity Disorders (5)	12,178.5	4,731.1	7,447.3	39%	61%
Rate Per 100 Patient Visits	1.2	1.1	1.3		
Diagnoses Per 100 U.S. Population [6]	3.9	3.1	4.7		

Table 3.1.1: Prevalence of Spinal Deformity Disorders by Gender, United States, Summary Years 2008-2011

	Prevalence (in 000s)			% of Total	
	Total	Male	Female	Male	Female
Total Health Care Visits for Spinal Deformity Disorders	Total Number of Health Care Visits for Spinal Deformity Disorders (in 000s)				
Curvature of spine	2,273.5	595.8	1,677.5	26%	74%
Idiopathic	1,811.3	458.7	1,352.4	25%	75%
Acquired	419.0	114.3	304.7	27%	73%
Secondary	83.8	24.1	59.7	29%	71%
Spondylolisthesis	778.7	242.9	535.8	31%	69%
Spinal fractures	933.0	388.7	544.0	42%	58%
Vertebral compression fractures	895.4	361.6	533.5	40%	60%
Traumatic fractures	42.4	30.2	12.0	71%	28%
Spinal infection	1,871.5	864.3	1,007.3	46%	54%
Tuberculosis of spine	4.7	3.8	1.0	81%	21%
Unspecified tuberculosis	0.0	0.0	0.0	*	*
Intraspinal abscess	25.9	15.7	10.2	61%	39%
Acute osteomylitis	23.9	8.1	15.8	34%	66%
Chronic osteomylitis	51.8	33.1	18.6	64%	36%
Discitis	1,779.6	812.5	967.1	46%	54%
Complications of surgery	261.9	130.2	131.6	50%	50%
Spondylopathies	10,990.1	4,462.7	6,527.0	41%	59%
All Spinal Deformity Disorders (5)	16,592.4	6,538.7	10,052.6	39%	61%
Rate Per 100 Patient Visits	1.3	1.2	1.4		
Diagnoses Per 100 U.S. Population [6]	5.4	4.3	6.4		

* Estimate does not meet standards for reliability.

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[3] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Ambulatory Medical Care Survey (NAMCS), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient.

[6] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 3.1.2: Prevalence of Spinal Deformity Disorders by Age, United States, Summary Years 2008-2011

		Age in Years					Ave Age
	Total	<18	18-44	45-64	65-74	75 & over	for Dx
Hospital Discharges, 2011 [1]	Total Number of Hospital Discharges for Spinal Deformity Disorders (in 000s)						
Curvature of spine	229.1	20.1	40.7	50.0	37.1	81.0	59.6
Idiopathic	155.9	16.1	34.4	33.8	23.7	47.9	56.2
Acquired	66.0	3.4	5.8	14.9	12.2	29.5	67.0
Secondary	10.5	0.9	0.8	2.1	1.9	4.8	66.0
Spondylolisthesis	146.1	0.8	14.1	60.0	41.0	30.2	62.8
Spinal fractures	334.3	5.6	47.5	69.9	51.4	159.8	67.3
Vertebral compression fractures	324.1	5.0	43.3	67.5	50.3	157.8	67.9
Traumatic fractures	12.4	0.6	5.0	3.0	1.4	2.4	49.1
Spinal infection	91.9	0.8	14.4	39.7	18.1	18.9	60.0
Tuberculosis of spine	0.5	*	*	0.2	*	*	55.0
Unspecified tuberculosis	*	*	*	*	*	*	*
Intraspinal abscess	16.6	0.2	2.6	8.1	3.6	2.2	58.3
Acute osteomylitis	8.3	0.2	1.1	3.5	1.8	1.8	60.3
Chronic osteomylitis	11.4	0.2	2.2	4.8	1.9	2.3	57.8
Discitis	64.8	0.2	9.7	27.7	13.1	14.1	60.8
Complications of surgery	58.7	9.0	15.1	18.8	8.2	7.5	47.0
Spondylopathies	350.8	4.8	59.1	153.2	65.8	67.8	58.9
All Spinal Deformity Disorders (3)	1,141.7	40.1	184.4	368.7	205.9	342.1	61.1
Rate Per 100 Patient Visits	3.0	0.7	2.0	3.8	3.8	4.1	
Diagnoses Per 100 U.S. Population [4]	0.4	0.1	0.2	0.5	0.9	1.8	
Emergency Department Visits, 2010 [2]	Total Number of Emergency Department Visits for Spinal Deformity Disorders (in 000s)						
Curvature of spine	247.2	19.7	88.1	48.2	22.1	69.0	51.9
Idiopathic	199.8	17.5	79.1	40.4	16.5	46.3	48.9
Acquired	41.1	1.8	7.9	6.7	4.7	20.0	65.0
Secondary	8.1	0.6	1.7	1.4	1.0	3.4	61.4
Spondylolisthesis	39.3	0.7	7.2	11.9	6.2	13.3	62.1
Spinal fractures	461.0	13.5	96.6	101.5	58.4	190.9	62.8
Vertebral compression fractures	448.8	12.8	91.5	98.4	57.3	188.8	63.2
Traumatic fractures	14.7	0.8	6.1	3.9	1.4	2.5	48.0
Spinal infection	93.1	0.8	27.3	38.1	12.6	14.3	54.3
Tuberculosis of spine	0.6	*	0.2	0.2	*	*	47.2
Unspecified tuberculosis	*	*	*	*	*	*	*
Intraspinal abscess	9.3	*	1.5	4.5	1.8	1.3	57.6
Acute osteomylitis	5.0	*	0.9	1.8	1.0	1.2	60.0
Chronic osteomylitis	7.5	*	1.7	2.9	1.3	1.5	57.1
Discitis	75.2	0.5	23.8	30.7	9.2	11.1	53.5
Complications of surgery	47.6	9.2	12.4	12.6	6.1	7.2	45.4
Spondylopathies	1,638.0	115.3	761.0	512.9	114.0	134.8	43.7
All Spinal Deformity Disorders (3)	2,476.5	157.7	981.1	712.8	213.4	411.3	48.4
Rate Per 100 Patient Visits	1.9	0.6	1.9	2.5	2.4	3.1	
Diagnoses Per 100 U.S. Population [4]	0.8	0.2	0.9	0.9	1.0	2.2	

Table 3.1.2: Prevalence of Spinal Deformity Disorders by Age, United States, Summary Years 2008-2011

	Total	Age in Years <18	18-44	45-64	65-74	75 & over	Ave Age for Dx
Hospital Outpatient Visits, Annual Average 2008-2010 [3]	Total Number of Outpatient Department Visits for Spinal Deformity Disorders (in 000s)						
Curvature of spine	214.4	140.5	25.9	*	*	*	26.7
Idiopathic	186.7	133.3	*	*	*	*	23.2
Acquired	17.1	*	*	*	*	*	*
Secondary	*	*	*	*	*	*	*
Spondylolisthesis	42.5	*	*	*	*	*	*
Spinal fractures	76.0	*	*	*	*	*	*
Vertebral compression fractures	76.0	*	*	*	*	*	*
Traumatic fractures	*	*	*	*	*	*	*
Spinal infection	93.9	*	*	42.3	*	*	45.0
Tuberculosis of spine	*	*	*	*	*	*	*
Unspecified tuberculosis	0.0	0.0	0.0	0.0	0.0	0.0	NA
Intraspinal abscess	0.0	0.0	0.0	0.0	0.0	0.0	NA
Acute osteomylitis	*	*	*	*	*	*	*
Chronic osteomylitis	7.6	*	*	*	*	*	*
Discitis	81.5	*	*	36.3	*	*	44.8
Complications of surgery	10.5	*	*	*	*	*	*
Spondylopathies	578.5	*	161.6	257.8	67.3	52.5	48.6
All Spinal Deformity Disorders (5)	795.7	65.6	235.9	319.4	93.3	81.4	48.4
Rate Per 100 Patient Visits	0.8	0.3	0.8	1.2	0.9	0.9	
Diagnoses Per 100 U.S. Population [6]	0.3	0.1	0.2	0.4	0.4	0.4	
Physician Office Visits, Annual Average 2008-2010 [4]	Total Number of Physician Visits for Spinal Deformity Disorders (in 000s)						
Curvature of spine	1,582.8	*	*	*	*	*	*
Idiopathic	1,268.9	*	*	*	*	*	*
Acquired	*	*	*	*	*	*	*
Secondary	*	*	*	*	*	*	*
Spondylolisthesis	550.8	*	*	*	*	*	*
Spinal fractures	*	*	*	*	*	*	*
Vertebral compression fractures	*	*	*	*	*	*	*
Traumatic fractures	*	*	*	*	*	*	*
Spinal infection	1,592.6	*	*	727.7	*	*	57.6
Tuberculosis of spine	*	*	*	*	*	*	*
Unspecified tuberculosis	*	*	*	*	*	*	*
Intraspinal abscess	*	*	*	*	*	*	*
Acute osteomylitis	*	*	*	*	*	*	*
Chronic osteomylitis	*	*	*	*	*	*	*
Discitis	1,558.1	*	*	711.2	*	*	57.5
Complications of surgery	*	*	*	*	*	*	*
Spondylopathies	8,422.8	*	2,168.0	4,160.5	940.4	856.7	51.9
All Spinal Deformity Disorders (5)	12,178.5	*	2,808.7	5,389.5	1,637.0	1,517.8	
Rate Per 100 Patient Visits	1.2	0.4	1.1	1.8	1.2	1.2	
Diagnoses Per 100 U.S. Population [6]	3.9	1.1	2.5	6.6	7.5	8.2	

Table 3.1.2: Prevalence of Spinal Deformity Disorders by Age, United States, Summary Years 2008-2011

		Age in Years					
	Total	<18	18-44	45-64	65-74	75 & over	Ave Age for Dx
Total Health Care Visits for Spinal Deformity Disorders							
	Total Number of Health Care Visits for Spinal Deformity Disorders (in 000s)						
Curvature of spine	2,273.5	663.7	460.7	464.1	232.4	452.3	
Idiopathic	1,811.3	609.8	424.0	310.1	171.8	295.6	
Acquired	419.0	50.0	32.2	151.6	58.4	126.7	
Secondary	83.8	4.4	5.4	4.0	2.9	67.1	
Spondylolisthesis	778.7	14.5	72.6	302.2	231.1	158.4	
Spinal fractures	933.0	26.3	184.9	206.9	124.7	390.1	
Vertebral compression fractures	895.4	25.0	175.5	201.4	110.9	382.4	
Traumatic fractures	42.4	1.4	11.2	6.9	14.4	8.5	
Spinal infection	1,871.5	13.9	359.2	847.8	398.5	252.3	
Tuberculosis of spine	4.7	3.4	0.3	0.7	0.2	0.9	
Unspecified tuberculosis	0.0	0.0	0.0	0.0	0.0	0.0	
Intraspinal abscess	25.9	0.4	4.1	12.6	5.4	3.5	
Acute osteomylitis	23.9	0.3	2.0	15.5	3.1	3.0	
Chronic osteomylitis	51.8	0.3	11.4	19.7	15.2	5.0	
Discitis	1,779.6	9.7	343.3	805.9	377.7	243.1	
Complications of surgery	261.9	80.2	56.7	49.7	21.8	53.4	
Spondylopathies	10,990.1	456.8	3,149.7	5,084.4	1,187.5	1,111.8	
All Spinal Deformity Disorders (5)	16,592.4	1,088.9	4,210.1	6,790.4	2,149.6	2,352.6	
Rate Per 100 Patient Visits	1.3	0.4	1.2	1.9	1.4	1.5	
Diagnoses Per 100 U.S. Population [6]	5.4	1.5	3.7	8.3	9.8	12.6	

* Estimate does not meet standards for reliability.

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[3] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Ambulatory Medical Care Survey (NAMCS), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient.

[6] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 3.1.3: Estimated and Normalized Prevalence of Spinal Deformity and Related Conditions

	Cited Prevalence Rate (midpoint of range cited)			Normalized Prevalence Rate (per 100 persons)	Prevalence Rate (per 100,000 persons)
Congenital scoliosis [1]	1	in	1,000	0.100	100
Infantile idiopathic scoliosis [2]	0.04	in	100	0.040	40
Juvenile idiopathic scoliosis [3]	0.06	in	100	0.060	60
Adolescent idiopathic scoliosis [4]	2.5	in	100	2.500	2,500
Adult spinal deformity or scoliosis (age >18 yrs) [5,6,7]	11.3	in	100	11.300	11,300
Adult spinal deformity or scoliosis (age >60 yrs) [8]	68	in	100	68.000	68,000

[1] Hedequist D, Emans J: Congenital scoliosis: a review and update. *J Pediatr Ortho* 2007:27:106-116.

[2] Akbarnia B: Management themes in early onset scoliosis. *J Bone Joint Surg Am* 2007:89:42-54. (Prevalence rate computed based on cited rate for adolescent idiopathic scoliosis and proportion of total idiopathic cases that are infantile in citation.)

[3] Lenke LG, Dobbs MB: Management of juvenile idiopathic scoliosis. *J Bone Joint Surg Am* 2007:89:55-63. (Prevalence rate computed based on cited rate for adolescent idiopathic scoliosis and proportion of total idiopathic cases that are juvenile in citation.)

[4] Morais T, Bernier M, Turcotte F: Age- and sex-specific prevalence of scoliosis and the value of school screening programs. *Am J Public Health Nations Health* 1985:75:1377-1380.

[5] Battie MC, Videman T: Lumbar disc degeneration: epidemiology and genetics. *J Bone Joint Surg Am* 2006:88:3-9.

[6] Carter OD, Haynes SG: Prevalence rates for scoliosis in U.S. adults: results from the first National Health and Nutrition Examination Survey. *Int J Epidemiol* 1987:16:537-544.

[7] Gupta M: Degenerative scoliosis: options for surgical management. *Ortho Clin North Am* 2003;34:269-279.

[8] Schwab F, Dubey A, Galez L, et al: Adult scoliosis: prevalence, SF-36, and nutritional parameters in an elderly volunteer population. *Spine* 2005:30:1082-1085.

Table 3.2.1: Infections and Complications of Surgery by Sex and Age, United States, 2010/2011

BY SEX

	Total Number of Discharges (in 000s)			% of Total	
	Total	Male	Female	Male	Female
Hospital Discharges, 2011 [1]					
Spinal infection	91.9	48.1	43.7	52%	48%
Post operative infection	290.4	132.6	157.9	46%	54%
Complications of surgery	58.7	28.0	30.6	48%	52%
Inpatient Admissions from Emergency Department, 2010 [2,3]					
Spinal infection	47.3	24.4	22.9	52%	48%
Post operative infection	137.1	63.1	74.1	46%	54%
Complications of surgery	29.3	14.8	14.6	50%	50%
Emergency Department Visits, 2010 [3]					
Spinal infection	93.1	45.8	47.3	49%	51%
Post operative infection	217.6	97.0	120.6	45%	55%
Complications of surgery	47.6	24.2	23.4	51%	49%

BY AGE

	Total Number of Discharges (in 000s)					
	Total	<18	18-44	45-64	65-74	75 & over
Hospital Discharges, 2011 [1]						
Spinal infection	91.9	0.8	14.4	39.7	18.1	18.9
Post operative infection	290.4	8.6	55.0	118.1	58.8	49.8
Complications of surgery	58.7	9.0	15.1	18.8	8.2	7.5
Inpatient Admissions from Emergency Department, 2010 [2,3]						
Spinal infection	47.3	*	8.4	19.5	8.7	10.3
Post operative infection	137.1	4.5	29.7	54.2	24.6	24.1
Complications of surgery	29.3	5.9	8.1	7.5	3.7	4.1
Emergency Department Visits, 2010 [3]						
Spinal infection	93.1	0.8	27.3	38.1	12.6	14.3
Post operative infection	217.6	9.9	63.9	81.2	32.6	30.0
Complications of surgery	47.6	9.2	12.4	12.6	6.1	7.2

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Approximately 1 in 6 (15.3%) of emergency department visits resulted in the patient being admitted to the ED hospital. This group of patients form a separate, and unique, database of hospital discharge patients. In the 2010 NEDS data set, this constitutes 19.7 million hospital discharges.

[3] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 3.2.2: Prevalence of Curvature of Spine for Two Classification Systems by Sex and Age, United States 2010/2011

	TOTAL [3]	Sex		Age						% Total
NIS-Hospitalizations [1]		Male	Female	<18	18-44	45-64	65-74	75 & over	Ave Age	**Diagnoses**
Curvature of spine	227.7	60.8	166.7	20.1	40.4	49.5	36.9	80.7	60.0	
Adolescent	*	*	*	*	*	*	*	*	38.1	*
Kyphosis/Lordosis	51.7	15.2	36.5	0.9	3.7	11.1	8.8	27.2	71.3	22.7%
Scoliosis	178.9	46.3	132.4	19.3	36.9	39.1	28.9	54.5	56.4	78.6%
NEDS-Emergency Departments [2]										
Curvature of spine	241.8	63.5	178.3	19.4	86.3	47.2	21.6	67.3	51.8	
Adolescent	*	*	*	*	*	*	*	*	42.8	*
Kyphosis/Lordosis	30.9	8.0	22.9	0.6	3.3	4.4	3.9	19.7	72.2	12.8%
Scoliosis	212.3	55.8	156.4	18.9	83.2	43.0	17.8	49.3	48.9	87.8%
Total All Source Visits										
Curvature of spine	469.5	124.3	345.0	39.5	126.7	96.7	58.5	148.0		
Adolescent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0%
Kyphosis/Lordosis	82.6	23.2	59.4	1.5	7.0	15.5	12.7	46.9		17.6%
Scoliosis	391.2	102.1	288.8	38.2	120.1	82.1	46.7	103.8		83.3%
Diagnoses Per 100 U.S. Population [4]										
Curvature of spine	0.2	0.1	0.2	0.1	0.1	0.1	0.3	0.8		
Adolescent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Kyphosis/Lordosis	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3		
Scoliosis	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.6		

	TOTAL [3]	Sex		Age						
NIS-Hospitalizations [1]		Male	Female	<18	18-44	45-64	65-74	75 & over	Ave Age	
Curvature of spine	229.1	61.3	167.6	20.1	40.7	50.0	37.1	81.0	59.6	
Idiopathic	155.9	38.8	116.9	16.1	34.4	33.8	23.7	47.9	56.2	68.0%
Acquired	66.0	20.6	45.4	3.4	5.8	14.9	12.2	29.5	67.0	28.8%
Secondary	10.5	2.8	7.7	0.9	0.8	2.1	1.9	4.8	66.0	4.6%
NEDS -Emergency Departments [2]										
Curvature of spine	247.2	65.2	182.0	19.7	88.1	48.2	22.1	69.0	51.9	
Idiopathic	199.8	52.2	147.6	17.5	79.1	40.4	16.5	46.3	48.9	80.8%
Acquired	41.1	11.4	29.7	1.8	7.9	6.7	4.7	20.0	65.0	16.6%
Secondary	8.1	2.0	6.1	0.6	1.7	1.4	1.0	3.4	61.4	3.3%
Total All Source Visits										
Curvature of spine	476.3	126.5	349.6	39.8	128.8	98.2	59.2	150.0		
Idiopathic	355.7	91.0	264.5	33.6	113.5	74.2	40.2	94.2		74.7%
Acquired	107.1	32.0	75.1	5.2	13.7	21.6	16.9	49.5		22.5%
Secondary	18.6	4.8	13.8	1.5	2.5	3.5	2.9	8.2		3.9%
Diagnoses Per 100 U.S. Population [4]										
Curvature of spine	0.2	0.1	0.2	0.1	0.1	0.1	0.3	0.8		
Idiopathic	0.1	0.1	0.2	0.0	0.1	0.1	0.2	0.5		
Acquired	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3		
Secondary	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		

***** Estimate does not meet standards for reliability.

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[3] Total visit may be lower than sum of diagnoses due to multiple diagnoses per patient.

[4] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 3.3.1: Discharge Status Following Hospital Stay for Spinal Deformity Disorders by Sex and Age, United States, 2011

		Sex		Age				
	Total	Male	Female	>18 Years	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
Scoliosis/Curvature of spine (discharges in 000s)	229.1	61.3	167.6	20.1	40.7	50.0	37.1	81.0
Routine/discharge home	53%	56%	52%	86%	80%	61%	45%	29%
Discharge/transferred to short-term facility	2%	2%	2%	3%	2%	2%	2%	2%
Transferred to skilled nursing/intermediate care	27%	24%	28%	3%	8%	18%	30%	46%
Home health care	16%	15%	16%	8%	9%	17%	21%	20%
Other discharge status	3%	3%	2%	1%	2%	2%	2%	4%
Spondylolisthesis (discharges in 000s)	146.1	53.9	92.2	0.8	14.1	60.0	41.0	30.2
Routine/discharge home	61%	67%	57%	93%	85%	72%	54%	34%
Discharge/transferred to short-term facility	1%	1%	0%	1%	0%	0%	1%	1%
Transferred to skilled nursing/intermediate care	21%	15%	24%	3%	3%	11%	24%	44%
Home health care	18%	17%	19%	3%	11%	17%	20%	20%
Other discharge status	0%	0%	1%	1%	0%	0%	0%	1%
Spinal fracture/trauma (discharges in 000s)	334.3	137.8	196.3	5.6	47.5	69.9	51.4	159.8
Routine/discharge home	35%	44%	30%	72%	65%	51%	34%	19%
Discharge/transferred to short-term facility	3%	4%	3%	5%	3%	4%	4%	2%
Discharge/transferred to long-term care institution	43%	35%	48%	15%	19%	27%	41%	58%
Home health care	15%	13%	17%	6%	9%	15%	18%	17%
Other discharge status	4%	5%	3%	3%	3%	4%	4%	4%
Spinal infection (discharges in 000s)	91.9	48.1	43.7	0.8	14.4	39.7	18.1	18.9
Routine/discharge home	44%	42%	45%	69%	62%	49%	35%	27%
Discharge/transferred to short-term facility	5%	6%	4%	5%	4%	5%	5%	4%
Discharge/transferred to long-term care institution	29%	29%	29%	4%	13%	23%	36%	47%
Home health care	19%	20%	19%	22%	18%	20%	20%	18%
Other discharge status	3%	4%	3%	1%	4%	3%	3%	4%
Complications of spinal surgery (discharges in 000s)	58.7	28.0	30.6	9.0	15.1	18.8	8.2	7.5
Routine/discharge home	62%	61%	63%	88%	75%	58%	45%	31%
Discharge/transferred to short-term facility	4%	4%	3%	2%	3%	4%	4%	4%
Discharge/transferred to long-term care institution	16%	16%	16%	2%	8%	16%	25%	38%
Home health care	16%	15%	16%	7%	12%	18%	20%	21%
Other discharge status	3%	4%	2%	1%	2%	4%	5%	6%
Spondylopathies (discharges in 000s)	350.8	171.3	179.2	4.8	59.1	153.2	65.8	67.8
Routine/discharge home	67%	66%	67%	91%	86%	76%	58%	37%
Discharge/transferred to short-term facility	2%	3%	2%	4%	2%	2%	3%	3%
Discharge/transferred to long-term care institution	17%	17%	14%	2%	5%	11%	23%	39%
Home health care	12%	11%	11%	3%	6%	0%	15%	19%
Other discharge status	2%	2%	6%	0%	2%	12%	1%	2%
All Spinal Deformity Disorders (discharges in 000s)	1,141.7	474.5	666.4	40.1	184.4	368.7	205.9	342.1
Routine/discharge home	53%	57%	51%	85%	77%	66%	48%	27%
Discharge/transferred to short-term facility	2%	3%	2%	3%	2%	3%	3%	2%
Discharge/transferred to long-term care institution	27%	23%	29%	4%	10%	15%	29%	49%
Home health care	15%	14%	16%	7%	9%	14%	18%	18%
Other discharge status	2%	3%	2%	1%	3%	2%	2%	3%

Table 3.3.1: Discharge Status Following Hospital Stay for Spinal Deformity Disorders by Sex and Age, United States, 2011

		Sex		Age				
	Total	Male	Female	>18 Years	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
All Discharges (discharges in 000s)	38,526.8	16,154.5	22,297.8	5,655.5	9,370.2	9,680.0	5,365.6	8,425.6
Routine/discharge home	70%	69%	71%	95%	90%	72%	57%	38%
Discharge/transferred to short-term facility	2%	3%	2%	2%	1%	3%	3%	2%
Discharge/transferred to long-term care institution	14%	14%	14%	1%	3%	10%	19%	36%
Home health care	11%	11%	11%	2%	4%	12%	17%	19%
Other discharge status	3%	4%	2%	0%	2%	3%	3%	5%
Ratio Spinal Deformity Disorder Disposition to All Discharge Dispositions								
Routine/discharge home	0.76	0.83	0.72	0.89	0.86	0.92	0.83	0.70
Discharge/transferred to short-term facility	1.14	1.11	1.18	1.61	1.83	1.00	0.90	0.96
Discharge/transferred to long-term care institution	1.92	1.72	2.04	8.80	3.38	1.50	1.51	1.37
Home health care	1.38	1.23	1.49	2.88	2.21	1.16	1.06	0.97
Other discharge status	0.86	0.84	0.91	2.50	1.19	0.64	0.69	0.73

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 3.3.2: Discharge Status Following Inpatient Transfer from Emergency Department for Spinal Deformity Disorders [1] by Sex and Age, United States, 2010

		Sex		Age				
	Total	Male	Female	>18 Years	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
Scoliosis/Curvature of spine (discharges in 000s)	98.4	24.5	73.8	5.3	17.1	19.2	12.1	44.7
Routine/discharge home	50%	55%	48%	75%	77%	64%	50%	30%
Discharge/transferred to short-term facility	2%	3%	2%	3%	2%	3%	3%	2%
Transferred to skilled nursing/intermediate care	30%	25%	31%	6%	10%	18%	28%	45%
Home health care	15%	13%	16%	14%	8%	13%	16%	19%
Other discharge status	3%	4%	3%	1%	3%	3%	3%	4%
Spondylolisthesis (discharges in 000s)	17.4	9.6	11.7	0.1	1.5	4.8	3.3	7.5
Routine/discharge home	48%	58%	43%	81%	85%	67%	47%	28%
Discharge/transferred to short-term facility	2%	3%	2%	0%	2%	3%	3%	2%
Transferred to skilled nursing/intermediate care	34%	24%	38%	7%	4%	15%	31%	53%
Home health care	15%	13%	16%	12%	7%	14%	19%	16%
Other discharge status	1%	2%	1%	0%	3%	1%	1%	1%
Spinal fracture/trauma (discharges in 000s)	269.9	116.6	152.9	6.0	47.6	56.9	35.9	123.1
Routine/discharge home	37%	46%	29%	71%	67%	52%	33%	17%
Discharge/transferred to short-term facility	3%	4%	3%	4%	4%	4%	4%	2%
Discharge/transferred to long-term care institution	42%	33%	48%	15%	19%	26%	41%	59%
Home health care	14%	11%	16%	7%	7%	13%	17%	17%
Other discharge status	4%	5%	3%	3%	3%	4%	4%	5%
Spinal infection (discharges in 000s)	47.3	24.4	22.9	0.4	8.4	19.5	8.7	10.3
Routine/discharge home	46%	45%	47%	54%	63%	53%	37%	26%
Discharge/transferred to short-term facility	5%	6%	5%	6%	4%	5%	7%	5%
Discharge/transferred to long-term care institution	28%	26%	29%	5%	12%	21%	35%	48%
Home health care	17%	18%	17%	34%	16%	18%	17%	17%
Other discharge status	4%	5%	3%	0%	6%	3%	4%	4%
Complications of spinal surgery (discharges in 000s)	29.3	14.8	14.6	5.9	8.1	7.5	3.7	4.1
Routine/discharge home	59%	60%	59%	87%	71%	50%	40%	29%
Discharge/transferred to short-term facility	4%	4%	4%	2%	4%	5%	4%	4%
Discharge/transferred to long-term care institution	17%	17%	18%	3%	9%	19%	29%	38%
Home health care	17%	16%	17%	7%	14%	21%	21%	22%
Other discharge status	4%	4%	3%	1%	3%	4%	6%	7%
Spondylopathies (discharges in 000s)	147.7	70.5	77.0	2.7	28.8	58.6	23.5	33.9
Routine/discharge home	65%	65%	66%	90%	85%	74%	56%	37%
Discharge/transferred to short-term facility	3%	4%	3%	3%	2%	3%	4%	3%
Discharge/transferred to long-term care institution	19%	19%	19%	2%	5%	12%	23%	41%
Home health care	10%	10%	11%	5%	4%	8%	14%	17%
Other discharge status	3%	3%	2%	0%	3%	3%	2%	2%
All Spinal Deformity Disorders (discharges in 000s)	586.0	247.2	337.7	19.9	108.8	160.5	83.6	212.1
Routine/discharge home	48%	53%	45%	79%	74%	62%	43%	24%
Discharge/transferred to short-term facility	3%	4%	3%	3%	3%	4%	4%	2%
Discharge/transferred to long-term care institution	31%	26%	35%	7%	13%	19%	33%	52%
Home health care	14%	12%	15%	9%	8%	12%	16%	17%
Other discharge status	3%	4%	3%	1%	4%	3%	4%	4%

Table 3.3.2: Discharge Status Following Inpatient Transfer from Emergency Department for Spinal Deformity Disorders [1] by Sex and Age, United States, 2010

		Sex		Age				
	Total	Male	Female	>18 Years	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
All Visits (discharges in 000s)	19,733.5	9,150.2	10,583.0	1,012.1	4,015.0	5,823.8	3,067.7	5,812.4
Routine/discharge home	64%	66%	62%	93%	85%	73%	58%	37%
Discharge/transferred to short-term facility	3%	3%	2%	2%	2%	3%	4%	3%
Discharge/transferred to long-term care institution	18%	16%	20%	1%	5%	10%	20%	37%
Home health care	11%	10%	12%	3%	4%	9%	15%	18%
Other discharge status	4%	5%	4%	1%	4%	4%	4%	5%
Ratio Spinal Deformity Disorder Disposition to All Discharge Dispositions								
Routine/discharge home	0.76	0.81	0.72	0.86	0.86	0.85	0.75	0.64
Discharge/transferred to short-term facility	1.19	1.19	1.13	1.41	1.50	1.19	1.14	0.96
Discharge/transferred to long-term care institution	1.74	1.67	1.75	5.00	2.66	1.83	1.67	1.41
Home health care	1.22	1.17	1.24	2.76	1.88	1.31	1.13	0.97
Other discharge status	0.80	0.87	0.81	2.50	0.83	0.79	0.83	0.76

Approximately 1 in 6 (15.3%) of emergency department visits resulted in the patient being admitted to the ED hospital. This group of patients form a separate, and unique, database of hospital discharge patients. In the 2010 NEDS data set, this constitutes 19.7 million hospital discharges.

Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 3.3.3: Discharge Status Following Hospital Stay for Spinal Fractures by Fracture Type, United States, 2011

	NIS [1]			NEDS_IP [2, 3]		
	All Spinal Fractures	Vertebral Compression Fractures	Traumatic Fractures	All Spinal Fractures	Vertebral Compression Fractures	Traumatic Fractures
Spinal fracture/trauma (discharges in 000s)	334.3	324.0	12.4	269.9	260.7	11.3
Routine/discharge home	35%	36%	25%	37%	37%	18%
Discharge/transferred to short-term facility	3%	3%	6%	3%	3%	6%
Discharge/transferred to long-term care institution	43%	42%	54%	42%	42%	63%
Home health care	15%	15%	6%	14%	14%	6%
Other discharge status	4%	4%	10%	4%	4%	7%

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Approximately 1 in 6 (15.3%) of emergency department visits resulted in the patient being admitted to the ED hospital. This group of patients form a separate, and unique, database of hospital discharge patients. In the 2010 NEDS data set, this constitutes 19.7 million hospital discharges.

[3] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 3.3.4: Discharge Status Following Hospital Stay for Spinal Infection, Post-Operative Infection, and Complications of Surgery by Sex and Age, United States, 2011

		Sex		Age				
	Total	Male	Female	>18 Years	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
Spinal infection (discharges in 000s)	91.9	48.1	43.7	0.8	14.4	39.7	18.1	18.9
Routine/discharge home	44%	42%	45%	69%	62%	49%	35%	27%
Discharge/transferred to short-term facility	5%	6%	4%	5%	4%	5%	5%	4%
Discharge/transferred to long-term care institution	29%	29%	29%	4%	13%	23%	36%	47%
Home health care	19%	20%	19%	22%	18%	20%	20%	18%
Other discharge status	3%	4%	3%	1%	4%	3%	3%	4%
Post-Operative Infections (discharges in 000s)	290.0	132.4	157.5	8.6	55.0	117.9	58.8	49.7
Routine/discharge home	40%	41%	40%	78%	61%	43%	29%	19%
Discharge/transferred to short-term facility	3%	4%	3%	4%	2%	4%	4%	4%
Discharge/transferred to long-term care institution	21%	20%	22%	2%	6%	16%	30%	45%
Home health care	32%	32%	32%	16%	30%	36%	34%	27%
Other discharge status	3%	3%	3%	1%	1%	3%	3%	6%
Complications of spinal surgery (discharges in 000s)	58.7	28.0	30.6	9.0	15.1	18.8	8.2	7.5
Routine/discharge home	62%	61%	63%	88%	75%	58%	45%	31%
Discharge/transferred to short-term facility	4%	4%	3%	2%	3%	4%	4%	4%
Discharge/transferred to long-term care institution	16%	16%	16%	2%	8%	16%	25%	38%
Home health care	16%	15%	16%	7%	12%	18%	20%	21%
Other discharge status	3%	4%	2%	1%	2%	4%	5%	6%

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 3.4.1: Average Length of Hospital Stay (LOS) and Mean Hospital Charges for Spinal Deformity Disorders, 2011

Length of Stay (LOS)	Sex		Age					Mean LOS All Discharges	Number of Discharges (in 000s)	Total Hospital Days (in 000s)
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over			
Scoliosis/Curvature of spine	6.0	5.4	6.3	4.9	5.7	5.6	5.5	5.6	229.1	1,282.96
Spondylolisthesis	3.8	4.0	3.8	3.3	3.8	3.9	4.5	3.9	146.1	569.79
Spinal fracture/trauma	7.6	6.3	8.6	8.0	8.0	7.0	5.9	6.8	334.3	2,273.24
Spinal infection	9.7	8.2	12.0	8.6	9.2	9.4	8.5	9.0	91.9	827.10
Complications of spinal surgery	9.4	8.2	10.4	7.6	8.9	8.9	8.8	8.8	58.7	516.56
Spondylopathies	4.8	4.4	5.3	3.9	4.2	5.0	5.7	4.6	350.8	1,613.68
All Spinal Deformity Disorders	6.3	5.5	7.4	5.7	5.7	5.8	5.8	5.8	1,141.7	6,621.86
All Hospital Visits	5.0	4.4	3.8	3.6	5.0	5.2	5.4	4.6	38,590.7	177,517.22
Ratio Spinal Deformity to All Visits	1.26	1.25	1.95	1.58	1.14	1.12	1.07	1.26		
Proportion Spinal Deformity of Total Discharges									3%	4%

Mean Charges (in $000s)	Sex		Age					Mean Charges (in 000s)	Number of Discharges (in 000s)	Total Hospital Charges (in 000s)
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over			
Scoliosis/Curvature of spine	$ 80.9	$ 62.5	$ 92.0	$ 48.7	$ 88.7	$ 90.6	$ 46.9	$ 67.4	229.1	$ 15,441.3
Spondylolisthesis	$ 96.5	$ 92.5	$ 83.6	$ 91.3	$ 100.1	$ 98.9	$ 76.3	$ 93.9	146.1	$ 13,718.8
Spinal fracture/trauma	$ 88.4	$ 56.2	$ 101.2	$ 113.4	$ 91.9	$ 69.9	$ 45.3	$ 69.5	334.3	$ 23,233.9
Spinal infection	$ 82.6	$ 68.9	$ 91.3	$ 68.4	$ 81.3	$ 83.1	$ 63.6	$ 76.1	91.9	$ 6,993.6
Complications of spinal surgery	$ 100.5	$ 84.5	$ 99.0	$ 86.3	$ 98.6	$ 91.7	$ 79.8	$ 92.0	58.7	$ 5,400.4
Spondylopathies	$ 56.3	$ 48.3	$ 33.5	$ 41.4	$ 54.2	$ 60.9	$ 50.0	$ 52.2	350.8	$ 18,311.8
All Spinal Deformity Disorders	$ 75.2	$ 60.1	$ 87.6	$ 68.7	$ 74.3	$ 74.4	$ 49.2	$ 66.4	1,141.7	$ 75,808.9
All Hospital Visits	$ 40.3	$ 31.9	$ 17.5	$ 25.9	$ 44.6	$ 47.6	$ 39.6	$ 35.4	38,590.7	$ 1,366,110.8
Ratio Spinal Deformity to All Visits	1.87	1.88	5.01	2.65	1.67	1.56	1.24	1.88		
Proportion Spinal Deformity of Total Discharges									3%	6%

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 3.4.2: Average Length of Hospital Stay (LOS) and Mean Hospital Charges for Spinal Deformity Disorders Admitted as Inpatient (IP) [1] from Emergency Department, 2010

Length of Stay (LOS)	Sex		Age					Mean LOS	Number of	Total Hospital Days
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over	All Discharges	Discharges (in 000s)	(in 000s)
Scoliosis/Curvature of spine	5.8	5.1	6.1	5.1	5.4	5.5	5.1	5.3	98.5	517.13
Spondylolisthesis	5.1	5.2	3.4	4.6	5.6	5.1	5.1	5.2	17.4	89.78
Spinal fracture/trauma	8.1	6.5	7.2	8.3	5.6	7.0	6.0	7.2	269.9	1,935.18
Spinal infection	9.0	7.8	10.7	8.2	8.5	8.8	8.0	8.4	47.3	397.79
Complications of spinal surgery	9.5	8.8	7.7	8.9	9.7	10.4	9.5	9.1	29.3	266.63
Spondylopathies	4.9	4.4	3.2	4.0	4.6	5.1	5.0	4.7	147.7	688.28
All Spinal Deformity Disorders	7.0	5.8	6.6	6.6	6.7	6.6	5.8	6.3	586.0	3,691.80
All Inpatient Transfer Discharges	4.9	4.7	3.5	4.1	4.9	5.2	5.2	4.8	19,733.5	94,720.80
Ratio Spinal Deformity to All IP Discharges	1.43	1.23	1.89	1.61	1.37	1.27	1.12	1.31		
Proportion Spinal Deformity of Total IP Discharges									3%	4%

Mean Charges (in $000s)	Sex		Age					Mean Charges	Number of Discharges	Total Hospital Charges
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over	(in 000s)	(in 000s)	(in 000s)
Scoliosis/Curvature of spine	$ 43.0	$ 33.8	$ 49.8	$ 34.3	$ 40.1	$ 39.5	$ 32.4	$ 36.1	98.5	$ 3,555.9
Spondylolisthesis	$ 53.6	$ 43.5	$ 35.2	$ 49.9	$ 56.1	$ 47.5	$ 40.1	$ 46.8	17.4	$ 814.3
Spinal fracture/trauma	$ 90.0	$ 55.8	$ 93.7	$ 110.0	$ 94.2	$ 67.5	$ 44.1	$ 70.7	269.9	$ 19,081.9
Spinal infection	$ 66.2	$ 54.5	$ 82.8	$ 55.8	$ 64.3	$ 64.9	$ 52.8	$ 60.5	47.3	$ 2,861.7
Complications of spinal surgery	$ 87.5	$ 80.3	$ 78.8	$ 80.8	$ 91.5	$ 92.0	$ 77.0	$ 83.9	29.3	$ 2,458.3
Spondylopathies	$ 40.1	$ 32.9	$ 26.0	$ 30.5	$ 37.6	$ 41.4	$ 36.6	$ 36.4	147.7	$ 5,376.3
All Spinal Deformity Disorders	$ 67.7	$ 46.2	$ 68.5	$ 70.4	$ 61.7	$ 55.8	$ 41.2	$ 55.3	586.0	$ 32,405.8
All Inpatient Transfer Discharges	$ 36.9	$ 32.4	$ 22.8	$ 28.7	$ 37.0	$ 39.3	$ 35.6	$ 34.5	19,733.5	$ 680,805.8
Ratio Spinal Deformity to All IP Discharges	1.83	1.43	3.00	2.45	1.67	1.42	1.16	1.60		
Proportion Spinal Deformity of Total IP Discharges									3%	5%

[1] Approximately 1 in 6 (15.3%) of emergency department visits resulted in the patient being admitted to the ED hospital. This group of patients form a separate, and unique, database of hospital discharge patients. In the 2010 NEDS data set, this constitutes 19.7 million hospital discharges.

Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 3.4.3: Average Length of Hospital Stay (LOS) and Mean Hospital Charges for Spine Fractures by Type, 2011

Length of Stay (LOS)	Sex		Age					Mean LOS	Number of	Total Hospital Days
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over	All Discharges	Discharges (in 000s)	(in 000s)
Hospital Discharges, 2011 [1]										
Vertebral Compression Fractures	7.2	6.2	7.6	7.2	7.8	6.8	5.8	6.6	324.0	2,138.40
Traumatic Spinal Fractures	14.7	12.5	18.0	15.7	14.9	12.5	9.0	14.0	12.4	173.60
All Spinal Fracture/Trauma	7.6	6.3	8.6	8.0	8.0	7.0	5.9	6.8	334.3	2,273.24
Inpatient Admissions from Emergency Department, 2010 [2,3]										
Vertebral Compression Fractures	7.6	6.4	6.6	7.4	8.3	7.3	6.0	6.9	260.7	1,798.83
Traumatic Spinal Fractures	16.0	13.1	14.5	17.4	16.4	12.5	8.3	15.2	11.3	171.76
All Spinal Fracture/Trauma	8.1	6.5	7.2	8.3	5.6	7.0	6.0	7.2	269.9	1,935.18

Mean Charges (in $000s)	Sex		Age					Mean Charges	Number of Discharges	Total Hospital Charges
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over	(in 000s)	(in 000s)	(in 000s)
Hospital Discharges, 2011 [1]										
Vertebral Compression Fractures	$ 81.9	$ 54.7	$ 89.5	$ 103.0	$ 88.0	$ 67.8	$ 44.4	$ 65.7	324.0	$ 21,286.8
Traumatic Spinal Fractures	$ 213.8	$ 178.3	$ 212.8	$ 236.3	$ 203.8	$ 176.1	$ 115.2	$ 197.7	12.4	$ 2,451.5
All Spinal Fracture/Trauma	$ 88.4	$ 56.2	$ 101.2	$ 113.4	$ 91.9	$ 69.9	$ 45.3	$ 69.5	334.3	$ 23,233.9
										$ -
Inpatient Admissions from Emergency Department, 2010 [2,3]										$ -
Vertebral Compression Fractures	$ 82.4	$ 53.9	$ 85.3	$ 98.1	$ 88.8	$ 64.6	$ 43.5	$ 66.0	260.7	$ 17,206.2
Traumatic Spinal Fractures	$ 219.4	$ 160.6	$ 191.9	$ 241.7	$ 228.0	$ 184.5	$ 93.7	$ 207.9	11.3	$ 2,349.3
All Spinal Fracture/Trauma	$ 90.0	$ 55.8	$ 93.7	$ 110.0	$ 94.2	$ 67.5	$ 44.1	$ 70.7	269.9	$ 19,081.9

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Approximately 1 in 6 (15.3%) of emergency department visits resulted in the patient being admitted to the ED hospital. This group of patients form a separate, and unique, database of hospital discharge patients. In the 2010 NEDS data set, this constitutes 19.7 million hospital discharges.

[3] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 3.4.4: Average Length of Hospital Stay (LOS) and Mean Hospital Charges for Spinal Infection, Post-Operative Infections, and Complications of Spinal Surgery by Sex and Age, United States, 2011

Length of Stay (LOS)	Sex		Age					Mean LOS	Number of	Total Hospital Days
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over	All Discharges	Discharges (in 000s)	(in 000s)
Hospital Discharges, 2011 [1]										
Spinal Infection	9.7	8.2	12.0	8.6	9.2	9.4	8.5	9.0	91.9	827.10
Post-Operative Infection	11.8	10.4	17.2	8.5	10.4	11.7	11.8		290.0	-
Complications of Spinal Surgery	9.4	8.2	10.4	7.6	8.9	8.9	8.8	8.8	58.7	516.56
Inpatient Admissions from Emergency Department, 2010 [2,3]										
Spinal Infection	9.0	7.8	10.7	8.2	8.5	8.8	8.0	8.4	47.3	397.79
Post-Operative Infection	10.1	9.4	9.4	8.4	9.7	10.5	10.9	9.7	137.1	1,329.87
Complications of Spinal Surgery	9.5	8.8	7.7	8.9	9.7	10.4	9.5	9.1	29.3	266.63

Mean Charges (in $000s)	Sex		Age					Mean Charges	Number of Discharges	Total Hospital Charges
	Male	Female	< 18	18 to 44	45-64	64 to 75	75 & Over	(in 000s)	(in 000s)	(in 000s)
Hospital Discharges, 2011 [1]										
Spinal Infection	$ 82.6	$ 68.9	$ 91.3	$ 68.4	$ 81.3	$ 83.1	$ 63.6	$ 76.1	91.9	$ 6,993.6
Post-Operative Infection	$ 95.6	$ 81.6	$ 144.7	$ 70.8	$ 85.0	$ 98.0	$ 92.4	$ 88.0	290.0	$ 25,520.0
Complications of Spinal Surgery	$ 100.5	$ 84.5	$ 99.0	$ 86.3	$ 98.6	$ 91.7	$ 79.8	$ 92.0	58.7	$ 5,400.4
Inpatient Admissions from Emergency Department, 2010 [2,3]										
Spinal Infection	$ 66.2	$ 54.5	$ 82.8	$ 55.8	$ 64.3	$ 64.9	$ 52.8	$ 60.5	47.3	$ 2,861.7
Post-Operative Infection	$ 80.7	$ 70.5	$ 73.2	$ 63.4	$ 73.1	$ 82.1	$ 85.3	$ 75.2	137.1	$ 10,309.9
Complications of Spinal Surgery	$ 87.5	$ 80.3	$ 78.8	$ 80.8	$ 91.5	$ 92.0	$ 77.0	$ 83.9	29.3	$ 2,458.3

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Approximately 1 in 6 (15.3%) of emergency department visits resulted in the patient being admitted to the ED hospital. This group of patients form a separate, and unique, database of hospital discharge patients. In the 2010 NEDS data set, this constitutes 19.7 million hospital discharges.

[3] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 3.5.1: Proportion of Hospital Stays for Spinal Deformity (SD) Involving Surgical Procedure, United States, 2010/2011

	Total Discharges/ Visits (in 000s)	Proportion of Hospital Discharges Involving Procedure				
		Spinal Fusion	Instrumentation (insertion of device)	Kyphoplasty/ Vertebroplasty	Decompression (Diskectomy/ Laminectomy)	Epidural Injection
NIS: Hospital Discharges, 2011 [1]						
Scoliosis/Curvature of spine	229.1	21.9%	13.3%	1.1%	12.0%	0.3%
Spondylolisthesis	146.1	75.5%	55.9%	0.8%	51.0%	0.4%
Spinal fracture/trauma	334.3	8.8%	4.1%	10.6%	3.5%	0.4%
Spinal infection	91.9	10.2%	6.8%	0.3%	13.6%	0.3%
Complications of spinal surgery	58.7	1.7%	1.0%	0.1%	2.7%	0.1%
Spondylopathies	350.8	28.4%	16.4%	0.2%	25.3%	0.5%
All Spinal Deformity Disorders	1,141.7	23.2%	14.7%	3.2%	17.1%	0.4%
Total Procedures for Spinal Deformity Discharges (in 000s)		265.3	167.4	36.1	195.0	4.4
Proportion of SD Discharges w/Procedure to All Discharges	3%	55%	53%	97%	38%	9%
Total Hospital Discharges (in 000s)	38,590.7	1.2%	0.8%	0.1%	1.3%	0.1%
Total Procedures for Hospital Discharges (in 000s)		478.7	315.4	37.1	516.6	49.9
NEDS: Emergency Department Transfers to Inpatient Procedures, 2010 [2]						
Scoliosis/Curvature of spine	98.5	1.8%	1.0%	1.1%	1.0%	0.3%
Spondylolisthesis	17.4	13.1%	8.7%	2.8%	10.1%	1.2%
Spinal fracture/trauma	269.9	6.7%	2.5%	9.5%	2.3%	0.4%
Spinal infection	47.3	3.5%	1.7%	0.3%	7.9%	0.4%
Complications of spinal surgery	29.3	0.3%	0.1%	0.1%	1.2%	0.0%
Spondylopathies	147.7	5.3%	2.5%	0.3%	4.8%	0.7%
All Spinal Deformity Disorders	586.0	4.7%	2.0%	4.4%	3.0%	0.4%
Total Procedures for Spinal Deformity Discharges (in 000s)		27.8	11.8	25.8	17.8	2.5
Proportion of SD Discharges w/Procedure to All Discharges	3%	78%	70%	98%	44%	10%
Total ED Transfers to Inpatient Discharges (in 000s)	19,733.5	0.2%	0.1%	0.1%	0.2%	0.1%
Total Procedures for ED Inpatient Discharges (in 000s)		35.8	16.9	26.2	40.3	23.9

Table 3.5.1: Proportion of Hospital Stays for Spinal Deformity (SD) Involving Surgical Procedure, United States, 2010/2011

	Total Discharges/ Visits (in 000s)	Proportion of Hospital Discharges Involving Procedure				
		Spinal Fusion	Instrumentation (insertion of device)	Kyphoplasty/ Vertebroplasty	Decompression (Diskectomy/ Laminectomy)	Epidural Injection
NHDS: National Hospital Discharge Survey [3]						
Scoliosis/Curvature of spine	125.1	29.9%	7.7%	3.7%	13.7%	0.1%
Spondylolisthesis	110.6	75.4%	25.8%	0.4%	45.4%	1.0%
Spinal fracture/trauma	343.2	8.3%	1.2%	14.5%	2.6%	0.1%
Spinal infection	61.0	8.5%	1.3%	0.2%	14.5%	0.1%
Complications of spinal surgery	54.6	2.2%	0.4%	0.0%	3.3%	0.1%
Spondylopathies	219.4	30.3%	9.4%	0.1%	27.9%	0.5%
All Spinal Deformity Disorders	878.6	23.3%	6.8%	5.7%	15.7%	0.3%
Total Procedures for Spinal Deformity Discharges (in 000s)		204.9	59.9	50.2	138.2	2.6
Proportion of SD Discharges w/Procedure to All Discharges	2%	47%	44%	97%	31%	5%
Total Hospital Discharges (in 000s)	38,919.2	1.1%	0.3%	0.1%	1.1%	0.1%
Total Procedures for Hospital Discharges (in 000s)		435.9	137.0	52.0	446.6	47.9

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[3] Source: National Hospital Discharge Survey (NHDS), Annual Average Merged Years 2008 to 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

Table 3.5.2: Spinal Fusion for Spinal Deformity Fractures [1] by Sex and Age, United States 2010/2011

	Total	Sex		Age				
		Male	Female	<18 Years	18 to 44	45 to 64	65 to 74	75 & Older
NIS [2]								
Fracture Discharges (in 000s)	334.3	137.8	196.3	5.6	47.5	69.9	51.4	159.8
Fusion Procedures for Fractures (in 000s)	29.5	16.8	12.7	0.8	8.3	10.1	5.1	5.1
% Fusion to Fracture	8.8%	12.2%	6.5%	14.3%	17.5%	14.4%	9.9%	3.2%
NEDS-IP [3,4]								
Fracture Discharges (in 000s)	269.9	116.7	153.2	6.0	47.6	57.0	36.0	123.3
Fusion Procedures for Fractures (in 000s)	18.2	12.0	6.2	0.8	6.8	6.2	2.1	2.3
% Fusion to Fracture	6.7%	10.3%	4.0%	13.3%	14.3%	10.9%	5.8%	1.9%
NHDS [5]								
Fracture Discharges (in 000s)	343.2	150.5	192.8	5.7	54.5	72.9	48.1	162.0
Fusion Procedures for Fractures (in 000s)	28.5	16.8	11.6	*	8.5	8.3	4.6	6.1
% Fusion to Fracture	8.3%	11.2%	6.0%	15.8%	15.6%	11.4%	9.6%	3.8%
Average Across All Data Sources								
Fracture Discharges (in 000s)	315.8	135.0	180.8	5.8	49.9	66.6	45.2	148.4
Fusion Procedures for Fractures (in 000s)	25.4	15.2	10.2	0.8	7.9	8.2	3.9	4.5
% Fusion to Fracture	8.0%	11.3%	5.6%	14.5%	15.8%	12.3%	8.7%	3.0%

[1] Includes ICD-9-CM codes for vertebral compression fractures and traumatic fractures.

[2] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[3] HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[4] Approximately 1 in 6 (15.3%) of emergency department visits resulted in the patient being admitted to the ED hospital. This group of patients form a separate, and unique, database of hospital discharge patients. In the 2010 NEDS data set, this constitutes 19.7 million hospital discharges.

[5] Source: National Hospital Discharge Survey (NHDS), Annual Average Merged Years 2008 to 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

Table 3.5.3: Spinal Fusion for Spinal Deformity Fractures[1] by Site and Number of Levels Involved, United States 2010/2011

	NIS [2]		**NEDS-IP** [3,4]		**NHDS** [5]		**Average of Three Databases**	
	N (in 000s)	% Total	N (in 000s)	% Total	N (in 000s)	% Total	N (in 000s)	% Total
By Site								
Cervical Fusion	10.9	37.0%	8.4	46.2%	11.5	40.6%	10.3	40.5%
Thoracic/Dorsal Fusion	11.3	38.2%	7.3	40.1%	10.3	36.2%	9.6	37.9%
Lumbar Fusion	9.0	30.4%	3.3	18.1%	7.8	27.2%	6.7	26.3%
Sacral Fusion	0.3	1.0%	*	0.4%	*	0.2%	0.4	0.6%
By Level								
< 5 levels fused	18.2	61.8%	12.2	67.0%	26.1	91.6%	18.8	74.2%
5 or more levels fused	11.6	39.2%	6.1	33.5%	2.5	8.8%	6.7	26.5%
Total Fusion Procedures on Spinal Fracture Discharges [6]	29.5		18.2		28.5		25.4	
Total Spinal Fracture Discharges	334.3		269.9		343.2		315.8	
Proportion with Fusion Procedure	8.8%		6.7%		8.3%		8.0%	

[1] Includes ICD-9-CM codes for vertebral compression fractures and traumatic fractures.

[2] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[3] HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[4] Approximately 1 in 6 (15.3%) of emergency department visits resulted in the patient being admitted to the ED hospital. This group of patients form a separate, and unique, database of hospital discharge patients. In the 2010 NEDS data set, this constitutes 19.7 million hospital discharges.

[5] Source: National Hospital Discharge Survey (NHDS), Annual Average Merged Years 2008 to 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

[6] Sum of sites may be larger than overall total due to multiple sites included in the procedure.

Table 3.5.4: Vertebroplasty/Kyphoplasty Procedures for Vertebral Compression Fractures (VCF) by Sex and Age, United States 2010/2011

	Total	Sex		Age				
		Male	Female	<18 Years	18 to 44	45 to 64	65 to 74	75 & Older
NIS [1]								
Surgical procedure	10.9%	7.4%	13.3%	*	1.2%	6.7%	13.3%	15.0%
No surgery	89.1%	92.6%	86.7%	*	98.8%	93.3%	86.7%	85.0%
Total VCF Discharges	324.0	130.6	193.4	*	43.3	67.5	50.3	157.8
NEDS-IP [2, 3]								
Surgical procedure	9.8%	6.1%	12.5%	0.3%	0.8%	5.5%	11.6%	14.9%
No surgery	90.2%	93.7%	87.5%	99.7%	99.2%	94.5%	88.4%	85.1%
Total VCF Discharges	260.7	110.1	150.6	5.4	43.6	54.6	35.1	121.9
NHDS [4]								
Surgical procedure	14.9%	9.2%	19.2%	*	*	8.3%	19.0%	21.4%
No surgery	85.1%	90.8%	80.8%	*	*	91.7%	80.1%	78.6%
Total VCF Discharges	332.0	141.7	190.3	*	*	71.0	47.4	157.3
Average Across All Data Sources								
Surgical procedure	11.9%	7.6%	15.0%	0.1%	1.0%	6.8%	14.6%	17.1%
No surgery	88.1%	92.4%	85.0%	99.9%	99.0%	93.2%	85.1%	82.9%
Total VCF Discharges	305.6	127.5	178.1	5.2	46.0	64.4	44.3	145.7

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[3] Approximately 1 in 6 (15.3%) of emergency department visits resulted in the patient being admitted to the ED hospital. This group of patients form a separate, and unique, database of hospital discharge patients. In the 2010 NEDS data set, this constitutes 19.7 million hospital discharges.

[4] Source: National Hospital Discharge Survey (NHDS), Annual Average Merged Years 2008 to 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

Arthritis

Lead Author(s):
Charles G. Helmick, MD, CDC Team

Supporting Author(s):
Sylvia Watkins-Castillo, PhD

Arthritis remains the most common cause of disability in adults in the United States,1 and it is among the leading conditions causing work limitations.2 By 2030, the number of adults affected with doctor-diagnosed arthritis is projected to reach 67 million, or 25% of the adult population. Corresponding arthritis-attributable activity limitation is projected to reach 25 million, meaning that 9.3 % of all adults will be affected.3 Estimating the prevalence and burden of the various conditions that comprise arthritis and other rheumatic conditions is important for understanding the current and growing impact of these conditions on the health care and public health systems. It is equally important to identify the gaps in our understanding of these measures and target potential interventions.

1. Brault MW, Hootman J, Helmick CG, Theis KA, Armour BS: Prevalence and most common causes of disability among adults—United States, 2005. *MMWR* 2009;58(16):421-426.
2. Theis KA, Hootman JM, Helmick CG, Murphy L, Bolen J, Langmaid G: State-specific prevalence of arthritis-attributable work limitation—United States, 2003. *MMWR* 2007;56(40):1045-1049.
3. Hootman JM, Helmick CG: Projections of US prevalence of arthritis and associated activity limitations. *Arthritis Rheum* 2006;54(1):226-229.

Definitions

Arthritis and other rheumatic conditions (AORC) comprise more than 100 diseases. What many of them have in common is that they cause pain and aching, and stiffness or swelling in or around a joint.

Defining AORC to assess their burden in the population requires considering both what is important to measure and what data sources are available, such as population surveys and administrative data. Complicating any definition is the 100+ conditions that comprise what is generally thought of as arthritis. Furthermore, population measures need to be relatively simple and perhaps different from definitions used in clinical practice, where there is the luxury of having a medical history, physical examination, and laboratory and radiographic data. The Centers for Diseases Control and Prevention (CDC) Arthritis Program has worked with other organizations to develop case definitions, based on the best available expertise, that allow many measures of population burden to be addressed in a consistent way.1

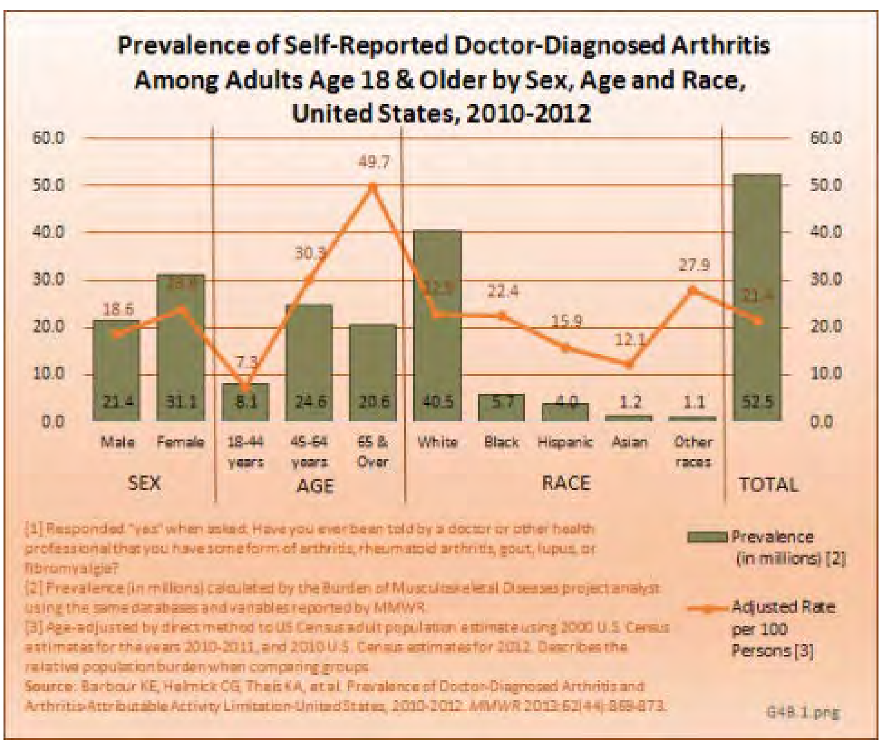
For self-reported population surveys, doctor-diagnosed arthritis is defined as a "yes" answer to the question: "Have you EVER been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?" This measure aims to capture most of the major categories of arthritis and is considered valid for surveillance purposes of estimating population prevalence.2 For data sources using International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes, arthritis and other rheumatic conditions (AORC) has been defined by the National Arthritis Data Workgroup using those codes, and further divided into 10 more specific subcategories defined in Arthritis and Joint Pain Codes. Both measures were designed to exclude or minimize other major categories of musculoskeletal disease such as osteoporosis and generic chronic back pain although some adults with arthritis do have chronic back pain. Doctor-diagnosed arthritis likely is better for estimating what is happening in the general population, while AORC is likely better for estimating what is happening in the health care system.

1. Centers for Disease Control and Prevention. *Case Definition.* Available at: http://www.cdc.gov/arthritis/data_statistics/case_definition.htm. Accessed December 1, 2014.
2. Sacks JJ, Harrold LR, Helmick CG, Gurwitz JH, Emani S, Yood RA: Validation of a surveillance case definition for arthritis. *J Rheumatol* 2005:32(2):340-347.

Prevalence of Arthritic Conditions

While AORC occurs in children, it is difficult to get population data on them, so most of the estimates presented in this report are for adults unless otherwise noted.

Arthritis: The prevalence of arthritis in the general population is better estimated by doctor-diagnosed arthritis than by AORC. Based on self-reported data, for the years 2010 to 2012, doctor-diagnosed arthritis affected an average of 52.5 million adults based on self-reported data,1 and in line with earlier projections.2 Estimates show the typical distribution of higher prevalence among females and older adults, and lower prevalence among Hispanics and Asians. Absolute estimates show that most of these adults (62%, or 32.7 million) are age 18 to 64. (Reference Table 4.1 PDF CSV)



Specific types of AORC: Clinical data are needed to provide some measure of validity for estimating the prevalence of specific types of arthritis because many people are not sure what specific type of arthritis they have. Data from the National Arthritis Data Workgroup provided the following national prevalence estimates for 2005.3,4

Osteoarthritis: Osteoarthritis (OA) is the most common type of arthritis, characterized by progressive damage to cartilage and other joint tissues. Joint injury is a risk factor for most types of OA, but the majority of cases occur without a specific history of injury. Obesity is a risk factor for knee OA, and to a lesser extent for hip and hand OA. Clinical OA was estimated to affect 26.9 million in 2005(4) and is likely to have increased since then. The joints most affected with radiographic OA and symptomatic OA were hands, knees, and hips.4

Rheumatoid arthritis: Rheumatoid arthritis (RA) is the prototypical inflammatory arthritis. It is a chronic autoimmune disease that causes pain, aching, stiffness, and swelling in multiple joints, especially the hands, in a symmetrical fashion. In 2005, RA was estimated to affect 1.3 million adults(2), but that estimate has since been updated on the basis on newer data to 1.5 million.5

Gout and other crystal arthropathies: Gout is a recurrent inflammatory arthritis that occurs when excess uric acid collects in the body. Gout has been recognized for centuries and often affects the big toe. In 2005, an estimated 6.1 million adults reported having gout at some time, with 3.0 million affected in the past year.4

Systemic lupus erythematosus: Systemic lupus erythematosus (SLE) is an autoimmune disease in which the body's immune system can attack many body systems, especially the skin, kidneys, and joints. In 2005, definite and suspected SLE was conservatively estimated to affect 322,000 people in the United States.3

Systemic sclerosis: Systemic sclerosis (SSc), or scleroderma, is an autoimmune disease that primarily affects the skin, but can affect any organ system. In 2005, SSc affected an estimated 49,000 adults.3

Primary Sjögren's syndrome: Primary Sjögren's syndrome (SS) is a syndrome of dry eyes, dry mouth, and arthritis. Secondary Sjögren's syndrome can occur in association with other rheumatologic diseases such as rheumatoid arthritis and lupus. Prevalence data are very limited. In 2005, an estimated 0.4 to 3.1 million adults had SS.3

Fibromyalgia: Fibromyalgia (FM) is a syndrome of widespread pain and tenderness. The diagnosis is difficult to make, so relevant prevalence data are hard to come by. In 2005, FM was estimated to affect about 5 million adults.4

Polymyalgia rheumatica and **giant cell (temporal) arteritis:** Polymyalgia rheumatic (PMR) is a syndrome of sudden aching and stiffness in older adults that responds to treatment with anti-inflammatory medications (eg, corticosteroids). Giant cell arteritis (GCA), which often occurs with PMR, is a type of vasculitis that affects medium-size arteries and results in headache, vision loss, and other symptoms. In 2005, PMR was estimated to affect 711,000 people and GCA was estimated to affect 228,000 people.4

Spondylarthropathies: Spondylarthropathies (or spondylarthritides) are a family of diseases that includes ankylosing spondylitis, reactive arthritis, psoriatic arthritis, enteropathic arthritis (associated with ulcerative colitis or Crohn's disease), juvenile spondylarthritis, and undifferentiated spondylarthritis. In 2005, spondylarthropathies affected an estimated 639,000 to 2.4 million adults ages 25 and older.3

Arthritis in children: Arthritis and other rheumatic conditions are relatively uncommon in children, although they can be particularly severe when they do occur. One estimate using significant pediatric arthritis and other rheumatologic conditions (SPARC) codes put the average annual prevalence at 294,000 for the years between 2001 to 2004, with codes for rheumatoid arthritis and other inflammatory polyarthropathies, allergic purpura, arthropathy associated with infections, other and unspecified arthropathies, polyarteritis nodosa and allied conditions, and rarer inflammatory conditions affecting 103,000.6

1. Barbour KE, Helmick CG, Theis KA, Murphy LB, Hootman JM, Brady, Cheng YJ: Prevalence of doctor-diagnosed arthritis and arthritis-attributable activity limitation—United States, 2010-2012. *MMWR* 2013;62(44):869-873.

2. Hootman JM, Helmick CG, Langmaid G: Projected prevalence of self-reported arthritis or chronic joint symptoms among persons aged greater than 65 years—United States, 2005–2030. *MMWR* 2003;52(21):498-491.

3. a. b. c. d. e. Helmick CG, Felson DT, Lawrence RC, Gabriel S, Hirsch R, , Kwoh CK, Liang MH, Maradit Kremers H, Mayes MD, Merkel PA, Pillemer SR, Reveille JD, Stone JH; National Arthritis Data Workgroup: Estimates of the prevalence of arthritis and other rheumatic conditions in the United States: Part I. *Arthritis Rheum* 2008;58(1):15-25.

4. a. b. c. d. e. Lawrence RC, Felson DT, Helmick CG, Arnold LM, Choi H, Deyo RA, Gabriel S, Hirsch R, Hochberg MC, Hunder GG, Jordan JM, Katz JN, Maradit Kremers H, Wolfe F; National Arthritis Data Workgroup. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States: Part II. *Arthritis Rheum* 2008;58(1):26-35.

5. Myasoedova E, Crowson DS, Kremers HM, Therneau TM, Gabriel SE: Is the incidence of rheumatoid arthritis rising?: Results from Olmsted County, Minnesota, 1955–2007. *Arthritis Rheum* 2010;62(6):1576-1582.

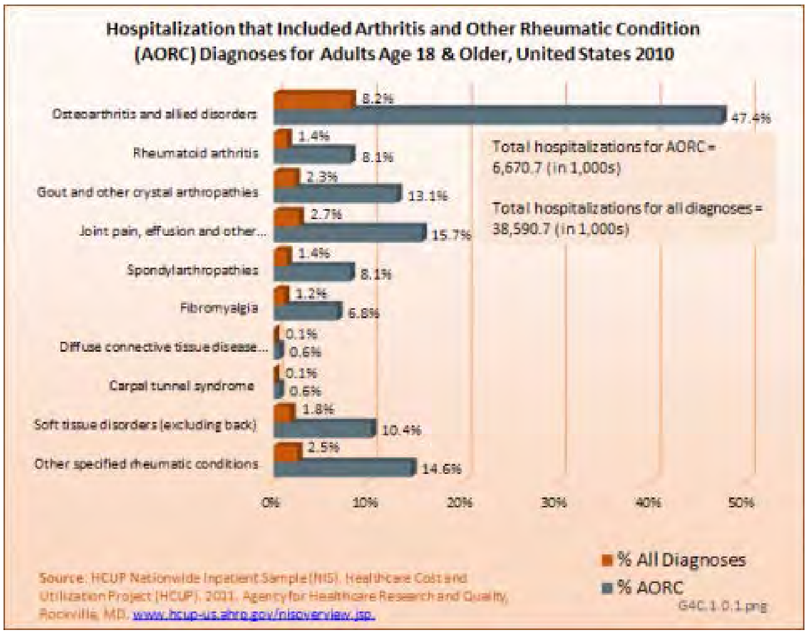
6. Sacks JJ, Helmick CG, Luo Y-H, Ilowite HT, Bowyer S: Prevalence of an annual ambulatory health care visits for pediatric arthritis and other rheumatologic conditions in the US in 2001–2004. *Arthritis Rheum* 2007;57(8):1439-1445.

Health Care Utilization

In recent years there has been an increase in the impact of arthritis and other rheumatic conditions on health care utilization. The rising prevalence of AORC and the resulting increase in ambulatory care visits as well as the increasing number of joint replacements and resultant increase in hospitalizations both result in increased health care utilization. As mentioned above, the AORC case definition is more appropriate to use within the health care system, so the following estimates are based on that.

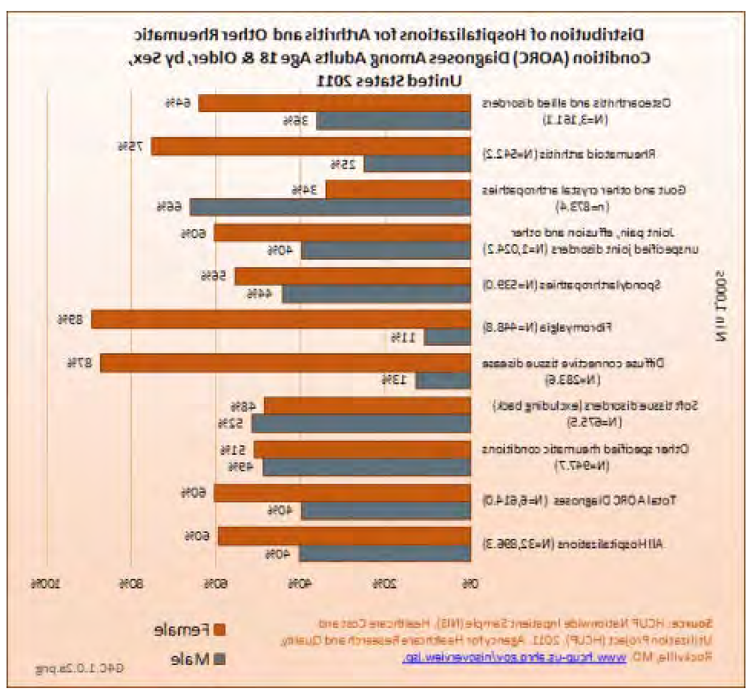
Hospitalization: Health Care Utilization

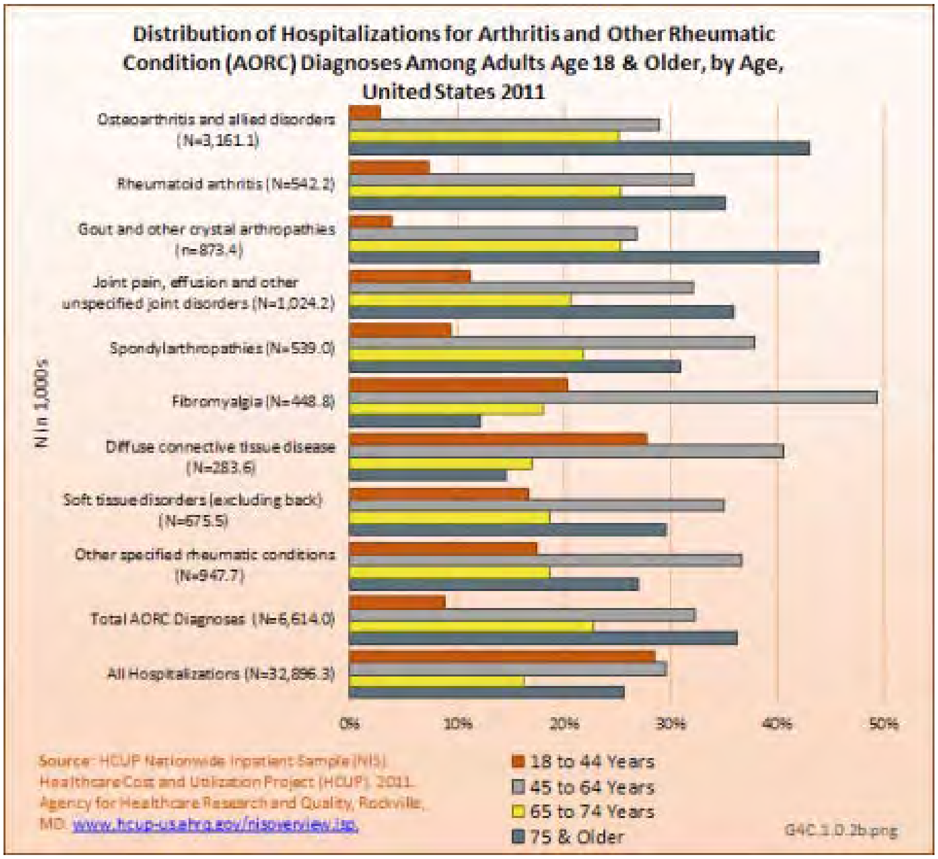
AORC hospitalizations. Data from the Healthcare Cost and Utility Project (HCUP) 2011 Nationwide Inpatient Sample (NIS) estimates 6.7 million hospitalizations that are associated with a diagnosis of AORC, or 17.3% of all hospitalizations that year. Because hospitalization for osteoarthritis (OA) and rheumatoid arthritis (RA) is rare, only about 1% of hospitalizations associated with an AORC diagnoses had this as the presenting, or first, diagnosis. However, arthritis is often a contributing cause to hospitalization, particularly when associated with joint replacement surgery; therefore, most of the 6.7 million hospitalizations were associated with OA, gout, RA, and other less specific disorders. (Reference Table 4.2 PDF CSV)



Most AORC-associated hospitalizations in 2011 occurred among women (60%), with gout the only arthritis condition where more men were hospitalized. Although people age 65 years and older comprise only 17% of the adult population, they accounted for 41% of AORC-associated hospitalizations. (Reference Table 4.3 PDF CSV).

The rate of hospitalization rate per 100 people for AORC-associated hospitalizations was similar men and women. Among the 10 AORC subgroups, hospitalizations rates increased by age most significantly for osteoarthritis and other specified rheumatic conditions. AORC did not differ from all hospitalizations in hospitalization rate by sex, but did differ in the rate by age. (Reference Table 4.3 PDF CSV)

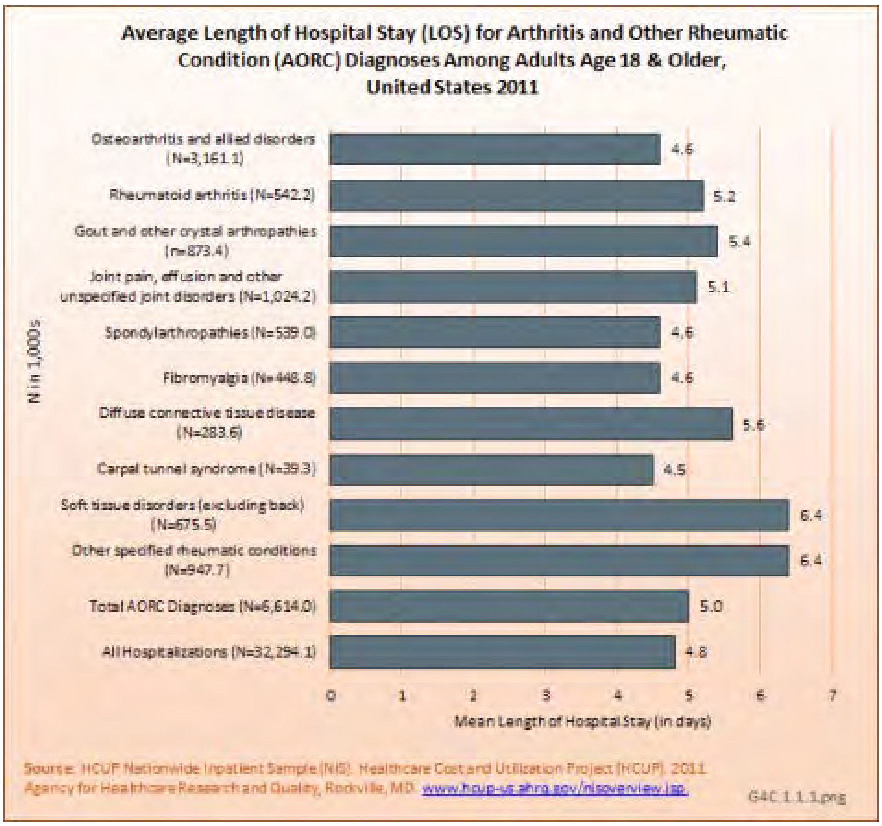




Distribution of Hospitalizations for Arthritis and Other Rheumatic Condition (AORC) Diagnoses Among Adults Age 18 & Older, by Age, United States 2011
Osteoarthritis and allied disorders (N=3,161.1)
Rheumatoid arthritis (N=542.2)
Gout and other crystal arthropathies (n=873.4)
Joint pain, effusion and other unspecified joint disorders (N=1,024.2)
Spondylarthropathies (N=539.0)
Fibromyalgia (N=448.8)
Diffuse connective tissue disease (N=283.6)
Soft tissue disorders (excluding back) (N=675.5)
Other specified rheumatic conditions (N=947.7)
Total AORC Diagnoses (N=6,614.0)
All Hospitalizations (N=32,896.3)
N in 1,000s
0%
10%
20%
30%
40%
50%
18 to 44 Years
45 to 64 Years
65 to 74 Years
75 & Older
Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp.
G4C.1.0.2b.png

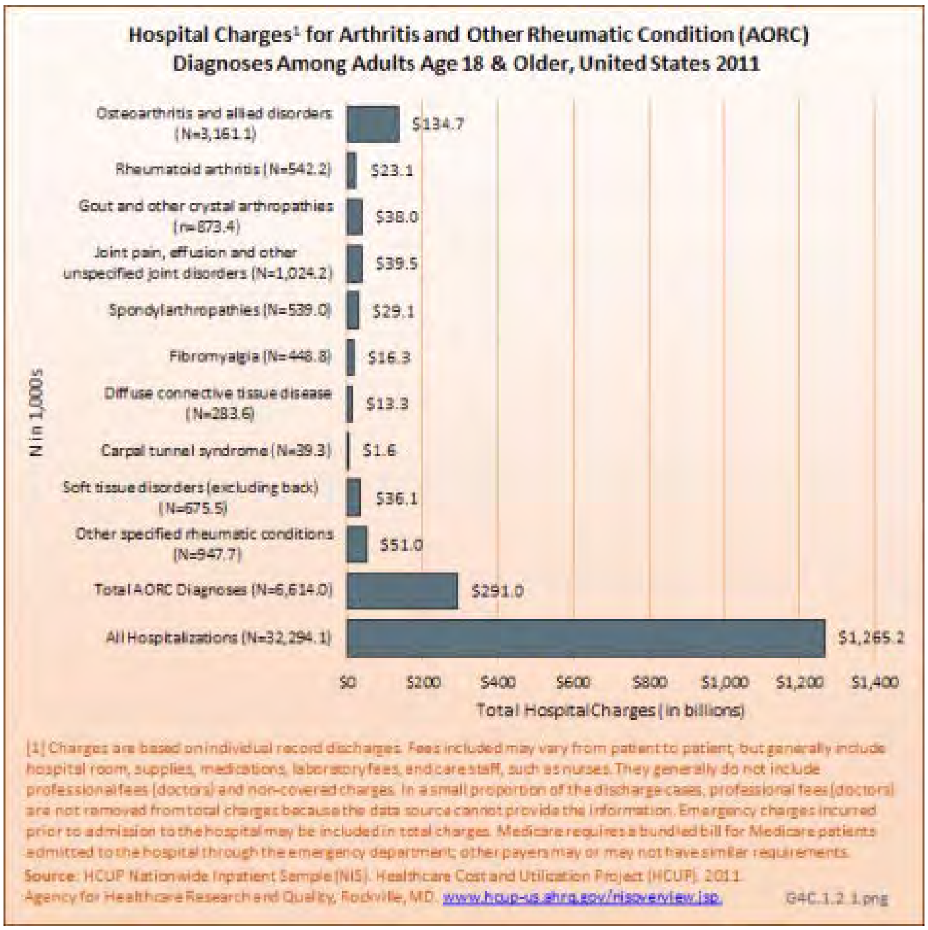
Length of Stay: Hospitalization, Health Care Utilization

The mean length of stay for AORC-associated hospitalizations was 5 days, and it did not differ much by sex or age. Compared with all hospitalizations, AORC-associated hospitalizations averaged 1.6 days longer mean length of stay, but was even longer for those aged 18 to 44 years. Among the 10 AORC subgroups, mean length of stay was longer than the AORC average for those with gout, diffuse connective tissue disease, soft tissue disorders, and other specified rheumatic conditions. (Reference Table 4.4 PDF CSV)



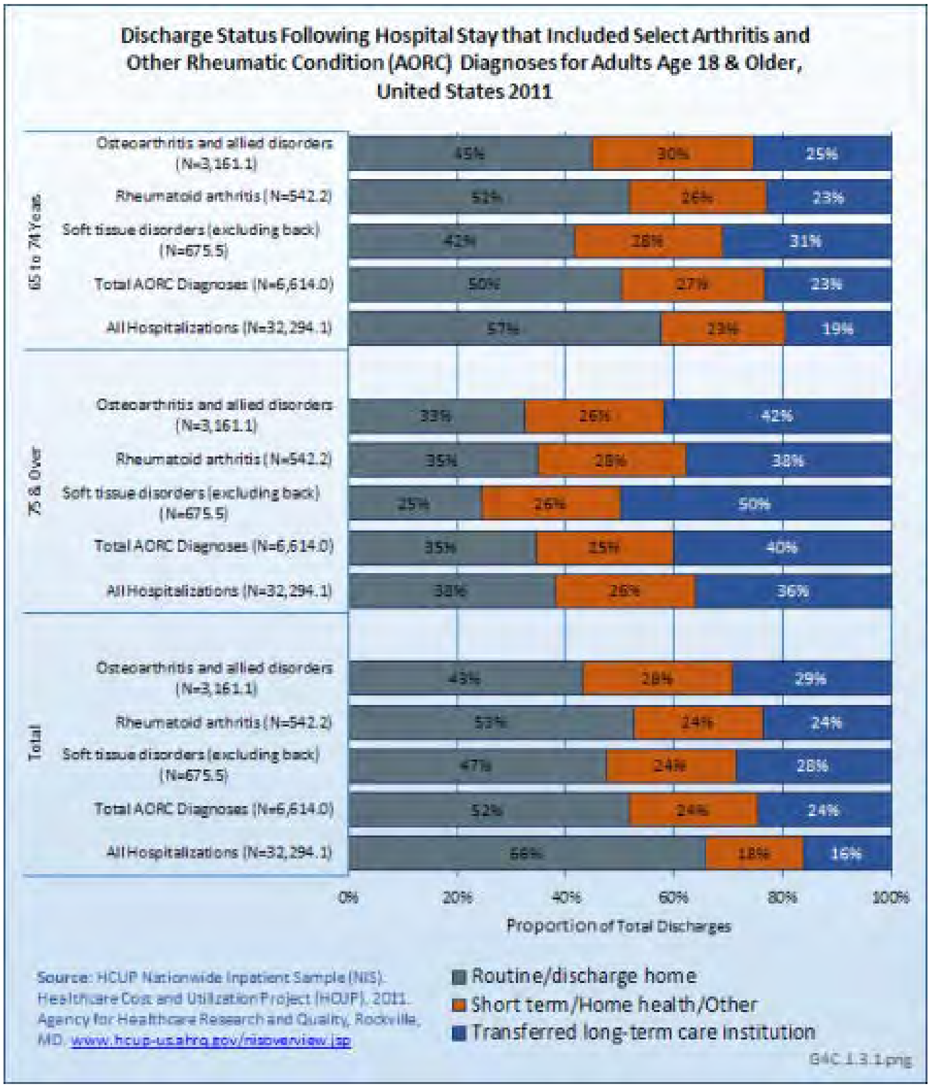
Hospital Charges: Hospitalization, Health Care Utilization

Mean hospital charges for AORC-associated hospitalizations were $5,500 higher than those for all hospitalizations, with the differences driven primarily by females and those younger than 65 years of age. Total charges for AORC-associated hospitalizations were $291 billion, comprising 23% of all hospital charges in 2011. This percentage was relatively consistent for all sex and age groups except those 18 to 44 years of age. Among the 10 AORC subgroups, osteoarthritis accounted for $135 billion, or 46% of total charges for AORC-associated hospitalizations. (Reference Table 4.4 PDF CSV)



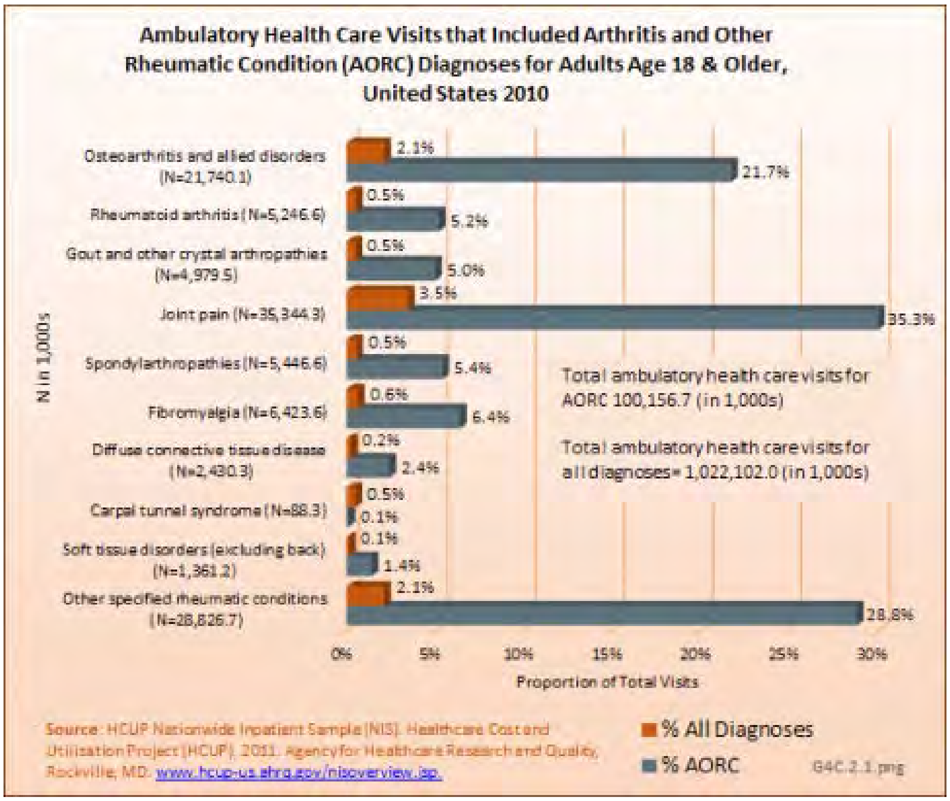
Discharge Status: Hospitalization, Health Care Utilization

Discharge from the hospital to long-term care or home health care occurs more often among AORC-associated hospitalizations than is found among hospitalizations for all causes. This is true regardless of sex or age. Among the 10 AORC subgroups, discharge to home was more frequent and similar to that among all hospitalizations among those with fibromyalgia, diffuse connective tissue disease, and spondylarthropathies. (Reference Table 4.5 PDF CSV)



Ambulatory Care Visits: Health Care Utilization

Data from the 2010 NHCS surveys on ambulatory care indicate that more than 100 million ambulatory care visits are associated with a diagnosis of AORC, or nearly 10% of all visits that year. An AORC is listed as the presenting (first) diagnosis for between 2.6% and 5.7% of all visits listed, depending on the health care site visited. Physicians' offices accounted for 84% of all ambulatory visits, greatly exceeding emergency department or outpatient sites. Among the 10 AORC subgroups, most of the 100 million visits were associated with unspecified joint disorders and other specified rheumatic conditions; osteoarthritis was the most common specific condition. (Reference Table 4.2 PDF CSV)

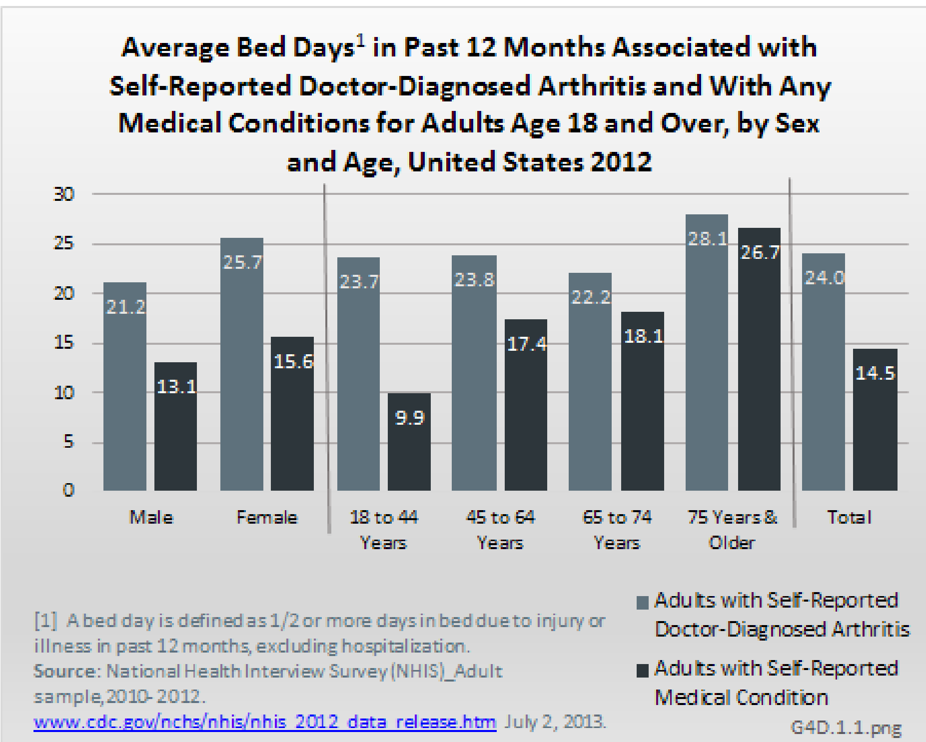


Burden of Arthritis and Other Rheumatic Conditions (AORC)

Disease burden can be measured in many ways. This is particularly important for AORC, which has a modest effect on conveniently measured outcomes like mortality, but a much larger impact on less conveniently measured outcomes important to the ability to function for most people. Such outcomes include effects on work, sports activities, health-related quality of life, independence, and ability to keep doing valued life activities. Three of these burdens, along with lifestyle factors that impact on arthritis, are addressed in the data.

Bed Days: Burden of AORC

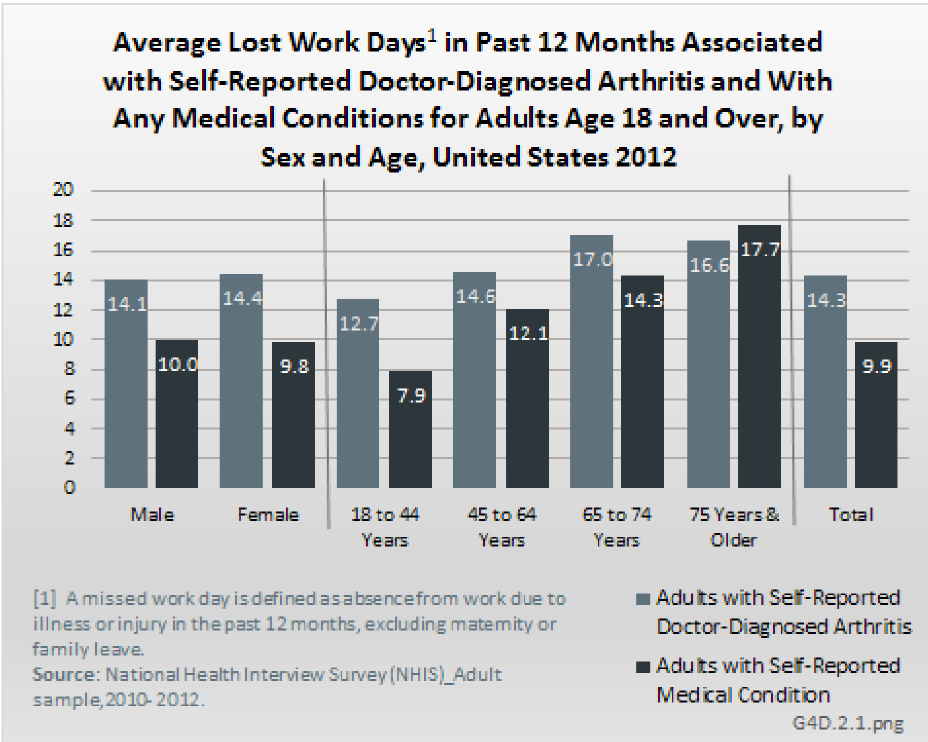
Bed days are defined as spending one-half or more days in bed because of injury or illness, excluding hospitalization. Among adults with doctor-diagnosed arthritis in 2012, 22.4 million, or 9.5% of the entire adult population experienced bed days. These individuals reported an average of 24.0 bed days in the past 12 months. This is far higher than the 14.5 bed days reported by adults with any medical condition. This resulted in 537.6 million bed days overall, or 53% of the 1 trillion bed days among adults reporting any medical condition. Females and those 75 years and older had higher than average bed days. (Reference Table 4.7 PDF CSV)



Lost Work Days: Burden of AORC

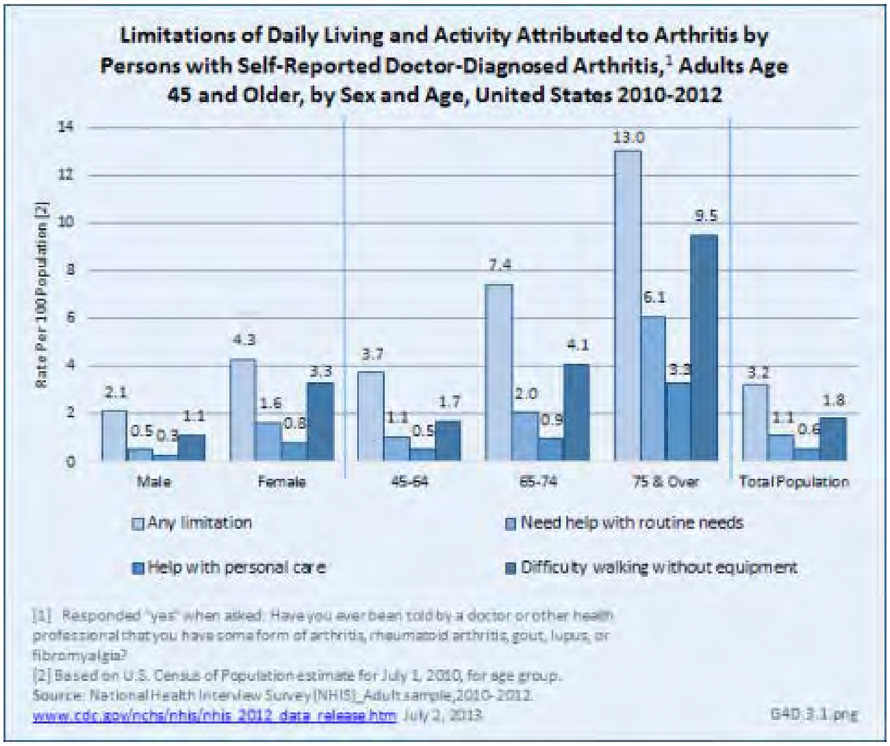
Lost work days for persons in the workforce are defined as absence from work because of illness or injury in the past 12 months, excluding maternity or family leave. Among adults with doctor-diagnosed arthritis in 2012, 12.0

million experienced lost work days. These individuals reported an average of 14.3 workdays lost in the past 12 months, far higher than the 9.9 work days reported by adults with any medical condition. This resulted in 172.1 million total work days lost due to AORC, or 33% of the 526.4 million work days lost among adults reporting any medical condition. There was little difference reported by sex in work days lost, but age was a factor, with more workdays lost by those aged 65 years and older. (Reference Table 4.7 PDF CSV)



Limitations: Burden of AORC

Arthritis-attributable activity limitations (AAAL) are defined by the self-reported question: “Are you now limited in any way in any of your usual activities because of arthritis or joint symptoms?” in the National Health Interview Survey. Estimated doctor-diagnosed arthritis prevalence was also used to estimate that AAAL affected an average of 22.7 million adults between 2010 and 2012,1 higher than the 22 million projected to be affected by 2020 in a 2006 project.2 Estimates showed the typical distribution of higher rates among females and older adults, and lower rates among Hispanics and Asians. Absolute estimates show that most of the adults with arthritis-attributable activity limitation (13.8 million, or 61%) were under age 65 years. However, these ages comprise 83% of the US population. Thus, the rate of AAAL is higher in persons age 65 years and older. (Reference Table 4.1 PDF CSV)

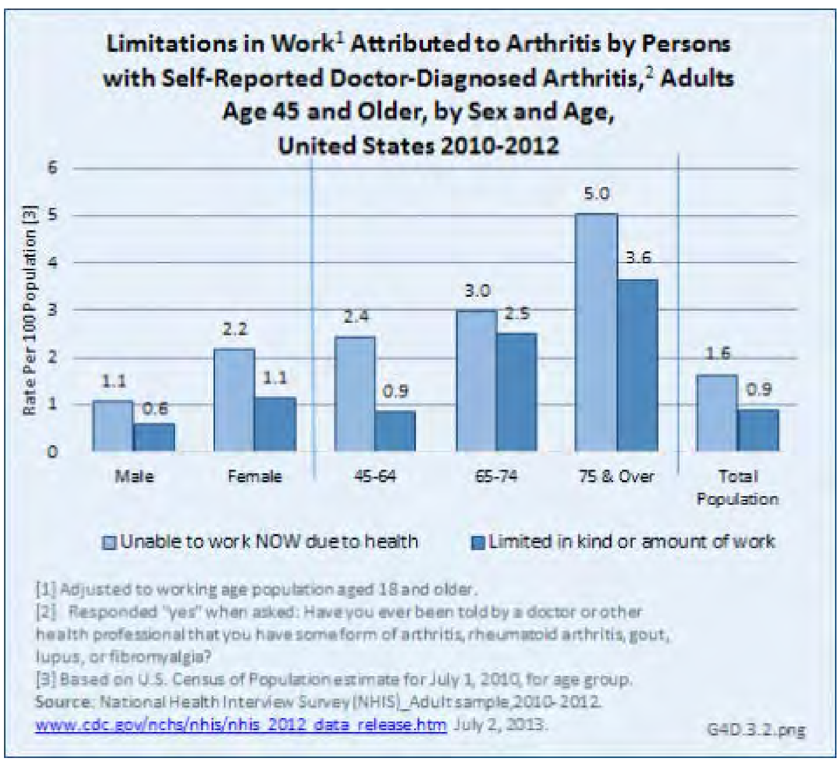


Limitations of Daily Living and Activity Attributed to Arthritis by Persons with Self-Reported Doctor-Diagnosed Arthritis,[1] Adults Age 45 and Older, by Sex and Age, United States 2010-2012

Arthritis-attributable work limitations (AAWL) are defined in reference to work for pay as: "Do arthritis or joint symptoms now affect whether you work, the type of work you do, or the amount of work you do?" In 2002, AAWL affected an estimated 30% adults (6.9 million) aged 18 to 64 years with doctor-diagnosed arthritis. Higher rates were found among those aged 45 to 64 years, women, non-Hispanic blacks, and those with low education or low income.[3] Between 2010 and 2012, 3.8 million people age 18 years and older with doctor-diagnosed arthritis reported they are "unable to work now due to a health," while 2.1 million reported they are "limited in the kind or amount of work they can do." Arthritis conditions represented about one in five people with a work limitation from any medical condition. (Reference Table 4.6.1 PDF CSV; Table 4.6.2 PDF CSV)

Limitations in daily living and activity (ACL) National Adult Survey data from 2010 to 2012 examined those with "any limitation" and with three specific ACL limitations—routine needs, personal care, and walking. Participants were asked to attribute their limitations to up to three medical conditions.

Among all adults with limitations, those with doctor-diagnosed arthritis naming arthritis as the cause comprised 19% of the estimated 40.8 million with "any limitation."



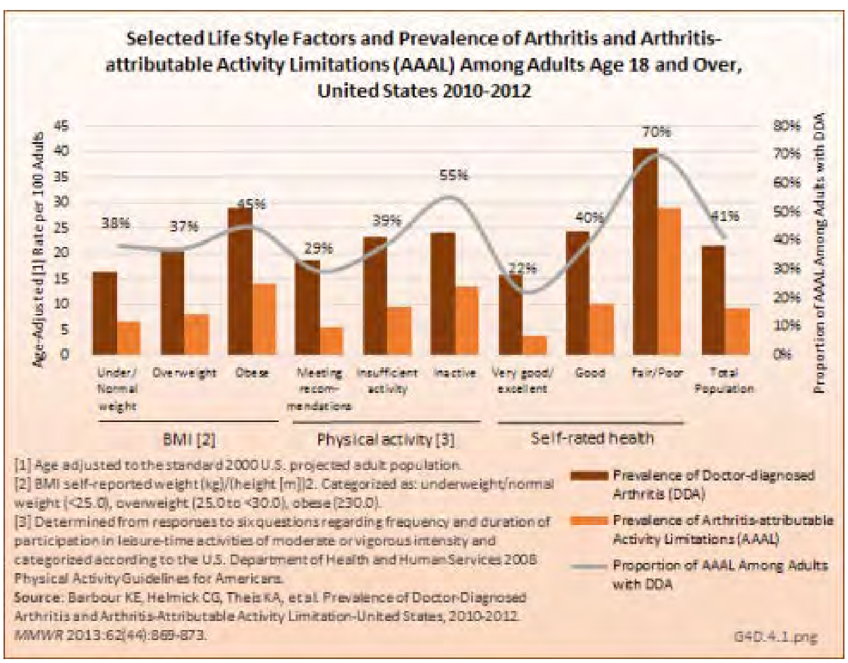
Limitations in Work[1] Attributed to Arthritis by Persons with Self-Reported Doctor-Diagnosed Arthritis,[2] Adults Age 45 and Older, by Sex and Age, United States 2010-2012

One-third of people with difficulty walking (32%) attributed their limitation to arthritis, while about one in four attributed limitations with personal care and routine needs to arthritis. This demonstrates the large impact of arthritis on adults with daily chronic limitations. This effect was much stronger among females than males and among older adults. Little difference was found between persons by race. (Reference Table 4.6.1 PDF CSV; Table 4.6.2 PDF CSV; and Table 4.6.3 PDF CSV)

1. Barbour KE, Helmick CG, Theis KA, Murphy LB, Hootman JM, Brady, Cheng YJ: Prevalence of doctor-diagnosed arthritis and arthritis-attributable activity limitation—United States, 2010-2012. *MMWR* 2013;62(44):869-873.
2. Hootman JM, Helmick CG: Projections of US prevalence of arthritis and associated activity limitations. *Arthritis Rheum* 2006;54(1):226-229.
3. Theis K, Murphy L, Hootman JM, Helmick CG, Yelin E: Prevalence and correlates of arthritis-attributable work limitation in the U.S. population among persons age 18–64: 2002 National Health Interview Survey data. *Arthritis Rheum* 2007;57(3):355-363.

Quality of Life: Burden of AORC

Among people with doctor-diagnosed arthritis (DDA) compared with those without doctor-diagnosed arthritis, Health-Related Quality of Life (HRQoL) is worse on several scales. When assessed by self-reported health status, 27% of those with DDA reported fair/poor health compared to 12% of those without DDA. The DDA group also reported a higher mean number of days in the past month with poor physical health (6.6 vs. 2.5 days), poor mental health (5.4 vs. 2.8 days), or days with limitations in usual activities (4.3 vs. 1.4 days).1



Switching to the perspective of the general population and using a different survey, the prevalence of doctor-diagnosed arthritis and of arthritis-attributable activity limitations is much higher among those with the lifestyle factors of obesity, insufficient or no physical activity, and fair/poor self-rated health. In this same survey, those with doctor-diagnosed arthritis had very high proportions of all three lifestyle factors. (Reference Table 4.8 PDF CSV)

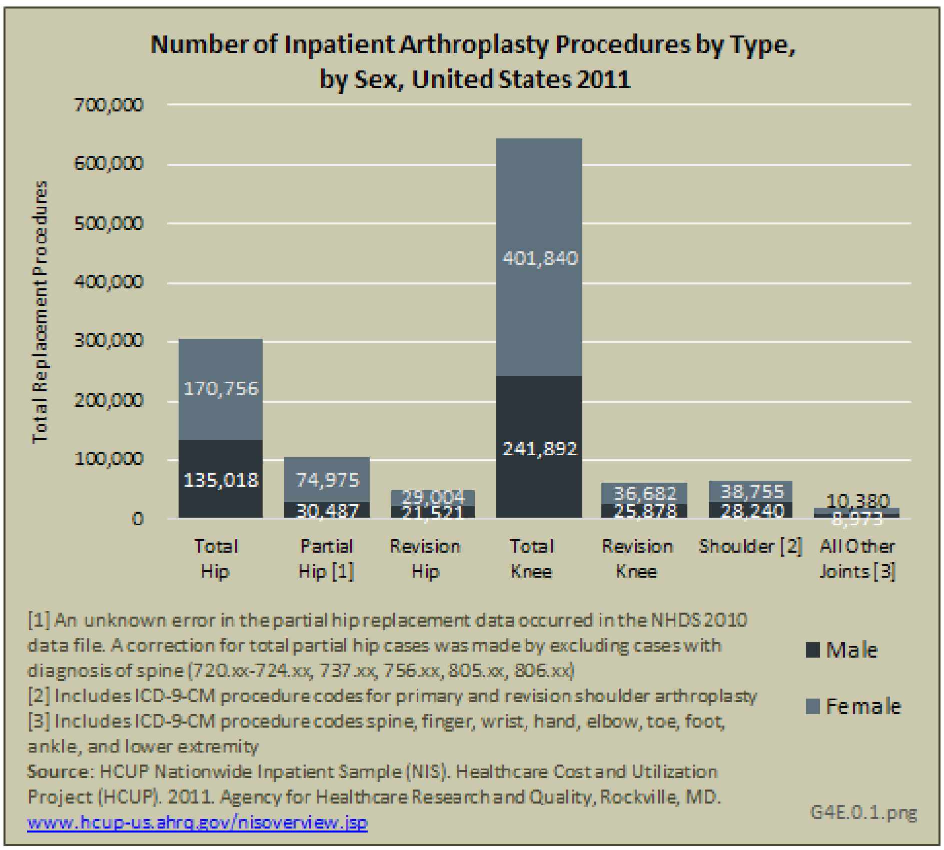
1. Furner SE, Hootman JM, Helmick CG, Bolen J, Zack MM. Health-related quality of life of US adults with arthritis: Analysis of data from the behavioral risk factor surveillance system, 2003, 2005, and 2007. *Arthritis Care Res* 2011;63(6):788-799.

Joint Replacement

While the need for a joint replacement in a sense represents a failure of measures to prevent the occurrence or progression of joint problems, for those with the severe pain or poor function of end-stage joint problems, it can represent a life-altering "cure." Joint replacement procedures for hips and knees are most common, but replacements have been expanding to other joint sites over the past few years. Joint replacements represent one of the fastest growing procedures in the United States.

Data are provided for both of the two national hospital discharge databases for comparison purposes. Although they vary slightly in the number of cases, overall they provide relatively consistent estimates of inpatient joint replacement procedures.

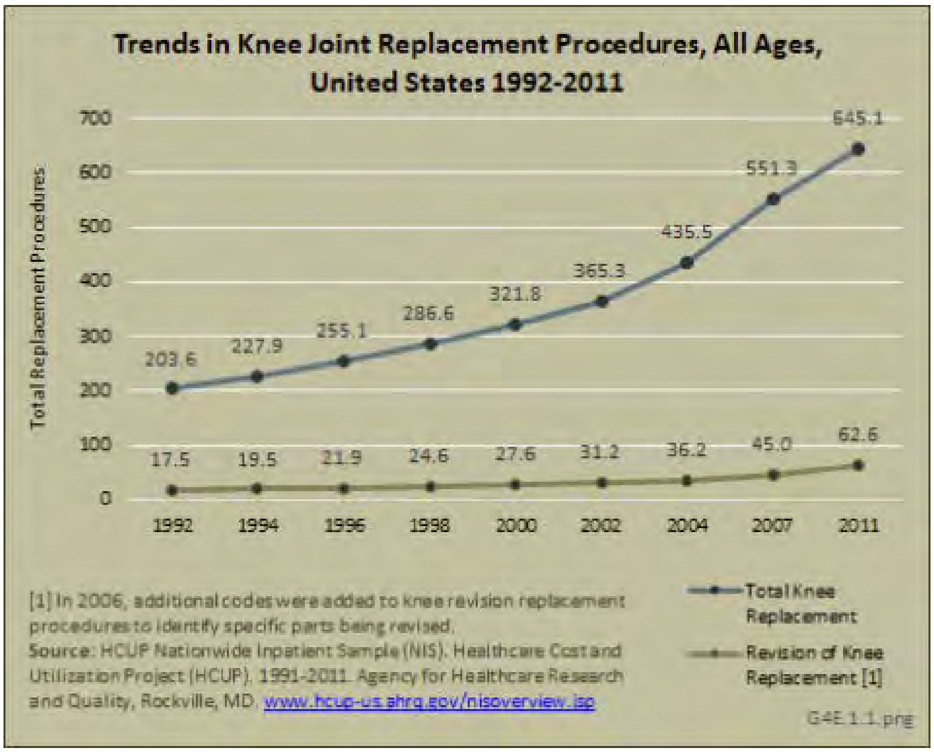
In 2010 and 2011, there were an estimated 1.3 to 1.4 million inpatient joint replacement procedures. Joint replacement procedures comprised about 3.5% of all inpatient procedures for those years. More joint replacements are performed on women than men, and 93% of the procedures are performed on knees or hips. (Reference Table 4.9 PDF CSV)



Knee Replacement Procedures: Joint Replacement

In 2010 and 2011, an estimated 706,000 to 757,000 knee replacement procedure were performed on patients in the United States, comprising 56% of all joint replacement procedures. Three in five knee replacements occurred in females. Total knee replacements far exceeded revision knee replacements, which occur when the original replacement fails or becomes infected. (Reference Table 4.9 PDF CSV)

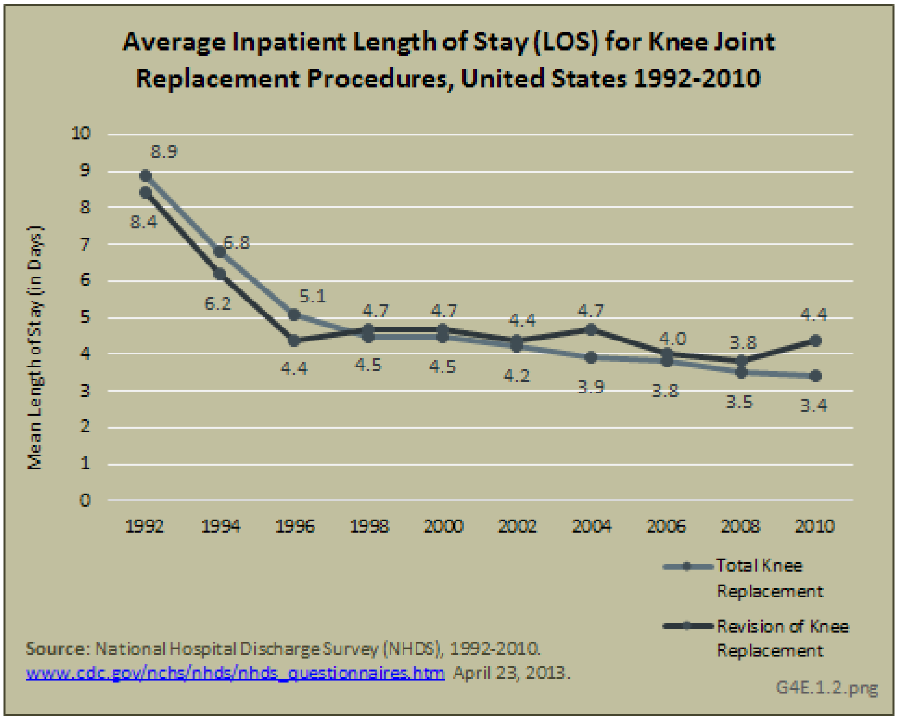
Estimated trends in knee replacement procedures from 1992 to 2010 or 2011 show steady increases in both total and revision knee replacements. Over the 18 years, knee replacement procedures approximately tripled, with the ratio of revisions to total remaining constant at 8% to 10%. (Reference Table 4.10 PDF CSV).



The principal diagnosis associated with total knee replacement is osteoarthritis, accounting for 95% or more of all replacements. (Reference Table 4.11 PDF CSV).

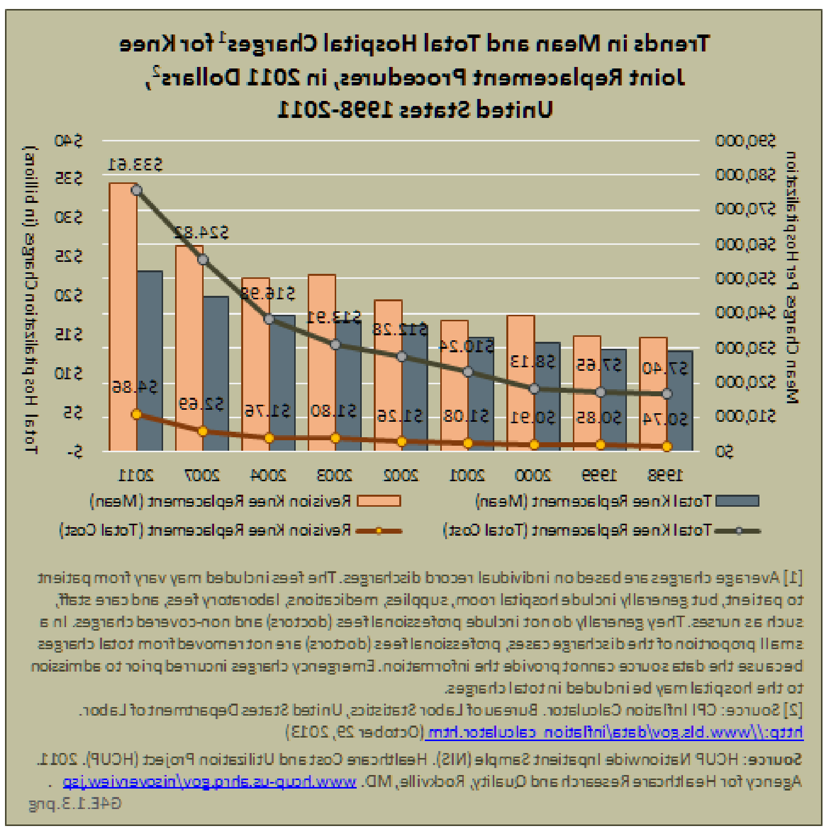
The mean age for both total knee and revision knee replacements was 68 years over an 18-year period. The mean age for both procedures shows a slow decline over this time period. (Reference Table 4.12 PDF CSV)

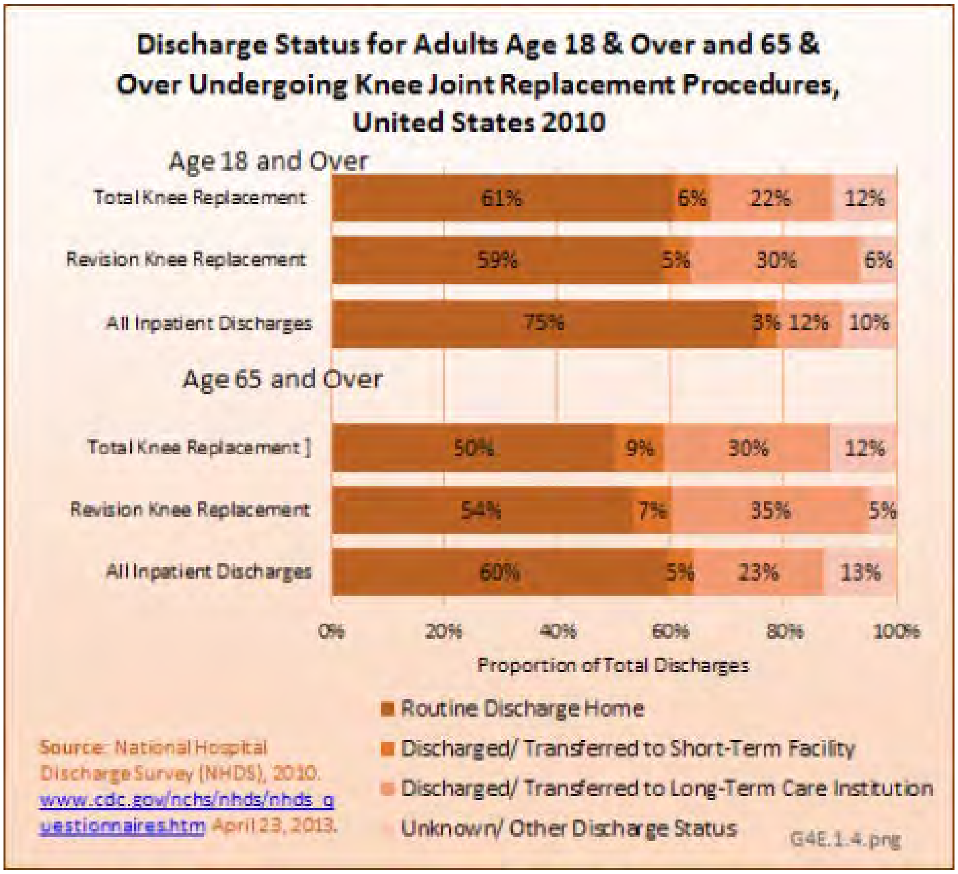
The mean length of stay for both total and revision knee replacements has shown a remarkable decline of about 50% from a mean of nearly 9 days in 1992 to a mean of 3.5 days in 2010. (Reference Table 4.13 PDF CSV).



In spite of shorter hospital stays, the mean hospital charges from 1998 through 2011 showed steady increases for both knee replacements, with revision knee replacement being more expensive than total knee replacement. Total hospitalization charges for both knee replacements have more than quadrupled (in constant 2011 dollars) from $8.1 billion in 1998 to $38.5 billion in 2011. (Reference Table 4.14 PDF CSV)

Most adults with knee replacements are routinely discharged home, with 20% to 30% discharged to long-term care. Among persons age 65 years and older, a slightly higher proportion are discharged to long-term care. (Reference Table 4.15 PDF CSV).

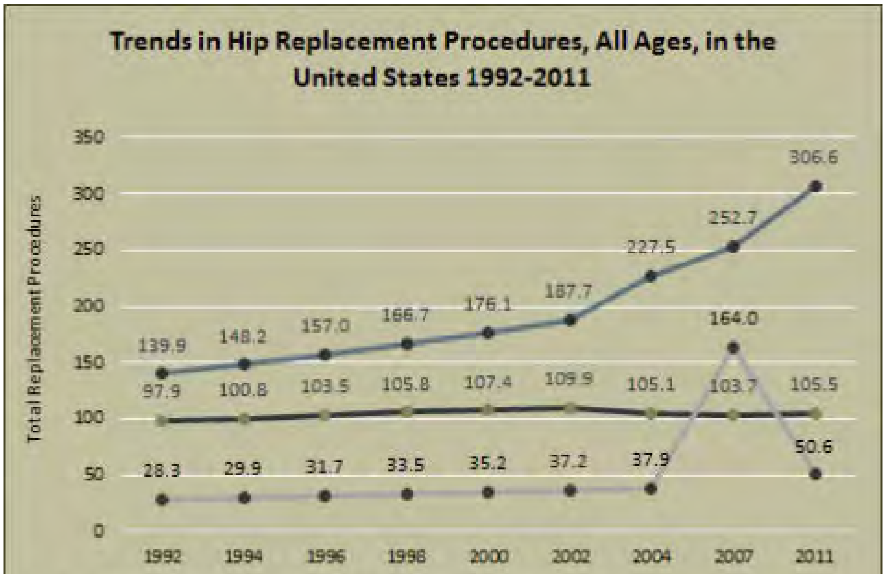



Discharge Status for Adults Age 18 & Over and 65 & Over Undergoing Knee Joint Replacement Procedures, United States 2010
Age 18 and Over
Total Knee Replacement
61%
6%
22%
12%
Revision Knee Replacement
59%
5%
30%
6%
All Inpatient Discharges
75%
3%
12%
10%
Age 65 and Over
Total Knee Replacement
50%
9%
30%
12%
Revision Knee Replacement
54%
7%
35%
5%
All Inpatient Discharges
60%
5%
23%
13%
0%
20%
40%
60%
80%
100%
Proportion of Total Discharges
Routine Discharge Home
Discharged/ Transferred to Short-Term Facility
Discharged/ Transferred to Long-Term Care Institution
Unknown/ Other Discharge Status
Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.
G4E.1.4.png

Hip Replacement Procedures: Joint Replacement

In 2010 and 2011, there were an estimated 465,000 to 512,000 hip replacement procedures, comprising 37% of all joint replacement procedures. A majority, about 63%, occurred in females. Total hip replacements occur nearly three times as frequently as partial hip replacements, and both are far more common that revision hip replacement. (Reference Table 4.9 PDF CSV)

Estimated trends in hip replacement procedures from 1992 to 2010 or 2011 show a steady increase in all types of replacements, with total hip replacements more than doubling by 2010/2011. Growth is slowest in partial hip replacements. The ratio of revision hip to total hip replacements hovers around 20% for most years. The years 2006/2007 showed anomaly data for revision hip replacements in both data sets. (Reference Table 4.10 PDF CSV)

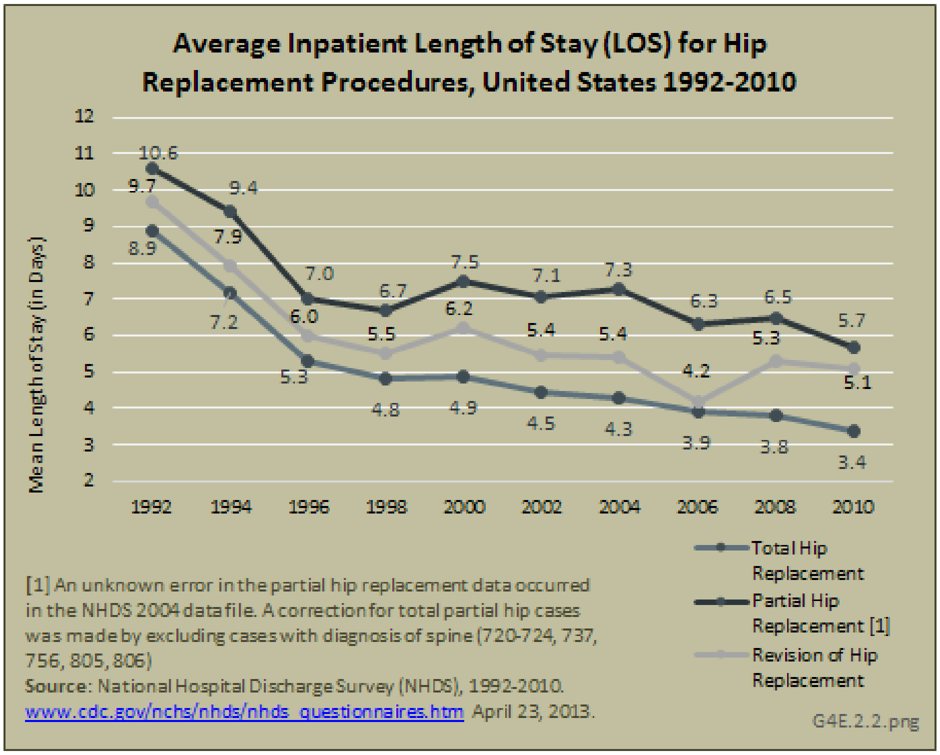


[1] An unknown error in the partial hip replacement data occurred in the NHDS 2010 data file. A correction for total partial hip cases was made by excluding cases with diagnosis of spine (720-724, 737, 756, 805, 806).
[2] A significant jump in the number of hip revision procedures was found between the 2004 and the 2006/2007 data. The increase was similar in both the NHDS and NIS data sets, indicating the increase may have occurred; however, the 2010/2011 numbers indicate it was an error.
[3] In 2006, additional codes were added to hip revision replacement procedures to identify specific parts being revised.
Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 1991-2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

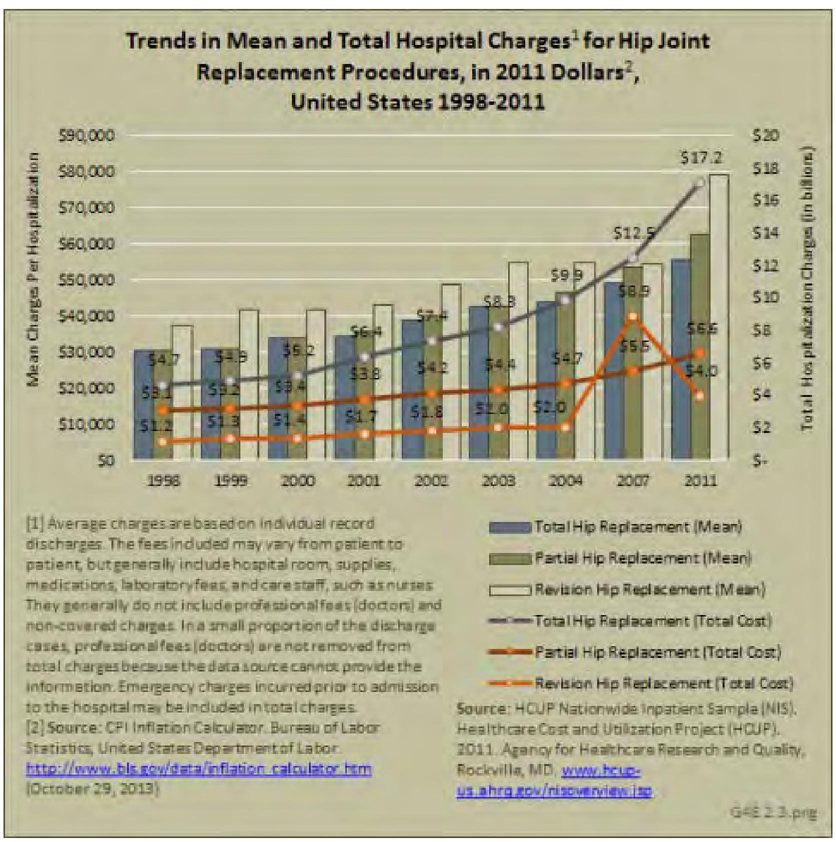
The principal diagnoses associated with hip replacements varied, with osteoarthritis associated with more than 80% of total hip replacements and fractures or congenital deformities being associated with more than 85% of partial hip replacements. There is some variation between diagnoses for the two databases. (Reference Table 4.11 PDF CSV)

The 18-year mean age was about 66 years for total hip replacements and 77 for partial hip replacements, reflecting the different underlying diagnoses. Mean ages for both procedures show a slight decline over the time period, reflecting the younger age at which joint replacements are now considered. (Reference Table 4.12 PDF CSV)

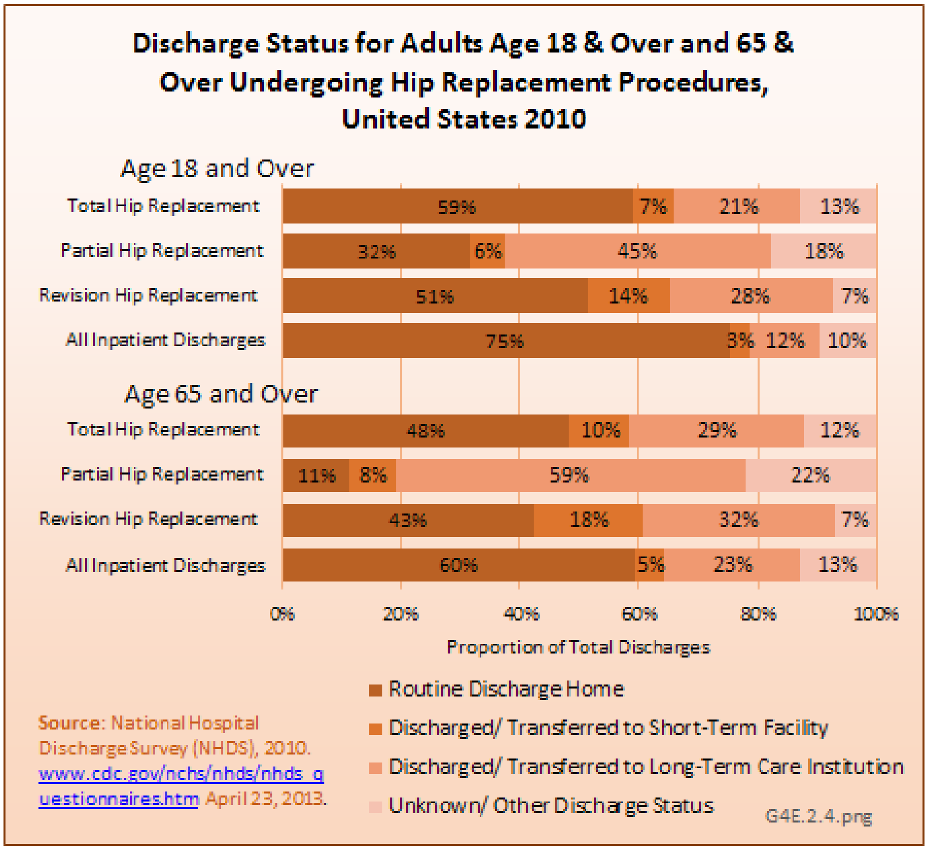
The mean length of stay for all hip replacements has shown a remarkable decline of at least 50% from 1992 through 2010. (Reference Table 4.13 PDF CSV)



In spite of shorter hospital stays, mean hospital charges from 1998 through 2011 steadily increase for all hip replacements. Revision hip replacements are the most expensive, while total hip replacements are the least expensive. Total hospitalization charges for all hip replacements have tripled (in constant 2011 dollars) from $8.9 billion in 1998 to $27.8 billion in 2011, led by charges for total hip replacements. (Reference Table 4.14 PDF CSV)



Most adults with total hip and revision hip replacements are routinely discharged home, but 20% to 30% are discharged to long-term care. Slightly higher rates of persons age 65 years and older go to long-term care. Among patients who undergo a partial hip replacement, nearly half (45%) go to long-term care, with three out of five who are 65 years and older with a partial hip replacement doing so. (Reference Table 4.15 PDF CSV)



Other Joint Replacement Procedures: Joint Replacement

In 2010 and 2011, an estimated 67,000 to 76,000 shoulder replacement procedures were performed, comprising 5% to 6% of all joint replacement procedures. At the same time, an estimated 19,000 to 25,000 other joint replacement procedures were performed. This small group, which includes fingers, toes, wrist, ankle, and spine replacements, comprise less than 2% of all joint replacement procedures. As with hip and knee replacements, a majority of other joint replacement procedures occurred in females. (Reference Table 4.9 PDF CSV)

Impact of Aging

Because many types of arthritis have a higher prevalence among older adults, expectations are that the current aging of the population will increase the prevalence and impact of AORC unless new means to lessen that impact are discovered in the near future. Projections of arthritis impact among adults are based on 2003 data adjusted for age distribution in the US population, but not for other potentially important factors such as the obesity epidemic and the possible increasing frequency of joint injuries.[1] Doctor-diagnosed arthritis among adults is occurring as projected, with 52.5 million in 2010 to 2012 and 67 million expected by 2030. Arthritis-attributable activity limitations among adults appear to be occurring at a faster pace than previously projected. This suggests the projected 25 million in 2030 will also be exceeded.1 Previous costs of arthritis have been driven by age-related increases in prevalence.2 Future costs of arthritis are likely to be driven higher by the same age-related increase in prevalence, but also from the increasing frequency of surgical interventions.

1. a. b. Hootman JM. Helmick CG: Projections of US prevalence of arthritis and associated activity limitations. *Arthritis Rheum* 2006;54(1):226-229.

2. Cisternas MG, Murphy L, Yelin E, Foreman AJ, Pasta DJ, Helmick CG: Trends in medical care expenditures of adults with arthritis and other rheumatic conditions: 1997 to 2005. *J Rheum* 2009;36:2531-2538.

Juvenile Arthritis

Lead Author(s):
Aimee O. Hersh, MD
Charles G. Helmick, MD, CDC Team

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

Juvenile arthritis (JA) is an umbrella term used to describe a number of autoimmune and inflammatory conditions that can develop in children.

The most common form of JA is Juvenile Idiopathic Arthritis (JIA), formally called juvenile rheumatoid arthritis (JRA) or juvenile chronic arthritis (JCA). Juvenile idiopathic arthritis is diagnosed in a child less than 16 years of age with at least 6 weeks of persistent arthritis. There are seven distinct subtypes, each having different symptoms and association to the child's autoimmunity and genetics.1 Certain subtypes are associated with an increased risk of inflammatory eye disease (uveitis). Understanding the differences in the various forms of JIA, their causes, and methods to better diagnose and treat these conditions in children is important for future treatment and prevention. Among all subtypes, 40% to 45% of children with JIA still have active disease after 10 years.2

Because of the various forms of JA, estimates of prevalence and incidence are difficult to identify. Overall estimates are that 300,000 children in the United States are diagnosed with JIA.3

In 2006, the CDC Arthritis Program finalized a case definition for ongoing surveillance of pediatric arthritis and other rheumatologic conditions (SPARC) using the current ICD-9-CM diagnostically based data systems.

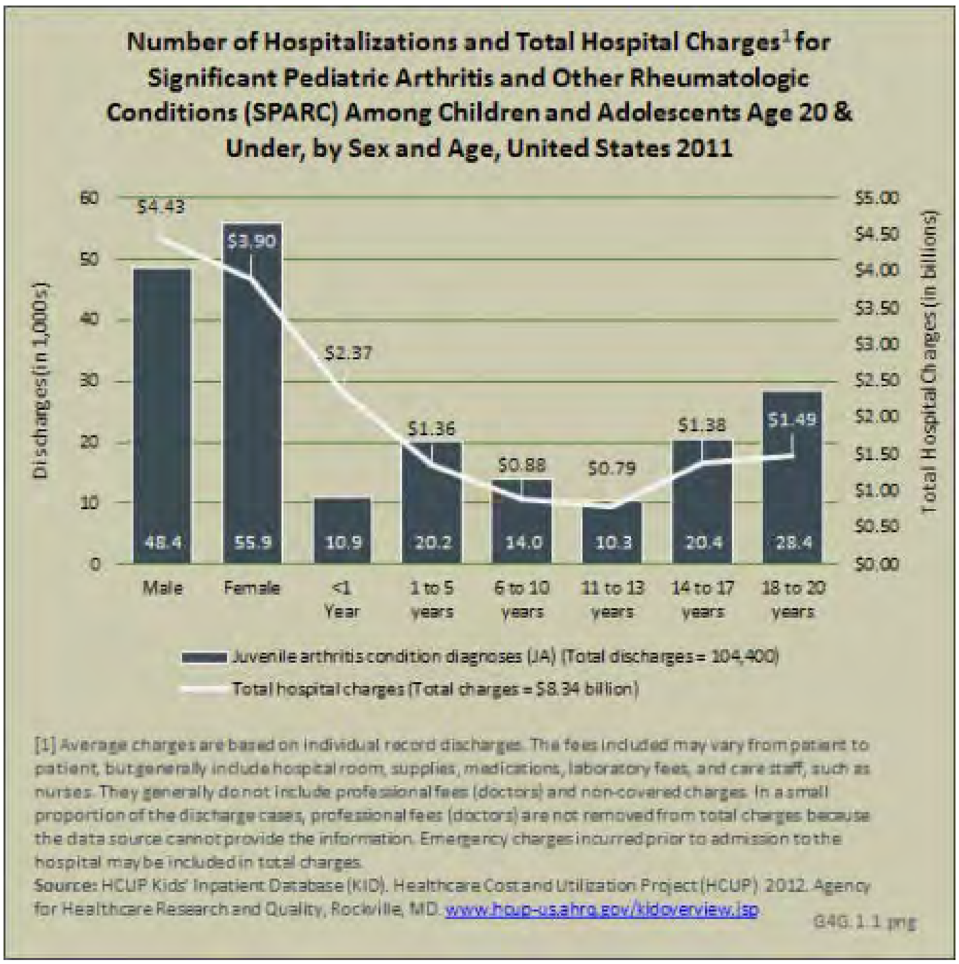
1. Petty RE, Southwood TR, Manners P, Baum J, Glass DN, Goldenberg J, He X, Maldonado-Cocco J, Orozco-Alcala J, Prieur AM, Suarez-Almazor ME, Woo P; International League of Associations for Rheumatology: International League of Associations for Rheumatology classification of juvenile idiopathic arthritis: Second revision, Edmonton, 2001. *J Rheumatol* 2004 Feb;31(2):390-2.

2. Arthritis Foundation: *Juvenile Arthritis.* Available at: http://www.arthritis.org/arthritis-facts/disease-center/juvenile-arthrit.... November 11, 2014.

3. Centers for Disease Control and Prevention (CDC): *Childhood Arthritis.* Available at: http://www.cdc.gov/arthritis/basics/childhood.htm. Accessed November 11, 2014.

Hospital Discharges for JA: Juvenile Arthritis

Analysis of recent national health care databases using the SPARC showed that 61,800 children age 17 years and younger were discharged from a hospital with any diagnosis of SPARC in 2011. Of those, 17,000 (more than one in four) had an admitting diagnosis of SPARC. Distribution was evenly split between males and females, but children age 6 years and younger were more likely to be hospitalized with a diagnosis of SPARC than older children, accounting for 45% with any SPARC diagnosis and half with an admitting SPARC diagnosis. Only a small number of children (3.2%) discharged with any diagnosis of SPARC had a diagnosis of juvenile idiopathic arthritis.1 Females accounted for 70% of discharges with a diagnosis of JIA, with 50% of the discharges for children age 13 to 17 years.



Hospital stays of nearly 9 days (mean of 8.6 days) were found for any diagnosis of SPARC. Children age 6 years and younger had a mean hospital stay nearly twice that of children ages 7 to 17 years, resulting in higher mean hospital charges. Children with a diagnosis of JIA had hospital stays of a mean of 3.6 days, with subsequently lower mean charges.

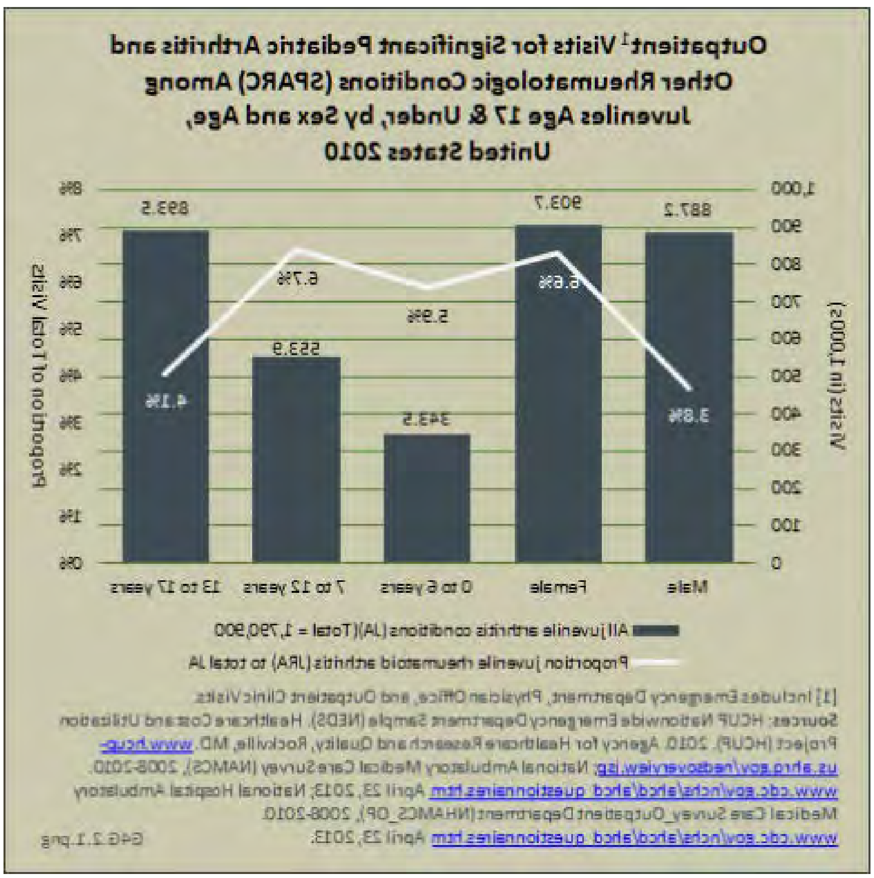
Total hospital charges associated with any diagnoses of SPARC in the population age 17 years and younger were $4.45 billion in 2012. (Reference Table 4.16 PDF CSV)

1. JIA codes for juvenile idiopathic arthritis are based on ICD-9-CM codes for juvenile rheumatoid arthritis.

JA Outpatient Visits: Juvenile Arthritis

Emergency rooms saw 443,000 patients ages 1 day to 17 years with any diagnoses of SPARC in 2010. Among these patients, 5,400 had a primary diagnosis of JIA. Females and those ages 13 to 17 years were most likely to have juvenile idiopathic arthritis.

Due to smaller sample sizes in the currently available databases for physician office visits and outpatient clinics, outpatient visits for a diagnosis of SPARC in the juvenile population are difficult to quantify. Physician visits for treatment of JA for the years 2008 to 2010 averaged just over 1 million per year. Evenly split between males and females, 60% of the visits were for children ages 13 to 17 years. Because of small sample sizes, the number of visits with a diagnosis of JIA was unreliable.



Outpatient clinics saw 282,500 patients, on a yearly average, for these same years. Patterns for distribution by sex and age reflected that of other treatment sites. However, a larger share of these patients (17%) had a diagnosis of JIA.

From these data, an estimated 1.8 million outpatient visits for any diagnoses of SPARC occurred in those 1 day to 17 years of age in 2010. (Reference Table 4.16 PDF CSV)

Economic Burden

Lead Author(s):
Charles G. Helmick, MD, CDC Team

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

The Economic Cost section of this report uses the Medical Expenditures Panel Survey (MEPS), a standard source of cost of illness estimates, to estimate the total direct and indirect costs of musculoskeletal conditions and selected categories of musculoskeletal conditions, as well as the incremental direct and indirect costs specifically attributable to the selected category. Total costs are all costs for a patient regardless of the condition responsible; incremental costs are those costs attributed to a specified condition.

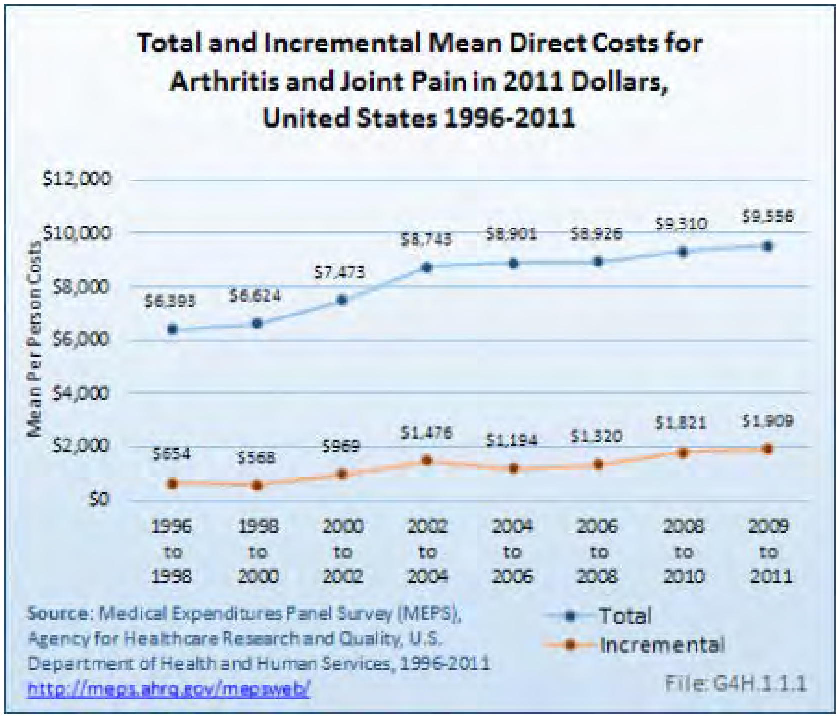
There are several important points to remember here. First, for arthritis and other rheumatic conditions, MEPS requires the use of selected three-digit ICD-9-CM codes, using the three- and four-digit NADW AORC ICD-9-CM codes to create a similar category called "arthritis and joint pain." This approach provides the best available estimates of the costs of AORC. Additionally, costs estimates are per person and reported as mean per-person costs. To arrive at the estimated aggregate cost, the mean per-person cost is multiplied by the number of people affected, resulting in a total cost for conditions in the United States.

Direct Medical Costs: Economic Burden

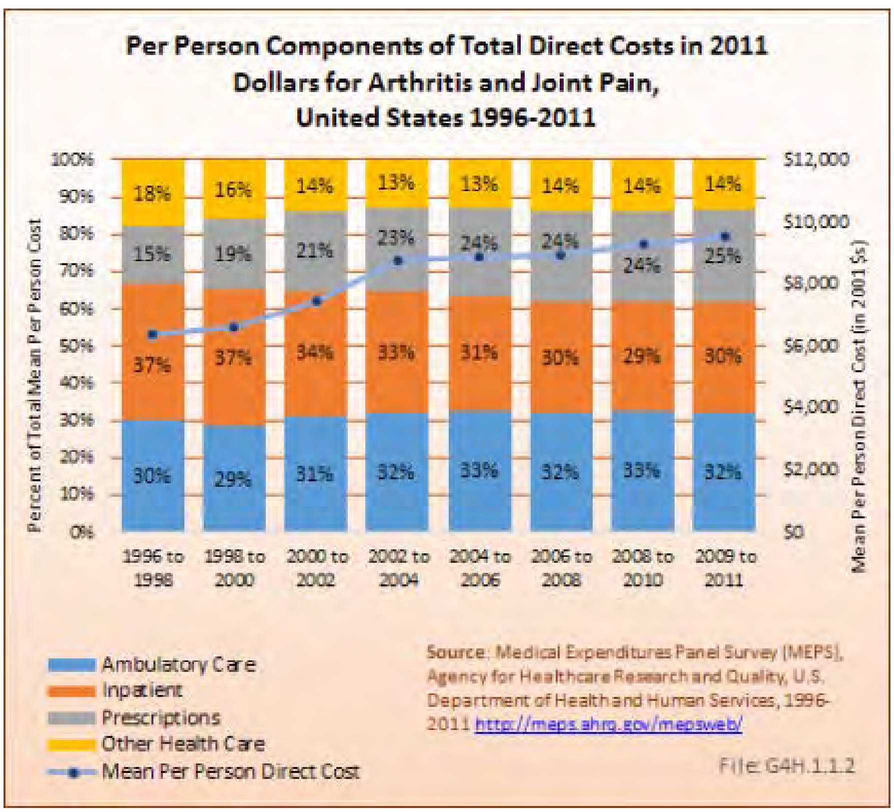
MEPS provides estimates of actual medical expenditures, meaning money changing hands, rather than medical charges, which are based on what is originally billed but rarely paid in full. Thus, the term direct costs as used here reflects actual medical expenditures.

Arthritis and Joint Pain: Direct Medical Costs, Economic Burden

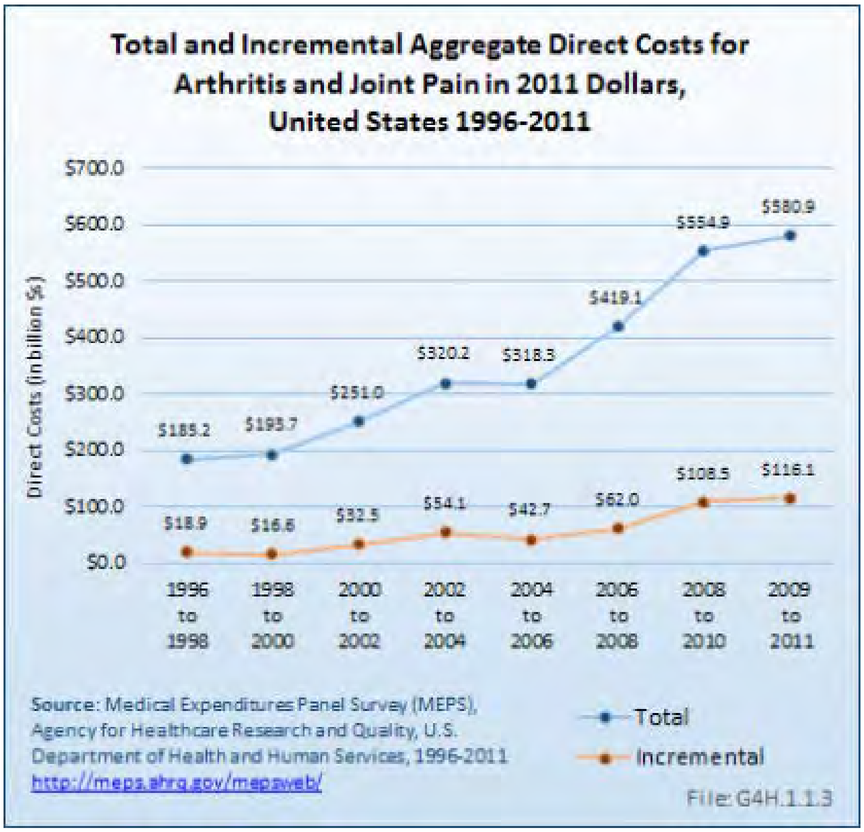
For total medical expenditures, mean per-person expenditures for arthritis and joint pain increased from an average of $6,393 in the years 1996 to 1998 to an average of $9,556 from 2009 to 2011 in 2011 dollars. For incremental medical expenditures, mean per-person expenditures for arthritis and joint pain increased from an average of $654 in the years 1996 to 1998 to an average of $1,909 in 2009 to 2011 in 2011 dollars. The change in total mean expenditures was 50%, while incremental mean expenditures rose by 192%. (Reference Table 10.6 PDF CSV)



Mean per person direct costs include ambulatory care, inpatient care, prescriptions, and other health care costs. In 2011, ambulatory care and inpatient care each accounted for about a third of per person direct costs, with prescriptions accounting for another 25%. Over the past 15 years, prescription costs have seen the greatest change, rising nearly 60% per person in that time. Both inpatient and other health care costs went down by 20% and 23%, respectively. (Reference Table 10.4 PDF CSV)



Total aggregate medical expenditures for people treated for all causes, including a diagnosis of arthritis and joint pain, in the United States increased from $185.2 billion in 1996 to 1998 to $580.9 billion in 2011 dollars, on average, for the years 2009 to 2011. Aggregate medical expenditures specifically attributed to arthritis and joint pain (incremental costs) in the United States increased from $18.9 billion in 1996 to 1998 to $116.1 billion in 2011 dollars, on average, for the years 2009 to 2011. While the increase over the 15-year period for total aggregate costs was more than 200%, the increase for incremental aggregate costs was greater than 500%. (Reference Table 10.6 PDF CSV)



Mean and aggregate total and incremental direct and indirect costs for two types of arthritis using the annual average for years 2008 to 2011 MEPS data are calculated.

Osteoarthritis and Allied Disorders: Direct Medical Costs, Economic Burden

For total medical expenditures, mean per-person expenditures for osteoarthritis and allied disorders were $11,029 average for the years 2008 to 2011. Aggregate medical expenditures for the estimated 30.8 million persons with osteoarthritis and allied disorders in the United States averaged $340 billion in each of the years 2008 to 2011.

For incremental medical expenditures, mean per-person expenditures for osteoarthritis and allied disorders were $2,017 on average for the years 2008 to 2011. Aggregate incremental medical expenditures for the United States for osteoarthritis and allied disorders were $62.1 billion in each of the years 2008 to 2011. (Reference Table 10.13 PDF CSV)

Rheumatoid Arthritis: Direct Medical Costs, Economic Burden

For total medical expenditures, mean per-person expenditures for rheumatoid arthritis averaged $17,010 for the years 2008 to 2011. Aggregate medical expenditures for the estimated 1.04 million people with rheumatoid arthritis in the United States averaged $17.8 billion in each of the years 2008 to 2011.

For incremental medical expenditures, mean per person expenditures for rheumatoid arthritis averaged $6,428 for the years 2008 to 2011. Aggregate medical expenditures for the United States for rheumatoid averaged $6.7 billion in each of the years 2008 to 2011. (Reference Table 10.13 PDF CSV)

Indirect Costs (Society/Employers): Economic Burden

Indirect costs as used in this report reflects estimates of earnings losses for people with a work history who are unable to work because of a medical condition. It does not reflect supplemental measures such as reduced productivity, worker replacement, or early retirement due to medical conditions.

Indirect costs are not estimated for the broad category of arthritis and joint pain.

Osteoarthritis and Allied Disorders: Direct Medical Costs, Economic Burden

For total earnings losses, mean per-person earnings losses attributed to osteoarthritis and allied disorders averaged $7,548 per year in 2008 to 2011. Aggregate earnings losses for the 16.1 million people in the workforce with osteoarthritis and allied disorders in the United States averaged $122 billion in each of the years 2008 to 2011.

For incremental medical expenditures, mean per-person earnings losses attributed to osteoarthritis and allied disorders averaged $4,951 per year in 2008 to 2011. Aggregate earnings losses for the United States due to osteoarthritis and allied disorders averaged $80 billion in each of the years 2008 to 2011.

Combining direct and indirect costs for osteoarthritis and allied disorders sums to total average costs of $461 billion, with incremental costs of $142 billion. (Reference Table 10.13 PDF CSV)

Rheumatoid Arthritis: Direct Medical Costs, Economic Burden

For total earnings losses, mean per-person earnings losses attributed to rheumatoid arthritis averaged $13,886 per year in 2008 to 2011. Aggregate earnings losses for the estimated 900,000 persons in the workforce with rheumatoid arthritis in the United States averaged $12.3 billion per year in 2008 to 2011.

For incremental medical expenditures, mean per-person earnings losses attributed to rheumatoid arthritis averaged $8,684 per year in 2008 to 2011. Aggregate earnings losses for the United States due to rheumatoid arthritis averaged $7.7 billion in each of the years from 2008 to 2011.

Combining direct and indirect costs for rheumatoid arthritis sums to total costs of $30 billion, with incremental costs of $14.4 billion. (Reference Table 10.13 PDF CSV)

Key Challenges to Future

Lead Author(s):
Charles G. Helmick, MD, CDC Team

Several data limitations exist for addressing AORC in the future. First, on October 1, 2015, ICD-10-CM will be required for use in clinical records; it is already in use for death records. The current National Arthritis Data Workgroup definition of AORC uses ICD-9-CM codes. Due to changes in conditions for the new codes, a direct translation cannot be made. This means a new definition of AORC or some similar concept will be needed for analyses using ICD-based data after that date. CDC will be working with ICD-10-CM translation experts and selected stakeholders to propose a draft standard ICD-10-CM–based definition, which will shared with the larger arthritis community to reach agreement on a new definition.

Second, there is a need for data on more specific conditions—for example, rheumatoid arthritis, SLE, psoriatic arthritis—to help drive clinical (eg, treatment, quality) and public health (eg, self-management education, safe physical activity) efforts. Electronic health records may prove helpful in creating valid measures.

Arthritis and other rheumatic conditions are not addressed with the same priority as many other chronic conditions, perhaps because such priorities are driven more by measures of mortality rather than measures for quality of life and disability. However, there is a growing policy interest in the role of multiple chronic conditions in health and health costs.[1] Arthritis and other rheumatic conditions play a major role from this perspective, with about half of people with heart disease or diabetes and about a third of those with obesity also affected by arthritis and rheumatic conditions.[2,3,4]

1. HHS initiative on multiple chronic conditions. Available at: http://www.hhs.gov/ash/initiatives/mcc/. Accessed on December 2, 2014.

2. Bolen J, Murphy L, Greenlund K, , Helmick CG, Hootman J, Brady TJ, Langmaid G, Keenan N: Arthritis as a potential barrier to physical activity among adults with heart disease—United States, 2005 and 2007. *MMWR* 2009;58(7):165-169.

3. Bolen J, Hootman J, Helmick CG, Murphy L, Langmaid G, Caspersen CJ: Arthritis as a potential barrier to physical activity among adults with diabetes—United States, 2005 and 2007. *MMWR* 2008;57(18):486-489.

4. Barbour KE, Hootman JM, Murphy LB, Helmick CG: Arthritis as a potential barrier to physical activity among adults with obesity—United States, 2007 and 2009. *MMWR* 2011;60(19):614-618.

Unmet Needs

There are widespread and consistent professional recommendations for most types of AORC that involve increasing self-management of the disease through education, physical activity, and achieving a healthy weight, but little progress is being made.[1] Such behavior interventions offer evidence-based improvements to patients without the side effects seen with medications and other interventions. While most clinical settings are not set up to help patients achieve these recommendations effectively, increasing clinical/community linkages may offer a better approach. To see if provider referrals to community resources is a better solution, approaches such as the 1.2.3 Approach to Provider Outreach and Spread the Word: Marketing Self-Management Education Through Ambassador Outreach are being pilot tested in communities.

The Healthy People project started with the 1979 Surgeon General's Report, Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention. Healthy People 2020, the current program, has set nine arthritis objectives for the nation to achieve by 2020, but only limited progress has occurred with the current level of investments in interventions. Currently, four new objectives are being proposed in the Arthritis, Osteoporosis, and Chronic Back Conditions topic area as part of a larger effort to ensure that chronic pain, as a condition separate from the original cause, is included in Healthy People 2020.

There is a need for more conveniently measured outcomes that are important to most people. Such outcomes include effects on work, activities, health-related quality of life, independence, and ability to keep doing valued life activities.

Research funding to develop and evaluate more effective clinical and public health interventions is relatively modest, given that arthritis is the most common cause of disability and is a large and growing problem, affecting 52.5 million adults now, and a projected 67 million by 2030.[2] This is especially frustrating because even the evidence-based interventions we have now are not reaching the people who would benefit from them.

Although most adults with doctor-diagnosed arthritis are younger than 65 years and in the working years, the effect of their arthritis on employment and work, and the effect of reasonable workplace accommodations, have not been explored in depth. This is an urgent issue right now, and will continue to be an urgent issue as an aging workforce keeps working beyond age 65 years, as is anticipated.

1. *Arthritis, Osteoporosis and Chronic Back Conditions*. Accessed at: http://www.healthypeople.gov/2020/data-search/Search-the-Data?&f[0]=fiel.... Accessed December 2, 2014.

2. CDC Arthritis-Related Statistics. http://www.cdc.gov/arthritis/data_statistics/arthritis_related_stats.htm. Accessed November 20, 2014.

ICD-9-CM Codes for Arthritis and Other Rheumatic Conditions

Codes used in this analysis of AORC are based on the National Arthritis Data Workgroup ICD-9-CM diagnostic codes for arthritis and other rheumatic conditions.[1]

Osteoarthritis and Allied Disorders:
- Osteoarthritis and allied disorders: 715

Rheumatoid Arthritis
- Rheumatoid arthritis and other inflammatory polyarthropathies: 714

Gout and Other Crystal Arthropathies:
- Gout: 274
- Crystal arthropathies: 712

Joint Pain, Effusion and Other Unspecified Joint Disorders
- Other unspecified arthropathies: 716.1, 716.3-716.6-716.9
- Other and unspecified joint disorders: 719.0, 719.4-719.9

Spondylarthropathies:
- AS/inflammatory spondylopathies: 720
- Spondylosis and allied disorders: 721
- Reiter’s disease: 99.3
- Psoriatic arthopathy: 696.0

Fibromyalgia:
- Myalgia and myositis unspecified: 729.1

Diffuse Connective Tissue Disease
- Diffuse connective tissue disease: 710 [excl 710.0-.2]
- Sicca syndrome (also called Sjögren's syndrome): 710.2
- Systemic sclerosis (SSC, scleroderma): 710.1
- Systemic lupus erythematosus (SLE): 710.0

Carpal Tunnel Syndrome:
- Carpal tunnel syndrome: 354.0

Soft Tissue Disorders (excluding back):
- Peripheral enthesopathies and allied disorders: 726
- Other disorders of synovium/tendon/bursa: 727
- Disorders of muscle/ligament/fascia: 728.0-728.3, 728.6-728.0
- Rheumatism, unspecified and fibrositis: 729.0
- Fascitis, unspecified: 729.4

Other Specified Rheumatic Conditions:
- Syphilis of muscle: 95.6
- Syphilis of synovium/tendon/bursa: 95.7
- Gonococcal infection of joint: 98.5
- Behcet’s syndrome: 136.1
- Other disorders purine/pyrimidine metabolism: 277.2
- Allergic purpura: 287.0

Cauda equina syndrome: 344.6
Brachial plexus/thoracic outlet lesions:353.0
Tarsal tunnel syndrome: 355.5
Polyneuropathy in collagen vascular disease: 357.1
Rheumatic fever w/o heart disease: 390
Rheumatic fever w/heart disease: 391
Cerebral arteritis: 437.4
Raynaud's syndrome: 443.0
Polyarteritis nodosa and allied conditions: 446 [excl 446.5]
Arteritis, unspecified: 447.6
Arthritis associated with infections: 711
Arthropathy associated w/disorders classified elsewhere: 713
Specified arthropathies: 716.0, 716.2-716.8
Specified joint disorders: 719.2, 719.3
Polymyalgia rheumatica: 725

1. Centers for Disease Control and Prevention, Arthritis Program, National Arthritis Data Workgroup. http://www.cdc.gov/arthritis/data_statistics/pdf/arthritis_codes_2004.pdf. Accessed October 29, 2013.

ICD-9-CM Codes for Juvenile Arthritis

In 2006, the CDC Arthritis Program finalized a case definition for ongoing surveillance of pediatric arthritis and other rheumatologic conditions (SPARC), using the current ICD-9-CM diagnostically based data systems.

Reactive arthritis: 099.3
Behcet's syndrome: 136.1
Gout: 274
Amyloidosis (includes Familial Mediterranean Fever): 277.3
Allergic purpura / Henoch Schonlein purpura: 287.0
Rheumatic fever without heart involvement: 390
Rheumatic fever with heart involvement: 391
Cerebral arteritis: 437.4
Raynaud's syndrome: 443.0
Polyarteritis nodosa and allied conditions: 446
Arteritis, unspecified: 447.6
Erythema Nodosum: 695.2
Psoriatic arthropathy: 696.0
Linear scleroderma / Circumscribed scleroderma / Morphea: 701.0
Diffuse diseases of connective tissue: 710
Arthropathy associated with infections: 711
Crystal arthropathies: 712

Arthropathy associated with other disorders classified elsewhere: 713
Rheumatoid arthritis and other inflammatory polyarthropathies: 714
Osteoarthritis and allied disorders: 715
Other and unspecified arthropathies: 716
Villonodular synovitis: 719.2
Palindromic rheumatism: 719.3
Ankylosing spondylitis and other inflammatory spondylopathies: 720
Tenosynovitis: 727.0
Rheumatism, unspecified and fibrositis: 729. 0
Myalgia and myositis, unspecified: 729.1

Table 4.J: Diagnostic Categories and ICD-9-CM Codes for Arthritis and Other Rheumatic Conditions (AORC)

Osteoarthritis and allied disorders
- 715-Osteoarthritis and allied disorders

Rheumatoid arthritis
- 714-Rheumatoid arthritis and other inflammatory polyarthropathies

Gout and other crystal arthropathies
- 274-Gout
- 712-Crystal arthropathies

Joint pain, effusion and other unspecified joint disorders
- 716.1, .3-.6-.9 - Other unspecified arthropathies
- 719.0, .4-.9-Other and unspecified joint disorders

Spondylarthropathies
- 720-AS/inflammatory spondylopathies
- 721-Spondylosis and allied disorders
- 99.3-Reiter's Disease
- 696.0-Psoriatic arthopathy

Fibromyalgia
- 729.1-Myalgia and myositis unspecified

Diffuse connective tissue disease
- 710-Diffuse connective tissue disease [excl 710.0-.2]
- 710.2-Sicca syndrome (also called Sjögren's syndrome)
- 710.1-Systemic sclerosis (SSC, scleroderma)
- 710.0-Systemic lupus erythematosus (SLE)

Carpal tunnel syndrome
- 354.0-Carpal tunnel syndrome

Soft tissue disorders (excluding back)
- 726-Peripheral enthesopathies and allied disorders
- 727-Other disorders of synovium/tendon/bursa
- 728.0-.3, .6–.9-Disorders of muscle/ligament/fascia
- 729.0-Rheumatism, unspecified and fibrositis
- 729.4-Fascitis, unspecified

Other specified rheumatic conditions
- 95.6-Syphilis of muscle
- 95.7-Syphilis of synovium/tendon/bursa
- 98.5-Gonococcal infection of joint
- 136.1-Behcet's syndrome
- 277.2-Other disorders purine/pyrimidine metabolism
- 287.0-Allergic purpura
- 344.6-Cauda equina syndrome
- 353.0-Brachial plexus/thoracic outlet lesions
- 355.5-Tarsal tunnel syndrome
- 357.1-Polyneuropathy in collagen vascular disease
- 390-Rheumatic fever w/o heart disease
- 391-Rheumatic fever w/heart disease
- 437.4-Cerebral arteritis
- 443.0-Raynaud's syndrome
- 446-Polyarteritis nodosa and allied conditions [excl 446.5]
- 447.6-Arteritis, unspecified
- 711-Arthritis associated with infections
- 713-Arthropathy associated w/disorders classified elsewhere
- 716.0, .2, .8-Specified arthropathies
- 719.2, .3-Specified joint disorders
- 725-Polymyalgia rheumatica

Source: "National Arthritis Data Workgroup ICD-9-CM diagnostic codes for arthritis and other rheumatic conditions." Centers for Disease Control and Prevention, Arthritis Program, National Arthritis Data Workgroup. http://www.cdc.gov/arthritis/data_statistics/arthritis_codes_2004.pdf (October 29,

Table 4.1: Prevalence of Self-Reported Doctor-Diagnosed Arthritis and Arthritis-Attributable Activity Limitations Among Adults Age 18 & Older by Sex and Age, United States, 2010-2012

National Health Interview Survey (NHIS)

Self-Reported Doctor-Diagnosed Arthritis and Arthritis-Attributable Activity Limitation Prevalence

	Doctor-Diagnosed Arthritis in Total Population [1]			Arthritis-Attributable Activity Limitation in Total Population [2]		
	Prevalence (in millions) [3]	Unadjusted Rate per 100 Persons [4]	Adjusted Rate per 100 Persons [5]	Prevalence (in millions) [3]	Unadjusted Rate per 100 Persons [4]	Adjusted Rate per 100 Persons [5]
Sex						
Male	21.4	19.1	18.6	9.0	8.0	7.8
Female	31.1	26.0	23.9	13.7	11.5	10.5
Age						
18-44 years	8.1	7.3	na	3.0	2.7	na
45-64 years	24.6	30.3	na	10.8	13.4	na
65 & Over	20.6	49.7	na	8.8	22.0	na
Race/Ethnicity						
White	40.5	25.9	22.9	16.8	10.8	9.5
Black	5.7	21.3	22.4	2.8	10.5	11.0
Hispanic	4.0	12.1	15.9	2.0	5.9	8.0
Asian	1.2	11.0	12.1	0.5	4.5	5.1
Other races	1.1	27.0	27.9	0.6	16.3	17.0
Total	52.5	22.7	21.4	22.7	9.8	9.2

[1] Responded "yes" when asked: Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?

[2] Responded "yes" when asked: Are you now limited in any way in any of your usual activities because of arthritis or joint symptoms?

[3] Prevalence (in millions) calculated by the Burden of Musculoskeletal Diseases project analyst using the same databases and variables reported by MMWR.

[4] The absolute population burden.

[5] Age-adjusted by direct method to US Census adult population estimate using 2000 U.S. Census estimates for the years 2010-2011, and 2010 U.S. Census estimates for 2012. Describes the relative population burden when comparing groups.

Source: Barbour KE, Helmick CG, Theis KA, et al. Prevalence of Doctor-Diagnosed Arthritis and Arthritis-Attributable Activity Limitation-United States, 2010-2012. *MMWR* 2013:62(44):869-873.

Table 4.2: Health Care Utilization that Included Arthritis and Other Rheumatic Condition (AORC) Diagnoses for Adults Age 18 & Older, United States, 2010

AORC Condition [1]	Inpatient Hospitalizations (in 1,000s) [2]	Ambulatory Care Service Visits (in 1,000s): Physician Visits [3]	Emergency Department Visits [4]	Outpatient Visits [5]	Total Ambulatory Care
Osteoarthritis and allied disorders	3,164.1	18,796.1	1,978.5	965.5	21,740.1
Rheumatoid arthritis	542.7	4,544.8	545.1	156.7	5,246.6
Gout and other crystal arthropathies	873.6	3,849.0	897.0	233.5	4,979.5
Joint pain, effusion and other unspecified joint disorders	1,045.9	28,595.0	4,620.3	2,129.0	35,344.3
Spondylarthropathies	539.9	4,505.8	586.3	354.5	5,446.6
Fibromyalgia	452.5	4,796.0	1,148.5	479.1	6,423.6
Diffuse connective tissue disease (Sjögren's syndrome, SSC, SLE)	283.6	1,848.2	384.4	197.7	2,430.3
Carpal tunnel syndrome	39.4	0.0	88.3	0.0	88.3
Soft tissue disorders (excluding back)	691.9	0.0	1361.2	0.0	1,361.2
Other specified rheumatic conditions	973.2	25,745.4	1,692.3	1,389.0	28,826.7
Total hospitalizations or ambulatory care visits with AORC diagnoses [6]	6,670.7	84,151.5	10,623.9	5,381.3	100,156.7
All Visits	38,590.7	817,302.5	128,970.4	75,829.1	1,022,102.0

AORC Condition [1]	Proportion of Total AORC Visits: Inpatient Hospitalization [2]	Ambulatory Care Service Visits: Physician Visits [3]	Emergency Department Visits [4]	Outpatient Visits [5]	Total Ambulatory Care
Osteoarthritis and allied disorders	47.4%	22.3%	18.6%	17.9%	21.7%
Rheumatoid arthritis	8.1%	5.4%	5.1%	2.9%	5.2%
Gout and other crystal arthropathies	13.1%	4.6%	8.4%	4.3%	5.0%
Joint pain, effusion and other unspecified joint disorders	15.7%	34.0%	43.5%	39.6%	35.3%
Spondylarthropathies	8.1%	5.4%	5.5%	6.6%	5.4%
Fibromyalgia	6.8%	5.7%	10.8%	8.9%	6.4%
Diffuse connective tissue disease (Sjögren's syndrome, SSC, SLE)	4.3%	2.2%	3.6%	3.7%	2.4%
Carpal tunnel syndrome	0.6%	0.0%	0.8%	0.0%	0.1%
Soft tissue disorders (excluding back)	10.4%	0.0%	12.8%	0.0%	1.4%
Other specified rheumatic conditions	14.6%	30.6%	15.9%	25.8%	28.8%
Total hospitalizations or ambulatory care visits with AORC diagnoses [6]	100.0%	100.0%	100.0%	100.0%	100.0%
% of Ambulatory Visits by Service		84.0%	10.6%	5.4%	
Of all hospitalizations or ambulatory care service visits:					
% Having an AORC diagnosis	17.3%	10.3%	8.2%	7.1%	9.8%
% Having an AORC diagnoses presenting (first) diagnosis	1.1%	5.7%	2.6%	3.7%	

* Estimate does not meet standards for reliability.

[1] ICD-9-CM diagnosis codes for AORC listed in Table 4.1.

[2] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp.

[3] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[5] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[6] Total is less than sum of AORC conditions because some had more that one condition listed. Analysis used "any listed" condition, not just the first listed conditions. The NHDS includes up to 15 diagnoses; the NAMCS and NHAMCS include up to three diagnoses.

NOTE: This table and all related graphs created by the Burden of Musculoskeletal Diseases project analyst.

Table 4.3: Number of Hospitalizations and Population Hospitalization Rate for Arthritis and Other Rheumatic Condition (AORC) Diagnoses Among Adults Age 18 & Older, by Sex and Age United States, 2011

	Hospitalizations						
		Sex		Age			
	Total	Male	Female	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
Osteoarthritis and allied disorders (in 1,000s)	3,161.1	1,140.1	2,020.9	87.2	917.6	798.0	1,360.2
Distribution by sex, age (%)		36.1%	63.9%	2.8%	29.0%	25.2%	43.0%
Rate per 100 persons [1]	1.3	1.0	1.7	0.1	1.1	3.7	7.3
Rheumatoid arthritis (in 1,000s)	542.2	134.6	407.5	39.5	174.2	137.7	190.9
Distribution by sex, age (%)		24.8%	75.2%	7.3%	32.1%	25.4%	35.2%
Rate per 100 persons [1]	0.2	0.1	0.3	< 0.1	0.2	0.6	1.0
Gout and other crystal arthropathies (in 1,000s)	873.4	577.3	296.2	33.8	234.7	221.6	383.4
Distribution by sex, age (%)		66.1%	33.9%	3.9%	26.9%	25.4%	43.9%
Rate per 100 persons [1]	0.4	0.5	0.2	< 0.1	0.3	1.0	2.1
Joint pain, effusion and other unspecified joint disorders (in 1,000s)	1,024.2	406.3	617.9	115.1	329.2	211.7	368.4
Distribution by sex, age (%)		39.7%	60.3%	11.2%	32.1%	20.7%	36.0%
Rate per 100 persons [1]	0.4	0.4	0.5	0.1	0.4	1.0	2.0
Spondylarthropathies (in 1,000s)	539.0	239.6	299.4	50.8	204.3	117.5	166.5
Distribution by sex, age (%)		44.5%	55.5%	9.4%	37.9%	21.8%	30.9%
Rate per 100 persons [1]	0.2	0.2	0.2	< 0.1	0.2	0.5	0.9
Fibromyalgia (in 1,000s)	448.8	48.0	400.8	91.5	221.8	81.0	54.6
Distribution by sex, age (%)		10.7%	89.3%	20.4%	49.4%	18.0%	12.2%
Rate per 100 persons [1]	0.2	< 0.1	0.3	0.1	0.3	0.4	0.3
Diffuse connective tissue disease (Sjögren's syndrome, SSC, SLE) (in 1,000s)	283.6	36.2	247.5	78.5	115.3	48.4	41.5
Distribution by sex, age (%)		12.8%	87.3%	27.7%	40.7%	17.1%	14.6%
Rate per 100 persons [1]	0.1	< 0.1	0.2	0.1	0.1	0.2	0.2
Carpal tunnel syndrome (in 1,000s)	39.3	*	*	*	*	*	*
Distribution by sex, age (%)							
Rate per 100 persons [1]	0.0						

Table 4.3: Number of Hospitalizations and Population Hospitalization Rate for Arthritis and Other Rheumatic Condition (AORC) Diagnoses Among Adults Age 18 & Older, by Sex and Age United States, 2011

	Hospitalizations						
		Sex		Age			
	Total	Male	Female	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
Osteoarthritis and allied disorders (in 1,000s)	3,161.1	1,140.1	2,020.9	87.2	917.6	798.0	1,360.2
Distribution by sex, age (%)		36.1%	63.9%	2.8%	29.0%	25.2%	43.0%
Rate per 100 persons [1]	1.3	1.0	1.7	0.1	1.1	3.7	7.3
Rheumatoid arthritis (in 1,000s)	542.2	134.6	407.5	39.5	174.2	137.7	190.9
Distribution by sex, age (%)		24.8%	75.2%	7.3%	32.1%	25.4%	35.2%
Rate per 100 persons [1]	0.2	0.1	0.3	< 0.1	0.2	0.6	1.0
Gout and other crystal arthropathies (in 1,000s)	873.4	577.3	296.2	33.8	234.7	221.6	383.4
Distribution by sex, age (%)		66.1%	33.9%	3.9%	26.9%	25.4%	43.9%
Rate per 100 persons [1]	0.4	0.5	0.2	< 0.1	0.3	1.0	2.1
Joint pain, effusion and other unspecified joint disorders (in 1,000s)	1,024.2	406.3	617.9	115.1	329.2	211.7	368.4
Distribution by sex, age (%)		39.7%	60.3%	11.2%	32.1%	20.7%	36.0%
Rate per 100 persons [1]	0.4	0.4	0.5	0.1	0.4	1.0	2.0
Spondylarthropathies (in 1,000s)	539.0	239.6	299.4	50.8	204.3	117.5	166.5
Distribution by sex, age (%)		44.5%	55.5%	9.4%	37.9%	21.8%	30.9%
Rate per 100 persons [1]	0.2	0.2	0.2	< 0.1	0.2	0.5	0.9
Fibromyalgia (in 1,000s)	448.8	48.0	400.8	91.5	221.8	81.0	54.6
Distribution by sex, age (%)		10.7%	89.3%	20.4%	49.4%	18.0%	12.2%
Rate per 100 persons [1]	0.2	< 0.1	0.3	0.1	0.3	0.4	0.3
Diffuse connective tissue disease (Sjögren's syndrome, SSC, SLE) (in 1,000s)	283.6	36.2	247.5	78.5	115.3	48.4	41.5
Distribution by sex, age (%)		12.8%	87.3%	27.7%	40.7%	17.1%	14.6%
Rate per 100 persons [1]	0.1	< 0.1	0.2	0.1	0.1	0.2	0.2
Carpal tunnel syndrome (in 1,000s)	39.3	*	*	*	*	*	*
Distribution by sex, age (%)							
Rate per 100 persons [1]	0.0						

Table 4.3: Number of Hospitalizations and Population Hospitalization Rate for Arthritis and Other Rheumatic Condition (AORC) Diagnoses Among Adults Age 18 & Older, by Sex and Age United States, 2011

	Hospitalizations						
		Sex		Age			
	Total	Male	Female	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
Soft tissue disorders (excluding back) (in 1,000s)	675.5	348.2	327.4	112.6	237.0	126.1	200.1
Distribution by sex, age (%)		51.5%	48.5%	16.7%	35.1%	18.7%	29.6%
Rate per 100 persons [1]	0.3	0.3	0.3	0.1	0.3	0.6	1.1
Other specified rheumatic conditions (in 1,000s)	947.7	464.2	483.5	166.2	348.2	177.3	256.3
Distribution by sex, age (%)		49.0%	51.0%	17.5%	36.7%	18.7%	27.0%
Rate per 100 persons	0.4	0.4	0.4	0.1	0.4	0.8	6.2
Total AORC Diagnoses (in 1,000s)	6,614.0	2,631.8	3,982.1	582.5	2,135.2	1,502.5	2,396.4
Distribution by sex, age (%)		39.8%	60.2%	8.8%	32.3%	22.7%	36.2%
Rate per 100 persons [1]	2.8	2.3	3.3	0.5	2.6	6.9	12.9
All Hospitalizations	32,896.3	13,294.1	19,570.9	9,385.3	9,694.0	5,374.3	8,442.3
Distribution by sex, age (%)		40.4%	59.5%	28.5%	29.5%	16.3%	25.7%
Rate per 100 persons [1]	14.0	11.6	16.2	8.3	11.9	24.6	45.3

* Estimates do not meet standards for reliability.

[1] Age-adjusted rate by direct method to US Census population estimate for July 1, 2010. Source: United States: 2010 Summary Population and Housing Characteristics, 2010 Census of Population and Housing. Issued January 2013. United States Census Bureau, U. S. Department of Commerce. http://www.census.gov/prod/cen2010/cph-1-1.pdf (September 16, 2013).

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 4.4: Number of Hospitalizations, Average Length of Hospital Stay (LOS), and Hospital Charges [1] for Arthritis and Other Rheumatic Condition (AORC) Diagnoses Among Adults Age 18 & Older, by Sex and Age, United States, 2011

	Hospitalizations						
		Sex		Age			
	Total	Male	Female	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
Osteoarthritis and allied disorders (number in 1,000s)	3,161.1	1,140.1	2,020.9	87.2	917.6	798.0	1,360.2
Mean LOS (days)	4.6	4.5	4.7	4.0	4.2	4.4	5.1
Mean hospital charges (in 000s)	$ 42.62	$ 45.28	$ 41.09	$ 39.59	$ 45.81	$ 46.43	$ 38.43
Total hospital charges (in billions)	$ 134.7	$ 51.6	$ 83.0	$ 3.5	$ 42.0	$ 37.1	$ 52.3
Rheumatoid arthritis (number in 1,000s)	542.2	134.6	407.5	39.5	174.2	137.7	190.9
Mean LOS (days)	5.2	5.2	5.2	4.3	5.0	5.3	5.4
Mean hospital charges (in 000s)	$ 42.59	$ 45.26	$ 41.70	$ 34.57	$ 45.28	$ 46.70	$ 38.86
Total hospital charges (in billions)	$ 23.1	$ 6.1	$ 17.0	$ 1.4	$ 7.9	$ 6.4	$ 7.4
Gout and other crystal arthropathies (number in 1,000s)	873.4	577.3	296.2	33.8	234.7	221.6	383.4
Mean LOS (days)	5.4	5.4	5.5	4.8	5.3	5.4	5.5
134.7/291.0	$ 43.54	$ 45.64	$ 39.48	$ 40.07	$ 46.79	$ 46.98	$ 39.87
Total hospital charges (in billions)	$ 38.0	$ 26.3	$ 11.7	$ 1.4	$ 11.0	$ 10.4	$ 15.3
Joint pain, effusion and other unspecified joint disorders (number in 1,000s)	1,024.2	406.3	617.9	115.1	329.2	211.7	368.4
Mean LOS (days)	5.1	5.2	5.0	4.8	4.9	5.0	5.3
Mean hospital charges (in 000s)	$ 38.55	$ 41.16	$ 36.26	$ 35.35	$ 40.74	$ 42.75	$ 35.18
Total hospital charges (in billions)	$ 39.5	$ 16.7	$ 22.4	$ 4.1	$ 13.4	$ 9.1	$ 13.0
Spondylarthropathies (number in 1,000s)	539.0	239.6	299.4	50.8	204.3	117.5	166.5
Mean LOS (days)	4.6	4.8	4.5	3.7	4.2	4.9	5.3
Mean hospital charges (in 000s)	$ 53.98	$ 58.33	$ 50.49	$ 54.45	$ 58.78	$ 60.14	$ 43.54
Total hospital charges (in billions)	$ 29.1	$ 14.0	$ 15.1	$ 2.8	$ 12.0	$ 7.1	$ 7.2
Fibromyalgia (number in 1,000s)	448.8	48.0	400.8	91.5	221.8	81.0	54.6
Mean LOS (days)	4.6	5.1	4.5	4.3	4.5	4.8	5.0
Mean hospital charges (in 000s)	$ 36.23	$ 39.06	$ 35.88	$ 29.78	$ 37.55	$ 40.04	$ 36.11
Total hospital charges (in billions)	$ 16.3	$ 1.9	$ 14.4	$ 2.7	$ 8.3	$ 3.2	$ 2.0
Diffuse connective tissue disease (Sjögren's syndrome, SSC, SLE) (number in 1,000s)	283.6	36.2	247.5	78.5	115.3	48.4	41.5
Mean LOS (days)	5.6	6.0	5.5	5.3	5.6	5.9	5.7
Mean hospital charges (in 000s)	$ 47.02	$ 54.57	$ 45.84	$ 44.84	$ 49.12	$ 50.04	$ 41.79
Total hospital charges (in billions)	$ 13.3	$ 2.0	$ 11.3	$ 3.5	$ 5.7	$ 2.4	$ 1.7

Table 4.4: Number of Hospitalizations, Average Length of Hospital Stay (LOS), and Hospital Charges [1] for Arthritis and Other Rheumatic Condition (AORC) Diagnoses Among Adults Age 18 & Older, by Sex and Age, United States, 2011

	Hospitalizations						
		Sex		Age			
	Total	Male	Female	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
Carpal tunnel syndrome (number in 1,000s)	39.3	*	*	*	*	*	*
Mean LOS (days)	4.5	*	*	*	*	*	*
Mean hospital charges (in 000s)	$ 41.25	*	*	*	*	*	*
Total hospital charges (in billions)	$ 1.6	*	*	*	*	*	*
Soft tissue disorders (excluding back) (number in 1,000s)	675.5	348.2	327.4	112.6	237.0	126.1	200.1
Mean LOS (days)	6.4	6.7	6.1	6.4	6.8	6.3	6.1
Mean hospital charges (in 000s)	$ 53.50	$ 57.09	$ 49.98	$ 53.62	$ 59.68	$ 56.90	$ 44.00
Total hospital charges (in billions)	$ 36.1	$ 19.9	$ 16.4	$ 6.0	$ 14.1	$ 7.2	$ 8.8
Other specified rheumatic conditions (number in 1,000s)	947.7	464.2	483.5	166.2	348.2	177.3	256.3
Mean LOS (days)	6.4	6.8	6.1	6.3	6.7	6.4	6.2
Mean hospital charges (in 000s)	$ 53.86	$ 57.96	$ 50.09	$ 53.01	$ 58.90	$ 57.48	$ 45.11
Total hospital charges (in billions)	$ 51.0	$ 26.9	$ 24.2	$ 8.8	$ 20.5	$ 10.2	$ 11.6
Total AORC Diagnoses (number in 1,000s)	6,614.0	2,631.8	3,982.1	582.5	2,135.2	1,502.5	2,396.4
Mean LOS (days)	5.0	5.2	4.9	4.9	4.8	5.0	5.3
Mean hospital charges (in 000s)	$ 44.00	$ 47.72	$ 41.49	$ 42.19	$ 47.38	$ 47.75	$ 39.09
Total hospital charges (in billions)	$ 291.0	$ 125.6	$ 165.2	$ 24.6	$ 101.2	$ 71.7	$ 93.7
All Hospitalizations (number in 1,000s)	32,896.3	13,294.1	19,570.9	9,385.3	9,694.0	5,374.3	8,442.3
Mean LOS (days)	4.8	5.2	4.5	3.6	5.0	5.2	5.4
Mean hospital charges (in 000s)	$ 38.46	$ 44.90	$ 34.08	$ 25.88	$ 44.57	$ 47.56	$ 39.60
Total hospital charges (in billions)	$ 1,265.2	$ 596.9	$ 667.0	$ 242.9	$ 432.1	$ 255.6	$ 334.3
Proportion Total Hospital Charges Attributed to AORC Hospital Stays	23%	21%	25%	10%	23%	28%	28%

* Estimates do not meet standards for reliability.

[1] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges. Medicare requires a bundled bill for Medicare patients admitted to the hospital through the emergency department; other payers may or may not have similar requirements.

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-

Table 4.5: Number of Hospitalizations and Discharge Status Following Hospital Stay that Included Arthritis and Other Rheumatic Condition (AORC) Diagnoses for Adults Age 18 & Older, by Sex and Age, United States, 2011

		Sex		Age			
	Total	Male	Female	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
Osteoarthritis and allied disorders (number in 1,000s)	3,161.1	1,140.1	2,020.9	87.2	917.6	798.0	1,360.2
Routine/discharge home	43%	47%	41%	71%	55%	45%	33%
Discharge/transferred to short-term facility	2%	2%	2%	1%	2%	2%	2%
Transferred to skilled nursing/intermediate care	29%	23%	32%	8%	15%	25%	42%
Home health care	24%	25%	24%	19%	28%	27%	21%
Other discharge status	2%	2%	2%	2%	1%	1%	3%
Rheumatoid arthritis (number in 1,000s)	542.2	134.6	407.5	39.5	174.2	137.7	190.9
Routine/discharge home	53%	56%	51%	81%	66%	52%	35%
Discharge/transferred to short-term facility	2%	3%	2%	2%	2%	3%	2%
Discharge/transferred to long-term care institution	24%	20%	25%	4%	12%	23%	38%
Home health care	19%	18%	19%	10%	17%	20%	20%
Other discharge status	3%	4%	3%	3%	2%	3%	4%
Gout and other crystal arthropathies (number in 1,000s)	873.4	577.3	296.2	33.8	234.7	221.6	383.4
Routine/discharge home	54%	58%	45%	81%	69%	57%	39%
Discharge/transferred to short-term facility	3%	3%	2%	2%	3%	3%	2%
Discharge/transferred to long-term care institution	23%	19%	29%	5%	10%	19%	34%
Home health care	19%	18%	21%	9%	15%	19%	21%
Other discharge status	3%	3%	2%	2%	2%	2%	3%
Joint pain, effusion and other unspecified joint disorders (number in 1,000s)	1,024.2	406.3	617.9	115.1	329.2	211.7	368.4
Routine/discharge home	57%	61%	55%	83%	71%	57%	37%
Discharge/transferred to short-term facility	2%	3%	2%	2%	2%	2%	2%
Discharge/transferred to long-term care institution	22%	19%	24%	5%	10%	20%	39%
Home health care	17%	16%	17%	8%	15%	19%	20%
Other discharge status	2%	2%	2%	3%	2%	2%	2%

Table 4.5: Number of Hospitalizations and Discharge Status Following Hospital Stay that Included Arthritis and Other Rheumatic Condition (AORC) Diagnoses for Adults Age 18 & Older, by Sex and Age, United States, 2011

		Sex		Age			
	Total	Male	Female	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
Spondylarthropathies (number in 1,000s)	539.0	239.6	299.4	50.8	204.3	117.5	166.5
Routine/discharge home	60%	63%	58%	86%	75%	58%	35%
Discharge/transferred to short-term facility	2%	2%	1%	1%	2%	2%	2%
Discharge/transferred to long-term care institution	22%	19%	24%	4%	10%	22%	42%
Home health care	15%	14%	16%	7%	12%	17%	20%
Other discharge status	2%	2%	1%	1%	1%	1%	1%
Fibromyalgia (number in 1,000s)	448.8	48.0	400.8	91.5	221.8	81.0	54.6
Routine/discharge home	69%	72%	69%	85%	73%	59%	42%
Discharge/transferred to short-term facility	2%	3%	2%	2%	2%	2%	2%
Discharge/transferred to long-term care institution	13%	12%	14%	4%	9%	20%	35%
Home health care	14%	11%	14%	6%	14%	18%	19%
Other discharge status	2%	3%	1%	2%	2%	1%	2%
Diffuse connective tissue disease (Sjögren's syndrome, SSC, SLE) (number in 1,000s)	283.6	36.2	247.5	78.5	115.3	48.4	41.5
Routine/discharge home	64%	53%	65%	81%	68%	53%	38%
Discharge/transferred to short-term facility	3%	3%	2%	3%	3%	3%	2%
Discharge/transferred to long-term care institution	14%	14%	15%	5%	11%	21%	34%
Home health care	15%	15%	15%	9%	16%	20%	21%
Other discharge status	3%	15%	3%	3%	3%	3%	5%
Soft tissue disorders (excluding back) (number in 1,000s)	675.5	348.2	327.4	112.6	237.0	126.1	200.1
Routine/discharge home	47%	51%	44%	72%	58%	42%	25%
Discharge/transferred to short-term facility	3%	3%	2%	3%	3%	3%	2%
Discharge/transferred to long-term care institution	28%	25%	32%	10%	18%	31%	50%
Home health care	17%	16%	19%	10%	17%	21%	19%
Other discharge status	4%	5%	3%	5%	4%	4%	4%
Other specified rheumatic conditions (number in 1,000s)	947.7	464.2	483.5	166.2	348.2	177.3	256.3
Routine/discharge home	49%	51%	47%	72%	58%	42%	26%
Discharge/transferred to short-term facility	3%	3%	2%	3%	3%	3%	2%
Discharge/transferred to long-term care institution	27%	24%	29%	9%	17%	30%	48%
Home health care	18%	17%	19%	11%	18%	21%	19%
Other discharge status	4%	5%	3%	4%	4%	3%	4%

Table 4.5: Number of Hospitalizations and Discharge Status Following Hospital Stay that Included Arthritis and Other Rheumatic Condition (AORC) Diagnoses for Adults Age 18 & Older, by Sex and Age, United States, 2011

		Sex		Age			
	Total	Male	Female	18 to 44 Years	45 to 64 Years	65 to 74 Years	75 & Older
Total AORC Diagnoses (number in 1,000s)	6,614.0	2,631.8	3,982.1	582.5	2,135.2	1,502.5	2,396.4
Routine/discharge home	52%	55%	50%	79%	64%	50%	35%
Discharge/transferred to short-term facility	2%	3%	2%	2%	2%	2%	2%
Discharge/transferred to long-term care institution	24%	21%	27%	6%	13%	23%	40%
Home health care	20%	19%	20%	10%	20%	23%	20%
Other discharge status	2%	3%	2%	3%	2%	2%	3%
All Hospitalizations (number in 1,000s)	32,896.3	13,294.1	19,570.9	9,385.3	9,694.0	5,374.3	8,442.3
Routine/discharge home	66%	63%	68%	90%	72%	57%	38%
Discharge/transferred to short-term facility	2%	3%	2%	1%	3%	3%	2%
Discharge/transferred to long-term care institution	16%	16%	16%	3%	10%	19%	36%
Home health care	12%	13%	12%	4%	12%	17%	19%
Other discharge status	3%	4%	2%	2%	3%	3%	5%

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 4.6.1: Limitations of Daily Living and Activity Attributed to Arthritis by Persons with Self-Reported Doctor-Diagnosed Arthritis, Adults Age 18 and Older, by Sex, United States 2010-2012

Limitations	Adults with Self-Reported Doctor-Diagnosed Arthritis [1] Who Attribute Limitations to Arthritis [2]					
	Male (in 1,000s)	Rate Per 100 Population [3]	Female (in 1,000s)	Rate Per 100 Population [3]	Total (in 1,000s)	Rate Per 100 Population [3]
Any limitation	2,412.1	2.1	5,153.7	4.3	7,565.9	3.2
Need help with routine needs	593.7	0.5	1,991.5	1.6	2,585.2	1.1
Help with personal care	328.7	0.3	971.9	0.8	1,300.6	0.6
Difficulty walking without equipment	1,265.4	1.1	3,960.8	3.3	4,226.2	1.8
Unable to work NOW due to health [4]	1,215.4	1.1	2,623.0	2.2	3,838.3	1.6
Limited in kind or amount of work	685.4	0.6	1,375.9	1.1	2,061.3	0.9
	Adults with Any Medical Condition (5) Reporting Limitations for All Causes					
	Male (in 000s)	Rate Per 100 Population [3]	Female (in 1,000s)	Rate Per 100 Population [3]	Total (in 1,000s)	Rate Per 100 Population [3]
Any limitation	19,740.8	17.3	21,084.3	17.4	40,825.1	17.4
Need help with routine needs	3,446.1	3.0	6,075.6	5.0	9,521.7	4.0
Help with personal care	2,224.0	1.9	3,167.3	2.6	5,391.3	2.3
Difficulty walking without equipment	5,269.2	4.6	7,867.0	6.5	13,136.2	5.6
Unable to work NOW due to health [4]	8,056.9	7.1	9,561.9	7.9	17,617.8	7.5
Limited in kind or amount of work	4,543.1	4.0	5,219.9	4.3	9,763.0	4.2
	Proportion of Adults With Limitations Due to Self-Reported Doctor-Diagnosed Arthritis					
		Male		Female		Total
Any limitation		12%		24%		19%
Need help with routine needs		17%		33%		27%
Help with personal care		15%		31%		24%
Difficulty walking without equipment		24%		50%		32%
Unable to work NOW due to health [4]		15%		27%		22%
Limited in kind or amount of work		15%		26%		21%

[1] Responded "yes" when asked: Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?

[2] Responded "arthritis/rheumatism" when asked: What conditions or health problems cause limitations?

[3] Based on U.S. Census of Population estimate for July 1, 2010, for sex group.

[4] Adjusted to working age population age 18 and older.

(5) Responded "yes" when asked if have a medical condition, including circulatory (coronary, heart), respiratory, musculoskeletal, hearing trouble, seeing trouble, emotional disorder, mental health disorder, diabetes, cancer, recurring severe headaches, cognitive function issue, or sleeping issue. Respondents may indicate more than one medical condition.

Source: National Health Interview Survey (NHIS)_Adult sample, 2010-2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 4.6.2: Limitations Due to Self-Reported Doctor-Diagnosed Arthritis and Arthritis-Attributed Activity Limitations Among Adults Age 18 and Older, by Age, United States 2010-2012

	Adults Reporting Limitation Due to Self-Reported Doctor-Diagnosed Arthritis [1]									
	18-44 (in 1,000s)	Rate Per 100 Population [2]	45-64 (in 1,000s)	Rate Per 100 Population [2]	65-74 (in 1,000s)	Rate Per 100 Population [2]	75 & over (in 1,000s)	Rate Per 100 Population [2]	Total (in 1,000s)	Rate Per 100 Population [2]
Any limitation	472.8	0.4	3,040.3	3.7	1,625.1	7.4	2,427.7	13.0	7,565.9	3.2
Need help with routine needs	148.8	0.1	858.9	1.1	446.9	2.0	1,130.6	6.1	2,585.2	1.1
Help with personal care	69.4	0.1	411.0	0.5	206.6	0.9	613.7	3.3	1,300.6	0.6
Difficulty walking without equipment	170.8	0.2	1,398.4	1.7	889.9	4.1	1,767.1	9.5	4,226.2	1.8
Unable to work NOW due to health [3]	273.8	0.2	1,979.4	2.4	649.5	3.0	935.7	5.0	3,838.3	1.6
Limited in kind or amount of work	141.5	0.1	695.1	0.9	546.5	2.5	678.2	3.6	2,061.3	0.9

	Adults Reporting Limitation Due to Any Medical Condition (4)									
	18-44 (in 1,000s)	Rate Per 100 Population [2]	45-64 (in 1,000s)	Rate Per 100 Population [2]	65-74 (in 1,000s)	Rate Per 100 Population [2]	75 & over (in 1,000s)	Rate Per 100 Population [2]	Total (in 1,000s)	Rate Per 100 Population [2]
Any limitation	6,649.1	5.9	14,240.4	17.4	5,858.7	26.8	7,802.3	41.9	40,825.1	17.4
Need help with routine needs	1,567.1	1.4	2,999.9	3.7	1,422.3	6.5	3,532.4	19.0	9,521.7	4.0
Help with personal care	710.5	0.6	1,548.9	1.9	773.5	3.5	1,893.5	10.2	5,391.3	2.3
Difficulty walking without equipment	1,139.7	1.0	4,498.1	5.5	2,387.6	10.9	4,905.2	26.3	13,136.2	5.6
Unable to work NOW due to health [3]	3,618.8	3.2	8,699.4	10.6	2,510.4	11.5	2,789.2	15.0	17,617.8	7.5
Limited in kind or amount of work	1,967.5	1.7	3,663.5	4.5	1,951.7	8.9	2,180.3	11.7	9,763.0	4.2

	Proportion of Adults With Limitations Due to Self-Reported Doctor-Diagnosed Arthritis				
	18-44	45-64	65-74	75 & over	Total
Any limitation	7%	21%	28%	31%	19%
Need help with routine needs	9%	29%	31%	32%	27%
Help with personal care	10%	27%	27%	32%	24%
Difficulty walking without equipment	15%	31%	37%	36%	32%
Unable to work NOW due to health [3]	8%	23%	26%	34%	22%
Limited in kind or amount of work	7%	19%	28%	31%	21%

[1] Responded "yes" when asked: Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?

[2] Based on U.S. Census of Population estimate for July 1, 2010, for age group.

[3] Adjusted to working age population aged 18 and older.

(4) Responded "yes" when asked if have a medical condition, including circulatory (coronary, heart), respiratory, musculoskeletal, hearing trouble, seeing trouble, emotional disorder, mental health disorder, diabetes, cancer, recurring severe headaches, cognitive function issue, or sleeping issue. Respondents may indicate more than one medical condition.

Source: National Health Interview Survey (NHIS)_Adult sample, 2010-2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 4.6.3: Limitations Due to Self-Reported Doctor-Diagnosed Arthritis and Arthritis-Attributed Activity Limitations Among Adults Age 18 and Older, by Race, United States 2010-20126

Adults Reporting Limitation Due to Self-Reported Doctor-Diagnosed Arthritis [1]

	White (in 1,000s)	Rate Per 100 Population [2]	Black (in 1,000s)	Rate Per 100 Population [2]	Asian (in 000s)	Rate Per 100 Population [2]	Other or Mixed (in 000s)	Rate Per 100 Population [2]	Total (in 1,000s)	Rate Per 100 Population [2]
Any limitation	6,035.0	3.3	1,233.5	4.5	172.0	2.7	125.4	1.1	7,565.9	3.2
Need help with routine needs	2,014.0	1.1	447.6	1.6	79.6	1.3	44.0	0.4	2,585.2	1.1
Help with personal care	979.0	0.5	249.4	0.9	48.8	0.8	23.5	0.2	1,300.6	0.6
Difficulty walking without equipment	3,275.4	1.8	785.4	2.8	96.1	1.5	69.2	0.6	4,226.2	1.8
Unable to work NOW due to health [3]	2,952.5	1.6	727.2	2.6	80.3	1.3	78.4	0.7	3,838.3	1.6
Limited in kind or amount of work	1,732.5	1.0	260.0	0.9	41.2	0.7	28.6	0.3	2,061.3	0.9

Adults Reporting Limitation Due to Any Medical Condition (4)

	White (in 000s)	Rate Per 100 Population [2]	Black (in 1,000s)	Rate Per 100 Population [2]	Asian (in 1,000s)	Rate Per 100 Population [2]	Other or Mixed (in 1,000s)	Rate Per 100 Population [2]	Total (in 1,000s)	Rate Per 100 Population [2]
Any limitation	32,987.6	18.2	6,017.0	21.8	1,107.2	17.6	713.3	6.3	40,825.1	17.4
Need help with routine needs	7,587.8	4.2	1,444.3	5.2	332.8	5.3	156.9	1.4	9,521.7	4.0
Help with personal care	4,176.4	2.3	930.3	3.4	209.7	3.3	74.9	0.7	5,391.3	2.3
Difficulty walking without equipment	10,441.0	5.8	2,159.8	7.8	361.2	5.7	174.2	1.5	13,136.2	5.6
Unable to work NOW due to health [3]	13,941.3	7.7	2,937.4	10.7	430.9	6.8	308.2	2.7	17,617.8	7.5
Limited in kind or amount of work	8,226.4	4.5	1,165.1	4.2	244.8	3.9	126.7	1.1	9,763.0	4.2

Proportion of Adults With Limitations Due to Self-Reported Doctor-Diagnosed Arthritis

	White	Black	Asian	Other or Mixed	Total
Any limitation	18%	21%	16%	18%	19%
Need help with routine needs	27%	31%	24%	28%	27%
Help with personal care	23%	27%	23%	31%	24%
Difficulty walking without equipment	31%	36%	27%	40%	32%
Unable to work NOW due to health [3]	21%	25%	19%	25%	22%
Limited in kind or amount of work	21%	22%	17%	23%	21%

[1] Responded "yes" when asked: Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?

[2] Based on U.S. Census of Population estimate for July 1, 2010, for racial group.

[3] Adjusted to working age population aged 18 and older.

(4) Responded "yes" when asked if have a medical condition, including circulatory (coronary, heart), respiratory, musculoskeletal, hearing trouble, seeing trouble, emotional disorder, mental health disorder, diabetes, cancer, recurring severe headaches, cognitive function issue, or sleeping issue. Respondents may indicate more than one medical condition.

Source: National Health Interview Survey (NHIS)_Adult sample, 2010-2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 4.7: Bed and Lost Work Days Associated with Self-Reported Doctor-Diagnosed Arthritis and With Any Medical Conditions for Adults Age 18 and Over, by Sex, United States 2012

	Condition		Bed Days				Lost Work Days			
	All Adults Aged 18 and Over		All Adults Aged 18 and Over				Adults in Workforce Past 12 Months			
	Adults with Reported Condition [1] (in 000s)	% Total Population [3]	Adults with Bed Days [4] (in 000s)	% of Total Population	Average Number Bed Days in Past 12 Months	Total Bed Days (in millions)	Adults with Lost Work Days [5] (in 000s)	% of Total Population	Average Number Work Days Lost in Past 12 Months	Total Lost Work Days (in millions)
Adults With Self-Reported Doctor-Diagnosed Arthritis [1]										
Sex										
Male	21,426	18.8%	8,101	7.1%	21.2	171.7	4,973	4.4%	14.1	70.1
Female	31,094	25.7%	14,301	11.8%	25.7	367.5	7,063	5.8%	14.4	101.7
Total	52,520	22.3%	22,402	9.5%	24.0	537.6	12,036	5.1%	14.3	172.1
Age										
18 to 44 Years	8,084	7.2%	4,485	4.0%	23.7	106.3	3,364	3.0%	12.7	42.7
45 to 64 Years	24,566	30.0%	11,704	14.3%	23.8	278.6	7,651	9.4%	14.6	111.7
65 to 74 Years	10,648	48.7%	3,522	16.1%	22.2	78.2	862	3.9%	17.0	14.7
75 Years & Older	9,222	49.5%	2,691	14.5%	28.1	75.6	159	0.9%	16.6	2.6
Total	52,520	22.3%	22,402	9.5%	24.0	537.6	12,036	5.1%	14.3	172.1
Adults Reporting Any Medical Condition [2]										
Sex										
Male	83,801	73.4%	28,968	25.4%	13.1	378.3	24,846	21.8%	10.0	248.5
Female	96,008	79.3%	40,837	33.7%	15.6	636.6	28,328	23.4%	9.8	277.6
Total	179,809	76.4%	69,805	29.7%	14.5	1,015.0	53,174	22.6%	9.9	526.4
Age										
18 to 44 Years	73,851	65.4%	32,560	28.8%	9.9	322.3	29,431	26.1%	7.9	232.5
45 to 64 Years	68,318	83.5%	26,792	32.8%	17.4	465.4	21,809	26.7%	12.1	263.9
65 to 74 Years	20,757	95.0%	6,035	27.6%	18.1	109.4	1,676	7.7%	14.3	24.0
75 Years & Older	16,883	90.7%	4,419	23.7%	26.7	117.8	258	1.4%	17.7	4.6
Total	179,809	76.4%	69,805	29.7%	14.5	1,015.0	53,174	22.6%	9.9	526.4

Table 4.7: Bed and Lost Work Days Associated with Self-Reported Doctor-Diagnosed Arthritis and With Any Medical Conditions for Adults Age 18 and Over, by Sex, United States 2012

[1] Responded "yes" when asked: Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?

[2] Responded "yes" when asked if have a medical condition, including circulatory (coronary, heart), respiratory, musculoskeletal, hearing trouble, seeing trouble, emotional disorder, mental health disorder, diabetes, cancer, recurring severe headaches, cognitive function issue, or sleeping issue. Respondents may indicate more than one medical condition.

[3] Age-adjusted by direct method to US Census population estimate for July 1, 2010. Source: United States: 2010 Summary Population and Housing Characteristics, 2010 Census of Population and Housing. Issued January 2013. United States Census Bureau, U. S. Department of Commerce. http://www.census.gov/prod/cen2010/cph-1-1.pdf (September 16, 2013).

[4] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[5] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

Source: National Health Interview Survey (NHIS)_Adult sample,2010- 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 4.8: Selected Life Style Factors and Prevalence of Arthritis and Arthritis-attributable Activity Limitations (AAAL) among Adults Age 18 and Over, United States, 2010-2012

Selected Life Style Factor	Prevalence of Doctor-diagnosed Arthritis (DDA)		Prevalence of Arthritis-attributable Activity Limitations (AAAL)		Proportion of AAAL Among Adults with DDA	
	Rate per 100 adults		Rate per 100 adults		Proportion	
	Unadjusted	Adjusted {1}	Unadjusted	Adjusted {1}	Unadjusted	Adjusted {1}
BMI [2]						
Under/Normal weight	15.9	16.3	6.3	6.5	39.8%	38.2%
Overweight	22.6	20.3	8.8	7.9	38.9%	37.2%
Obese	31.2	28.9	15.2	14.0	48.6%	44.8%
Physical activity [3]						
Meeting recommendations	17.4	18.6	5.3	5.6	30.2%	29.3%
Insufficient activity	25.3	23.3	10.3	9.4	40.6%	38.9%
Inactive	28.9	24.0	16.3	13.5	56.5%	54.8%
Self-rated health						
Very good/excellent	14.4	15.8	3.4	3.7	23.5%	22.3%
Good	28.0	24.4	11.6	10.0	41.3%	39.9%
Fair/Poor	50.1	40.7	35.9	28.8	71.8%	69.8%
Total Population (Overall)	22.7	21.4	9.8	9.2	43.2%	40.7%

[1] Age adjusted to the standard 2000 U.S. projected adult population.

[2] BMI self-reported weight (kg)/(height [m])^2. Categorized as: underweight/normal weight (<25.0), overweight (25.0 to <30.0), obese (≥30.0).

[3] Determined from responses to six questions regarding frequency and duration of participation in leisure-time activities of moderate or vigorous intensity and categorized according to the U.S. Department of Health and Human Services *2008 Physical Activity Guidelines for Americans* . Total minutes (moderate to vigorous) of physical activity per week were categorized as follows: meeting recommendations (≥ 150 minutes per week), insufficient activity (1-149 minutes), and inactive (0 minutes).

Source: Barbour KE, Helmick CG, Theis KA, et al. Prevalence of Doctor-Diagnosed Arthritis and Arthritis-Attributable Activity Limitation-United States, 2010-2012. *MMWR* 2013:62(44):869-873.

Table 4.9: Number of Inpatient Arthroplasty Procedures by Type, by Sex, United States, 2010/2011

	Male		Female		All Persons	% of Total Procedures (column %)	
	Number of Procedures on Males	% of Total Procedures on Males	Number of Procedures on Females	% of Total Procedures on Females	Total Number of Procedures	All Joint Replacement Procedures [8]	All Medical Procedures Performed on Hospital Discharge Patients
National Hospital Discharge Survey, 2010							
All Hip Replacement Procedures [1]	221,974	36.9%	290,579	63.1%	512,553	37.4%	1.3%
Total Hip Replacement	149,868	46.0%	176,268	54.0%	326,136	23.8%	0.8%
Partial Hip Replacement [2]	46,755	34.7%	88,079	65.3%	134,834	9.8%	0.3%
Revision Hip Replacement	22,276	46.9%	25,229	53.1%	47,505	3.5%	0.1%
All Knee Replacement Procedures [3]	279,393	36.9%	477,906	63.1%	757,299	55.3%	1.9%
Total Knee Replacement	261,584	37.7%	431,836	62.3%	693,420	50.6%	1.8%
Revision Knee Replacement	19,005	29.2%	46,172	70.8%	65,177	4.8%	0.2%
All Shoulder Replacement Procedures [4]	31,923	42.2%	43,803	57.8%	75,726	5.5%	0.2%
All Other Joint Replacement Procedures [5]	8,428	34.2%	16,222	65.8%	24,650	1.8%	< 0.1%
All Joint Replacement Procedures [6]	541,718	39.5%	828,510	60.5%	1,370,228	100.0%	3.5%

Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

	Male		Female		All Persons	% of Total Procedures (column %)	
National Inpatient Sample, 2011							
All Hip Replacement Procedures [1]	190,663	40.9%	274,943	59.1%	465,606	37.0%	1.2%
Total Hip Replacement	135,018	44.2%	170,756	55.8%	305,774	24.3%	0.8%
Partial Hip Replacement [2]	30,487	28.9%	74,975	71.1%	105,462	8.4%	0.3%
Revision Hip Replacement	21,521	42.6%	29,004	57.4%	50,525	4.0%	0.1%
All Knee Replacement Procedures [3]	267,476	37.9%	438,173	62.1%	705,649	56.1%	1.8%
Total Knee Replacement	241,892	37.6%	401,840	62.4%	643,732	51.2%	1.7%
Revision Knee Replacement	25,878	41.4%	36,682	58.6%	62,560	5.0%	0.2%
All Shoulder Replacement Procedures [4]	28,240	42.2%	38,755	57.8%	66,995	5.3%	0.2%
All Other Joint Replacement Procedures [5]	8,973	46.4%	10,380	53.6%	19,353	1.5%	< 0.1%
All Joint Replacement Procedures [6]	495,352	39.4%	762,251	60.6%	1,257,603		3.3%

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[1] Includes ICD-9-CM procedure codes for total, partial, revision, and hip repair procedures.

[2] An unknown error in the partial hip replacement data occurred in the NHDS 2010 data file. A correction for total partial hip cases was made by excluding cases with diagnosis of spine (720 724, 737, 756, 805, 806).

[3] Includes ICD-9-CM procedure codes for total, revision, and knee repair procedures.

[4] Includes ICD-9-CM procedure codes for primary and revision shoulder arthroplasty.

[5] Includes ICD-9-CM procedure codes spine, finger, wrist, hand, elbow, toe, foot, ankle, and lower extremity.

[6] Includes ICD-9-CM procedure codes for all above procedures and may include cases with multiple procedures.

Table 4.10: Trends in Hip and Knee Joint Replacement Procedures, All Ages, in the United States, 1992-2011

National Hospital Discharge Survey, 1992- 2010

		Joint Replacement Procedures (in 000s)									
Description	**ICD-9 CM Code**	**1992**	**1994**	**1996**	**1998**	**2000**	**2002**	**2004**	**2006**	**2008**	**2010**
All Hip Replacement Procedures											
Total Hip Replacement	81.51	127.0	124.0	138.0	160.0	152.0	193.0	234.0	230.1	262.7	326.1
Partial Hip Replacement [1]	81.52	88.0	93.0	103.0	112.0	106.0	108.8	119.7	138.5	132.4	134.8
Revision of Hip Replacement [2,3]	81.53, 00.70, 00.71, 00.72, 00.73	23.0	28.0	30.0	33.0	31.0	42.7	46.0	144.0	36.6	47.5
Ratio Hip Revision to Primary		18.1%	22.6%	21.7%	20.6%	20.4%	22.1%	19.7%	62.6%	13.9%	14.6%
All Knee Replacement Procedures											
Total Knee Replacement	81.54	167.0	209.0	245.0	266.0	299.0	381.3	478.0	516.4	609.1	693.4
Revision of Knee Replacement [3]	81.55,00.80, 00.81,00.82, 00.83,00.84	13.0	19.0	20.0	23.0	28.0	35.1	40.0	35.3	43.0	65.2
Ratio Knee Revision to Primary		7.8%	9.1%	8.2%	8.6%	9.4%	9.2%	8.4%	6.8%	7.1%	9.4%
TOTAL Hip and Knee Replacement/ Revision Procedures		418.0	473.0	536.0	594.0	616.0	760.8	917.7	954.1	1,083.8	1,267.0

Source: National Hospital Discharge Survey (NHDS), 1991-2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

Table 4.10: Trends in Hip and Knee Joint Replacement Procedures, All Ages, in the United States, 1992-2011

National Hospital Discharge Survey, 1992- 2010

Description	ICD-9 CM Code	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010
		Joint Replacement Procedures (in 000s)									

Nationwide Inpatient Sample, 1992-2011

Description	ICD-9 CM Code	1992	1994	1996	1998	2000	2002	2004	2007	2011
		Joint Replacement Procedures (in 000s)								
All Hip Replacement Procedures										
Total Hip Replacement	81.51	139.9	148.2	157.0	166.7	176.1	187.7	227.5	252.7	306.6
Partial Hip Replacement	81.52	97.9	100.8	103.5	105.8	107.4	109.9	105.1	103.7	105.5
Revision of Hip Replacement [2,3]	81.53, 00.70, 00.71, 00.72, 00.73	28.3	29.9	31.7	33.5	35.2	37.2	37.9	164.0	50.6
Ratio Hip Revision to Primary		20.2%	20.2%	20.2%	20.1%	20.0%	19.8%	16.7%	64.9%	16.5%
All Knee Replacement Procedures										
Total Knee Replacement	81.54	203.6	227.9	255.1	286.6	321.8	365.3	435.5	551.3	645.1
Revision of Knee Replacement [3]	81.55,00.80, 00.81,00.82, 00.83,00.84	17.5	19.5	21.9	24.6	27.6	31.2	36.2	45.0	62.6
Ratio Knee Revision to Primary		8.6%	8.6%	8.6%	8.6%	8.6%	8.5%	8.3%	8.2%	9.7%
TOTAL Hip and Knee Replacement/ Revision Procedures		487.2	526.3	569.2	617.2	668.1	731.3	842.2	999.5	1,170.4

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 1991-2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[1] An unknown error in the partial hip replacement data occurred in the NHDS 2010 data file. A correction for total partial hip cases was made by excluding cases with diagnosis of spine (720 724, 737, 756, 805, 806).

[2] A significant jump in the number of hip revision procedures was found between the 2004 and the 2006/2007 data. The increase was similar in both the NHDS and NIS data sets, indicating the increase may have occurred; however, the 2010/2011 data indicates it was an error.

[3] In 2006, additional codes were added to hip and knee revision replacement procedures to identify specific parts being revised.

Table 4.11: Principal Diagnoses [1] Associated with Hip and Knee Joint Replacement, United States 2010/2011

Principal Diagnosis	Proportion of Total Replacement Procedures		
National Hospital Discharge Survey, 2010	Total Hip Replacement [2]	Partial Hip Replacement [3,5]	Total Knee Replacement [4]
Osteoarthritis, Primary and Secondary	82.8%	1.0%	94.8%
Fracture of Neck of Femur, Femur or Lower Leg, Including Pathological Fracture and Non-union of Fracture	5.3%	66.5%	<0.1%
Infection	6.0%	1.0%	0.1%
Other or Unspecified Arthropathy (joint disease)	2.2%	0.0%	0.9%
Complications of internal orthopedic device	1.0%	6.9%	0.5%
Rheumatoid Arthritis	0.1%	0.0%	0.7%
Congenital or acquired deformities, Including Spondylolysis/Spondylolisthesis	0.1%	19.9%	0.0%
All Other	2.5%	4.7%	3.0%
Total Procedures (in 000s)	326.1	134.8	693.4

Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

	Proportion of Total Replacement Procedures		
Nationwide Inpatient Sample, 2011	Total Hip Replacement [2]	Partial Hip Replacement [3,5]	Total Knee Replacement [4]
Osteoarthritis, Primary and Secondary	85.3%	0.7%	97.3%
Fracture of Neck of Femur, Femur or Lower Leg, Including Pathological Fracture and Non-union of Fracture	4.8%	91.9%	0.1%
Infection	6.3%	0.5%	0.0%
Other or Unspecified Arthropathy (joint disease)	1.2%	<0.1%	1.4%
Complications of internal orthopedic device	0.9%	1.5%	0.2%
Rheumatoid Arthritis	0.4%	0.0%	0.5%
Congenital or acquired deformities, Including Spondylolysis/Spondylolisthesis	0.5%	<0.1%	0.1%
All Other	100.0%	100.0%	100.0%
Total Procedures (in 000s)	306.6	105.5	645.1

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[1] Based on first diagnosis code recorded for visit.

[2] ICD-9-CM procedure code 8151. [3] ICD-9-CM procedure code 8152. [4] ICD-9-CM procedure code 8154.

[5] An unknown error in the partial hip replacement data occurred in the NHDS 2010 data file. A correction for total partial hip cases was made by excluding cases with diagnosis of spine (720 724, 737, 756, 805, 806).

Table 4.12: Mean Age of Patients for Joint Replacement Procedures By Type, United States 1992-2010

	Mean Age of Joint Replacement Patients										
	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	18-Year Average
Hip Replacements											
Total Hip Replacement [1]	67.0	66.6	67.6	67.7	65.6	66.7	65.9	65.2	65.1	65.0	66.2
Partial Hip Replacement [2,6]	76.7	79.7	78.6	79.5	78.9	79.9	74.8	75.6	73.0	73.0	77.0
Revision Hip Replacement [3]	68.1	63.6	65.9	68.9	66.2	68.4	68.4	66.7	71.7	68.8	67.7
Knee Replacements											
Total Knee Replacement [4]	69.6	69.1	69.4	68.4	68.3	67.6	67.2	67.1	66.5	65.4	67.9
Revision Knee Replacement [5]	68.7	68.5	67.8	70.3	67.7	69.7	67.0	64.2	65.1	65.5	67.5

[1] ICD-9-CM procedure code 81.51.

[2] ICD-9-CM procedure code 81.52.

[3] ICD-9-CM procedure code 81.53, 00.70-00.73.

[4] ICD-9-CM procedure code 81.54.

[5] ICD-9-CM procedure code 81.55, 00.80-00.84.

[6] An unknown error in the partial hip replacement data occurred in the NHDS 2010 data file. A correction for total partial hip cases was made by excluding cases with diagnosis of spine (720 724, 737, 756, 805, 806). The resulting age drop may be due to this error.

Source: National Hospital Discharge Survey (NHDS), 1992-2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

Table 4.13: Average Inpatient Length of Stay (LOS) for Select Joint Replacement Procedures, United States 1992-2010

	Mean LOS for Procedure									
	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010
Hip Replacement Procedures										
Total Hip Replacement [1]	8.9	7.2	5.3	4.8	4.9	4.5	4.3	3.9	3.8	3.4
Partial Hip Replacement [2,6]	10.6	9.4	7.0	6.7	7.5	7.1	7.3	6.3	6.5	5.7
Revision of Hip Replacement [3]	9.7	7.9	6.0	5.5	6.2	5.4	5.4	4.2	5.3	5.1
Knee Replacement Procedures										
Total Knee Replacement [4]	8.9	6.8	5.1	4.5	4.5	4.2	3.9	3.8	3.5	3.4
Revision of Knee Replacement [5]	8.4	6.2	4.4	4.7	4.7	4.4	4.7	4.0	3.8	4.4

[1] ICD-9-CM procedure code 81.51.

[2] ICD-9-CM procedure code 81.52.

[3] ICD-9-CM procedure code 81.53, 00.70-00.73.

[4] ICD-9-CM procedure code 81.54.

[5] ICD-9-CM procedure code 81.55, 00.80-00.84.

[6] An unknown error in the partial hip replacement data occurred in the NHDS 2010 data file. A correction for total partial hip cases was made by excluding cases with diagnosis of spine (720 724, 737, 756, 805, 806).

Source: National Hospital Discharge Survey (NHDS), 1992-2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

Table 4.14: Trends in Mean and Total Hospital Charges [1] for Hip and Knee Joint Replacement Procedures, United States 1998-2011

In Actual Dollars

Average (Mean) Charges Per Hospitalization

	1998	1999	2000	2001	2002	2003	2004	2007	2011
Total Hip Replacement [2]	$22,000	$23,000	$26,000	$27,000	$31,000	$35,000	$37,000	$45,500	$56,000
Partial Hip Replacement [3]	$22,000	$23,000	$26,000	$28,000	$32,000	$35,000	$39,000	$49,300	$62,800
Revision Hip Replacement [4]	$27,000	$31,000	$32,000	$34,000	$39,000	$45,000	$46,000	$50,200	$79,500
Total Knee Replacement [5]	$21,000	$22,000	$24,000	$26,000	$29,000	$31,000	$33,000	$41,500	$52,100
Revision Knee Replacement [6]	$24,000	$25,000	$30,000	$30,000	$35,000	$42,000	$42,000	$55,100	$77,700

Total Hospitalization Charges for Joint Replacements (in billions)

	1998	1999	2000	2001	2002	2003	2004	2007	2011
Total Hip Replacement [2]	$3.37	$3.64	$4.00	$5.07	$5.91	$6.77	$8.34	$11.50	$17.17
Partial Hip Replacement [3]	$2.27	$2.39	$2.63	$2.98	$3.35	$3.58	$3.97	$5.11	$6.62
Revision Hip Replacement [4]	$0.83	$0.99	$1.04	$1.32	$1.47	$1.66	$1.69	$8.23	$4.02
Total Knee Replacement [5]	$5.36	$5.67	$6.22	$8.06	$9.82	$11.38	$14.26	$22.88	$33.61
Revision Knee Replacement [6]	$0.54	$0.63	$0.70	$0.85	$1.01	$1.47	$1.48	$2.48	$4.86
Total Hip and Knee Replacement Cost	$12.37	$13.32	$14.59	$18.29	$21.57	$24.86	$29.74	$50.20	$66.29

In 2011 Dollars [7]

Average (Mean) Charges Per Hospitalization

	1998	1999	2000	2001	2002	2003	2004	2007	2011
Total Hip Replacement [2]	$ 30,400	$ 31,054	$ 33,963	$ 34,293	$ 38,761	$ 42,787	$ 44,059	$ 49,362	$ 56,000
Partial Hip Replacement [3]	$ 30,400	$ 31,054	$ 33,963	$ 35,563	$ 40,011	$ 42,787	$ 46,441	$ 53,484	$ 62,800
Revision Hip Replacement [4]	$ 37,300	$ 41,855	$ 41,801	$ 43,184	$ 48,764	$ 55,012	$ 54,776	$ 54,460	$ 79,500
Total Knee Replacement [5]	$ 29,000	$ 29,704	$ 31,350	$ 33,023	$ 36,260	$ 37,897	$ 39,296	$ 45,022	$ 52,100
Revision Knee Replacement [6]	$ 33,100	$ 33,754	$ 39,188	$ 38,104	$ 43,762	$ 51,345	$ 50,013	$ 59,776	$ 77,700

Table 4.14: Trends in Mean and Total Hospital Charges [1] for Hip and Knee Joint Replacement Procedures, United States 1998-2011

	Total Hospitalization Charges for Joint Replacements (in billions)								
	1998	1999	2000	2001	2002	2003	2004	2007	2011
Total Hip Replacement [2]	$ 4.65	$ 4.91	$ 5.23	$ 6.44	$ 7.39	$ 8.27	$ 9.93	$ 12.47	$ 17.17
Partial Hip Replacement [3]	$ 3.13	$ 3.23	$ 3.43	$ 3.79	$ 4.19	$ 4.37	$ 4.73	$ 5.55	$ 6.62
Revision Hip Replacement [4]	$ 1.15	$ 1.34	$ 1.36	$ 1.68	$ 1.84	$ 2.04	$ 2.01	$ 8.93	$ 4.02
Total Knee Replacement [5]	$ 7.40	$ 7.65	$ 8.13	$ 10.24	$ 12.28	$ 13.91	$ 16.98	$ 24.82	$ 33.61
Revision Knee Replacement [6]	$ 0.74	$ 0.85	$ 0.91	$ 1.08	$ 1.26	$ 1.80	$ 1.76	$ 2.69	$ 4.86
Total Hip and Knee Replacement Cost	$ 17.06	$ 17.98	$ 19.06	$ 23.23	$ 26.97	$ 30.39	$ 35.41	$ 54.46	$ 66.29

[1] Average charges are based on individual record discharges.The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges. Medicare requires a bundled bill for Medicare patients admitted to the hospital through the emergency department; other payers may or may not have similar requirements.

[2] ICD-9-CM procedure code 81.51. [3] ICD-9-CM procedure code 81.52, 00.70-00.73. [4] ICD-9-CM procedure code 81.53.

[5] ICD-9-CM procedure code 81.54. [6] ICD-9-CM procedure code 81.55, 00.80-00.84.

[7] Source: CPI Inflation Calculator. Bureau of Labor Statistics, United States Department of Labor. http://www.bls.gov/data/inflation_calculator.htm (October 29, 2013).

HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 4.15: Discharge Status for Adults Age 18 & Over and 65 & Over Undergoing Hip or Knee Joint Replacement Procedures, National Hospital Discharge Survey[1], United States 2010

Aged 18 Years and Older

Discharge Status	Total Hip Replacement [2]	Partial Hip Replacement [3,7]	Revision Hip Replacement [4]	Total Knee Replacement [5]	Revision Knee Replacement [6]	All Hip and Knee Replacements	Proportion of All Inpatient Discharges
	Proportion of Specified Joint Replacement Discharges						
Routine Discharge Home	59.0%	31.6%	51.4%	60.5%	58.7%	56.8%	75.4%
Discharged/ Transferred to Short-Term Facility	7.0%	5.7%	13.7%	6.4%	4.8%	6.7%	3.3%
Discharged/ Transferred to Long-Term Care Institution	21.3%	45.0%	27.5%	21.6%	30.2%	24.5%	11.7%
Unknown/ Other Discharge Status	12.7%	17.7%	7.4%	11.5%	6.3%	12.0%	9.6%
Total Cases (in 000s)	326.1	134.0	47.5	690.5	65.2	1,265.2	32,643.8

Age 65 Years and Older

Discharge Status	Total Hip Replacement [2]	Partial Hip Replacement [3,7]	Revision Hip Replacement [4]	Total Knee Replacement [5]	Revision Knee Replacement [6]	All Hip and Knee Replacements	All Inpatient Discharges
	Proportion of Specified Joint Replacement Discharges						
Routine Discharge Home	48.4%	11.4%	42.5%	50.2%	53.5%	44.2%	59.5%
Discharged/ Transferred to Short-Term Facility	10.1%	7.6%	18.2%	8.7%	6.7%	9.2%	4.8%
Discharged/ Transferred to Long-Term Care Institution	29.3%	58.9%	32.2%	29.5%	34.8%	33.8%	22.9%
Unknown/ Other Discharge Status	12.2%	22.1%	7.1%	11.6%	5.0%	12.8%	12.8%
Total Cases (in 000s)	168.0	97.6	30.5	373.3	35.7	703.1	13,591.0

[1] National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

[2] ICD-9-CM procedure code 81.51

[3] ICD-9-CM procedure code 81.52

[4] ICD-9-CM procedure code 81.53, 00.70-00.73

[5] ICD-9-CM procedure code 81.54

[6] ICD-9-CM procedure code 81.55, 00.80-00.84

[7] An unknown error in the partial hip replacement data occurred in the NHDS 2010 data file. A correction for total partial hip cases was made by excluding cases with diagnosis of spine (720 724, 737, 756, 805, 806)

Table 4.16: Number of Hospitalizations, Average Length of Hospital Stay (LOS), Hospital Charges [1], and Outpatient Visits for Significant Pediatric Arthritis and Other Rheumatologic Conditions (SPARC) Among Juveniles and Youth Age 20 & Under, by Sex and Age, United States 2008-2012

	Hospitalizations with Any SPARC Diagnoses [3]								
		Sex		Age					
	Total	Male	Female	<1 Year	1 to 5 years	6 to 10 years	11 to 13 years	14 to 17 years	18 to 20 years
Juvenile arthritis condition diagnoses (JA) (in 1,000s)	104.4	48.4	55.9	10.9	20.2	14.0	10.3	20.4	28.4
Mean LOS (days)	8.0	8.8	7.2	23.4	6.5	5.9	6.8	6.4	5.6
Mean hospital charges (in $1,000s)	$ 79.90	$ 91.50	$ 69.80	$ 217.80	$ 67.20	$ 62.80	$ 76.80	$ 67.40	$ 52.60
Total hospital charges (in millions)	$ 8,341.6	$ 4,428.6	$ 3,901.8	$ 2,374.0	$ 1,357.4	$ 879.2	$ 791.0	$ 1,375.0	$ 1,493.8
Juvenile idiopathic arthritis (JIA)[2] (in 1,000s)	4.0	1.2	2.9	*	0.4	0.4	0.6	1.1	1.4
Mean LOS (days)	4.6	4.8	4.6	*	5.9	4.0	4.9	4.7	4.2
Mean hospital charges (in $1,000s)	$ 39.30	$ 36.80	$ 40.40	*	$ 58.10	$ 34.40	$ 45.50	$ 40.00	$ 31.70
Total hospital charges (in millions)	$ 157.2	$ 44.2	$ 117.2	*	$ 23.2	$ 13.8	$ 27.3	$ 44.0	$ 44.4
Proportion JIA to total JA	3.8%	2.5%	5.2%	*	2.0%	2.9%	5.8%	5.4%	4.9%
Primary (1st) diagnosis of JA (in 1,000s)	25.2	12.6	12.7	1.4	8.6	4.7	2.7	4.0	3.8
Mean LOS (days)	3.7	3.5	3.8	4.2	3.2	3.3	3.9	4.0	4.5
Mean hospital charges (in $1,000s)	$ 35.60	$ 33.40	$ 37.80	31.3	$ 26.80	$ 32.20	$ 41.10	$ 47.40	$ 43.00
Total hospital charges (in millions)	$ 897.1	$ 420.8	$ 480.1	$ 43.8	$ 230.5	$ 151.3	$ 111.0	$ 189.6	$ 163.4
Proportion primary JA to total JA	24.1%	26.0%	22.7%	12.8%	42.6%	33.6%	26.2%	19.6%	13.4%
Primary (1st) diagnosis a chronic condition (in 1,000s)	15.6	6.9	8.7	1.0	5.5	2.3	1.6	2.6	2.5
Proportion chronic to total primary JA	61.9%	54.8%	68.5%	71.4%	64.0%	48.9%	59.3%	65.0%	65.8%
Primary (1st) diagnosis chronic musculoskeketal condition (in 1,000s)	12.1	5.7	6.4	0.3	2.6	2.2	1.6	2.7	2.6
Proportion musculoskeletal chronic to total primary JA	48.0%	45.2%	50.4%	21.4%	30.2%	46.8%	59.3%	67.5%	68.4%

Table 4.16: Number of Hospitalizations, Average Length of Hospital Stay (LOS), Hospital Charges [1], and Outpatient Visits for Significant Pediatric Arthritis and Other Rheumatologic Conditions (SPARC) Among Juveniles and Youth Age 20 & Under, by Sex and Age, United States 2008-2012

	Outpatient Visits with Any SPARC Diagnoses					
	Total	Male	Female	0 to 6 years	7 to 12 years	13 to 17 years
Emergency room visits [4]						
All juvenile arthritis conditions (JA) (in 1,000s)	443.0	228.4	214.6	139.9	130.5	172.7
Juvenile rheumatoid arthritis (JRA) (in 1,000s)	5.4	1.8	3.6	1.0	1.7	2.8
Proportion JRA to total JA	1.2%	0.8%	1.7%	0.7%	1.3%	1.6%
Physician office visits [5]						
All juvenile arthritis conditions (JA) (in 1,000s)	1,065.4	533.9	531.5	*	*	604.4
Juvenile rheumatoid arthritis (JRA) (in 1,000s)	*	*	*	*	*	*
Proportion JRA to total JA	*	*	*	*	*	*
Outpatient clinic visits [6]						
All juvenile arthritis conditions (JA) (in 1,000s)	282.5	124.9	157.6	59.2	106.9	116.4
Juvenile rheumatoid arthritis (JRA) (in 1,000s)	47.5	*	33.3	*	*	*
Proportion JRA to total JA	16.8%	*	21.1%	*	*	*
Total Outpatient Visits						
All juvenile arthritis conditions (JA) (in 1,000s)	1,790.9	887.2	903.7	343.5	553.9	893.5
Juvenile rheumatoid arthritis (JRA) (in 1,000s)	93.7	33.4	60.0	20.3	37.2	36.4
Proportion JRA to total JA	5.2%	3.8%	6.6%	5.9%	6.7%	4.1%

* Estimates do not meet standards for reliability.

[1] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges. Medicare requires a bundled bill for Medicare patients admitted to the hospital through the emergency department; other payers may or may not have similar requirements.

[2] Previously known as juvenile rheumatoid arthritis (JRA).

[3] Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-

[4] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[5] Source: National Ambulatory Medical Care Survey (NAMCS), 2008-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[6] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

Osteoporosis and Related Conditions

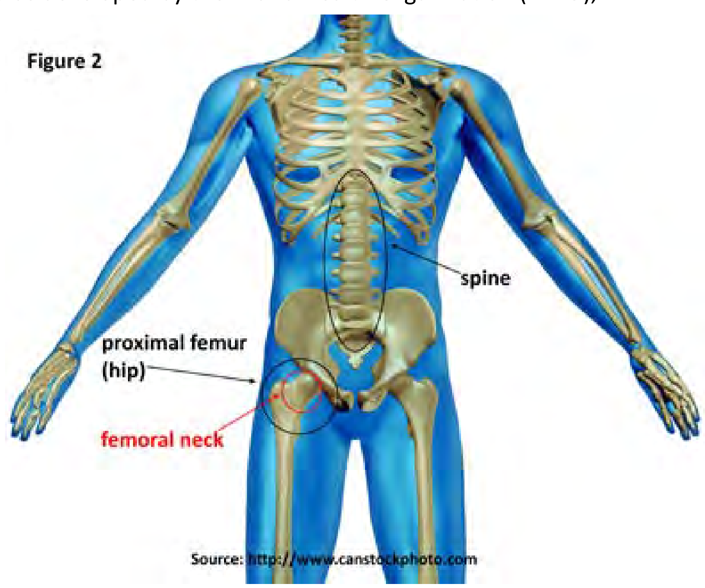
Lead Author(s):
Nicole C. Wright, PhD, MPH
Kenneth G. Saag, MD, MSc
Sylvia I. Watkins-Castillo, PhD

Osteoporosis is a skeletal disorder characterized by compromised bone disorder predisposing to an increased risk of fracture. It occurs when your body produces too little bone, there is a reduction in bone mass due to aging or other causes, or both (Figure 1).

Figure 1

The primary diagnostic test for osteoporosis is bone mineral density (BMD). This test, which is generally taken at the proximal femur (hip) and spine (Figure 2), helps estimate the density of bones and the likelihood of breaking a bone. The hip, particularly the femoral neck, and spine are used because these are the most common sites for fractures. BMD is measured by a dual-energy X-ray absorptiometry (DXA). DXA testing provides an estimate of real BMD in g/cm^2, and the estimate is converted into a T-score by comparing it to the BMD levels of a healthy young adult population. The BMD values of the 20- to 29-year-old females from the NHANES-III study (1988 to 1994) population are typically used as the reference population. Using thresholds developed by the World Health Organization (WHO), osteoporosis is defined as a T-score of -2.5 or less at either the lumbar spine or proximal femur (hip). T-scores between -2.5 and -1.0 identify individuals with low bone mass. T-scores greater than -1.0 represent normal bone mass.[1]

Figure 2



When BMD measurements are not available, diagnosis of osteoporosis is sometimes made based on fragility fractures, particularly with respect to the spine. The presence of vertebral fracture (VF) identifies a patient who has clinical osteoporosis; however, up to

75% of VFs are asymptomatic. Lifetime height loss of 1.5 inches or more also can be a sign of osteoporosis when BMD does not indicate osteoporosis or vertebral fractures are not present. One study found that 30% of men and women would have been misclassified (undiagnosed with osteoporosis) based on bone mineral density alone.2

1. World Health Organization: *WHO Scientific Group on the Assessment of Osteoporosis at Primary Health Care Level.* Brussels, Belgium, World Health Organization, 2004.

2. WanWan X, Subashan P, Medich D: Height loss, vertebral fractures, and misclassification of osteoporosis. *Bone* 2011;48(2):307-311.

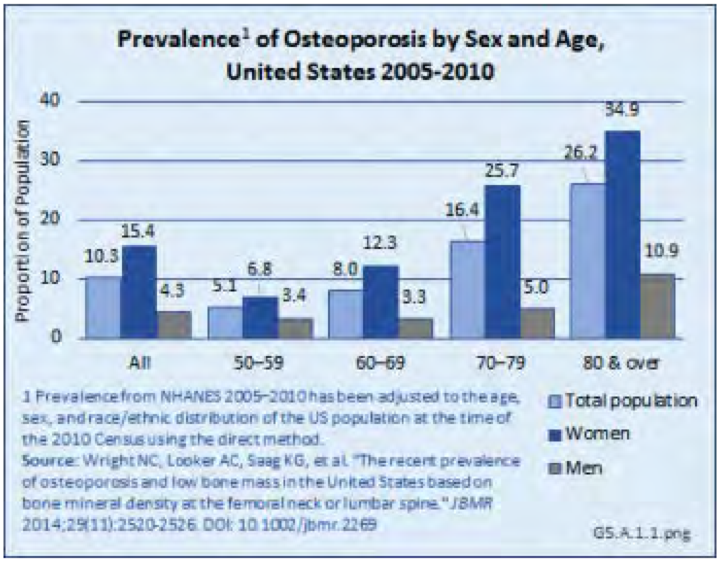
Osteoporosis Prevalence

Lead Author(s):
Nicole C. Wright, PhD, MPH

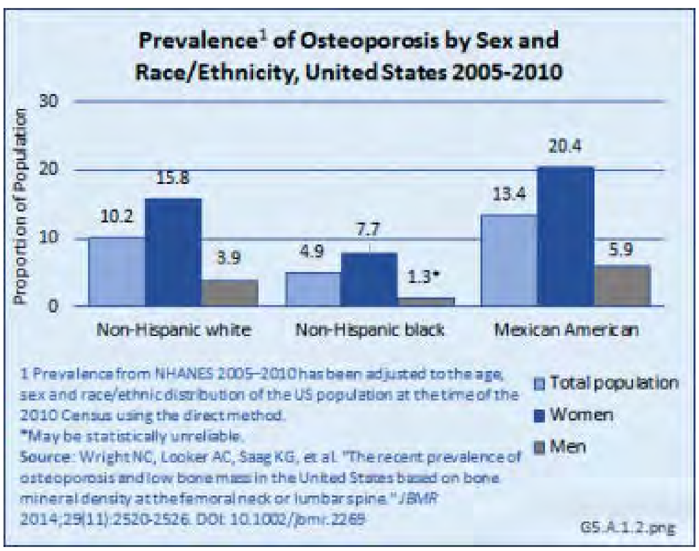
In the United States, the national prevalence of osteoporosis is based on data from the National Health and Nutrition Examination Survey (NHANES). NHANES is conducted by the National Center for Health Statistics, Centers for Disease Control and Prevention (CDC), to assess the health and nutrition status of a representative sample of the noninstitutionalized US population. Interviews of participants in the study are conducted in their homes. They receive standardized physical measurements, including BMD measurements via DXA, in mobile examination centers that are moved around the nation. The most recent national estimates of the prevalence of osteoporosis are based on femoral neck and spine BMD data from NHANES 2005–2010.

Current Prevalence by Demographics: Osteoporosis

After adjusting for age, sex, and race/ethnicity, the prevalence of osteoporosis at either the femoral neck or lumbar spine is estimated to be 10.3% among adults age 50 years and older, representing more than 10 million people in the United States.1 (Reference Table 5.1 PDF CSV)
Women have higher rates of osteoporosis at either of these two skeletal sites than men in the same age group across all ages: the prevalence of osteoporosis in adults age 50 years and older was 4.3% in men and 15.4% in women. Age is an even greater factor than sex in prevalence rates, particularly among women. Women ages 50 years to 59 years have a prevalence of 6.8%, while the prevalence increases to 34.9% for women age 80 years and older. Men show a similar, but less dramatic increase, with prevalence increasing from 3.4% among those ages 50 years to 59 years to 10.9% among men age 80 years and older. (Reference Table 5.1 PDF CSV)



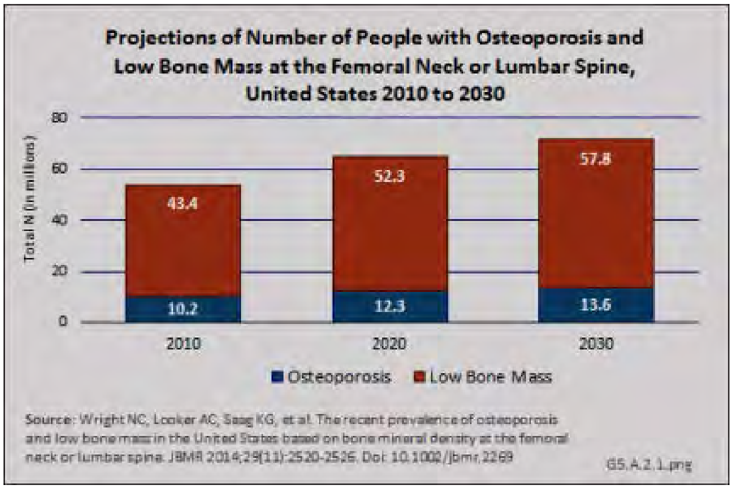
The prevalence of osteoporosis by race and ethnicity differs somewhat by BMD measurement site. Non-Hispanic Blacks have the lowest prevalence when based on BMD at either the hip or the spine, while Mexican Americans have the highest prevalence. However, when looking at the two skeletal sites separately, the group with the highest prevalence differs. Mexican Americans have the highest prevalence of osteoporosis if based on the lumbar spine BMD alone, but Non-Hispanic Whites have the highest prevalence if based on the femoral neck BMD alone.[1] (Reference Table 5.1 PDF CSV)



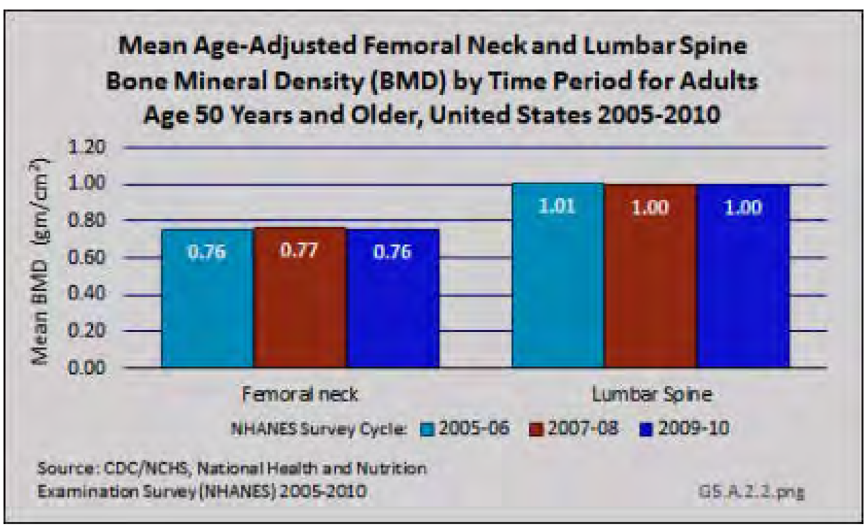
1. a. b. Wright NC, Looker AC, Saag KG, et al.: The recent prevalence of osteoporosis and low bone mass in the United States based on bone mineral density at the femoral neck or lumbar spine. *JBMR* 2014;29(11):2520-2526. DOI: 10.1002/jbmr.2269.

Projected Prevalence: Osteoporosis

Using the current prevalence estimates of osteoporosis based on the NHANES BMD measurements at either the femoral neck or lumbar spine and future US Census projections, the number of people with osteoporosis will increase from an estimated 10.2 million in 2010 to 13.6 million people in 2030, with low bone mass, which may be a precursor to osteoporosis, increasing from 43.4 million people to 57.8 million over the same time frame.1



Although the prevalence of clinically diagnosed osteoporosis is projected to increase further, it is not clear whether the increase reflects an increase in diagnosis or an increase in the actual prevalence of the condition. Specifically, a comparison of femoral neck data from NHANES between 1988 and 1994 and 2005 and 2008 showed an increase in femoral neck BMD and a decline in prevalence of osteoporosis during this time. The observed differences in participant demographics and DXA methods between these NHANES surveys did not completely explain the observed increase in femoral neck BMD. Furthermore, data from NHANES 2005–2010 indicate that both mean femoral neck BMD and total lumbar spine BMD have remained stable during this five-year period among those age 50 years and older.



However, as noted in the introduction to osteoporosis, the diagnosis can also be made based on fragility fracture, which could also play a role in the discrepancy observed between secular trends in the prevalence of clinically diagnosed osteoporosis versus BMD-defined osteoporosis based on femoral neck data from NHANES.2

1. Wright NC, Looker AC, Saag KG, et al.: The recent prevalence of osteoporosis and low bone mass in the United States based on bone mineral density at the femoral neck or lumbar spine. *JBMR* 2014;29(11):2520- 2526. Doi: 10.1002/jbmr.2269.

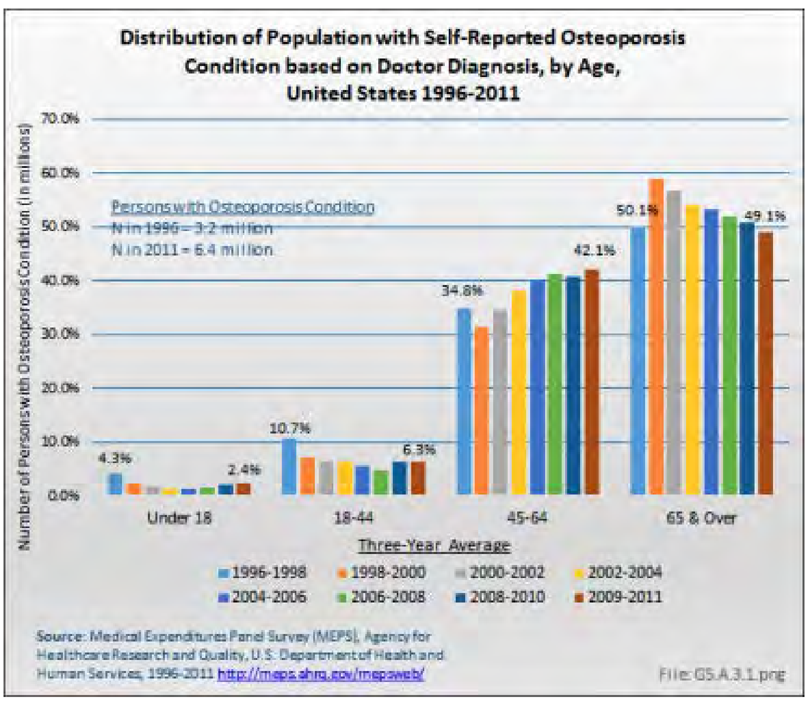
2. Looker AC, Melton LJ, Borrud LG, Shepherd JA: Changes in femoral neck bone density in US adults between 1988-1994 and 2005-2008: Demographic patterns and possible determinants. *Osteoporosis Internationa*l 2012;23:771-780.

Diagnosis Coded Osteoporosis

Lead Author(s):
Sylvia I. Watkins-Castillo, PhD
Edward H. Yelin, PhD

International Classification of Diseases (ICD) codes are often used in studies to define conditions in records of national health databases. However, health care providers may include codes that are not primary to the condition being treated, or may make errors in the coding process. Nevertheless, analysis of medical conditions based on ICD diagnosis or treatment codes is the most frequently used basis for health conditions research. Osteoporosis is identified with the ICD code of 733.

Data from the Agency for Healthcare Research and Quality Medical Expenditures Panel Survey (MEPS) is used to estimate the economic burden (cost) of musculoskeletal diseases throughout this site. The MEPS is the only US database to include actual cost paid by insurance companies and patients for the health care they receive.



Using the MEPS data, the prevalence of people with diagnosed osteoporosis has risen as the population ages. The number of persons in the population with an osteoporosis condition rose from 3.2 million to 6.5 million between 1996 and 1998 and 2009 and 2011, nearly doubling the number of people with osteoporosis. This number is lower than the 10 million estimated prevalence for people age 50 years and older reported based on BMD.

People between the ages of 45 years and 64 years experienced the steepest rise in osteoporosis diagnosis, increasing from 32% to 35% of all people with osteoporosis in the late 1990s to more than 40% in recent years. (Reference Table 10.1 PDF CSV)

A recent report using Medicare data showed an overall increase of 18 percentage points in the number of Medicare beneficiaries with diagnosed osteoporosis, based on ICD-9-CM codes, between 2008 and 2010.[1]

1. Erdem E: Prevalence of chronic conditions among Medicare Part A beneficiaries in 2008 and 2010: Are Medicare beneficiaries getting sicker? *Prev Chronic Dis* 2014;11:130118. DOI: http://dx.doi.org/10.5888/pcd11.130118.

Fragility Fractures

Lead Author(s):
Sylvia I. Watkins-Castillo, PhD
Nicole C. Wright, PhD, MPH

Osteoporosis can be clinically diagnosed in individuals who have had a fragility fracture, irrespective of BMD,[1] particularly if the fracture occurs at the hip or spine. Fragility fractures are used to measure the burden of osteoporosis, since osteoporosis in and of itself exhibits no clinical presentations such as pain or debility.

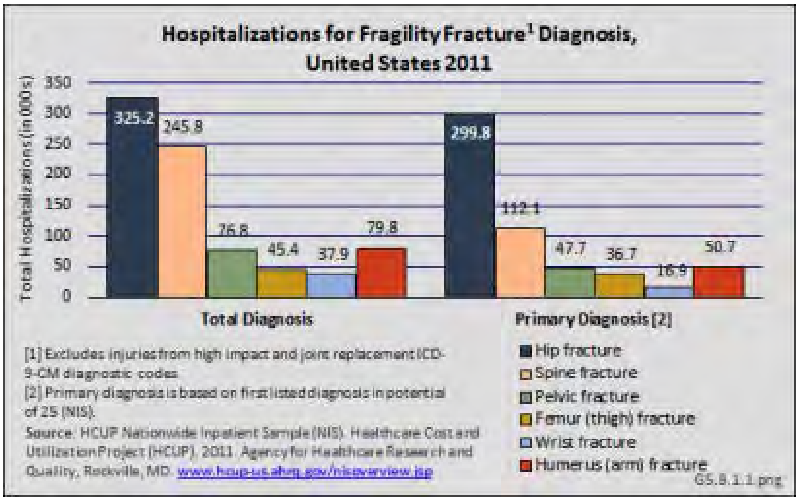
1. Siris ES, Adler R, Bilezikian J, et al.: The clinical diagnosis of osteoporosis: A position statement from the National Bone Health Alliance Working Group. *Osteoporos Int* 2014 May;25(5):1439-1443. doi: 10.1007/s00198-014-2655-z. Epub 2014 Feb 28.

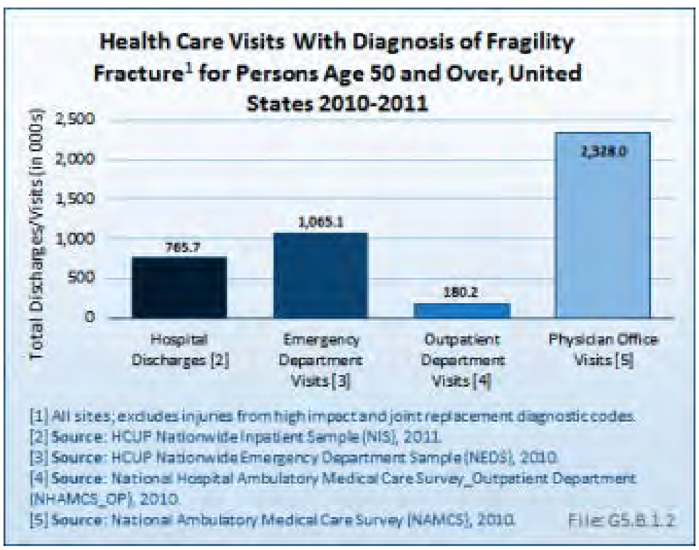
Prevalence of Fragility Fractures

There is no one national database that captures the number of all hip and spinal fractures and estimates how many additional people have fractures without BMD-defined osteoporosis. The Centers for Disease Control and Prevention have estimated at least 250,000 people age 65 years and older are hospitalized for hip fractures each year, using the National Hospital Discharge Survey (NHDS). Nearly all (95%) hip fractures are caused by falling, usually falling sideways.[1]

Another comprehensive database for evaluation of the total number of hospitalized fractures is the Agency for Healthcare Research and Quality's (AHRQ) Nationwide Inpatient Sample (NIS), and is used throughout this site to estimate burden. The NIS includes more than 8 million inpatient hospitalizations each year from all payers in the United States, and is representative of 95% of all hospitalizations in the US. Among women 55 years and older, there were almost 1.7 million hospitalizations for fragility fractures in 2011. Hip fractures were the most common (23%) fractures requiring hospitalization, representing 325,200 hip fractures. Hospitalizations for clinically evident spine fractures (8.4%), representing 245,800 patients, was the second most common type of fragility fracture. For

92% of hospitalizations for hip fracture, this was the primary, or first, diagnosis; for spine fractures, 46% were the primary diagnosis. (Reference Table 5.2.1 PDF CSV)





Relying on hospitalized fractures may underestimate the true prevalence of fragility fractures in the United States, since many fractures do not require hospital treatment and approximately two-thirds of all vertebral fractures are not clinically diagnosed.2 An analysis of the AHRQ NIS and National Emergency Department Sample (NEDS), and the CDC National Center for Health Statistics National Hospital Ambulatory Medical Care Survey (NHAMCS–Outpatient) and National Ambulatory Medical Care Survey (NAMCS–Physician Offices) for the years 2010 and 2011, showed 4.3 million fragility fracture visits, of which only 18% were hospital discharge visits. Wrist and arm fractures are the most likely fragility fractures to be treated outside a hospital. (Reference Table 5.2.1 PDF CSV)

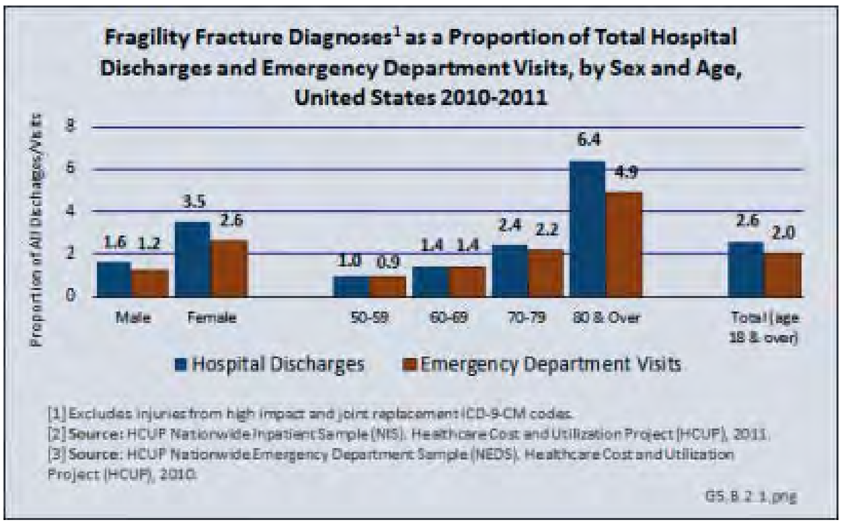
1. Centers for Disease Control and Prevention: *Home and Recreational Safety. Hip Fractures Among Older Adults*.Available at: http://www.cdc.gov/homeandrecreationalsafety/falls/adulthipfx.html. Accessed September 29, 2015.

2. Singer A, Exuzides A, Spangler L. et al.: Burden of illness for osteoporotic fractures compared with other serious diseases among postmenopausal women in the United States. *Mayo Clin Proc* 2015 Jan;90(1):53-62. doi: 10.1016/j.mayocp.2014.09.011. Epub 2014 Dec 4.

Fragility Fracture Demographics

Women are more likely than men to have an osteoporosis diagnosis and to have a fragility fracture. Hospital discharges in 2011 with a fragility fracture diagnosis for women were more than twice the number of discharges in men with the same diagnosis (404,300 discharges for women; 159,500 discharges for men). This difference is evidenced for fragility fractures at all sites, and is also representative of emergency department (ED) visits with a fragility fracture diagnosis.

Age also is a major factor among people diagnosed with a fragility fracture, with people aged 80 years and older representing twice the rate of those between the ages of 70 and 79 years.
Overall, hospital discharges for fragility fractures accounted for 2.6% of hospital discharges for any diagnosis in 2011, and 2.0% of all ED visits. Among women, fragility fractures accounted for 3.5% of all hospital discharges and 2.6% of all ED visits. Among people aged 80 years and older, fragility fractures accounted for 6.4% of all hospital discharges and 4.9% of all ED visits. (Reference Table 5.2.2 PDF CSV)



A more detailed discussion of sex and age differences in osteoporosis and fragility fractures can be found in the Special Populations section of this site in Sex and Gender and Aging.

Hip Fracture Trends: Fragility Fractures

Although the number of hospital discharges for hip fractures has increased in recent years due to an aging population, several studies indicate a decreasing rate of hip fractures among white women and men, both in the United States and worldwide, by as much as an annualized 1.5% per year since the early 1990s.[1,2,3,4,5] One recent study reports a reduction in the 10-year hip fracture probability for the white population, based on an updated study of hospital discharges using the National Inpatient Sample (NIS).[6]

The most recent national examination of hip fracture trends shown a decline in the age-adjusted incidence rate of fracture of 24.5% in women and 19.2% in men from 1995 to 2005.7 Racial and ethnic differences in the declines in hip fractures incidence have been evaluated. For example, a Medicare population study of hip fractures between 2000 and 2009 reported statistically significant declines in White men and women; however, due to smaller numbers, a decline among Black and Hispanic women is not statistically supported.8 Another study of hip fractures among Hispanics reported an increase in hip fractures in this population.9 Given these declines, the US version of the 10-year fracture probability calculator, FRAX, has been undated.

While declines in hip fracture incidence is being observed, fractures remain a concern because there is some indication the reduction in hip fractures is being offset with fractures in other sites, particularly vertebral fractures, due in large part to extended longevity.4

1. Gehlback SH, Avrunn JS, Puleo E: Trends in hospital care for hip fractures. *Osteoporosis Int* 2007;18(5):585-491. Epub 2006 Dec 5.

2. Melton LJ 3rd, Kearns AD, Atkinson EJ, et al.: Secular trends in hip fracture incidence and recurrence. *Osteoporosis Int* 2009;20(5):687-694. doi: 10.1007/s00198-008-0742-8.

3. Kanis JA, Odén A, McCloskey EV, et al.: A systematic review of hip fracture incidence and probability of fracture worldwide. *Osteoporosis Int* 2012. doi: 10.1007/s00198-012-1964-3.

4. a. b. Shreyasee A, Achenback SJ, Atkinson EJ, et al.: Trends in fracture incidence: A population-based study over 20 years. *JBMR* 2014;29(3):581-589. doi: 10.1002/jbmr.2072.

5. Stevens JS, Rudd RA: Research letter: Declining hip fracture rates in the United States. *Age Ageing*. 2010;39(4):500-503. doi: 10.1093/ageaging/afq044.

6. Ettinger B, Black DM, Dawson-Hughes B, et al.: Updated fracture incidence rates for the US version of FRAX®. *Osteoporos Int* 2010;21(1):20-33. doi: 10.1007/s00198-009-1032-9.

7. Brauer CA, Coca-Perraillon M, Cutler DM, Rosen AB: Incidence and mortality of hip fractures in the United States. *JAMA* 2009;302:1573-1579. doi: 10.1001/jama.2009.1462.8

8. Wright NC, Saag KG, Curtis JR, et al.: Recent trends in hip fracture rates by race/ethnicity among older US adults. *JBMR* 2012;27(11):2325-2332. doi: 10.1002/jbmr.1684.

9. Zingmond DS, Melton LJ 3rd, Silverman SL: Increasing hip fracture incidence in California Hispanics, 1983 to 2000. *Osteopoross Int* 2004;15(8):603-610. Epub 2004 Mar 4.

Health Care Utilization

Lead Author(s):
Meredith L. Kilgore, PhD
Sylvia I. Watkins-Castillo, PhD

Osteoporosis-related fractures are associated with a substantial increase in the utilization of health services for both acute and long-term care. Fracture risk increases with age,1,2 as does the burden of disease in terms of morbidity, mortality, and costs.3 Here we focus on the effects of osteoporosis and related fractures on health care utilization.

1. Wolinsky FD, Bentler SE, Liu L et al.: Recent hospitalization and the risk of hip fracture among older Americans. *J Gerontol A Biol Sci Med Sci* 2009;64A:249-255.

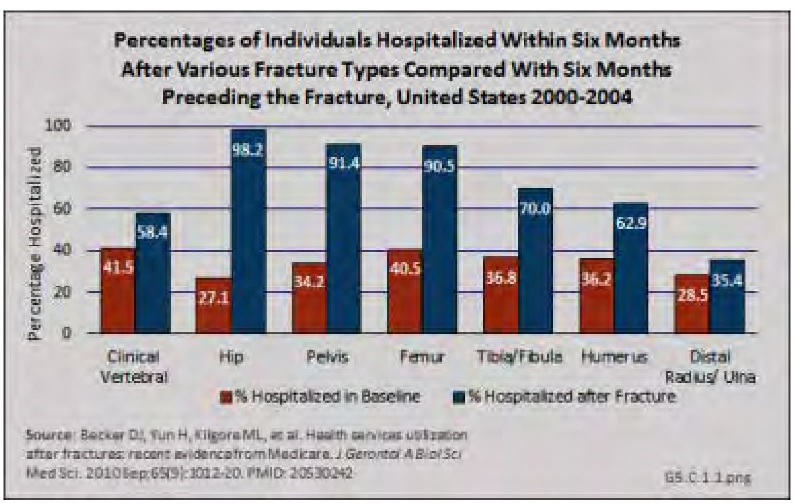
2. Cheng HC, Gary LC, Curtis JR et al.: Estimated prevalence and patterns of presumed osteoporosis among older Americans based on Medicare data. *Osteoporos Int* 2009;20:1507-1515.

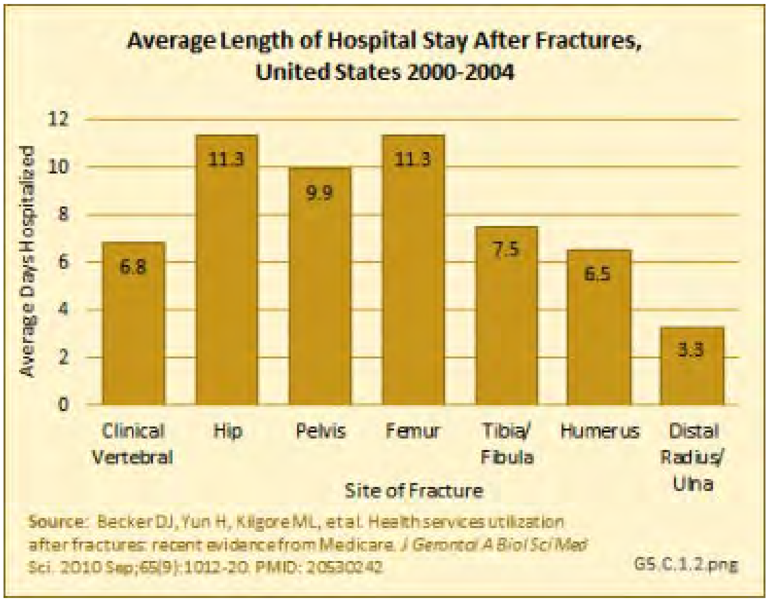
3. Braithwaite RS, Col NF, Wong JB: Estimating hip fracture morbidity, mortality, and costs. *J Am Geriatr Soc* 2003;51:364-370.

Hospitalization: Osteoporosis

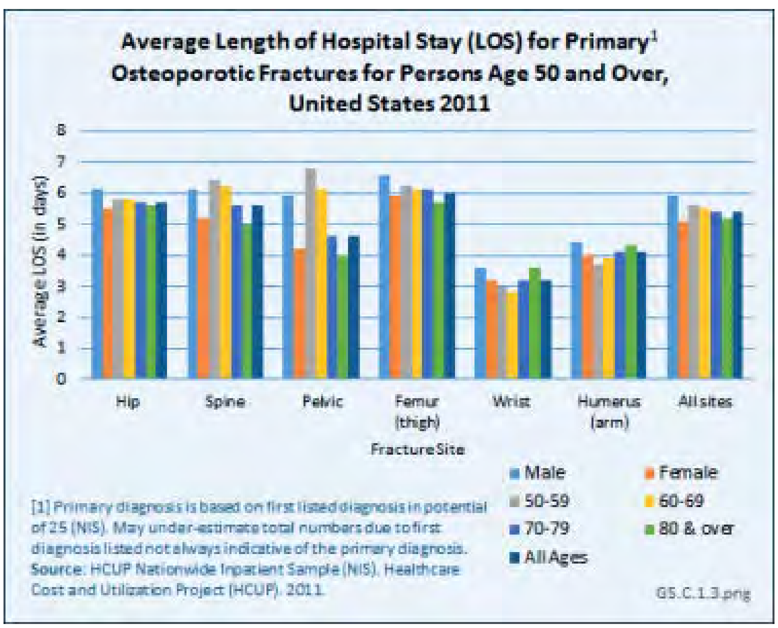
While the incidence of hip fracture appears to have declined overall since the mid 1990s, as discussed in a previous section, hospital discharges from the MEPS database related to osteoporosis were 44% greater in 2009 to 2011 than they were in the years from 1996 to 1998. Recent years, however, have shown a decline after peaking in 2001 to 2003. (Reference Table 10.2 PDF CSV) This increase in hospitalizations likely reflects the increase in older population cohorts as the Boomer generation enters the prime years for fracture incidence.

In a study among Medicare beneficiaries, the 65 years and older population, experiencing hip fractures in the years 2000 to 2004, 98.2% were hospitalized in the six months following the fracture compared to 27.1% hospitalized at least once in the prior six months for other reasons.1 Thus, hip fractures were associated with a 71% increase in the probability of being hospitalized. The average length of stay for hip and upper leg (femur) fractures was more than 11 days. (Reference Tables 5.3 PDF CSV and 5.4 PDF CSV)





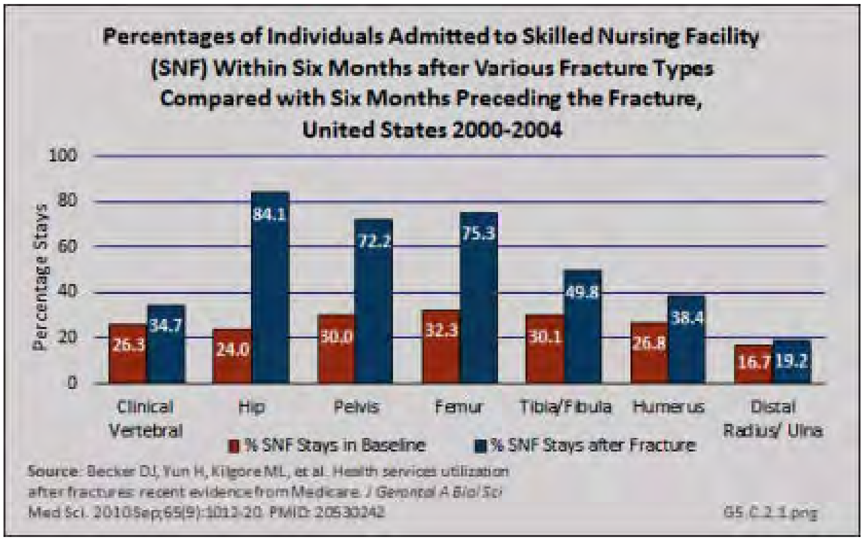
Using recent 2011 data from the NIS hospital discharge database, an average hospital stay of 5.5 days was reported for people age 50 years and older with a primary (first) diagnosis of fragility fracture. While it might be assumed the inclusion of younger-age patients could account for this difference from the earlier study, age was not a factor in length of stay. Sex was a more significant factor, with males staying nearly a day longer than females. With the exception of wrist and arm fractures, site of the fracture was also not a factor. (Reference Table 5.5 PDF CSV)



1. Becker DJ, Yun H, Kilgore ML, et al.: Health services utilization after fractures: Recent evidence from Medicare. *J Gerontol A Biol Sci Med Sci* 2010 Sep;65(9):1012-1020. PMID: 20530242

Long Term Care: Osteoporosis

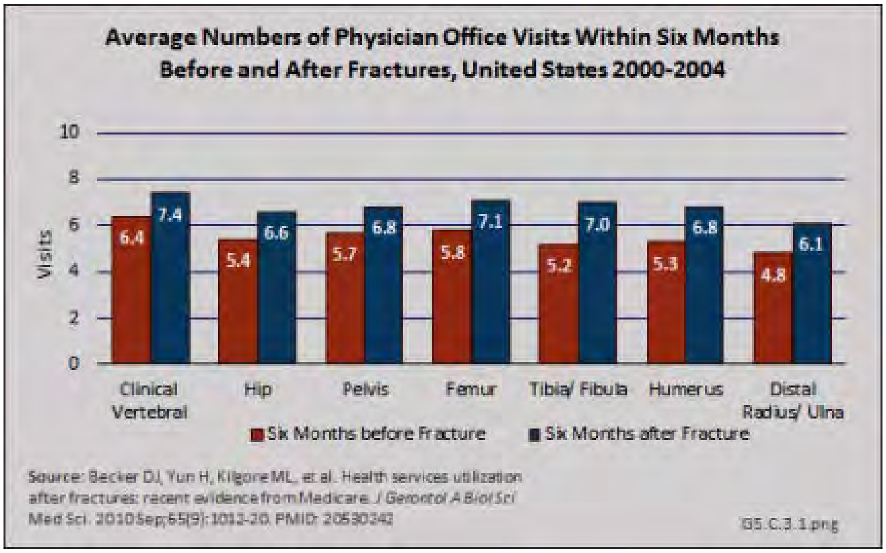
Patterns similar to hospitalization for the Medicare population were reported for use of skilled nursing facility and home health services following hospitalization before and after fractures, although the rates for these services were somewhat lower. Hip fractures were associated with an 84% increase in probability of a stay in a skilled nursing facility.[1] (Reference Tables 5.3 PDF CSV and 5.4 PDF CSV)



1. Becker DJ, Yun H, Kilgore ML, et al.: Health services utilization after fractures: Recent evidence from Medicare. *J Gerontol A Biol Sci Med Sci* 2010 Sep;65(9):1012-1020. PMID: 20530242

Ambulatory Care Visits: Osteoporosis

In a recent study, the effect of fracture on physician office visits using a baseline of visits six months before fracture and comparing it to six months after fracture, was less than for hospitalization, but still substantial.[1] Fractures of the tibia/fibula had the greatest increase in physician office visits (35% increase in probability of a visit), but this could be because of higher rates of transfer to nursing home care for hip, pelvis, and femur fractures shown in studies discussed previously. (Reference Table 5.6 PDF CSV)



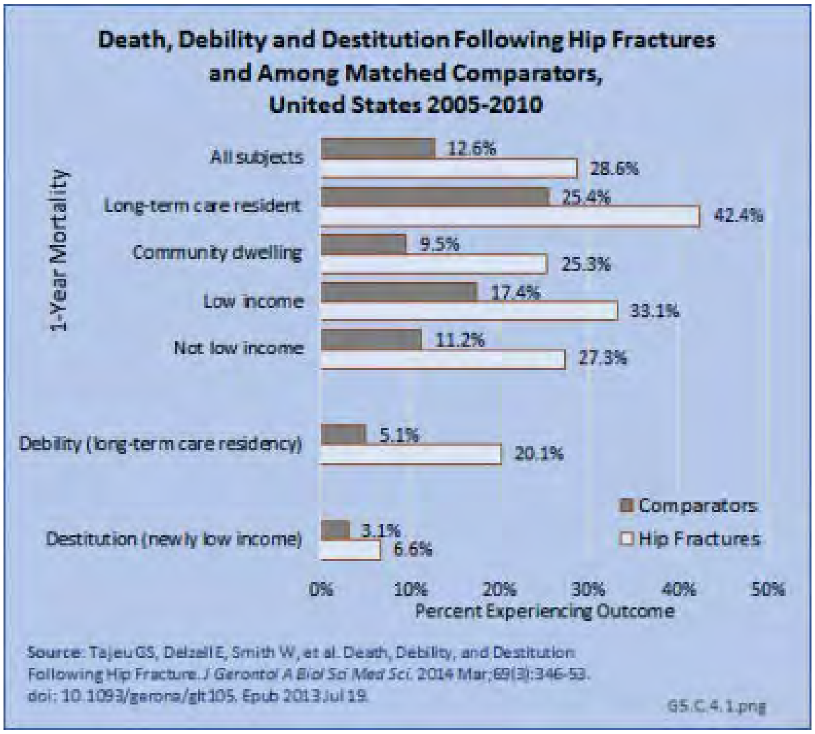
Following fractures, utilization of physical and occupational therapy services increased by similar proportions.1 Although the mean number of ambulatory physician visits for osteoporosis care from the MEPS study, the data upon which estimated cost burden from osteoporosis is based, declined between 1996 and 1998 and between 2009 and 2011, the total number of visits over this timeframe increased by 67% because of the larger number of people with osteoporosis. Because the MEPS data is based on only an osteoporosis diagnosis rather than a fracture diagnosis, the actual numbers may be larger than reported.

Again, using the MEPS, the mean number of home health visits for osteoporosis between 1996 and 1998 was 7.7; from 2009 to 2011 it was 7.4. However, the total number of visits rose from 24.3 million to 47.5 million due to the rise in reported prevalence of osteoporosis. Ambulatory nonphysician health care visits nearly tripled, increasing from 10.7 million to 28.9 million, due to an increase in both mean number of visits and the share of persons with reported osteoporosis who made at least one such visit. (Reference Table 10.2 PDF CSV)

1. a. b. Tajeu GS, Delzell E, Smith W, et al.: Death, debility, and destitution following hip fracture. *J Gerontol A Biol Sci Med Sci* 2014 Mar;69(3):346-353. PMID: 23873945

Long Term Outcomes: Osteoporosis

Serious adverse outcomes following hip fractures include mortality, debility requiring institutional care, and destitution (poverty) sufficient to qualify for Medicaid enrollment. In a recent study of Medicare beneficiaries, the population age 65 years and older, individuals experiencing hip fracture had more than double the risk of death, an almost four-fold increased risk of becoming a nursing home resident, and more than double the risk of enrolling in Medicaid within one year of the fracture.1 (Reference Table 5.7 PDF CSV)



Two recent studies of the Medicare population support a significant decline in mortality from hip fractures in recent years, with reported mortality rates of 22%2 and 30%3 in the first year following fracture. However, hip fracture remains a major mortality risk 2- to 8-fold higher than non-hip-fracture matched controls.3

1. Tajeu GS, Delzell E, Smith W, et al.: Death, debility, and destitution following hip fracture. *J Gerontol A Biol Sci Med Sci* 2014 Mar;69(3):346-353. PMID: 23873945

2. Lo JC, Srinivasan S, Chandra M: Trends in mortality following hip fracture in older women. *Am J Manag Care* 2015;21(3):e206-e214. Published online: April 15, 2015.

3. a. b. Brauer CA, Coca-Perraillon M, Cutler DM, Rosen AB: Incidence and mortality of hip fractures in the United States. *JAMA* 2009;302(14):1573-1579. doi: 10.1001/jama.2009.1462.

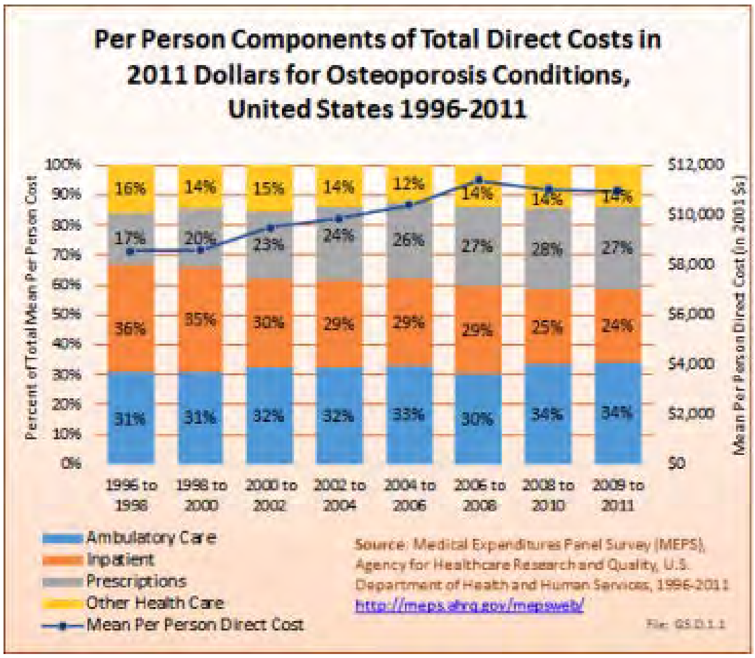
Economic Burden: Osteoporosis

Lead Author(s):
Edward H. Yelin, PhD
Sylvia I. Watkins-Castillo, PhD

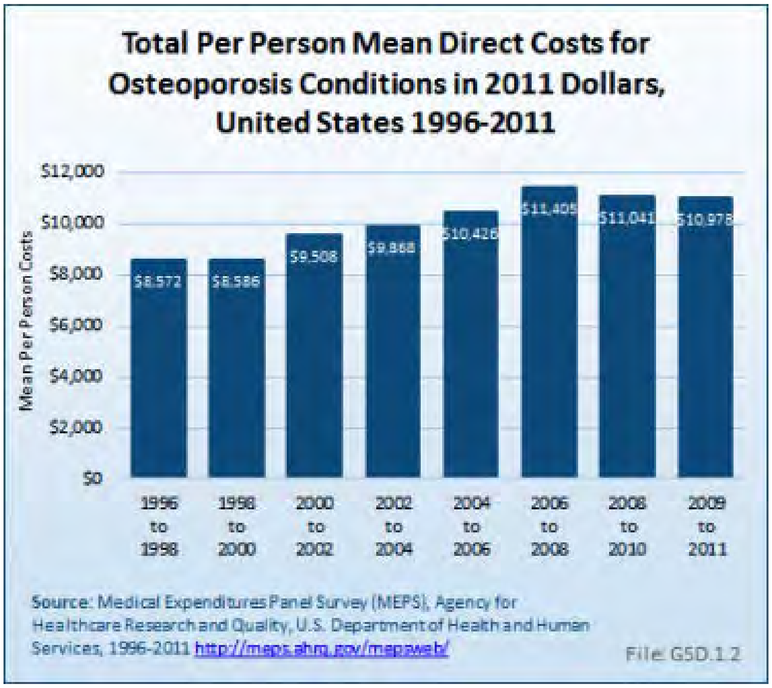
Health care treatments and visits contribute to the economic burden of osteoporosis, with increasing visits to physicians, to ambulatory nonphysician health care sites, and for home health services.

Direct Medical Costs: Economic Burden, Osteoporosis

Overall, ambulatory care visits accounted for the largest share of per-person direct cost for people with an osteoporosis condition. At an average cost of $3,758 per person between 2009 and 2011, an increase of 42% from 1996 to 1998, ambulatory care accounted for 34% of per-person direct cost between 2009 and 2011. Both the share of per-person cost for inpatient care and the mean cost dropped between 1996 and 1998 to 2009 and 2011, with the share dropping from 36% to 24% and the mean cost from $3,009 to $2,681. However, the average per-person cost for prescriptions rose from $1,477 to $2,989, in 2011 dollars, an increase of 102%. (Reference Table 10.4 PDF CSV)



Total direct per-person health care costs in 2009 to 2011 for people with an osteoporosis condition were $10,978, an increase of 28% since 1996 to 1998. Incremental direct per-person costs, those costs most likely attributable to an osteoporosis condition, were not calculated for osteoporosis because of the small sample size. (Reference Table 10.6 PDF CSV)



Total aggregate direct costs for persons with an osteoporosis condition were $70.5 billion from 2009 to 2011, a rise of 160% from the $27.1 billion from 1996 to 1998, in 2011 dollars.

Indirect Costs (Society/Employers): Economic Burden, Osteoporosis

Lead Author(s):
Sylvia I. Watkins-Castillo, PhD
Kenneth G. Saag, MD, MSc
Nicole C. Wright, PhD, MPH

Indirect costs associated with lost wages for people ages 18 years to 64 years are not calculated for those with an osteoporosis condition. Osteoporosis is rarely cited as a reason for lost workdays or bed days, in part because of the older age of the most commonly affected adults. However, approximately 50% of people with hip fractures do not regain their prior activity level, leading to societal costs for added care. Similarly, vertebral compression fractures due to osteoporosis contribute to spinal deformity, reduced mobility, and the need for assistance with activities of daily living, which increases the indirect societal costs.

Key Challenges to Future: Osteoporosis

Lead Author(s):
Nicole C. Wright, PhD, MPH

There are many challenges in osteoporosis healthcare and delivery that need to be addressed in the future, including but not limited to screening, pharmacotherapy use, pharmacotherapy adherence, and addressing osteoporosis care in patients with multiple comorbidities.

Osteoporosis Screening

Screening and treating at-risk patients can prevent fractures and reduce the morbidity associated with osteoporosis. Over the last few years, rates of osteoporosis screening via DXA testing have steadily declined in the US. The initial decline in 2006 was associated with reductions in the DXA reimbursement rates by Medicare. Fewer DXA scans were performed in 2007 and 2008 than the number projected using Commercial and Medicare Supplemental Insurance data from 2000 to 2006,[1] and similar declines were observed in Medicare Fee-for-Service population.[2] More recently, DXA examination rates were studied in women aged 50 years to 64 years, and the authors found reductions in the number of DXA scans performed between 2006 and 2012 (-35 DXAs per 1,000 patient years) in this younger population, with the most significant reduction (-33%) in the 50- to 54-year age group.[3]

The reduction in overall DXA screening is also affecting the high-risk fracture patient population. The use of DXA postfracture is low. In one Midwestern county hospital, only 10% of hip fracture patients had a DXA ordered upon hospital discharge.[4] Only 10% of Medicare beneficiaries who sustained a major osteoporotic fracture received postfracture DXA testing,[5]. Four well-established Midwestern health care systems reported less than one-quarter of patients who had a hip fracture had bone density testing before or after their fracture.[6] This data was corroborated by national Healthcare Effectiveness Data and Information Set (HEDIS) measures, demonstrating that less than one-third of people postfracture have received testing or treatment.[7]

1. O'Malley CD, Johnston SS, Lenhart G, et al.: Trends in dual-energy X-ray absorptiometry in the United States, 2000–2009. *J Clin Densitom* 2011 Apr-Jun;14(2):100-107. doi: 10.1016/j.jocd.2011.03.003.

2. Zhang J, Delzell E, Zhao H, et al.: Central DXA utilization shifts from office-based to hospital-based settings among medicare beneficiaries in the wake of reimbursement changes. *J Bone Miner Res* 2012 Apr;27(4):858-864. doi: 10.1002/jbmr.1534.

3. Overman RA, Farley JF, Curtis JR, et al.: DXA utilization between 2006 and 2012 in commercially insured younger postmenopausal women. *J Clin Densitom* 2015 Apr-Jun;18(2):145-149. doi: 10.1016/j.jocd.2015.01.005. Epub 2015 Feb 18.

4. Antonelli M, Einstadter D, Magrey M.: Screening and treatment of osteoporosis after hip fracture: Comparison of sex and race. *J Clinic Densitometry* 2014;17(4):479-483. doi: 10.1016/j.jocd.2014.01.009. PMID: 24657109.

5. Liu SK, Munson JC, Bell JE, et al.: Quality of osteoporosis care among older medicare fragility fracture patients 2006–2010. *J Am Geriatr Soc* 2013 Nov;61(11):1855-1862. Published online 2013 Oct 28. doi: 10.1111/jgs.12507.

6. Harrington JT, Broy SB, Derosa AM, et al.: Hip fracture patients are not treated for osteoporosis: A call to action. *Arthritis Rheum* 2002 Dec 15;47(6):651-654.

7. National Committee on Quality Assurance: The state of health care quality 2014. 2014:90-91. Available at: http://www.ncqa.org/ReportCards/HealthPlans/StateofHealthCareQuality.aspx. Accessed August 2015.

Osteoporosis Pharmacotherapy

Lead Author(s):
Nicole C. Wright, PhD, MPH
Kenneth S. Saag, MD, MSc

Currently, the pharmacotherapies approved for the treatment and prevention of osteoporosis fall under two categories: antiresorptive and anabolic agents. The antiresorptive agents inhibit the action of bone cells that degrade bone, whereas the anabolic agents promote bone formation. Teriparitide is the only approved anabolic agent. There are a number of FDA- approved classes of antiresporptive agents including bisphosphonates, selective-estrogen receptor modulators (SERMS), receptor activator of nuclear factor kappa beta (RANK) ligand inhibitors, and estrogen. The bisphosphonates are the most commonly used agents, which include oral (alendronate, ibandronate, and risedronate) and parenteral (ibandronate and zoledronic acid) preparations. All of these agents have been shown to reduce the risk of vertebral fracture. Some of these have been shown also to reduce the risk of nonvertebral fractures, in some cases including hip fracture. Large randomized, placebo-controlled studies suggest that there is a 30% to 70% reduction in the risk of vertebral fractures and a 16% to 25% reduction in the risk of nonvertebral fractures with pharmacologic treatment.[1,2] A number of general recommendations can be made regarding pharmacologic therapy for osteoporosis:

- Bisphosphonates are usually considered first-line treatment for osteoporosis, particularly because of their positive effects on vertebral, nonvertebral, and hip fractures.

- Second-line options include denosumab, raloxifene, strontium ranelate (in countries where available), and teriparatide.
- Teriparatide use is often confined to high-risk patients, those with fractures, and in those with glucocorticoid- induced osteoporosis. Risk of osteosarcoma limits administration to two years.
- Largely in light of the Women's Health Initiative (WHI) study results and the availability of many other efficacious compounds, estrogen is no longer considered first-line therapy.
- Combination use of antiresorptive drugs is generally not recommended because there is no current evidence of additional antifracture benefits, and there may be an increased risk of side effects and the over-suppression of bone turnover.

Patients deemed appropriate candidates for a pharmacologic therapy include:

- Men and women who have experienced a hip or spine fracture
- Those with osteoporotic range BMD determined by DXA
- Persons with low bone mass (osteopenia) meeting a fracture risk (FRAX) threshold of more than 3% for hip and more than 20% for major osteoporotic fracture, based on the National Osteoporosis Foundation (NOF) recommendations3
- Selected individuals without low bone mass but high fracture risk due to risk states such as use of glucocorticoids

Fracture risk thresholds may be different outside the United States.

Although a number of agents are available, the use of osteoporosis pharmacotherapy is also declining. Using commercial dispensing data, the use of oral bisphosphonates, the most commonly prescribed anti-osteoporosis pharmacotherapy, decreased by more than 50% from a peak of 31 million prescriptions dispensed in 2007 to only 14.7 million in 2012.4 Although less drastic, the sales of parenteral bisphosphonates for osteoporosis have also declined by 22% since its peak of 561,600 units in 2010 to 436,900 in 2012.4 It is speculated that declining treatment rates may be associated with a decrease in osteoporosis screening, lower physician initiation of therapy, and/or patient- or provider-initiated "drug holidays," which are becoming more common because of perceived safety concerns of long-term bisphosphonate use.

The declining use of pharmacotherapy is also prevalent among those newly diagnosed with osteoporosis. In a recent study among women with incident osteoporosis, more than 64% of women had no indications of osteoporosis pharmacotherapy use one year after diagnosis.5 Pharmacotherapy use in those who have sustained a fracture is low. Recent evaluations have found that only 12% of Medicare beneficiaries had evidence of osteoporosis pharmacotherapy use six months after sustaining a fracture.6 In a managed care population, only 18% of fracture patients had indications for osteoporosis pharmacotherapy within 90 days of their fracture, and only 23% appeared to use osteoporosis pharmacotherapy within a year postfracture.7 Studies in hip fracture patients found that 19% to 24% received therapy within one year postfracture,8,9 and that pharmacotherapy use posthip fracture has declined from 40% in 2002 to 21% in 2011.9

1. Kanis JA1, Burlet N, Cooper C, et al.: European guidance for the diagnosis and management of osteoporosis in postmenopausal women. *Osteoporos Int* 2008 Apr;19(4):399-428. doi: 10.1007/s00198-008-0560-z. Epub 2008 Feb 12.

2. Sambrook P1, Cooper C: Osteoporosis. *Lancet* 2006 Jun 17;367(9527):2010-2018.

3. Cosman F, deBeur SJ, LeBoff MS, et al.: Clinician's guide to prevention and treatment of osteoporosis. *Osteoporos Int* 2014;25(10):2359–2381. doi: 10.1007/s00198-014-2794-2.

4. a. b. Wysowski DK, Greene P.: Trends in osteoporosis treatment with oral and intravenous bisphosphonates in the United States, 2002–2012. *Bone* 2013;57(2):423-428.

5. Siris ES, Modi A, Tang J, et al.: Substantial under-treatment among women diagnosed with osteoporosis in a US managed-care population: A retrospective analysis. *Curr Med Res Opin* 2014 Jan;30(1):123-130. doi: 10.1185/03007995.2013.851074. Epub 2013 Oct 25.

6. Liu SK, Munson JC, Bell JE, et al.: Quality of osteoporosis care of older Medicare recipients with fragility fractures: 2006 to 2010. *J Am Geriatr Soc* 2013 Nov;61(11):1855-1862. doi: 10.1111/jgs.12507. Epub 2013 Oct 28.

7. Wilk A, Sajjan S, Modi A, et al.: Post-fracture pharmacotherapy for women with osteoporotic fracture: Analysis of a managed care population in the USA. *Osteoporos Int* 2014 Dec;25(12):2777-2786. doi: 10.1007/s00198-014-2827-x. Epub 2014 Aug 12.

8. Antonelli M, Einstadter D, Magrey M.: Screening and treatment of osteoporosis after hip fracture: Comparison of sex and race. *J Clinic Densitometry* 2014;17(4):479-483. doi: 10.1016/j.jocd.2014.01.009. PMID: 24657109.

9. a. b. Solomon DH, Johnston SS, Boytsov NN, et al.: Osteoporosis medication use after hip fracture in US patients between 2002 and 2011. *J Bone Miner Res* 2014 Sep; 29(9):1929-1937. Published online 2014 Aug 20. doi: 10.1002/jbmr.2202 PMCID: PMC4258070.

Adherence to Osteoporosis Pharmacotherapies

Lead Author(s):
Nicole C. Wright, PhD, MPH

Low adherence to osteoporosis pharmacotherapies has been documented since bisphosphonates first became available in 1995. Less than 50% of patients starting an oral bisphosphonate are still receiving this drug one year later.[1] The early formulations had strict dosing instructions and significant gastrointestinal side effects. The availability of parenteral preparations (intravenous [IV] zoledronic acid and ibandronate) and later formulations improved adherence rates, but even with these agents, adherence rates are not at 100%. Only 32% of IV zoledronic acid users received their second annual dose, and nearly 20% of IV ibandronate users received only one of the four annual doses.[2] Mechanisms to improve adherence to medications include engaging pharmacists in patient education activities to encourage adherence.[3,4] In Kaiser Permanente Colorado, an interactive voice response (IVR) reminder system followed by a personalized letter for patients prescribed osteoporosis medications led to increased medication purchase in the short term but did not change the medication adherence in the long term.[5] Additional efforts targeting patients, providers, and the health system are needed to improve adherence to osteoporosis medications.

1. Curtis JR, Westfall AO, Allison JJ, et al.: Channeling and adherence with alendronate and risedronate among chronic glucocorticoid users. *Osteoporos Int* 2006;17(8):1268-1274. Epub 2006 May 19.

2. Curtis JR, Yun H, Matthews R, et al.: Adherence with intravenous zoledronate and intravenous ibandronate in the United States Medicare population. *Arthritis Care Res (Hoboken)* 2012 Jul;64(7):1054-1060. doi: 10.1002/acr.21638.

3. Murphy-Menezes M: Role of the pharmacist in medication therapy management services in patients with osteoporosis. *Clinical Therapeutics* Jul 2015;37(7);1573-1586. Published Online: April 23, 2015. DOI: Available at: http://dx.doi.org/10.1016/j.clinthera.2015.03.023. Accessed August 23, 2015.

4. Stuurman-Bieze AG, Hiddink EG, van Boven JF, Vegter S.: Proactive pharmaceutical care interventions decrease patients' nonadherence to osteoporosis medication. *Osteoporos Int* 2014 Jun;25(6):1807-1812. doi: 10.1007/s00198-014-2659-8. Epub 2014 Feb 26.

5. Cizmic AD, Heilmann RM, Milchak JL, et al.: Impact of interactive voice response technology on primary adherence to bisphosphonate therapy: A randomized controlled trial. *Osteoporos Int* 2015 Aug;26(8):2131-2136. doi: 10.1007/s00198-015-3116-z. Epub 2015 May 9.

Multimorbidity

Multiple comorbidities create further challenges in the care of osteoporosis patients. Certain comorbidities and the medications used to treat them could also negatively impact bone health, for example, rheumatoid arthritis and the corticosteroids used in symptom relief. A recent study evaluated the comorbidities of women with and without osteoporosis in the Geisinger Health System.[1] Of the comorbidities commonly found among women with osteoporosis compared to women without osteoporosis, two have known independent and/or drug-related adverse effects on bone. Gastroesophageal reflux disease (GERD) was found in 55.6 per 1,000 person-years in women with osteoporosis versus 40.3 per 1,000 person-years in those without, while depression was found in 46.8 versus 36.9 per 1,000 person-years in the respective groups.[1] Diagnosed depression,[2,3] depressive symptoms,[4,5,6,7,8] and medications used to treat depression[9,10,11,12,13] have been associated with osteoporosis and fractures. Proton Pump Inhibitors (PPIs) are a common GERD treatment. The use of PPIs, particularly at high doses, has been associated with higher overall fracture risk[14,15,16,17,18] and hip fracture risk.[19,20,21] Like the prevalence of osteoporosis, the number of comorbidities increases with aging. Comorbidities compete with health care and medication priorities and may contribute to the low adherence levels to osteoporosis drugs.

1. a. b. O'Malley CD, Tran N, Zapalowski C, et al.: Multimorbidity in women with and without osteoporosis: Results from a large US retrospective cohort study 2004–2009. *Osteoporos Int* 2014 Aug;25(8):2117-2130. doi: 10.1007/s00198-014-2740-3. Epub 2014 May 24.

2. Schweiger U, Deuschle M, Körner A, et al.: Low lumbar bone mineral density in patients with major depression. *Am J Psychiatry* 1994 Nov;151(11):1691-1693.

3. Lee CW, Liao CH, Lin CL, et al.: Increased risk of osteoporosis in patients with depression: A population-based retrospective cohort study. *Mayo Clin Proc* 2015 Jan;90(1):63-70. doi: 10.1016/j.mayocp.2014.11.009.

4. Robbins J, Hirsch C, Whitmer R, et al.: The association of bone mineral density and depression in an older population. *J Am Geriatr Soc* 2001 Jun;49(6):732-736.

5. Wong SY, Lau EM, Lynn H, et al.: Depression and bone mineral density: Is there a relationship in elderly Asian men? Results from Mr. Os (Hong Kong). *Osteoporos Int* 2005 Jun;16(6):610-615. Epub 2004 Sep 23. PMID: 15448988.

6. Silverman SL, Shen W, Minshall ME, et al.: Prevalence of depressive symptoms in postmenopausal women with low bone mineral density and/or prevalent vertebral fracture: Results from the multiple outcomes of raloxifene evaluation (MORE) study. *J Rheumatol* 2007;34:140-144.

7. Erez HB, Weller A, Vaisman N, et al.: The relationship of depression, anxiety and stress with low bone mineral density in post-menopausal women. *Arch Osteoporos* 2012 Dec; 7(1-2):247-255.

8. Diem SJ, Ruppert K, Cauley JA, et al.: Rates of bone loss among women initiating antidepressant medication use in midlife. *J Clin Endocrinol Metab* 2013 Nov;98(11):4355-4363. doi: 10.1210/jc.2013-1971. Epub 2013 Sep 3.

9. Ensrud KE, Blackwell T, Mangione CM, et al.: Central nervous system active medications and risk for fractures in older women. *Arch Intern Med* 2003;163(8):949-957. doi:10.1001/archinte.163.8.949.

10. Cauley JA, Fullman RL, Stone KL, et al.: Factors associated with the lumbar spine and proximal femur bone mineral density in older men. *Osteoporos Int* 2005 Dec;16(12):1525-1537. Epub 2005 May 11.

11. Haney EM, Chan BKS, Diem SJ, et al.: Association of low bone mineral density with selective serotonin reuptake inhibitor use by older men. *Arch Intern Med* 2007;167(12):1246-1251. doi:10.1001/archinte.167.12.1246.

12. Richards JB, Papaioannou A, Adachi JD, et al.: Effect of selective serotonin reuptake inhibitors on the risk of fracture. *Arch Intern Med* 2007;167(2):188-194. doi:10.1001/archinte.167.2.188.

13. Ak E, Bulut SD, Bulut S, et al.: Evaluation of the effect of selective serotonin reuptake inhibitors on bone mineral density: An observational cross-sectional study. *Osteoporos Int* 2015;26:273–279. doi: 10.1007/s00198-014-2859-2. PMCID: PMC4286623.

14. Vestergaard P, Rejnmark L, Mosekilde L: Proton pump inhibitors, histamine H_2 receptor antagonists, and other antacid medications and the risk of fracture. *Calcif Tissue Int* 2006 Aug;79(2):76-83. Epub 2006 Aug 15.

15. Targownik LE, Lix LM, Metge CJ, et al.: Use of proton pump inhibitors and risk of osteoporosis-related fractures. *CMAJ* 2008 Aug 12;179(4):319-326. doi: 10.1503/cmaj.071330.

16. Gray SL, LaCroix AZ, Larson J, et al.: Proton pump inhibitor use, hip fracture, and change in bone mineral density in postmenopausal women: Results from the Women's Health Initiative. *Arch Intern Med* 2010 May 10;170(9):765-771. doi: 10.1001/archinternmed.2010.94.

17. Khalili H, Huang ES, Jacobson BC, et al.: Use of proton pump inhibitors and risk of hip fracture in relation to dietary and lifestyle factors: A prospective cohort study. *BMJ* 2012;344:e372. Available at doi: http://dx.doi.org/10.1136/bmj.e372. Accessed August 2014.

18. Moberg LME, Nilsson PM, Samsioe G, Borgfeldt C.: Use of proton pump inhibitors (PPI) and history of earlier fracture are independent risk factors for fracture in postmenopausal women. The WHILA study. *Maturitas* Aug;78(4):310-315. Available at doi: http://dx.doi.org/10.1016/j.maturitas.2014.05.019. Accessed August 2015.

19. Yang YX, Lewis JD, Epstein S, Metz DC: Long-term proton pump inhibitor therapy and risk of hip fracture. *JAMA* 2006 Dec 27;296(24):2947-2953.

20. Corley DA, Kubo A, Zhao W, Quesenberry C: Proton pump inhibitors and histamine-2 receptor antagonists are associated with hip fractures among at-risk patients. *Gastroenterology* 2010 Jul;139(1):93-101. doi: 10.1053/j.gastro.2010.03.055. Epub 2010 Mar 27.

21. Adams AL, Black MH, Zhang JL, et al.: Proton-pump inhibitor use and hip fractures in men: A population-based case-control study. *Ann Epidemiol*. 2014 Apr;24(4):286-290. doi: 10.1016/j.annepidem.2014.01.004. Epub 2014 Jan 16.

Unmet Needs

Lead Author(s):
Kenneth S. Saag, MD, MSc

While the burden of osteoporosis is growing significantly, the declining pattern of osteoporosis testing and treatment has created considerable unmet need and clear opportunities for new treatments and programs. Even after a fracture, many healthcare providers do not discuss osteoporosis with their patients. Indeed, fractures beget fractures: Fractures at nearly any site are significantly associated with subsequent fractures,[1,2] emphasizing the need for new drugs, treatment care approaches, and research funding to test the effectiveness of new therapies and treatment approaches.

1. Eisman JA, Bogoch ER, Dell R, et al.: Making the first fracture the last fracture: ASBMR task force report on secondary fracture prevention. *J Bone Miner Res* 2012 Oct;27(10):2039-2046. doi: 10.1002/jbmr.1698. Epub 2012 Jul 26.

2. Gehlbach S, Saag KG, Adachi JD, et al.: Previous fractures at multiple sites increase the risk for subsequent fractures: The Global Longitudinal Study of Osteoporosis in Women. *J Bone Miner Res* 2012 Mar;27(3):645-653. doi: 10.1002/jbmr.1476.

New Drugs: Unmet Needs, Osteoporosis

There are three new drugs being tested as potential osteoporosis treatments.

Abaloparatide
Abaloparatide is an analog of parathyroid hormone-related protein (PTHrP) being developed as a potential anabolic agent for osteoporosis treatment. In a phase 2 study, abaloparatide increased BMD at the lumbar spine, femoral neck, and total hip in a dose-dependent fashion. The abaloparatide-induced BMD increases either trended to or were significantly greater than those seen with teriparatide. Phase 3 studies will evaluate fracture outcome and additional safety with this therapy.

Odanacatib
Odanacatib is a selective inhibitor of cathepsin K, a collagenase produced by osteoclasts and responsible for the degradation of bone mineral and matrix. Women receiving odanacatib for five years gained BMD at the spine and hip, and showed bone biomarker changes somewhat different from those seen with bisphosphonates and typical antiresorptive therapies.[1,2] Also in contrast with bisphosphonates, after odanacatib discontinuation there was rapid reversal of treatment effects. Although the safety profile has been mild, cathepsin inhibitors have been associated with a scleroderma-like skin lesion. Other potential safety signals are being further investigated.

Anti-sclerostin antibodies
Sclerostin is produced by osteocytes and inhibits anabolic signaling pathway important for bone formation. Rare natural deficiencies in sclerostin result in sclerosing bone diseases, sclerosteosis, and van Buchem disease, which

are radiographically characterized by thickened bones, including all long bones. Monoclonal antibodies to sclerostin are being investigated for both osteoporosis treatment and for fracture healing. Preliminary studies suggest a significant increase in BMD with the anti-sclerostin romosuzumab.[3] Phase 3 clinical trials evaluating fracture risk protection are underway.

1. Eisman JA, Bone HG, Hosking DJ, et al.: Odanacatib in the treatment of postmenopausal women with low bone mineral density: Three-year continued therapy and resolution of effect. *J Bone Miner Res* 2011 Feb;26(2):242-251. doi: 10.1002/jbmr.212.

2. Langdahl B, Binkley N, Bone H, et al.: Odanacatib in the treatment of postmenopausal women with low bone mineral density: Five years of continued therapy in a phase 2 study. *J Bone Miner Res* 2012 Nov;27(11):2251- 2258. doi: 10.1002/jbmr.1695.

3. McClung MR, Grauer A, Boonen S, et al.: Romosozumab in postmenopausal women with low bone mineraldensity. *N Engl J Med* 2014;370:412-420. doi: 10.1056/NEJMoa1305224.

Fracture Liaison Service: Unmet Needs, Osteoporosis

Coordination of acute postfracture care with subsequent secondary osteoporosis prevention and treatment is a tenet of good osteoporosis management. Although most people who experience a fracture receive excellent and appropriate acute care management in a hospital or emergency department, most are not subsequently referred to or do not pursue postfracture osteoporosis care with a bone health specialist.

The fracture liaison service (FLS) is a model of care developed in Europe and successfully implemented in a number of US managed health care systems that seeks to facilitate postfracture care coordination. FLS operates under the supervision of bone health specialists and collaborates with primary care, orthopedic, and emergency department health care providers. Care typically is coordinated postfracture through a nurse or other allied health professional. Patients with recent fractures are tracked via a registry, and timelines are established for postfracture assessments and follow-ups. FLS programs recognize that patients who have fractured are at highest risk of future fractures. FLS programs in certain settings have reduced the number of fractures and have achieved cost savings by identifying and appropriately treating postfracture patients.

The efficiency of the FLS approach varies depending on its intensity and potentially the location of its implementation.[1,2]

1. Ganda K, Puech M, Chen JS, et al.: Models of care for the secondary prevention of osteoporotic fractures: A systematic review and meta-analysis. *Osteoporos Int* 2013 Feb;24(2):393-406. doi: 10.1007/s00198-012-2090-y. Epub 2012 Jul 25.

2. Solomon DH, Patrick AR, Schousboe J, Losina E: The potential economic benefits of improved post-fracture care: A cost-effectiveness analysis of a fracture liaison service in the US healthcare system. *J Bone Miner Res* 2014 Jul;29(7):1667-1674. doi: 10.1002/jbmr.2180.

Research Funding: Unmet Needs, Osteoporosis

The National Institutes of Health (NIH) supports both basic and clinical investigation in osteoporosis. Within the NIH, the National Institute of Arthritis, Musculoskeletal, and Skin Diseases (NIAMS); the National Institute on Aging (NIA); the National Institute of Dental and Craniofacial Research (NIDCR); National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK); and The National Institute of Child Health and Human Development (NICHD) all support osteoporosis-related research. NIAMS, the top institute for osteoporosis research, reported $72 million in osteoporosis research funding in fiscal year 2014, with an NIH-wide total of $141 million for osteoporosis-related projects.[1] Additional research support is provided by other federal agencies including the Agency for Health Care Research and Quality (AHRQ), the Centers for Disease Control and Prevention (CDC), and the Veterans Administration Research program. The new Patient-Centered Outcomes Research Institute (PCORI) has also supported osteoporosis research. The top private and agency funds for osteoporosis include the American Society of Bone and Mineral Research and the American College of Rheumatology. Although numerous agencies fund osteoporosis research, the dollars available are limited in comparison to other conditions prevalent in older Americans. Additional research funding would assist in identifying treatments, management strategies, and factors that can minimize the burden associated with osteoporosis.

1. National Institutes of Health, NIH Categorical Spending: Estimates of funding for various research, condition, and disease categories (RCDC). Available at: http://report.nih.gov/categorical_spending.aspx. Accessed August 8, 2015.

ICD-9-CM & ICD-10-CM Codes

OSTEOPOROSIS

Osteoporosis unspecified: 733.00 (ICD-10-CM: M81.0)
Senile osteoporosis: 733.01 (ICD-10-CM: M81.0)
Idiopathic osteoporosis: 733.02 (ICD-10-CM: M81.8)
Disuse osteoporosis: 733.03 (ICD-10-CM: M81.8)
Other osteoporosis: 733.09 (ICD-10-CM: M81.8)

FRAGILITY FRACTURES

Hip fracture: 820.0, 820.2, 733.14 (ICD-10-CM: S72.019A, S72.023A, S72.033A, S72.043A, S72.099A, S72.109A, S72.143A, S72.23XA, M84.459A)

Spine fracture: 805.0, 805.2, 805.4, 805.8, 806.0, 806.2, 806.4, 806.8, 733.13
(ICD-10-CM: S12.9XXA, S12.000A, S12.001A, S12.100A, S12.101A, S12.200A, S12.201A, S12.300A, S12.301A, S12.400A, S12.401A, S12.500A, S12.501A, S12.600A, S12.601A, S22.009A, S32.009A, S32.10XA, S32.2XXA, S14.101A, S14.102A, S14.103A, S14.104A, S14.111A, S14.112A,S14.113A, S14.114A, S14.121A, S14.122A, S14.123A, S14.124A, S14.131A, S14.132A, S14.133A, S14.134A, S14.151A, S14.152A, S14.153A, S14.154A, S14.105A,S14.106A, S14.107A, S14.115A, S14.116A, S14.117A, S14.125A,

S14.126A, S14.127A, S14.135A, S14.136A, S14.137A, S14.155A, S14.156A, S14.157A, S24.101AS24.102A, S24.111A, S24.112A, S24.131A, S24.132A, S24.151A, S24.152A, S24.103A, S24.104A, S24.113A, S24.114A, S24.133A, S24.134A, S24.153A, S24.154A,S34.109A, S34.119A, S34.129A, S32.009A, S34.101A, S34.111A, S34.121A, S32.019A, S34.102A, S34.112A, S34.122A, S32.029A, S34.103A, S34.113A, S34.123A,S32.039A, S34.104A, S34.114A, S34.124A, S32.049A, S34.105A, S34.115A, S34.125A, S32.059A, S14.109A, S24.109A, S34.109A, S34.139A, M48.50XA, M80.08XA,M84.48XA, M84.68XA)

Pelvic fracture: 808.0, 808.2, 808.4, 808.8 (ICD-10-CM: S32.409A, S32.501A, S32.501A, S32.509A, S32.309A, S32.609A, S32.810A, S32.811A, S32.82XA, S32.89XA, S32.9XXA)

Femur (thigh) fracture: 821.0, 821.2, 733.15 (ICD-10-CM: S72.90XA, S72.309A, S72.409A, S72.413A, S72.416A, S72.443A, S72.446A, S72.453A, S72.456A, S72.499A, M84.453A)

Wrist fracture: 813.4, 733.12 ICD-10-CM: S52.90XA, S52.539A, S52.549A, S52.509A, S52.609A, S52.119A, S52.529A, S52.019A, S52.629A, S52.011A, S52.012A, S52.621A, A52.622A, M84.439A)

Humerus (arm) fracture: 812.0, 812.2, 812.4, 733.1 (ICD-10-CM: S42.209A, S42.213A, S42.216A, S42/293A, S42.295A, S42.253A, S42.256A, S42/293A, S42.296A, S42.309A, S42.399A, S42.409A, S42.413A, S42.416A, S42.433A, S42.436A, S42.453A, S42.456A, S42.443A, S42.446A, S42.463A, S42.466A, S42.473A, S42.476A, S42.493A, S42.496A, M84.40XA)

Table 5.1: Estimated Number of Persons Age 50 and Older With Osteoporosis and Low Bone Mass at Either the Femoral Neck or Lumbar Spine, by Sex, Age, and Race, United States 2005-2010

		Osteoporosis		Low Bone Mass	
	Total population *n*	Prevalence[1] % (SE)	OP *n* (95% CI)[2]	Prevalence[1] % (SE)	LBM *n* (95% CI)[2]
Both sexes					
Total population	99,048,838	10.3 (0.37)	10.2 (9.4, 10.9)	43.9 (0.72)	43.4 (42.0, 44.8)
50–59	41,962,930	5.1 (0.60)	2.2 (1.7, 2.6)	40.2 (1.12)	16.9 (16.0, 17.8)
60–69	29,253,187	8.0 (0.87)	2.3 (1.8, 2.8)	43.6 (1.18)	12.8 (12.1, 13.4)
70–79	16,595,961	16.4 (0.94)	2.7 (2.4, 3.0)	47.3 (1.41)	7.9 (7.4, 8.3)
80 & over	11,236,760	26.2 (1.59)	2.9 (2.6, 3.4)	52.9 (2.22)	5.9 (5.5, 6.4)
Race/ethnicity[3]					
NH white	75,272,609	10.2 (0.47)	7.7 (7.0, 8.4)	44.9 (0.89)	33.8 (32.5, 35.1)
NH black	9,830,977	4.9 (0.65)	0.5 (0.4, 0.6)	29.7 (1.51)	2.9 (2.6, 3.2)
Mexican American	4,595,535	13.4 (1.10)	0.6 (0.5, 0.7)	43.2 (1.41)	2.0 (1.9, 2.1)
Women					
Total population	53,151,456	15.4 (0.63)	8.2 (7.5, 8.9)	51.4 (0.93)	27.3 (26.3, 28.3)
50–59	21,506,008	6.8 (0.83)	1.5 (1.1, 1.8)	49.3 (1.69)	10.6 (9.9, 11.3)
60–69	15,323,140	12.3 (1.44)	1.9 (1.5, 2.3)	53.4 (1.54)	8.2 (7.7, 8.6)
70–79	9,169,601	25.7 (1.56)	2.4 (2.1, 2.6)	51.8 (1.70)	4.7 (4.4, 5.1)
80 & over	7,152,707	34.9 (2.44)	2.5 (2.2, 2.8)	52.7 (3.07)	3.8 (3.3, 4.2)
Race/ethnicity[3]					
NH white	40,089,289	15.8 (0.81)	6.3 (5.7, 7.0)	52.6 (1.17)	21.1 (20.2, 22.0)
NH black	5,534,149	7.7 (1.10)	0.4 (0.3, 0.5)	36.2 (2.03)	2.0 (1.8, 2.2)
Mexican American	2,371,091	20.4 (1.70)	0.5 (0.4, 0.6)	47.8 (2.33)	1.1 (1.0, 1.2)
Men					
Total population	45,897,382	4.3 (0.40)	2.0 (1.6, 2.3)	35.2 (0.93)	16.1 (15.3, 17.0)
50–59	20,456,922	3.4 (0.68)	0.7 (0.4, 1.0)	30.7 (1.78)	6.3 (5.6, 7.0)
60–69	13,930,047	3.3 (0.73)	0.5 (0.3, 0.7)	32.9 (1.82)	4.6 (4.1, 5.1)
70–79	7,426,360	5.0 (0.78)	0.4 (0.3, 0.5)	41.8 (2.51)	3.1 (2.7, 3.5)
80 & over	4,084,053	10.9 (1.7)	0.4 (0.3, 0.6)	53.1 (2.82)	2.2 (1.9, 2.4)
Race/ethnicity[3]					
NH white	35,183,320	3.9 (0.39)	1.4 (1.1, 1.6)	36.0 (1.13)	12.7 (11.9, 13.4)
NH black	4,296,828	1.3* (0.40)	0.1 (0.02, 0.1)	21.3 (1.75)	0.9 (0.8, 1.1)
Mexican American	2,224,444	5.9 (1.08)	0.1 (0.1, 0.2)	38.3 (2.55)	0.9 (0.7, 1.0)

OP = osteoporosis; LBM = low bone mass; SE = standard error; 95% CI = 95% confidence interval; NH = non-Hispanic.

1 Prevalence from NHANES 2005–2010 has been adjusted to the age, sex, and race/ethnic distribution of the US population at the time of the 2010 Census using the direct method.

2 Count expressed in millions.

3 Other races not shown separately.

* May be statistically unreliable; standard error/percent is 31% to 39% or sample size is <30.

Source: Wright NC, Looker AC, Saag KG, et al. "The recent prevalence of osteoporosis and low bone mass in the United States based on bone mineral density at the femoral neck or lumbar spine." *JBMR* 2014;29(11):2520-2526. DOI: 10.1002/jbmr.2269

Table 5.2.1: Health Care Visits With Diagnosis of Osteoporotic Fracture for Persons Age 50 and Over, United States 2008-2011

	Diagnoses (in 000s)				
	Fracture [1] Diagnosis		Fracture with Osteoporosis [2] Diagnosis		
	Total Diagnosis	Primary Diagnosis [3]	Total Diagnosis	Primary (1st) Diagnosis [3]	Total Osteoporosis Diagnosis [2]
Hospital Discharges [4]					1,179.1
Hip fracture [5]	325.2	299.8	67.6	63.6	
Spine fracture [6]	245.8	112.1	75.7	39.5	
Pelvic fracture [7]	76.8	47.7	17.7	12.0	
Femur (thigh) fracture [8]	45.4	36.7	11.3	9.8	
Wrist fracture [9]	37.9	16.9	6.7	2.8	
Humerus (arm) fracture [10]	79.8	50.7	13.1	8.7	
Total all OP fracture discharges	765.7	563.8	181.2	136.5	
Emergency Department Visits [11]					1,019.7
Hip fracture [5]	304.8	284.8	54.2	51.9	
Spine fracture [6]	297.4	156.7	66.4	36.3	
Pelvic fracture [7]	96.6	66.4	16.7	12.6	
Femur (thigh) fracture [8]	46.4	38.9	8.8	7.8	
Wrist fracture [9]	182.5	149.9	9.1	6.0	
Humerus (arm) fracture [10]	183.9	144.8	12.5	8.9	
Total all OP fracture visits	1,065.1	841.6	159.3	123.4	
Outpatient Department Visits [12]					308.8
Hip fracture [5]	43.3	36.4	NA	NA	
Spine fracture [6]	32.0	26.4	NA	NA	
Pelvic fracture [7]	15.6	12.7	NA	NA	
Femur (thigh) fracture [8]	14.8	13.2	NA	NA	
Wrist fracture [9]	25.0	22.3	NA	NA	
Humerus (arm) fracture [10]	56.9	47.9	NA	NA	
Total all OP fracture visits	180.2	158.9	NA	NA	
Physician Office Visits [13]					4,467.5
Hip fracture [5]	450.5	378.5	NA	NA	
Spine fracture [6]	373.0	279.2	18.1	18.1	
Pelvic fracture [7]	134.3	134.3	NA	NA	
Femur (thigh) fracture [8]	171.1	115.5	NA	NA	
Wrist fracture [9]	713.5	658.6	NA	NA	
Humerus (arm) fracture [10]	514.6	480.6	6.3	6.3	
Total all OP fracture visits	2,328.0	2,046.6	24.4	24.4	

Table 5.2.1: Health Care Visits With Diagnosis of Osteoporotic Fracture for Persons Age 50 and Over, United States 2008-2011

	Diagnoses (in 000s)				
	Fracture [1] Diagnosis		Fracture with Osteoporosis [2] Diagnosis		
	Total Diagnosis	Primary Diagnosis [3]	Total Diagnosis	Primary (1st) Diagnosis [3]	Total Osteoporosis Diagnosis [2]
Total All Health Care Sites [4, 11, 12, 13]					6,975.1
Hip fracture [5]	1,123.8	999.5	121.8	115.5	
Spine fracture [6]	948.2	574.4	160.2	93.9	
Pelvic fracture [7]	323.3	261.1	34.4	24.6	
Femur (thigh) fracture (8)	277.7	204.3	20.1	17.6	
Wrist fracture [9]	958.9	847.7	15.8	8.8	
Humerus (arm) fracture [10]	835.2	724.0	31.9	23.9	
Total all OP fracture visits	4,339.0	3,610.9	364.9	284.3	

[1] Excludes injuries from high impact ICD-9-CM diagnostic codes E880, 733.81, 733.82, and joint replacement ICD-9-CM procedure codes 00.71, 81.53, 78.60.
[2] ICD-9-CM codes 73300, 73301, 73302, 73303, 73309
[3] Primary diagnosis is based on first listed diagnosis in potential of 25 (NIS) or 15 (NEDS) diagnoses. May under-estimate total numbers due to first diagnosis listed not always indicative of the primary diagnosis.
[4] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp
[5] ICD-9-CM codes 820.0, 820.2, 73314
[6] ICD-9-CM codes 805.0, 805.2, 805.4, 805.8, 806.0, 806.2, 806.4, 806.8, 733.13
[7] ICD-9-CM codes 808.0, 808.2, 808.4, 808.8
[8] ICD-9-CM codes 821.0, 821.2, 733.15
[9] ICD-9-CM codes 813.4, 733.12
[10] ICD-9-CM codes 812.0, 812.2, 812.4, 733.1
[11] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp
[12] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.
[13] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

Table 5.2.2: Health Care Visits with Primary Diagnosis[1] or Osteoporotic Fracture[2] in Hospitals and Emergency Rooms for Persons Age 50 and Over, by Sex and Age, United States 2011

	Male	Female	50-59	60-69	70-79	80 & Over	Total (age 18 & over)
Hospital Discharges [3]							
Osteoporosis diagnosis [4]	141.9	1037.1	82.5	187.0	308.3	379.5	1,179.1
	Primary Diagnosis of Osteporotic Fracture (in 000s)						
Hip fracture [5]	86.4	213.4	16.5	32.8	65.6	125.8	299.8
Spine fracture [6]	38.6	73.4	13.3	17.0	25.2	35.9	112.1
Pelvic fracture [7]	11.4	36.3	3.8	4.9	9.1	21.1	47.7
Femur (thigh) fracture [8]	8.2	28.5	5.1	7.0	8.7	10.5	36.7
Wrist fracture [9]	3.2	13.7	3.6	3.7	3.6	3.6	16.9
Humerus (arm)fracture [10]	11.7	39.0	7.4	10.4	12.5	12.3	50.7
Total all OP fracture discharges	159.5	404.3	49.7	75.8	124.8	209.2	563.8
Diagnoses per 100 US population [12]	0.4	1.4	0.1	0.3	0.8	1.9	0.6
All hospital discharges	9,844.3	11,595.4	5,003.6	5,436.7	5,200.8	3,266.4	21,445.3
Proportion all hospital discharges	1.6%	3.5%	1.0%	1.4%	2.4%	6.4%	2.6%
Emergency Department (ED) Visits [11]							
Osteoporosis diagnosis [4]	103.6	916.0	81.1	151.3	251.0	346.1	1,019.7
Hip fracture [5]	83.1	201.7	16.0	31.3	61.2	119.8	284.8
Spine fracture [6]	54.9	101.9	23.9	23.4	34.8	47.2	156.7
Pelvic fracture [7]	16.4	50.0	6.7	7.5	12.8	27.3	66.4
Femur (thigh) fracture [8]	9.5	29.4	5.8	7.5	9.1	11.0	38.9
Wrist fracture [9]	28.5	121.4	45.8	40.2	30.5	18.8	149.9
Humerus (arm)fracture [10]	33.9	110.8	29.9	34.3	34.2	27.4	144.8
Total all OP fracture visits	226.3	615.2	128.1	144.1	182.6	251.5	841.6
Diagnoses per 100 US population [12]	0.5	1.2	0.3	0.5	1.1	2.2	0.8
All ED visits	18,604.5	23,436.5	14,660.6	10,175.9	8,162.0	5,098.5	42,046.0
Proportion all ED visits	1.2%	2.6%	0.9%	1.4%	2.2%	4.9%	2.0%

Table 5.2.2: Health Care Visits with Primary Diagnosis[1] or Osteoporotic Fracture[2] in Hospitals and Emergency Rooms for Persons Age 50 and Over, by Sex and Age, United States 2011

[1] Primary diagnosis is based on first listed diagnosis in potential of 25 (NIS) or 15 (NEDS) diagnoses. May under-estimate total numbers due to first diagnosis listed not always indicative of the primary diagnosis.
[2] Excludes injuries from high impact ICD-9-CM diagnostic codes E880, 733.81, 733.82, and joint replacement ICD-9-CM procedure codes 00.71, 81.53, 78.60.
[3] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp
[4] ICD-9-CM codes 73300, 73301, 73302, 73303, 73309
[5] ICD-9-CM codes 820.0, 820.2, 73314
[6] ICD-9-CM codes 805.0, 805.2, 805.4, 805.8, 806.0, 806.2, 806.4, 806.8, 733.13
[7] ICD-9-CM codes 808.0, 808.2, 808.4, 808.8
[8] ICD-9-CM codes 821.0, 821.2, 733.15
[9] ICD-9-CM codes 813.4, 733.12
[10] ICD-9-CM codes 812.0, 812.2, 812.4, 733.1
[11] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp
[12] Adjusted to 2010 U.S. Census Population. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml. Accessed April 13, 2015.There is the potential for multiple diagnoses per person which is not accounted for.

Table 5.3: Percentages of Individuals Hospitalized or Admitted to Skilled Nursing Facility within Six Months After Various Fracture Types Compared With Six Months Preceding the Fracture, United States 2000-2004

	Site of Fracture						
	Clinical Vertebral	Hip	Pelvis	Femur	Tibia/ Fibula	Humerus	Distal Radius/
Hospital Discharges							
% Hospitalized six months after fracture	58.4	98.2	91.4	90.5	70.0	62.9	35.4
% Hospitalized in baseline (six months before)	41.5	27.1	34.2	40.5	36.8	36.2	28.5
Skilled Nursing Facility Stays After Fracture							
% Stays after fracture	34.7	84.1	72.2	75.3	49.8	38.4	19.2
% Stays in baseline (six months before)	26.3	24.0	30.0	32.3	30.1	26.8	16.7

Source: Becker DJ, Yun H, Kilgore ML, et al. Health services utilization after fractures: recent evidence from Medicare. *J Gerontol A Biol Sci Med Sci* . 2010 Sep;65(9):1012-20. PMID: 20530242

Table 5.4: Average Length of Hospital Stay After Fractures, United States 2000-2004

	Site of Fracture						
	Clinical Vertebral	Hip	Pelvis	Femur	Tibia/ Fibula	Humerus	Distal Radius/ Ulna
Average (Days)	6.8	11.3	9.9	11.3	7.5	6.5	3.3
St. Dev.	10.3	10.4	10.8	11.8	10.4	10.1	7.1

Source: Becker DJ, Yun H, Kilgore ML, et al. Health services utilization after fractures: recent evidence from Medicare. *J Gerontol A Biol Sci Med Sci* . 2010 Sep;65(9):1012-20. PMID: 20530242

Table 5.5: Average Length of Hospital Stay (LOS) and Mean Hospital Charges for Primary[1] Osteoporotic Fractures for Persons Age 50 and Over, United States 2011

Length of Stay (LOS)	Sex		Age				Mean LOS	Number of	
	Male	Female	50-59	60-69	70-79	80 & over	All Discharges	Discharges (in 000s)	Total Hospital Days (in 000s)
Hip fracture [3]	6.1	5.5	5.8	5.8	5.7	5.6	5.7	299.8	1,708.86
Spine fracture [4]	6.1	5.2	6.4	6.2	5.6	5.0	5.6	112.1	627.76
Pelvic fracture [5]	5.9	4.2	6.8	6.1	4.6	4.0	4.6	47.7	219.42
Femur (thigh) fracture [6]	6.6	5.9	6.2	6.1	6.1	5.7	6.0	36.7	220.20
Wrist fracture [7]	3.6	3.2	3.0	2.8	3.2	3.6	3.2	16.9	54.08
Humerus (arm)fracture [8]	4.4	4.0	3.7	3.9	4.1	4.3	4.1	50.7	207.87
Total all OP fracture discharges	5.9	5.1	5.6	5.5	5.4	5.2	5.4	563.8	3,044.5
All hospital discharges age 50 & over	5.3	5.2	5.0	5.2	5.4	5.3	5.2	21,445.3	111,515.6
Ratio osteoporosis fractures to all visits	1.11	0.98	1.12	1.06	1.00	0.98	1.04		
Proportion osteoporosis discharges to total discharges								2.6%	2.7%

Mean Charges (in $000s)	Sex		Age				Mean	Number of	Total Hospital
	Male	Female	50-59	60-69	70-79	80 & over	Charges (in 000s)	Discharges (in 000s)	Charges (in millions)
Hip fracture [3]	$ 57.7	$ 51.9	$ 57.9	$ 57.3	$ 54.7	$ 51.2	$ 53.6	299.8	$ 16,069
Spine fracture [4]	$ 68.2	$ 46.2	$ 80.4	$ 48.1	$ 56.2	$ 38.0	$ 53.8	112.1	$ 6,031
Pelvic fracture [5]	$ 50.5	$ 23.7	$ 69.3	$ 51.7	$ 30.5	$ 20.7	$ 30.1	47.7	$ 1,436
Femur (thigh) fracture [6]	$ 72.9	$ 60.5	$ 73.1	$ 65.3	$ 64.7	$ 56.6	$ 63.3	36.7	$ 2,323
Wrist fracture [7]	$ 44.6	$ 34.1	$ 41.7	$ 38.1	$ 36.5	$ 28.7	$ 36.1	16.9	$ 610
Humerus (arm)fracture [8]	$ 50.8	$ 43.0	$ 49.7	$ 49.8	$ 46.8	$ 36.6	$ 44.8	50.7	$ 2,271
Total all OP fracture discharges	$ 59.7	$ 47.4	$ 63.9	$ 59.6	$ 52.6	$ 44.9	$ 50.9	563.8	28,697.42
All hospital discharges age 50 & over	47.1	41.0	44.6	48.2	45.7	34.6	43.8	18,998.2	832,121.2
Ratio osteoporosis fractures to all visits	1.27	1.16	1.43	1.24	1.15	1.30	1.16		
Proportion osteoporosis discharges to total discharges								3.0%	3.4%

[1] Primary diagnosis is based on first listed diagnosis in potential of 25 (NIS) diagnoses. May under-estimate total numbers due to first diagnosis listed not always indicative of the primary diagnosis.

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 5.6: Average Numbers of Physician Office Visits in Six Months Before and After Fractures, United States 2000-2004

	Site of Fracture						
	Clinical Vertebral	Hip	Pelvis	Femur	Tibia/ Fibula	Humerus	Distal Radius/ Ulna
% Visits six months after fracture	7.4	6.6	6.8	7.1	7.0	6.8	6.1
% Visits in baseline (six months before)	6.4	5.4	5.7	5.8	5.2	5.3	4.8

Source: Becker DJ, Yun H, Kilgore ML, et al. Health services utilization after fractures: recent evidence from Medicare. *J Gerontol A Biol Sci Med Sci* . 2010 Sep;65(9):1012-20. PMID: 20530242

Table 5.7: Death, Debility and Destitution Following Hip Fractures and Among Matched Comparators, United States 2005-2010

Outcome event		Hip fractures		Comparators			
Subject group	N pairs [1]	N events	(%) [2]	N events	(%)	IPR [3]	95% CI [4]
1-year Mortality							
All subjects	43,332	12,413	-28.6	5,470	-12.6	2.27	2.20-2.34
Long-term care resident	8,438	3,581	-42.4	2,141	-25.4	1.67	1.60-1.75
Community dwelling	34,894	8,832	-25.3	3,329	-9.5	2.65	2.56-2.75
Low income	9,866	3,265	-33.1	1,716	-17.4	1.91	1.81-2.01
Not low income	33,466	9,148	-27.3	3,754	-11.2	2.44	2.35-2.52
Debility (long-term care residency)							
Community dwelling	34,894	7,022	-20.1	1,773	-5.1	3.96	3.77-4.16
Destitution (newly low income)							
Not low income	33,466	2,213	-6.6	1,032	-3.1	2.14	1.99-2.31

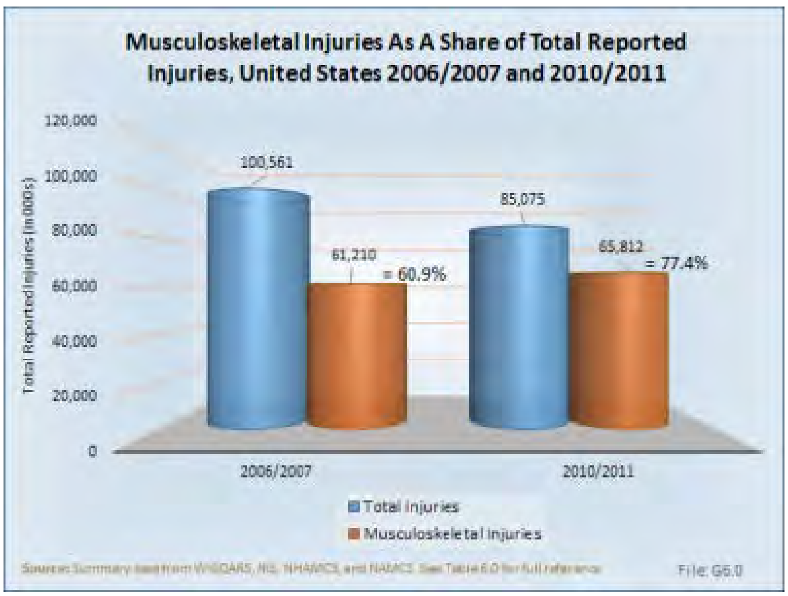
[1] Number of hip fracture and comparator matched pairs included in the analysis.
[2] Percent experiencing each outcome among total hip fractures or comparators in the subject group being analyzed.
[3] Incidence proportion ratio for the event of interest in hip fracture patients versus comparators.
[4] 95% confidence interval of the IPR.
Source: Tajeu GS, Delzell E, Smith W, et al. Death, debility, and destitution following hip fracture. *J Gerontol A Biol Sci Med Sci* . 2014 Mar;69(3):346-53. doi: 10.1093/gerona/glt105. Epub 2013 Jul 19.

Injuries

Lead Author(s):
Andrew N. Pollak, MD

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

More than three of every five unintentional injuries that occur annually in the United States are to the musculoskeletal system. Although the incidence of total unintentional injuries is difficult to estimate, numerous databases and reports since the early 1990s have shown that between 60% and 77% of injuries occurring annually involve the musculoskeletal system. (Reference Table 6.0 PDF CSV)



Definition

Musculoskeletal injuries are injuries occurring to the neck, spine, pelvis, and extremities. As defined by medical diagnosis codes, musculoskeletal injuries include fractures, derangements, dislocations, sprains and strains, contusions, crushing injuries, open wounds, and traumatic amputations. They are often caused by sudden physical contact of the body with external objects, but the most common cause is falls. Additional major causes of musculoskeletal injuries are sports injuries, playground accidents, motor vehicle crashes, civilian interpersonal violence, war injuries, stress injuries, overexertion, and repetitive workplace injuries.[1]

Musculoskeletal disorders (MSDs) are injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and disorders of the nerves; tendons; muscles; and supporting structures of the upper and lower limbs, neck, and lower back that are caused, precipitated, or exacerbated by sudden exertion or prolonged exposure to physical factors such as repetition, force, vibration, or awkward posture.[2]

In 2010/2011, more than 65.8 million annual episodes of treatment for musculoskeletal injuries were recorded in physician offices, emergency departments, outpatient clinics, and hospitalizations. This compares to 85.1 million episodes of treatment for all kinds of injuries, including burns, poisoning, and drowning, a number that is down by 15% from the 2006/2007 reporting year.

1. The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), based on the World Health Organization's Ninth Revision, International Classification of Diseases (ICD-9). ICD-9-CM is the official system of assigning codes to diagnoses and procedures associated with hospital utilization in the United States.

2. National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC). http://www.cdc.gov/niosh/programs/msd/ Accessed June 2, 2014.

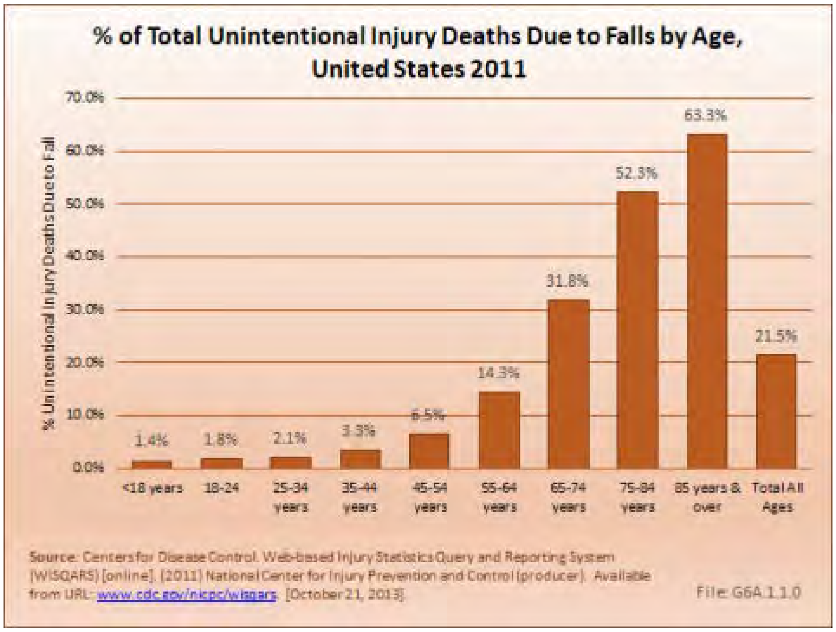
Falls and Traumatic Injuries

A traumatic injury is defined as "an injury or wound to a living body caused by the application of external force or violence,"[1] and includes injuries incurred in vehicular accidents, machinery, falls, sports, and other injuries caused by something outside a person's body.

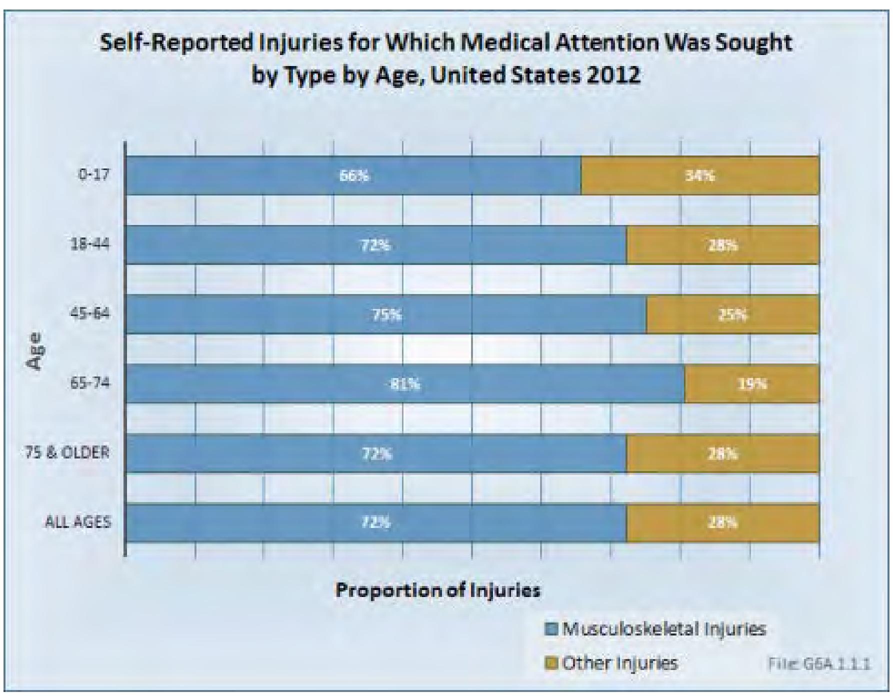
1. National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC). http://www.cdc.gov/niosh/programs/ti/ Accessed June 3, 2014.

Self-Reported Musculoskeletal Injuries: Falls and Traumatic Injuries

In 2012, 8.86 million persons reported seeking medical care for an injury during the prior three months. The number of self-reported injuries, even when extrapolated out to a full year, is much lower than the number of health care visits to physicians, emergency departments, outpatient clinics, and hospitals reported over the course of a year, suggesting that self-reported injuries are underreported. However, the proportion of these injuries that were musculoskeletal was similar to that reported by the national health care databases for injury-related health care visits, 72% and 77%, respectively. In addition, self-reported injuries reflected the distribution by demographic characteristics (i.e., sex, age, and race) in the same proportion as found in the general population and among health care visits in the national databases, confirming that musculoskeletal injuries occur to all people. (Reference Table 6A.1.1.1 PDF CSV)



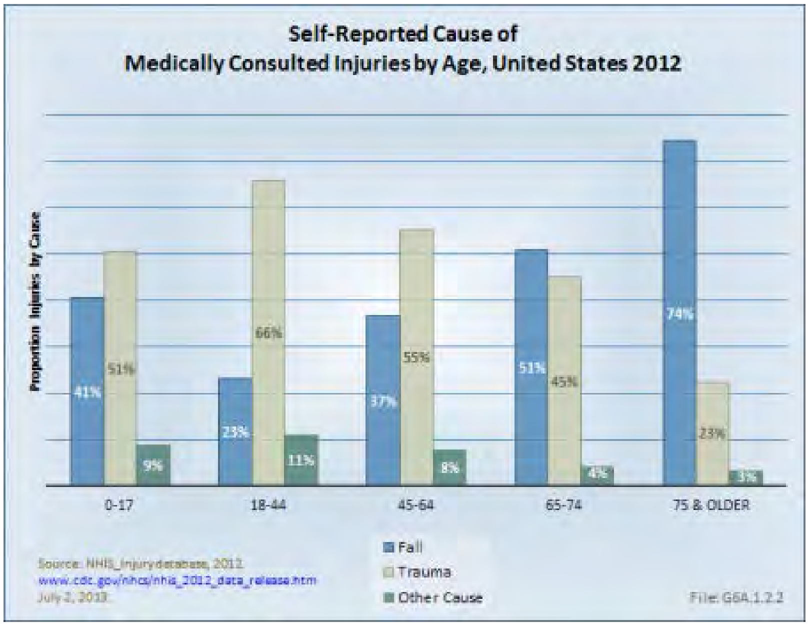
The type of self-reported injury reported varied somewhat by demographic group, particularly with respect to sex and age. Overall, the most common type of musculoskeletal injury for which medical attention was sought was a sprain or strain. This was particularly true for persons aged 65 to 74 years, and for females. People age 75 years and older were most likely to report a contusion, but this age group also reported higher proportions of fractures than other ages. Open wounds requiring medical attention were more likely to be reported by males and people 18 to 44 years than by other demographic groups. Sprains and strains as well as fractures were the most common musculoskeletal injury type reported for children ages 0 to 17 years; overall, children had a lower proportion of musculoskeletal injuries for which medical attention was sought than did other age groups. (Reference Table 6A.1.1.1 PDF CSV)



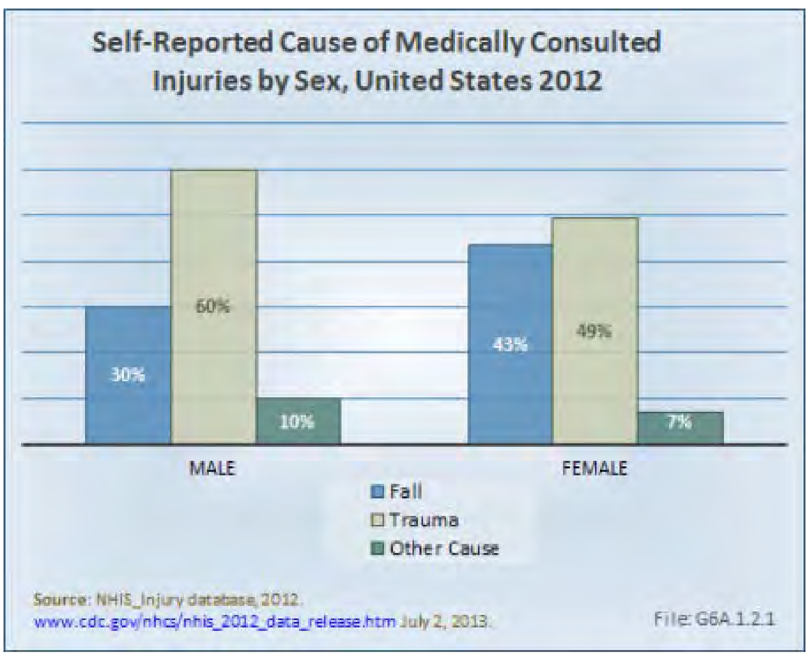
Injuries to the knee were the most common, accounting for 10% of all musculoskeletal injuries for which medical attention was sought. Knee injuries were slightly more likely to occur to young and middle age adults (18 to 64 years) than to children and older persons. Injuries to the back were the second most common injury for which medical attention was sought. People age 18 to 44 years were most likely to have a back injury, while children rarely reported injuries to the back. Children were most likely to have an ankle injury that required medical attention. About 40% of persons reported an injury in multiple anatomic sites that required medical attention. (Reference Table 6A.1.1.2 PDF CSV)

Cause and Source of Self-Reported Injuries: Falls and Traumatic Injuries

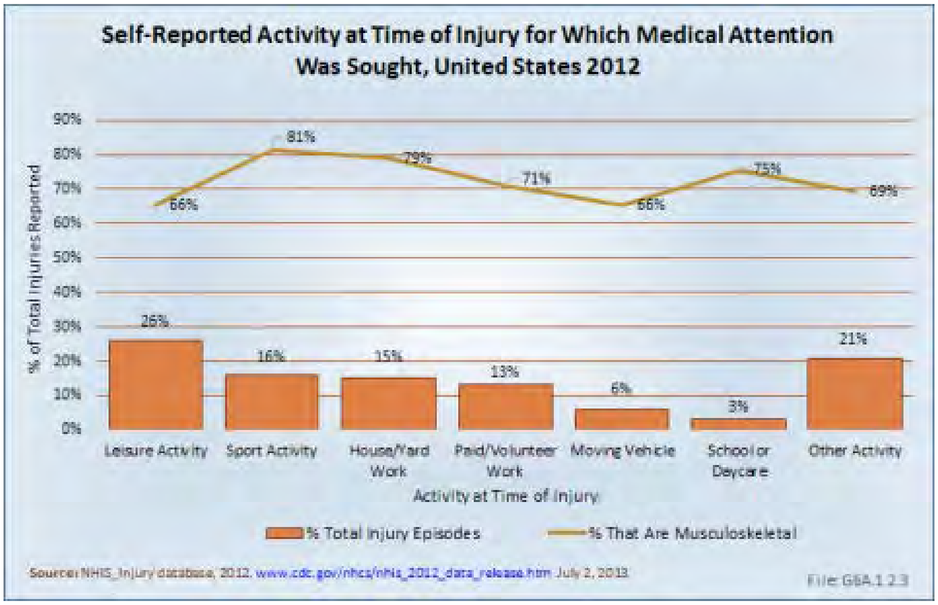
Although all are traumatic injuries, the NHIS separates falls from trauma caused by vehicular accidents, machinery, moving objects, and other types of traumatic injuries in self-reported data. Trauma was the most common cause of musculoskeletal injuries for which medical attention was sought, accounting for slightly more than half the injuries. This was particularly true for young adults age 18 to 44 years, when sports and activities can be the source of musculoskeletal injuries. However, for older persons, particularly those age 75 years and older, falls accounted for three in four injuries for which they sought medical attention. Males were also more likely to suffer an injury requiring medical attention as a result of trauma, while females reported falls and trauma about equally as the cause of the injury. (Reference Table 6A.1.2.1 PDF CSV)



It has long been known that most accidents occur in or around the home. In 2012, people reported more than one-half of the injuries for which they sought medical treatment occurred in the home (31%) or outside the home or farm (21%). Other common places of injury are recreation sites, public streets, and sidewalks. The proportion of injuries that are musculoskeletal is highest for injuries incurred at recreation sites, including fields, courts, parks, lakes, and rivers. More than three of four injuries for these sites were musculoskeletal. Injuries occurring inside the home had the lowest ratio of being musculoskeletal. (Reference Table 6A.1.2.2 PDF CSV)



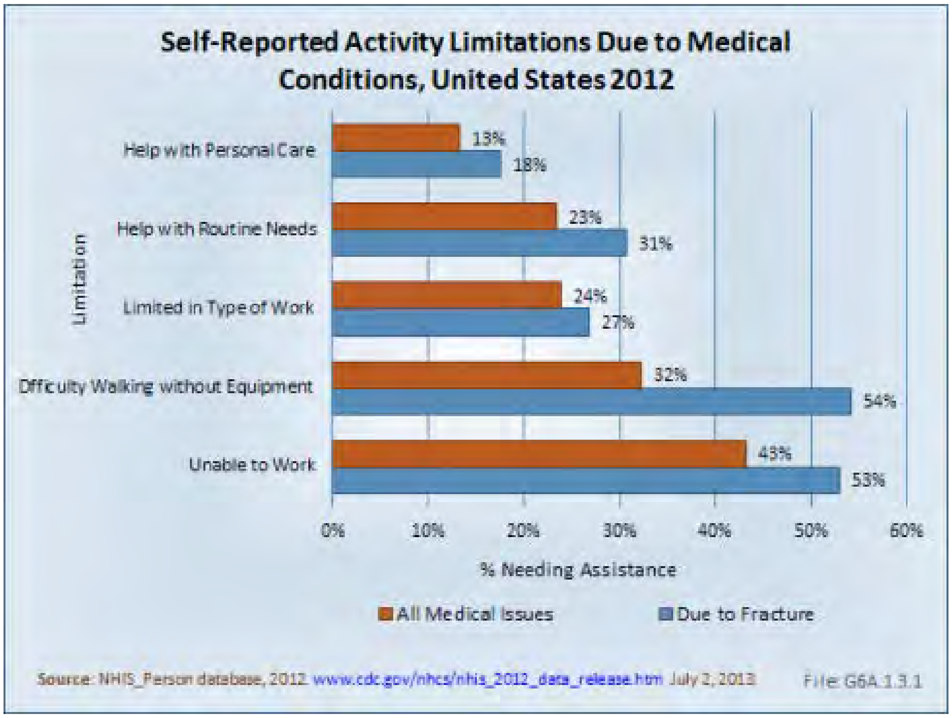
The type of activity engaged in was not significantly different as a cause of musculoskeletal versus injuries to other body systems. More injuries occur when involved in non-sport leisure activities than any other activity. Sports and working in and around the home or other workplace are the cause of similar numbers of injuries for which medical care is sought. (Reference Table 6A.1.2.3 PDF CSV)



Self-Reported Musculoskeletal Injuries Limitations: Falls and Traumatic Injuries

The annual National Health Interview Survey asks participants if they are limited in activities of daily living, such as the ability to dress oneself, to get in or out of bed or a chair, or to work due to health issues. For all health concerns,1 more than 13 in 100 people in the United States reported they had limitations in a prior three-month period due to health issues. Fractures accounted for 8% of the primary causes of limitation, resulting in limitation in 1 in 100 people in the United States. Among older women, those age 75 years and older, fractures rose to 10.3% of the total causes of limitations, but was only 6.4% for men. Fractures were responsible for limitations in daily activities in 14% of men in the age range of 45 to 64 years who reported limitations. Overall, women reported being limited due to fractures more often than men until they reached the age of 75 years or older. (Reference Table 6A.1.3.1 PDF CSV)

Help required with routine needs was reported by 23% of people requiring help with activities of daily living; nearly one in three of those with a fracture reported needing help with routine needs. When broken down into specific types of help, help with personal care was identified more frequently than other types of care. Four of ten reported not being able to work at all due to health care issues, with half with a fracture unable to work. An additional one in four reported they were limited in the type of work that could be done. Walking without equipment was difficult for one-third of those with a medical problem, while one-half of those with a fracture required some sort of medical equipment to walk. (Reference Table 6A.1.3.2 PDF CSV)



1. Participants were asked, "What condition or health problem causes you to have difficulty with or need help with the following activities?" The list included conditions of vision, hearing, arthritis, back problems, injuries, heart and circulation conditions, diabetes, lung conditions, mental conditions, genitourinary system problems, tumors, alcohol or drug abuse, and old age," and responses included "yes" to at least one condition.

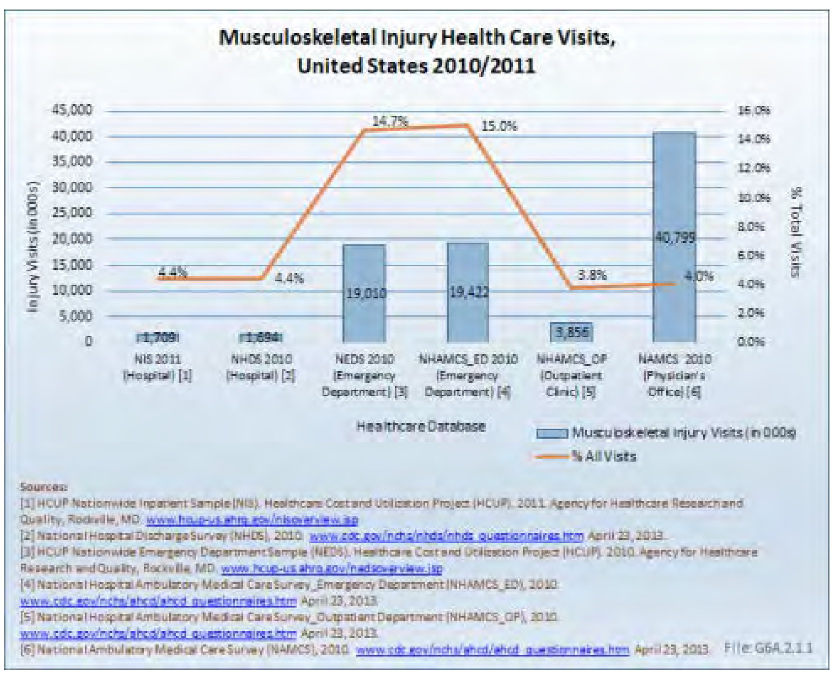
Incidence of Musculoskeletal Injuries: Falls and Traumatic Injuries

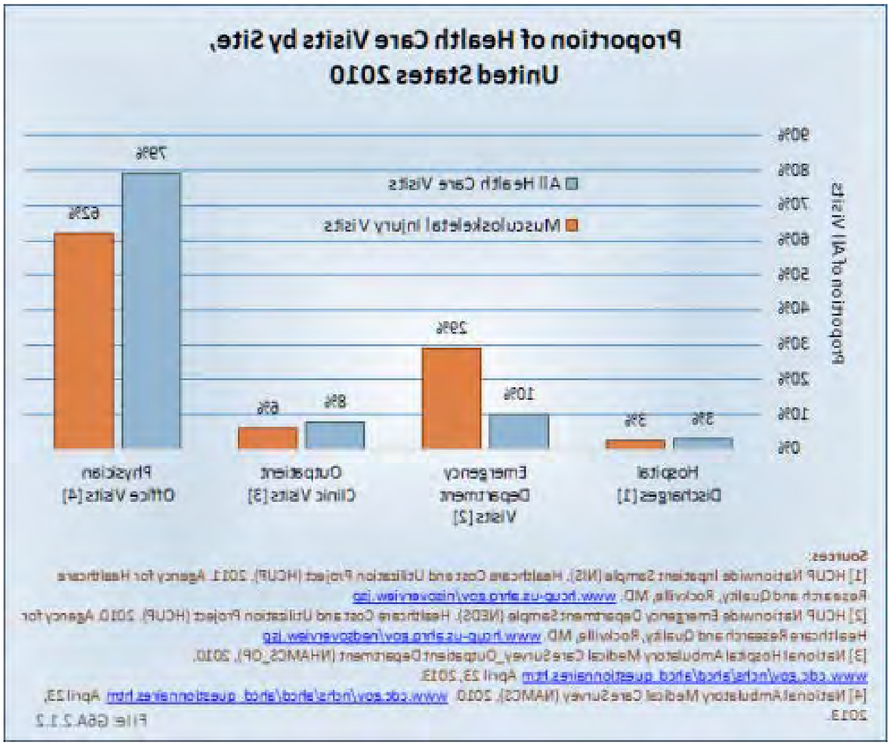
In order to compile a complete picture of the impact of musculoskeletal injuries, six major health care databases are used to estimate the number of visits to a health care provider in a specific year. Treatment episodes, for purposes of this study, have been defined as the accumulative total of cases for all diagnoses treated in physician offices, emergency departments, outpatient clinics, and hospital discharges. Diagnoses are based on variables within publicly available health care database that identify diagnoses or treatments based on ICD-9-CM codes submitted by health care providers. Databases used include from 3 to 25 diagnosis codes, or variables, per record. When analyzing the databases for a specific diagnosis or procedure, if any of the diagnosis variables in the database matches the code of interest, it is included in the total count. Hence, total numbers of injuries may exceed total records if more than one injury is sustained. In addition, health care visits, or episodes, are not the equivalent of patients, as there is some unknown probability that a person may have multiple visits over the year included in the database. While not an absolute, the numbers presented are a solid estimation of how a particular health care issue such as a musculoskeletal injury, compares to other health care issues.

Four of the databases included are produced by the National Center for Health Statistics (http://www.cdc.gov/nchs/index.htm), a division of the Centers for Disease Control and Prevention, and include data on visits to physician offices (NAMCS), emergency departments (NHAMCS_ED), outpatient clinics (NHAMCS_OP), and hospital discharges (NHDS). These four databases include a representative sample that is weighted to reflect the U.S. population by demographic characteristics for the year from which the data is produced. The remaining two databases are produced by the Healthcare Cost and Utilization Project (HCUP: http://www.hcup-us.ahrq.gov/) under the U.S. Department of Health and Human Services Agency for Research and Healthcare Quality. These two databases focus on hospital discharges (NIS) and visits to emergency departments (NEDS), and include millions of data points submitted by participating hospitals and emergency departments. HCUP data is also weighted for representativeness of the U.S. population. All databases are structured to provide only autonomous data. When the two databases were analyzed for hospital discharges and emergency department visits, they yielded similar results, supporting the validity of the findings reported.

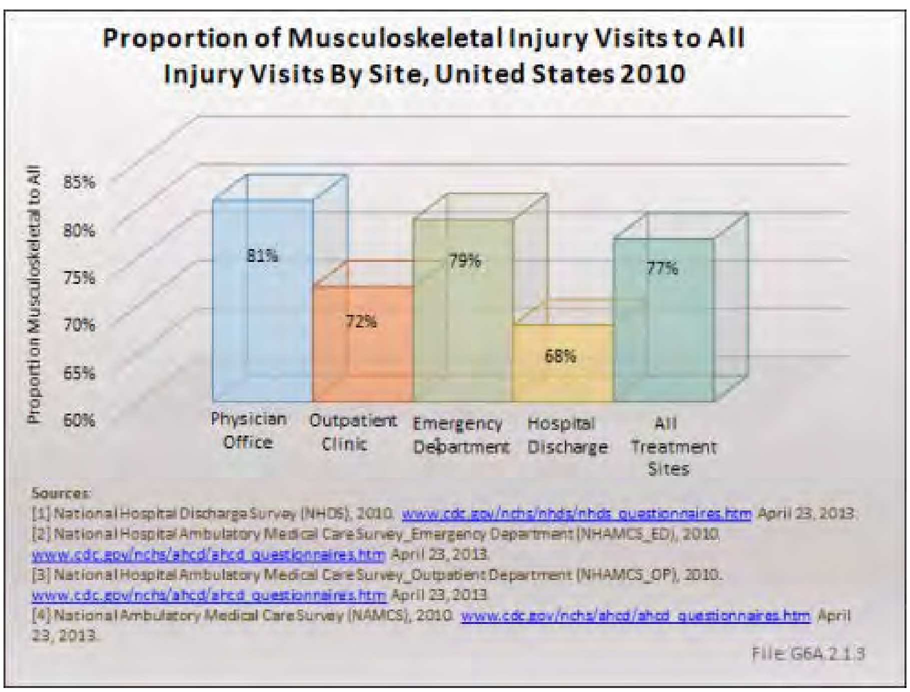
Health Care Treatment Visits for Musculoskeletal Injuries: Incidence, Falls and Traumatic Injuries

Musculoskeletal injuries accounted for 4% of health care visits to physician offices, outpatient clinics, and hospital discharges. Visits to emergency departments for musculoskeletal injuries accounted for 15% of all emergency department visits. Overall, more than 65 million health care visits were made in 2010 for musculoskeletal injuries. By far, the largest share of these visits was to physician offices, accounting for nearly 80% of all visits and for 62% of visits for musculoskeletal injuries. Emergency departments and outpatient clinics see similar percentages of total patients (10% [NHAMCS_ED] and 8% [NHAMCS_OP]), but emergency departments are more likely to see patients with a musculoskeletal injury. Hospital discharges account for about 3% of patient visits for all health care reasons and for musculoskeletal injuries. (Reference Table 6A.2.2.1 PDF CSV)

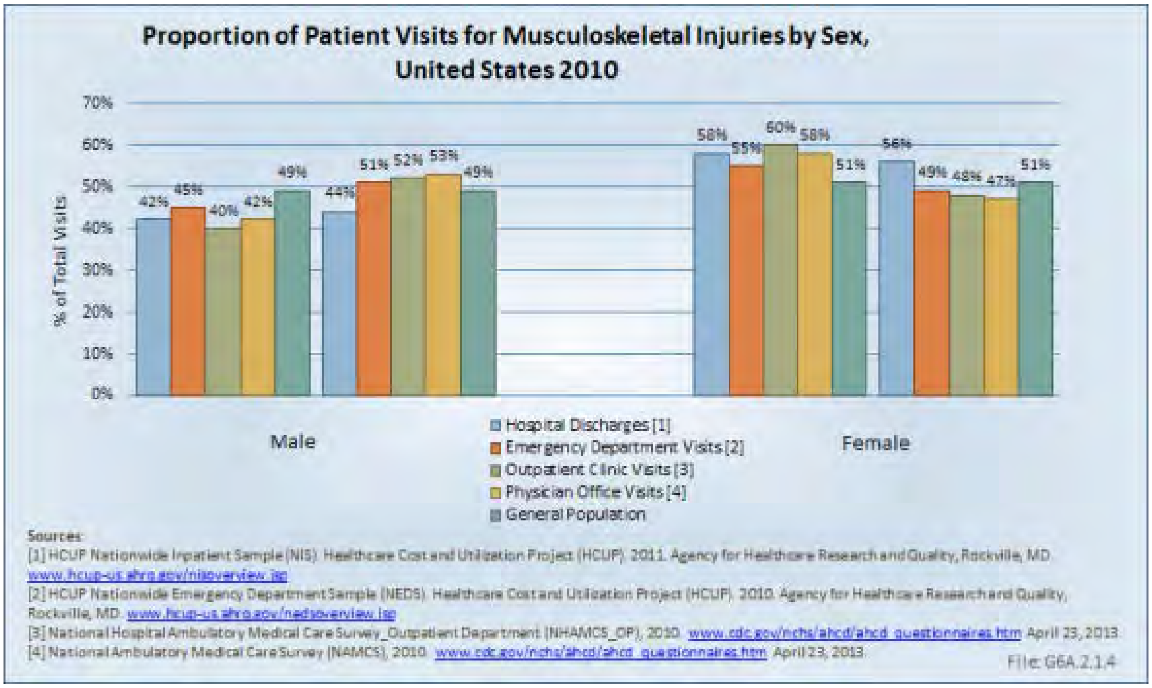




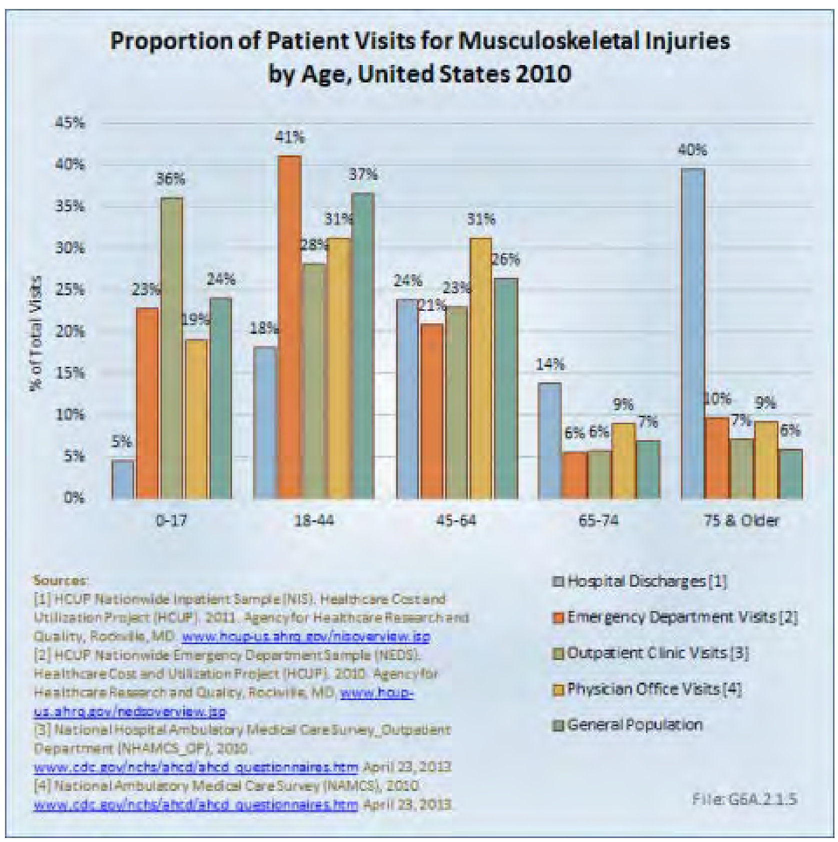
Three of four (77%) health care visits associated with an injury diagnosis are related to a musculoskeletal injury. The largest share is found in injury treatments in a physician's office, where four of five (81%) injuries treated are musculoskeletal. The smallest share, 68%, is for hospital discharges. (Reference Table 6A.2.2.4 PDF CSV)



Females, in general, are more likely overall to have a health care visit than are males. With regard to musculoskeletal injury, however, this is true only for the category of health care visits related to hospital discharges, where females represent slightly more than their proportion in the general population. For other care sites, males represent a higher than expected proportion of visits for musculoskeletal injuries.

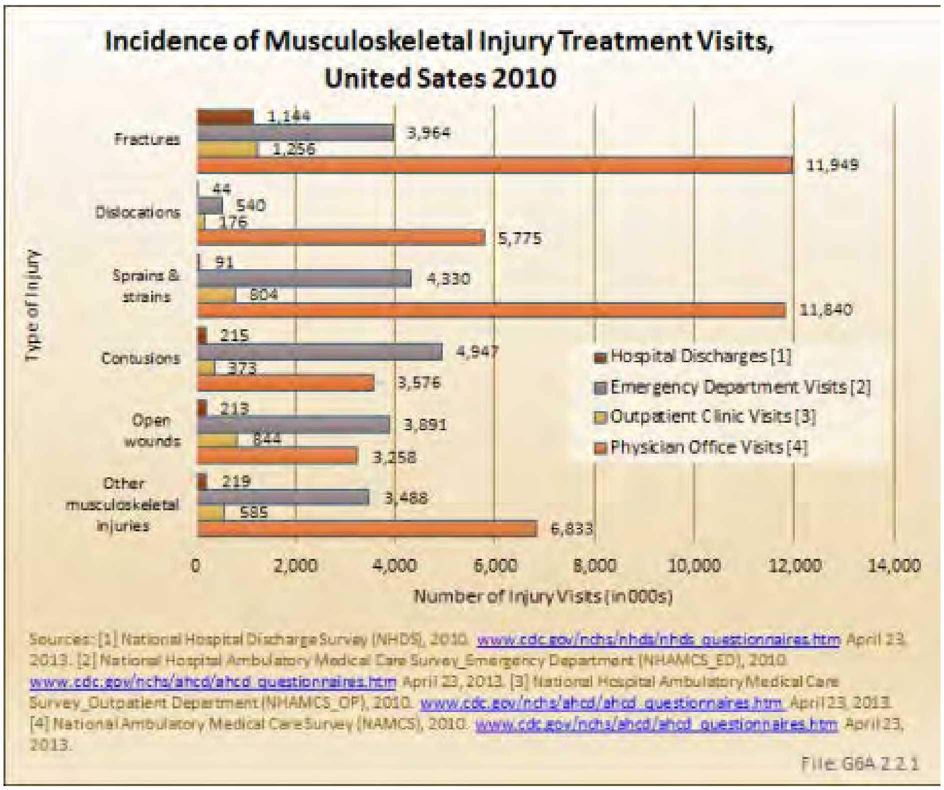


When it comes to age, persons 75 years and older are far more likely to have a hospital discharge for a musculoskeletal injury than those younger in age. Children, defined as those under the age of 17, utilize outpatient clinics for injury treatment more than persons of other age groups. Young adults between the ages of 18 and 44 years visit emergency departments more frequently for injury care, while their slightly older peers, those aged 45 to 64 years, visit physician offices most often. People aged 65 to 74 years comprise about the same proportion of the general population as those 75 years and older, but they make fewer health care visits for musculoskeletal injury treatment.



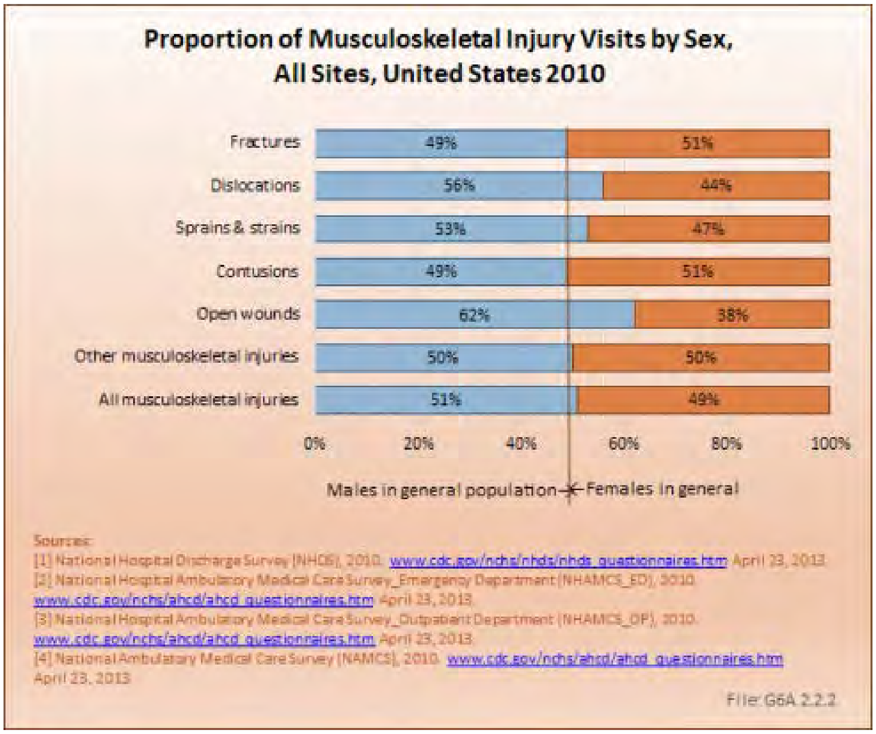
Musculoskeletal Injuries by Type for Age and Sex: Incidence, Falls and Traumatic Injuries

More than 18.3 million health care visits were for the treatment of fractures in 2010. A close second, sprains and strains accounted for 17 million health care visits. Contusions, open wounds, and dislocation visits numbered 9 million, 8 million, and 6.5 million, respectively. Other types of musculoskeletal injuries represented another 11 million visits. With the exception of contusions, musculoskeletal injuries are treated most frequently in a physician's office. Nearly 5 million contusions were treated in emergency departments; this compares to 3.6 million treated in a physician's office. (Reference Table 6A.2.2.1 PDF CSV, Table 6A.2.2.4 PDF CSV, and Table 6A.2.2.5 PDF CSV)

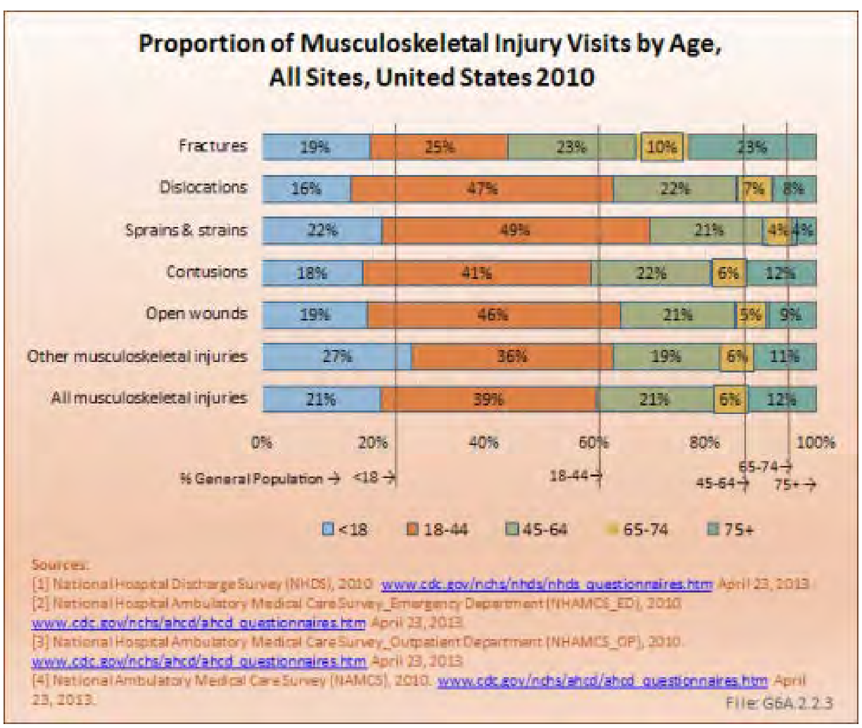


Males have a slightly higher rate of musculoskeletal injury than females, with 22.0 injury visits to all provider sites per 100 males in 2010. This compares to 20.5 injury visits per 100 females. The proportion of all musculoskeletal injury visits for males versus females is the reverse of that found in the general population: 51% male to 49% female injury visits versus the 49% to 51% male to female ratio found in the general population. Males are more likely to suffer open wounds (62%) and dislocations (56%). Females have correspondingly lower rates for these injuries, and an expected share of other types of musculoskeletal injuries.

Males have a higher rate of injuries seen in a physician's office, while females are more likely to be discharged from a hospital or seen in an emergency department because of a musculoskeletal injury. Because injuries for which a patient is hospitalized are potentially more severe than those seen in a physician office, it might be surmised that females may incur more severe musculoskeletal injuries. (Reference Table 6A.2.2.1 PDF CSV and Table 6A.2.2.5 PDF CSV)



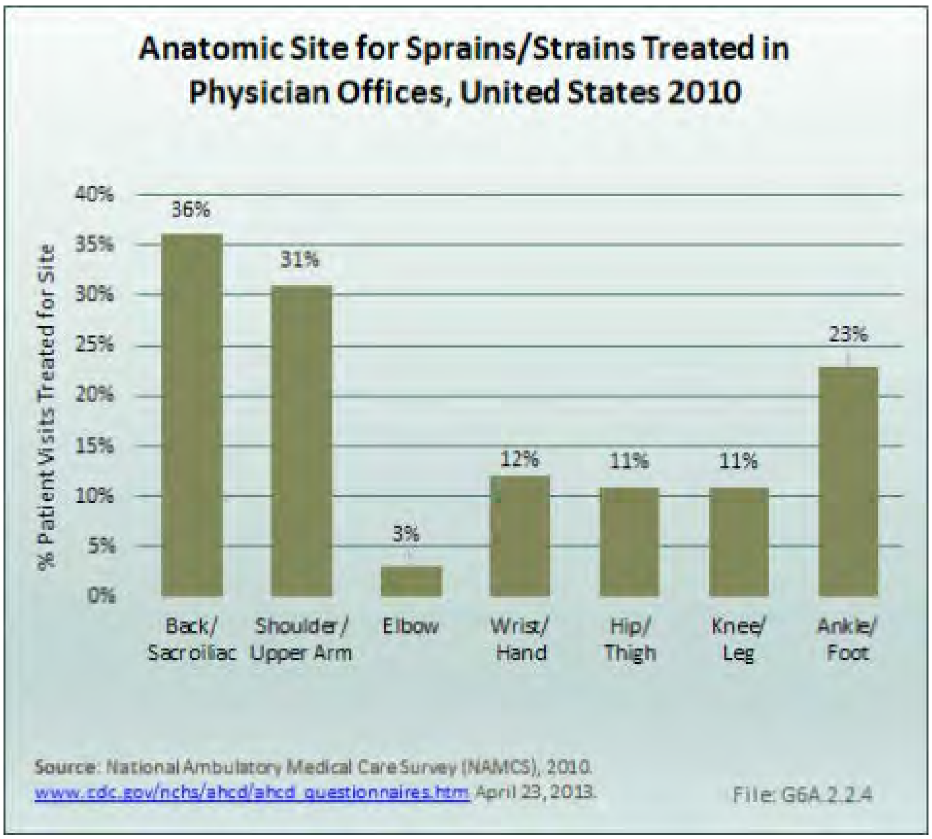
Age is also a factor in the rate of musculoskeletal injury health care visits, with the rate per 100 persons increasing from 19.5 for children (ages 0 to 17 years) to 33.9 for people age 75 years and older. This rate increase is found across all provider sites. However, because elderly people comprise a smaller share of the general population, the actual number of injuries for which treatment is delivered is much larger in the younger age brackets. Those aged 45 to 64 years, with 22.3 million visits, had the largest number of musculoskeletal injuries treated in 2010. Older people aged 65 to 74 years had just over 5 million injury visits, while those age 75 years and older accounted for 6.3 million episodes.



Elderly people are particularly prone to fractures, accounting for 23% of fractures treated in 2010, while representing only 6% of the general population. Overall, the elderly accounted for 12% of all musculoskeletal injuries. Those between the ages of 18 and 44 years are disproportionately prone to dislocations and sprains and strains requiring medical attention. (Reference Table 6A.2.2.2 PDF CSV and Table 6A.2.2.5 PDF CSV)

In 2010, a substantial majority of the 5.8 million dislocations (76%) were treated in physician offices. Dislocation of the knee or leg joint represented 86% of these injuries, with the shoulder (8%) the only other anatomic site to account for more than a very small fraction of dislocations. This finding is likely an artifact of an ICD-9 coding anomaly. Isolated acute ligamentous injuries of the knee, (ie, anterior cruciate ligament [ACL], medial collateral ligament [MCL], posterior cruciate ligament [PCL], and lateral collateral ligament [LCL] disruptions) are coded as dislocations using ICD-9-CM methodology, whereas equivalent injuries in other joints are coded as sprains or strains rather than dislocations. True complete dislocations of the knee joint are actually very rare, and associated with marked morbidity.

More than one-third (36%) of the 11.8 million sprain and strain injuries treated in physician offices in 2010 were to the back and sacroiliac joint. Shoulder (31%) and ankle and foot injuries (23%) represented the other two most common anatomic sites for sprains and strains treated in physician offices.

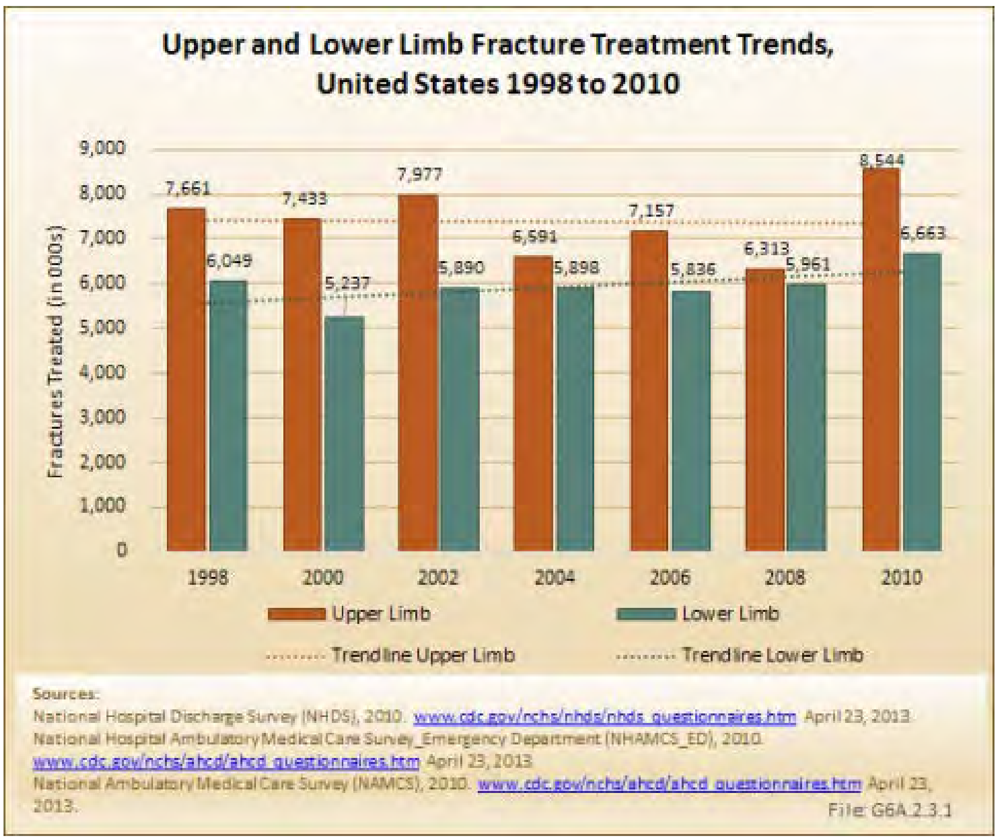


Fracture Trends: Incidence, Falls and Traumatic Injuries

The total number of fractures of the upper and lower extremities treated in physician offices, emergency departments, and hospitals, while fluctuating from year to year, has varied between 12 million and 15 million from 1998 to 2010. Upper limb fractures, including those of the arm, forearm, wrist, hand, and fingers, have accounted for slightly more than one-half of all fractures, with a range of 52% to 59%. Fractures of the upper arm, or humerus, are the least common. In recent years, upper arm fractures have accounted for about 20% of total upper limb fractures. Fractures of the wrist, hand, and fingers occur slightly more often than fractures of the forearm.

Lower limb fractures, which include those of the hip and upper leg (femur), lower leg, ankle, foot, and toes, are reported in similar numbers to upper limb fractures, ranging from 11 million to 15 million. Between two-third and three-fourth of lower limb fractures occur in the ankle, foot, and toes. Breaks of the lower leg (tibia and fibula) are the least common overall.

The majority of fracture care episodes, 65% to 73%, occurred in a physician's office. Fewer than one in ten fractures (8% or less) were treated with inpatient hospitalization in any given year. However, it is possible that initial care for a fracture was either at the ED or in a hospital admission, with follow-up visits associated with a physician's office visit. It is, therefore, likely each individual fractures may have been associated with multiple episodes of care. (Reference Table 6A.2.3.1 PDF CSV and Table 6A.2.3.2 PDF CSV)



Unintentional Injuries: Falls and Traumatic Injuries

Unintentional injuries are tracked by the Centers for Disease Control and Prevention (CDC) through the Injury Center, and reported at WISQARS(TM).1 Injuries kill thousands every year, and many of those who survive have life-long impairment as a result of those injuries. Musculoskeletal injuries are the most common type of injury.

While much of the focus has been on injury prevention, research to alleviate the impact of major trauma from vehicular accidents, falls, sports, and war injuries, among other causes, is necessary to reduce the burden.

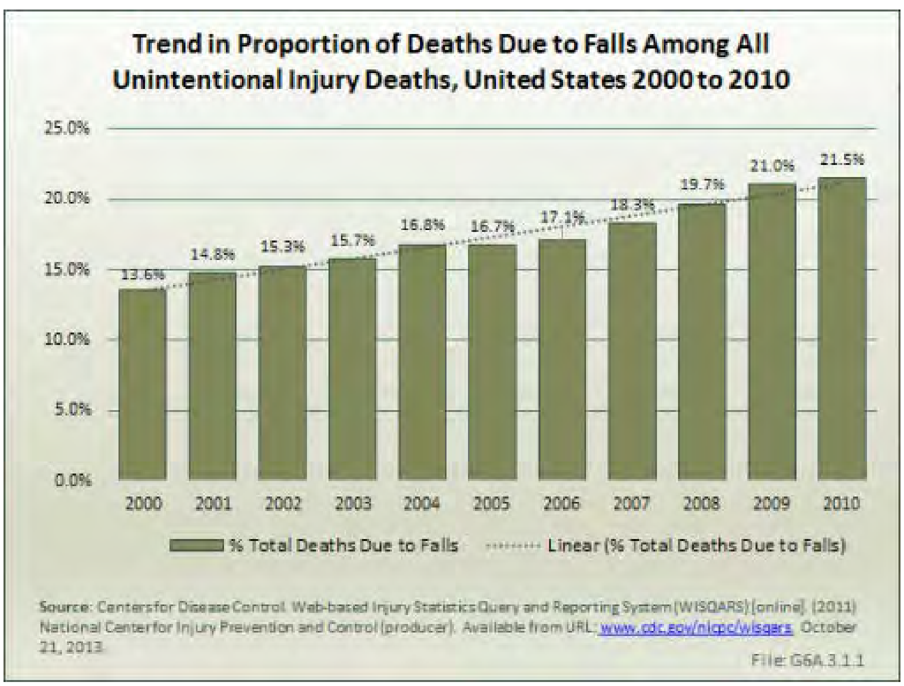
1. Web-based Injury Statistics Query and Reporting System: http://www.cdc.gov/injury/wisqars/index.html Accessed December 24, 2014.

Deaths Due to Unintentional Injuries: Falls and Traumatic Injuries

The number of unintentional deaths from injuries has remained fairly steady since the early 2000s, with 110,000 to 120,000 deaths occurring as a result of injuries each year.1 However, the proportion of these unintentional deaths that occur as a result of a fall has been steadily rising since 2000, increasing from 14% of deaths in 2000 to 24% in 2010. The age-adjusted rate2 per 100,000 persons has increased from 4.8 to 7.8 for the same time frame.

The primary cause of this increasing proportion is due to deaths from falls in the aging population. Among persons age 65 years and older, the proportion of unintentional injury deaths from falls has risen from 33% to 52% between 2000 and 2010. There has been a slight rate increase from 12% to 14% among persons age 55 to 64 years. The proportion has remained relatively steady for persons under the age of 54 years. Unintentional injuries are the top cause of death for all persons age 1 to 44 years; the third highest cause for those age 45 to 54 years; fourth highest for those age 55 to 64 years; and ninth for those age 65 years and older.3 (Reference Table 6A.3.1.1 PDF CSV)

In 2011, the death rate due to unintentional injury from falls remained at 22%. Females, however, experienced a higher death rate from falls than did males (29% versus 17%). Although the number of deaths from unintentional injury is similar across age groups, both sexes show a steep increase in deaths from falls with increasing age. Among children under age 18 years, the proportion of deaths from falls among all unintentional injury deaths is only 1.4%. Among persons age 85 years and older, it is 63%. (Reference Table 6A.3.1.2 PDF CSV)



1. Centers for Disease Control: Web-based Injury Statistics Query and Reporting System (WISQARS) (2011). National Center for Injury Prevention and Control. Available from URL: http://www.cdc.gov/injury/wisqars/ Accessed October 24, 2013.

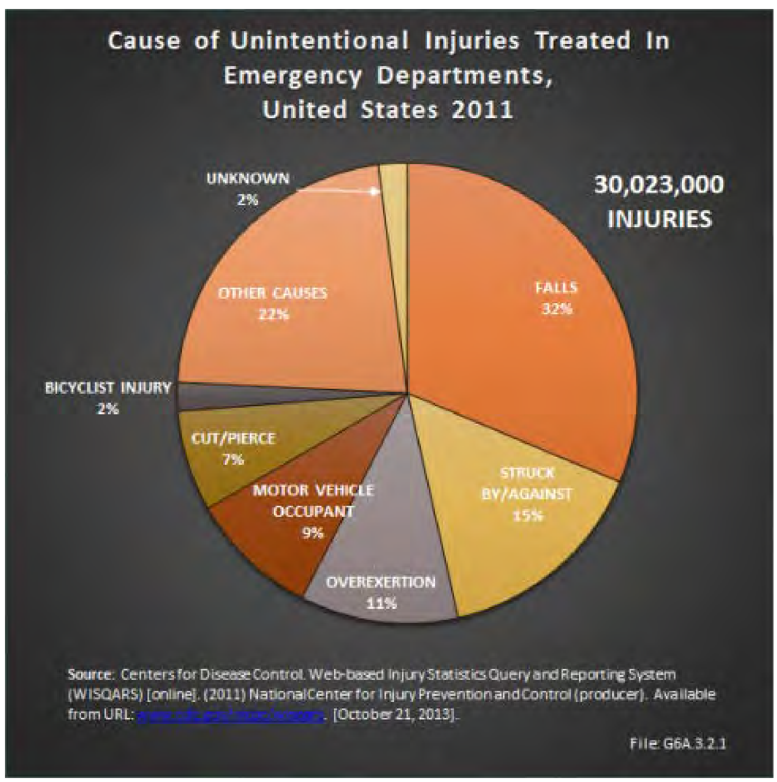
2. Age-adjusted to the 2010 US Census Population. Age-adjusting rates is a way to make fairer comparisons between groups with different age distributions. For example, a county having a higher percentage of elderly people may have a higher rate of death or hospitalization than a county with a younger population, merely because the elderly are more likely to die or be hospitalized. A standard population distribution is used to adjust death and hospitalization rates. The age-adjusted rates are rates that would have existed if the population under study had the same age distribution as the standard population. You cannot compare adjusted rates that use different standard populations, for example, a different Census year.

3. Centers for Disease Control: Web-based Injury Statistics Query and Reporting System (WISQARS) (2011). National Center for Injury Prevention and Control. "20 Leading Causes of Death, United States 2010, All Races, Both Sexes". Available at: http://www.cdc.gov/injury/wisqars/ Accessed October 24, 2013.

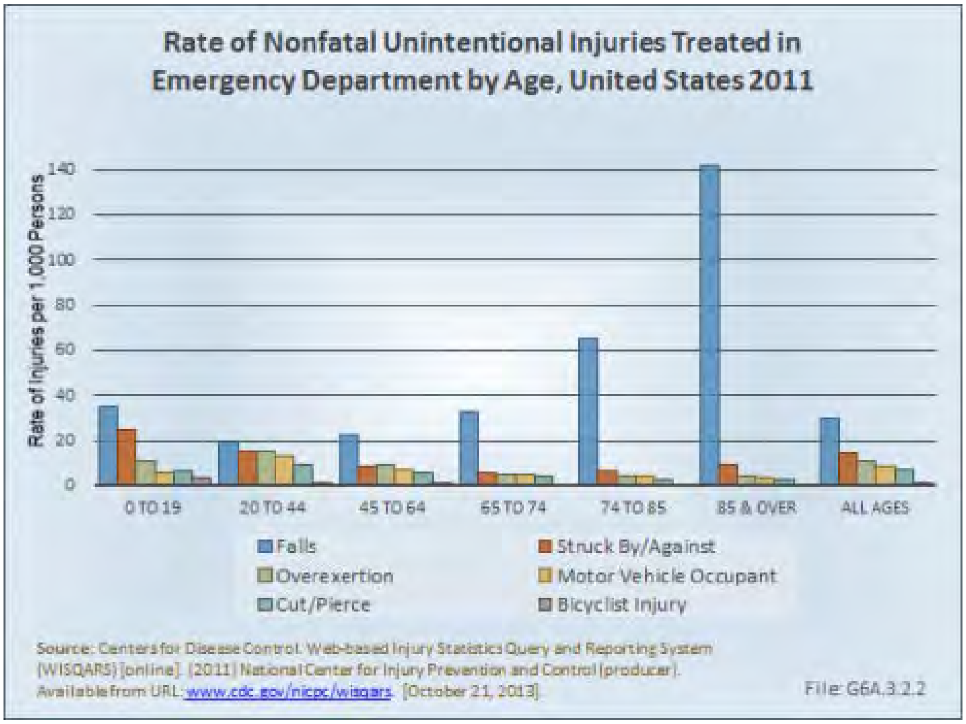
Cause of Nonfatal Unintentional Injuries: Falls and Traumatic Injuries

The CDC reported that 30 million unintentional injuries were treated in hospital emergency departments in 2011. Of these 30 million, 90%, or 27.2 million patients, were treated and released. The remaining 10% were hospitalized. These numbers are very similar to those reported in the national health care databases (29.1 million, 91% treated in the ED, 9% hospitalized). (Reference Table 6A.3.2.1 PDF CSV)

Falls are the most common cause of nonfatal unintentional injuries, and are responsible for slightly more than 3 in 10 injuries overall. For injuries in which the person is hospitalized, falls account for nearly one in two. Other forms of trauma are described as the cause in the majority of injury visits to an emergency department in the national health care databases, accounting for 54% of all the injury visits. Among persons hospitalized, trauma other than falls was the cause in 27% of the discharges. The CDC breaks down the cause of unintentional injuries into more categories. (Reference Table 6A.3.2.4 PDF CSV)



In 2011, the overall rate of visits to an emergency department for treatment of unintentional injuries was 87.2 per 1,000 persons. When visits for which the patient was hospitalized are included, the rate increases to 96.4 per 1,000, or roughly 1 in 100 persons who are treated for an injury in an emergency department in a given year. The rate per injury by cause varies significantly by age of the patient. For example, while falls have an overall rate of 29.7 per 1,000 persons, among persons age 74 to 85 years the rate increases to 64.9. For persons age 85 years and older, it jumps to 141.6 per 1,000. (Reference Table 6A.3.2.2 PDF CSV)



Hospital Stays, Cost, and Disposition Due to Musculoskeletal Injuries: Falls and Traumatic Injuries

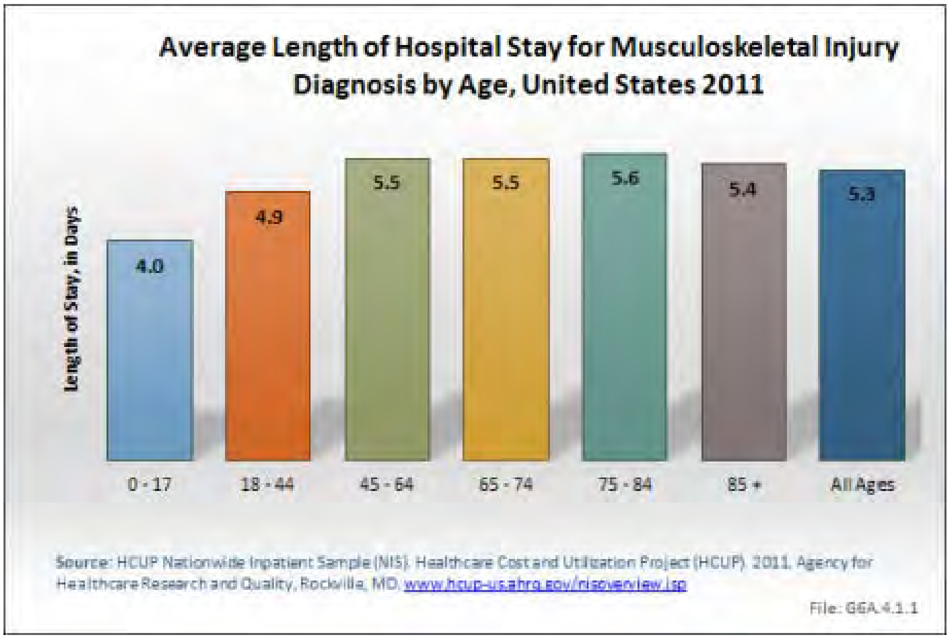
The Nationwide Inpatient Sample1(NIS) and Nationwide Emergency Department Sample2 (NEDS) produced by HCUP include data on hospital stays and disposition of patients from hospital and ED visits. This information is used to provide an estimate of the cost related to hospitalization, and the need for additional care by some patients.

1. HCUP Nationwide Inpatient Sample (NIS): *Healthcare Cost and Utilization Project (HCUP).* Agency for Healthcare Research and Quality, Rockville, MD. 2011. Available at: www.hcup-us.ahrq.gov/nisoverview.jsp Accessed December 26, 2014.

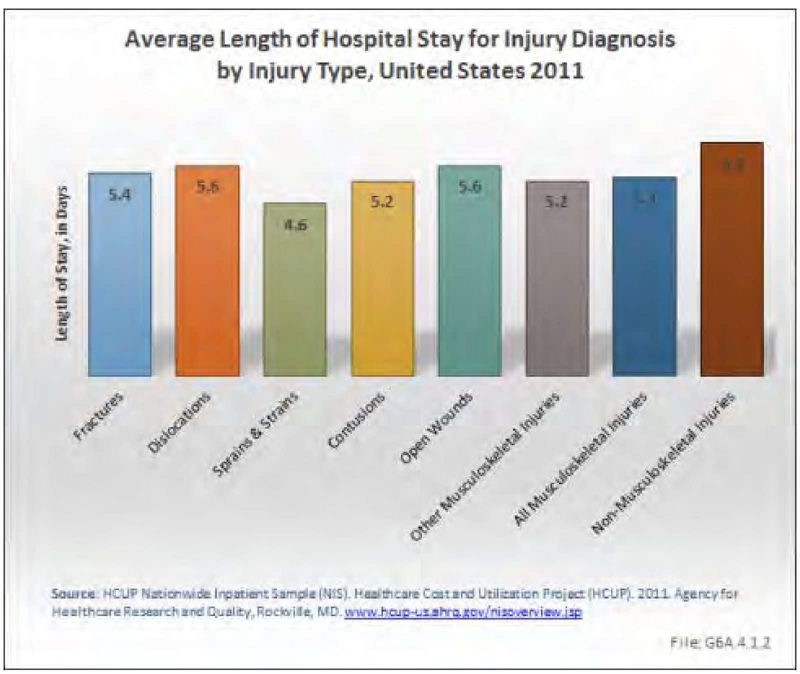
2. HCUP Nationwide Emergency Department Sample (NEDS): *Healthcare Cost and Utilization Project (HCUP).* Agency for Healthcare Research and Quality, Rockville, MD. 2010. Available at: www.hcup-us.ahrq.gov/nedsoverview.jsp Accessed on December 26, 2014/

Hospital Stays: Falls and Traumatic Injuries

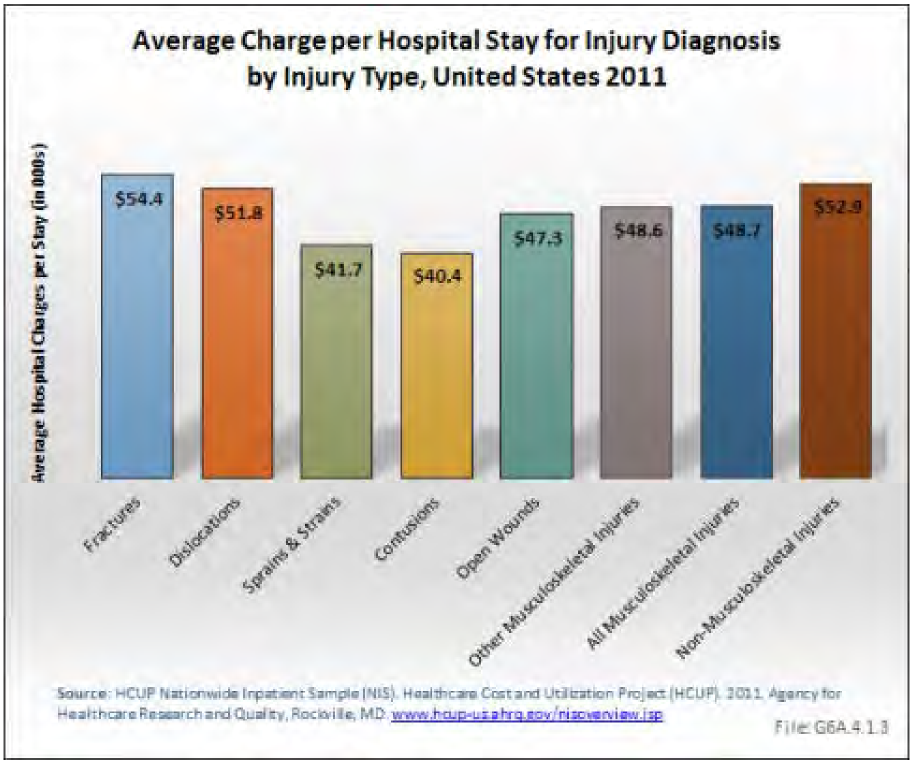
The average length of stay for hospital discharges with any injury diagnosis was approximately 6 days in 2011. Injuries other than musculoskeletal had a slightly longer length of stay of just over 6 days, while musculoskeletal injury patients had an average of slightly more than 5 days. Increasing age was associated with a longer stay, with the longest average stays reported by persons in the 45- to 74-year range. The type of injury also had an impact on length of stay, with open wounds resulting in the longest hospital stay among musculoskeletal injuries. The range for all types of injuries varied between 4 and 7 days. (Reference Table 6A.4.1.1 PDF CSV)



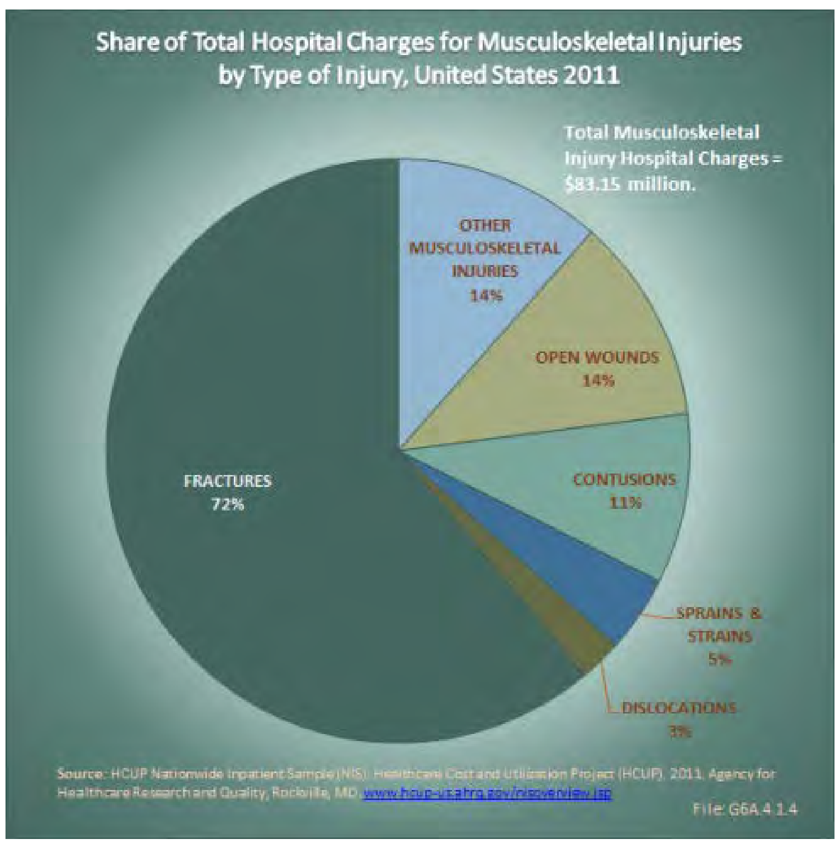
Average hospital charges1 were also slightly higher for patients with non-musculoskeletal injuries, which include brain and spinal injuries, with the exception of average charges for fracture injury patients. However, because of the much higher number of musculoskeletal injury patient stays, the overall total hospital charges for treatment of musculoskeletal injuries were almost twice those of non-musculoskeletal injuries in 2010.

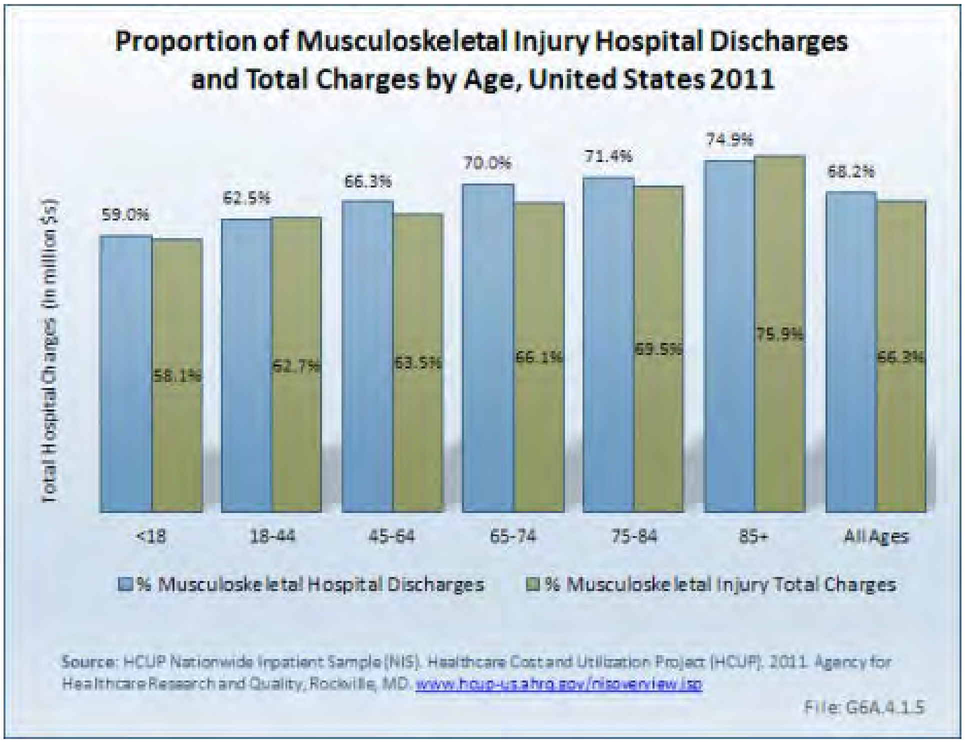


Average total hospital charges for musculoskeletal injuries were $48,700, while they were $52,900 for non-musculoskeletal injuries. The highest average hospital charges were $73,300 for those aged 18 to 44 hears being treated for dislocations.



Total cost for inpatient hospital care for injuries in 2011 was more than $123 million, with musculoskeletal injuries accounting for two-thirds of this total. Fractures, with more than $59.5 million in total hospital charges in 2011, accounted for 72% of musculoskeletal injury charges and nearly one-half (48%) of all injury charges. Increasing age was associated with a steady increase in the proportion of charges for musculoskeletal injury to all injury hospital discharges and in the share of total charges.



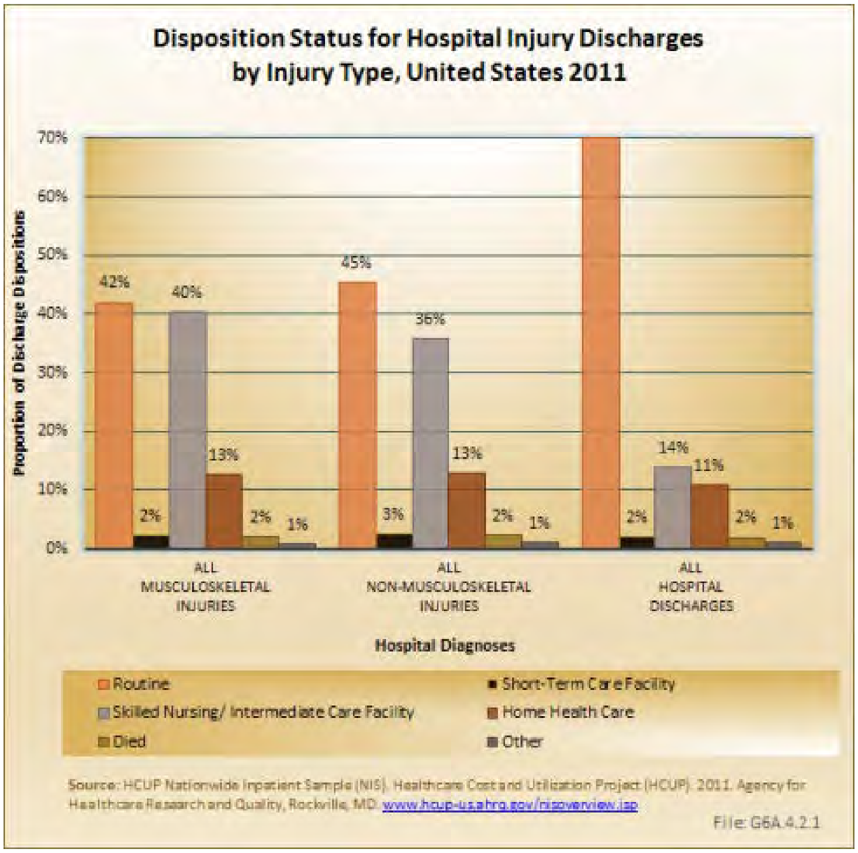


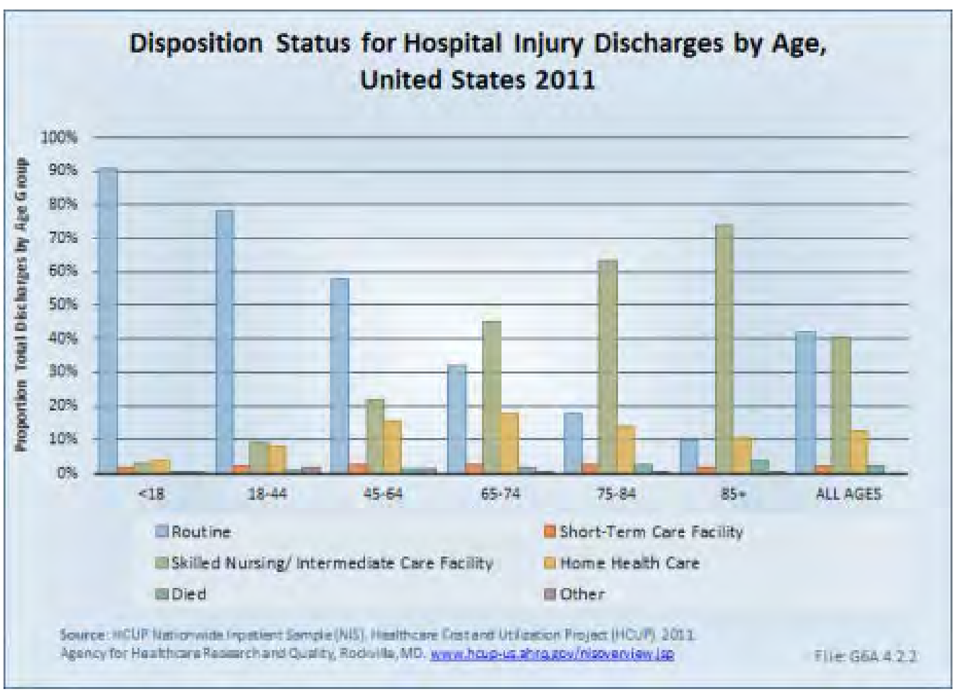
1. Generally, total charges in the HCUP databases do not include professional fees and non-covered charges. If the source provides total charges with professional fees, then the professional fees are removed from the charge during HCUP processing. In a small number of HCUP databases, professional fees cannot be removed from total charges because the data source cannot provide the information. Emergency department charges incurred prior to admission to the hospital may be included in total charges. Medicare requires a bundled bill for Medicare patients admitted to the hospital through the ED. Other payers may or may not have similar requirements.

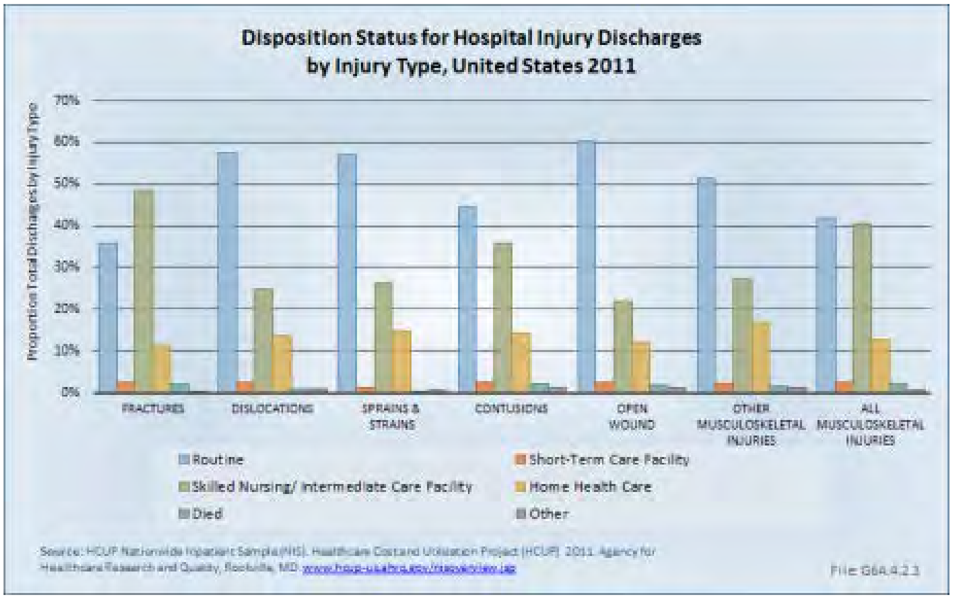
Hospital Discharges: Falls and Traumatic Injuries

Hospital charges are only part of the cost burden associated with musculoskeletal injuries. Nearly one-half of people discharged from a hospital following an injury are discharged to another type of care facility, such as a short-term, skilled nursing, or intermediate care facility. Still another 13% receive home health care following discharge. These ratios are substantially higher than for all hospital discharges, where 70% of patients are discharged to home without additional care.

Age is clearly a factor in the type of hospital discharge received. By the age of 85 years and older, only 10% of hospital discharges for musculoskeletal injuries are to home without additional home health care, with 76% being discharged to another type of care facility and 10% receiving home health care. With the exception of those under the age of 18 years, fracture injuries are the most likely to result in discharge to additional care. After the age of 45 years, fractures to the lower limb are most likely to result in discharge to additional care, while for those younger than 45 years, a torso fracture is the most likely diagnosis to require additional care. (Reference Table 6A.4.2.1 PDF CSV, Table 6A.4.2.3 PDF CSV, and Table 6A.4.2.5 PDF CSV)





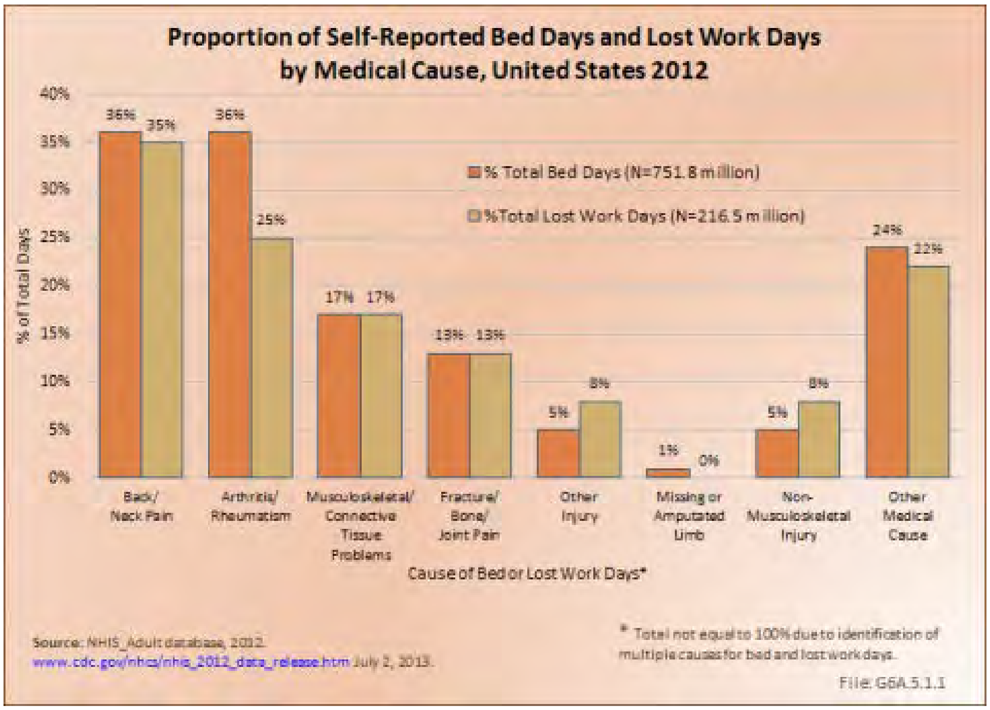


Among those seen in an ED for injury treatment overall, 8% to 9% are admitted to a hospital for further care. About 1% will be sent to a skilled nursing or intermediate care facility. Again, as the age of the patient increases, so does the likelihood of being admitted to the hospital from the ED or being sent to a skilled or intermediate care facility. Very few patients are referred to home health care from the ED. Type of injury follows the same pattern as hospital discharges, with fractures the most likely type of injury to require additional health care outside the ED. Fractures to the torso result in more hospital admissions than upper or lower limb fractures overall, but lower limb fractures for persons age 65 years and older account for more hospital admissions. (Reference Table 6A.4.2.2 PDF CSV, Table 6A.4.2.4 PDF CSV, and Table 6A.4.2.6 PDF CSV)

Bed and Lost Work Days Due to Musculoskeletal Injuries

Every year, musculoskeletal injuries result in hundreds of millions of days spent in bed[1] or missed work[2] for the millions of persons suffering the injuries. In 2012, 57.5 million adults aged 18 years and older reported spending an average of more than 9 days in bed, for a total of 528 million bed days, due to a musculoskeletal injury. Musculoskeletal injuries accounted for 70% of self-reported bed days for all medical conditions in 2012. The most common musculoskeletal conditions for which persons reported days in bed were back or neck pain (average of 12.3 days in bed) and arthritis/rheumatism (average of 10.3 bed days). Together, these conditions accounted for nearly 3 in 4 days spent in bed because of a musculoskeletal condition. With respect to bed days, age is not a factor in increasing numbers, as persons aged 65 years and older report fewer bed days for all musculoskeletal conditions, and for all medical conditions, than those younger than 65 years. (Reference Table 6A.5.1 PDF CSV and Table 6A.5.3 PDF CSV)

Work days lost due to medical conditions were reported at more than 216 million days, based on average lost. As with bed days, musculoskeletal conditions accounted for 70% of the work days reported lost. Back and neck pain was reported as the cause of one-third of the lost work days, with arthritis and rheumatism accounting for another quarter of days. Not unexpectedly, persons age 65 years and older reported fewer lost work days than did younger persons, in part because many are out of the work force already. Although males reported one day longer, on average, of time away from work due to a medical cause, the lower number of males reporting lost work days resulted in females having a slightly higher share of total days lost. This was also true for musculoskeletal conditions, with fewer males reporting work days lost than females, but with a higher average of days lost per person. (Reference Table 6A.5.2 PDF CSV and Table 6A.5.3 PDF CSV)



1. A bed day is defined as one-half or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

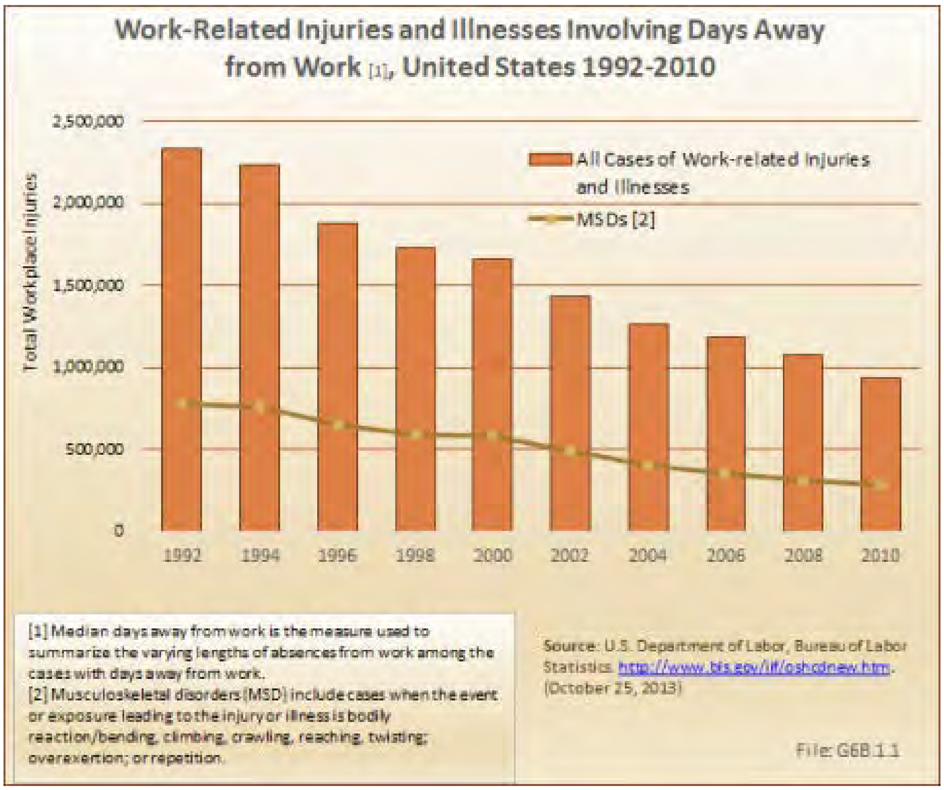
2. A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

Workplace Injuries

Workplace injuries are tracked by the U.S. Department of Labor, Bureau of Labor Statistics, with data published annually on these injuries (http://www.bls.gov/news.release/osh2.toc.htm). Musculoskeletal workplace injuries include fractures, bruises/contusions, and amputations, as well as musculoskeletal disorders (MSDs). MSDs are often cumulative and include repetitive motion injuries that occur when the body reacts to strenuous repetitive motions (ie, bending, climbing, crawling, reaching, twisting) or overexertion. MSD injuries include sprains, strains, tears, back pain, soreness, carpal tunnel syndrome, hernia, and musculoskeletal system and connective diseases. MSD cases are more severe than the average nonfatal workplace injury or illness, typically involving an average of several additional days away from work. In 2011, the median number of days away from work for all workplace injuries was 8 days; for MSD injuries, the median was 11 days. (Reference Table 6B.2.1 PDF CSV)

Trends in Workplace MSDs

The rate of nonfatal occupational injuries and illnesses has significantly decreased over the past 18 years, in some part potentially because of heightened attention to workplace safety. In 1992, more than 2.3 million cases of work-related injuries and illnesses were reported by the Bureau of Labor Statistics. By 2010, the number had dropped to 933 thousand. A similar decline has been seen in the number of MSD injuries; however, the relative percentage of MSD injuries to all workplace injuries has declined only a few percentage points. In the 1990s and early 2000s, one in three workplace injuries was a MSD injury. For the last five years, this ratio has hovered around 30%.

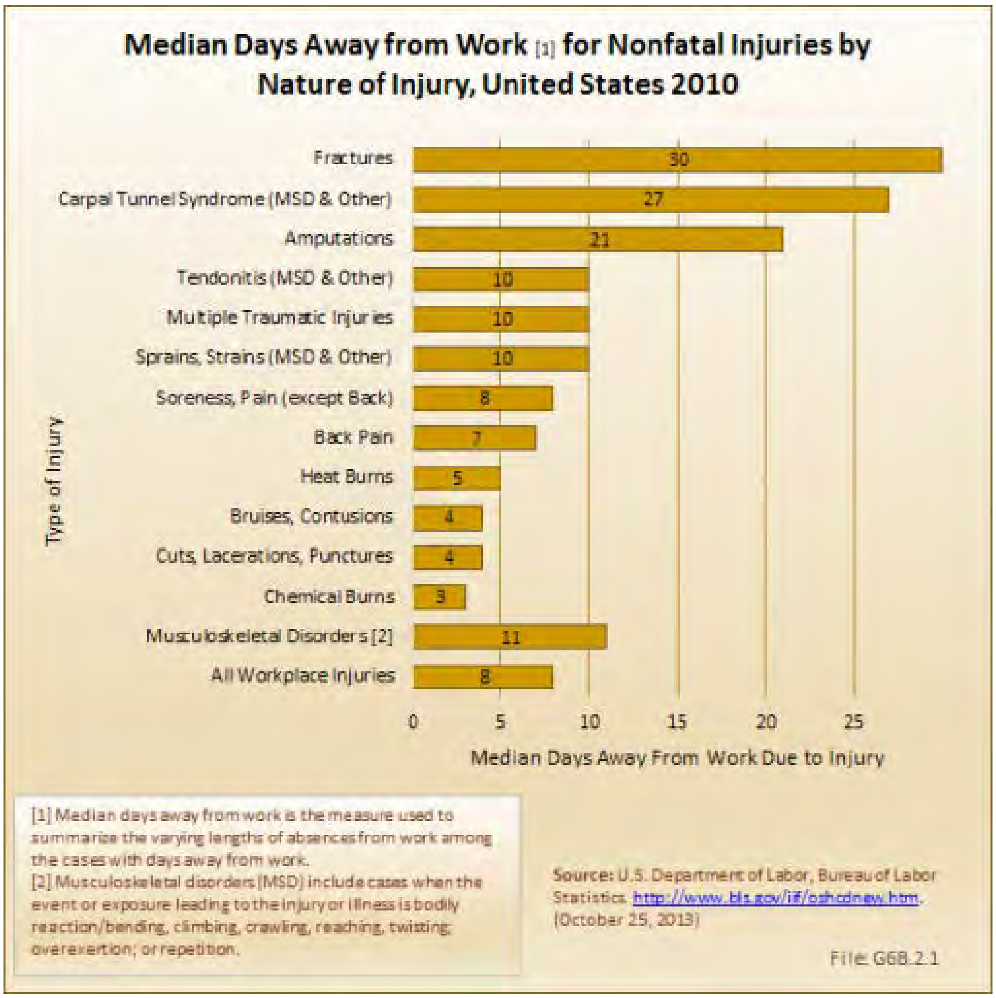


Males sustain workplace injuries at twice the rate of females. They also are away from work an average of 2 days longer than females after a workplace injury. It is likely that at least a portion of the reason for this difference is the type of work involved, with males working more frequently in industries where a workplace injury is more common. (Reference Table 6B.1.1 PDF CSV and Table 6B.1.2 PDF CSV)

Workplace MSD Injuries

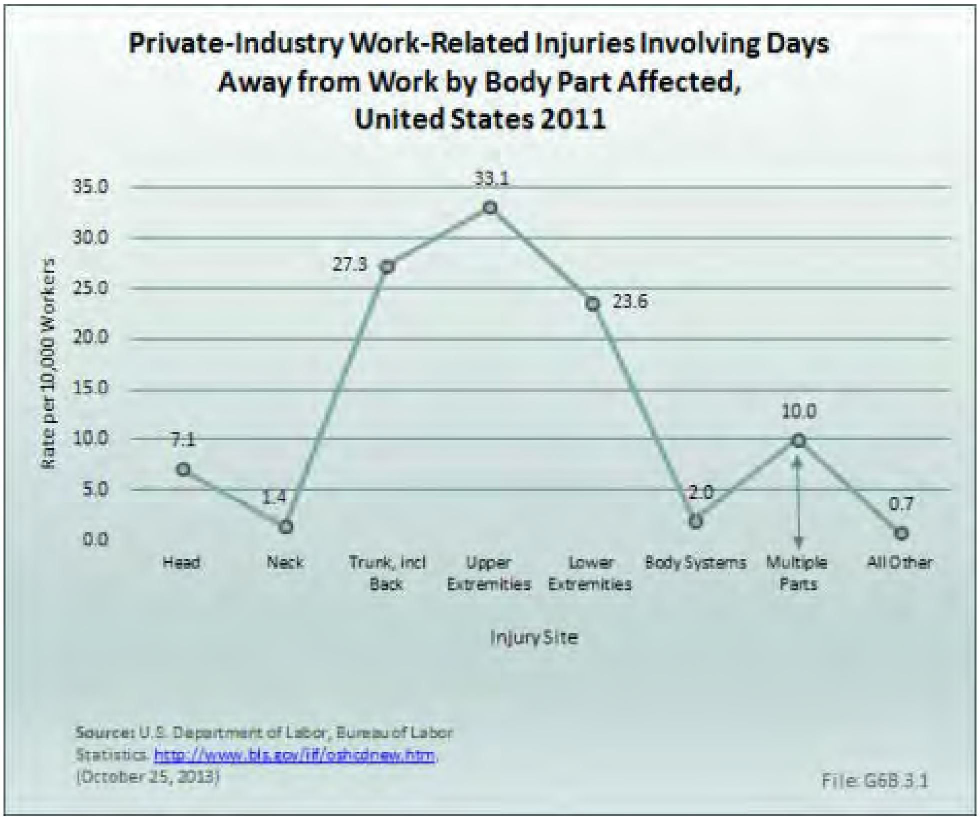
The type of workplace injury is a major factor in defining the median number of associated days away from work. Fractures have historically, and remain, the injury associated with the highest number of days away from work. In the late 1990s, a median of 20 to 21 days away from work were reported for a fracture; since the early 2000s, the median days away has been about 30. Carpal tunnel syndrome is a close second in terms of days away from work, but the median has fluctuated between 21 and 32 days over the years 1997 to 2010, with no discernible trend pattern. Amputations and tendonitis are the remaining two injury types that are associated with a median of more than 10 days away from work.

Workers between the ages of 35 and 54 years sustain the largest number of nonfatal occupational injuries that involve days away from work, possibly reflecting the ages found in the workforce. Days away from work by type of injury reflected the distribution of workers by age, with the exception of carpal tunnel syndrome, where a larger proportion of days away from work was reported for workers between ages 45 and 54 years. (Reference Table 6B.2.1 PDF CSV and Table 6B.2.2 PDF CSV)



Injuries by Body Part: Workplace Injuries

Workers often sustain injuries that affect multiple parts of their body. However, injuries to the upper extremities (shoulder, arm, wrist, hand), trunk (including the back), and lower extremities (knee, ankle, foot, toe) far outnumber injuries to the head, neck, other body systems, and multiple parts of the body. About one-third of workplace injuries involving days away from work involve the upper extremities, with hand injuries the most common. Trunk and lower extremity injuries each account for about a fourth of all injuries. Knee injuries are the most common lower extremity injury. Back injuries account for three-fourths of trunk injuries. (Reference Table 6B.3.1 PDF CSV)



Sports Injuries

Lead Author(s):
Brett D. Owens, MD
Kenneth L. Cameron, PhD, MPH, ATC

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

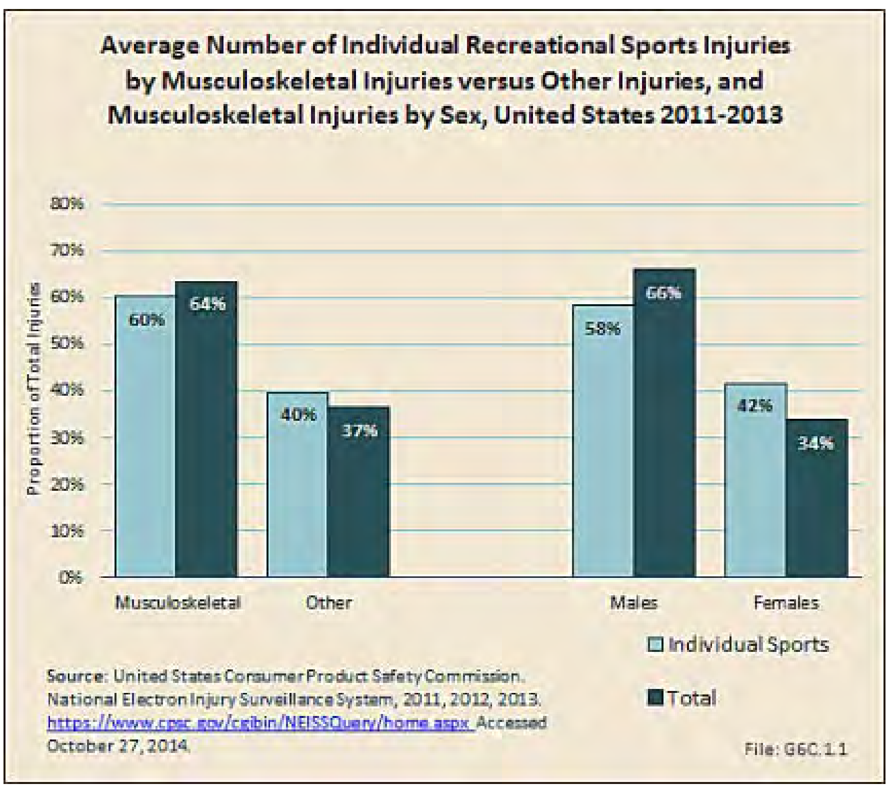
Sports are integrally woven into the fabric of American society. From fandom, through recreational athletics, all the way to participation in professional athletics, sports are an important facet of our lives. Over the past few decades, an increase in participation in both youth sports as well as recreational activity has been noted—with a resultant increase in both acute and chronic musculoskeletal injuries.

The goal of this section is to provide an overview of the epidemiology of athletic injuries currently in the US population. As we ascend the athletic ladder from recreational activities to professional sports, we note an increase in participation and injury data available. However, the lowest levels of athletic participation—eg, the middle-aged person who begins jogging for fitness, the 12-year-old who rides a bicycle—have poor mechanisms for the study of associated injuries despite a high anecdotal injury rates. We will attempt to provide an overview of these less-organized athletic injuries from available data. We will also focus on higher levels of organized sports, primarily scholastic sports (high school level) and intercollegiate sports.

Recreational Athletics: Sports Injuries

An estimated 30 million children and adolescents participate in organized sports. In addition, some 150 million adults participate in physical activity that is not related to their employment. However, both of these large at-risk populations lack a mechanism for tracking injuries.

While professional and collegiate athletics have epidemiologic systems in place to track injury patterns, recreational athletics lack any type of surveillance system. However, the US Consumer Product Safety Commission has established the National Electronic Injury Surveillance System (NEISS) in 1997 to track emergency room visits and injury patterns associated with specific products. This database has also been helpful as a means of documenting injuries associated with athletic endeavors.

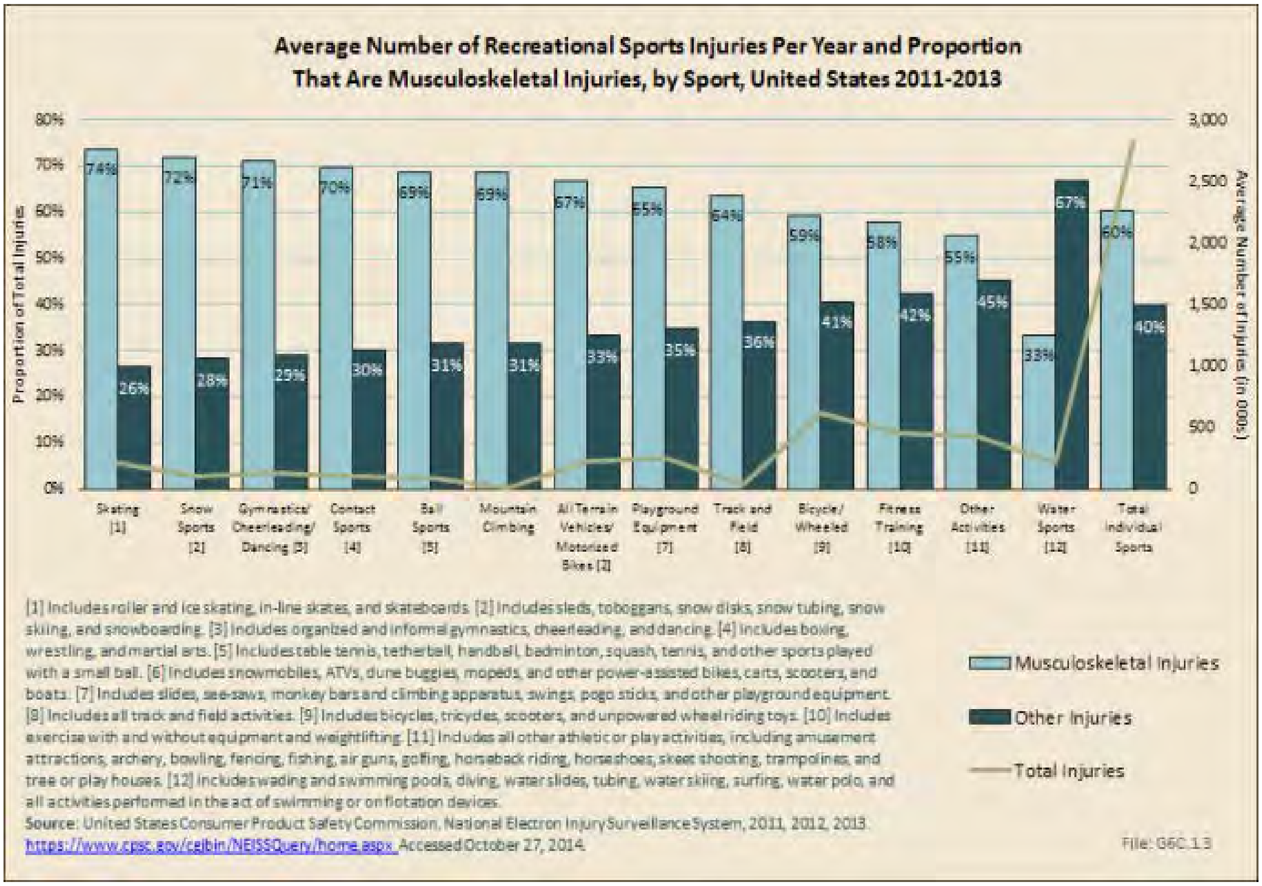


Using the data, a 2002 CDC report detailed 4.3 million sports- and recreation-related injuries that were treated in US Eds.1 Injury rate was highest for boys aged 10 to 14 years. A more recent paper documented an estimated 600,000 knee injuries annually in EDs in the United States. Of these, 49.3% resulted from sports and recreation activities.2

An estimated 2.8 million injuries resulting from individual sports are reported annually in EDs in the United States, of which 64% are musculoskeletal.

Two out of three musculoskeletal injuries occur in males, with the proportion slightly lower for individual sports than for team sports.

Cycling and wheeled sports account for 22% of all recreational sports injuries and musculoskeletal injuries serious enough to warrant a visit to the ED. Fitness training results in additional 16% of the total injuries and musculoskeletal injuries seen. Musculoskeletal injuries account for more than one-half of all injuries in all sports, with the exception of water sports. (Reference Table 6C.1 PDF CSV)

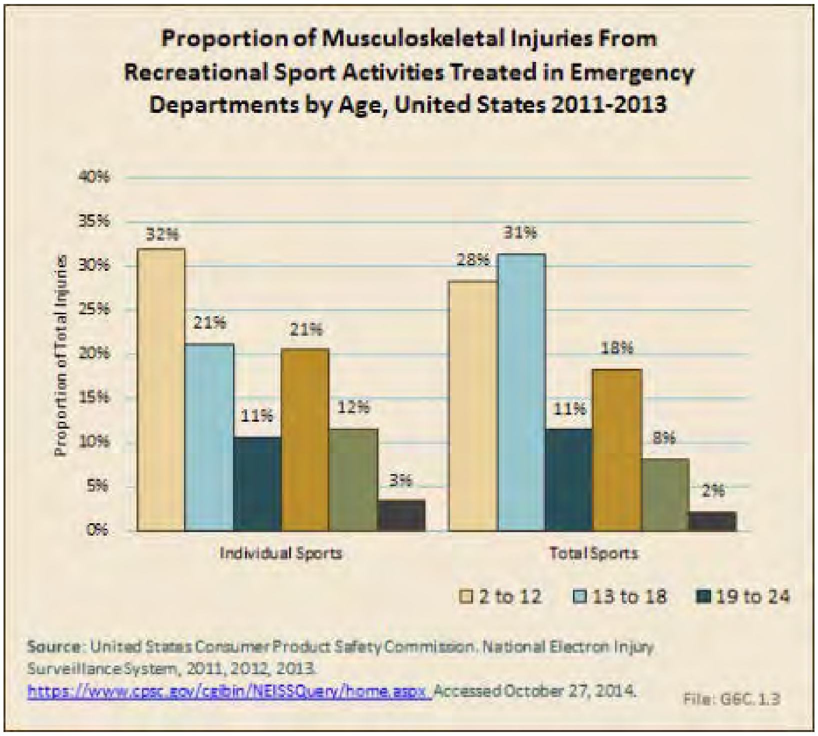


Average Number of Recreational Sports Injuries Per Year and Proportion That Are Musculoskeletal Injuries, by Sport, United States 2011-2013

[1] Includes roller and ice skating, in-line skates, and skateboards. [2] Includes sleds, toboggans, snow disks, snow tubing, snow skiing, and snowboarding. [3] Includes organized and informal gymnastics, cheerleading, and dancing. [4] Includes boxing, wrestling, and martial arts. [5] Includes table tennis, tetherball, handball, badminton, squash, tennis, and other sports played with a small ball. [6] Includes snowmobiles, ATVs, dune buggies, mopeds, and other power-assisted bikes, carts, scooters, and boats. [7] Includes slides, see-saws, monkey bars and climbing apparatus, swings, pogo sticks, and other playground equipment. [8] Includes all track and field activities. [9] Includes bicycles, tricycles, scooters, and unpowered wheel riding toys. [10] Includes exercise with and without equipment and weightlifting. [11] Includes all other athletic or play activities, including amusement attractions, archery, bowling, fencing, fishing, air guns, golfing, horseback riding, horseshoes, skeet shooting, trampolines, and tree or play houses. [12] Includes wading and swimming pools, diving, water slides, tubing, water skiing, surfing, water polo, and all activities performed in the act of swimming or on flotation devices.

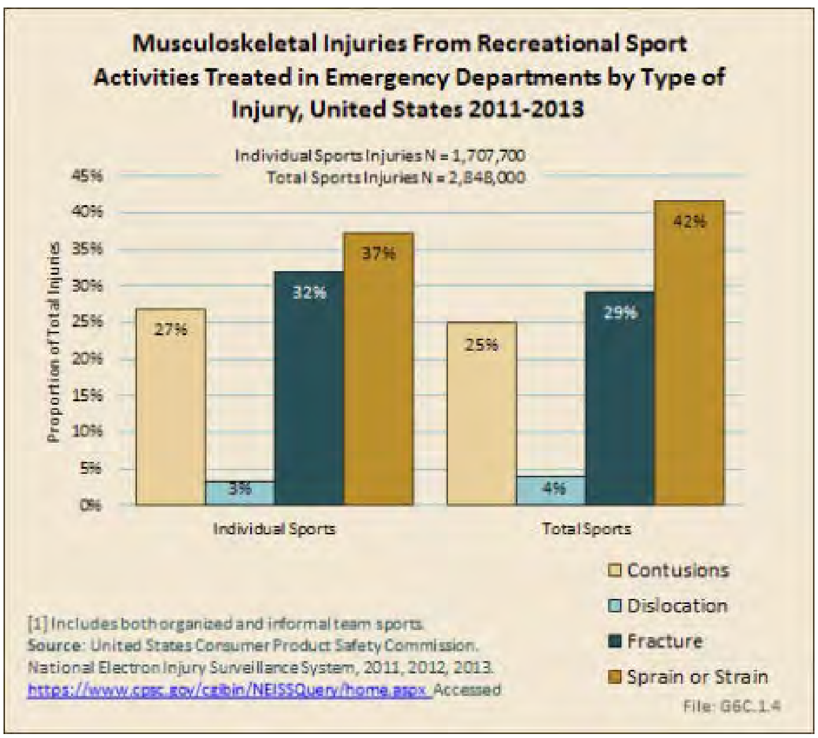
Source: United States Consumer Product Safety Commission. National Electron Injury Surveillance System, 2011, 2012, 2013. https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014.

Musculoskeletal injuries treated in the ED as a result of a recreational sport injury occur in the highest proportion in children aged 2 to 12 years. This is in large part due to the high number of playground injuries, as well as biking and other wheeled equipment such as skate boards and scooters. Adults between the ages of 25 and 44 account for a substantial proportion of treated musculoskeletal injuries, but they also are a larger share of the population and more likely to be active in recreational sport activities. (Reference Table 6C.2 PDF CSV)



An estimated 37% of musculoskeletal injuries from athletic mechanisms result in sprains or strains, while fractures comprise 32% and contusions 27%. (Reference Table 6C.3 PDF CSV)

Injuries to the extremities are the most common, with 41% occurring in the upper extremity, compared with 34% in the lower extremity. The trunk sustains most of the remaining injuries, with less than 7% involving the head. (Reference Table 6C.4 PDF CSV; Table 6C.7 PDF CSV)



Nearly all sports injuries seen in the ED are treated and released to home. Fewer than 4% of recreational sports injuries result in hospitalization. Injuries from all-terrain vehicles and motorized bikes result in the highest hospitalization rate (7%) among individual sports, followed by 5% for injuries from nonmotorized wheeled activities (bicycles, skateboards, scooters, etc.). About 1 in 25 playground injuries results in hospitalization. (Reference Table 6C.5 PDF CSV)

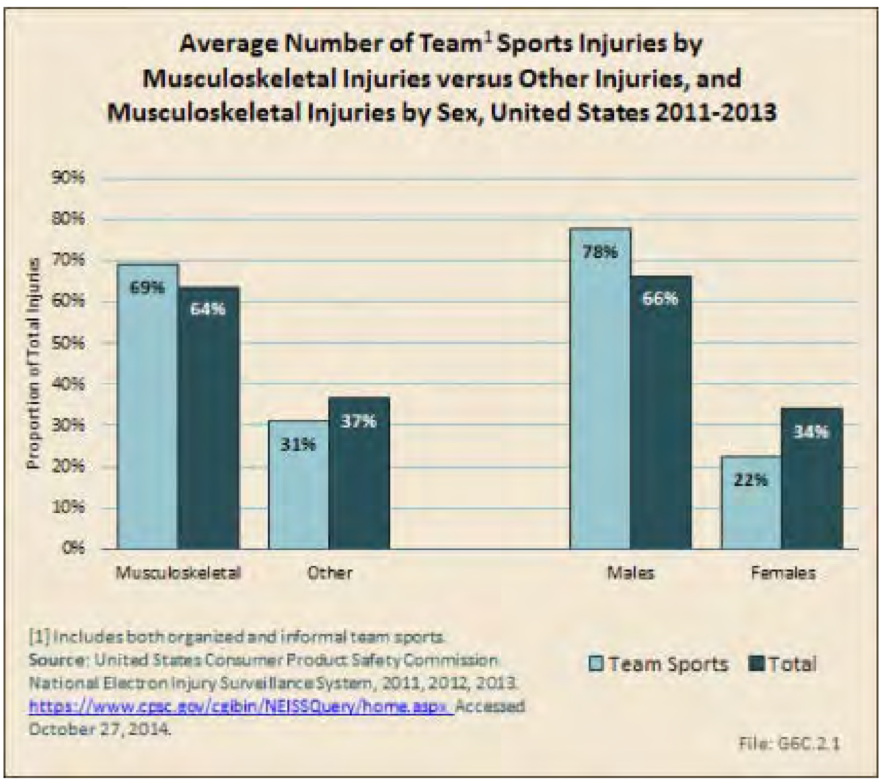
1. Centers for Disease Control and Prevention: Nonfatal sports- and recreation-related injuries treated in emergency departments—United States, July 2000–June 2001. *MMWR Morb Mortal Wkly Rep* 2002 Aug 23;51(33):736-740.

2. Gage BE, McIlvain NM, Collins CL, Fields SK, Comstock RD: Epidemiology of 6.6 million knee injuries presenting to United States emergency departments from 1999 through 2008. *Academic Emergency Medicine* 2012 Apr;19(4):378-385.

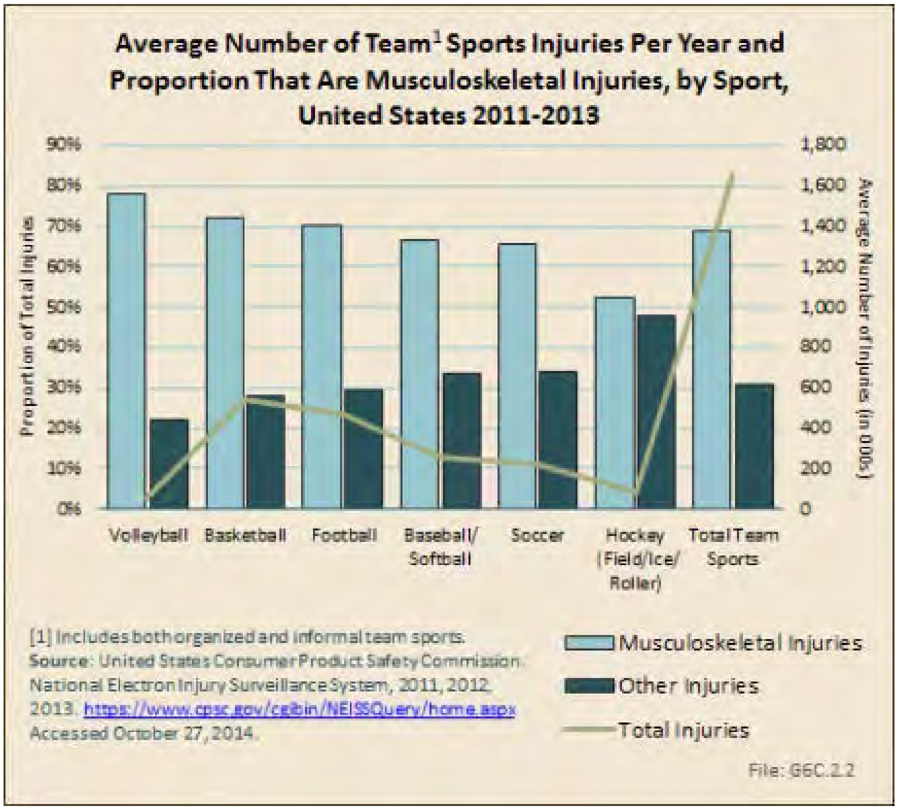
Scholastic Athletics: Sports Injuries

Scholastic sports has seen an 80% increase in participation between 1971 and 2005. These high school athletes experience an estimated 2,000,000 injuries, 500,000 doctor visits, and 30,000 hospitalizations per year.

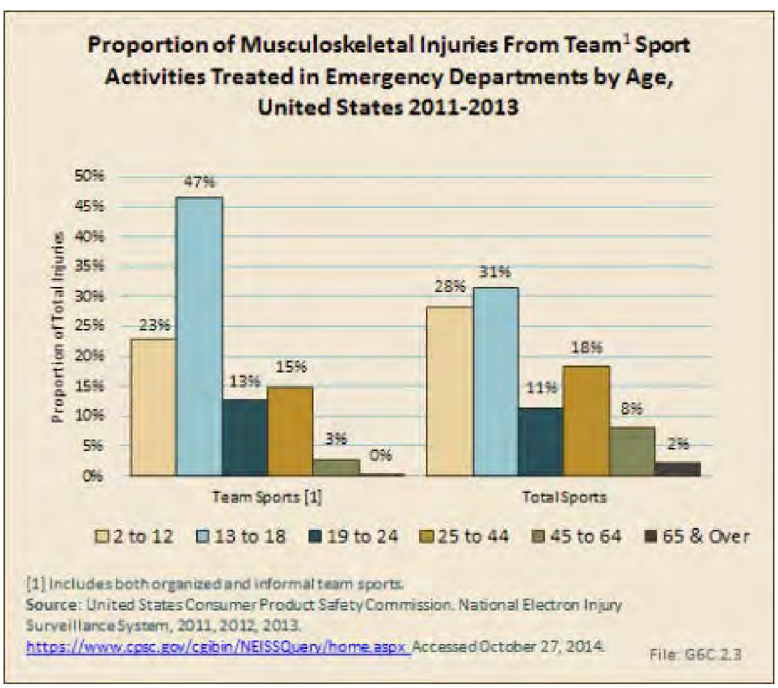
Using the NEISS dataset, more than 1.6 million injuries occurring as the result of team sports were reported in EDs in the United States annually in the three years studied. Musculoskeletal injuries comprised 69% of team sport injuries seen in the ED. The team sports causing the most injuries are basketball and football, which comprise 33% and 28%, respectively, of all injuries seen. (Reference T6C.1 PDF CSV)



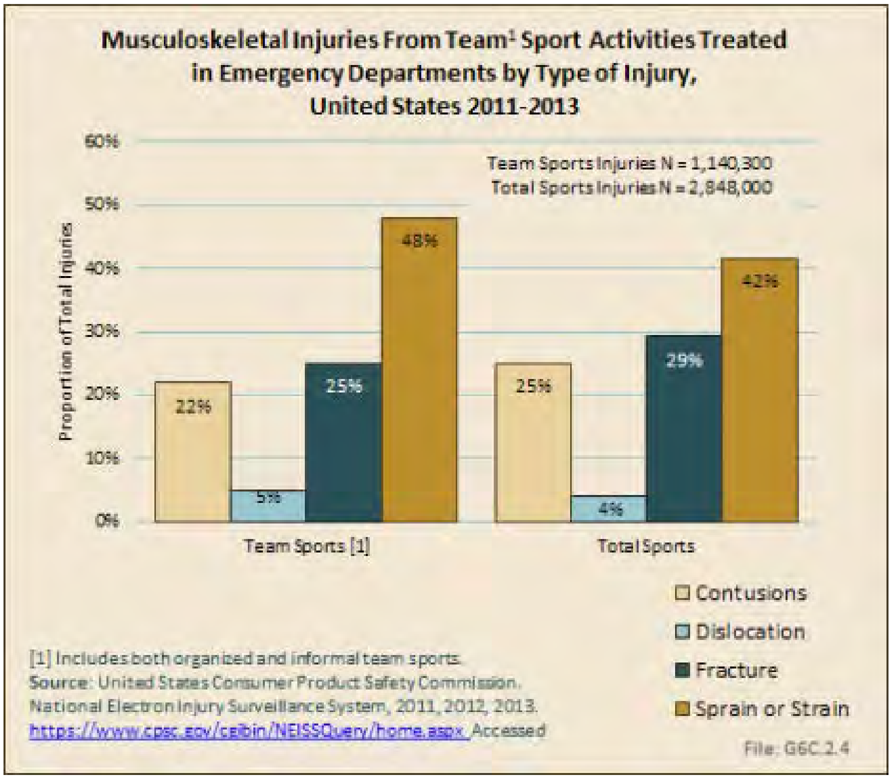
Volleyball has the highest proportion of musculoskeletal injuries among the team sports, but accounts for a small number of total injuries. Hockey sports injuries, including field, ice, and roller hockey, are split about evenly between musculoskeletal injuries and other types of injuries. (Reference T6C.1 PDF CSV)



Musculoskeletal injuries seen in emergency departments occur most frequently (47%) within team sports in children between the ages of 13 and 18 years, the age at which many are participating in Little League and high school sports. Injuries from volleyball are more likely in this age group than other sports, but all team sports show about one-half of injuries seen in the ED within this age group. (Reference T6C.2 PDF CSV)



Nearly one-half (48%) of musculoskeletal injuries occurring while participating in team sports result in sprains or strains. Fractures occur in one in four injuries (25%), while contusions result in 22% of cases. (Reference Table 6C.3 PDF CSV)



The majority of team injuries (84%) occur to the extremities. (Reference Table 6C.4 PDF CSV) Only 1% of team sport injuries results in hospitalization, with soccer injuries the most likely a cause for hospitalization (1.6%). (Reference Table 6C.5 PDF CSV)

Another dataset created in 2004 to track scholastic sports injuries, the Reporting Information Online (RIO™), also provides quality epidemiologic information entered by athletic trainers associated with participating schools. Data from the 2005–2006 academic year suggests that injuries resulting from competition were 2.7 times higher than from practice, with boys' football having the highest injury rates, both in practice as well as games.1

While less data on long-term health impact is available on scholastic athletes, one such study by McLeod and colleagues offers insight into the significant impact of athletic injury in this large population.2 They studied a convenience sample of 160 uninjured and 45 injured scholastic athletes with health-related quality-of-life measures. They found significantly lower scores among the injured athletes for the following subscores of the Quality of Life Short Form Questionnaire (SF-36)3: physical functioning, limitations due to health problems, bodily pain, social functioning, and the physical composite score. These findings suggest that physical injuries in our young athletes affect not only their physical function and risk for future musculoskeletal disability, but also extend beyond the physical aspects of overall health.

1. Rechel JA, Yard EE, Comstock RD: An epidemiologic comparison of high school sports injuries sustained in practice and competition. *J Athl Train* 2008 Apr-Jun;43(2):197-204.

2. Valovich McLeod TC, Ba y RC, Parsons JT, Sauers EL, Snyder AR: Recent injury and health-related quality of life in adolescent athletes. *J Athl Train* 2009 Nov-Dec;44(6):603-610.

3. The SF-36 is a widely used measurement in health to determine quality of life based on eight scales: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. Two summary measurements, physical health and mental health, are also calculated.

Intercollegiate Athletics: Sports Injuries

The National Collegiate Athletic Association (NCAA)1 is comprised of nearly 1,100 member schools that compete in three division levels. More than 375,000 student athletes participate in NCAA sports that offer national championships annually, and this number continues to grow.2 During the 2013–2014 academic year, the number of teams competing in NCAA championship sponsored sports reached an all-time high of 19,086.

While there are numerous benefits associated with participating in collegiate athletics, there is also an increased risk of injury associated with participating in many types of sports. These injuries primarily affect the musculoskeletal system in general, and the lower and upper extremities specifically. Although awareness of risk of injury associated with participating in collegiate athletics is growing, there is little known about the long-term impact of injuries sustained while participating in collegiate athletics. Recent injury data from the NCAA Injury Surveillance System, as well as reports for specific joint injuries sustained by NCAA athletes and emerging data on the potential long-term impact of these injuries on health-related quality of life is presented.

For more than 30 years the NCAA, and since 2009 the Datalys Center, have been engaged in active injury surveillance within the unique population of college athletes. The collaborative effort between the NCAA and the National Athletic Trainers' Association (NATA) has yielded rich injury surveillance data used to develop important rule changes to protect player safety.3 In a 2007 special issue of *The Journal of Athletic Training*, data from the NCAA injury surveillance system from the 1988–1989 academic year through the 2003–2004 academic year were reviewed for 15 collegiate sports.4 With permission from the publisher, data from this study is included in this site. To read the full article, click here.

The 15 sports examined included five fall sports (men's football, women's field hockey, men's soccer, women's soccer, and women's volleyball), six winter sports (men's basketball, women's basketball, women's gymnastics, men's gymnastics, men's ice hockey, and men's wrestling), and five spring sports (men's baseball, men's football, women's softball, men's lacrosse, and women's lacrosse). Data for men's spring football were only included in the analysis of practice injuries. These data provide insight into the burden of musculoskeletal injury experienced by collegiate athletes.

Hootman et al4 provided an overall summary of the NCAA data from the years 1988–1989 through 2003–2004, and made recommendations for injury prevention initiatives. Some of these data are highlighted in this section. CDC, which estimates 2.6 million children ages 0 through 19 years are treated in EDs each year for sports- and recreation-related injuries5, provides tips on how to prevent sports-related injuries in their Protect the Ones You Love Initiative.

1. The National Collegiate Athletic Association (NCAA) is a nonprofit association that regulates athletes of more than 1,200 institutions, conferences, organizations, and individuals that organize athletic programs of many colleges and universities in the United States and Canada. Athletic programs are divided into three levels or divisions. Division I is the highest level of intercollegiate athletics sanctioned NCAA in the United States. Division I schools include the major collegiate athletic powers, with larger budgets, more elaborate facilities, and more athletic scholarships than Divisions II and III as well as many smaller schools committed to the highest level of intercollegiate competition. Division II is an

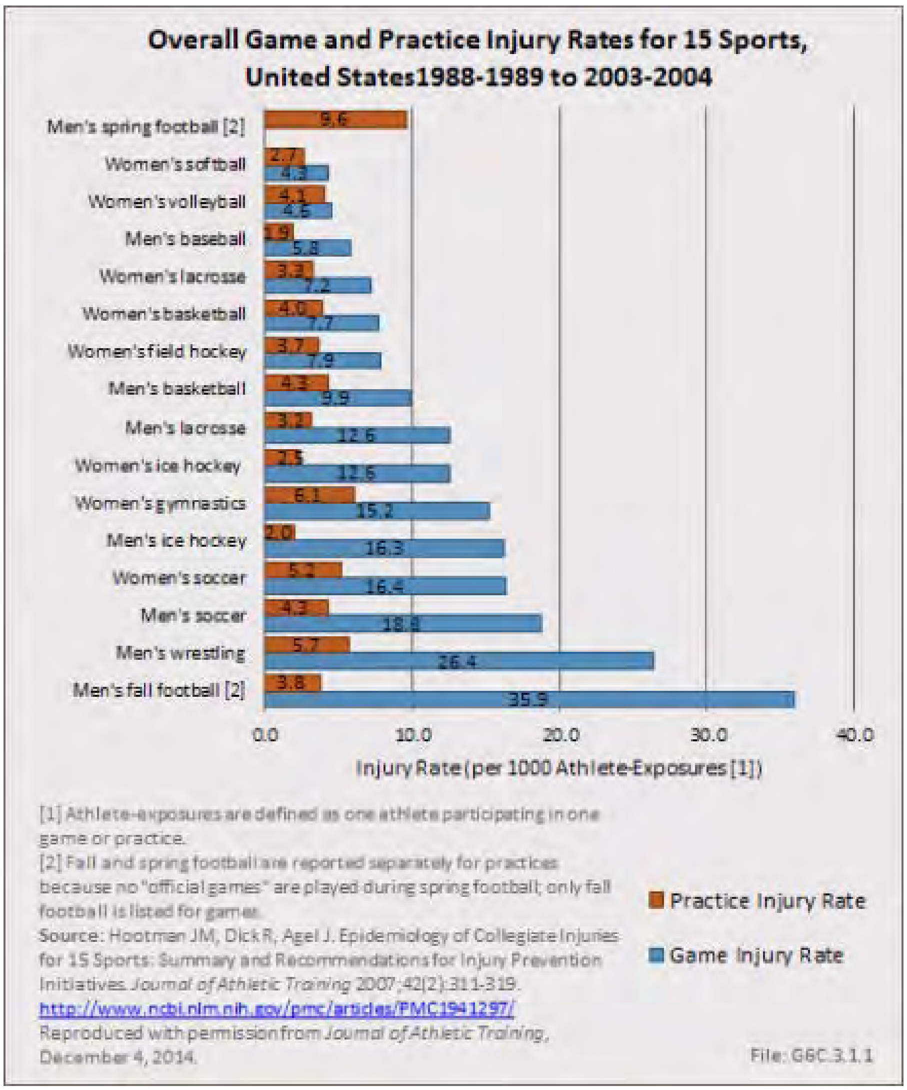
intermediate-level division of competition in the NCAA. It offers an alternative to both the highly competitive, and highly expensive, level of intercollegiate sports offered in NCAA Division I and to the no-athletic-scholarship environment offered in Division III. Division III consists of colleges and universities that choose not to offer athletically related financial aid to their student athletes.

2. Dick R, Agel J, Marshall SW: National Collegiate Athletic Association Injury Surveillance System commentaries: Introduction and methods. *J Athl Train* 2007 Apr-Jun;42(2):173-182.

3. Hootman JM: Celebrating 25 years of making sports safer. *J Athl Train* 2007;42(2):170.

4. a. b. Hootman JM, Dick R, Agel J: Epidemiology of collegiate injuries for 15 sports: Summary and recommendations for injury prevention initiatives. *J Athl Train* 2007 Apr-Jun;42(2):311-319.

5. Centers for Disease Control and Prevention: Protect the Ones You Love: Child Injuries are Preventable. Accessed at: http://www.cdc.gov/safechild/index.html Accessed December 5, 2013.

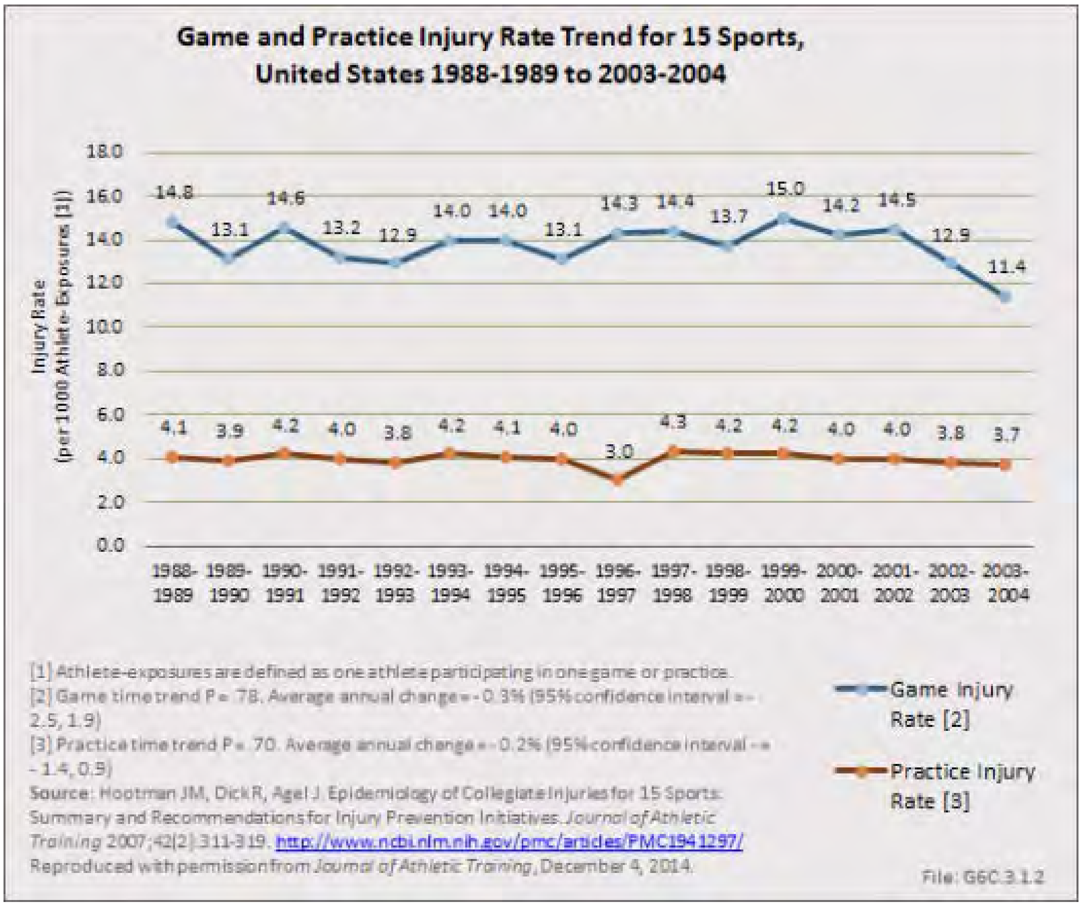


Incidence Rates: Intercollegiate Athletics, Sports Injuries

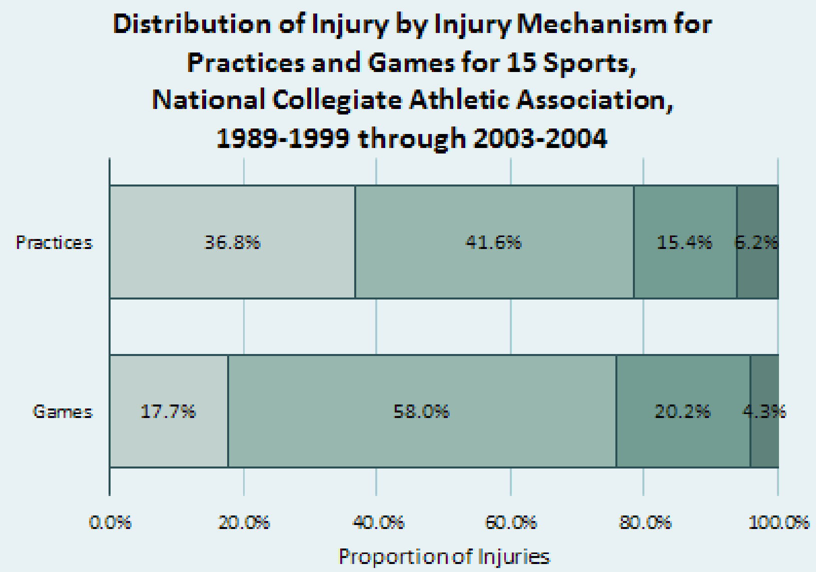
Overall, incidence rates for the 15 sports examined range from a high of 35.9 per 1,000 game athlete exposures for men's football to a low of 1.9 for men's practice basketball. Among men, the highest injury rates were observed in football, wrestling, soccer, and ice hockey. Among women, the highest injury rates were experienced in soccer, gymnastics, ice hockey, and field hockey. (Reference Table 6C.9 PDF CSV)

When data for all 15 sports are combined, injury rates are significantly higher in games (13.8 injuries per 1,000 athlete exposures) when compared to practice (4.0 injuries per 1,000 athlete exposures). Pre-season practice injury rates were significantly higher when compared to in-season or post-season training sessions. (Reference Table 6C.8 PDF CSV)

Combined injury rates for all 15 NCAA sports studied remained relatively stable over time. No significant changes were observed in injury rates during games or practices over the 16-year study period. (Reference Table 6C.10 PDF CSV)



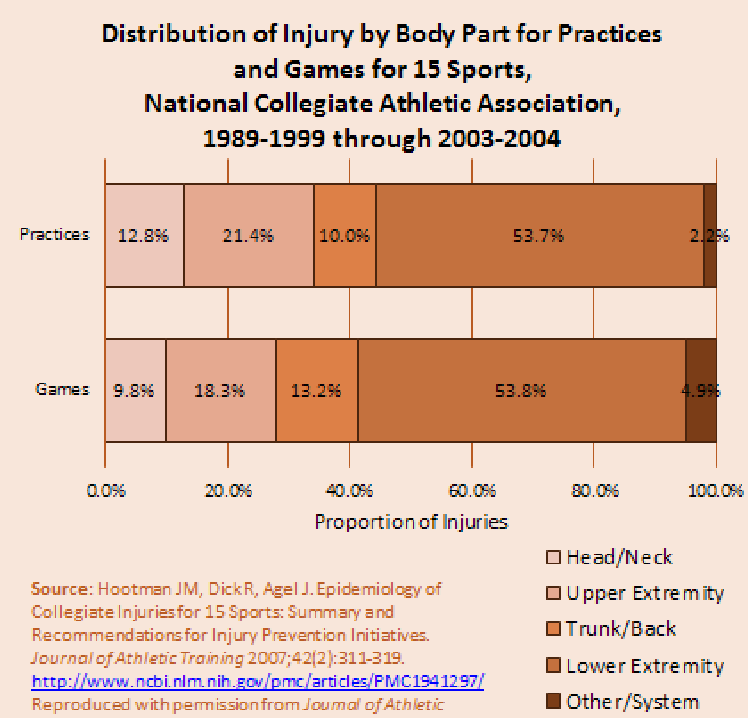
The majority of injuries resulted from contact with another player, regardless of whether or not injuries were sustained in practices or games. (Reference Table 6C.11 PDF CSV)



Source: Hootman JM, Dick R, Agel J. Epidemiology of Collegiate Injuries for 15 Sports: Summary and Recommendations for Injury Prevention Initiatives. *Journal of Athletic Training* 2007;42(2):311-319. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1941297/ Reproduced with permission from *Journal of Athletic Training*, December 4, 2014.

File: G6C.3.1.3

The majority of injuries documented during the study period affected the musculoskeletal system, with 72% of all injuries in games and 75% of all injuries in practices affecting the extremities. Regardless of whether injuries occurred in practices or games, more than one-half of all injuries reported across the 15 sports examined during the study period were to the lower extremity. (Reference Table 6C.12 PDF CSV)



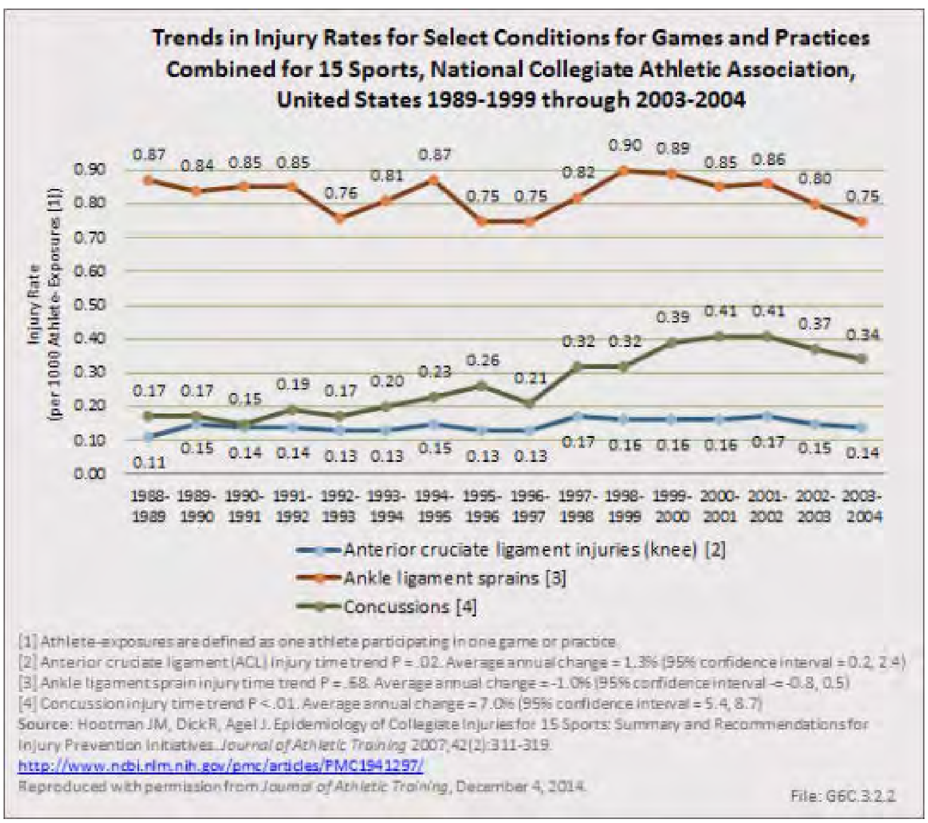
Source: Hootman JM, Dick R, Agel J. Epidemiology of Collegiate Injuries for 15 Sports: Summary and Recommendations for Injury Prevention Initiatives. *Journal of Athletic Training* 2007;42(2):311-319. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1941297/ Reproduced with permission from *Journal of Athletic Training*, December 4, 2014.

File: G6C.3.1.4

Specific Injury Rates: Intercollegiate Athletics, Sports Injuries

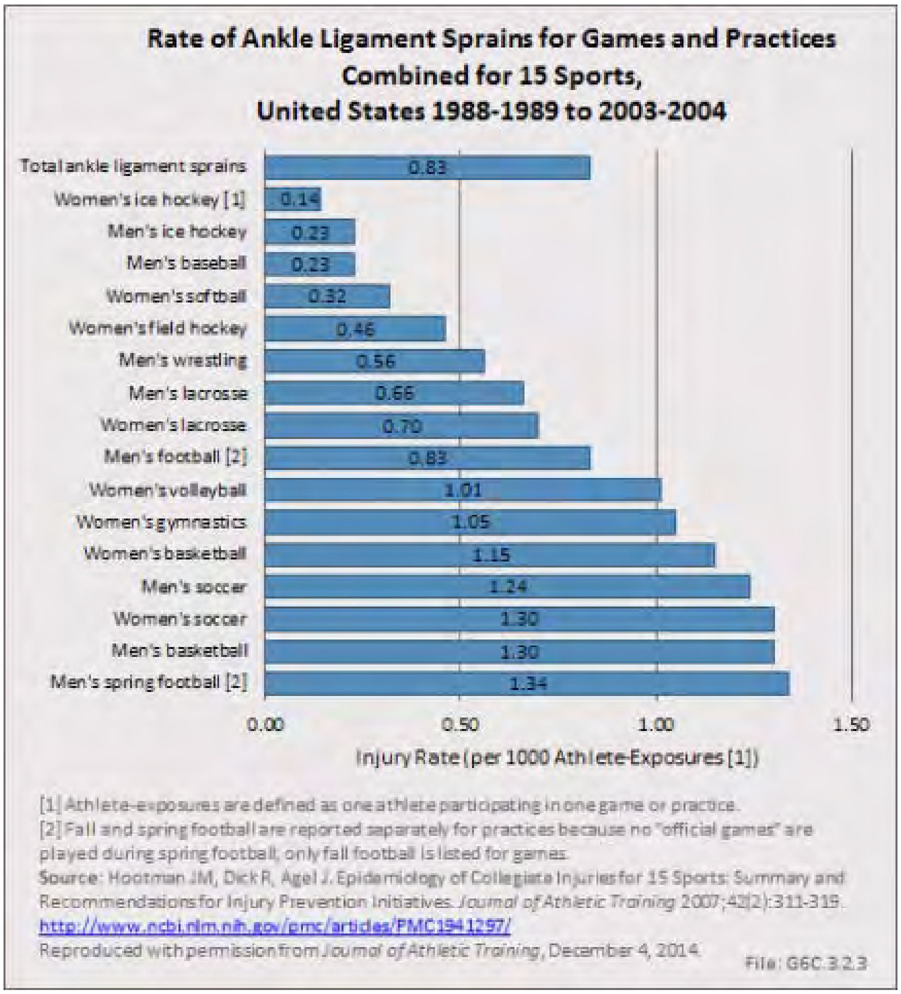
The NCAA injury surveillance system has also been used to examine the incidence and injury patterns of specific injuries among collegiate athletes.[1,2] These studies have primarily focused on those injuries that likely have the greatest burden in terms of time loss from sport, the need for surgical intervention, and the potential for long-term impact on health. Specifically, joint injuries have been a primary concern, as it is well documented that these injuries can lead to chronic instability and increase the risk of osteoarthritis and degenerative joint disease.

Acute traumatic anterior cruciate ligament (ACL) injuries in the knee often lead to chronic pain and instability, and generally require surgical repair to restore function. There is also substantial evidence to suggest that acute traumatic knee joint injuries such as ACL tears significantly increase the risk for post-traumatic osteoarthritis. Several studies have focused on the rate of ACL injuries among collegiate athletes.[1,3,4,5,6] Hootman et al[6] estimated that approximately 2,000 athletes participating in 15 different men's and women's NCAA sports sustain an ACL tear annually. The average annual rate of ACL injury during the 16-year study period examined was 0.15 per 1,000 athlete-exposures. Arendt and Dick[4] first reported that there were disparities in ACL injury incidence rates between males and females participating in the NCAA gender matched sports of soccer and basketball. This observation was confirmed in a follow-up study that examined data from 1990 through 2002.[3] in male soccer players, Hootman et al[6] reported that ACL injury rates among males and females combined, participating in 15 different NCAA sports, significantly increased during the 16-year study period. On average, they reported a 1.3% annual increase in the rate of ACL injury over time (P=0.02). (Reference Table 6C.14 PDF CSV)



Dragoo et al[7] compared ACL injury rates between NCAA football players participating on artificial turf and those participating on natural grass. They reported that the rate of ACL injury on artificial surfaces was significantly higher (1.39 times higher) than the injury rate on grass surfaces. They also noted that non-contact injuries occurred more frequently on artificial turf surfaces (44.29%) than on natural grass (36.12%).

Ankle sprains are also common among NCAA athletes and they frequently lead to chronic pain, instability, and functional limitations. Hootman et al6 estimated that approximately 11,000 athletes participating in 15 different men's and women's NCAA sports sustain an ankle sprain annually. The average annual rate of ankle sprain injury during the 16-year study period examined was 0.86 per 1,000 athlete exposures. They also examined the annual injury rates for ankle sprains among males and females participating in these sports combined between 1988 and 2004 and reported that injury rates remained constant during the 16-year study period. On average, there was a nonsignificant 0.1% (P=0.68) annual decrease in the rate of ankle sprains during the study period. (Reference Table 6C.13 PDF CSV)



Shoulder instability also impacts a significant number of NCAA athletes and can lead to chronic pain, recurrent instability, and functional limitations. Recurrent shoulder instability has also been associated with the increased risk of osteoarthritis in the shoulder. Surgical reconstruction is common following shoulder instability in young athletes. Owens et al2 examined the injury rates and patterns for shoulder instability among NCAA athletes over the 16-year period from 1988 through 2004 in the same 15 sports described previously. The overall injury rate for shoulder instability during the study period was 0.12 per 1,000 athlete exposures. On average, this is comparable to just under 2,000 shoulder instability events experienced annually in NCAA athletes. Injury rates for shoulder instability were significantly higher in games when compared to practice. Overall, NCAA athletes were 3.5 (95%CI: 3.29–3.73) times more likely to experience shoulder instability events in games when compared to practices. Just over half (53%) of the shoulder instability events documented during the study period were first-time instability events, with the remaining injuries being recurrent instability events (47%). The majority of shoulder instability events were due to contact with another athlete (68%) and other contact (20%). Nearly half (45%) of all shoulder instability events experienced by NCAA athletes during the study period resulted at least 10 days of lost playing time, with the remainder returning to play within 10 days of injury.

1. a. b. Dragoo JL, Braun HJ, Durham JL, Chen MR, Harris AH: Incidence and risk factors for injuries to the anterior cruciate ligament in National Collegiate Athletic Association football: Data from the 2004–2005 through 2008–2009 National Collegiate Athletic Association Injury Surveillance System. *Am J Sports Med* 2012 May;40(5):990-995.

2. a. b. Owens BD, Agel J, Mountcastle SB, Cameron KL, Nelson BJ: Incidence of glenohumeral instability in collegiate athletics. *Am J Sports Med* 2009 Sep;37(9):1750-1754.

3. a. b. Agel J, Arendt EA, Bershadsky B: Anterior cruciate ligament injury in national collegiate athletic association basketball and soccer: A 13-year review. *Am J Sports Med* 2005 Apr;33(4):524-530.

4. a. b. Arendt E, Dick R: Knee injury patterns among men and women in collegiate basketball and soccer. NCAA data and review of literature. *Am J Sports Med* 1995 Nov-Dec;23(6):694-701.

5. Arendt EA, Agel J, Dick R Anterior cruciate ligament injury patterns among collegiate men and women. *J Athl Train* 1999 Apr;34(2):86-92.

6. a. b. c. d. Hootman JM, Dick R, Agel J: Epidemiology of collegiate injuries for 15 sports: Summary and recommendations for injury prevention initiatives. *J Athl Train* 2007 Apr-Jun;42(2):311-319.

7. Valovich McLeod TC, Bay RC, Parsons JT, Sauers EL, Snyder AR: Recent injury and health-related quality of life in adolescent athletes. *J Athl Train* 2009 Nov-Dec;44(6):603-610.

Long Term Impacts: Sports Injuries

While we still have a rudimentary understanding of the impact that musculoskeletal injuries sustained by collegiate athletes have on long-term health outcomes, studies have recently begun to examine health related quality of life in current and former NCAA athletes. McAllister et al[1] evaluated health-related quality of life in NCAA Division I athletes using the SF-36, and examined the association between scores and injury history and severity. Collegiate athletes who reported a history of mild injury had significantly lower physical component summary scale scores, role physical scores, bodily pain scores, social function scores, and general health scores on the SF-36 when compared to those with no history of injury. Collegiate athletes who reported a serious injury had significantly lower scores on all SF-36 component scores when compared athletes with no history of injury. Similar results were observed in a separate study that examined NCAA Division I and Division II athletes.[2]

More recently, studies have examined health-related quality of life in former NCAA athletes. Sorenson et al[3] reported that former NCAA Division I athletes were significantly more likely to have joint-related health concerns when compared to non-athletes, and were 14 times more likely to seek professional treatment for their symptoms. They also reported that the prevalence of joint-related health concerns was significantly higher in older former athletes when compared to younger former athletes.

In a similar study, Simon et al[4] examined health-related quality of life in former NCAA Division I athletes and former non-athletes using the Patient-Reported Outcomes Measurement Information System (PROMIS).[5] They reported that former collegiate athletes report significantly worse scores for five of the seven PROMIS scales examined when compared to non-athletes. Specifically, former athletes reported poorer scores on the physical function, depression, fatigue, sleep disturbances, and pain interference scales. There were no differences noted between former NCAA athletes and non-athletes for the anxiety and satisfaction with participation in social roles scales. The authors also noted that former collegiate athletes reported significantly more major injuries, chronic injuries, daily limitations, and physical activity limitations when compared to non-athletes.

Overall, these studies suggest that NCAA athletes who sustain injuries during their college years have significantly lower health-related quality-of-life scores, and that these scores may get worse with time, particularly for join-related health issues and long-term major and chronic injuries. Decreased health-related quality of life in former college athletes may also contribute to greater daily activity and physical activity limitations when compared to non-athletes and may lead to significant chronic health comorbidities. Further research is needed to determine which factors contribute to the poorer health-related quality of life outcomes observed among former collegiate athletes in these studies.

1. McAllister DR, Motamedi AR, Hame SL, Shapiro MS, Dorey FJ: Quality of life assessment in elite collegiate athletes. *Am J Sports Med* 2001 Nov-Dec;29(6):806-810.

2. Huffman GR, Park J, Roser-Jones C, Sennett BJ, Yagnik G, Webner D: Normative SF-36 values in competing NCAA intercollegiate athletes differ from values in the general population. *J Bone Joint Surg Am* 2008 Mar;90(3):471-476.

3. Sorenson SC, Romano R, Scholefield RM, et al: Holistic life-span health outcomes among elite intercollegiate student-athletes. *J Athl Train* 2014 Sep-Oct;49(5):684-695.

4. Simon JE, Docherty CL: Current health-related quality of life is lower in former Division I collegiate athletes than in non-collegiate athletes. *Am J Sports Med* 2014 Feb;42(2):423-429.

5. PROMIS uses modern measurement theory to assess patient-reported health status for physical, mental, and social well-being to reliably and validly measure patient-reported outcomes (PROs) for clinical research and practice.

Military Injuries

Lead Author(s):
Stephen W. Marshall, PhD
Michelle Canham-Chervak, PhD, MPH
Esther O. Dada, MPH
Bruce H. Jones, MD, MPH

This section of the report presents medical surveillance data on injuries affecting Active Duty, nondeployed US Army soldiers. As with civilians, injuries impose a major public health problem in the US Army, impacting more than 300,000 active duty Army soldiers annually and leading to more than 1.0 million medical encounters.

Unintentional injuries, a substantial and highly preventable problem, were the leading cause of the 4,053 active duty Army nonbattle deaths from 2005 to 2011 (45%), followed by disease (24%), suicide (23%), and homicide (5%).1

Ongoing analysis of surveillance data from the Defense Medical Surveillance System (DMSS), a central repository of all inpatient and outpatient medical encounters for US military personnel, is a key source of information on military injuries.2 The data presented here were obtained from the Armed Forces Health Surveillance Center, and prepared by the Army Institute of Public Health, Injury Prevention Program. Data on fatalities, hospitalizations, and outpatient visits were obtained and analyzed for all nondeployed US Army soldiers in the Active Component, hereafter referred to as "active duty." The analysis is limited to nondeployed Army since recent standardized medical encounter data are most reliably captured in the nondeployed (garrison) environment.

Fatality data contained in the DMSS originate from two data sources: Washington Headquarters Service and the Armed Forces Institute of Pathology. Hospitalization (inpatient) and outpatient visit data are obtained from DMSS, which draws data from the Military Health System (MHS) Executive Information and Decision Support data systems. Data include treatment received within the MHS, as well as treatment outside the MHS that was paid for by the US military. All data on medical conditions other than injuries are reported according to the 17 major diagnosis code groups as outlined in the International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM).3 Injuries resulting in hospitalization and outpatient treatment were identified by ICD-9-CM diagnosis codes from the 800–999 code series for acute (traumatic) injuries and 710–739 code series for injury-related (chronic) musculoskeletal conditions, in concordance with recommendations for monitoring of military injuries.4

Consistent with prior reporting,5,6 injuries and injury-related musculoskeletal conditions are reported in combination in the “injury and musculoskeletal” category. Injury-related musculoskeletal conditions include conditions such as Achilles tendinitis (code 726.71), meniscal tears of the knee (codes 717.0–717.5), non-traumatic rupture of the quadriceps (code 727.65), and tibial stress fracture (code 733.93). Other non-injury conditions in the 710–739 ICD-9 codes series, such as rheumatoid arthritis and arthropathies associated with infection, are captured in the “musculoskeletal, non-injury” category. With the exception of the Relative Burden analysis, a 60-day ”unique hospitalization/outpatient rule” was used in this analysis in order to reduce the effect of follow-up injury visits and potential overestimation of frequencies and rates. The rule states that multiple visits for the same three-digit ICD-9-CM diagnosis within 60 days of the initial visit will be counted only once.

Causes of injury hospitalizations are coded at the military treatment facility using the coding scheme outlined in the North Atlantic Treaty Organization (NATO) Standardization Agreement (STANAG) No. 2050, ed. 5.7 The coding system is employed for coding all injury hospitalizations, but is required for the first (incident) visit for acute injuries only.8 The STANAG codes are four-digit codes describing the intent/situation of the injury incident, injury cause, and location at which the injury occurred. This report includes injury hospitalizations coded as accidental (a STANAG trauma code, or first digit, of 5–9), which are used in this analysis, and hereafter referred to as unintentional injuries. Outpatient injury cause coding is not yet required in the military health system, although ICD-9 external cause of injury cause codes may be recorded. In this report, data for incident outpatient injury visits with an ICD-9 external cause of injury code are reported.

1. *Mortality Surveillance in the US Army,* 2005–2011. Army Institute of Public Health; July 2014.

2. Rubertone MV and Brundage JF: The Defense Medical Surveillance System and the Department of Defense serum repository: glimpses of the future of public health surveillance. *Am J Public Health* 2002;92(12):1900-1904.

3. National Center for Health Statistics. The International Classification of Diseases, ed. 9. Revision, Clinical Modification (ICD-9-CM). Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Centers for Medicaid and Medicare Services.

4. DoD Military Injury Metrics Working Group White Paper: Washington, DC: Office of the Assistant Secretary of Defense for Health Affairs, Clinical and Program Policy. 2002.

5. Jones BH, M Canham-Chervak, S Canada, T Mitchener, S Moore. Medical surveillance of injuries in the US military: Descriptive epidemiology and recommendations for improvement. *Amer J Prev Med* 2010;38(1S):S42-S60.

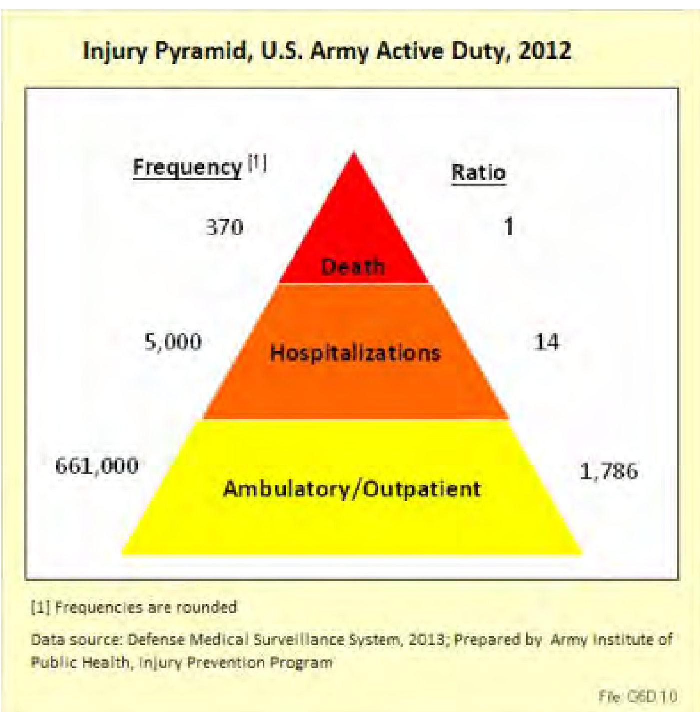
6. Jones BH, Amoroso PJ, Canham ML, Schmitt JB, Weyandt MB. Chapter 9. Conclusions and recommendations of the DoD injury surveillance and prevention work group. *Mil Med* 1999;164(8S):1-26.

7. Military Agency for Standardization, North Atlantic Treaty Organization. 2 March 1989. Standardized Classification of Diseases, Injuries, and Causes of Death. 5th ed: STANAG 2050.

8. Amoroso PJ, Bell NS, Smith GS, Senier L, Pickett D. Viewpoint: a comparison of cause-of-injury coding in U.S. military and civilian hospitals. *Am J Prev Med* 2000;18(3 Suppl):164-173.

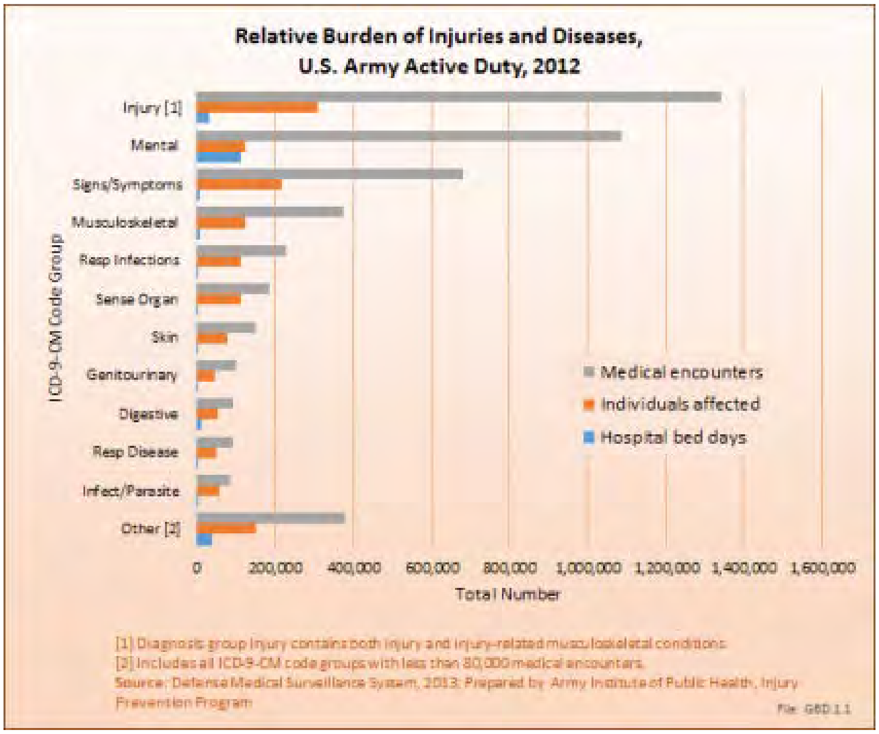
Summary Data: Military Injuries

In 2012, there were approximately 370 injury-related deaths, 5,000 injury-related hospitalizations (3,000 acute injuries and 2,000 injury-related musculoskeletal conditions), and 661,000 injury-related outpatient visits (245,000 acute injuries and 415,000 injury-related musculoskeletal conditions).

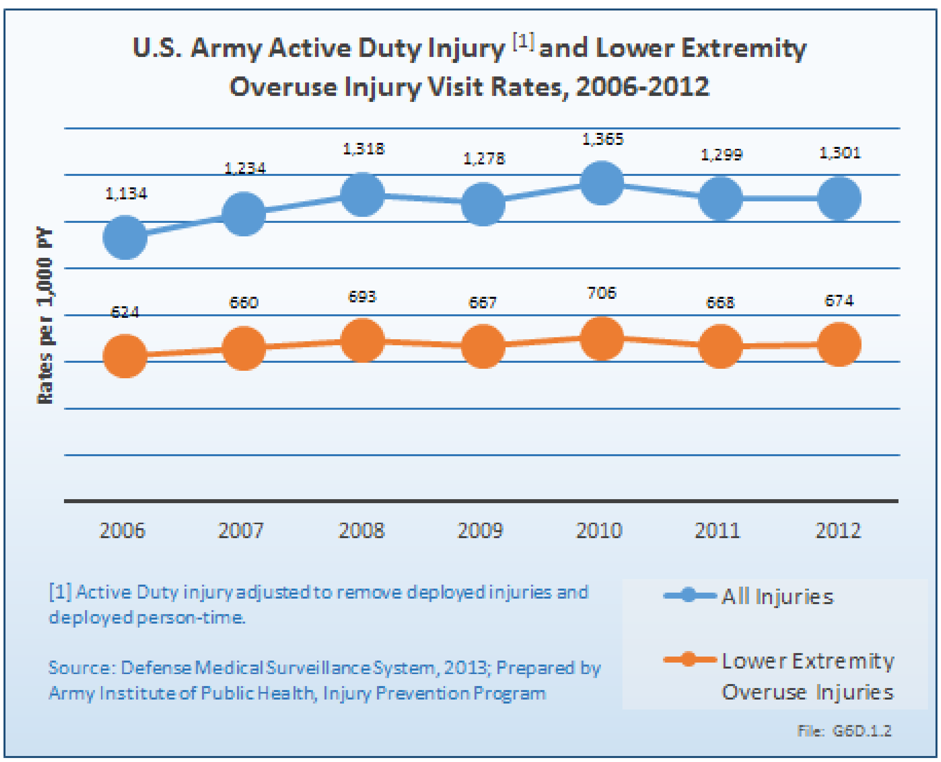


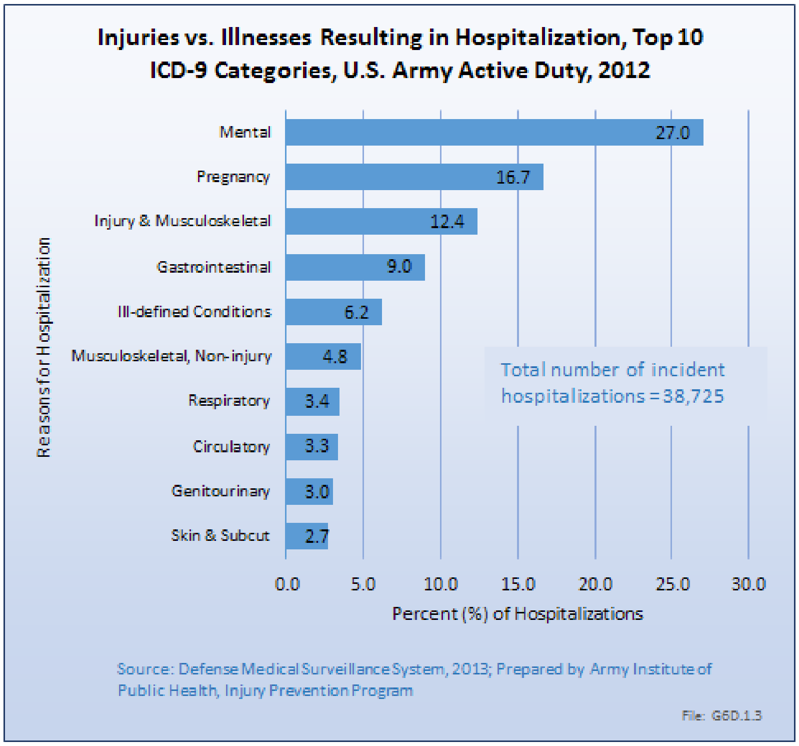
Fatalities have been a major focus of injury prevention activities in the past. As illustrated by these data, however, there are far more injury-related hospitalizations and outpatient visits than deaths. These nonfatal outcomes result in significant losses in duty time and manpower for the Army.

In 2012, injuries accounted for approximately 30% of all medical encounters. Injuries were the leading cause of medical encounters and affected more individuals than all other medical conditions, including mental health disorders.



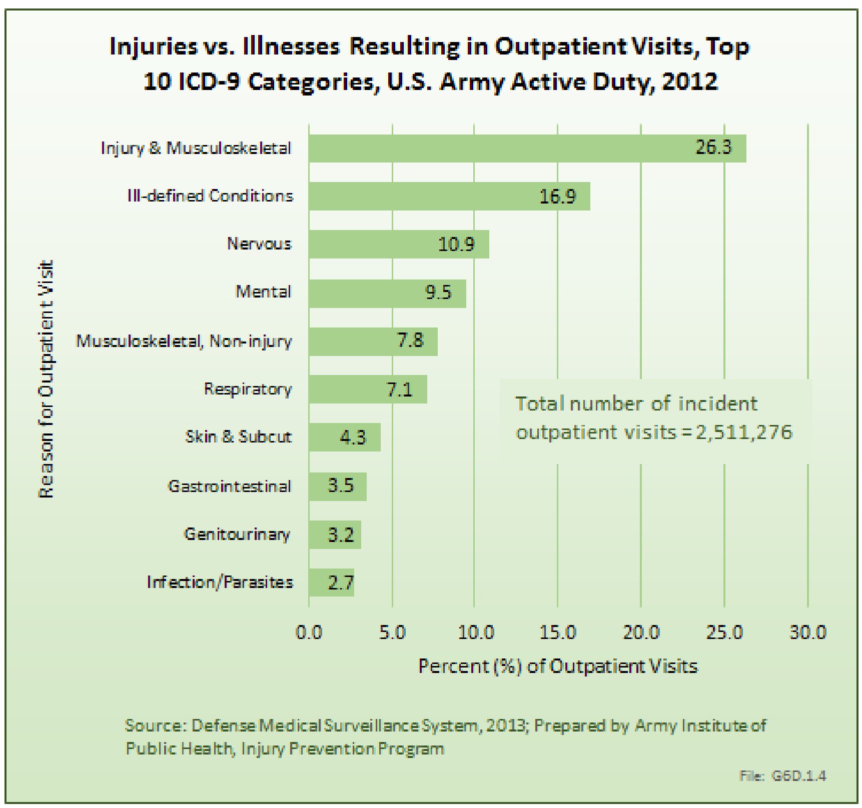
Rates of all injury visits among nondeployed active duty soldiers climbed slightly between 2006 and 2012. During this period, more than half the injury visits were due to lower extremity overuse injuries.





In 2012, out of approximately 39,000 incident hospitalizations, three major diagnoses groups accounted for over half of all admissions (56%). The top three reasons for hospitalization were mental disorders (27%), pregnancy-related issues (17%), and injuries and injury-related musculoskeletal conditions (12%).

A total of 2,511,276 unique outpatient visits were made by active duty Army personnel. Injuries and injury-related musculoskeletal conditions were responsible for 26%, or more than 660,000, of visits.



Acute Injuries and Injury-Related Musculoskeletal Conditions: Military Injuries

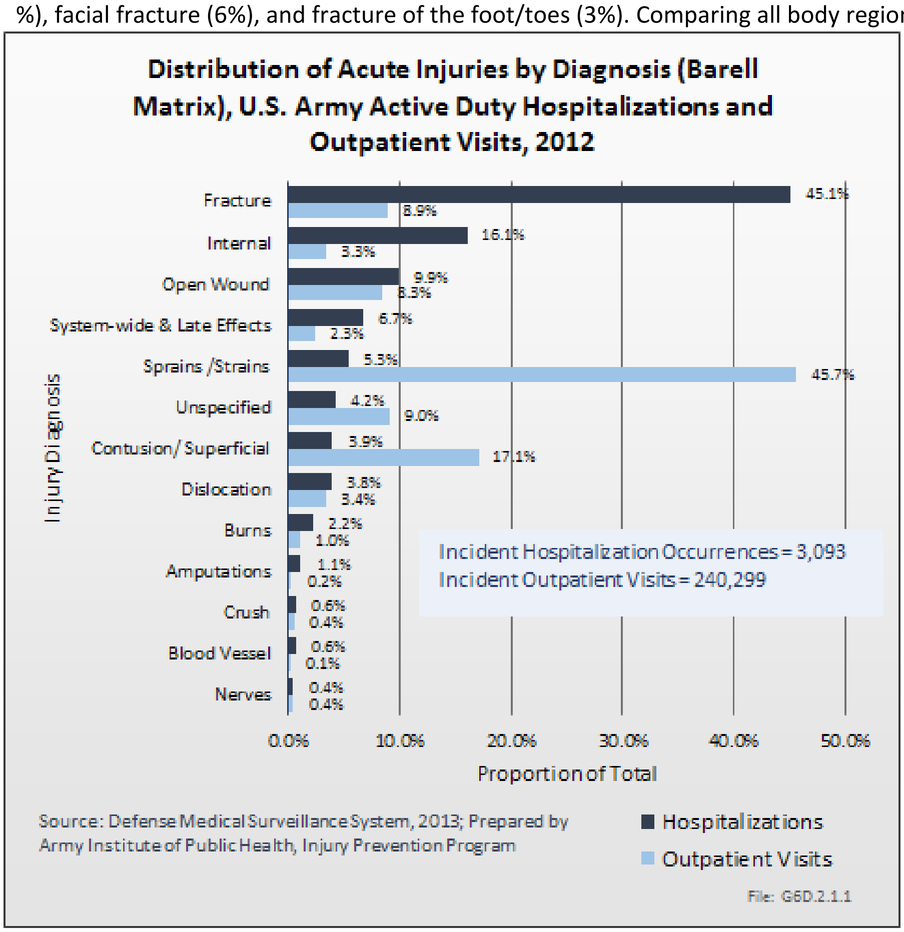
Acute injuries among active duty, nondeployed US Army soldiers are characterized by the types of injuries incurred, as well as the bodily site of the injuries. Two types of analytical injury matrices are available to further describe acute injuries and injury-related musculoskeletal conditions: (1) the Barell Injury Diagnosis matrix1 and (2) the injury-related musculoskeletal conditions matrix.2 Matrices report ICD-9-CM code frequencies by type of injury and body region. (Reference Table 6D.1 PDF CSV and Table 6D.2 PDF CSV)

1. Barell V, Aharonson-Daniel L, Fingerhut LA, Mackenzie EJ, Ziv A, Boyko V, Abargel A, Avitzour M, Heruti R: An introduction to the Barell body region by nature of injury diagnosis matrix. *Inj Prev* 2002;8(2):91-96. USAPHC (Prov) Injury Prevention Report No. 12-HF-0APLa-09 A-2

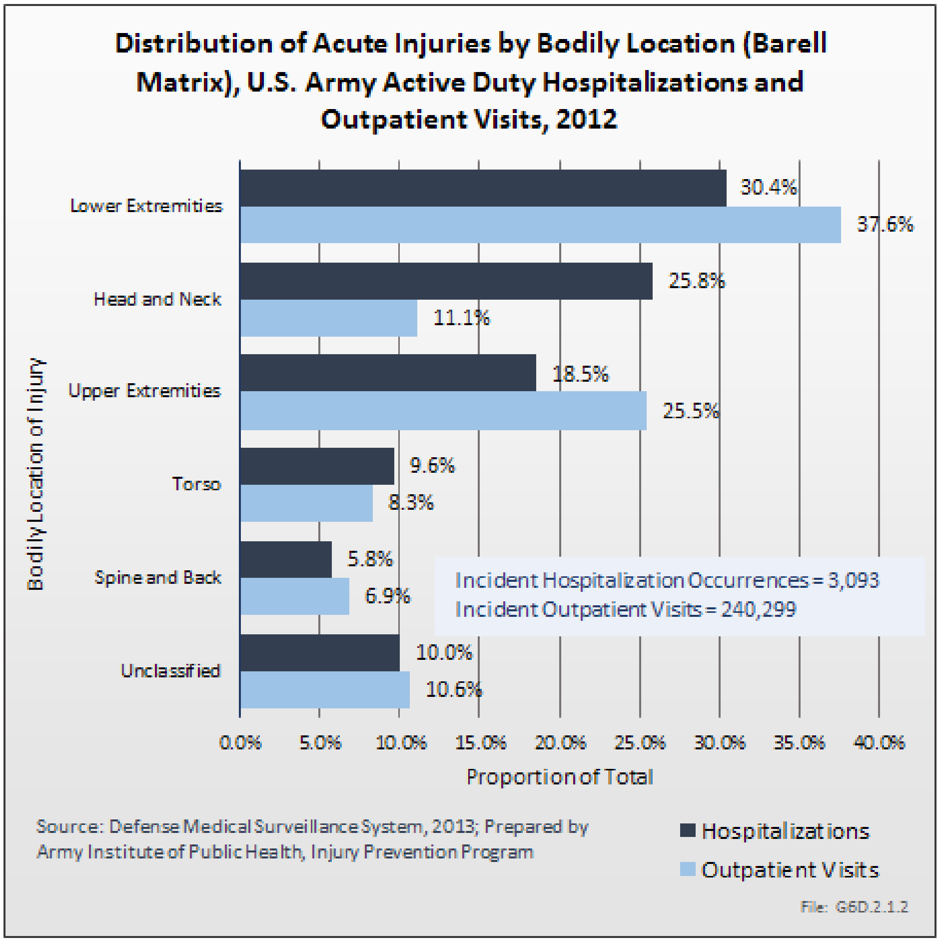
2. Hauret KG, Jones BH, Bullock SH, Canham-Chervak M, Canada S: Musculoskeletal injuries: Description of an under-recognized injury problem among military personnel. *Am J Prev Med* 2010;38(1S):S61-S70.

Types and Sites of Injuries: Acute, Military Injuries

In 2012, there were 3,093 acute traumatic injuries (coded in the 800–900 ICD-9-CM code series) requiring hospitalization. Leading specific reasons for hospitalizations included fractures of the lower leg and/or ankle (13 %), facial fracture (6%), and fracture of the foot/toes (3%). Comparing all body regions, the lower extremity accounted for 30%, the upper extremity for 19%, and the head for 16%. Within the head region, traumatic brain injury, including skull fracture, accounted for 15%, and other specified head injuries accounted for less than 1%. (Reference Table 6D.1 PDF CSV)



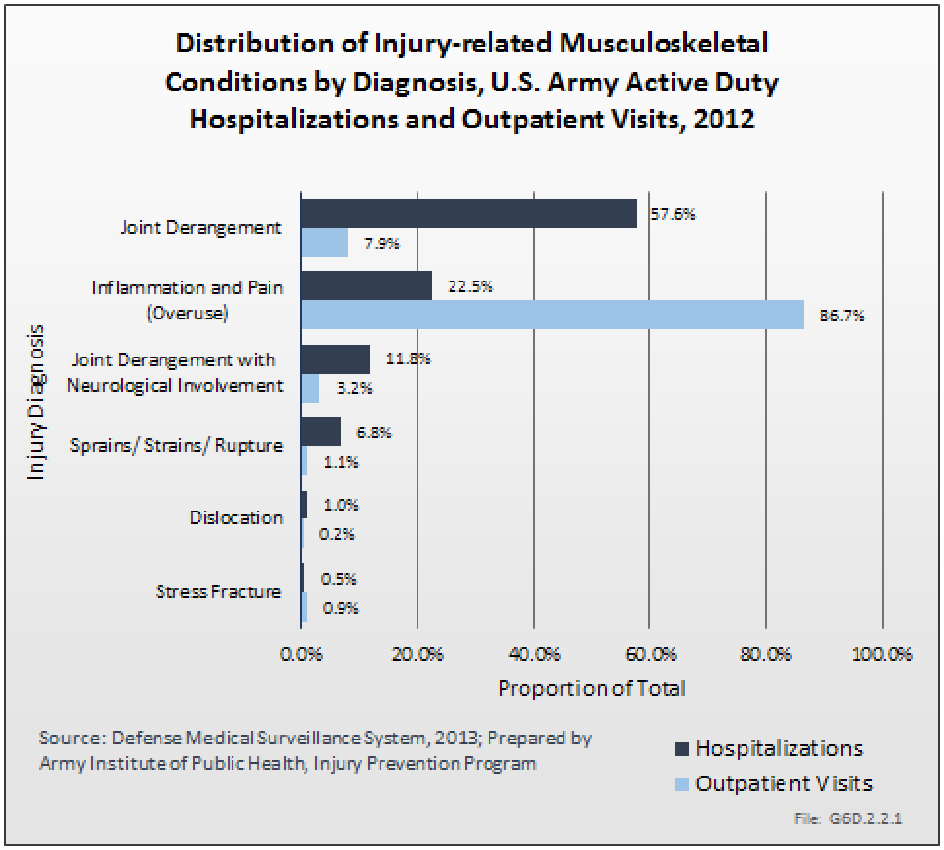
During the same year, US Army active duty, nondeployed soldiers incurred 240,299 acute traumatic injuries (coded in the 800–900 ICD-9-CM code series) for which outpatient care was required. Leading specific reasons for outpatient visits included strains/sprains to the lower leg and/or ankle (9%) and strains/sprains of the shoulder/upper arm (7%). Body regions most affected were lower extremities (38%), upper extremities (26%), and the head and neck region (TBI and other head, face, and neck) (11%). (Reference Table 6D.2 PDF CSV)

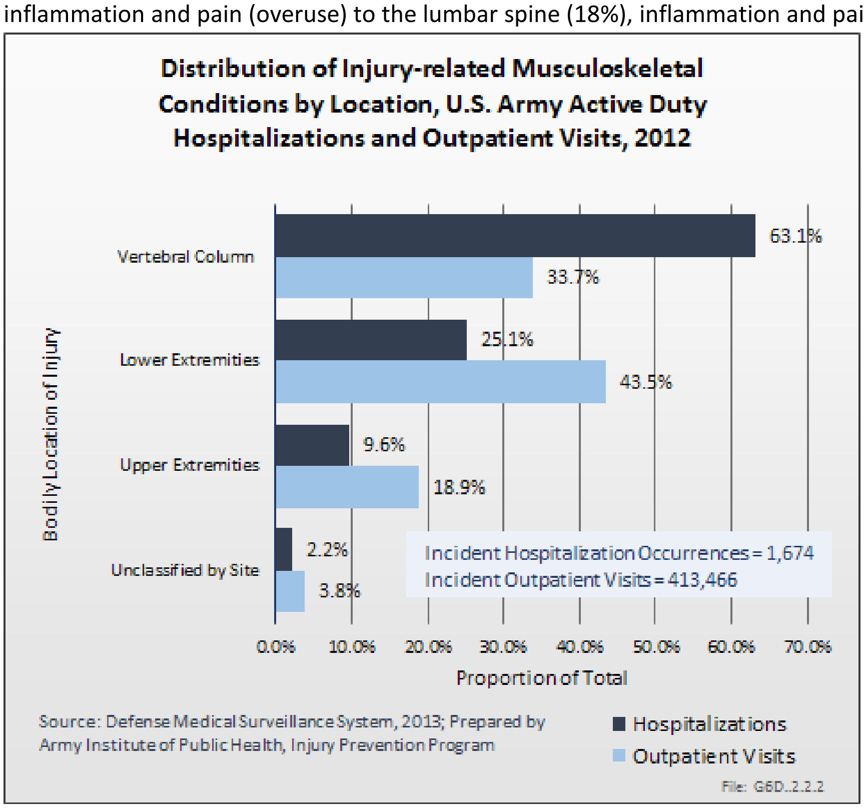


Injury-Related Musculoskeletal Conditions: Acute, Military Injuries

In 2012, there were 1,674 hospitalizations due to injury-related musculoskeletal conditions, roughly one-half the number of acute traumatic injuries requiring hospitalization. The most common types of injury-related musculoskeletal conditions leading to hospital admission were joint derangement (58%), followed by inflammation and pain due to overuse (23%). Joint derangement with neurological involvement accounted for another 12%. The vertebral column (including spine/back) was the most affected by injury-related musculoskeletal conditions (63%), followed by lower extremities (25%) and upper extremities (10%). (Reference Table 6D.3 PDF CSV)

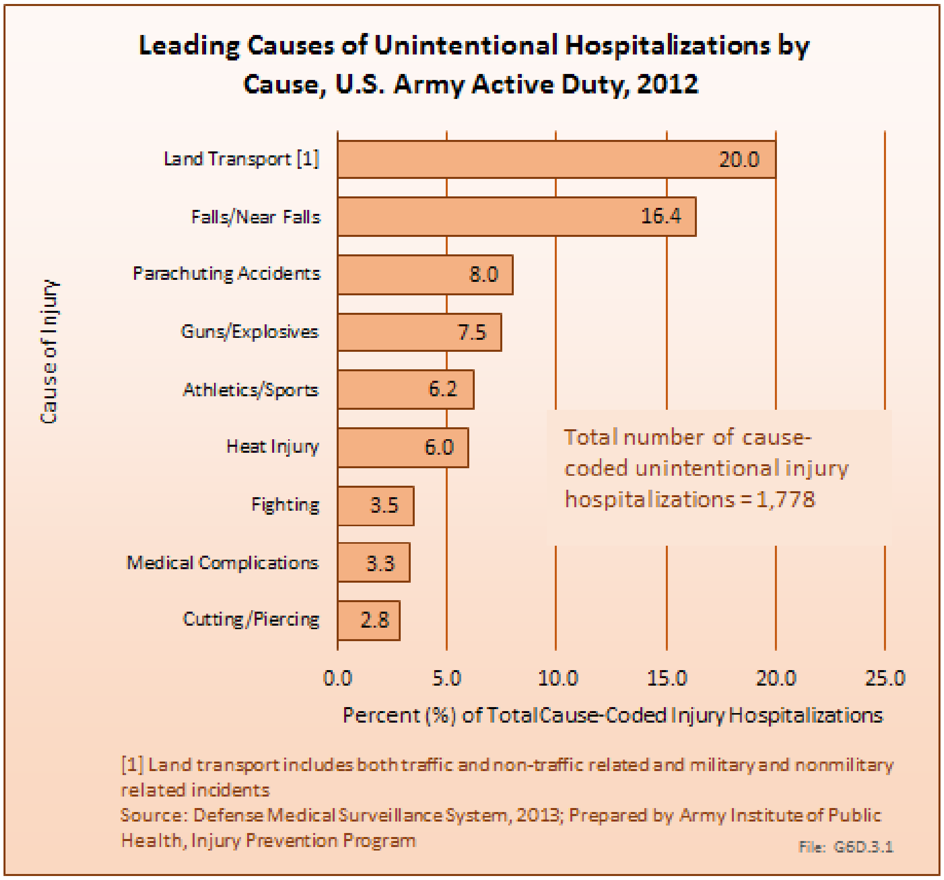
There was nearly twice the number of injury-related musculoskeletal conditions requiring outpatient visits as there were acute traumatic injuries. In 2012, there were a total of 413,466 outpatient visits for injury-related musculoskeletal conditions (710–739 ICD-9-CM series). Most outpatient visits for injury-related musculoskeletal conditions involved inflammation and pain due to overuse (87%). Lower extremities (44%) was the body region most often treated on an outpatient basis, followed by the vertebral column (including spine/back) at (34%), and upper extremities at 19%. The leading specific injury-related musculoskeletal conditions requiring outpatient treatment were inflammation and pain (overuse) to the knee and/or lower leg (20%), inflammation and pain (overuse) to the lumbar spine (18%), inflammation and pain (overuse) to the ankle and/or foot (14%), and inflammation and pain (overuse) to the shoulder (12%). (Reference Table 6D.4 PDF CSV)





Cause of Injuries: Military Injuries

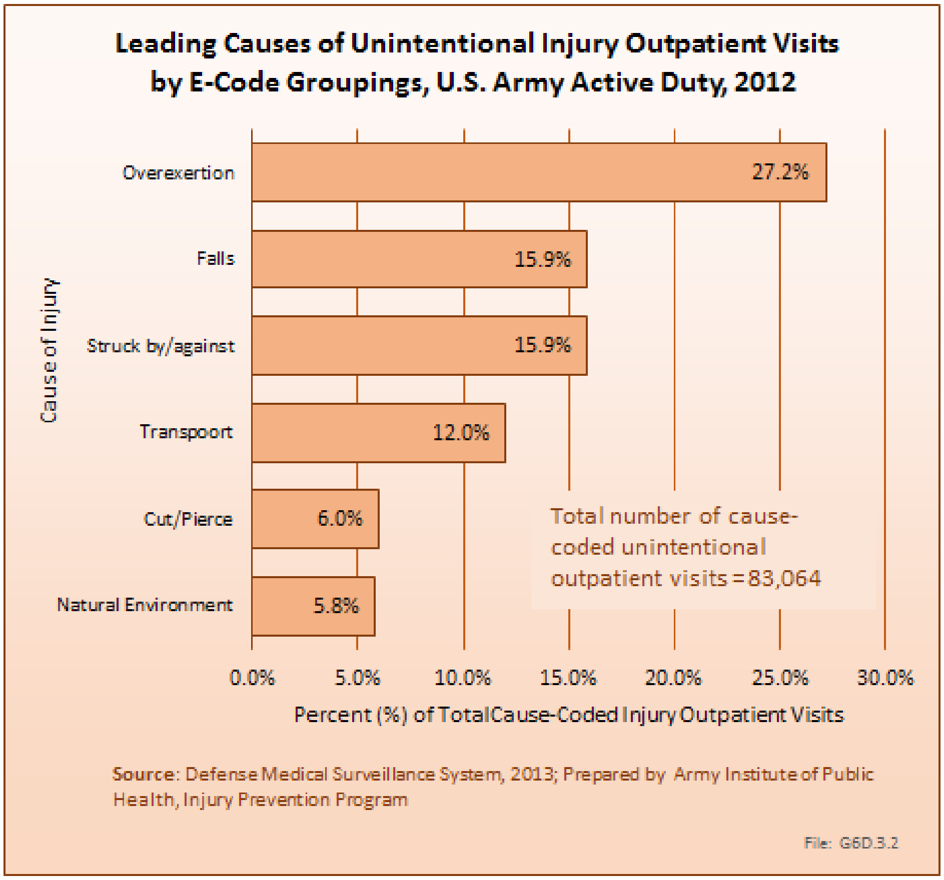
The leading cause of unintentional injury hospitalizations in 2012 was land transport accidents (20%), followed by falls or near-falls (16%). Parachuting and guns/explosives accounted for 8% each. A total of 6% of unintentional injury hospitalizations were due to sports and another 6% were due to heat injury. The top nine causes of unintentional injuries accounted for nearly three-fourths of hospitalizations (74%). Intervention strategies to address many of these issues are available.



The leading causes of unintentional injury outpatient visits in 2012 were attributed to overexertion (27%), falls (16%), and injuries due to soldiers being struck by or against objects or other people (16%).

Key Challenges to Future: Military Injuries

To address a large and complex problem such as injuries in the US Army, a systematic approach is needed.1 This approach should include routine assessment of surveillance data, data-driven and objective priorities, pursuit of detailed risk factor analyses, evaluation of existing prevention strategies, and research to address gaps in intervention and risk factor knowledge. Over the past three decades, contributions to Army injury prevention have been made in each of these areas, including the establishment of deployment injury surveillance capabilities2 and implementation of a data-driven process to define Army injury prevention priorities.3 Epidemiologic analyses and program evaluations have described potential technologies to address motor vehicle crashes among Army personnel4 and the effects of extreme conditioning program elements incorporated into unit physical training.5 Systematic reviews have defined physical training programs to enhance load carriage performance6 and interventions to prevent physical training-related injuries.7 Research efforts have quantified physical-training



activities in Army basic training8 and described physical training to improve performance on tactical occupational tasks.9

To maintain progress, continued focus on leading causes of Army injuries such as physical training/exercise, sports, falls, and motor vehicle (land transport) crashes is needed. Collaborations with academia and other government organizations will aid in identifying modifiable causes, risk factors, and effective prevention strategies. Fostering existing and new partnerships between Army leadership, public health, safety, research, health promotion, and other communities will be critical for the success of military injury prevention activities. Given the magnitude and severity of the problem of injuries, effective injury prevention will make a significant contribution to the health and productivity of soldiers and the Army.

1. Jones BH, Canham-Chervak M, Sleet DA: An evidence-based public health approach to injury priorities and prevention recommendations for the U.S. Military. *Am J Prev Med* 2010 Jan;38(1 Suppl):S1-10.

2. Hauret KG, Taylor BJ, Clemmons NS, Block SR, Jones BH: Frequency and causes of nonbattle injuries air evacuated from Operations Iraqi Freedom and Enduring Freedom, U.S. Army, 2001–2006. *Am J Prev Med* 2010 Jan;38(1 Suppl):S94-107.

3. Canham-Chervak M, Hooper TI, Brennan FH Jr, Craig SC, Girasek DC, Schaefer RA, Barbour G, Yew KS, Jones BH: A systematic process to prioritize prevention activities sustaining progress toward the reduction of military injuries. *Am J Prev Med* 2010 Jan;38(1 Suppl):S11-8.

4. Pollack KM, Yee N, Canham-Chervak M, Rossen L, Bachynski KE, Baker SP: Narrative text analysis to identify technologies to prevent motor vehicle crashes: Examples from military vehicles. *J Safety Res* 2013 Feb;44:45-9

5. Grier T, Canham-Chervak M, McNulty V, Jones BH Extreme conditioning programs and injury risk in a US Army Brigade Combat Team. *US Army Med Dep J* 2013 Oct-Dec:36-47.

6. Knapik JJ, Harman EA, Steelman RA, Graham BS: A systematic review of the effects of physical training on load carriage performance. *J Strength Cond Res* 2012 Feb;26(2):585-97.

7. Bullock SH, Jones BH, Gilchrist J, Marshall SW: Prevention of physical training-related injuries recommendations for the military and other active populations based on expedited systematic reviews. *Am J Prev Med* 2010 Jan;38(1 Suppl):S156-81.

8. Simpson K, Redmond JE, Cohen BS, Hendrickson NR, Spiering BA, Steelman R, Knapik JJ, Sharp MA: Quantification of physical activity performed during US Army Basic Combat Training. *US Army Med Dep J* 2013 Oct-Dec:55-65

9. Hendrickson NR, Sharp MA, Alemany JA, Walker LA, Harman EA, Spiering BA, Hatfield DL, Yamamoto LM, Maresh CM, Kraemer WJ, Nindl BC: Combined resistance and endurance training improves physical capacity and performance on tactical occupational tasks. *Eur J Appl Physiol* 2010 Aug;109(6):1197-208.

Acknowledgements: Military Injuries

The material presented here is adapted from the following sources:

Esther Dada-Laseinde, Michelle Canham-Chervak, Bruce H. Jones: U.S. Army Annual Injury Epidemiology Report 2008. USAPHC (PROV) REPORT NO. 12-HF-0APLa-09. U.S. Army Public Health Command (Provisional), 5158 Blackhawk Rd, Aberdeen Proving Ground, Maryland 21010-5403.

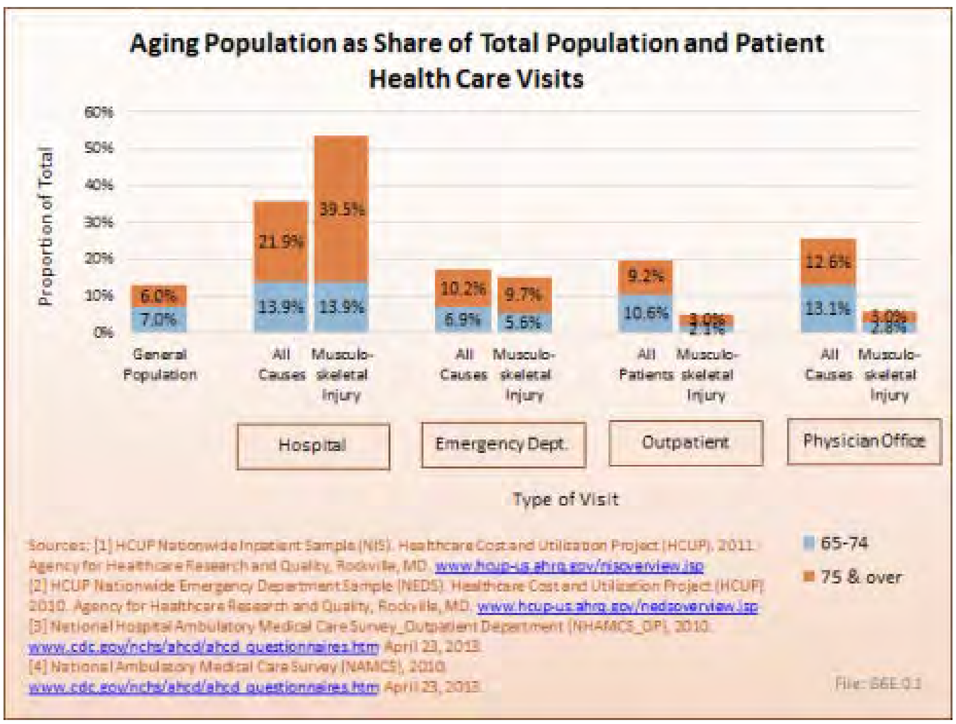
Esther Dada, Michelle Canham-Chervak, Bruce H. Jones: U.S. Army Injury Surveillance Summary 2012. U.S. Army Institute of Public Health, Epidemiology and Disease Surveillance Portfolio, Injury Prevention Program.

Impacts of Aging: Musculoskeletal Injuries

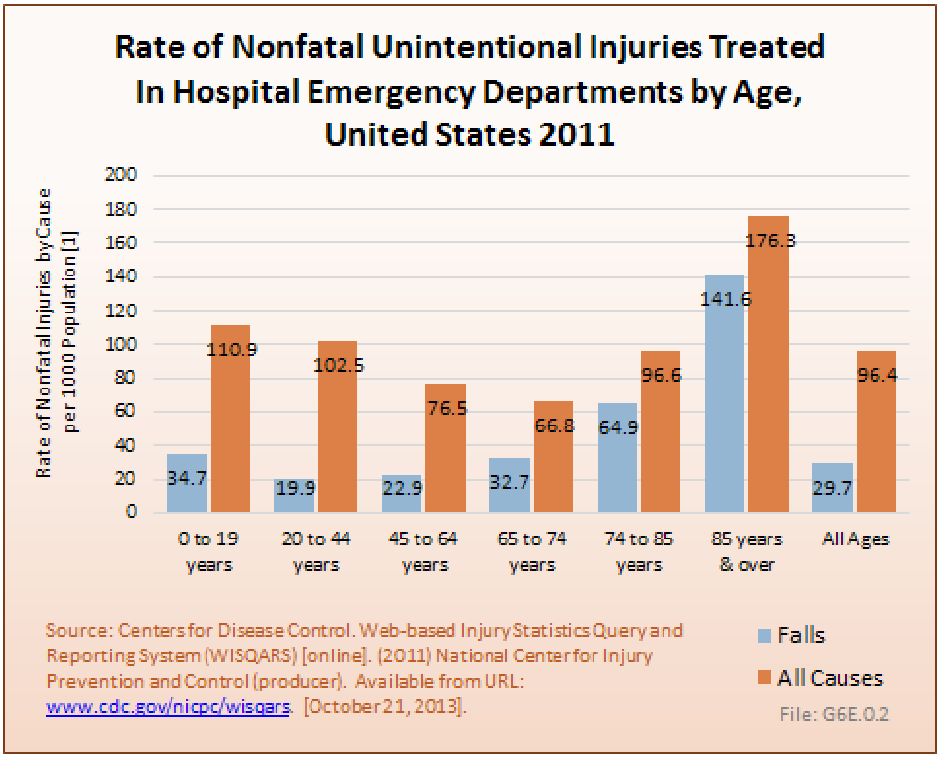
Lead Author(s):
Andrew N. Pollak, MD

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

While persons age 65 years and older account for only 13% of the total US population, they represent more than one-half of patients admitted to the hospital with a musculoskeletal injury. Advancing age, those 75 years and older, account for the largest share of these patients, with a rate of 3.4 in 100 of an age-adjusted population admitted to the hospital in a given year for a musculoskeletal injury and 14.7 in 100 seen in an emergency department. Fractures are the primary injury type among older patients hospitalized or seen in an emergency department. (Reference Table 6A.2.1 PDF CSV; Table 6A.2.2.2 PDF CSV; Table 6A.2.2.5 PDF CSV)



Falls are the primary cause of musculoskeletal injuries, increasing steadily with age and accounting for more than 80% of nonfatal unintentional injuries among persons aged 85 years and older seen in emergency departments in 2011. The rate of death due to a fall is the cause of more than 63% of unintentional injury deaths in persons age 85 years and older. After the age of 65, the proportion of hospital discharge patients with a musculoskeletal injury who are transferred to a skilled nursing, intermediate care, or other long-term care facility is more than one in two. (Reference Table 6A.3.1.2 PDF CSV; Table 6A.3.2.2 PDF CSV; Table 6A.4.2.1 PDF CSV)



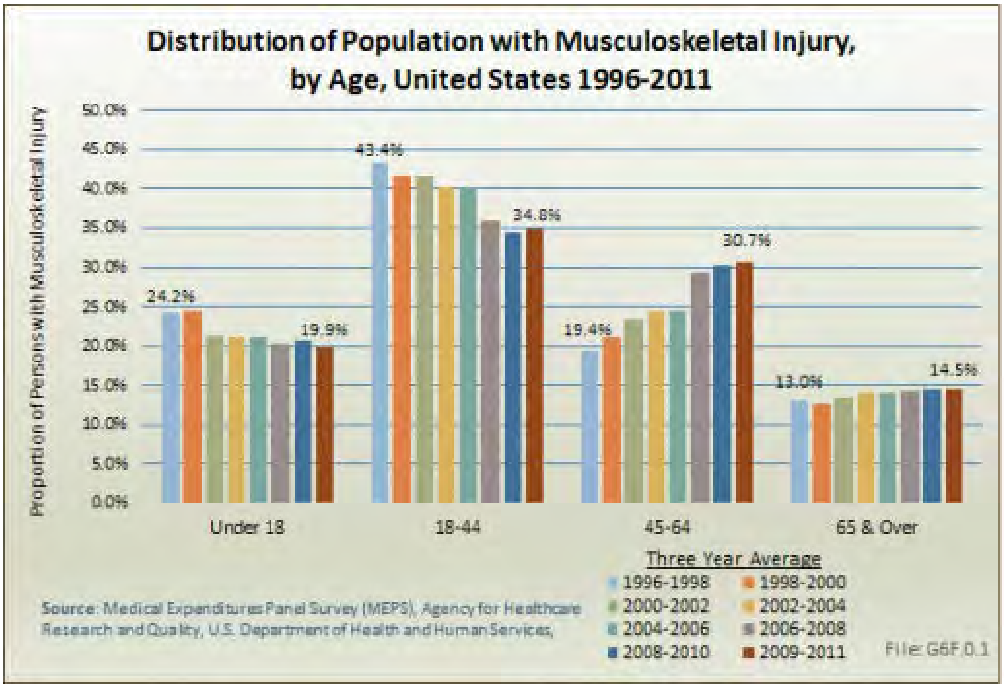
With current average life expectancies of persons in their 40s, 50s, and 60s in the United States well beyond the age of 80 years, the risk of incurring a musculoskeletal injury is significant.

Economic Cost of Musculoskeletal Injuries

Lead Author(s):
Edward H. Yelin, PhD

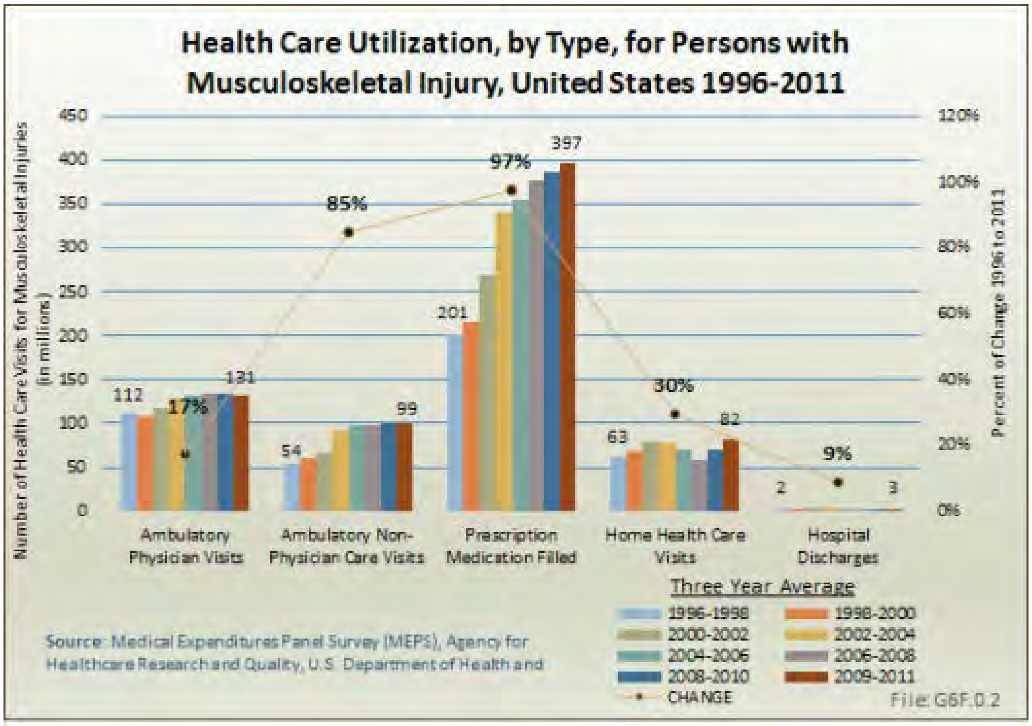
Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

Between the years 1996-1998 and 2009-2011, the number of persons in the population reporting a musculoskeletal injury rose only slightly, from 23.4 million to 24.8 million, resulting in a slight decline in the proportion of the population with a musculoskeletal injury (8.6% to 8.0%). However, the distribution of the population with a musculoskeletal injury, by age group, showed a consistent shift upward as the population ages, reflecting the overall aging of the US population. Persons in the 44- to 64-year age group showed the sharpest increase. (Reference Table 10.1 PDF CSV)



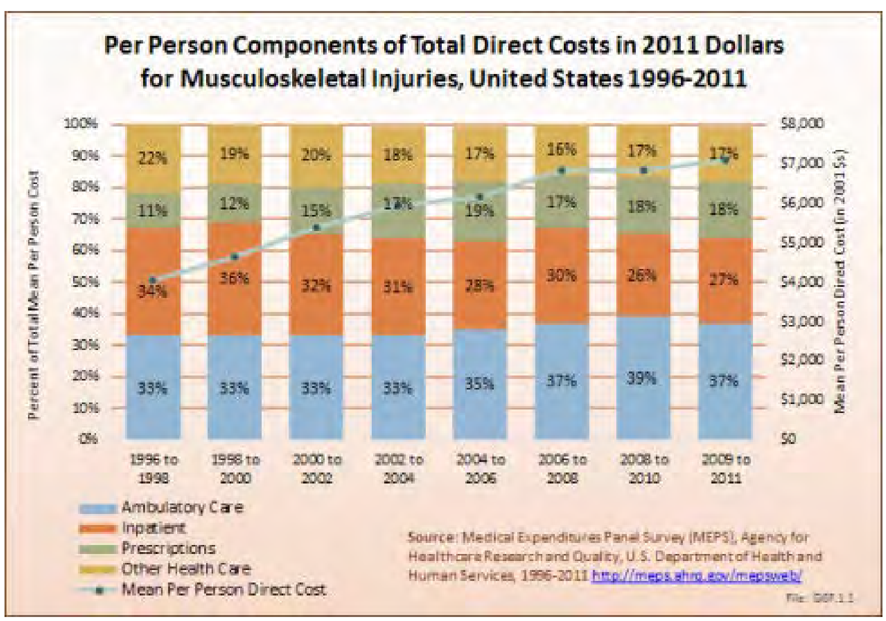
Health care treatments and visits contribute to the burden of musculoskeletal injuries. Ambulatory health care visits for musculoskeletal injuries rose by 85% between the years 1996-1998 and 2009-2011, from 54 million to 99 million visits. However, physician office visits continue to account for the largest share of treatment visits. Hospital discharges for musculoskeletal injuries remain a very small proportion of overall treatment visits, indicating that most musculoskeletal injuries are not serious enough to require hospitalization.

Prescription medications for musculoskeletal injuries nearly doubled over the time frame, jumping from 201 million prescriptions to 397 million between 1996-1998 and 2009-2011, an increase of 97%. (Reference Table 10.2 PDF CSV)



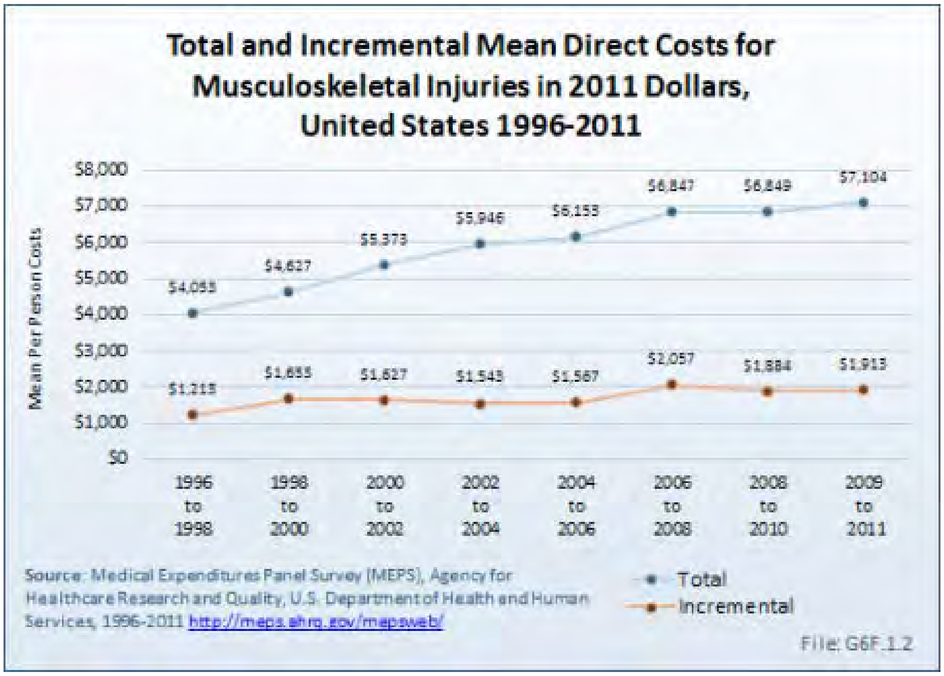
Direct Medical Costs: Musculoskeletal Injuries

In recent years, ambulatory care visits account for the largest share of per-person direct cost for persons with a musculoskeletal injury, with the share increasing while inpatient costs share drops. At an average cost of $2,648 per person in 2009-2011, an increase of 80% from 1996-1998, ambulatory care accounted for 34% of per person direct cost in 2009-2011.

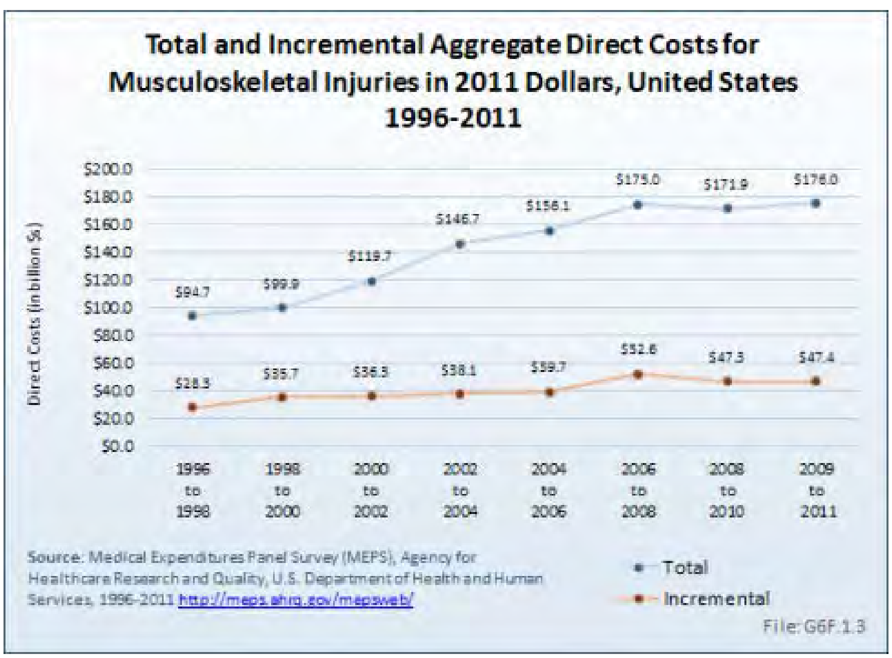


While the share of mean per-person cost for inpatient care dropped from 35% to 27% between 1996-1998 and 2009-2011, the mean cost rose from $1,367 to $1,928, an increase of 26%. At the same time, the average per person cost for prescriptions rose from $427 to $1,314, in 2011 dollars, an increase of 161%. (Reference Table 10.4 PDF CSV)

Total direct per-person health care cost for those with a musculoskeletal injury were $7,104, and increase of 75% since 1996-1998. Incremental direct per-person costs, those costs most likely attributable to a musculoskeletal injury, rose from $1,213 to $1,913, in 2011 dollars, an increase of 58%. (Reference Table 10.6 PDF CSV)



Total aggregate direct costs for those with a musculoskeletal injury were $176.1 billion in 2009-2011, a rise of 86% from the $94.7 billion in 1996-1998, in 2011 dollars. Incremental aggregate direct costs increased from $28.3 billion in 1996-1998 to $47.4 billion in 2009-2011, an increase of 67%.



Indirect Costs (Society/Employers): Musculoskeletal Injuries

Lead Author(s):
Andrew N. Pollak, MD

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

Indirect costs associated with lost wages for those aged 18 to 64 years are not calculated for persons with a musculoskeletal injury. However, musculoskeletal injuries are a primary cause of lost work days by persons in the labor force. In 2010, musculoskeletal disorders (MSD) accounted for nearly one-third (30.5%) of the 933,200 injuries involving days away from work. In addition, MSD injuries consistently across the years result in more median days away from work than all workplace injuries. In 2011, MSDs had a median of 11 days away from work compared to a median of 8 days for all injuries, which includes the MSDs in this median. (Reference Table 6B.1.1 PDF CSV and Table 6B.2.1 PDF CSV)

Workforce Implications: Musculoskeletal Injuries

Musculoskeletal workplace injuries are a major concern, accounting for a large proportion of all nonfatal injuries that result in days away from work. Even though long-term trends show significant reductions in the total number of worker injuries each year, the proportion that are related to musculoskeletal (MSD, which include fractures, bruises/ contusions, and amputations) continues to account for more than one-half of all worker nonfatal injury cases involving days away from work. In addition to the cost of medical care for these injuries, the cost of lost wages and the potential for long-term impairment negatively impacting worker productivity are enormous.

ICD-9-CM Codes for Injuries

Analysis includes all five digit codes within each three-digit category.

Fractures
- Trunk and Multiple Site Fractures
  - Fracture of rib(s), sternum, larynx, and trachea : 807
  - Fracture of pelvis : 808
  - Ill-defined fractures of bones of trunk : 809
  - Multiple fractures involving both upper limbs and upper limb with rib(s) and sternum : 819
  - Multiple fractures involving both lower limbs, lower with upper limb, and lower limb(s) with rib(s) and sternum : 828
  - Fracture of unspecified bones : 829

Upper Limb Fractures
- Fracture of clavicle : 810
- Fracture of scapula : 811
- Fracture of humerus : 812
- Fracture of radius and ulna : 813
- Fracture of carpal bone(s) : 814
- Fracture of metacarpal bone(s) : 815
- Fracture of one or more phalanges of hand : 816
- Multiple fractures of hand bones : 817
- Ill-defined fractures of upper limb : 818
- Multiple fractures involving both upper limbs and upper limb

Table 6.0: Comparison of Incidence of Unintentional Injuries, United States, Various Years 1985 thru 2011

Incidence of Injuries (in 000s)

	Rice, 1985 [1]		NSCUS, 1992-1994 [2]		Finkelstein, 2000 [3]		BMUS 2009		BMUS 2014	
	Incidence	Total	Incidence	Total	Incidence	Total	Incidence	Total	Incidence	Total
Total Injuries	56,443		57,885		50,127		100,561		85,075	
Fatal Unintentional Injuries	143	0.3%	NA		149	0.3%	122 [4]	0.1%	121 [10]	0.1%
Hospitalized Injuries	2,300	4.1%	NA		1,870	3.7%	5,527 [5]	5.5%	2,506 [11]	2.9%
Non-hospitalized, Medically Treated Injuries	54,000	95.7%	NA		48,108	96.0%	94,912 [6]	94.4%	82,448 [12]	96.9%
Musculoskeletal Injuries	NA		36,901		33,460		61,210		65,812	
Fatal Unintentional Injuries	NA		NA		33 [7]	0.1%	21 [8]	0.0%	26 [10]	0.0%
Hospitalized Injuries	NA		NA		1,273 [7]	3.8%	1,589 [5]	2.6%	1,709 [11]	2.6%
Non-hospitalized, Medically Treated Injuries	NA		NA		32,154 [7]	96.1%	59,600 [9]	97.4%	64,077 [12]	97.4%
Musculoskeletal as % of All Unintentional Injuries	NA		63.7%		66.8%		60.9%		77.4%	

[1] Rice DP, MacKenzie EJ: *Cost of Injury in the United States: A Report to Congress* , 1989. San Francisco, CA: Institute for Health & Aging, University of California and Injury Prevention Center, The Johns Hopkins University, 1989.

[2] Praemer A, Furner S, Rice DP. *Musculoskeletal Conditions in the United States.* Rosemont, IL: American Academy of Orthopaedic Surgeons, 1999, p 83.

[3] Finkelstein EA, Corso PS, Miller TR. *The Incidence and Economic Burden of Injuries in the United States* . New York, NY: Oxford University Press, 2006, p 8.

[4] Centers for Disease Control, National Center for Injury Prevention and Control, **WISQARS™** (Web-based Injury Statistics Query and Reporting System), 20 Leading Causes of Death, Unintentional Injuries, 2006. Available at: http://webappa.cdc.gov/cgi-bin/broker.exe. Accessed on November 10, 2009.

[5] Agency for Healthcare Research and Quality, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2007

[6] National Center for Health Statistics. National Ambulatory Medical Care Survey, 2006; National Hospital Ambulatory Medical Care Survey, Emergency Room Visits, 2006; National Hospital Ambulatory Medical Visits, Outpatient Department Visits, 2006

[7] Defined as spinal cord, vertebral column, torso, upper extremity, lower extremity injuries. Finkelstein EA, Corso PS, Miller TR. *The Incidence and Economic Burden of Injuries in the United States* . New York, NY: Oxford University Press,2006, p 13.

[8] Defined as falls. Centers for Disease Control, National Center for Injury Prevention and Control, **WISQARS™** (Web-based Injury Statistics Query and Reporting System), Fatal Injuries Report, Unintentional Injuries Only, 2006. Available at: http://webappa.cdc.gov/cgi-bin/broker.exe; all ages percentages. Accessed on November 10, 2009.

[9] Defined as fracture, derangement, dislocation, sprain/strain, contusion, crushing injury, open wound, traumatic amputation, and late effects of injury. National Center for Health Statistics. National Ambulatory Medical Care Survey, 2006; National Hospital Ambulatory Medical Care Survey, Emergency Room Visits, 2006; National Hospital Ambulatory Medical Visits, Outpatient Department Visits, 2006

[10] Source: Source: Centers for Disease Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. (2011) National Center for Injury Prevention and Control (producer). Available from URL: www.cdc.gov/nicpc/wisqars. [December 11, 2013].

[11] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[12] Defined as fracture, derangement, dislocation, sprain/strain, contusion, crushing injury, open wound, traumatic amputation, and late effects of injury. Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013. National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

Table 6A.1.1.1: Self-Reported Medically-Consulted Musculoskeletal Injuries In Past Three Months, United States 2012

Proportion of Injury/Poisoning Episodes Reported (1)	Sex		Total
	Male	Female	
Fracture	15.6%	16.0%	15.8%
Dislocation	2.5%	*	2.2%
Sprain/ Strain	24.8%	32.3%	28.7%
Contusion	10.5%	16.7%	13.7%
Open Wounds	15.9%	10.6%	13.1%
All Other Musculoskeletal Injuries (2)	4.3%	4.2%	4.2%
All Musculoskeletal Injuries	69.3%	75.0%	72.2%
Non-Musculoskeletal Injuries	30.7%	25.0%	27.8%
Total Injury/Poisoning Episodes	4,260.5	4,626.0	8,864.5
By Demographic Group			
% of Injuries	48%	52%	100%
% of Population	49%	51%	

Proportion of Injury/Poisoning Episodes Reported (1)	Age				
	0-17 years	18-44 years	45-64 years	65-74 years	75 & over
Fracture	18.1%	12.6%	15.8%	18.4%	20.4%
Dislocation	*	*	*	*	*
Sprain/ Strain	24.7%	31.1%	29.4%	35.2%	20.5%
Contusion	9.6%	11.3%	15.5%	*	25.5%
Open Wounds	10.0%	15.7%	13.8%	*	*
All Other Musculoskeletal Injuries (2)	*	4.1%	4.9%	*	*
All Musculoskeletal Injuries	65.8%	72.2%	75.2%	80.7%	72.3%
Non-Musculoskeletal Injuries	34.2%	27.8%	24.8%	19.3%	27.7%
Total Injury/Poisoning Episodes	2,049.4	2,969.7	2,468.5	736.1	662.8
By Demographic Group					
% of Injuries	23%	34%	28%	8%	7%
% of Population	24%	37%	26%	7%	6%

Table 6A.1.1.1: Self-Reported Medically-Consulted Musculoskeletal Injuries In Past Three Months, United States 2012

	Race			
Proportion of Injury/Poisoning Episodes Reported (1)	White	Black	Asian	Other
Fracture	16.1%	14.0%	*	*
Dislocation	2.2%	*	*	*
Sprain/ Strain	28.3%	31.7%	*	*
Contusion	13.6%	15.0%	*	*
Open Wounds	13.3%	11.6%	*	*
All Other Musculoskeletal Injuries (2)	4.4%	*	*	*
All Musculoskeletal Injuries	72.4%	72.3%	72.5%	67.6%
Non-Musculoskeletal Injuries	27.6%	27.7%	27.5%	32.4%
Total Injury/Poisoning Episodes	7,462.4	990.1	233.7	200.3
By Demographic Group				
% of Injuries	84%	11%	3%	2%
% of Population	78%	13%	4%	5%

* Estimate does not meet standards for reliability.

[1] All medically-consulted injury/poisoning episodes that reportedly occurred during the past 3 months, based on ICD-9-CM codes recorded for 8 possible diagnosis.

[2] Includes derangement, crushing injuries, open wounds, traumatic amputation, and late effect of musculoskeletal injuries.

Source: National Health Interview Survey (NHIS)_Injury database, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 6A.1.1.2: Incidence of Self-Reported Musculoskeletal Injury Episodes in Previous Three Months by Anatomic Site by Age, United States 2012

	Total Identified Anatomic Site Injuries (in 000s) [1]	Incidence of Self-Reported Injury Sites for All Musculoskeletal Injury Episodes (in 000s) [2]				
		< 18	18 to 44	45 to 64	65 to 74	75 & Older
Knee	1,018.8	172.6	330.9	342.9	111.8	60.5
Back	985.8	55.6	425.4	348.6	86.4	69.7
Ankle	928.1	218.7	326.5	256.2	76.0	50.7
Foot or toe	840.5	196.6	3.6	224.8	67.5	51.0
Finger/Thumb	694.1	168.2	284.1	186.9	38.0	17.0
Shoulder	652.3	98.7	233.3	200.4	63.7	56.3
Hand	547.5	84.6	205.3	168.7	47.6	41.3
Lower leg	441.2	98.6	113.6	132.1	70.0	26.8
Wrist	420.6	110.6	158.5	79.3	42.9	29.2
Forearm	346.2	83.0	112.0	88.0	28.9	24.2
Hip	273.7	11.9	76.7	57.7	53.8	73.6
Elbow	269.2	71.9	91.1	51.9	33.1	21.2
Upper Arm	209.6	49.5	48.5	63.4	34.3	13.8
Thigh	152.9	34.7	39.7	44.9	7.6	26.1
Other	2,379.4	655.2	382.3	606.4	185.4	250.1
All MS Injury Episodes by Anatomic Sites*	10,159.7	2,110.3	2,831.5	2,852.3	947.0	811.5
Total Population Reporting an Injury	6,649.0	1,496.3	2,292.9	1,828.9	559.6	471.3

	Proportion of All Injury Sites for All Musculoskeletal Injury Episodes [2]					
		< 18	18 to 44	45 to 64	65 to 74	75 & Older
Knee	10.0%	8.2%	11.7%	12.0%	11.8%	7.5%
Back	9.7%	2.6%	15.0%	12.2%	9.1%	8.6%
Ankle	9.1%	10.4%	11.5%	9.0%	8.0%	6.2%
Foot or toe	8.3%	9.3%	0.1%	7.9%	7.1%	6.3%
Finger/Thumb	6.8%	8.0%	10.0%	6.6%	4.0%	2.1%
Shoulder	6.4%	4.7%	8.2%	7.0%	6.7%	6.9%
Hand	5.4%	4.0%	7.2%	5.9%	5.0%	5.1%
Lower leg	4.3%	4.7%	4.0%	4.6%	7.4%	3.3%
Wrist	4.1%	5.2%	5.6%	2.8%	4.5%	3.6%
Forearm	3.4%	3.9%	4.0%	3.1%	3.1%	3.0%
Hip	2.7%	0.6%	2.7%	2.0%	5.7%	9.1%
Elbow	2.6%	3.4%	3.2%	1.8%	3.5%	2.6%
Upper Arm	2.1%	2.3%	1.7%	2.2%	3.6%	1.7%
Thigh	1.5%	1.6%	1.4%	1.6%	0.8%	3.2%
Other	23.4%	31.0%	13.5%	21.3%	19.6%	30.8%
All MS Injury Episodes by Anatomic Sites*	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total Population Reporting an Injury	6,649	1,496	2,293	1,829	560	471

* Total episodes by site larger than population due to multiple injury sites.

[1] All medically-consulted injury/poisoning episodes that reportedly occurred during the past 3 months, based on ICD-9-CM codes recorded for 8 possible diagnosis.

[2] Multiple anatomic sites per injury episode possible.

Source: National Health Interview Survey (NHIS)_Injury database, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 6A.1.2.1: Self-Reported Cause of Medically-Consulted Musculoskeletal Injuries/Poisoning Episodes In Past Three Months, National Health Interview Survey, United States 2012

		Proportion of Injury/Poisoning Episodes by Cause (1)			All Reported Injury/Poisoning Episodes (N in 000s)
		Fall	Trauma (2)	Other Cause (3)	
Gender	Male	30.1%	60.0%	9.9%	4,260.5
	Female	43.4%	49.4%	7.1%	4,626.0
Age	0-17 years	40.6%	50.5%	8.9%	2,049.4
	18-44 years	23.1%	65.9%	10.9%	2,969.7
	45-64 years	36.8%	55.4%	7.8%	2,468.5
	65-74 years	50.8%	45.1%	*	736.1
	75 & over	74.3%	22.5%	*	662.8
Race	White	37.5%	54.6%	7.9%	7,462.4
	Black	34.5%	52.1%	13.4%	990.1
	Asian	*	55.5%	*	233.7
	Other	*	49.0%	*	200.3
Total		37.0%	54.5%	8.5%	8,864.5

* Estimate does not meet standards for reliability.

[1] All medically-consulted injury/poisoning episodes that reportedly occurred during the past 3 months, based on ICD-9-Ecode recorded.

(2) Includes vehicular accidents (auto, train, boat, plane, motorcycle), machinery, moving objects, and other types of traumatic injury.

[3] Includes military injuries, sports injuries, poisonings, and other causes.

Source: National Health Interview Survey (NHIS)_Injury database, 2012.
www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 6A.1.2.2: Self-Reported Location of First Injury Episodes for Which A Medical Professional Was Consulted, United States 2012

	Total Injury Episodes		Musculoskeletal Injury Episodes		
	Total (in 000s)	% Total Injury Episodes	Total (in 000s)	% MS Injury Episodes	% of Total Injury Episodes
Inside Home	2,752.3	31%	1861.0	29%	67.6%
Outside Home or Farm	1,853.5	21%	1426.0	22%	76.9%
Recreation Sites: Fields, Courts, Parks, Lakes, Rivers	1,108.1	13%	851.8	13%	76.9%
Sidewalks, Streets, Highway	1,025.5	12%	736.7	12%	71.8%
Public and Business Places, including Industry	720.6	8%	500.0	8%	69.4%
School or Child Care	631.3	7%	476.9	8%	72.1%
Other	709.3	8%	503.5	8%	71.0%
All Injuries	8,800.6	100%	6353.0	100%	72.2%

Source: National Health Interview Survey (NHIS)_Injury database, 2012.
www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 6A.1.2.3: Self-Reported Activity at Time of First Injury Episodes for Which A Medical Professional Was Consulted, United States 2012

	Total Injury Episodes		Musculoskeletal Injury Episodes		
	Total (in 000s)	% Total Injury Episodes	Total (in 000s)	% MS Injury Episodes	% of Total Injury Episodes
Participating in Non-sport Leisure Activity	2,256.1	26%	1,494.9	24%	66.3%
Participating in Sport Activity	1,437.6	16%	1,169.2	18%	81.3%
Working: House or Yard	1,284.5	15%	1,015.9	16%	79.1%
Working: Paid or Volunteer	1,132.9	13%	803.9	13%	71.0%
Riding In or On Moving Vehicle	561.2	6%	367.1	6%	65.5%
In School or Daycare	245.3	3%	184.6	3%	75.3%
Other	1,864.8	21%	1,294.4	20%	69.4%
All Injuries	8,800.6	100%	6,330.0	100%	72.1%

Source: National Health Interview Survey (NHIS)_Injury database, 2012.
www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 6A.1.3.1: Activity Limitations Due to Fracture or Bone/Joint Injury by Sex and Age for Persons Age 18 and Over, United States 2012

	Rate of Reported Limitations Due to Fracture or Bone/Joint Injury [1] (per 100 persons)			Rate of Reported Limitations Due to Other Injury [2] (per 100 persons)			Rate of Reported Limitations Due to All Conditions [3] (per 100 persons)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
<18 years	NA	NA	NA	NA	NA	NA	10.9	6.0	8.5
18-44 years	0.5	0.3	0.4	0.4	0.2	0.3	5.8	6.1	6.0
45-64 years	2.4	1.8	2.1	1.0	0.6	0.8	17.3	17.4	17.4
65-74 years	1.7	0.2	1.8	*	*	0.6	23.9	2.8	24.6
75 & over	2.5	4.7	3.8	*	1.1	1.0	39.5	45.6	43.2
All ages	1.1	1.1	1.1	0.5	0.3	0.4	13.1	13.4	13.2

* Does not meet standards for reliability

[1] "What condition or health problem causes you to have difficulty with or need help with the following activities?" Response: "Fractures, bone/joint injury."

[2] "What condition or health problem causes you to have difficulty with or need help with the following activities?" Response: "Other injury."

[3] "What condition or health problem causes you to have difficulty with or need help with the following activities?" Includes conditions of vision, hearing, arthritis, back problems, injuries, heart and circulation conditions, diabetes, lung conditions, mental conditions, genitourinary system problems, tumors, alcohol or drug abuse, and old age.

Source: National Health Interview Survey (NHIS)_Person sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 6A.1.3.2: Activity Limitations Due to Fracture or Bone/Joint Injury for Persons Aged 18 and Over, United States 2012

	Proportion of Respondents	
Activity Limitation Reported [2]	All Respondents with Limitation [1]	Respondents with Limitation due to Fracture [2]
Needs help with personal care	13.2%	17.5%
Needs help with bathing/showering	9.0%	11.8%
Needs help with dressing	7.7%	10.2%
Needs help eating	3.3%	2.4%
Needs help getting in/out of bed or chair	6.0%	8.4%
Needs help using the toilet	4.8%	5.4%
Needs help to get around the home	5.3%	7.3%
Needs help with routine needs	23.3%	30.7%
Is unable to work NOW due to health problems	43.2%	52.9%
Is limited in kind/amount of work	23.9%	26.7%
Has difficulty walking without equipment	32.2%	54.1%

[1] Responded flagged "yes" when asked if limited in play, education, personal care, work, memory, or in any other way.

[1] Responded "yes" to fracture or bone/joint injury when asked "What condition or health problem causes you to have difficulty with or need help with the following activities . . . ?"

National Health Interview Survey (NHIS)_Person sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 6A.2.1: Patient Visits for Injuries as Proportion of All Health Care Visits, by Sex and Age, United States 2010/2011

	Total Visits (in 000s) [7]	Proportion of All Patient Visits							
			Sex		Age in Years				
		All Visits	Male	Female	<18	18-44	45-64	65-74	75 & over
Proportion of General Population			49.2%	50.8%	24.0%	36.5%	26.4%	7.0%	6.0%
HOSPITAL VISITS									
NIS 2011 [1]									
All Patient Visits	38,590.7	100.0%	42.0%	58.0%	14.7%	24.3%	25.1%	13.9%	21.9%
Visits for Musculoskeletal Injury	1,708.6	4.4%	44.1%	55.9%	4.6%	18.2%	23.9%	13.9%	39.5%
Visits for Other Injuries	797.7	2.1%	58.4%	41.6%	6.8%	23.4%	26.0%	12.7%	31.1%
NHDS 2010 [2]									
All Patient Visits	38,919.2	100.0%	41.7%	58.3%	16.1%	24.6%	24.4%	13.3%	21.6%
Visits for Musculoskeletal Injury	1,693.9	4.4%	42.9%	57.1%	7.1%	18.5%	24.3%	12.4%	37.7%
Visits for Other Injuries	784.3	2.0%	59.1%	40.9%	8.3%	22.1%	24.9%	12.9%	31.8%
EMERGENCY DEPARTMENTS									
NEDS 2010 [3]									
All Patient Visits	128,970.4	100.0%	44.5%	55.5%	19.8%	40.6%	22.6%	6.9%	10.2%
Visits for Musculoskeletal Injury	19,010.2	14.7%	51.0%	49.0%	22.8%	41.0%	20.9%	5.6%	9.7%
Visits for Other Injuries	7,630.1	5.9%	54.1%	45.9%	27.9%	41.6%	18.1%	4.3%	8.1%
NHAMCS_ED 2010 [4]									
All Patient Visits	129,843.4	100.0%	44.9%	55.1%	23.0%	40.6%	21.5%	6.3%	8.7%
Visits for Musculoskeletal Injury	19,421.6	15.0%	52.3%	47.7%	26.3%	42.0%	18.3%	4.9%	8.5%
Visits for Other Injuries	7,620.2	5.9%	57.2%	42.8%	32.9%	39.8%	16.3%	4.3%	6.6%
OUTPATIENT CLINICS									
NHAMCS_OP 2010 [5]									
All Patient Visits	100,742.1	100.0%	40.4%	59.6%	24.7%	28.0%	27.5%	10.6%	9.2%
Visits for Musculoskeletal Injury	3,856.2	3.8%	52.3%	47.7%	5.6%	3.8%	3.2%	2.1%	3.0%
Visits for Other Injuries	1,010.6	1.0%	53.5%	46.5%	1.9%	1.0%	0.6%	0.3%	0.6%
PHYSICIAN OFFICES									
NAMCS 2010 [6]									
All Patient Visits	1,008,802.0	100.0%	41.8%	58.2%	19.0%	26.0%	29.4%	13.1%	12.6%
Visits for Musculoskeletal Injury	40,799.1	4.0%	52.7%	47.3%	4.1%	4.9%	4.3%	2.8%	3.0%
Visits for Other Injuries	9,740.8	1.0%	50.4%	49.6%	0.6%	1.5%	1.1%	0.5%	0.6%

Table 6A.2.1: Patient Visits for Injuries as Proportion of All Health Care Visits, by Sex and Age, United States 2010/2011

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

[3] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[4] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[6] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[7] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient

Table 6A.2.2.1: Hospital Discharges and Outpatient Visits for Musculoskeletal Injuries by Sex, United States 2010

		Sex		% of Total	
	Total	Male	Female	Male	Female
Hospital Discharges [1]	Total Number Hospital Discharges for Musculoskeletal Injuries (in 000s)				
Fractures	1,144.2	468.1	676.2	41%	59%
Dislocations	43.7	28.7	15.0	66%	34%
Sprains & strains	91.1	42.3	48.8	46%	54%
Contusions	214.9	91.0	123.9	42%	58%
Open wounds	213.4	119.9	93.5	56%	44%
All other musculoskeletal injuries	219.2	110.0	109.2	50%	50%
All musculoskeletal injuries (5)	1,693.9	726.9	967.0	43%	57%
Rate Per 100 Patient Visits	4.4	4.5	4.3		
Diagnoses Per 100 U.S. Population [6]	0.5	0.5	0.6		
Emergency Department Visits [2]	Total Number of Emergency Department Visits for Musculoskeletal Injuries (in 000s)				
Fractures	3,964.5	2,006.1	1,961.4	51%	49%
Dislocations	540.4	365.4	175.0	68%	32%
Sprains & strains	4,330.4	1,986.0	2,344.4	46%	54%
Contusions	4,947.7	2,265.1	2,682.6	46%	54%
Open wounds	3,890.6	2,509.1	1,381.5	64%	36%
All other musculoskeletal injuries	3,488.2	1,875.9	1,612.3	54%	46%
All musculoskeletal injuries (5)	19,421.6	9,263.2	10,158.3	48%	52%
Rate Per 100 Patient Visits	15.0	17.4	12.9		
Diagnoses Per 100 U.S. Population [6]	6.3	6.1	6.5		
Hospital Outpatient Visits [3]	Total Number of Outpatient Department Visits for Musculoskeletal Injuries (in 000s)				
Fractures	1,256.2	668.0	588.2	53%	47%
Dislocations	175.9	90.6	85.3	52%	48%
Sprains & strains	803.6	446.4	357.2	56%	44%
Contusions	373.4	170.3	203.1	46%	54%
Open wounds	843.7	425.2	418.5	50%	50%
All other musculoskeletal injuries	584.6	303.7	280.9	52%	48%
All musculoskeletal injuries (5)	3,856.2	2,018.4	1,837.8	52%	48%
Rate Per 100 Patient Visits	3.8	5.0	3.1		
Diagnoses Per 100 U.S. Population [6]	1.2	1.3	1.2		

Table 6A.2.2.1: Hospital Discharges and Outpatient Visits for Musculoskeletal Injuries by Sex, United States 2010

		Sex		% of Total	
	Total	Male	Female	Male	Female
Physician Office Visits [4]	Total Number of Physician Visits for Musculoskeletal Injuries (in 000s)				
Fractures	11,948.5	5,840.7	6,107.8	49%	51%
Dislocations	5775.1	3,164.8	2,610.4	55%	45%
Sprains & strains	11,840.5	6,584.5	5,256.0	56%	44%
Contusions	3,576.0	1,935.6	1,640.4	54%	46%
Open wounds	3,257.7	2,013.0	*	62%	38%
All other musculoskeletal injuries	6,832.8	3,274.9	3,557.9	48%	52%
All musculoskeletal injuries (5)	40,799.1	21,507.8	19,291.2	53%	47%
Rate Per 100 Patient Visits	4.0	5.1	3.3		
Diagnoses Per 100 U.S. Population [6]	13.2	14.1	12.3		
Total Health Care Visits for Musculoskeletal Injuries, 2010					
	Total Number of Health Care Visits for Musculoskeletal Injuries (in 000s)				
Fractures	18,313.4	8,982.9	9,333.6	49%	51%
Dislocations	6,535.1	3,649.5	2,885.7	56%	44%
Sprains & strains	17,065.6	9,059.2	8,006.4	53%	47%
Contusions	9,112.0	4,462.0	4,650.0	49%	51%
Open wounds	8,205.4	5,067.2	3,138.2	62%	38%
All other musculoskeletal injuries	11,124.8	5,564.5	5,560.3	50%	50%
All musculoskeletal injuries (5)	65,770.8	33,516.3	32,254.3	51%	49%
Rate Per 100 Patient Visits	5.1	6.2	4.4		
Diagnoses Per 100 U.S. Population [6]	21.3	22.0	20.5		

* Estimate does not meet standards for reliability

[1] Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

[2] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[3] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013

[5] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient

[6] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 6A.2.2.2: Hospital Discharges and Outpatient Visits for Musculoskeletal Injuries by Age, United States 2010

	Total	Age in Years <18	18-44	45-64	65-74	75 & over	Ave Age for Dx
Hospital Discharges [1]	Total Number of Hospital Discharges for Musculoskeletal Injuries (in 000s)						
Fractures	1,144.2	72.3	181.2	279.6	145.4	465.7	62.1
Dislocations	43.7	*	17.3	16.1	*	*	48.7
Sprains & strains	91.1	*	24.4	28.2	8.8	24.2	54.7
Contusions	214.9	14.3	37.8	46.7	20.5	95.6	62.3
Open wounds	231.4	20.2	85.2	50.5	14.8	42.6	46.7
All other musculoskeletal injuries	219.2	19.9	57.5	59.0	33.2	49.6	52.9
All musculoskeletal injuries (5)	1,693.9	120.9	314.2	411.1	209.9	637.8	59.9
Rate Per 100 Patient Visits	4.4	1.9	3.3	4.3	4.0	7.6	
Diagnoses Per 100 U.S. Population [6]	0.5	0.2	0.3	0.5	1.0	3.4	
Emergency Department Visits [2]	Total Number of Emergency Department Visits for Musculoskeletal Injuries (in 000s)						
Fractures	3,964.5	1,186.4	1,118.8	874.1	247.7	540.4	39.0
Dislocations	540.4	*	314.6	*	*	*	35.3
Sprains & strains	4,330.4	1,097.1	2,228.3	739.4	138.2	127.5	31.7
Contusions	4,947.7	976.4	2,252.0	922.8	303.5	523.0	38.3
Open wounds	3,890.6	1,017.1	1,633.3	765.9	150.7	323.7	34.7
All other musculoskeletal injuries	3,488.2	1,161.5	1,359.2	503.8	169.6	294.1	31.6
All musculoskeletal injuries (5)	19,421.6	5,113.0	8,159.9	3,544.6	948.6	1,655.6	35.0
Rate Per 100 Patient Visits	15.0	17.1	15.5	12.7	11.6	14.7	
Diagnoses Per 100 U.S. Population [6]	6.3	6.9	7.2	4.3	4.3	8.9	
Hospital Outpatient Visits [3]	Total Number of Outpatient Department Visits for Musculoskeletal Injuries (in 000s)						
Fractures	1,256.2	613.8	279.9	207.1	*	*	30.1
Dislocations	175.9	24.1	78.3	64.0	*	*	38.8
Sprains & strains	803.6	190.5	295.7	280.7	*	*	36.3
Contusions	373.4	172.9	101.5	*	*	*	29.8
Open wounds	843.7	255.4	171.4	236.8	*	*	40.8
All other musculoskeletal injuries	584.6	182.2	227.8	87.1	*	*	33.6
All musculoskeletal injuries (5)	3,856.2	1,389.5	1,081.7	883.0	225.2	277.0	34.5
Rate Per 100 Patient Visits	3.8	5.6	3.8	3.2	2.1	3.0	
Diagnoses Per 100 U.S. Population [6]	1.2	1.9	1.0	1.1	1.0	1.5	
Physician Office Visits [4]	Total Number of Physician Visits for Musculoskeletal Injuries (in 000s)						
Fractures	11,948.5	3,132.6	3,006.3	3,010.1	*	1,660.4	42.6
Dislocations	5775.1	*	1,741.0	2,602.3	*	*	48.0
Sprains & strains	11,840.5	1,964.1	3,878.3	4,325.4	*	*	42.7
Contusions	3,576.0	*	*	*	*	*	40.9
Open wounds	3,257.7	*	*	*	*	*	45.8
All other musculoskeletal injuries	6,832.8	1,702.8	2,371.7	1,877.2	*	*	38.0
All musculoskeletal injuries (5)	40,799.1	7,813.0	12,766.2	12,771.0	3,707.1	3,741.7	42.7
Rate Per 100 Patient Visits	4.0	4.1	4.9	4.3	2.8	3.0	
Diagnoses Per 100 U.S. Population [6]	13.2	10.5	11.3	15.6	17.0	20.1	

Table 6A.2.2.2: Hospital Discharges and Outpatient Visits for Musculoskeletal Injuries by Age, United States 2010

		Age in Years					
	Total	<18	18-44	45-64	65-74	75 & over	Ave Age for Dx
Total Health Care Visits for Musculoskeletal Injuries, 2010							
	Total Number of Health Care Visits for Musculoskeletal Injuries (in 000s)						
Fractures	18,313.4	5,005.1	4,586.2	4,370.9	1,574.7	2,779.4	
Dislocations	6,535.1	393.3	2,151.2	2,772.0	813.9	404.7	
Sprains & strains	17,065.6	3,257.2	6,426.7	5,373.7	887.2	1,120.9	
Contusions	9,112.0	1,870.0	3,634.2	2,051.0	681.9	904.9	
Open wounds	8,223.4	1,668.8	3,070.4	1,965.2	575.4	905.6	
All other musculoskeletal injuries	11,124.8	3,066.4	4,016.2	2,527.1	919.9	595.3	
All musculoskeletal injuries (5)	65,770.8	14,436.4	22,322.0	17,609.7	5,090.8	6,312.1	
Rate Per 100 Patient Visits	5.1	5.7	6.3	4.9	3.3	4.1	
Diagnoses Per 100 U.S. Population [6]	21.3	19.5	19.8	21.5	23.3	33.9	

* Estimate does not meet standards for reliability

[1] Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

[2] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[3] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient

[6] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 6.2.2.3 : Resource Utilization Summary for Injury Visits by Treatment Location, United States 2010

	Total Visits (in 000s) [1]					
	Physician Office Visits [2]	Emergency Department Visits [3]	Hospital Outpatient Visits [4]	Inpatient Stays [5]	Total All Treatment Sites	% All Diagnoses for All Treatment Locations
Fractures	11,948.5	3,964.5	1,256.2	1,144.2	18,313	28%
Dislocations	5775.1	540.4	175.9	43.7	6,535	10%
Sprains and Strains	11,840.5	4,330.4	803.6	91.1	17,066	26%
Contusions	3,576.0	4,947.7	373.4	214.9	9,112	14%
Open Wounds	3,257.7	3,890.6	843.7	213.4	8,205	12%
All Other Musculoskeletal Injuries	6,832.8	3,488.2	584.6	219.2	11,125	17%
Total All Musculoskeletal Traumatic Injuries	40,799.1	19,421.6	3,856.2	1,693.9	65,771	
All Injury Treatment Episodes	50,540	27,042	4,867	2,478	84,927	
Proportion of Total Diagnoses That Are Musculoskeletal	81%	72%	79%	68%	77%	

[1] All listed diagnoses for patient visits or inpatients discharged from short-stay hospitals. Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient.

[2] Source: National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[3] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[4] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

Table 6A.2.2.4: Health Care Visits for Musculoskeletal Injuries by Sex, United States 2010/2011

		Sex		% of Total	
	Total	Male	Female	Male	Female
Hospital Discharges [1]	Total Number of Hospital Discharges for Musculoskeletal Injuries (in 000s)				
Fractures	1,095.3	451.5	641.3	41%	59%
Dislocations	44.9	25.9	18.9	58%	42%
Sprains & strains	99.9	47.3	52.4	47%	52%
Contusions	229.1	95.3	133.8	42%	58%
Open wounds	238.2	141.4	96.3	60%	40%
All other musculoskeletal injuries	232.5	117.7	114.2	51%	49%
All musculoskeletal injuries (3)	1,708.6	752.0	953.0	44%	56%
Rate Per 100 Patient Visits	4.4	4.6	4.3		
Diagnoses Per 100 U.S. Population [4]	0.6	0.5	0.6		
Emergency Department Visits [2]	Total Number of Emergency Department Visits for Musculoskeletal Injuries (in 000s)				
Fractures	4,044.6	2,063.7	1,980.6	51%	49%
Dislocations	445.1	287.9	157.2	65%	35%
Sprains & strains	4,338.2	1,998.7	2,339.1	46%	54%
Contusions	5,056.9	2,280.1	2,776.2	45%	55%
Open wounds	3,816.6	2,386.3	1,430.0	63%	37%
All other musculoskeletal injuries	3,384.7	1,764.8	1,619.7	52%	48%
All musculoskeletal injuries (3)	19,010.2	9,720.5	9,288.0	51%	49%
Rate Per 100 Patient Visits	14.7	16.8	12.9		
Diagnoses Per 100 U.S. Population [4]	6.1	6.4	5.9		
Total Health Care Visits for Musculoskeletal Injuries, 2010/2011					
	Total Number of Health Care Visits for Musculoskeletal Injuries (in 000s)				
Fractures	5,139.9	2,515.2	2,621.9	49%	51%
Dislocations	490.0	313.8	176.1	64%	36%
Sprains & strains	4,438.1	2,046.0	2,391.5	46%	54%
Contusions	5,286.0	2,375.4	2,910.0	45%	55%
Open wounds	4,054.8	2,527.7	1,526.3	62%	38%
All other musculoskeletal injuries	3,617.2	1,882.5	1,733.9	52%	48%
All musculoskeletal injuries (3)	20,718.8	10,472.5	10,241.0	51%	49%
Rate Per 100 Patient Visits	12.4	14.2	10.9		
Diagnoses Per 100 U.S. Population [4]	6.7	6.9	6.5		

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[3] Total visit may be lower than sum of diagnoses due to multiple diagnoses per patient

[4] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 6A.2.2.5: Health Care Visits for Musculoskeletal Injuries by Age, United States 2010/2011

	Total	Age in Years					Ave Age
		<18	18-44	45-64	65-74	75 & over	for Dx
Hospital Discharges [1]	Total Number of Hospital Discharges for Musculoskeletal Injuries (in 000s)						
Fractures	1,095.3	46.4	172.1	248.7	150.5	476.6	64.5
Dislocations	44.9	2.0	14.9	14.3	5.6	8.0	51.7
Sprains & strains	99.9	2.7	22.7	31.2	15.9	27.3	58.6
Contusions	229.1	7.5	34.0	49.2	32.5	105.8	65.8
Open wounds	238.2	16.0	88.9	56.0	20.7	56.4	50.7
All other musculoskeletal injuries	232.5	14.1	51.8	69.4	35.5	61.3	56.8
All musculoskeletal injuries (3)	1,708.6	78.0	310.3	408.2	236.7	673.9	62.4
Rate Per 100 Patient Visits	4.4	1.4	3.3	4.2	4.4	8.0	
Diagnoses Per 100 U.S. Population [4]	0.6	0.1	0.3	0.5	1.1	3.6	
Emergency Department Visits [2]	Total Number of Emergency Department Visits for Musculoskeletal Injuries (in 000s)						
Fractures	4,044.6	949.8	1,116.7	934.7	335.5	707.6	43.8
Dislocations	445.1	76.7	217.4	94.7	26.3	30.1	37.2
Sprains & strains	4,338.2	955.1	2,128.0	914.4	170.5	170.0	34.4
Contusions	5,056.9	955.1	2,146.1	1,103.1	304.8	547.3	40.0
Open wounds	3,816.6	749.8	1,773.0	793.0	197.6	303.1	36.9
All other musculoskeletal injuries	3,384.7	964.6	1,260.5	630.8	181.0	347.4	35.5
All musculoskeletal injuries (3)	19,010.2	4,331.5	7,796.4	3,967.5	1,066.1	1,847.2	37.7
Rate Per 100 Patient Visits	14.7	17.0	14.9	13.6	12.0	14.0	
Diagnoses Per 100 U.S. Population [4]	6.1	5.8	6.9	4.9	4.9	9.9	
Total Health Care Visits for Musculoskeletal Injuries, 2010/2011	Total Number of Health Care Visits for Musculoskeletal Injuries (in 000s)						
Fractures	5,139.9	996.2	1,288.8	1,183.4	486.0	1,184.2	
Dislocations	490.0	78.7	232.3	109.0	31.9	38.1	
Sprains & strains	4,438.1	957.8	2,150.7	945.6	186.4	197.3	
Contusions	5,286.0	962.6	2,180.1	1,152.3	337.3	653.1	
Open wounds	4,054.8	765.8	1,861.9	849.0	218.3	359.5	
All other musculoskeletal injuries	3,617.2	978.7	1,312.3	700.2	216.5	408.7	
All musculoskeletal injuries (3)	20,718.8	4,409.5	8,106.7	4,375.7	1,302.8	2,521.1	
Rate Per 100 Patient Visits	12.4	14.1	13.1	11.3	9.1	11.7	
Diagnoses Per 100 U.S. Population [4]	6.7	5.9	7.2	5.4	6.0	13.5	

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[3] Total visit may be lower than sum of diagnoses due to multiple diagnoses per patient

[4] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 6A.2.3.1: Trends in Fracture Treatment Episodes for Selected Anatomic Sites by Treatment Location, United States, 1998-2010

Emergency Room Visits

ICD-9-CM	Description	Total Visits (rounded to nearest 000) [1] 1998	2000	2002	2004	2006	2008	2010
Upper Limb								
812	Fracture of Upper Arm (Humerus)	261	417	329	342	270	257	377
813	Fracture of Lower Arm (Radius/Ulna)	647	588	583	763	505	624	662
814 - 817	Wrist/Hand/Fingers	832	1,033	970	1,093	974	983	962
Lower Limb								
820 - 821	Fracture of Hip/Upper Leg (Femur)	324	297	282	307	326	365	275
823	Fracture of Lower Leg (Tibia/Fibula)	244	209	212	264	195	218	202
824 - 826	Fracture of Ankle/Foot/Toes	787	836	740	783	944	793	839
All Anatomic Sites [2]								
812 - 817	Fracture of Upper Limb	1,726	2,009	1,853	2,163	1,743	1,842	1,968
820 - 821, 823 - 826	Fracture of Lower Limb	1,339	1,331	1,217	1,348	1,429	1,363	1,299
812 - 817, 820 - 821, 823 - 826	All Fracture of Upper/Lower Limb	3,041	3,308	3,058	3,495	3,135	3,195	3,232

Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

Physician Office Visits

ICD-9-CM	Description	Total Visits (rounded to nearest 000) [1] 1998	2000	2002	2004	2006	2008	2010
Upper Limb								
812	Fracture of Upper Arm (Humerus)	*	*	*	*	*	*	*
813	Fracture of Lower Arm (Radius/Ulna)	2,429	1,852	2,710	1,485	1,567	1,417	2,623
814 - 817	Wrist/Hand/Fingers	2,691	2,450	2,740	1,988	2,423	2,004	2,602
Lower Limb								
820 - 821	Fracture of Hip/Upper Leg (Femur)	*	*	*	*	*	*	*
823	Fracture of Lower Leg (Tibia/Fibula)	*	*	*	*	*	*	*
824 - 826	Fracture of Ankle/Foot/Toes	2,170	1,883	2,555	2,100	2,355	2,355	3,201
All Anatomic Sites [2]								
812 - 817	Total Upper Limb Fractures	5,718	5,203	5,915	4,203	5,169	4,227	6,330
820 - 821, 823 - 826	Total Lower Limb Fractures	4,027	3,244	4,008	3,862	3,753	3,927	4,716
812 - 817, 820 - 821, 823 - 826	All Fracture of Upper/Lower Limb	9,746	8,349	9,816	7,976	8,923	8,084	10,885

Source: National Ambulatory Medical Care Survey (NAMCS), 1998-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

Table 6A.2.3.1: Trends in Fracture Treatment Episodes for Selected Anatomic Sites by Treatment Location, United States, 1998-2010

Inpatient Hospitalization

		Total Visits (rounded to nearest 000) [1]						
ICD-9-CM	**Description**	**1998**	**2000**	**2002**	**2004**	**2006**	**2008**	**2010**
Upper Limb								
812	Fracture of Upper Arm (Humerus)	90	91	89	102	108	120	123
813	Fracture of Forearm (Radius/Ulna)	96	98	92	94	111	101	96
814 - 817	Wrist/Hand/Fingers	42	41	37	39	43	36	43
Lower Limb								
820 - 821	Fracture of Hip/Upper Leg (Femur)	445	423	431	449	425	420	399
823	Fracture of Lower Leg (Tibia/Fibula)	91	94	86	88	85	102	112
824 - 826	Fracture of Ankle/Foot/Toes	164	169	166	173	159	174	160
All Anatomic Sites [2]								
812 - 817	Total Upper Limb Fractures	216	221	209	224	245	244	246
820 - 821, 823 - 826	Total Lower Limb Fractures	682	663	665	689	654	671	648
812 - 817, 820 - 821, 823 - 826	All Fracture of Upper/Lower Limb	863	850	843	885	863	888	858

Source: National Hospital Discharge Survey (NHDS), 1998-2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

* Estimate does not meet standards for reliability.

[1] All diagnoses [2] Totals may not add due to rounding and inclusion of additional anatomic sites.

Table 6A.2.3.2: Fracture Treatment Episode Trends for Total Physician Office Visits, Emergency Room Visits, and Inpatient Hospitalization for Selected Anatomic Sites, United States, 1998-2010

		Total Visits (rounded to nearest 000) [1]						
ICD-9-CM	Description	1998*	2000*	2002*	2004*	2006*	2008	2010
Upper Limb								
812	Fracture of Upper Arm (Humerus)	351	509	418	444	378	1,281	1,605
813	Fracture of Forearm (Radius/Ulna)	3,172	2,539	3,385	2,342	2,183	2,142	3,381
814 - 817	Wrist/Hand/Fingers	3,564	3,524	3,746	3,120	3,440	3,023	3,607
Lower Limb								
820 - 821	Fracture of Hip/Upper Leg (Femur)	769	720	713	756	751	1,526	1,588
823	Fracture of Lower Leg (Tibia/Fibula)	334	303	298	352	280	1,151	908
824 - 826	Fracture of Ankle/Foot/Toes	3,121	2,888	3,461	3,057	3,458	3,322	4,200
All Anatomic Sites [2]								
812 - 817	Total Upper Limb Fractures	7,661	7,433	7,977	6,591	7,157	6,313	8,544
820-821, 823-826	Total Lower Limb Fractures	6,049	5,237	5,890	5,898	5,836	5,961	6,663
812-817, 820-821, 823-826	All Fracture of Upper/Lower Limb	13,650	12,507	13,718	12,356	12,921	12,167	14,975

ICD-9-CM	Description	1998	2000	2002	2004	2006	2008	2010
Upper Limb		Proportion of Upper Limb Fractures						
812	Fracture of Upper Arm (Humerus)	5.0%	7.7%	5.5%	7.5%	6.3%	19.9%	18.7%
813	Fracture of Forearm (Radius/Ulna)	44.8%	38.6%	44.8%	39.7%	36.4%	33.2%	39.3%
814 - 817	Wrist/Hand/Fingers	50.3%	53.6%	49.6%	52.8%	57.3%	46.9%	42.0%
	% Upper/Lower Limb Fractures	56.1%	59.4%	58.2%	53.3%	55.4%	51.9%	57.1%
Lower Limb		Proportion of Lower Limb Fractures						
820 - 821	Fracture of Hip/Upper Leg (Femur)	18.2%	18.4%	15.9%	18.2%	16.7%	25.4%	23.7%
823	Fracture of Lower Leg (Tibia/Fibula)	7.9%	7.7%	6.7%	8.5%	6.2%	19.2%	13.6%
824 - 826	Fracture of Ankle/Foot/Toes	73.9%	73.8%	77.4%	73.4%	77.0%	55.4%	62.7%
	% Upper/Lower Limb Fractures	44.3%	41.9%	42.9%	47.7%	45.2%	49.0%	44.5%
		Proportion of Upper/Lower Limb Fractures Treated by Site						
Location	Emergency Room Visits	22.3%	26.5%	22.3%	28.3%	24.3%	26.3%	21.6%
	Physician Office Visits	71.4%	66.8%	71.6%	64.6%	69.1%	66.4%	72.7%
	Inpatient Hospitalization	6.3%	6.8%	6.1%	7.2%	6.7%	7.3%	5.7%

* Unreliable estimates not included in summary total, impacting the actual distribution of fractures by body site.

[1] All diagnoses [2] Totals may not add due to rounding and inclusion of additional anatomic sites.

Sources: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.
National Ambulatory Medical Care Survey (NAMCS), 1998-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.
National Hospital Discharge Survey (NHDS), 1998-2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013.

Table 6A.3.1.1: Trends in Deaths Due to Falls, by Age, United States 2000-2010

Year	Total Unintentional Injury Deaths Occurring All Locations: Total Unintentional Injury Deaths	Death due to Falls	% of Deaths due to Falls	Age-Adjusted Rate per 100,000 Persons [1]
2000	97,900	13,300	13.6%	4.82
2001	101,500	15,000	14.8%	5.33
2002	106,700	16,300	15.3%	5.69
2003	109,300	17,200	15.7%	5.93
2004	112,000	18,800	16.8%	6.37
2005	117,800	19,700	16.7%	6.53
2006	121,600	20,800	17.1%	6.77
2007	123,700	22,600	18.3%	7.21
2008	121,900	24,000	19.7%	7.50
2009	118,000	24,800	21.0%	7.58
2010	120,900	26,000	21.5%	7.82
2000-2010	1,251,400	218,600	17.5%	6.56

	% of Unintentional Injury Deaths Due to Falls by Age					
	≤24	25-34	35-44	45-54	55-64	65+
2000	1.6%	2.6%	3.9%	7.1%	12.6%	33.1%
2001	1.9%	2.9%	4.1%	7.7%	13.1%	35.6%
2002	1.7%	2.4%	4.0%	6.9%	13.0%	38.2%
2003	1.7%	2.3%	3.8%	6.6%	13.3%	39.9%
2004	1.7%	2.5%	4.0%	7.0%	14.4%	42.5%
2005	1.5%	2.1%	3.6%	6.4%	13.4%	43.0%
2006	1.6%	2.1%	3.6%	6.6%	13.9%	45.4%
2007	1.6%	2.2%	3.5%	6.4%	14.3%	47.9%
2008	1.7%	2.0%	3.4%	6.4%	14.2%	50.2%
2009	1.7%	2.1%	3.6%	6.7%	14.6%	52.2%
2010	1.7%	2.1%	3.3%	6.5%	14.3%	52.4%

[1] Age-adjusted to 2000 population, all races, both sexes.

Source: Centers for Disease Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. (2011) National Center for Injury Prevention and Control (producer). Available from URL: http://www.cdc.gov/injury/wisqars/fatal.html . [October 24, 2013].

Table 6A.3.1.2: Deaths Due to Falls from Unintentional Injury Episodes by Age, United States 2011

Age	Total Unintentional Injury Deaths	Total Deaths Due to Falls	Rate of Unintentional Injury Deaths Due to Falls (per 100,000	% of Total Unintentional Injury Deaths Due to Falls
	Total Population			
<18 years	6,020	*	*	1.4%
18-24	10,468	189	0.0	1.8%
25-34 years	14,573	299	0.0	2.1%
35-44 years	14,792	493	0.0	3.3%
45-54 years	19,667	1,283	0.0	6.5%
55-64 years	14,023	2,011	0.1	14.3%
65-74 years	9,407	2,988	0.1	31.8%
75-84 years	13,853	7,249	0.6	52.3%
85 years & over	18,040	11,412	2.1	63.3%
Total All Ages	120,843	26,008	0.1	21.5%
	Males			
<18 years	3,827	*	*	1.5%
18-24	7,818	157.0	0.0%	2.0%
25-34 years	10,803	254.0	0.0%	2.4%
35-44 years	10,196	389.0	0.0%	3.8%
45-54 years	13,178	960.0	0.0%	7.3%
55-64 years	9,609	1,393.0	0.1%	14.5%
65-74 years	5,938	1,776.0	0.2%	29.9%
75-84 years	7,359	3,679.0	0.7%	50.0%
85 years & over	7,182	4,383.0	2.5%	61.0%
Total All Ages	75,910	13,049.0	0.1%	17.2%
	Females			
<18 years	2,193	*	*	1.2%
18-24	2,650	*	*	1.2%
25-34 years	3,770	*	*	1.2%
35-44 years	4,596	*	*	2.3%
45-54 years	6,489	323	0.0	5.0%
55-64 years	44,414	618	0.0	1.4%
65-74 years	3,469	1,212	0.1	34.9%
75-84 years	6,494	3,570	0.1	55.0%
85 years & over	10,858	7,029	1.9	64.7%
Total All Ages	44,933	12,959	0.1	28.8%

* Does not meet standards for reliability

[1] Age adjusted to 2000 standard population.

Source: Centers for Disease Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. (2011) National Center for Injury Prevention and Control (producer). Available from URL: http://www.cdc.gov/injury/wisqars/index.html . [October 21, 2013].

Table 6A.3.2.1: Incidence of Nonfatal Unintentional Injuries Treated in Hospital Emergency Departments, United States 2011

Cause of Injury	Total Nonfatal Unintentional Injuries (in 000s)	% of Total Nonfatal Unintentional Injuries	Total Nonfatal Unintentional Injuries Treated and Released (in 000s)	% of Total Nonfatal Unintentional Injuries Treated and Released	Rate of Nonfatal Unintentional Injuries Treated and Released per 1,000 Persons [1]
Falls	9,256	31%	8,054	87%	25.8
Struck By/Against	4,620	15%	4,466	97%	14.3
Overexertion	3,440	11%	3,375	98%	10.8
Motor Vehicle Occupant	2,687	9%	2,475	92%	7.9
Cut/Pierce	2,165	7%	2,094	97%	6.7
Bicyclist Injury	534	2%	491	92%	1.6
Other Causes	6,618	22%	5,559	84%	17.8
Unknown	704	2%	643	91%	2.1
Total All Causes	30,023	100%	27,158	90%	87.2

[1] Age adjusted to 2000 standard population.

Source: Centers for Disease Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. (2011) National Center for Injury Prevention and Control (producer). Available from URL: www.cdc.gov/nicpc/wisqars. [October 21, 2013].

Table 6A.3.2.2: Rate of Nonfatal Unintentional Injuries Treated In Hospital Emergency Departments by Age, United States 2011

	Rate of Nonfatal Injuries by Cause per 1000 Population [1]							
Cause of Injury	0 to 19 years	20 to 44 years	45 to 64 years	65 to 74 years	75 to 84 years	85 years & over	All Ages	Total Nonfatal Unintentional Injuries (in 000s)
Falls	34.7	19.9	22.9	32.7	64.9	141.6	29.7	9,256
Struck By/Against	25.1	15.0	8.5	5.8	6.5	9.1	14.8	4,620
Overexertion	10.6	15.3	9.1	5.2	4.5	4.6	11.0	3,440
Motor Vehicle Occupant	5.8	13.3	7.5	5.1	4.5	3.5	8.6	2,687
Cut/Pierce	6.7	9.3	5.9	4.1	3.1	2.6	6.9	2,165
Bicyclist Injury	3.5	1.4	1.0	0.5	0.3	*	1.7	534
Total All Causes	110.9	102.5	76.5	66.8	96.6	176.3	96.4	30,023

[1] Age adjusted to 2000 standard population.
Source: Centers for Disease Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. (2011) National Center for Injury Prevention and Control (producer). Available from URL: www.cdc.gov/nicpc/wisqars. [October 21, 2013].

Table 6A.3.2.3: Unintentional Injuries from Falls and All Causes Treated In Hospital Emergency Departments, by Age and Sex, United States 2011

Age	Total Unintentional Injuries from Falls (in 000s)	Rate of Unintentional Injuries from Falls (per 1000 persons) [1]	Total Injuries All Causes (in 000s)	Rate of Unintentional Injuries All Causes (per 1000 persons) [1]	Proportion Unintentional Falls to All Causes
			Total Population		
<18 years	2,697.1	36.5	8,075.1	109.2	33.4%
18-24	636.0	20.5	3,762.5	121.1	16.9%
25-34 years	830.8	19.9	4,392.1	105.1	18.9%
35-44 years	795.2	19.6	3,674.5	90.4	21.6%
45-54 years	985.0	22.0	3,801.5	85.0	25.9%
55-64 years	909.2	23.9	2,532.0	66.5	35.9%
65-74 years	735.8	32.7	1,502.0	66.8	49.0%
75-84 years	855.2	64.9	1,272.2	86.6	67.2%
85 years & over	512.2	141.6	1,011.4	176.3	50.6%
Total All Ages	8,956.4	29.7	30,023.3	96.4	29.8%
			Males		
<18 years	1,558.3	41.2	4,765.0	126.0	32.7%
18-24	320.0	20.1	2,150.1	135.3	14.9%
25-34 years	391.3	18.6	2,453.7	116.6	15.9%
35-44 years	364.0	18.0	2,023.2	100.0	18.0%
45-54 years	434.8	19.8	2,042.0	92.7	21.3%
55-64 years	349.2	19.0	1,241.8	67.6	28.1%
65-74 years	262.4	25.1	656.3	62.7	40.0%
75-84 years	276.9	49.7	453.3	81.3	61.1%
85 years & over	223.3	117.9	294.0	155.2	76.0%
Total All Ages	4,180.3	27.3	16,079.3	104.9	26.0%
			Females		
<18 years	1,138.7	31.5	3,309.9	91.6	34.4%
18-24	316.0	20.8	1,612.3	106.3	19.6%
25-34 years	439.5	21.2	1,938.4	93.4	22.7%
35-44 years	431.2	21.1	1,651.4	81.0	26.1%
45-54 years	550.1	24.2	1,759.5	77.5	31.3%
55-64 years	560.0	28.4	1,290.1	65.5	43.4%
65-74 years	473.4	39.4	845.7	70.4	56.0%
75-84 years	578.3	76.1	818.9	107.7	70.6%
85 years & over	588.9	153.2	717.5	1,886.7	82.1%
Total All Ages	5,076.0	32.1	13,943.6	88.1	36.4%

[1] Age adjusted to 2000 standard population.

Source: Centers for Disease Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. (2011) National Center for Injury Prevention and Control (producer). Available from URL: www.cdc.gov/nicpc/wisqars. [October 21, 2013].

Table 6A.3.2.4: Cause of Injuries Seen in Hospital and Emergency Department, by Sex and Age, United States, 2011/2010

		Hospital Admissions [4]				Emergency Department Visits [5]			
		Proportion of Injuries by Cause (1)			All Reported Injuries (N in 000s)	Proportion of Injuries by Cause (1)			All Reported Injuries (N in 000s)
		Fall	Trauma (2)	Other Cause (3)		Fall	Trauma (2)	Other Cause (3)	
Musculoskeletal Injury	Male	40.2%	33.2%	26.6%	752.0	26.7%	58.7%	14.6%	9,720.5
	Female	60.9%	17.0%	22.1%	953.0	39.7%	47.1%	13.2%	9,288.0
Non-Musculoskeletal Injury	Male	30.1%	37.3%	32.5%	465.7	24.9%	54.8%	20.3%	4,142.9
	Female	47.2%	28.2%	24.7%	331.2	29.0%	55.0%	16.0%	3,486.6
Musculoskeletal Injury	0-17 years	25.4%	39.6%	34.9%	78.0	32.1%	57.2%	10.7%	4,331.5
	18-44 years	19.5%	47.6%	32.9%	310.3	21.2%	61.6%	17.2%	7,796.4
	45-64 years	41.5%	30.8%	27.7%	408.2	35.2%	50.9%	13.8%	3,967.5
	65-74 years	57.9%	17.6%	24.6%	236.7	51.6%	37.4%	11.0%	1,066.1
	75-84 years	69.8%	11.6%	18.5%	335.1	65.9%	24.1%	10.0%	1,027.2
	85 & over	77.5%	8.2%	14.4%	338.8	75.6%	15.6%	8.8%	820.1
Non-Musculoskeletal Injury	0-17 years	19.1%	50.1%	30.7%	54.2	35.7%	51.8%	12.6%	2,128.5
	18-44 years	13.9%	45.9%	40.2%	186.6	12.3%	63.9%	23.8%	3,176.5
	45-64 years	29.1%	39.7%	31.2%	207.4	23.3%	58.0%	18.7%	1,383.7
	65-74 years	46.2%	27.6%	26.2%	101.6	46.1%	40.0%	13.9%	325.1
	75-84 years	57.5%	20.1%	22.4%	134.4	63.9%	24.2%	12.0%	343.8
	85 & over	66.8%	15.3%	17.9%	113.6	74.1%	15.5%	10.3%	272.0
Total		47.1%	27.1%	25.7%	2,506.3	31.3%	53.5%	15.1%	26,638.3
Total All Visits						32.6%	51.3%	16.1%	29,144.6
Proportion Treated and Released									91%

[1] Based on medical coding cause of injury (ICD-9-CM Ecodes)

(2) Includes vehicular accidents (auto, train, boat, plane, motorcycle), machinery, moving objects, and other types of traumatic injury.

[3] Includes military injuries, sports injuries, and other causes.

[4] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[5] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 6A.4.1.1: Average Length of Hospital Stay (LOS) and Total Charges[1] for Injury Diagnoses by Age, United States 2011

	Age at Admission						
	< 18 years	18-44	45-64	65-74	75-84	85+	Total
Fractures							
Total Hospital Diagnoses (in 000s)	46.4	172.1	248.7	150.5	229.7	246.9	1,094.4
Proportion of Age Group Hospital Discharges	0.8%	1.8%	2.6%	2.8%	4.5%	7.5%	2.8%
Average LOS (in days), 2011	3.7	5.3	5.6	5.5	5.4	5.4	5.4
Average Total Hospital Charges (in 000 $s)	$ 42.0	$ 70.7	$ 60.0	$ 54.3	$ 42.5	$ 44.1	$ 54.4
Total Hospital Charges (in 000 $s)	$ 1,947.9	$ 12,172.6	$ 14,909.6	$ 8,176.7	$ 9,762.3	$ 10,888.3	$ 59,515.7
Dislocations							
Total Hospital Diagnoses (in 000s)	2.0	14.9	14.3	5.6	5.0	3.0	44.8
Proportion of Age Group Hospital Discharges	0.0%	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%
Average LOS (in days), 2011	4.5	5.7	5.8	5.9	5.5	5.4	5.6
Average Total Hospital Charges (in 000 $s)	$ 52.8	$ 73.3	$ 63.6	$ 55.5	$ 47.4	$ 38.0	$ 51.8
Total Hospital Charges (in 000 $s)	$ 105.6	$ 1,091.7	$ 909.6	$ 311.0	$ 237.2	$ 114.0	$ 2,321.6
Sprains and Strains							
Total Hospital Diagnoses (in 000s)	2.7	22.7	31.2	15.9	16.1	11.2	99.8
Proportion of Age Group Hospital Discharges	0.0%	0.2%	0.3%	0.3%	0.3%	0.3%	0.3%
Average LOS (in days), 2011	3.9	4.5	4.6	4.4	4.9	5.2	4.6
Average Total Hospital Charges (in 000 $s)	$ 42.1	$ 46.3	$ 42.7	$ 42.1	$ 39.5	$ 32.5	$ 41.7
Total Hospital Charges (in 000 $s)	$ 113.7	$ 1,051.5	$ 1,332.6	$ 669.2	$ 635.6	$ 364.0	$ 4,165.9
Contusions							
Total Hospital Diagnoses (in 000s)	7.5	34.0	49.2	32.5	52.8	53.0	229.1
Proportion of Age Group Hospital Discharges	0.1%	0.4%	0.5%	0.6%	1.0%	1.6%	0.6%
Average LOS (in days), 2011	4.5	4.6	5.5	5.7	5.4	5.0	5.2
Average Total Hospital Charges (in 000 $s)	$ 39.1	$ 45.6	$ 47.1	$ 43.6	$ 37.4	$ 31.9	$ 40.4
Total Hospital Charges (in 000 $s)	$ 293.0	$ 1,551.8	$ 2,316.8	$ 1,416.0	$ 1,974.7	$ 1,688.2	$ 9,245.3
Open Wounds							
Total Hospital Diagnoses (in 000s)	16.0	88.9	56.0	20.7	27.4	29.0	238.0
Proportion of Age Group Hospital Discharges	0.3%	0.9%	0.6%	0.4%	0.5%	0.9%	0.6%
Average LOS (in days), 2011	4.8	4.9	5.3	6.5	6.4	5.7	5.6
Average Total Hospital Charges (in 000 $s)	$ 37.7	$ 51.0	$ 50.2	$ 49.8	$ 44.5	$ 36.1	$ 47.3
Total Hospital Charges (in 000 $s)	$ 602.4	$ 4,530.3	$ 2,811.2	$ 1,031.1	$ 1,218.5	$ 1,048.1	$ 11,247.4
All Other Musculoskeletal Injuries							
Total Hospital Diagnoses (in 000s)	14.1	51.8	69.4	35.5	34.8	26.5	232.0
Proportion of Age Group Hospital Discharges	0.2%	0.6%	0.7%	0.7%	0.7%	0.8%	0.6%
Average LOS (in days), 2011	4.5	5.0	5.3	5.3	5.5	5.5	5.2
Average Total Hospital Charges (in 000 $s)	$ 42.6	$ 52.3	$ 52.9	$ 51.3	$ 43.6	$ 36.0	$ 48.6
Total Hospital Charges (in 000 $s)	$ 600.0	$ 2,706.6	$ 3,672.6	$ 1,820.4	$ 1,518.0	$ 952.7	$ 11,269.9

Table 6A.4.1.1: Average Length of Hospital Stay (LOS) and Total Charges[1] for Injury Diagnoses by Age, United States 2011

	Age at Admission						
	< 18 years	18-44	45-64	65-74	75-84	85+	Total
All Musculoskeletal Injuries [2]							
Total Hospital Diagnoses (in 000s)	78.0	310.3	408.2	236.7	335.1	338.8	1,707.0
Proportion of Age Group Hospital Discharges	1.4%	3.3%	4.2%	4.4%	6.5%	10.3%	4.4%
Average LOS (in days), 2011	4.0	4.9	5.5	5.5	5.6	5.4	5.3
Average Total Hospital Charges (in 000 $s)	$ 38.7	$ 55.3	$ 53.0	$ 50.7	$ 46.2	$ 40.8	$ 48.7
Total Hospital Charges (in 000 $s)	$ 3,018.6	$ 17,168.9	$ 21,650.9	$ 11,996.0	$ 15,488.3	$ 13,822.0	$ 83,149.7
All Non-Musculoskeletal Injuries							
Total Hospital Diagnoses (in 000s)	54.2	186.6	207.4	101.6	134.4	113.6	797.7
Proportion of Age Group Hospital Discharges	1.0%	2.0%	2.1%	1.9%	2.6%	3.5%	2.1%
Average LOS (in days), 2011	4.9	5.9	6.9	6.9	6.3	5.5	6.2
Average Total Hospital Charges (in 000 $s)	$ 40.2	$ 54.6	$ 60.1	$ 60.6	$ 50.5	$ 38.7	$ 52.9
Total Hospital Charges (in 000 $s)	$ 2,178.3	$ 10,188.4	$ 12,458.5	$ 6,159.0	$ 6,789.9	$ 4,396.0	$ 42,184.8
Musculoskeletal Injuries vs Non-Musculoskeletal Injuries: Proportion of Total Injury Admissions							
All Musculoskeletal Injuries	59.0%	62.5%	66.3%	70.0%	71.4%	74.9%	68.2%
All Non-Musculoskeletal Injuries	41.0%	37.5%	33.7%	30.0%	28.6%	25.1%	31.8%
Musculoskeletal Injuries vs Non-Musculoskeletal Injuries: Proportion of Total Injury Hospital Charges							
All Musculoskeletal Injuries	58.1%	62.8%	63.5%	66.1%	69.5%	75.9%	66.3%
All Non-Musculoskeletal Injuries	41.9%	37.2%	36.5%	33.9%	30.5%	24.1%	33.7%

[1] Generally, total charges in the HCUP databases do not include professional fees and non-covered charges. If the source provides total charges with professional fees, then the professional fees are removed from the charge during HCUP processing. In a small number of HCUP databases, professional fees cannot be removed from total charges because the data source cannot provide the information. Emergency department charges incurred prior to admission to the hospital may be included in total charges. Medicare requires a bundled bill for Medicare patients admitted to the hospital through the emergency department. Other payers may or may not have similar requirements.

[2] Totals based on all reported admissions and may not equal sum of subcategories.

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 6A.4.2.1: Hospital Discharges and Disposition of Injuries for Hospital Admissions by Age, United States 2011

		Disposition (% of Total Patients with Injury Type)					
	Hospital Discharges (in 000s)	Routine	Transferred to Other Short-Term Care Facility (Hospital)	Transfer to Skilled Nursing/ Intermediate Care/ Other Facility	Home Health Care	Died	Other
<18 years							
All Musculoskeletal Injuries	78.0	90.9%	1.6%	3.0%	3.6%	0.6%	0.3%
All Non-Musculoskeletal Injuries	54.2	90.9%	2.0%	2.5%	3.1%	1.3%	0.2%
All Hospital Diagnoses	5,655.5	94.9%	1.8%	0.5%	2.4%	0.3%	0.1%
18 to 44 years							
All Musculoskeletal Injuries	310.3	78.1%	2.0%	9.1%	8.1%	0.9%	1.8%
All Non-Musculoskeletal Injuries	186.6	75.4%	2.3%	9.8%	8.1%	1.8%	2.6%
All Hospital Diagnoses	9,370.2	89.9%	1.2%	2.9%	3.9%	0.4%	1.7%
45 to 64 years							
All Musculoskeletal Injuries	408.2	57.8%	2.5%	21.8%	15.6%	1.2%	1.1%
All Non-Musculoskeletal Injuries	207.4	59.9%	3.3%	18.9%	13.1%	2.7%	2.1%
All Hospital Diagnoses	9,680.0	71.7%	2.5%	10.3%	12.2%	1.7%	1.6%
65 to 74 years							
All Musculoskeletal Injuries	236.7	32.2%	2.6%	45.2%	17.8%	1.8%	0.4%
All Non-Musculoskeletal Injuries	101.6	43.0%	3.4%	31.8%	16.8%	4.3%	0.7%
All Hospital Diagnoses	5,365.6	57.4%	2.9%	19.2%	17.3%	2.7%	0.5%
75 to 84 years							
All Musculoskeletal Injuries	335.1	17.7%	2.6%	63.2%	13.9%	2.5%	0.1%
All Non-Musculoskeletal Injuries	134.4	29.9%	3.4%	43.3%	17.9%	5.1%	0.4%
All Hospital Diagnoses	5,149.2	44.0%	2.7%	30.5%	18.6%	3.7%	0.5%
85 years and over							
All Musculoskeletal Injuries	338.7	9.7%	1.9%	74.0%	10.5%	3.6%	0.3%
All Non-Musculoskeletal Injuries	113.6	19.8%	2.2%	54.7%	17.5%	5.5%	0.3%
All Hospital Diagnoses	3,276.4	28.7%	2.0%	44.5%	19.0%	5.5%	0.3%
All Ages							
All Musculoskeletal Injuries	1,708.6	42.0%	2.3%	40.4%	12.6%	2.0%	0.7%
All Non-Musculoskeletal Injuries	796.5	45.4%	2.5%	35.9%	12.8%	2.4%	1.0%
All Hospital Diagnoses	38,496.9	70.2%	2.1%	13.9%	10.9%	1.9%	1.0%

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 6A.4.2.2: Incidence and Disposition of Injuries by Age for Emergency Departments (ED) Visits, United States 2011

	Incidence (in 000s)	Disposition (% of Total Patients with Injury Type)					
		Routine	Admitted to Hospital	Transfer to Skilled Nursing/ Intermediate Care/ Other Facility	Home Health Care	Died	Other
<18 years							
All Musculoskeletal Injuries	4,331.5	96.6%	2.5%	0.2%	0.0%	0.0%	0.7%
All Non-Musculoskeletal Injuries	2,128.5	96.0%	3.3%	0.2%	0.0%	0.0%	0.5%
All ED Diagnoses	25,511.1	93.3%	5.2%	0.4%	0.0%	0.0%	1.1%
18 to 44 years							
All Musculoskeletal Injuries	7,796.4	94.3%	4.2%	0.4%	0.0%	0.0%	1.1%
All Non-Musculoskeletal Injuries	3,176.5	92.8%	5.7%	0.3%	0.0%	0.1%	1.1%
All ED Diagnoses	52,300.4	88.7%	8.5%	0.7%	0.0%	0.1%	2.0%
45 to 64 years							
All Musculoskeletal Injuries	3,967.5	89.9%	8.6%	0.6%	0.0%	0.1%	0.8%
All Non-Musculoskeletal Injuries	1,383.7	85.8%	12.4%	0.7%	0.0%	0.1%	1.0%
All ED Diagnoses	29,085.8	75.0%	21.8%	1.0%	0.1%	0.2%	1.9%
65 to 74 years							
All Musculoskeletal Injuries	1,066.1	81.0%	16.8%	1.3%	0.1%	0.1%	0.7%
All Non-Musculoskeletal Injuries	325.1	73.3%	23.8%	2.0%	0.1%	0.1%	0.7%
All ED Diagnoses	8,902.3	59.7%	37.3%	1.3%	0.2%	0.1%	1.4%
75 to 84 years							
All Musculoskeletal Injuries	1,027.2	69.2%	27.0%	3.0%	0.2%	0.1%	0.5%
All Non-Musculoskeletal Injuries	343.8	62.3%	32.4%	4.3%	0.3%	0.2%	0.5%
All ED Diagnoses	8,031.3	50.9%	45.2%	2.3%	0.3%	0.5%	0.8%
85 years and over							
All Musculoskeletal Injuries	820.1	56.9%	36.0%	6.1%	0.4%	0.1%	0.5%
All Non-Musculoskeletal Injuries	272.0	54.6%	36.3%	8.0%	0.4%	0.2%	0.5%
All ED Diagnoses	5,130.6	43.3%	50.6%	4.3%	0.4%	0.6%	0.8%
All Ages							
All Musculoskeletal Injuries	19,010.2	90.2%	8.0%	0.8%	0.1%	0.1%	0.8%
All Non-Musculoskeletal Injuries	7,629.6	88.8%	9.3%	0.9%	0.1%	0.1%	0.8%
All ED Diagnoses	128,974.4	80.4%	16.8%	1.0%	0.1%	0.2%	1.5%

Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 6A.4.2.3: Discharges and Disposition of Musculoskeletal Injuries by Type and Age for Hospital Admissions, United States 2011

		Disposition (% of Total Patients with Injury Type)					
	Incidence (in 000s)	Routine	Transferred to Another Short-Term Care Facility (Hospital)	Transfer to Skilled Nursing, Intermediate Care, Another Facility	Home Health Care	Died	Other
<18 years							
Fractures	46.4	90.7%	1.8%	3.1%	3.7%	0.7%	0.0%
Dislocations	2.0	88.2%	1.7%	3.8%	6.0%	0.3%	0.0%
Sprains and strains	2.7	90.7%	1.4%	3.1%	4.7%	0.0%	0.1%
Contusion	7.5	90.8%	1.5%	3.3%	2.3%	1.8%	0.3%
Open Wound	16.0	88.8%	1.4%	4.9%	4.0%	0.6%	0.3%
Other Musculoskeletal Injury	14.1	89.7%	2.1%	2.6%	4.9%	0.4%	0.3%
All Musculoskeletal Injuries	78.0	90.9%	1.6%	3.0%	3.6%	0.6%	0.3%
18 to 44 years							
Fractures	172.1	75.9%	2.2%	10.3%	9.5%	1.2%	0.9%
Dislocations	14.9	74.2%	2.1%	11.3%	10.6%	0.7%	1.1%
Sprains and strains	22.7	82.6%	1.2%	6.6%	8.3%	0.0%	1.3%
Contusion	34.0	89.9%	1.2%	2.9%	3.9%	0.4%	1.7%
Open Wound	88.9	79.2%	2.1%	9.4%	6.3%	0.8%	2.2%
Other Musculoskeletal Injury	51.8	76.6%	2.0%	9.2%	9.5%	0.7%	2.0%
All Musculoskeletal Injuries	310.3	78.1%	2.0%	9.1%	8.1%	0.9%	1.8%
45 to 64 years							
Fractures	248.7	54.6%	2.6%	25.5%	15.1%	1.4%	0.8%
Dislocations	14.3	61.6%	2.5%	19.9%	14.4%	0.5%	1.1%
Sprains and strains	31.2	67.6%	1.4%	16.1%	14.0%	0.3%	0.6%
Contusion	49.2	63.2%	3.1%	17.7%	12.7%	1.4%	1.9%
Open Wound	56.0	65.4%	3.1%	15.2%	13.2%	1.4%	1.7%
Other Musculoskeletal Injury	69.4	56.5%	1.9%	19.6%	19.7%	0.8%	1.5%
All Musculoskeletal Injuries	408.2	57.8%	2.5%	21.8%	15.6%	1.2%	1.1%
65 to 74 years							
Fractures	150.5	25.8%	2.8%	53.6%	15.6%	1.9%	0.3%
Dislocations	5.6	40.4%	2.6%	36.7%	19.4%	0.8%	0.1%
Sprains and strains	15.9	46.1%	1.5%	31.5%	20.2%	0.4%	0.3%
Contusion	32.5	41.3%	2.7%	34.6%	18.8%	1.9%	0.7%
Open Wound	20.7	44.7%	3.1%	29.7%	19.2%	2.7%	0.6%
Other Musculoskeletal Injury	35.5	38.4%	2.2%	35.0%	22.3%	1.5%	0.6%
All Musculoskeletal Injuries	236.7	32.2%	2.6%	45.2%	17.8%	1.8%	0.4%

Table 6A.4.2.3: Discharges and Disposition of Musculoskeletal Injuries by Type and Age for Hospital Admissions, United States 2011

	Incidence (in 000s)	Disposition (% of Total Patients with Injury Type) Routine	Transferred to Another Short-Term Care Facility (Hospital)	Transfer to Skilled Nursing, Intermediate Care, Another Facility	Home Health Care	Died	Other
75 to 84 years							
Fractures	229.7	11.7%	2.7%	72.4%	10.6%	2.5%	0.1%
Dislocations	5.0	27.3%	2.0%	51.5%	17.6%	1.3%	0.3%
Sprains and strains	16.1	31.8%	1.3%	46.2%	20.0%	0.5%	0.2%
Contusion	52.8	27.6%	2.3%	48.9%	18.2%	2.7%	0.3%
Open Wound	27.4	28.8%	3.3%	43.7%	20.4%	3.4%	0.4%
Other Musculoskeletal Injury	34.8	26.5%	2.4%	47.8%	20.7%	2.2%	0.4%
All Musculoskeletal Injuries	335.1	17.7%	2.6%	63.2%	13.9%	2.5%	0.1%
85 years and over							
Fractures	246.9	5.9%	2.0%	80.7%	7.5%	3.8%	0.1%
Dislocations	3.0	16.0%	2.8%	64.3%	13.7%	2.9%	0.3%
Sprains and strains	11.2	18.1%	1.0%	63.3%	16.2%	1.4%	0.0%
Contusion	53.0	16.8%	1.6%	62.5%	16.1%	2.8%	0.2%
Open Wound	29.0	17.9%	2.0%	57.3%	17.9%	4.5%	0.4%
Other Musculoskeletal Injury	26.5	17.8%	1.8%	59.0%	17.4%	3.6%	0.4%
All Musculoskeletal Injuries	338.7	9.7%	1.9%	74.0%	10.5%	3.6%	0.3%
All Ages							
Fractures	1,095.3	35.6%	2.4%	48.3%	11.1%	2.2%	0.4%
Dislocations	44.9	57.5%	2.3%	24.9%	13.7%	0.8%	0.8%
Sprains and strains	99.9	56.9%	1.3%	26.2%	14.7%	0.4%	0.5%
Contusion	229.1	44.7%	2.3%	35.7%	14.2%	2.0%	1.1%
Open Wound	238.2	60.3%	2.5%	22.0%	12.0%	1.9%	1.3%
Other Musculoskeletal Injury	232.5	51.3%	2.1%	27.3%	16.8%	1.4%	1.1%
All Musculoskeletal Injuries	1,708.6	42.0%	2.3%	40.4%	12.6%	2.0%	0.7%

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 6A.4.2.4: Incidence and Disposition of Musculoskeletal Injuries and Other Injuries by Age for Emergency Departments (ED), United States 2011

		Disposition (% of Total Patients with Injury Type)					
	Incidence (in 000s)	Routine	Admitted to Hospital	Transfer to Skilled Nursing, Intermediate Care, Another Facility	Home Health Care	Died	Other
<18 years							
Fractures	949.8	91.8%	7.5%	0.4%	0.0%	0.3%	0.0%
Dislocations	76.7	95.9%	3.5%	0.2%	0.0%	0.0%	0.4%
Sprains and strains	955.1	99.3%	0.3%	0.0%	0.0%	0.0%	0.4%
Contusion	955.1	98.3%	1.1%	0.1%	0.0%	0.0%	0.5%
Open Wound	749.8	96.2%	2.7%	0.5%	0.0%	0.0%	0.6%
Other Musculoskeletal Injury	964.6	96.7%	1.9%	0.2%	0.0%	0.0%	1.2%
All Musculoskeletal Injuries	4,331.5	96.6%	2.5%	0.2%	0.0%	0.0%	0.7%
18 to 44 years							
Fractures	1,116.7	82.8%	16.1%	0.3%	0.0%	0.7%	0.1%
Dislocations	217.4	92.0%	7.0%	0.3%	0.0%	0.0%	0.7%
Sprains and strains	2,128.0	98.6%	0.8%	0.1%	0.0%	0.0%	0.7%
Contusion	2,146.1	97.0%	1.9%	0.2%	0.0%	0.0%	0.9%
Open Wound	1,773.0	92.0%	5.8%	0.8%	0.0%	0.1%	1.3%
Other Musculoskeletal Injury	1,260.5	93.0%	4.1%	0.4%	0.0%	0.1%	2.4%
All Musculoskeletal Injuries	7,796.4	94.3%	4.2%	0.4%	0.0%	0.0%	1.1%
45 to 64 years							
Fractures	934.7	74.1%	24.5%	0.7%	0.1%	0.6%	0.0%
Dislocations	94.7	86.4%	12.4%	0.5%	0.0%	0.0%	0.7%
Sprains and strains	914.4	97.2%	2.1%	0.2%	0.0%	0.0%	0.5%
Contusion	1,103.1	94.5%	4.2%	0.5%	0.0%	0.0%	0.8%
Open Wound	793.0	92.0%	6.4%	0.6%	0.0%	0.1%	0.9%
Other Musculoskeletal Injury	630.8	90.0%	6.9%	1.0%	0.0%	0.2%	1.9%
All Musculoskeletal Injuries	3,967.5	89.9%	8.6%	0.6%	0.0%	0.1%	0.8%
65 to 74 years							
Fractures	335.5	60.0%	38.1%	1.2%	0.2%	0.5%	0.0%
Dislocations	26.3	83.3%	14.6%	1.1%	0.4%	0.0%	0.6%
Sprains and strains	170.5	94.0%	4.9%	0.6%	0.1%	0.0%	0.0%
Contusion	304.8	88.8%	9.0%	1.5%	0.1%	0.0%	0.6%
Open Wound	197.6	90.8%	7.8%	0.7%	0.1%	0.1%	0.5%
Other Musculoskeletal Injury	181.0	85.9%	10.0%	2.5%	0.1%	0.2%	1.3%
All Musculoskeletal Injuries	1,066.1	81.0%	16.8%	1.3%	0.1%	0.1%	0.7%

Table 6A.4.2.4: Incidence and Disposition of Musculoskeletal Injuries and Other Injuries by Age for Emergency Departments (ED), United States 2011

		Disposition (% of Total Patients with Injury Type)					
	Incidence (in 000s)	Routine	Admitted to Hospital	Transfer to Skilled Nursing, Intermediate Care, Another Facility	Home Health Care	Died	Other
75 to 84 years							
Fractures	375.7	42.9%	54.2%	2.1%	0.3%	0.4%	0.1%
Dislocations	20.3	75.9%	20.8%	2.6%	0.3%	0.0%	0.4%
Sprains and strains	112.3	88.4%	9.3%	1.8%	0.2%	0.0%	0.3%
Contusion	306.1	81.4%	14.1%	3.7%	0.3%	0.1%	0.4%
Open Wound	167.9	86.0%	11.3%	2.0%	0.2%	0.1%	0.4%
Other Musculoskeletal Injury	189.6	80.6%	12.7%	5.3%	0.3%	0.2%	0.9%
All Musculoskeletal Injuries	1,027.2	69.2%	27.0%	3.0%	0.2%	0.1%	0.5%
85 years and over							
Fractures	331.9	28.6%	66.9%	3.8%	0.3%	0.4%	0.0%
Dislocations	9.8	66.3%	26.3%	6.5%	0.6%	0.0%	0.3%
Sprains and strains	57.7	80.0%	14.7%	4.5%	0.4%	0.0%	0.4%
Contusion	241.2	72.5%	18.8%	7.6%	0.4%	0.1%	0.6%
Open Wound	135.2	77.2%	16.3%	5.6%	0.4%	0.2%	0.3%
Other Musculoskeletal Injury	157.8	74.7%	14.1%	9.9%	0.4%	0.2%	0.7%
All Musculoskeletal Injuries	820.1	56.9%	36.0%	6.1%	0.4%	0.1%	0.5%
All Ages							
Fractures	4,044.6	72.9%	25.6%	0.9%	0.1%	0.5%	0.0%
Dislocations	445.1	89.7%	9.0%	0.6%	0.1%	0.0%	0.6%
Sprains and strains	4,338.2	97.8%	1.5%	0.2%	0.0%	0.0%	0.5%
Contusion	5,056.9	94.1%	4.2%	0.9%	0.1%	0.0%	0.7%
Open Wound	3,816.6	92.0%	6.0%	0.9%	0.0%	0.1%	1.0%
Other Musculoskeletal Injury	3,384.7	91.5%	5.3%	1.3%	0.1%	0.1%	1.7%
All Musculoskeletal Injuries	19,010.2	90.2%	8.0%	0.8%	0.1%	0.1%	0.8%

Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 6A.4.2.5: Discharges and Disposition of Fractures by Body Region by Age for Hospital Admissions, United States 2011

	Incidence (in 000s)	Disposition (% of Total Patients with Injury Type) Routine	Transferred to Another Short-Term Care Facility (Hospital)	Transfer to Skilled Nursing, Intermediate Care, Another Facility	Home Health Care	Died	Other
<18 years							
Torso	6.6	74.5%	4.0%	11.9%	6.4%	3.2%	0.0%
Upper Limb	21.9	93.2%	1.6%	2.5%	2.0%	0.5%	0.2%
Lower Limb	21.9	89.1%	1.8%	3.0%	5.6%	0.5%	0.0%
All Fractures	46.3	90.7%	1.8%	3.1%	3.7%	0.7%	0.0%
18 to 44 years							
Torso	50.6	67.6%	3.6%	16.6%	8.3%	3.0%	0.9%
Upper Limb	58.1	78.0%	2.2%	11.1%	6.2%	1.4%	1.1%
Lower Limb	94.6	72.2%	2.2%	11.3%	12.9%	0.8%	0.6%
All Fractures	172.1	75.9%	2.2%	10.3%	9.5%	1.2%	0.9%
45 to 64 years							
Torso	70.6	60.0%	3.4%	22.1%	10.4%	3.0%	1.1%
Upper Limb	70.6	64.6%	2.7%	19.9%	10.5%	1.4%	0.9%
Lower Limb	141.2	44.2%	2.7%	32.5%	19.0%	1.0%	0.6%
All Fractures	248.7	54.6%	2.6%	25.5%	15.1%	1.4%	0.8%
65 to 74 years							
Torso	34.6	34.3%	3.7%	43.7%	14.0%	3.8%	0.5%
Upper Limb	37.5	40.4%	2.5%	39.6%	15.4%	1.8%	0.3%
Lower Limb	92.0	15.5%	2.8%	64.4%	15.6%	1.6%	0.1%
All Fractures	150.5	25.8%	2.8%	53.6%	15.6%	1.9%	0.3%
75 to 84 years							
Torso	51.2	17.9%	2.7%	62.2%	12.9%	4.1%	0.2%
Upper Limb	47.9	23.0%	2.4%	57.8%	14.4%	2.2%	0.2%
Lower Limb	147.0	5.3%	2.8%	81.3%	8.2%	2.3%	0.1%
All Fractures	229.7	11.7%	2.7%	72.4%	10.6%	2.5%	0.1%
85 years and over							
Torso	56.9	9.6%	1.7%	72.8%	11.2%	4.5%	0.2%
Upper Limb	41.6	11.4%	1.8%	71.7%	11.1%	3.8%	0.2%
Lower Limb	165.1	3.2%	2.2%	85.7%	4.9%	3.9%	0.1%
All Fractures	246.9	5.9%	2.0%	80.7%	7.5%	3.8%	0.1%
All Ages							
Torso	270.6	39.9%	3.0%	41.8%	11.0%	3.6%	0.7%
Upper Limb	277.7	51.2%	2.3%	33.6%	10.4%	1.9%	0.6%
Lower Limb	667.7	26.8%	2.5%	57.0%	11.3%	2.0%	0.4%
All Fractures	1,095.3	35.6%	2.4%	48.3%	11.1%	2.2%	0.4%

[1] Fracture of sternum, larynx, trachea, and pelvis

[2] Fracture of clavicle, scapula, humerus, radius, ulna, carpal and metacarpal bones, phalanges of hand

[3] Fracture of femur, patella, tibia, fibula, ankle, tarsal and metatarsal bones, phalanges of foot

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 6A.4.2.6: Incidence and Disposition of Fractures by Body Region by Age for Emergency Department Patients, United States 2011

		Disposition (% of Total Patients with Injury Type)					
	Incidence (in 000s)	Routine	Admitted to Hospital	Transfer to Skilled Nursing/ Intermediate Care/ Other Facility	Home Health Care	Died	Other
<18 years							
Torso [1]	15.6	46.9%	51.5%	1.2%	0.0%	0.5%	0.0%
Upper Limb [2]	715.0	93.9%	5.4%	0.3%	0.0%	0.3%	0.1%
Lower Limb [3]	225.5	86.3%	12.8%	0.5%	0.0%	0.3%	0.1%
All Fractures	949.8	91.8%	7.5%	0.4%	0.0%	0.3%	0.0%
18 to 44 years							
Torso	124.5	51.4%	46.9%	0.5%	0.0%	1.2%	0.0%
Upper Limb	605.8	88.2%	10.7%	0.4%	0.0%	0.7%	0.0%
Lower Limb	430.3	77.5%	21.5%	0.3%	0.0%	0.6%	0.1%
All Fractures	1,116.7	82.8%	16.1%	0.3%	0.0%	0.7%	0.1%
45 to 64 years							
Torso	175.2	55.8%	42.6%	0.7%	0.1%	0.9%	0.0%
Upper Limb	419.1	82.6%	16.1%	0.6%	0.0%	0.6%	0.1%
Lower Limb	387.9	66.7%	32.0%	0.7%	0.1%	0.5%	0.0%
	934.7	74.1%	24.5%	0.7%	0.1%	0.6%	0.0%
65 to 74 years							
Torso	65.0	48.4%	49.0%	1.5%	0.3%	0.8%	0.0%
Upper Limb	145.1	77.4%	20.9%	1.1%	0.2%	0.5%	0.0%
Lower Limb	141.4	42.7%	55.5%	1.2%	0.2%	0.4%	0.0%
All Fractures	335.5	60.0%	38.1%	1.2%	0.2%	0.5%	0.0%
75 to 84 years							
Torso	83.1	40.4%	55.9%	2.6%	0.4%	0.6%	0.1%
Upper Limb	138.8	67.5%	29.3%	2.4%	0.3%	0.5%	0.0%
Lower Limb	172.8	21.0%	76.8%	1.6%	0.2%	0.4%	0.0%
All Fractures	375.7	42.9%	54.2%	2.1%	0.3%	0.4%	0.1%
85 years and over							
Torso	79.9	31.3%	63.1%	4.6%	0.5%	0.5%	0.0%
Upper Limb	96.6	55.6%	37.1%	5.5%	0.5%	0.4%	0.9%
Lower Limb	171.6	10.3%	87.0%	2.3%	0.2%	0.3%	0.0%
All Fractures	331.9	28.6%	66.9%	3.8%	0.3%	0.4%	0.0%
All Ages							
Torso	543.2	47.7%	49.6%	1.6%	0.2%	0.8%	0.1%
Upper Limb	2,120.4	85.4%	13.2%	0.8%	0.1%	0.5%	0.0%
Lower Limb	1,529.4	58.9%	39.6%	0.9%	0.1%	0.4%	0.1%
All Fractures	4,044.6	72.9%	25.6%	0.9%	0.1%	0.5%	0.0%

[1] Fracture of sternum, larynx, trachea, and pelvis

[2] Fracture of clavicle, scapula, humerus, radius, ulna, carpal and metacarpal bones, phalanges of hand

[3] Fracture of femur, patella, tibia, fibula, ankle, tarsal and metatarsal bones, phalanges of foot

Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Table 6A.5.1: Bed Days Due to Major Health Conditions by Gender for Persons Age 18 and Over, United States 2012

	Bed Days [1]		
	Persons Reporting Bed Days (in 000s)	Mean Bed Days	Total Bed Days (in millions)
All Causes [2]			
Total Population	79,720	9.4	751.8
Male	33,175	8.0	264.7
Female	46,546	10.5	486.9
18 to 44 Years	20,949	10.3	216.4
45 to 64 Years	32,766	10.9	355.5
65 Years & Over	26,005	6.9	179.4
Musculoskeletal Conditions			
Fracture/Bone/Joint Injury [4]			
Total Population	8,216	12.2	99.9
Male	3,916	11.5	45.1
Female	4,300	12.8	54.8
18 to 44 Years	2,436	8.4	20.4
45 to 64 Years	3,727	14.0	52.3
65 Years & Over	2,052	13.2	27.1
Missing or Amputated Limb [5]			
Total Population	478	22.0	10.5
Male	367	22.8	8.4
Female	*	*	*
18 to 44 Years	*	*	*
45 to 64 Years	288	33.8	9.8
65 Years & Over	*	*	*
Other Injury [6]			
Total Population	3,041	13.0	39.5
Male	1,421	9.9	14.0
Female	1,620	15.7	25.4
18 to 44 Years	1,020	15.1	15.4
45 to 64 Years	1,535	13.3	20.4
65 Years & Over	486	7.6	3.7

	Bed Days [1]		
	Persons Reporting Bed Days (in 000s)	Mean Bed Days	Total Bed Days (in millions)
All Musculoskeletal Injuries or Conditions [3]			
Total Population	57,554	9.2	528.3
Male	23,477	8.2	192.0
Female	34,077	9.9	336.3
18 to 44 Years	13,623	10.4	141.4
45 to 64 Years	25,226	10.4	261.8
65 Years & Over	18,705	6.7	125.1
Back/Neck Problem [7]			
Total Population	22,315	12.3	274.0
Male	9,811	11.7	115.1
Female	12,504	12.7	159.1
18 to 44 Years	6,622	13.4	88.9
45 to 64 Years	10,078	13.8	139.3
65 Years & Over	5,614	8.2	45.9
Arthritis/Rheumatism [8]			
Total Population	26,472	10.3	272.9
Male	9,456	8.2	77.2
Female	17,016	11.5	195.9
18 to 44 Years	2,818	15.7	44.2
45 to 64 Years	11,832	11.6	137.4
65 Years & Over	11,823	7.7	91.5
Musculoskeletal/Connective Tissue Problem [9]			
Total Population	14,711	8.9	131.5
Male	5,636	5.9	33.2
Female	9,075	10.8	98.3
18 to 44 Years	4,048	8.1	32.8
45 to 64 Years	6,734	11.7	79.1
65 Years & Over	3,928	5.0	19.6

* Does not meet standards for reliability.

[1] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[2] Respondents reported "Yes" when asked "Are you limited in any way in any activities because of physical, mental or emotional problems."

[3] Limitation caused by: "Fracture/bone/joint injury; Back/neck problem; Arthritis/Rheumatism; Amputated limb/finger/digit; or Musculoskeletal/connective tissue problem."

[4] Limitation caused by: "Fracture/bone/joint injury."

[5] Limitation caused by: "Missing or amputated limb/finger/digit."

[6] Limitation caused by: "Other injury."

[7] Limitation caused by: "Back/neck problem."

[8] Limitation caused by: "Arthritis/rheumatism."

[9] Limitation caused by: "Musculoskeletal/connective tissue problem."

Source: National Health Interview Survey (NHIS)_Adult sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 6A.5.2: Lost Work Days Due to Major Health Conditions by Gender for Persons Age 18 and Over, United States 2012

	Work Days Lost [1]		
	Persons Reporting Lost Work Days (in 000s)	Mean Work Days Lost	Total Work Days Lost (in millions)
All Causes [2]			
Total Population	38,014	8.2	309.8
Male	17,050	8.7	148.2
Female	20,964	7.7	161.6
18 to 44 Years	14,709	8.6	126.1
45 to 64 Years	19,307	8.6	166.6
65 Years & Over	3,998	4.3	17.1
Musculoskeletal Conditions			
Fracture/Bone/Joint Injury [4]			
Total Population	4,418	9.4	41.4
Male	2,255	7.4	16.6
Female	2,163	11.5	24.8
18 to 44 Years	1,841	9.6	17.6
45 to 64 Years	2,221	9.3	20.5
65 Years & Over	356	9.2	3.3
Missing or Amputated Limb [5]			
Total Population	149	4.6	0.7
Male	147	4.5	0.7
Female	*	*	*
18 to 44 Years	*	*	*
45 to 64 Years	68	7.9	0.5
65 Years & Over	*	*	*
Other Injury [6]			
Total Population	1,822	13.7	25.0
Male	933	15.3	14.2
Female	888	12.1	10.7
18 to 44 Years	772	12.8	9.8
45 to 64 Years	964	15.4	14.8
65 Years & Over	85	3.6	0.3

	Work Days Lost [1]		
	Persons Reporting Lost Work Days (in 000s)	Mean Work Days Lost	Total Work Days Lost (in millions)
All Musculoskeletal Injuries or Conditions [3]			
Total Population	28,076	7.7	216.5
Male	12,698	8.0	102.0
Female	15,378	7.5	114.6
18 to 44 Years	9,984	8.5	85.2
45 to 64 Years	15,087	8.1	121.5
65 Years & Over	3,005	3.4	10.1
Back/Neck Problem [7]			
Total Population	10,846	10.0	108.3
Male	5,215	12.2	63.4
Female	5,631	8.0	45.0
18 to 44 Years	4,642	10.9	50.8
45 to 64 Years	5,417	10.4	56.3
65 Years & Over	786	1.7	1.3
Arthritis/Rheumatism [8]			
Total Population	9,935	7.9	78.2
Male	3,912	7.9	31.0
Female	6,024	7.8	47.2
18 to 44 Years	1,940	9.1	17.7
45 to 64 Years	6,284	8.7	54.7
65 Years & Over	1,712	3.4	5.8
Musculoskeletal Connective Tissue Problem [9]			
Total Population	7,842	6.7	52.5
Male	3,513	5.0	17.6
Female	4,329	8.1	34.9
18 to 44 Years	2,984	6.6	19.6
45 to 64 Years	4,196	7.6	31.8
65 Years & Over	663	1.7	1.1

* Does not meet standards for reliability.
[1] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.
[2] Respondents reported "Yes" when asked "Are you limited in any way in any activities because of physical, mental or emotional problems."
[3] Limitation caused by: "Fracture/bone/joint injury; Back/neck problem; Arthritis/Rheumatism; Amputated limb/finger/digit; or
[4] Limitation caused by: "Fracture/bone/joint injury."
[5] Limitation caused by: "Missing or amputated limb/finger/digit."
[6] Limitation caused by: "Other injury."
[7] Limitation caused by: "Back/neck problem."
[8] Limitation caused by: "Arthritis/rheumatism."
[9] Limitation caused by: "Musculoskeletal/connective tissue problem."
Source: National Health Interview Survey (NHIS)_Adult sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 6A.5.3: Summary of Bed and Lost Work Days Due to Health Problems for Persons Age 18 and Over, United States 2012

	Bed Days [2]		Lost Work Days [3]	
Cause of Bed/Lost Work Days [1]	Total (in millions)	% of All Causes	Total (in millions)	% of All Causes
Back/Neck Pain [4]	274.0	36%	108.3	35%
Arthritis/Rheumatism [5]	272.9	36%	78.2	25%
Musculoskeletal/Connective Tissue Problem [6]	131.5	17%	52.5	17%
Fracture/Bone/Joint Pain [7]	99.9	13%	41.4	13%
Other Injury [8]	39.5	5%	25.0	8%
Missing or Amputated Limb [9]	10.5	1%	0.7	0%
All Musculoskeletal Conditions [10]	528.3	70%	216.5	70%
Non-Musculoskeletal Injury	39.5	5%	25.0	8%
Other Medical Cause	183.9	24%	68.3	22%
All Causes	751.8		309.8	

[1] Respondents reported "Yes" when asked "Are you limited in any way in any activities because of physical, mental or emotional problems." Multiple conditions as cause of bed/lost work days reported by some respondents.

[2] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[3] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

[4] Limitation caused by: "Back/neck problem."

[5] Limitation caused by: "Arthritis/rheumatism."

[6] Limitation caused by: "Musculoskeletal/connective tissue problem."

[7] Limitation caused by: "Fracture/bone/joint injury."

[8] Limitation caused by: "Other injury."

[9] Limitation caused by: "Missing or amputated limb/finger/digit."

[10] Multiple musculoskeletal conditions may be identified as a cause of bed or lost work days.

Source: National Health Interview Survey (NHIS)_Adult sample, 2012.
www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 6B.1.1: Musculoskeletal Disorders (MSDs) for Work-Related Injuries and Illnesses Involving Days Away from Work [1], United States 1992-2010

	All Cases of Work-related Injuries and Illnesses	MSDs [2]	% of MSD Cases to All Cases
1992	2,331,098	784,145	33.6%
1993	2,252,591	762,727	33.9%
1994	2,236,639	755,594	33.8%
1995	2,040,929	695,789	34.1%
1996	1,880,525	647,355	34.4%
1997	1,833,380	626,352	34.2%
1998	1,730,534	592,544	34.2%
1999	1,702,420	582,340	34.2%
2000	1,664,018	577,814	34.7%
2001	1,537,567	522,528	34.0%
2002	1,436,194	487,915	34.0%
2003	1,315,920	435,180	33.1%
2004	1,259,320	402,700	32.0%
2005	1,234,860	375,540	30.4%
2006	1,183,500	357,160	30.2%
2007	1,158,870	335,390	28.9%
2008	1,078,140	317,440	29.4%
2009	964,990	283,800	29.4%
2010	933,200	284,340	30.5%

[1] Median days away from work is the measure used to summarize the varying lengths of absences from work among the cases with days away from work. Half the cases involved more days and half involved less days than a specified median.

[2] Musculoskeletal disorders (MSD) include cases where the nature of the injury or illness is sprains, strains, tears; back pain, hurt back; soreness, pain, hurt, except the back; carpal tunnel syndrome; hernia; or musculoskeletal system and connective tissue diseases or disorders, when the event or exposure leading to the injury or illness is bodily reaction/bending, climbing, crawling, reaching, twisting; overexertion; or repetition.

Source (1992 to 1997): U.S. Department of Labor, Bureau of Labor Statistics: *Worker Health Chartbook 2004* . Available at: http://www2a.cdc.gov/niosh-Chartbook/imagedetail.asp?imgid=77. Accessed August 24, 2007.

Source (1998 to 1999): U.S. Department of Labor, Bureau of Labor Statistics, Injuries, Illnesses and Fatalities Program: Case and Demographic Characteristics for Work-related Injuries and Illnesses Involving Days Away from Work. "Table 10. Number, percent, and incidence rate of nonfatal occupational injuries and illnesses involving days away from work by selected worker and case characteristics and musculoskeletal disorders, All United States, private industry, 2006 and 2007". Available at: http://www.bls.gov/iif/oshwc/osh/case/ostb1790.pdf and http://www.bls.gov/iif/oshwc/osh/case/ostb1941.pdf. Accessed November 11, 2009.

Source (2000-2010): "Supplemental Table 6: Number, percent distribution, and median days away from work for nonfatal occupational injuries and illnesses involving days away from work by selected worker and case characteristics and musculoskeletal disorders, (2000 thru 2010)". U.S. Department of Labor, Bureau of Labor Statistics. http://www.bls.gov/iif/oshcdnew.htm. (October 25, 2013)

Table 6B.1.2: Trends in Injuries Involving Days Away from Work [1] in Private Industry by Sex, United States 2008 to 2011

		All Injuries		
		Male	**Female**	**Total**
2008	Number	688,790	384,930	1,078,140
	Percent	63.9%	35.7%	
	Incidence Rate	124.8	97.3	113.3
	Median Days-	*	*	8.0
2009	Number	596,930	363,930	964,990
	Percent	61.9%	37.7%	
	Incidence Rate	114.8	94.9	106.4
	Median Days-	9	6	8
2010	Number	563,850	365,610	933,200
	Percent	60.4%	39.2%	
	Incidence Rate	113.6	99.7	107.7
	Median Days-	9	7	8
2011	Number	559,740	344,730	908,310
	Percent	61.6%	38.0%	
	Incidence Rate	112.3	95.3	105.2
	Median Days-	*	*	*

* Data not available

[1] Days-away-from-work cases include those that result in days-away-from-work with or without job transfer or restriction.

[2] Incidence rates represent the number of injuries and illnesses per 10,000 full-time workers.

Source: "Table 1: Number, percent, and incidence rate of nonfatal occupational injuries and illnesses involving days away from work by selected worker and case characteristics and gender, All United States, private industry, (2008 - 2011)" AND "Table R102/R111: Incidence rates for nonfatal occupational injuries and illnesses involving days away from work per 10,000 full-time workers by event or exposure leading to injury or illness and gender, private industry, (2009/ 2010)". U.S. Department of Labor, Bureau of Labor Statistics. http://www.bls.gov/iif/oshcdnew.htm (October 25, 2013)

Table 6B.2.1: Median Days Away from Work [1] for Nonfatal Injuries and Illnesses by Nature of Injury or Illnesses, United States 1997-2011

	Median Days Away from Work								
	1997	1999	2001	2003	2005	2007	2009	2010	2011
Fractures	21	20	21	30	27	30	30	30	*
Carpal Tunnel Syndrome (MSD & Other)	25	27	25	32	27	28	21	27	*
Amputations	18	18	18	30	22	21	21	21	*
Tendonitis (MSD & Other)	11	9	10	11	12	10	14	10	*
Multiple Traumatic Injuries	7	7	8	9	8	10	9	10	*
Sprains, Strains (MSD & Other)	6	6	6	8	8	8	9	10	*
Soreness, Pain (except Back)	NA	NA	NA	NA	NA	8	8	8	*
Back Pain	NA	NA	NA	NA	NA	8	8	7	*
Heat Burns	4	4	5	5	5	5	5	5	*
Bruises, Contusions	3	3	3	4	4	4	4	4	*
Cuts, Lacerations, Punctures	3	3	3	4	4	4	4	4	*
Chemical Burns	2	3	2	2	3	1	3	3	*
Musculoskeletal Disorders (MSDs) [2]	*	7	8	10	9	9	10	11	11
All Workplace Injuries	5	6	6	8	7	7	8	8	8
MSD Cases (in 000s)	*	582.3	522.5	435.2	375.5	335.4	283.8	284.3	*
All Workplace Injuries (in 000s)	1,833.3	1,702.5	1,537.6	1,315.9	1,234.7	1158.9	965.0	933.2	908.3

* Data not available

[1] Median days away from work is the measure used to summarize the varying lengths of absences from work among the cases with days away from work. Half the cases involved more days and half involved less days than a specified median.

[2] Musculoskeletal disorders (MSD) include cases where the nature of the injury or illness is sprains, strains, tears; back pain, hurt back; soreness, pain, hurt, except the back; carpal tunnel syndrome; hernia; or musculoskeletal system and connective tissue diseases or disorders, when the event or exposure leading to the injury or illness is bodily reaction/bending, climbing, crawling, reaching, twisting; overexertion; or repetition.

Source (1997 to 2005): U.S. Department of Labor, Bureau of Labor Statistics, Survey of Occupational Injuries and Illnesses." Table 9 (1997-2001) or 11 (2003-2005): Percent distribution of nonfatal occupational injuries and illnesses involving days away from work by selected injury or illness characteristics and number of days away from work: Nature of injury or illness. Lost work time:1996-2005". Available at: www.bls.gov/iif/oshcdnew.htm. Accessed July 7, 2007.

Source (2007): U.S. Department of Labor, Bureau of Labor Statistics, Injuries, Illnesses and Fatalities Program: "Case and Demographic Characteristics for Work-related Injuries and Illnesses Involving Days Away from Work. 2007 nonfatal occupational injuries and illnesses: case and demographics". November 20, 2008, reissued March 2009. Available at: http://www.bls.gov/iif/oshwc/osh/case/osch0038.pdf. Accessed November 13, 2009.

Source (2008-2010): "Supplemental Table 6: Number, percent distribution, and median days away from work for nonfatal occupational injuries and illnesses involving days away from work by selected worker and case characteristics and musculoskeletal disorders, (2008 - 2010"). U.S. Department of labor, Bureau of Labor Statistics. http://www.bls.gov/iif/oshcdnew.htm (October 25, 2013)

Table 6B.2.2: Nonfatal Occupational Injuries Involving Days Away from Work [1] by Age, United States 2011

	Age								
	14 to 15	16 to 19	20 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 +	Total
Sprains and Strains									
Number	130	5,950	29,020	77,130	84,830	91,980	50,990	7,900	352,950
% Total Injuries	0.0%	1.7%	8.2%	21.9%	24.0%	26.1%	14.4%	2.2%	
Open Wounds									
Number	30	5,320	14,310	23,050	18,880	17,610	9,350	1,660	92,380
% Total Injuries	0.0%	5.8%	15.5%	25.0%	20.4%	19.1%	10.1%	1.8%	
Fractures									
Number	0	940	5,850	16,160	14,690	20,240	17,790	4,820	81,300
% Total Injuries	0.0%	1.2%	7.2%	19.9%	18.1%	24.9%	21.9%	5.9%	
Carpal Tunnel Syndrome									
Number	0	0	180	1,280	1,850	3,340	1,350	190	8,300
% Total Injuries	0.0%	0.0%	2.2%	15.4%	22.3%	40.2%	16.3%	2.3%	
Tendonitis									
Number	0	30	210	570	730	930	380	130	3,050
% Total Injuries	0.0%	1.0%	6.9%	18.7%	23.9%	30.5%	12.5%	4.3%	
Nonfatal Injuries and Illnesses									
Number	200	20,030	85,940	198,660	202,270	225,680	133,740	26,670	908,310
% Total Injuries	0.0%	2.2%	9.5%	21.9%	22.3%	24.8%	14.7%	2.9%	

[1] Days-away-from-work cases include those that result in days-away-from-work with or without job transfer or restriction.

Source: "Table R45: Number of nonfatal occupational injuries and illnesses involving days away from work by nature of injury or illness and age of worker, private industry, 2011". U.S. Department of Labor, Bureau of Labor Statistics. http://www.bls.gov/iif/oshwc/osh/case/ostb3247.pdf (October 25, 2013)

Table 6B.3.1: Private-Industry Work-Related Injuries Involving Days Away from Work [1] by Body Part Affected, United States 2011

	Number	Rate per 10,000 Workers	Proportion Total Injuries
Head	60,950	7.1	6.7%
Neck	12,120	1.4	1.3%
Trunk (total)	236,070	27.3	26.0%
Back	*182,270*	*21.1*	*20.1%*
Upper Extremities (total)	285,650	33.1	31.4%
Shoulder	*67,980*	*7.9*	*7.5%*
Arm	*44,750*	*1.7*	*4.9%*
Wrist	*38,650*	*4.5*	*4.3%*
Hand	*118,170*	*13.7*	*13.0%*
Lower Extremities (total)	204,040	23.6	22.5%
Knee	*78,600*	*9.1*	*8.7%*
Ankle	*46,040*	*5.3*	*5.1%*
Foot, Toe	*42,160*	*4.9*	*4.6%*
Body Systems	17,520	2.0	1.9%
Multiple Parts	86,110	10.0	9.5%
All Other	5,840	0.7	0.6%
Total Cases	908,310	105.2	

[1] Days-away-from-work cases include those that result in days-away-from-work with or without job transfer or restriction.

Source: "Table R2: Number of nonfatal occupational injuries and illnesses involving days away from work by industry and selected parts of body affected by injury or illness, private industry, 2011" AND "Table R73: Incidence rates for nonfatal occupational injuries and illnesses involving days away from work per 10,000 full-time workers by part of body affected by injury or illness and industry sector, private industry, 2011". U.S. Department of Labor, Bureau of Labor Statistics.
http://www.bls.gov/iif/oshwc/osh/case/ostb3204.pdf (October 24, 2013)

Table 6C.1: Average Number of Injuries From Sport Activities Treated Per Year in Emergency Departments by Activity and Sex, United States 2011-2013

	Proportion of Total Injuries: Musculoskeletal	Proportion of Total Injuries: Other	Total Injuries (in 000s)	Proportion of Total Injuries	Proportion of Musculoskeletal Injuries: Male	Proportion of Musculoskeletal Injuries: Female	Total Musculoskeletal Injuries (in 000s)	Proportion of Total Injuries
TEAM SPORTS [1]								
Baseball/Softball	66.4%	33.6%	256.8	15.5%	64.3%	35.7%	170.5	15.0%
Basketball	72.1%	27.9%	546.7	33.1%	80.8%	19.2%	393.9	34.5%
Football	70.3%	29.7%	466.3	28.2%	93.5%	6.5%	328.0	28.8%
Hockey (Field/Ice/Roller)	52.3%	47.7%	80.9	4.9%	79.0%	21.0%	42.3	3.7%
Soccer	65.7%	34.3%	224.9	13.6%	63.1%	36.9%	160.9	14.1%
Volleyball	78.1%	21.9%	57.9	3.5%	33.5%	66.5%	44.7	3.9%
Total Team Sports	69.0%	31.0%	1,652.8		77.6%	22.4%	1,140.3	
INDIVIDUAL SPORTS								
All Terrain Vehicles/Motorized Bikes [2]	66.8%	33.2%	224.3	7.9%	74.4%	25.6%	149.8	8.8%
Ball Sports [3]	68.6%	31.4%	82.9	2.9%	59.7%	40.3%	56.9	3.3%
Bicycle/Wheeled [4]	59.4%	40.6%	610.2	21.5%	69.3%	30.7%	362.4	21.2%
Contact Sports [5]	69.8%	30.2%	99.2	3.5%	85.0%	15.0%	69.3	4.1%
Fitness Training [6]	57.8%	42.2%	447.4	15.8%	54.0%	46.0%	258.6	15.1%
Gymnastics/Cheering leading/Dancing [7]	70.9%	29.1%	130.3	4.6%	15.0%	85.0%	92.4	5.4%
Mountain Climbing	68.5%	31.5%	4.7	0.2%	65.1%	34.9%	3.2	0.2%
Playground Equipment [8]	65.3%	34.7%	251.4	8.9%	49.6%	50.4%	164.2	9.6%
Skating [9]	73.7%	26.3%	204.3	7.2%	60.8%	39.2%	150.5	8.8%
Snow Sports [10]	71.9%	28.1%	103.7	3.7%	62.2%	37.8%	74.6	4.4%
Track and Field [11]	63.6%	36.4%	29.0	1.0%	45.3%	54.7%	18.5	1.1%
Water Sports [12]	33.4%	66.6%	216.9	7.7%	52.4%	47.6%	72.4	4.2%
Other Activities [13]	54.9%	45.1%	428.1	15.1%	51.1%	48.8%	234.8	13.7%
Total Individual Sports	60.3%	39.7%	2,832.4		58.4%	41.6%	1,707.7	
Total Team and Individual Sports	63.5%	36.5%	4,485.2		66.1%	33.9%	2,848.0	

[1] Includes both organized and informal team sports.
[2] Includes snowmobiles, ATVs, dune buggies, mopeds, and other power-assisted bikes, carts, scooters, and boats.
[3] Includes table tennis, tetherball, handball, badminton, squash, tennis, and other sports played with a small ball.
[4] Includes bicycles, tricycles, scooters, and unpowered wheel riding toys.
[5] Includes boxing, wrestling, and martial arts.
[6] Includes exercise with and without equipment and weightlifting.
[7] Includes organized and informal gymnastics, cheerleading, and dancing.
[8] Includes slides, see-saws, monkey bars and climbing apparatus, swings, pogo sticks, and other playground equipment.
[9] Includes roller and ice skating, in-line skates, and skateboards.
[10] Includes sleds, toboggans, snow disks, snow tubing, snow skiing, and snowboarding.
[11] Includes all track and field activities.
[12] Includes wading and swimming pools, diving, water slides, tubing, water skiing, surfing, water polo, and all activities performed in the act of swimming or on flotation devices.
[13] Includes all other athletic or play activities, including amusement attractions, archery, bowling, fencing, fishing, air guns, golfing, horseback riding, horseshoes, skeet shooting, trampolines, and tree or play houses.
Source: United States Consumer Product Safety Commission. National Electronic Injury Surveillance System, 2011, 2012, 2013. https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014.

Table 6C.2: Proportion of Musculoskeletal Injuries From Sport Activities Treated Per Year in Emergency Departments by Activity and Age, United States 2011-2013

	Proportion of Total Musculoskeletal Injuries							Total Musculoskeletal Injuries (in 000s)
	<2	2 to 12	13 to 18	19 to 24	25 to 44	45 to 64	65 & Over	
TEAM SPORTS [1]								
Baseball/Softball	*	26.7%	36.1%	8.2%	22.5%	5.9%	0.7%	170.5
Basketball	*	17.1%	46.3%	18.1%	16.0%	2.4%	0.2%	393.9
Football	*	28.1%	51.8%	9.6%	9.1%	1.2%	*	328.0
Hockey (Field/Ice/Roller)	*	14.1%	55.2%	13.1%	14.1%	3.4%	*	42.3
Soccer	*	27.8%	43.9%	10.4%	15.3%	2.4%	*	160.9
Volleyball	*	11.7%	53.5%	10.9%	17.1%	6.1%	*	44.7
Total Team Sports	0.0%	22.9%	46.6%	12.6%	14.8%	2.8%	0.2%	1,140.3
INDIVIDUAL SPORTS								
All Terrain Vehicles/Motorized Bikes [2]	*	14.7%	20.7%	17.3%	33.4%	11.4%	2.3%	149.8
Ball Sports [3]	*	33.9%	24.5%	7.9%	16.0%	11.5%	5.9%	56.9
Bicycle/Wheeled [4]	0.2%	34.1%	16.5%	9.2%	18.7%	17.2%	3.8%	362.4
Contact Sports [5]	*	15.9%	41.8%	15.0%	23.7%	3.5%	*	69.3
Fitness Training [6]	0.2%	9.1%	16.1%	14.0%	35.0%	18.6%	7.0%	258.6
Gymnastics/Cheering leading/Dancing [	*	29.4%	41.0%	9.7%	12.1%	5.3%	2.3%	92.4
Mountain Climbing	*	*	14.5%	30.4%	39.1%	*	*	3.2
Playground Equipment [8]	1.7%	84.9%	4.7%	1.5%	3.6%	1.2%	0.5%	164.2
Skating [9]	*	32.4%	31.3%	14.3%	16.3%	5.2%	0.4%	150.5
Snow Sports [10]	*	19.8%	25.6%	16.5%	23.1%	12.0%	2.8%	74.6
Track and Field [11]	*	16.5%	68.9%	4.0%	6.6%	3.2%	*	18.5
Water Sports [12]	*	24.7%	17.6%	11.9%	25.5%	14.8%	4.6%	72.4
Other Activities [13]	0.3%	40.0%	20.9%	6.7%	15.7%	11.3%	4.7%	234.8
Total Individual Sports	0.3%	31.9%	21.2%	10.6%	20.5%	11.6%	3.4%	1,707.7
Total Team and Individual Sports	0.2%	28.3%	31.4%	11.4%	18.3%	8.1%	2.2%	2,848.0

* Does not meet standards for reliability.
[1] Includes both organized and informal team sports.
[2] Includes snowmobiles, ATVs, dune buggies, mopeds, and other power-assisted bikes, carts, scooters, and boats.
[3] Includes table tennis, tetherball, handball, badminton, squash, tennis, and other sports played with a small ball.
[4] Includes bicycles, tricycles, scooters, and unpowered wheel riding toys.
[5] Includes boxing, wrestling, and martial arts.
[6] Includes exercise with and without equipment and weightlifting.
[7] Includes organized and informal gymnastics, cheerleading, and dancing.
[8] Includes slides, see-saws, monkey bars and climbing apparatus, swings, pogo sticks, and other playground equipment.
[9] Includes roller and ice skating, in-line skates, and skateboards.
[10] Includes sleds, toboggans, snow disks, snow tubing, snow skiing, and snowboarding.
[11] Includes all track and field activities.
[12] Includes wading and swimming pools, diving, water slides, tubing, water skiing, surfing, water polo, and all activities performed in the act of swimming or on flotation devices.
[13] Includes all other athletic or play activities, including amusement attractions, archery, bowling, fencing, fishing, air guns, golfing, horseback riding, horseshoes, skeet shooting, trampolines, and tree or play houses.
Source: United States Consumer Product Safety Commission. National Electronic Injury Surveillance System, 2011, 2012, 2013. https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014.

Table 6C.3: Average Number of Musculoskeletal Injuries From Sport Activities Treated Per Year in Emergency Departments by Activity and Injury Type, United States 2011-2013

	Proportion of Total Musculoskeletal Injuries [14]						Total Injuries (in 000s)
	Amputation	Contusions	Crushing Injury	Dislocation	Fracture	Sprain or Strain	
TEAM SPORTS [1]							
Baseball/Softball	*	35.6%	*	3.6%	26.0%	34.7%	170.5
Basketball	*	15.3%	*	5.1%	20.7%	58.8%	393.9
Football	*	22.5%	*	5.3%	28.4%	43.7%	328.0
Hockey (Field/Ice/Roller)	*	32.9%	*	3.6%	29.2%	34.1%	42.3
Soccer	*	21.6%	*	4.3%	29.1%	44.9%	160.9
Volleyball	*	15.2%	*	6.1%	16.8%	61.8%	44.7
Total Team Sports	*	22.0%	0.1%	4.8%	25.1%	48.1%	1,140.3
INDIVIDUAL SPORTS							
All Terrain Vehicles/Motorized Bikes [2]	*	35.9%	0.5%	2.5%	36.2%	24.7%	149.8
Ball Sports [3]	0.0%	20.9%	*	5.2%	26.3%	47.5%	56.9
Bicycle/Wheeled [4]	0.1%	41.7%	0.2%	2.2%	35.4%	20.4%	362.4
Contact Sports [5]	*	23.1%	0.0%	6.4%	27.1%	43.4%	69.3
Fitness Training [6]	*	15.4%	0.7%	3.4%	14.8%	65.6%	258.6
Gymnastics/Cheering leading/Dancing [7]	0.0%	14.3%	*	5.4%	21.7%	58.5%	92.4
Mountain Climbing	*	17.7%	*	*	36.1%	40.9%	3.2
Playground Equipment [8]	*	26.7%	*	2.3%	51.1%	19.8%	164.2
Skating [9]	*	22.9%	*	2.4%	42.3%	32.3%	150.5
Snow Sports [10]	*	18.3%	*	6.6%	40.1%	35.0%	74.6
Track and Field [11]	0.0%	12.6%	0.0%	2.8%	20.4%	64.1%	18.5
Water Sports [12]	*	29.6%	*	6.0%	22.4%	41.8%	72.4
Other Activities [13]	*	24.9%	0.3%	2.7%	31.2%	40.7%	234.8
Total Individual Sports	0.1%	27.0%	0.3%	3.3%	32.0%	37.4%	1,707.7
Total Team and Individual Sports	0.1%	25.0%	0.2%	3.9%	29.2%	41.7%	2,848.0

* Does not meet standards for reliability.
[1] Includes both organized and informal team sports.
[2] Includes snowmobiles, ATVs, dune buggies, mopeds, and other power-assisted bikes, carts, scooters, and boats.
[3] Includes table tennis, tetherball, handball, badminton, squash, tennis, and other sports played with a small ball.
[4] Includes bicycles, tricycles, scooters, and unpowered wheel riding toys.
[5] Includes boxing, wrestling, and martial arts.
[6] Includes exercise with and without equipment and weightlifting.
[7] Includes organized and informal gymnastics, cheerleading, and dancing.
[8] Includes slides, see-saws, monkey bars and climbing apparatus, swings, pogo sticks, and other playground equipment.
[9] Includes roller and ice skating, in-line skates, and skateboards.
[10] Includes sleds, toboggans, snow disks, snow tubing, snow skiing, and snowboarding.
[11] Includes all track and field activities.
[12] Includes wading and swimming pools, diving, water slides, tubing, water skiing, surfing, water polo, and all activities performed in the act of swimming or on flotation devices.
[13] Includes all other athletic or play activities, including amusement attractions, archery, bowling, fencing, fishing, air guns, golfing, horseback riding, horseshoes, skeet shooting, trampolines, and tree or play houses.
[14] Includes amputations, contusions, crushing injuries, dislocations, fractures, and sprains and strains.
Source: United States Consumer Product Safety Commission. National Electronic Injury Surveillance System, 2011, 2012, 2013. https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014.

Table 6C.4: Average Number of Musculoskeletal Injuries From Sport Activities Treated Per Year in Emergency Departments by Activity and Injury Site, United States 2011-2013

	Proportion of Total Musculoskeletal Injuries [14]						Total
	Upper Extremity	Lower Extremity	Trunk	Head	More than 25% of Body	Not Reported	Injuries (in 000s)
TEAM SPORTS [1]							
Baseball/Softball	39.6%	32.1%	9.1%	19.2%	0.0%	0.0%	170.5
Basketball	35.3%	51.9%	6.9%	5.8%	0.0%	0.0%	393.9
Football	50.9%	32.8%	12.5%	3.7%	0.0%	0.0%	328.0
Hockey (Field/Ice/Roller)	48.9%	29.4%	14.7%	7.0%	0.0%	0.1%	42.3
Soccer	32.6%	53.8%	8.1%	5.5%	0.0%	0.0%	160.9
Volleyball	42.4%	46.4%	6.7%	4.4%	0.0%	0.0%	44.7
Total Team Sports	40.8%	42.7%	9.3%	7.2%	0.0%	0.0%	1,140.3
INDIVIDUAL SPORTS							
All Terrain Vehicles/Motorized Bikes [2]	39.0%	27.7%	25.1%	7.1%	*	1.0%	149.8
Ball Sports [3]	43.5%	39.9%	9.0%	7.6%	0.0%	0.0%	56.9
Bicycle/Wheeled [4]	46.7%	26.3%	16.2%	9.6%	*	1.1%	362.4
Contact Sports [5]	49.2%	27.9%	16.2%	6.7%	0.0%	0.0%	69.3
Fitness Training [6]	24.4%	45.9%	26.9%	2.7%	*	0.1%	258.6
Gymnastics/Cheering leading/Dancing [7]	31.5%	49.5%	15.0%	3.9%	0.0%	0.1%	92.4
Mountain Climbing	23.2%	60.1%	14.2%	*	0.0%	0.2%	3.2
Playground Equipment [8]	58.1%	21.3%	11.1%	9.6%	0.0%	0.0%	164.2
Skating [9]	55.9%	32.0%	8.0%	4.0%	*	0.2%	150.5
Snow Sports [10]	48.9%	28.2%	18.4%	4.3%	*	0.2%	74.6
Track and Field [11]	19.7%	62.3%	15.4%	*	0.0%	0.2%	18.5
Water Sports [12]	26.6%	37.9%	25.7%	9.7%	0.0%	0.1%	72.4
Other Activities [13]	35.0%	37.2%	21.2%	6.5%	*	0.1%	234.8
Total Individual Sports	41.0%	33.7%	18.3%	6.6%	*	0.4%	1,707.7
Total Team and Individual Sports	41.0%	37.3%	14.7%	6.8%	0.0%	0.2%	2,848.0

* Does not meet standards for reliability.
[1] Includes both organized and informal team sports.
[2] Includes snowmobiles, ATVs, dune buggies, mopeds, and other power-assisted bikes, carts, scooters, and boats.
[3] Includes table tennis, tetherball, handball, badminton, squash, tennis, and other sports played with a small ball.
[4] Includes bicycles, tricycles, scooters, and unpowered wheel riding toys.
[5] Includes boxing, wrestling, and martial arts.
[6] Includes exercise with and without equipment and weightlifting.
[7] Includes organized and informal gymnastics, cheerleading, and dancing.
[8] Includes slides, see-saws, monkey bars and climbing apparatus, swings, pogo sticks, and other playground equipment.
[9] Includes roller and ice skating, in-line skates, and skateboards.
[10] Includes sleds, toboggans, snow disks, snow tubing, snow skiing, and snowboarding.
[11] Includes all track and field activities.
[12] Includes wading and swimming pools, diving, water slides, tubing, water skiing, surfing, water polo, and all activities performed in the act of swimming or on flotation devices.
[13] Includes all other athletic or play activities, including amusement attractions, archery, bowling, fencing, fishing, air guns, golfing, horseback riding, horseshoes, skeet shooting, trampolines, and tree or play houses.
[14] Includes amputations, contusions, crushing injuries, dislocations, fractures, and sprains and strains.
Source: United States Consumer Product Safety Commission. National Electronic Injury Surveillance System, 2011, 2012, 2013.
https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014.

Table 6C.5: Average Number of Musculoskeletal Injuries From Sport Activities Treated Per Year in Emergency Departments by Activity and Disposition, United States 2011-2013

	Proportion of Total Musculoskeletal Injuries [14]						Total Injuries (in 000s)
	Treated and Released	Transferred	Hospitalized	Held for Observation	Left without Treatment	DOA or Died in ED	
TEAM SPORTS [1]							
Baseball/Softball	98.0%	0.5%	1.2%	*	*	*	170.5
Basketball	98.7%	0.3%	0.7%	*	0.3%	*	393.9
Football	97.9%	0.5%	1.3%	*	0.2%	*	328.0
Hockey (Field/Ice/Roller)	98.2%	*	1.0%	*	*	*	42.3
Soccer	97.9%	*	1.6%	*	*	*	160.9
Volleyball	99.0%	*	*	*	*	*	44.7
Total Team Sports	98.3%	0.4%	1.1%	*	0.2%	*	1,140.3
INDIVIDUAL SPORTS							
All Terrain Vehicles/Motorized Bikes [2]	88.8%	3.3%	6.9%	0.5%	0.4%	*	149.8
Ball Sports [3]	98.3%	*	1.2%	*	*	0.0%	56.9
Bicycle/Wheeled [4]	92.9%	1.0%	5.3%	0.2%	0.7%	*	362.4
Contact Sports [5]	98.0%	*	1.4%	*	*	0.0%	69.3
Fitness Training [6]	97.3%	*	1.9%	*	0.4%	*	258.6
Gymnastics/Cheering leading/Dancing [7]	97.4%	*	1.7%	*	*	0.0%	92.4
Mountain Climbing	89.0%	*	*	*	0.0%	0.0%	3.2
Playground Equipment [8]	93.2%	2.0%	4.3%	*	*	0.0%	164.2
Skating [9]	96.0%	0.8%	2.8%	*	*	0.0%	150.5
Snow Sports [10]	95.3%	1.4%	3.1%	*	*	0.0%	74.6
Track and Field [11]	98.3%	*	1.2%	*	*	0.0%	18.5
Water Sports [12]	96.2%	*	2.7%	*	*	0.0%	72.4
Other Activities [13]	93.8%	1.4%	4.3%	0.2%	0.2%	0.0%	234.8
Total Individual Sports	94.6%	1.2%	3.7%	0.2%	0.4%	0.0%	1,707.7
Total Team and Individual Sports	96.1%	0.8%	2.7%	0.1%	0.3%	0.0%	2,848.0

* Does not meet standards for reliability.
[1] Includes both organized and informal team sports.
[2] Includes snowmobiles, ATVs, dune buggies, mopeds, and other power-assisted bikes, carts, scooters, and boats.
[3] Includes table tennis, tetherball, handball, badminton, squash, tennis, and other sports played with a small ball.
[4] Includes bicycles, tricycles, scooters, and unpowered wheel riding toys.
[5] Includes boxing, wrestling, and martial arts.
[6] Includes exercise with and without equipment and weightlifting.
[7] Includes organized and informal gymnastics, cheerleading, and dancing.
[8] Includes slides, see-saws, monkey bars and climbing apparatus, swings, pogo sticks, and other playground equipment.
[9] Includes roller and ice skating, in-line skates, and skateboards.
[10] Includes sleds, toboggans, snow disks, snow tubing, snow skiing, and snowboarding.
[11] Includes all track and field activities.
[12] Includes wading and swimming pools, diving, water slides, tubing, water skiing, surfing, water polo, and all activities performed in the act of swimming or on flotation devices.
[13] Includes all other athletic or play activities, including amusement attractions, archery, bowling, fencing, fishing, air guns, golfing, horseback riding, horseshoes, skeet shooting, trampolines, and tree or play houses.
[14] Includes amputations, contusions, crushing injuries, dislocations, fractures, and sprains and strains.
Source: United States Consumer Product Safety Commission. National Electronic Injury Surveillance System, 2011, 2012, 2013.
https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014.

Table 6C.6: Average Number of Musculoskeletal Injuries From Sport Activities Treated Per Year in Emergency Departments by Activity and Location Injury Occurred, United States 2011-2013

	Proportion of Total Musculoskeletal Injuries [14]						
	Home	Street or Public Location	Industrial Site	School	Sports Field	Unknown	Total Musculoskeletal Injuries (in 000s)
TEAM SPORTS [1]							
Baseball/Softball	5.3%	1.0%	0.0%	6.5%	67.9%	19.3%	170.5
Basketball	6.1%	2.0%	*	16.0%	49.0%	26.9%	393.9
Football	6.0%	1.2%	0.0%	20.9%	49.1%	22.8%	328.0
Hockey (Field/Ice/Roller)	1.4%	1.5%	0.0%	11.8%	63.3%	22.1%	42.3
Soccer	3.0%	0.9%	*	11.2%	66.7%	18.2%	160.9
Volleyball	4.1%	*	0.0%	27.4%	50.0%	17.4%	44.7
Total Team Sports	5.3%	1.4%	*	15.6%	54.9%	22.8%	1,140.3
INDIVIDUAL SPORTS							
All Terrain Vehicles/Motorized Bikes [2]	21.0%	19.7%	*	*	18.8%	40.4%	149.8
Ball Sports [3]	9.1%	1.7%	0.0%	31.6%	37.6%	19.9%	56.9
Bicycle/Wheeled [4]	14.4%	46.8%	*	0.6%	5.2%	33.0%	362.4
Contact Sports [5]	5.4%	2.2%	0.0%	18.9%	54.9%	18.6%	69.3
Fitness Training [6]	15.0%	11.3%	0.0%	8.2%	29.6%	36.0%	258.6
Gymnastics/Cheering leading/Dancing [7	7.7%	12.8%	0.0%	18.6%	34.9%	26.0%	92.4
Mountain Climbing	0.0%	*	0.0%	*	85.6%	6.8%	3.2
Playground Equipment [8]	13.6%	3.2%	0.0%	25.1%	36.5%	21.5%	164.2
Skating [9]	9.2%	19.1%	0.0%	1.1%	36.7%	34.0%	150.5
Snow Sports [10]	3.6%	1.7%	0.0%	*	83.4%	11.2%	74.6
Track and Field [11]	*	4.1%	0.0%	43.8%	43.0%	8.3%	18.5
Water Sports [12]	22.9%	3.0%	0.0%	1.4%	43.8%	28.9%	72.4
Other Activities [13]	28.5%	3.7%	0.0%	17.5%	28.0%	22.3%	234.8
Total Individual Sports	15.3%	17.0%	0.0%	9.7%	29.3%	28.8%	1,707.7
Total Team and Individual Sports	11.3%	10.7%	0.0%	12.0%	39.6%	26.4%	2,848.0

* Does not meet standards for reliability.
[1] Includes both organized and informal team sports.
[2] Includes snowmobiles, ATVs, dune buggies, mopeds, and other power-assisted bikes, carts, scooters, and boats.
[3] Includes table tennis, tetherball, handball, badminton, squash, tennis, and other sports played with a small ball.
[4] Includes bicycles, tricycles, scooters, and unpowered wheel riding toys.
[5] Includes boxing, wrestling, and martial arts.
[6] Includes exercise with and without equipment and weightlifting.
[7] Includes organized and informal gymnastics, cheerleading, and dancing.
[8] Includes slides, see-saws, monkey bars and climbing apparatus, swings, pogo sticks, and other playground equipment.
[9] Includes roller and ice skating, in-line skates, and skateboards.
[10] Includes sleds, toboggans, snow disks, snow tubing, snow skiing, and snowboarding.
[11] Includes all track and field activities.
[12] Includes wading and swimming pools, diving, water slides, tubing, water skiing, surfing, water polo, and all activities performed in the act of swimming or on flotation devices.
[13] Includes all other athletic or play activities, including amusement attractions, archery, bowling, fencing, fishing, air guns, golfing, horseback riding, horseshoes, skeet shooting, trampolines, and tree or play houses.
[14] Includes amputations, contusions, crushing injuries, dislocations, fractures, and sprains and strains.
Source: United States Consumer Product Safety Commission. National Electronic Injury Surveillance System, 2011, 2012, 2013. https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014.

Table 6C.7: Proportion of Musculoskeletal Injuries[1] From Sport Activities Treated Per Year in Emergency Departments by Age and Body Region, United States 2011-2013

	Percent Injuries by Body Region					
	2 to 12	13 to 18	19 to 24	25 to 44	45 to 64	All Ages
TEAM SPORTS [1]						
Baseball/Softball (Average N injuries treated)	45,416	61,434	14,050	38,271	10,038	170,489
Upper extremity	41.2%	41.3%	41.4%	35.1%	36.4%	39.6%
Lower extremity	21.9%	33.0%	34.0%	41.3%	36.7%	32.1%
Trunk	6.6%	9.3%	8.0%	11.1%	11.4%	9.1%
Head	30.4%	16.4%	16.6%	12.4%	15.5%	19.2%
Basketball (Average N injuries treated)	67,385	182,161	71,088	62,901	9,468	393,928
Upper extremity	57.4%	34.6%	25.0%	26.3%	30.1%	35.3%
Lower extremity	31.3%	53.1%	62.8%	58.9%	52.1%	51.9%
Trunk	4.7%	6.8%	6.4%	9.5%	11.0%	6.9%
Head	6.6%	5.6%	5.9%	5.3%	6.8%	5.8%
Football (Average N injuries treated)	92,295	169,979	31,567	29,854	4,005	327,972
Upper extremity	58.5%	49.6%	45.0%	42.1%	48.0%	50.9%
Lower extremity	26.7%	34.2%	39.4%	37.7%	26.1%	32.8%
Trunk	11.2%	12.9%	9.4%	16.0%	23.3%	12.5%
Head	3.6%	3.2%	6.2%	4.3%	*	3.7%
Hockey (Average N injuries treated)	5,969	23,344	5,529	5,968	1,459	42,320
Upper extremity	49.8%	53.6%	45.2%	36.5%	34.8%	48.9%
Lower extremity	25.9%	28.1%	29.6%	36.9%	*	29.4%
Trunk	12.4%	13.9%	14.8%	17.4%	*	14..7%
Head	11.9%	4.4%	10.4%	*	*	7.0%
Soccer (Average N injuries treated)	44,761	70,583	16,786	24,588	3,801	160,924
Upper extremity	48.9%	27.3%	22.0%	25.5%	29.4%	32.6%
Lower extremity	40.3%	58.2%	61.9%	60.6%	54.4%	53.8%
Trunk	6.4%	8.6%	8.0%	9.2%	*	8.1%
Head	4.5%	5.9%	8.1%	4.6%	*	5.5%
Volleyball (Average N injuries treated)	5,233	23,896	4,876	7,639	2,715	44,655
Upper extremity	63.5%	43.9%	35.7%	28.8%	40.5%	42.4%
Lower extremity	25.7%	44.5%	53.7%	61.0%	49.4%	46.4%
Trunk	*	6.6%	*	7.3%	*	6.7%
Head	*	5.0%	*	*	*	4.4%

Table 6C.7: Proportion of Musculoskeletal Injuries[1] From Sport Activities Treated Per Year in Emergency Departments by Age and Body Region, United States 2011-2013

		Percent Injuries by Body Region					
INDIVIDUAL SPORTS	<2 years	2 to 12	13 to 18	19 to 24	25 to 44	45 to 64	All Ages
Bicycle/Wheeled [4] (Average N injuries treated)		123,729	59,850	33,398	67,950	62,432	362,428
Upper extremity		51.7%	50.4%	44.4%	44.9%	41.8%	47.2%
Lower extremity		27.6%	30.2%	30.2%	25.0%	22.3%	26.6%
Trunk		9.1%	11.5%	16.4%	21.0%	26.9%	16.4%
Head		11.6%	7.9%	9.1%	9.0%	8.9%	9.7%
Fitness Training [6] (Average N injuries treated)		23,548	41,640	36,125	90,567	48,030	258,644
Upper extremity		35.8%	27.5%	22.1%	20.5%	24.0%	24.4%
Lower extremity		48.5%	46.5%	46.9%	47.0%	46.5%	46.0%
Trunk		9.6%	23.5%	28.7%	31.1%	27.1%	26.9%
Head		6.1%	2.4%	2.3%	1.3%	2.4%	2.7%
Playground Equipment [8] (Average N injuries treated)	2830	139,462	7,731	2,436	5,921	1,932	164,199
Upper extremity	18.5%	62.8%	40.8%	33.3%	31.3%	31.3%	58.8%
Lower extremity	54.3%	17.6%	38.5%	44.9%	38.8%	38.8%	20.6%
Trunk	*	10.0%	15.5%	*	25.5%	25.5%	11.2%
Head	23.1%	9.6%	*	*	*	*	9.4%
Skating [9] (Average N injuries treated)		48,736	47,192	21,550	24,598	7,816	150,542
Upper extremity		66.2%	51.6%	49.9%	48.5%	60.4%	56.0%
Lower extremity		24.6%	38.0%	37.5%	34.3%	20.4%	32.0%
Trunk		4.4%	6.6%	8.2%	14.6%	16.1%	8.0%
Head		4.7%	3.8%	4.3%	2.5%	*	4.0%

* Does not meet standards for reliability.
[1] Includes amputations, contusions, crushing injuries, dislocations, fractures, and sprains and strains.
[2] Includes both organized and informal team sports.
[3] Includes bicycles, tricycles, scooters, and unpowered wheel riding toys.
[4] Includes exercise with and without equipment and weightlifting.
[5] Includes slides, see-saws, monkey bars and climbing apparatus, swings, pogo sticks, and other playground equipment.
[6] Includes roller and ice skating, in-line skates, and skateboards.
Source: United States Consumer Product Safety Commission. National Electronic Injury Surveillance System, 2011, 2012, 2013.
https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014.

Table 6C.8: Game and Practice Injury Rates, 15 Sports, National Collegiate Athletic Association, 1988-1989 through 2003-2004

	Game Athlete-Exposures [1]				Practice Athlete-Exposures [1]			
	Total Number of Exposures	Number of Injuries	Injury Rate per 1000 Exposures	95% Confidence Interval	Total Number of Exposures	Number of Injuries	Injury Rate per 1000 Exposures	95% Confidence Interval
Division I								
Preseason	114,528	803	7.01	6.53, 7.50	4,903,695	35,710	7.28	7.21, 7.36
In season	1,963,708	31,883	16.24	16.06, 16.41	7,305,903	17,502	2.40	2.36, 2.43
Postseason	89,610	849	9.47	8.84, 10.11	390,538	622	1.59	1.47, 1.72
Total Division I	2,167,846	33,535	15.47	15.30,15.63	12,600,136	53,834	4.27	4.24, 4.31
Division II								
Preseason	56,590	356	6.29	5.64, 6.94	2,290,173	14,696	6.42	6.31, 6.52
In season	1,017,991	13,855	13.61	13.38, 13.84	3,138,541	7,013	2.23	2.18, 2.29
Postseason	45,747	388	8.48	7.64, 9.33	146,101	179	1.23	1.05, 1.40
Total Division II	1,120,328	14,599	13.03	12.82, 13.24	5,574,815	21,888	3.93	3.87, 3.98
Division III								
Preseason	115,725	562	4.86	4.45, 5.26	3,502,829	20,545	5.87	5.79, 5.95
In season	1,754,358	22,940	13.08	12.91, 13.25	5,472,374	12,625	2.31	2.27, 2.35
Postseason	85,831	680	7.92	7.33, 8.52	252,727	268	1.06	0.93, 1.19
Total Division III	1,955,914	24,182	12.36	12.21, 12.52	9,227,930	33,438	3.62	3.58, 3.66
All Divisions								
Preseason	286,843	1,721	6.00	5.72, 6.28	10,696,697	70,951	6.63	6.58, 6.68
In season	4,736,057	68,678	14.50	14.39, 14.61	15,916,818	37,140	2.33	2.31, 2.36
Postseason	221,188	1,917	8.67	8.28, 9.05	789,366	1,069	1.35	1.27, 1.44
Total All Divisions	5,244,088	72,316	13.79	13.69, 13.89	27,402,881	109,160	3.98	3.96, 4.04

*Wald χ^2 statistics from negative binomial model: game injury rates differed among divisions ($P < .01$) and within season ($P < .01$). Practice injury rates differed among divisions ($P < .01$) and within season ($P < .01$). Postseason sample sizes are much smaller (and have a higher variability) than preseason and in season sample sizes because only a small percentage of schools participated in the postseason tournaments in any sport and not all of those were a part of the Injury Surveillance System sample. Numbers do not always sum to totals because of missing division or season information. Spring football data are not included here.

[1] Athlete-exposures are defined as one athlete participating in one game or practice.

Source: Hootman JM, Dick R, Agel J. Epidemiology of Collegiate Injuries for 15 Sports: Summary and Recommendations for Injury Prevention Initiatives. *Journal of Athletic Training* 2007;42(2):311-319. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1941297/

Reproduced with permission from *Journal of Athletic Training* , December 4, 2014.

Table 6C.9: Overall Game and Practice Injury Rates for 15 Sports, 1988-1989 to 2003-2004

Sports	Injury Rate (per 1000 Athlete-Exposures [1])
Game Injury Rate	
Men's baseball	5.8
Men's basketball	9.9
Women's basketball	7.7
Women's field hockey	7.9
Men's football [2]	35.9
Women's gymnastics	15.2
Men's ice hockey	16.3
Women's ice hockey	12.6
Men's lacrosse	12.6
Women's lacrosse	7.2
Men's soccer	18.8
Women's soccer	16.4
Women's softball	4.3
Women's volleyball	4.6
Men's wrestling	26.4
Practice Injury Rate	
Men's baseball	1.9
Men's basketball	4.3
Women's basketball	4.0
Women's field hockey	3.7
Men's fall football [2]	3.8
Women's gymnastics	6.1
Men's ice hockey	2.0
Women's ice hockey [1]	2.5
Men's lacrosse	3.2
Women's lacrosse	3.3
Men's soccer	4.3
Women's soccer	5.2
Women's softball	2.7
Women's volleyball	4.1
Men's wrestling	5.7
Men's spring football [2]	9.6

[1] Data collection for women's ice hockey began in 2000-2001.
[1] Athlete-exposures are defined as one athlete participating in one game or practice.
[2] Fall and spring football are reported separately for practices because no "official games" are played during spring football; only fall football is listed for games.
Source: Hootman JM, Dick R, Agel J. Epidemiology of Collegiate Injuries for 15 Sports: Summary and Recommendations for Injury Prevention Initiatives. *Journal of Athletic Training* 2007;42(2):311-319. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1941297/
Reproduced with permission from *Journal of Athletic Training* , December 4, 2014.

Table 6C.10: Trends in Game and Practice Injury Rates for Combined 15 Sports, National Collegiate Athletic Association, 1989-1999 through 2003-2004

	Injury Rate (per 1000 Athlete-Exposures [1])	
	Game Injury Rate [2]	Practice Injury Rate [3]
1988-1989	14.8	4.1
1989-1990	13.1	3.9
1990-1991	14.6	4.2
1991-1992	13.2	4.0
1992-1993	12.9	3.8
1993-1994	14.0	4.2
1994-1995	14.0	4.1
1995-1996	13.1	4.0
1996-1997	14.3	3.0
1997-1998	14.4	4.3
1998-1999	13.7	4.2
1999-2000	15.0	4.2
2000-2001	14.2	4.0
2001-2002	14.5	4.0
2002-2003	12.9	3.8
2003-2004	11.4	3.7

[1] Athlete-exposures are defined as one athlete participating in one game or practice.
[2] Game time trend P = .78. Average annual change = -0.3% (95% confidence interval = -2.5, 1.9)
[3] Practice time trend P = .70. Average annual change = -0.2% (95% confidence interval -= -1.4, 0.9)
Source: Hootman JM, Dick R, Agel J. Epidemiology of Collegiate Injuries for 15 Sports: Summary and Recommendations for Injury Prevention Initiatives. *Journal of Athletic Training* 2007;42(2):311-319. Reproduced with permission from *Journal of Athletic Training* , December 4, 2014.

Table 6C.11: Distribution of Injury by Injury Mechanism for Practices and Gamed for 15 Sports, National Collegiate Athletic Association, 1989-1999 through 2003-2004

	Proportion of Injuries	
	Games	Practices
No Contact	17.7%	36.8%
Player Contact	58.0%	41.6%
Other Contact	20.2%	15.4%
Unknown	4.3%	6.2%

Source: Hootman JM, Dick R, Agel J. Epidemiology of Collegiate Injuries for 15 Sports: Summary and Recommendations for Injury Prevention Initiatives. *Journal of Athletic Training* 2007;42(2):311-319. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1941297/
Reproduced with permission from *Journal of Athletic Training* , December 4, 2014.

Table 6C.12: Distribution of Injury by Body Part for Practices and Games for 15 Sports, National Collegiate Athletic Association, 1989-1999 through 2003-2004

	Proportion of Injuries	
	Games	Practices
Head/ Neck	9.8%	12.8%
Upper Extremity	18.3%	21.4%
Trunk/ Back	13.2%	10.0%
Lower Extremity	53.8%	53.7%
Other/ System	4.9%	2.2%

Source: Hootman JM, Dick R, Agel J. Epidemiology of Collegiate Injuries for 15 Sports: Summary and Recommendations for Injury Prevention Initiatives. *Journal of Athletic Training* 2007;42(2):311-319. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1941297/
Reproduced with permission from *Journal of Athletic Training* , December 4, 2014.

Table 6C.13: Frequency, Distribution, and Rates of Select Injuries (Ankle Ligament Sprains, Anterior Cruciate Ligament Injuries, and Concussions) for Games and Practices Combined for 15 Sports, 1988-1989 to 2003-2004

Injuries	Frequency	Percentage of All Injuries	Injury Rate per 1000 Exposures [2]	95% Confidence Interval
Ankle ligament sprains				
Men's baseball	663	7.9	0.23	0.21, 0.25
Men's basketball	3,205	26.6	1.30	1.26, 1.35
Women's basketball	2,446	24.0	1.15	1.10, 1.20
Women's field hockey	327	10.0	0.46	0.41, 0.51
Men's football	9,929	13.6	0.83	0.81, 0.84
Women's gymnastics	423	15.4	1.05	0.95, 1.15
Men's ice hockey	296	4.5	0.23	0.20, 0.26
Women's ice hockey [1]	12	2.8	0.14	0.06, 0.22
Men's lacrosse	698	14.4	0.66	0.61, 0.71
Women's lacrosse	602	17.7	0.70	0.65, 0.76
Men's soccer	2,231	17.2	1.24	1.19, 1.29
Women's soccer	1,876	16.7	1.30	1.24, 1.36
Women's softball	526	9.9	0.32	0.29, 0.35
Women's volleyball	1,649	23.8	1.01	0.96, 1.06
Men's wrestling	715	7.4	0.56	0.52, 0.60
Men's spring football	1,519	13.9	1.34	1.27, 1.40
Total ankle ligament sprains	27,117	14.9	0.83	0.82, 0.84
Anterior cruciate ligament injuries				
Men's baseball	56	0.7	0.02	0.01, 0.02
Men's basketball	167	1.4	0.07	0.06, 0.08
Women's basketball	498	4.9	0.23	0.21, 0.25
Women's field hockey	53	1.6	0.07	0.05, 0.09
Men's football	2,159	3.0	0.18	0.17, 0.19
Women's gymnastics	134	4.9	0.33	0.28, 0.39
Men's ice hockey	78	1.2	0.06	0.05, 0.07
Women's ice hockey [1]	3	0.7	0.03	0.00, 0.07
Men's lacrosse	131	2.7	0.12	0.10, 0.15
Women's lacrosse	145	4.3	0.17	0.14, 0.20
Men's soccer	168	1.3	0.09	0.08, 0.11
Women's soccer	411	3.7	0.28	0.26, 0.31

Table 6C.13: Frequency, Distribution, and Rates of Select Injuries (Ankle Ligament Sprains, Anterior Cruciate Ligament Injuries, and Concussions) for Games and Practices Combined for 15 Sports, 1988-1989 to 2003-2004

Injuries	Frequency	Percentage of All Injuries	Injury Rate per 1000 Exposures [2]	95% Confidence Interval
Women's softball	129	2.4	0.08	0.06, 0.09
Women's volleyball	142	2.0	0.09	0.07, 0.10
Men's wrestling	147	1.5	0.11	0.10, 0.13
Men's spring football	379	3.5	0.33	0.30, 0.37
Total anterior cruciate ligament injuries	4,800	2.6	0.15	0.14, 0.15
Concussions				
Men's baseball	210	2.5	0.07	0.06, 0.08
Men's basketball	387	3.2	0.16	0.14, 0.17
Women's basketball	475	4.7	0.22	0.20, 0.24
Women's field hockey	129	3.9	0.18	0.15, 0.21
Men's football	4,404	6.0	0.37	0.36, 0.38
Women's gymnastics	64	2.3	0.16	0.12, 0.20
Men's ice hockey	527	7.9	0.41	0.37, 0.44
Women's ice hockey [1]	79	18.3	0.91	0.71, 1.11
Men's lacrosse	271	5.6	0.26	0.23, 0.29
Women's lacrosse	213	6.3	0.25	0.22, 0.28
Men's soccer	500	3.9	0.28	0.25, 0.30
Women's soccer	593	5.3	0.41	0.38, 0.44
Women's softball	228	4.3	0.14	0.12, 0.16
Women's volleyball	141	2.0	0.09	0.07, 0.10
Men's wrestling	317	3.3	0.25	0.22, 0.27
Men's spring football	612	5.6	0.54	0.50, 0.58
Total concussions	9,150	5.0	0.28	0.27, 0.28

[1] Data collection for women's ice hockey began in 2000-2001.
[2] Athlete-exposures are defined as one athlete participating in one game or practice.
Source: Hootman JM, Dick R, Agel J. Epidemiology of Collegiate Injuries for 15 Sports: Summary and Recommendations for Injury Prevention Initiatives. *Journal of Athletic Training* 2007;42(2):311-319. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1941297/
Reproduced with permission from *Journal of Athletic Training* , December 4, 2014.

Table 6C.14: Trends in Injury Rates for Select Conditions for Games and Practices Combined for 15 Sports, National Collegiate Athletic Association, 1989-1999 through 2003-2004

	Game and Practice Combined Injury Rate (per 1000 Athlete-Exposures [1])		
	Anterior cruciate ligament injuries (knee) [2]	Ankle ligament sprains [3]	Concussions [4]
1988-1989	0.11	0.87	0.17
1989-1990	0.15	0.84	0.17
1990-1991	0.14	0.85	0.15
1991-1992	0.14	0.85	0.19
1992-1993	0.13	0.76	0.17
1993-1994	0.13	0.81	0.20
1994-1995	0.15	0.87	0.23
1995-1996	0.13	0.75	0.26
1996-1997	0.13	0.75	0.21
1997-1998	0.17	0.82	0.32
1998-1999	0.16	0.90	0.32
1999=2000	0.16	0.89	0.39
2000-2001	0.16	0.85	0.41
2001-2002	0.17	0.86	0.41
2002-2003	0.15	0.80	0.37
2003-2004	0.14	0.75	0.34

[1] Athlete-exposures are defined as one athlete participating in one game or practice.
[2] Anterior cruciate ligament (ACL) injury time trend *P* = .02. Average annual change = 1.3% (95% confidence interval = 0.2, 2.4)
[3] Ankle ligament sprain injury time trend *P* = .68. Average annual change = -1.0% (95% confidence interval -= -0.8, 0.5)
[4] Concussion injury time trend *P* < .01. Average annual change = 7.0% (95% confidence interval = 5.4, 8.7)
Source: Hootman JM, Dick R, Agel J. Epidemiology of Collegiate Injuries for 15 Sports: Summary and Recommendations for Injury Prevention Initiatives. *Journal of Athletic Training* 2007;42(2):311-319. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1941297/
Reproduced with permission from *Journal of Athletic Training* , December 4, 2014.

Table 6D.1: Frequency of Acute Injuries by Location and Diagnosis (Barell Matrix), U.S. Army Active Duty Incident Hospitalizations, 2012

	Diagnosis													Total	% By Body Region
	Fracture	Dislo-cation	Sprains /Strains	Internal	Open Wound	Ampu-tations	Blood Vessel	Contusion/ Superficial	Crush	Burns	Nerves	Unspec	System-wide & Late Effects		
Head and Neck															
Traumatic Brain Injury (TBI)															
Type 1 TBI	76	0	0	184	0	0	0	0	0	0	0	0	0	260	
Type 2 TBI	23	0	0	155	0	0	0	0	0	0	0	0	0	178	
Type 3 TBI	10	0	0	0	0	0	0	0	0	0	0	0	0	10	
TBI Unspec	0	0	0	0	0	0	0	0	0	0	0	22	0	22	15.2%
Other Head, Face, Neck															
Other head	0	0	0	0	21	0	0	0	0	1	0	0	0	22	
Face	190	0	0	0	26	0	0	0	0	5	0	0	0	221	
Eye	0	0	0	0	9	0	0	6	0	0	0	0	0	15	
Neck	3	0	0	0	10	0	0	0	2	1	0	0	0	16	
Head, Face, Neck Unspec	0	0	0	0	0	0	3	31	1	12	0	6	0	53	10.6%
Spine and Back															
Spinal Cord (SCI)															
Cervical SCI	9	0	0	8	0	0	0	0	0	0	0	0	0	17	
Thoracic/Dorsal SCI	10	0	0	1	0	0	0	0	0	0	0	0	0	11	
Lumbar SCI	3	0	0	1	0	0	0	0	0	0	0	0	0	4	
Sacrum, Coccyx SCI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Spine, Back Unspec SCI	0	0	0	6	0	0	0	0	0	0	0	0	0	6	1.2%
Vertebral Column (VCI)															
Cervical VCI	25	2	17	0	0	0	0	0	0	0	0	0	0	44	
Thoracic/Dorsal VCI	34	0	0	0	0	0	0	0	0	0	0	0	0	34	
Lumbar VCI	46	2	4	0	0	0	0	0	0	0	0	0	0	52	
Sacrum Coccyx VCI	8	0	0	0	0	0	0	0	0	0	0	0	0	8	
Spine, Back Unspec VCI	3	0	0	0	0	0	0	0	0	0	0	0	0	3	4.6%
Torso															
Chest (thorax)	30	0	0	71	5	0	0	5	0	2	0	0	0	113	
Abdomen	0	0	0	67	9	0	3	6	0	1	0	0	0	86	
Pelvis,Urogenital	37	2	7	3	6	0	0	2	1	0	0	0	0	58	
Trunk	2	0	0	0	0	0	0	9	0	0	1	10	0	22	
Back, Buttock	0	0	3	0	2	0	0	6	0	6	0	0	0	17	9.6%

Table 6D.1: Frequency of Acute Injuries by Location and Diagnosis (Barell Matrix), U.S. Army Active Duty Incident Hospitalizations, 2012

	Diagnosis													
	Fracture	Dislo-cation	Sprains /Strains	Internal	Open Wound	Ampu-tations	Blood Vessel	Contusion/ Superficial	Crush	Burns	Nerves	Unspec	System-wide & Late Effects	Total	% By Body Region
Extremities															
Upper															
Shoulder, Upper Arm	93	35	29	0	14	2	0	2	1	1	0	5	0	182	
Forearm, Elbow	83	6	0	0	26	2	0	0	2	7	0	0	0	126	
Wrist, Hand, Fingers	91	11	6	0	76	6	0	7	8	17	0	4	0	226	
Other & Unspec	1	0	0	0	4	0	7	9	0	1	9	8	0	39	18.5%
Lower															
Hip	27	9	5	0	0	0	0	4	0	0	0	0	0	45	
Upper leg, Thigh	64	0	0	0	0	3	0	6	0	0	0	0	0	73	
Knee	15	37	46	0	0	0	0	2	0	0	0	0	0	100	
Lower leg, Ankle	401	7	24	0	0	7	0	5	0	4	0	0	0	448	
Foot, Toes	100	5	1	0	10	2	0	6	5	0	0	0	0	129	
Other & Unspec	6	0	18	0	77	11	6	6	0	5	0	16	0	145	30.4%
Unclassified by Site															
Other Unspecified															
Other/Multiple	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0.1%
Unspec Site	6	1	5	1	11	0	0	9	0	4	1	60	0	98	3.2%
System-wide and Late Effects	0	0	0	0	0	0	0	0	0	0	0	0	208	208	6.7%
Total	1,396	117	165	497	306	33	19	121	20	67	13	131	208	3093	100%
% of Total	45.1%	3.8%	5.3%	16.1%	9.9%	1.1%	0.6%	3.9%	0.6%	2.2%	0.4%	4.2%	6.7%	100%	

Source: Defense Medical Surveillance System, 2013; Prepared by Army Institute of Public Health, Injury Prevention Program

Table 6D.2: Frequency of Acute Injuries by Location and Diagnosis (Barell Matrix), U.S. Army Active Duty Incident Outpatient Visits, 2012

	Diagnosis														
	Fracture	Dislo-cation	Sprains /Strains	Internal	Open Wound	Ampu-tations	Blood Vessel	Contusion/ Superficial	Crush	Burns	Nerves	Unspec	System-wide & Late Effects	Total	% By Body Region
Head and Neck															
Traumatic Brain Injury (TBI)															
Type 1 TBI	122	0	0	2,034	0	0	0	0	0	0	3	0	0	2,159	
Type 2 TBI	150	0	0	4,942	0	0	0	0	0	0	0	0	0	5,092	
Type 3 TBI	56	0	0	0	0	0	0	0	0	0	0	0	0	56	
TBI Unspec	0	0	0	0	0	0	0	0	0	0	0	3,011	0	3,011	4.3%
Other Head, Face, Neck															
Other head	0	0	0	0	1,320	0	0	0	0	7	47	0	0	1,374	
Face	1,428	39	61	0	3,584	0	0	0	0	49	0	0	0	5,161	
Eye	0	0	0	0	273	0	0	3,904	0	107	15	0	0	4,299	
Neck	7	0	1	0	82	0	0	0	22	41	9	0	0	162	
Head, Face, Neck Unspec	0	0	0	0	0	0	30	3,637	11	117	4	1,529	0	5,328	6.8%
Spine and Back															
Spinal Cord (SCI)															
Cervical SCI	50	0	0	27	0	0	0	0	0	0	0	0	0	77	
Thoracic/Dorsal SCI	63	0	0	15	0	0	0	0	0	0	0	0	0	78	
Lumbar SCI	42	0	0	15	0	0	0	0	0	0	0	0	0	57	
Sacrum, Coccyx SCI	5	0	0	5	0	0	0	0	0	0	0	0	0	10	
Spine, Back Unspec SCI	10	0	0	68	0	0	0	0	0	0	0	0	0	78	0.1%
Vertebral Column (VCI)															
Cervical VCI	138	16	5,574	0	0	0	0	0	0	0	0	0	0	5,728	
Thoracic/Dorsal VCI	262	4	2,113	0	0	0	0	0	0	0	0	0	0	2,379	
Lumbar VCI	372	10	7,331	0	0	0	0	0	0	0	0	0	0	7,713	
Sacrum Coccyx VCI	161	38	369	0	0	0	0	0	0	0	0	0	0	568	
Spine, Back Unspec VCI	53	1	0	0	0	0	0	0	0	0	0	0	0	54	6.8%
Torso															
Chest (thorax)	672	18	1,739	294	108	0	9	1,674	0	26	1	0	0	4,541	
Abdomen	0	0	0	241	147	0	7	318	0	21	17	0	0	751	
Pelvis,Urogenital	211	13	4,963	50	303	0	2	127	10	11	2	0	0	5,692	
Trunk	6	0	0	0	64	0	0	1,255	2	17	0	3,751	0	5,095	
Back, Buttock	0	0	3,120	0	107	0	0	684	4	43	0	0	0	3,958	8.3%

Table 6D.2: Frequency of Acute Injuries by Location and Diagnosis (Barell Matrix), U.S. Army Active Duty Incident Outpatient Visits, 2012

	Diagnosis													
	Fracture	Dislo-cation	Sprains /Strains	Internal	Open Wound	Ampu-tations	Blood Vessel	Contusion/ Superficial	Crush	Burns	Nerves	Unspec	System-wide & Late Effects	Total	% By Body Region
Extremities															
Upper															
Shoulder, Upper Arm	1,118	2,341	16,267	0	260	11	0	1,278	13	58	0	1,747	0	23,093	
Forearm, Elbow	1,331	111	1,097	0	888	14	0	800	22	196	0	0	0	4,459	
Wrist, Hand, Fingers	6,624	585	6,859	0	7,517	128	0	5,677	622	581	0	1,893	0	30,486	
Other & Unspec	49	0	0	0	232	19	35	1,136	7	73	530	1,206	0	3,287	25.5%
Lower															
Hip	213	67	6,886	0	0	0	0	465	2	0	0	0	0	7,633	
Upper leg, Thigh	262	0	0	0	0	80	0	270	5	51	0	0	0	668	
Knee	175	4,567	4,331	0	0	0	0	1,655	12	7	0	0	0	10,747	
Lower leg, Ankle	3,155	102	21,039	0	0	165	0	872	33	109	0	0	0	25,475	
Foot, Toes	3,895	129	3,151	0	1,330	28	0	6,575	198	90	0	0	0	15,396	
Other & Unspec	219	0	18,276	0	2,039	130	46	2,609	3	56	0	6,943	0	30,321	37.6%
Unclassified by Site															
Other Unspecified															
Other/Multiple	13	0	0	0	0	0	0	0	0	1	184	0	0	198	0.1%
Unspec Site	466	51	6,549	195	1,774	0	10	8,069	66	721	148	1,566	0	19,615	8.2%
System-wide and Late Effects	0	0	0	0	0	0	0	0	0	0	0	0	5,500	5,500	2.3%
Total	21,328	8,092	109,726	7,886	20,028	575	139	41,005	1,032	2,382	960	21,646	5,500	240,299	100%
% of Total	8.9%	3.4%	45.7%	3.3%	8.3%	0.2%	0.1%	17.1%	0.4%	1.0%	0.4%	9.0%	2.3%	100%	

Source: Defense Medical Surveillance System, 2013; Prepared by Army Institute of Public Health, Injury Prevention Program

Table 6D.3: Frequency of Injury-related Musculoskeletal Conditions by Location and Diagnosis, U.S. Army Active Duty IncidentHospitalizations, 2012

	Diagnosis							
Injury Location: Body Region	Inflammation and Pain (Overuse)	Joint Derangement	Joint Derangement with Neurological Involvement	Stress Fracture	Sprains/ Strains/ Rupture	Dislocation	Total	% By Body Region
Vertebral Column								
Cervical	21	245	91	0	0	0	357	
Thoracic/Dorsal	0	13	40	0	0	0	53	
Lumbar	82	465	56	0	0	0	603	
Sacrum, Coccyx	1	0	0	0	0	0	1	
Spine, Back Unspecified	26	11	5	0	0	0	42	63.1%
Extremities								
Upper								
Shoulder	80	42	0	0	5	7	134	
Upper Arm, Elbow	14	0	0	0	0	0	14	
Forearm, Wrist	5	1	0	1	0	1	8	
Hand	1	2	0	0	1	0	4	9.6%
Lower								
Pelvis, Hip, Thigh	28	40	0	1	2	3	74	
Knee, Lower Leg	63	88	0	2	105	5	263	
Ankle, Foot	32	52	0	0	0	0	84	25.1%
Unclassified by Site								
Other Unspecified	0	1	0	1	0	0	2	
Unspecified Site	23	4	5	3	0	0	35	2.2%
Total	376	964	197	8	113	16	1,674	100%
% of Total	22.5%	57.6%	11.8%	0.5%	6.8%	1.0%	100%	

Source: Defense Medical Surveillance System, 2013; Prepared by Army Institute of Public Health, Injury Prevention Program

Table 6D.4: Frequency of Injury-related Musculoskeletal Conditions by Location and Diagnosis, U.S. Army Active Duty Incident Outpatient Visits, 2012

	Diagnosis							
Injury Location: Body Region	Inflammation and Pain (Overuse)	Joint Derangement	Joint Derangement with Neurological Involvement	Stress Fracture	Sprains/ Strains/ Rupture	Dislocation	Total	% By Body Region
Vertebral Column								
Cervical	20,885	2,610	3,460	0	0	0	26,955	
Thoracic/Dorsal	0	459	5,263	0	0	0	5,722	
Lumbar	76,465	10,701	2,428	0	0	0	89,594	
Sacrum, Coccyx	3,594	0	0	0	0	0	3,594	
Spine, Back Unspecified	11,834	1,430	252	101	0	0	13,617	33.7%
Extremities								
Upper								
Shoulder	50,305	4,156	0	0	730	607	55,798	
Upper Arm, Elbow	8,113	123	0	2	0	7	8,245	
Forearm, Wrist	9,392	336	0	8	0	16	9,752	
Hand	3,851	116	0	0	256	23	4,246	18.9%
Lower								
Pelvis, Hip, Thigh	20,302	895	0	5	113	8	21,323	
Knee, Lower Leg	84,624	7,450	0	1,765	2,964	157	96,960	
Ankle, Foot	56,774	4,255	0	576	119	52	61,776	43.5%
Unclassified by Site								
Other Unspecified	1,337	69	0	88	79	1	1,574	
Unspecified Site	11,098	143	1,653	1,301	104	11	14,310	3.8%
Total	358,574	32,743	13,056	3,846	4,365	882	413,466	100%
% of Total	86.7%	7.9%	3.2%	0.9%	1.1%	0.2%	100%	

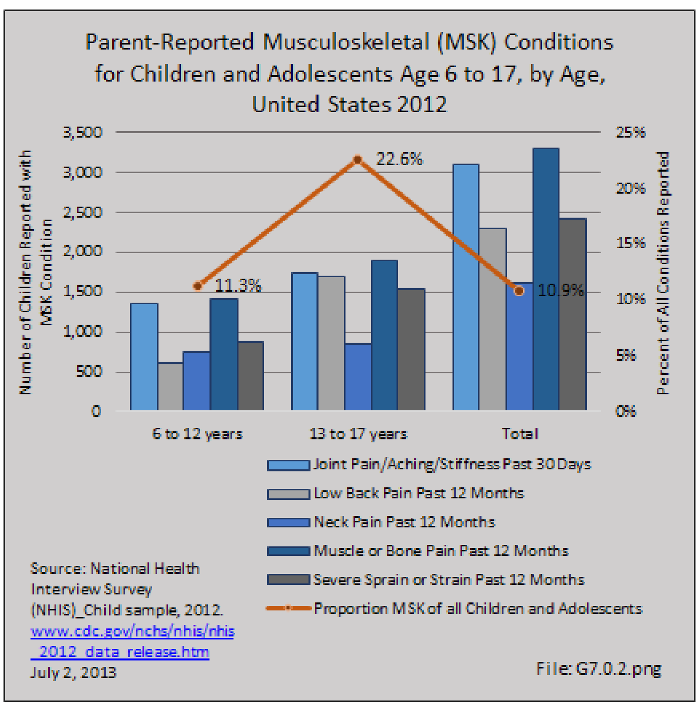
Source: Defense Medical Surveillance System, 2013; Prepared by Army Institute of Public Health, Injury Prevention Program

Children and Adolescents

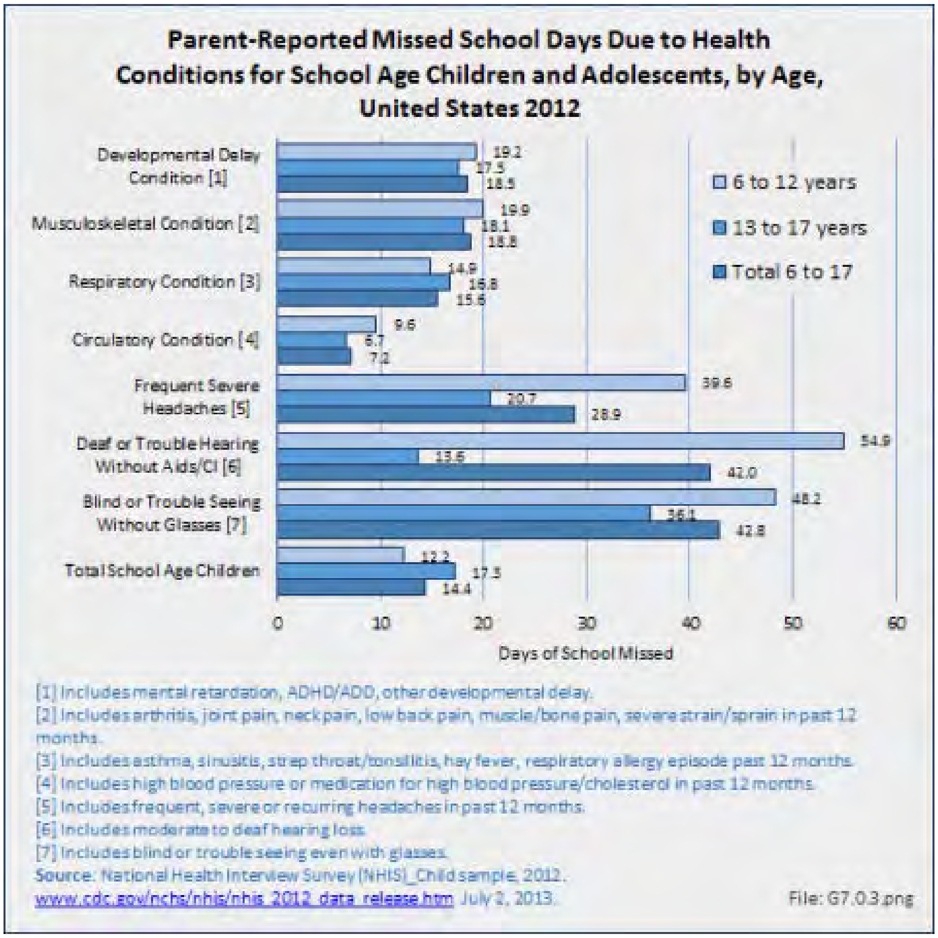
Lead Author(s):
Scott B. Rosenfeld, MD
Aimee O. Hersh, MD

Supporting Author(s):
Ellen M. Raney, MD
Sylvia Watkins-Castillo, PhD

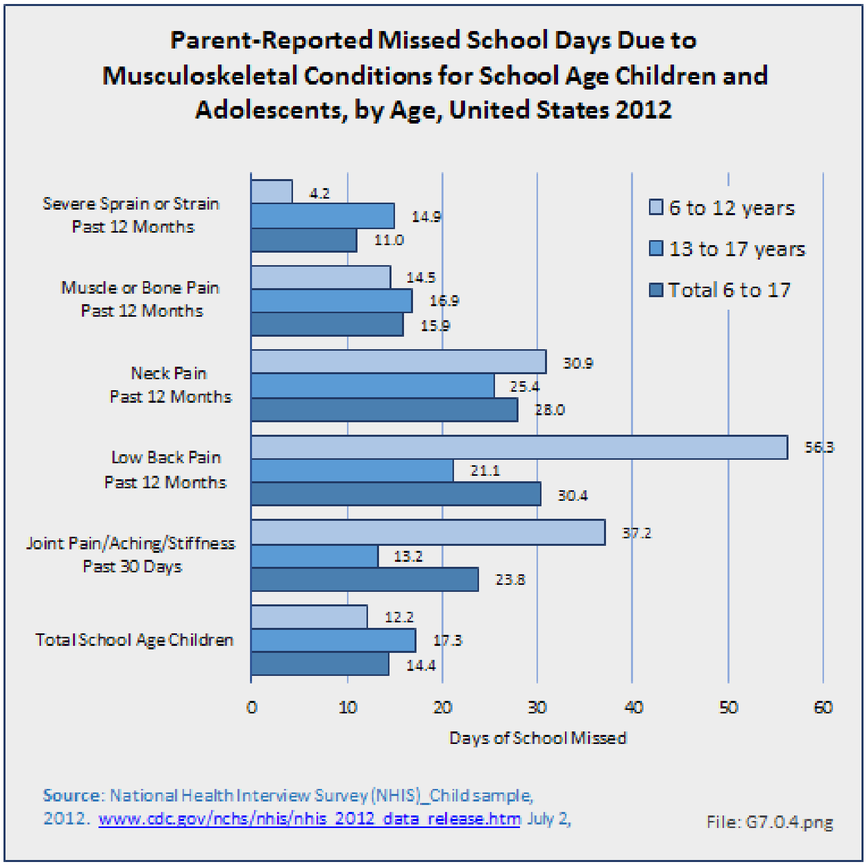
Previous sections in this text clearly demonstrate the large percentage of health care visits that are attributable to musculoskeletal conditions. Most of the data used to establish these estimates concern adult patients. Unfortunately, there is significantly less information regarding the burden of these conditions in young patients. Studies, however, do support that pediatric musculoskeletal conditions similarly account for a significant portion of visits to medical providers. For instance, de Inocencio reported that greater than 6% of total visits to pediatric clinics were for musculoskeletal pain.1 Schwend reported that approximately one third of pediatric medical problems are related to the musculoskeletal system.2 In a population-based study in Ontario, Gunz reported that 1 in 10 children made a health care visit for a musculoskeletal problem and that 13.5% of all visits for musculoskeletal disease were made by patient's age 0 to 19 years.3 Four in 1,000 children are reported by parents as having difficulty with activities of daily living due to musculoskeletal conditions. A search of the National Health Interview Survey (NHIS) child sample revealed that musculoskeletal conditions accounted for 10.9% of parent-reported health conditions for children and adolescents age 0 to 17 years in the US in 2012. This proportion was greatest at 22.6% in the 13- to 17-year-old age group. (Reference Table 7.0 PDF CSV)

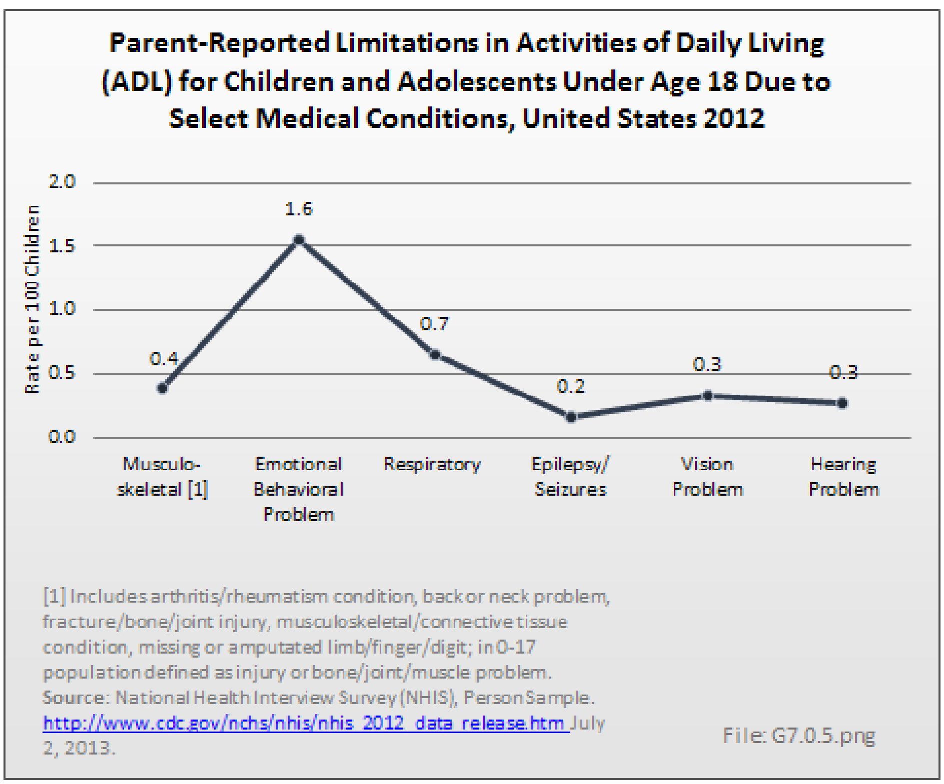


The evaluation and treatment of these pediatric musculoskeletal conditions resulted in approximately 149 million missed school days in 2012. Musculoskeletal conditions are surpassed only by respiratory infections as a cause of missed school days. Joint pain was the most frequent cause of missed school days, closely followed by low back pain. Missed school days due to musculoskeletal pain was higher for adolescents in the junior- and senior-high age range than for children of grammar-school age. (Reference Table 7.0.1 PDF CSV)

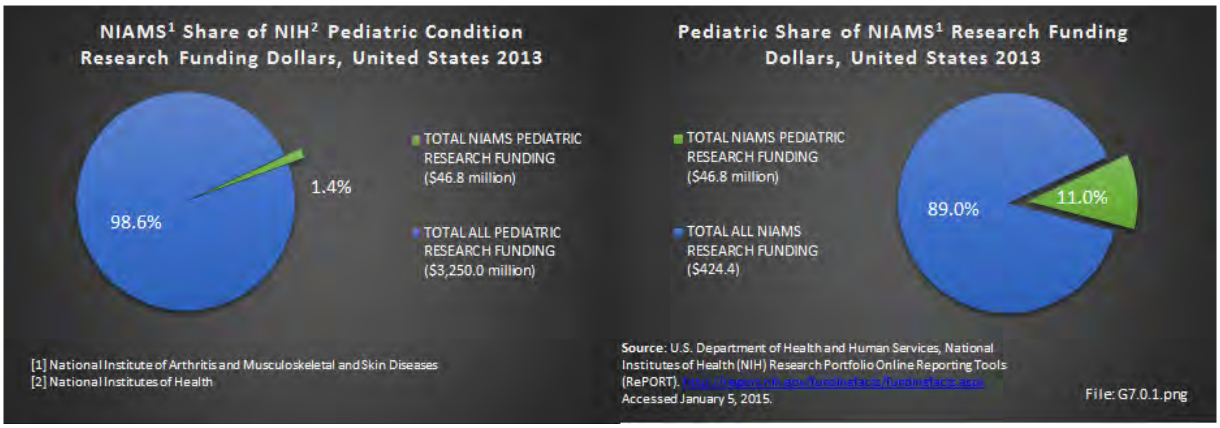


The indirect burden of pediatric musculoskeletal disorders is amplified by the effect on the family and caregivers. Each time a child visits a care provider for evaluation or treatment results in missed workdays and wages by parents and caregivers. Additionally, the emotional impact that many chronic musculoskeletal conditions have on the family is immeasurable. Furthermore, as compared to adult conditions, pediatric musculoskeletal conditions may have lifelong ramifications resulting in compounding burdens over time. (Reference Table 7.0.2 PDF CSV)


Parent-Reported Missed School Days Due to Musculoskeletal Conditions for School Age Children and Adolescents, by Age, United States 2012
Severe Sprain or Strain Past 12 Months
Muscle or Bone Pain Past 12 Months
Neck Pain Past 12 Months
Low Back Pain Past 12 Months
Joint Pain/Aching/Stiffness Past 30 Days
Total School Age Children
4.2
14.9
11.0
14.5
16.9
15.9
30.9
25.4
28.0
56.3
21.1
30.4
37.2
13.2
23.8
12.2
17.3
14.4
6 to 12 years
13 to 17 years
Total 6 to 17
0
10
20
30
40
50
60
Days of School Missed
Source: National Health Interview Survey (NHIS)_Child sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2,
File: G7.0.4.png


Parent-Reported Limitations in Activities of Daily Living (ADL) for Children and Adolescents Under Age 18 Due to Select Medical Conditions, United States 2012
Rate per 100 Children
2.0
1.5
1.0
0.5
0.0
0.4
1.6
0.7
0.2
0.3
0.3
Musculo-skeletal [1]
Emotional Behavioral Problem
Respiratory
Epilepsy/ Seizures
Vision Problem
Hearing Problem
[1] Includes arthritis/rheumatism condition, back or neck problem, fracture/bone/joint injury, musculoskeletal/connective tissue condition, missing or amputated limb/finger/digit; in 0-17 population defined as injury or bone/joint/muscle problem.
Source: National Health Interview Survey (NHIS), Person Sample. http://www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.
File: G7.0.5.png

Despite the significant contribution made by musculoskeletal conditions in the total US health care burden, research for pediatric musculoskeletal conditions is grossly underfunded. Of the $3.25 billion in National Institutes of Health (NIH) research funding for all pediatric conditions in 2013, only $46.8 million, or 1.4% of total pediatric medical research funding, went toward pediatric musculoskeletal research. Even under the umbrella of funding specifically for musculoskeletal research, pediatric-specific research is under-represented. Of the $424.4 million in funding for the National Institute of Arthritis and Musculoskeletal and Skin Disease (NIAMS) in 2013, this same $46.8 million represented only 11% of total musculoskeletal research dollars.4



1. de Inocencio J: Musculoskeletal pain in primary pediatric care: Analysis of 1000 consecutive general pediatric clinic visits. *Pediatrics* 1998 Dec;102(6):E63.

2. Schwend RM, Geiger J: Outpatient pediatric orthopedics: Common and important conditions. *Pediatric Clinics* 1998 Aug;45(4):943-971.

3. Gunz AC, Canizares M, Mackay C, Badley EM: Magnitude of impact and healthcare use for musculoskeletal disorders in the pediatric: A population-based study. *BMC Musculoskeletal Disorders* 2012;13:98.

4. U.S. Department of Health and Human Services, National Institutes of Health (NIH) Research Portfolio Online Reporting Tools (RePORT). http://report.nih.gov/fundingfacts/fundingfacts.aspx Accessed January 5, 2015.

Definitions

Lead Author(s):
Scott B. Rosenfeld, MD

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

CONDITIONS

In order to perform a comprehensive review of the burden of musculoskeletal disease in children and adolescents, all conditions that either are direct musculoskeletal diagnoses or have musculoskeletal implications were considered for this section. This chapter was divided into separate clinically relevant sections to better understand the burden of each. These sections include musculoskeletal infections, deformity, trauma, neuromuscular conditions, syndromes with musculoskeletal implications, sports injuries, skeletal dysplasias, neoplasms, rheumatologic conditions, medical problems with musculoskeletal implications, and pain syndromes.

DATA

Health care visits and hospitalization data are derived from diagnostic codes for each of the conditions presented. These codes are available in the ICD-9-CM Codes section of this topic. Total health care visits are the sum of cases seen in physicians' offices, outpatient clinics, emergency departments, and hospital discharges. The largest database used is the Healthcare Cost and Utilization Project (HCUP) Kids' Inpatient Database (KID), which includes nearly 6.7 million weighted records of children and adolescents through the age of 20 years. All databases were analyzed for the ages 0 through 20 years, with subsets of data by age groups under 1 year, ages 1 through 5 years, 6 through 10 years, 11 through 13 years, 14 through 17 years, and 18 through 20 years.

Each database includes multiple variables to define diagnoses, ranging from three possible diagnoses in the physicians' office and outpatient clinic data sets to 25 possible diagnoses in the KID database. If a diagnosis code is listed in any of the possible diagnoses variables, the record is coded as presenting with that condition. If the diagnosis code is listed in the first diagnosis variable, it is coded as the primary diagnosis. However, the databases do not permit diagnostic verification. The first diagnosis listed may not be the primary reason for the visit, but a contributing cause. Further, there is the potential for overlap in diagnosis of related conditions. Finally, sometimes diagnoses are provided primarily for reimbursement purposes, with little emphasis on accuracy. Therefore, these numbers provide only a guide to the impact of major childhood musculoskeletal conditions.

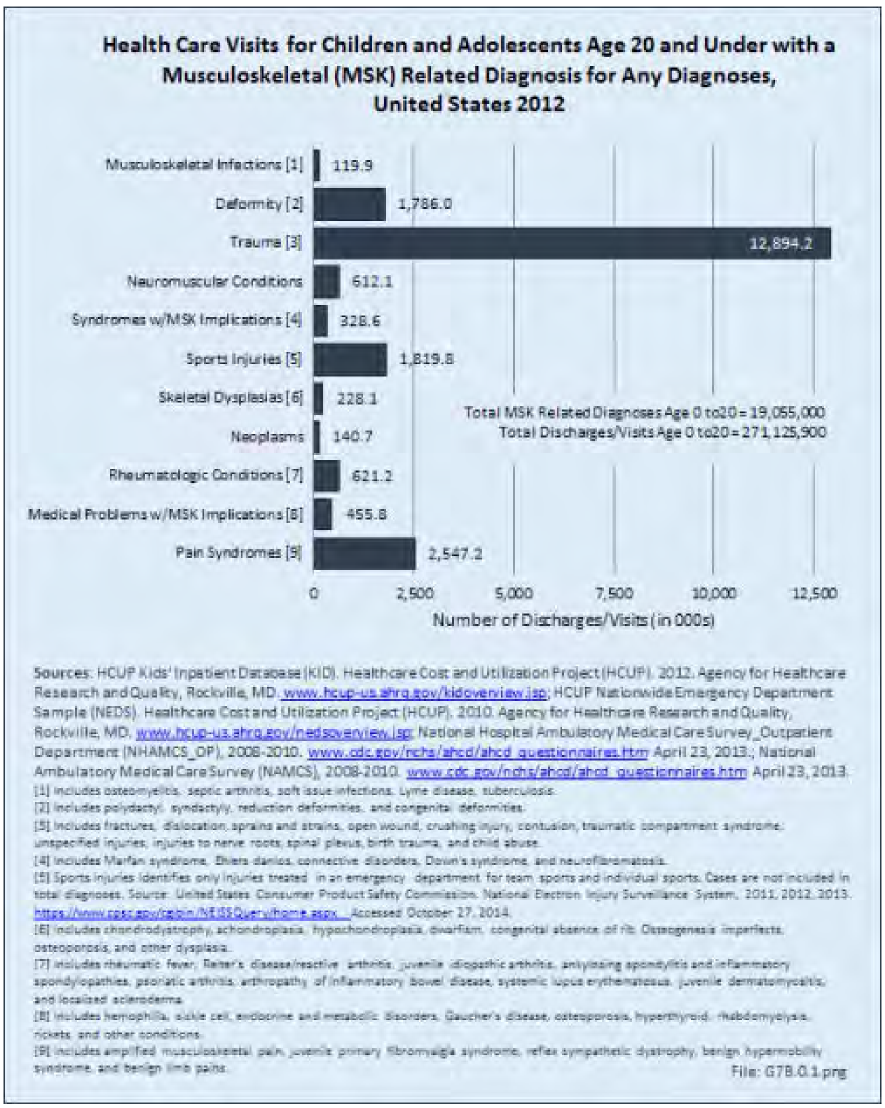
Injuries include two categories: sports injuries and all injuries due to a traumatic event. Sports injuries are identified by type of sports activity using the United States Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS), with annual injuries averaged across the years of 2011 to 2013. Because sports injuries cases are not analyzed by ICD-9-CM codes, they may duplicate trauma injury cases.

Musculoskeletal Conditions of Children & Adolescents

Lead Author(s):
Scott B. Rosenfeld, MD

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

The 11 categories of musculoskeletal conditions that follow represent the most common health care reasons for which children and adolescents are seen in doctors' offices, emergency departments, and hospitals. A number of these conditions, such as the skeletal dysplasias, are relatively rare, diagnosed infrequently in the health care system, and have little data available on prevalence and burden. Yet, though rare, they may result in significant morbidity and often require lifelong medical interventions; therefore, warrant discussion.

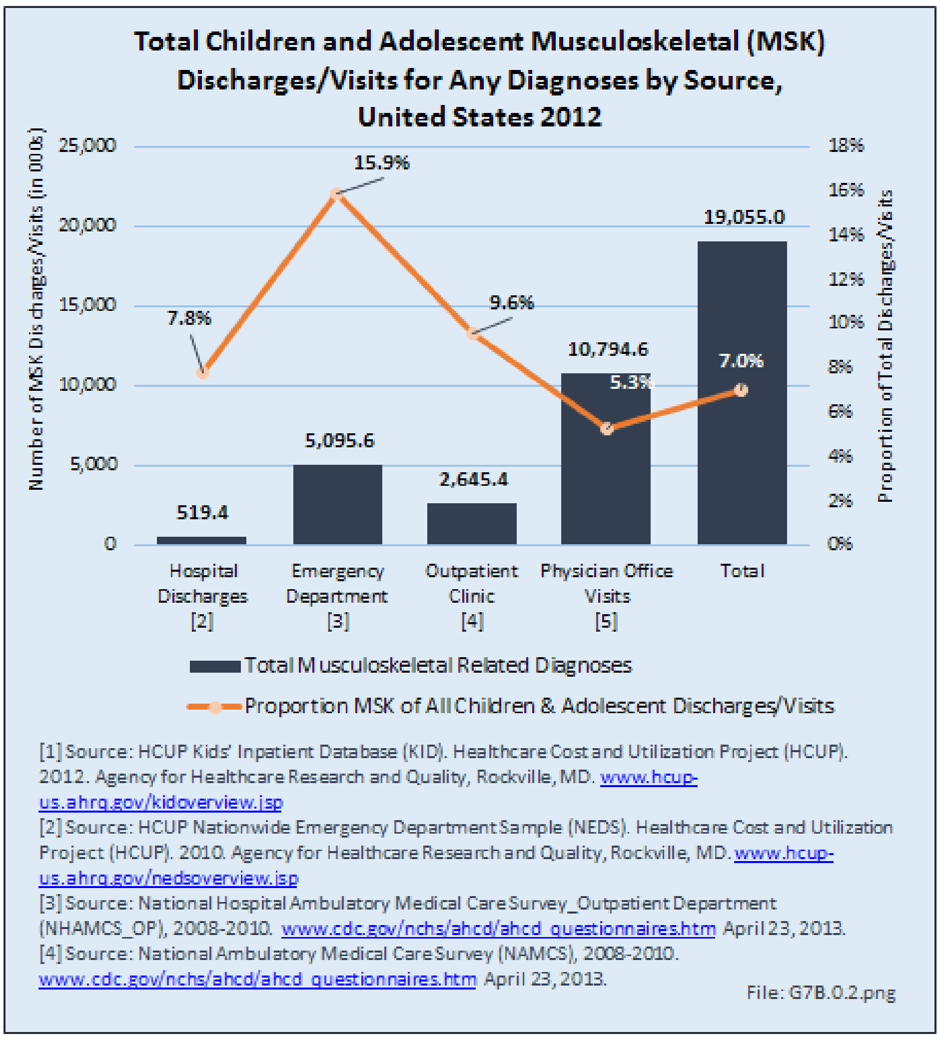


Summary Any Diagnoses: Musculoskeletal Conditions of Children and Adolescents

In 2012, more than 19 million children and adolescents age 20 years and younger received treatment in medical centers, physicians' office, and hospitals for a condition that included a musculoskeletal related condition. More than two in three visits/discharges (68%) were for the treatment of traumatic injuries, a number that excludes sports injuries not based on diagnosis codes and likely already included in traumatic injuries. The second most common diagnosis is a pain syndrome, accounting for more than 1 in 10 visits

(13%). Pain syndromes include amplified musculoskeletal pain, juvenile primary fibromyalgia syndrome, reflex sympathetic dystrophy, benign hypermobility syndrome, and benign limb pains. The third most frequent diagnosis is deformity, accounting for just over 9% of all visits. (Reference Table 7.1.1 PDF CSV)

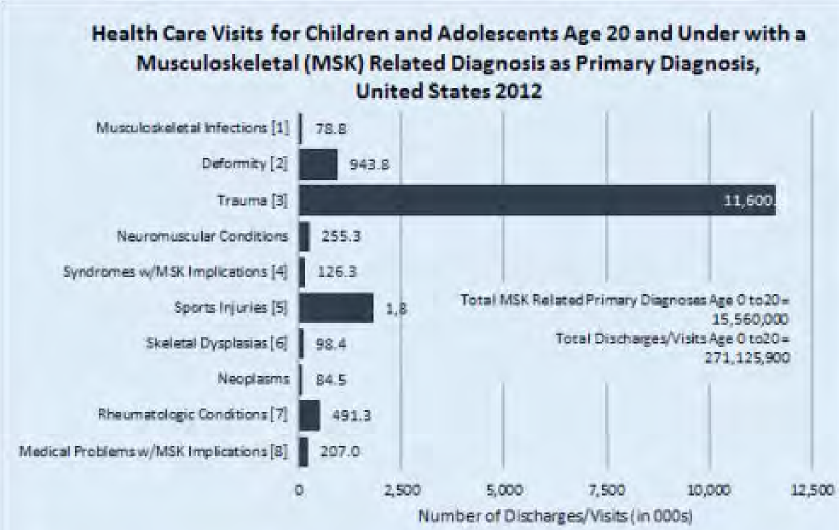
More than one-half (57%) of visits by children and adolescents for a condition that included a musculoskeletal-related condition were to physicians' offices. Hospital discharges accounted for less than 3% of total visits. Health care visits that included a musculoskeletal-related condition represented 7% of visits made by children and adolescents for any reason, but were nearly 16% of all visits to the emergency department. (Reference Table 7.1.1 PDF CSV)



Summary Primary Diagnosis: Musculoskeletal Conditions of Children and Adolescents

Of the 19 million health care visits by children and adolescents in 2012, 15.6 million had a primary diagnosis of a musculoskeletal-related condition. The greater proportion (75%) were for the treatment of traumatic injuries, again excluding sports injuries. The second and third most common primary diagnosis remained a pain syndrome

(11%) and deformity (6%). Although other musculoskeletal related conditions accounted for 3% or fewer of total health care visits for a musculoskeletal-related condition, they nevertheless remain serious health concerns for children and adolescents. (Reference Table 7.1.2 PDF CSV)



Sources: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD www.hcup-us.ahrq.gov/kidoverview.jsp; HCUP Nationwide Emergency Department Sample (NEDS) Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp; National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.; National Ambulatory Medical Care Survey (NAMCS), 2008-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[1] Includes osteomyelitis, septic arthritis, soft tissue infections, Lyme disease, tuberculosis.

[2] Includes polydactyl, syndactyly, reduction deformities, and congenital deformities.

[3] Includes fractures, dislocation, sprains and strains, open wound, crushing injury, contusion, traumatic compartment syndrome, unspecified injuries, injuries to nerve roots, spinal plexus, birth trauma, and child abuse.

[4] Includes Marfan syndrome, Ehlers danlos, connective disorders, Down's syndrome, and neurofibromatosis.

[5] Sports injuries identifies only injuries treated in an emergency department for team sports and individual sports. Cases are not included in total diagnoses. Source: United States Consumer Product Safety Commission. National Electron Injury Surveillance System, 2011, 2012, 2013. https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014.

[6] Includes chondrodystrophy, achondroplasia, hypochondroplasia, dwarfism, congenital absence of rib, Osteogenesis imperfecta, osteoporosis, and other dysplasia.

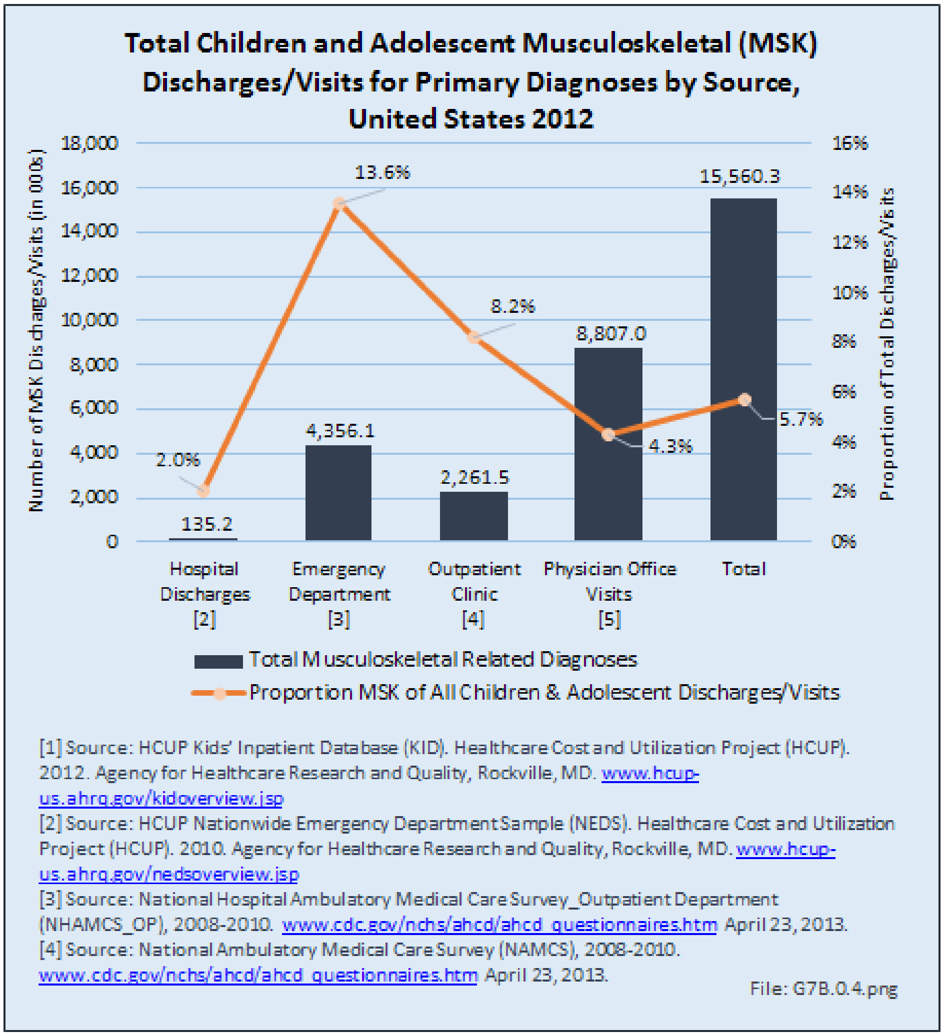
[7] Includes rheumatic fever, Reiter's disease/reactive arthritis, juvenile idiopathic arthritis, ankylosing spondylitis and inflammatory spondylopathies, psoriatic arthritis, arthropathy of inflammatory bowel disease, systemic lupus erythematosus, juvenile dermatomyositis, and localized scleroderma.

[8] Includes hemophilia, sickle cell, endocrine and metabolic disorders, Gaucher's disease, osteoporosis, hyperthyroid, rhabdomyolysis, rickets, and other conditions.

[9] Includes amplified musculoskeletal pain, juvenile primary fibromyalgia syndrome, reflex sympathetic dystrophy, benign hypermobility syndrome, and benign limb pains.

File: G7B.0.3.png

Again, the majority of visits were to physicians' offices (57%), while visits to an emergency department with a primary musculoskeletal-related condition diagnosis accounted for 28% of visits. Hospital discharges accounted for less than 1% of total visits with a primary musculoskeletal diagnosis. Health care visits that included a primary diagnosis of a musculoskeletal-related condition represented 6% of visits made by children and adolescents for any reason, but were 14% of all visits to the emergency department. (Reference Table 7.1.2 PDF CSV)



Musculoskeletal Infections: Children & Adolescents

Musculoskeletal infections included in this section are osteomyelitis, septic arthritis, soft tissue infections (myositis), Lyme disease, and tuberculosis. Osteomyelitis and septic arthritis are the most common form of pediatric musculoskeletal infections and most commonly occur in the first decade of life in previously healthy children. Lyme disease is caused by a bite from a deer tick and is less common than osteomyelitis and septic arthritis. It is more prevalent in the Northeastern and Midwestern regions of the United States.[1] Tuberculosis (TB) has become much less common in the United States over the last few decades, but has increased in incidence in developing countries secondary to immunodeficiency and multidrug resistance. TB infections involve the musculoskeletal system in 2% to 5% of cases.[2] Community-acquired *Staphylococcus aureus* (CA-SA) is the most common infecting organism in pediatric musculoskeletal infections and is typically treated with a first-generation cephalosporin, such as cefazolin. Over the past decade methicillin-resistant *Staphylococcus aureus* (MRSA) has become prevalent and requires treatment with second-line antibiotics such as clindamycin or vancomycin.[3] As

MRSA infections have become more prevalent, the disease course for patients with these infections has become much more severe, with greater systemic disease requiring multimodal and multidisciplinary treatments including medical, surgical, and critical care. Patients are often hospitalized for extended periods and most require continued care with long-term antibiotic treatment after discharge. Complications of musculoskeletal infections include growth deformity, fractures, and arthritis, and may result in long-term morbidity and dysfunction.

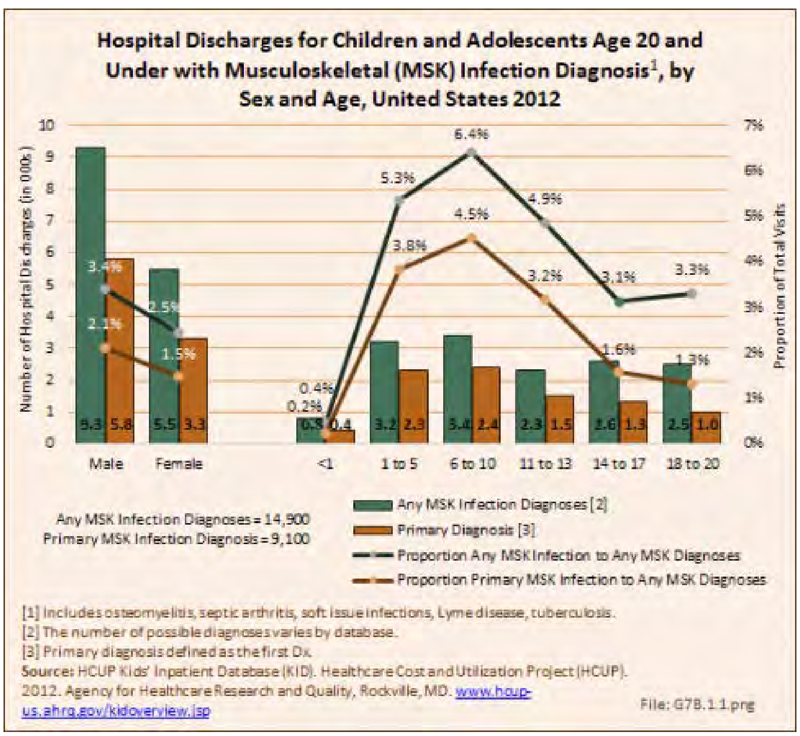
1. Willis AA, Widmann RF, Flynn JM, Green DW, Onel KB: Lyme arthritis presenting as acute septic arthritis in children. *J Pediatr Orthop* 2003 Jan-Feb;23(1):114-118.

2. Rasool MN: Osseous manifestations of tuberculosis in children. *J Pediatr Orthop* 2001 Nov-Dec;21(6):749-755.

3. Copley LA: Pediatric musculoskeletal infection: Trends and antibiotic recommendations. *JAAO*S 2009 Oct;17(10):618-626. PubMed PMID: 19794219. Epub 2009/10/02. eng.

Health Care Utilization: Musculoskeletal Infections, Children & Adolescents

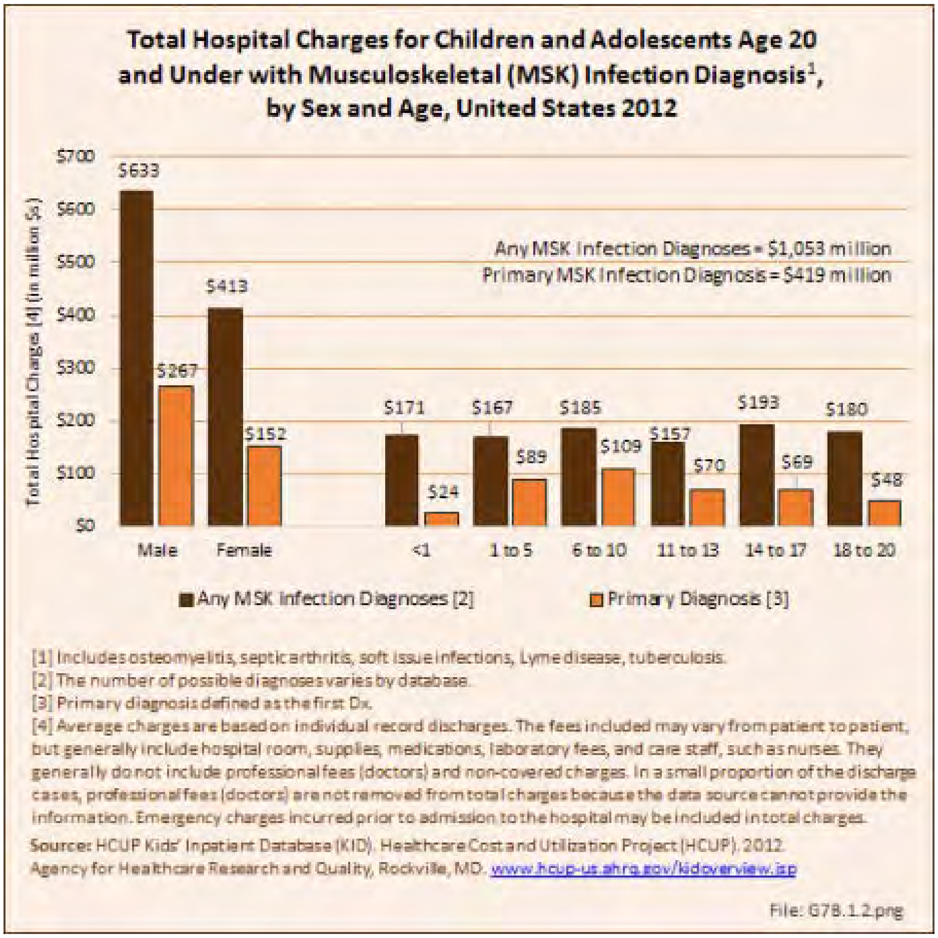
Musculoskeletal infections were diagnosed in 119,900 children and adolescent health care visits in 2012, of which 78,800 had a primary diagnosis of musculoskeletal infection. Of this total, 14,900 children and adolescents were hospital discharges, with 9,100 hospitalizations for a primary diagnosis of a musculoskeletal infection. (Reference Table 7.1.1 PDF CSV and Table 7.1.2 PDF CSV)



Males were more likely to be hospitalized with a musculoskeletal infection than females, as were children between the ages of 1 and 10 years. Musculoskeletal infections as a primary diagnosis accounted for 1.8% of hospital discharges for any musculoskeletal-related condition, but only 0.1% of hospital discharges for all health care reasons for children and adolescents age 20 years and younger. (Reference Table 7.2 PDF CSV)

Hospital Charges: Musculoskeletal Infections, Children & Adolescents

Total charges averaged $70,700 for a mean 8.5-day stay when children and adolescents were hospitalized with a diagnosis of musculoskeletal infection along with other medical conditions. With a primary diagnosis of infection, the stay was shorter (6.3 days), and mean charges were $46,000. Total hospital charges for all primary musculoskeletal infection discharges in 2012 were $419 million. (Reference Table 7.2 PDF CSV)



Deformity: Children & Adolescents

Deformity in children and adolescents was subdivided into five sections: upper extremity, lower extremity, hip and pelvis, spine, and other/unspecified.

Upper extremity deformity includes diagnoses such as polydactyly, syndactyly, reduction deformities such as amelia and longitudinal deficiencies of the upper extremity, and other congenital deformities such as synostosis, Madelung deformity, and Apert syndrome. A complete listing of deformity codes can be found by in the ICD-9-CM Child and Adolescents Codes.

Lower extremity deformity includes diagnoses such as polydactyly, syndactyly, reduction deformities such as amelia and longitudinal deficiencies of the lower extremity, genu varum, genu valgum, and other congenital developmental deformities such as clubfoot and flatfoot.

Hip and pelvis deformity includes diagnoses such as coxa valga, coxa vara, slipped capital femoral epiphysis, pelvic deformity, Legg Calves Perthes disease, and developmental dysplasia of the hip.

Spine deformity includes anomalies of the spinal cord such as syringomyelia and diastomatomyelia, as well as deformities of the vertebral column such as scoliosis, kyphosis, spondylolysis, spondylolisthesis, and congenital spinal anomalies.

Other and unspecified deformities include deformities of the chest wall such as pectus excavatum and pectus carinatum, as well as nonspecific deformity diagnoses.

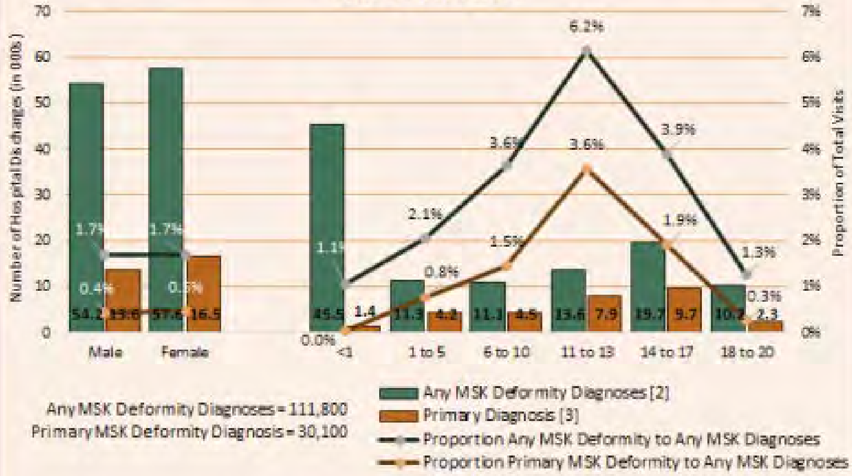
Health Care Utilization: Deformity, Children & Adolescents

Musculoskeletal deformities were diagnosed in 1.8 million children and adolescent health care visits in 2012, of which 943,800 had a primary diagnosis of musculoskeletal deformity. Among the total with any diagnoses of deformity, 111,800 children and adolescents were hospital discharges, with 30,100 hospitalizations for a primary diagnosis of a musculoskeletal infection. (Reference Table 7.1.1 PDF CSV and Table 7.1.2 PDF CSV)

Females had a slightly higher rate of overall deformity diagnoses with hospitalization, and accounted for 55% of primary diagnosis hospitalizations. Children under the age of 1 year had a high rate of musculoskeletal deformity for any diagnosis with hospitalization (41%), but accounted for only 5% of primary hospitalizations. Primary diagnosis of musculoskeletal deformity with hospitalization increased with age.

Musculoskeletal deformity as a primary diagnosis accounted for 6% of hospitalizations for any musculoskeletal condition diagnosis, but only 0.5% of hospitalizations for any health care reasons for children and adolescents age 20 years and under. (Reference Table 7.3 PDF CSV)

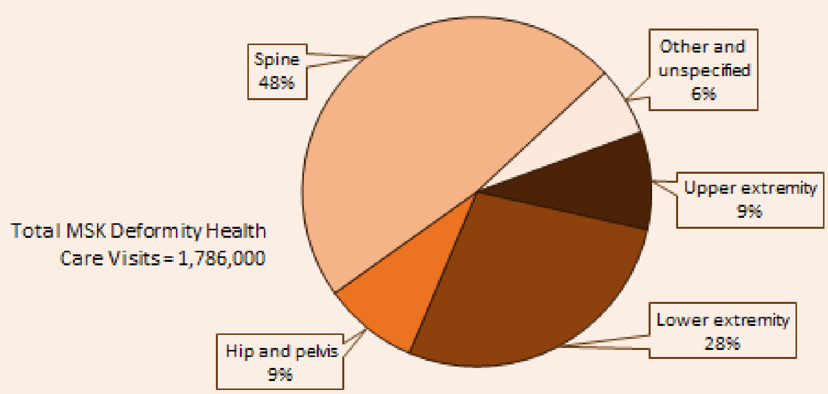
Hospital Discharges for Children and Adolescents Age 20 and Under with Musculoskeletal (MSK) Deformity Diagnosis[1], by Sex and Age, United States 2012



[1] Includes polydactyl, syndactyly, reduction deformities, and congenital deformities.
[2] The number of possible diagnoses varies by database.
[3] Primary diagnosis defined as the first Dx.
Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp File: G7B.2.1.png

Deformity of the spine represented the largest share of hospitalizations (42%), followed by the lower extremity at 29% and upper extremity at 18%.

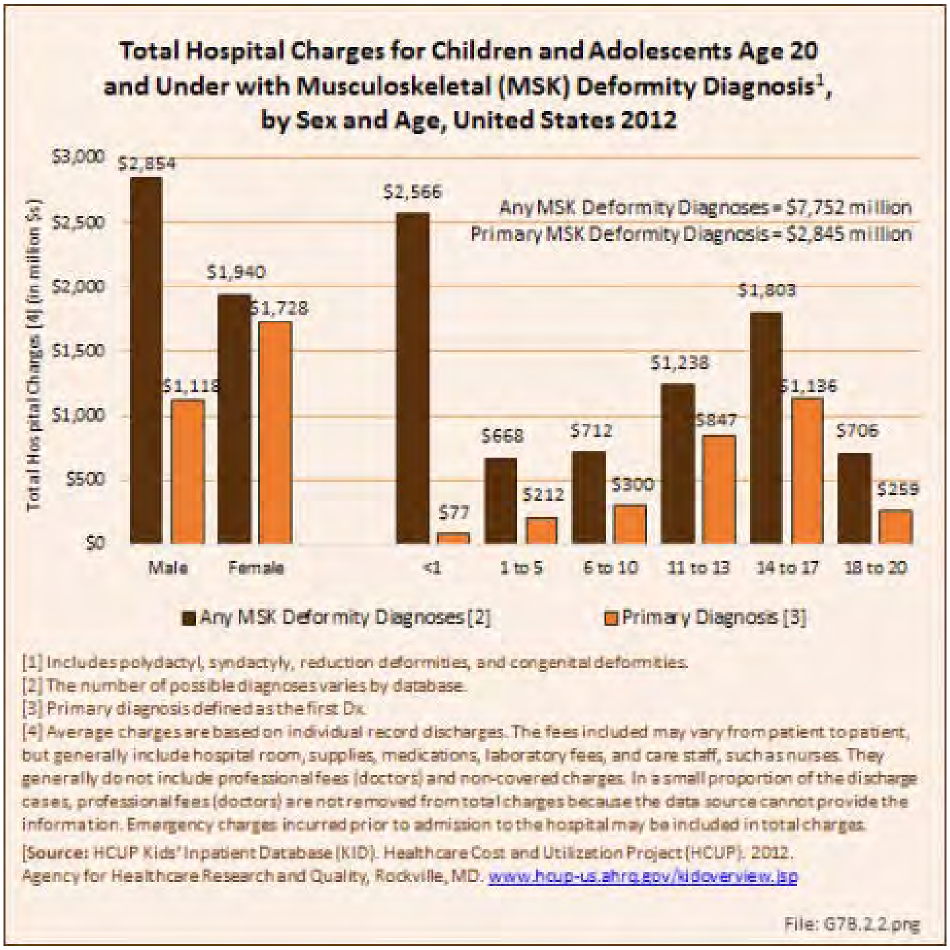
Health Care Visits for Children and Adolescents Age 20 and Under with Musculoskeletal (MSK) Deformity Diagnosis[1], by Body Site, United States 2012



[1] Includes polydactyl, syndactyly, reduction deformities, and congenital deformities.
Sources: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp; HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp; National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.; National Ambulatory Medical Care Survey (NAMCS), 2008-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013. File: G7B.2.3.png

Hospital Charges: Deformity, Children & Adolescents

Total charges averaged $69,300 for a mean 6.4-day stay when children and adolescents were hospitalized with a diagnosis of musculoskeletal deformity along with other medical conditions. With a primary diagnosis of deformity, the stay was shorter (4.1 days), but mean charges were much higher at $94,500, primarily due to the higher charges for children and adolescents age 11 years and older. Total hospital charges for all primary musculoskeletal deformity discharges in 2012 were $2.84 billion. (Reference Table 7.3 PDF CSV)



Trauma: Children & Adolescents

Traumatic injury is the leading cause of death in children and adolescents, accounting for 20,000 deaths per year in the United States.[1] Although most musculoskeletal injuries are not life threatening, they do account for approximately 10% to 25% of injuries in this age group.[2] The pediatric musculoskeletal system is different from that of an adult and therefore the assessment, treatment, and outcome of injuries is different. Pediatric bone is more elastic, allowing for superior remodeling capability. Because of this, many fractures in adults that require surgical treatment may be treated nonoperatively in children. On the other hand, injury to the growing child can result in growth deformity that can lead to long-term morbidity and the need for reconstructive treatments. This section subdivides pediatric musculoskeletal trauma into six sections: upper extremity, lower extremity, hip and pelvis, spine and trunk, birth trauma, and nonaccidental trauma (child abuse).

1. Depass K: Principles of trauma management in the pediatric patient. In: Abel M, ed. *Orthopaedic Knowledge Update Pediatrics*. 3rd ed. Rosemont, IL: American Academy of Orthopaedic Surgeons; 2006:249-258.

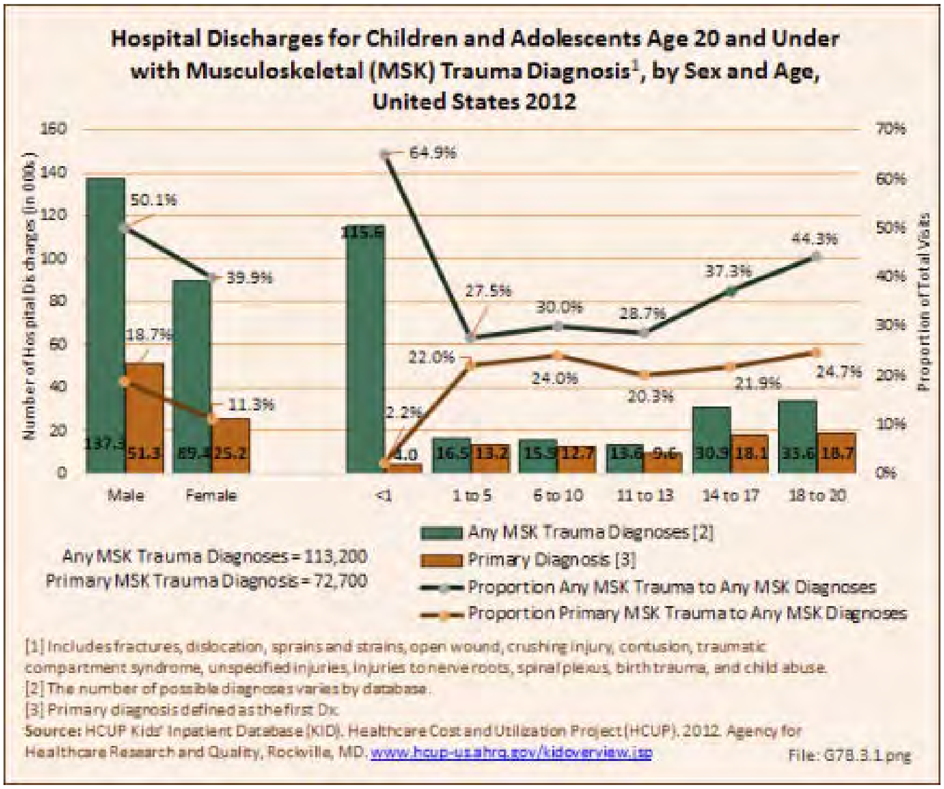
2. Price CT: Management of fractures. In: Morrissy RT WS, ed: *Lovell and Winter's Pediatric Orthopaedics*, 6th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2006:1429-1526.

Health Care Utilization: Trauma, Children & Adolescents

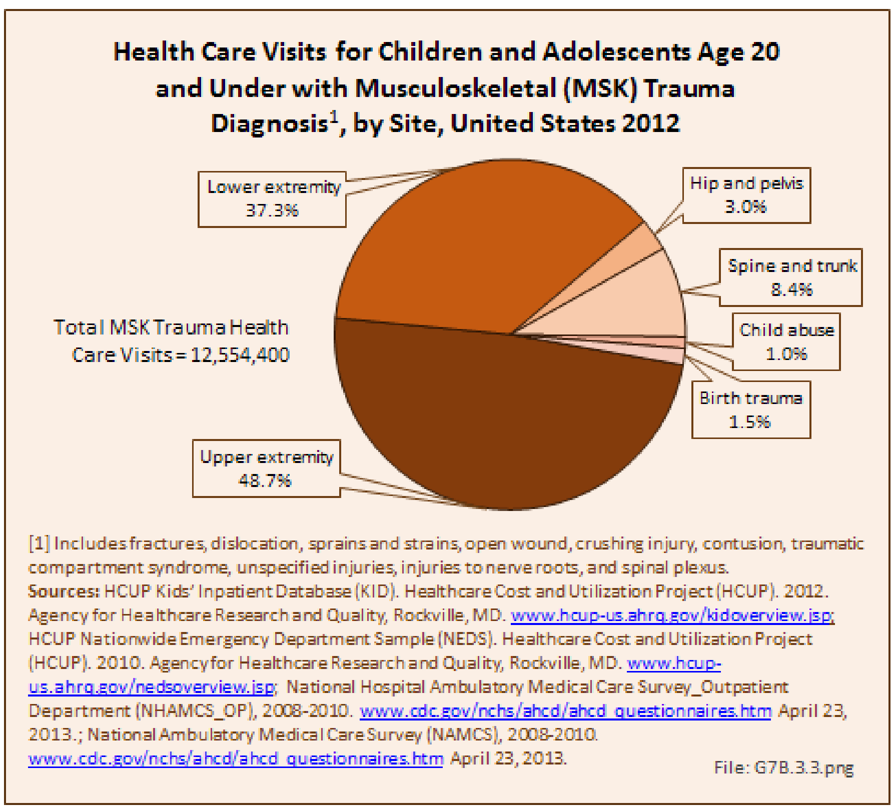
Trauma resulting in musculoskeletal injury was diagnosed in 12.9 million children and adolescent health care visits in 2012, of which 90% (11.6 million) had a primary diagnosis of musculoskeletal injury. Only a small number were serious enough to require hospitalization. Among any trauma musculoskeletal injury diagnoses, 226,700 children and adolescents were hospitalized, with 76,600 hospitalized with a primary diagnosis of a musculoskeletal injury. (Reference Table 7.1.1 PDF CSV and Table 7.1.2 PDF CSV)

Males had nearly double the injury rates with hospitalization of females for both any diagnoses or as a primary diagnosis. Hospitalization for musculoskeletal injuries were greater between the ages of 1 and 10 years than for the middle ages of 11 to 13 years. However, they were highest for the oldest adolescents, age 14 years and older. Children under the age of one year had a high rate of musculoskeletal injury for any diagnosis with hospitalization, primarily due to a diagnosis of birth trauma, and reflected in the much lower rate of hospitalization with a primary trauma diagnosis.

Musculoskeletal injury as a primary diagnosis accounted for 15% of hospitalizations for any musculoskeletal condition diagnosis, and 1.1% of hospitalizations for any health care reasons for children and adolescents age 20 years and younger. For all but the youngest age (under 1 year), which is skewed by birth trauma, trauma accounted for 20% to 25% of all hospitalization for any musculoskeletal diagnoses. (Reference Table 7.4 PDF CSV)

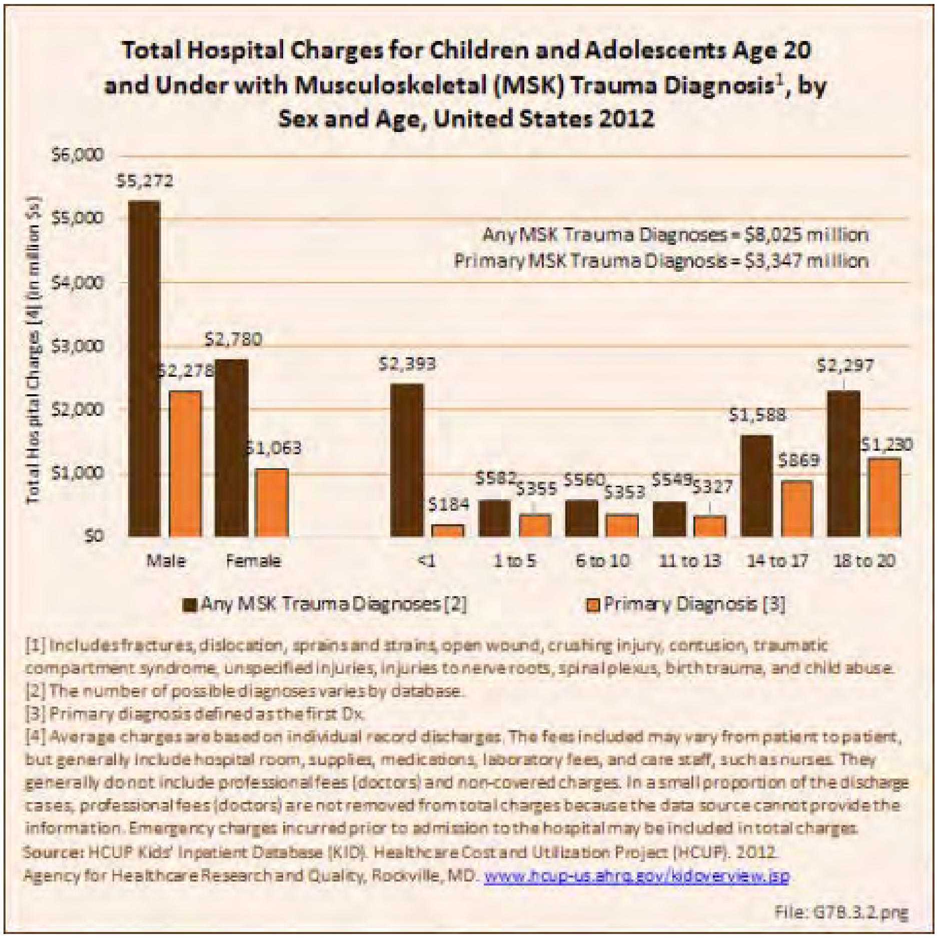


Trauma to the upper extremity account for nearly half (49%) of all trauma health care visits by children and adolescents. This was followed closely by lower extremity trauma (37%). Spine and trunk injuries were 8%, with hip and pelvis at 3%. Birth trauma was 1.5% of all health care visits, but accounted for nearly half (48%) of hospital discharges for musculoskeletal trauma diagnoses. Child abuse was reported in 1% of all health care visits for trauma. Trauma to multiple sites was cited in about 2% of cases. (Reference Table 7.1.1 PDF CSV)



Hospital Charges: Trauma, Children & Adolescents

Total charges averaged $35,400 for a mean 4.2-day stay when children and adolescents were hospitalized with a diagnosis of musculoskeletal injury along with other medical conditions. With a primary diagnosis of injury, the stay was shorter (3.2 days), but mean charges were higher at $43,700, likely due to the high number of birth trauma cases. Mean charges were highest for adolescents of high school age or older (14 to 20 years). Total hospital charges for all primary musculoskeletal injury discharges in 2012 were $3.35 billion. (Reference Table 7.4 PDF CSV)



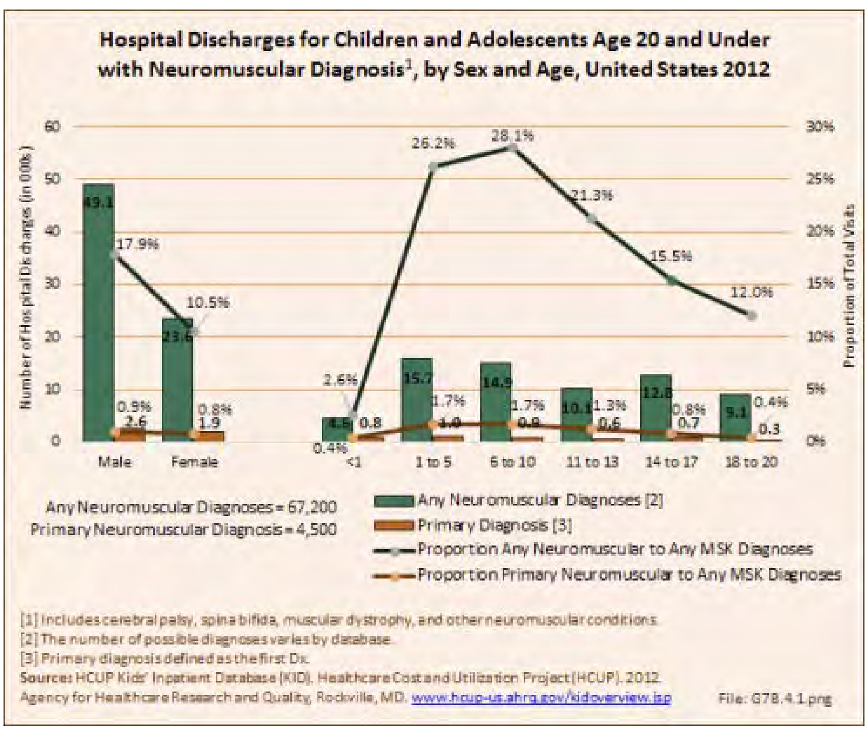
Neuromuscular Conditions: Children & Adolescents

Common pediatric neuromuscular conditions include cerebral palsy, myelomeningocele (spina bifida), muscular dystrophy, spinal muscular atrophy, hereditary motor sensory neuropathies, Friedrich ataxia, and Rett syndrome. This is a heterogeneous group of disorders with varying degrees of severity and involvement. Although some children and adolescents with these diagnoses can lead a relatively normal life, and participate in normal activities, many are completely dependent on their care provider. Most patients lie somewhere between the two ends of this range and require varying amounts of care for their condition. The overall burden of these diagnoses is not limited to number of visits or admissions. These diagnoses also carry significant indirect costs including, but certainly not limited to, lost wages by the caregiver who is unable to go to work; out-of-pocket costs for necessities such as therapy, bracing, and wheelchairs; and the significant emotional impact on the family and care provider.

Health Care Utilization: Neuromuscular Conditions, Children & Adolescents

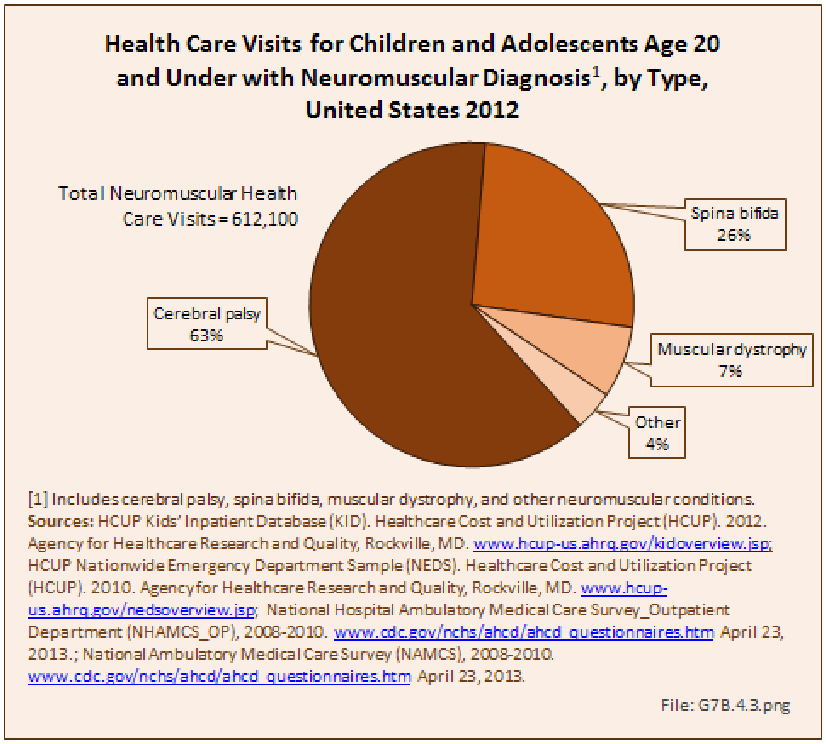
Neuromuscular conditions were diagnosed in 612,100 children and adolescent health care visits in 2012, of which 255,300 had a primary diagnosis of a neuromuscular condition. About 1 in 10 (11%) children and adolescents with any neuromuscular diagnoses were hospitalized (67,200), but fewer than 2% (4,500) with a primary neuromuscular diagnosis had a hospital discharge. (Reference Table 7.1.1 PDF CSV and Table 7.1.2 PDF CSV)

Males were more likely to be hospitalized than females for both any neuromuscular diagnoses or as a primary diagnosis. Children ages 6 to 10 years had the highest rate of hospitalization, both with any diagnoses and as a primary diagnosis. Rates of hospitalization declined as children age.



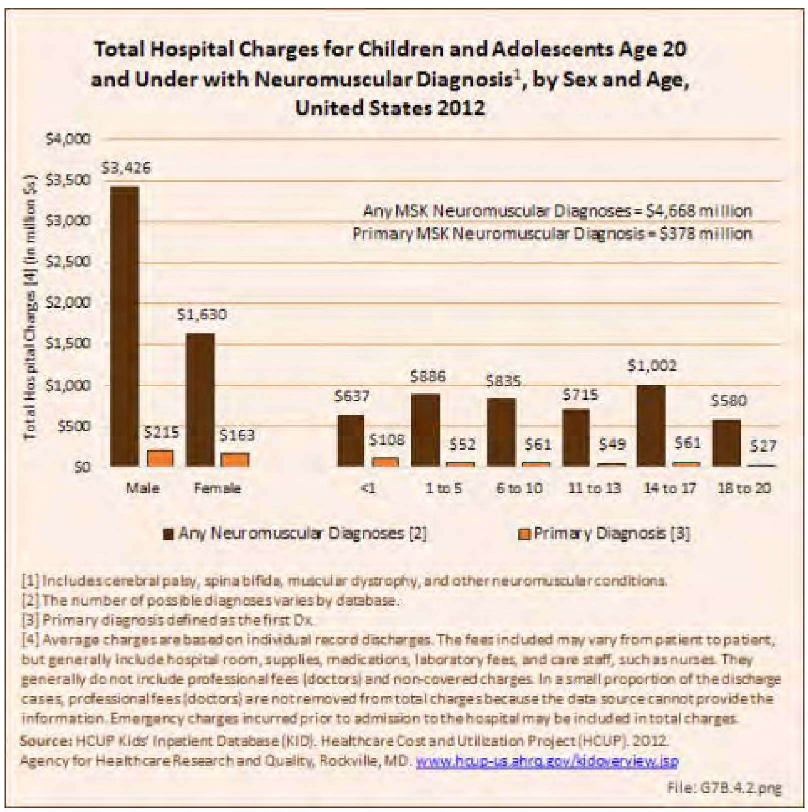
Neuromuscular conditions as a primary diagnosis accounted for about 1.5% of hospitalizations for any musculoskeletal condition diagnosis and only 0.1% of all hospitalizations for any health care condition. (Reference Table 7.5 PDF CSV)

Cerebral palsy was diagnosed in two-thirds (66%) of hospital discharges. Spina bifida and muscular dystrophy represented 18% and 8% of discharges, respectively.



Hospital Charges: Neuromuscular Conditions, Children & Adolescents

Total charges averaged $69,500 for a mean 6.7-day stay when children and adolescents were hospitalized with a diagnosis of a neuromuscular condition along with other medical conditions. With a primary neuromuscular diagnosis, the stay was longer (7.5 days), and mean charges were higher at $84,000. Mean charges and length of stay were highest for the youngest patients, those under 1 year of age. Total hospital charges for all primary neuromuscular discharges in 2012 were $378 million. (Reference Table 7.5 PDF CSV)



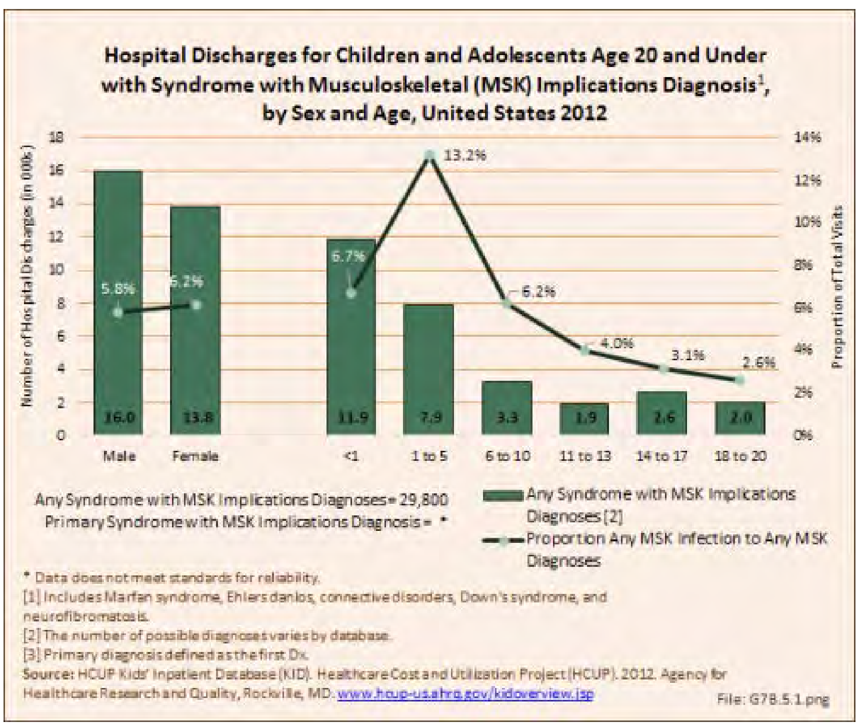
Syndromes with Musculoskeletal Implications: Children & Adolescents

Syndromes with musculoskeletal implications include those diagnoses that may result in or be associated with musculoskeletal problems or deformities. The most common syndromes with musculoskeletal implications include Marfan syndrome, Ehlers Danlos syndrome, Down syndrome, and neurofibromatosis. These patients may have musculoskeletal problems including scoliosis, pectus deformities, hip dysplasia, and flatfeet. Patients with neurofibromatosis may have congenital pseudarthrosis of the tibia. Many of these patients will require treatment for these musculoskeletal problems. Treatment, however, must be tailored to each individual patient as these syndromes often affect multiple body systems and require involvement of multiple medical disciplines.

Health Care Utilization: Syndromes, Children & Adolescents

Syndromes with musculoskeletal implications were diagnosed in 328,600 children and adolescent health care visits in 2012, of which 126,300 had a primary diagnosis of a syndrome condition. About 1 in 10 (9%) children and adolescents with any syndrome with musculoskeletal implications diagnoses were hospitalized (29,800), but less than 1% (600) with a primary diagnosis of a syndrome with musculoskeletal implications had a hospital discharge. (Reference Table 7.1.1 PDF CSV and Table 7.1.2 PDF CSV)

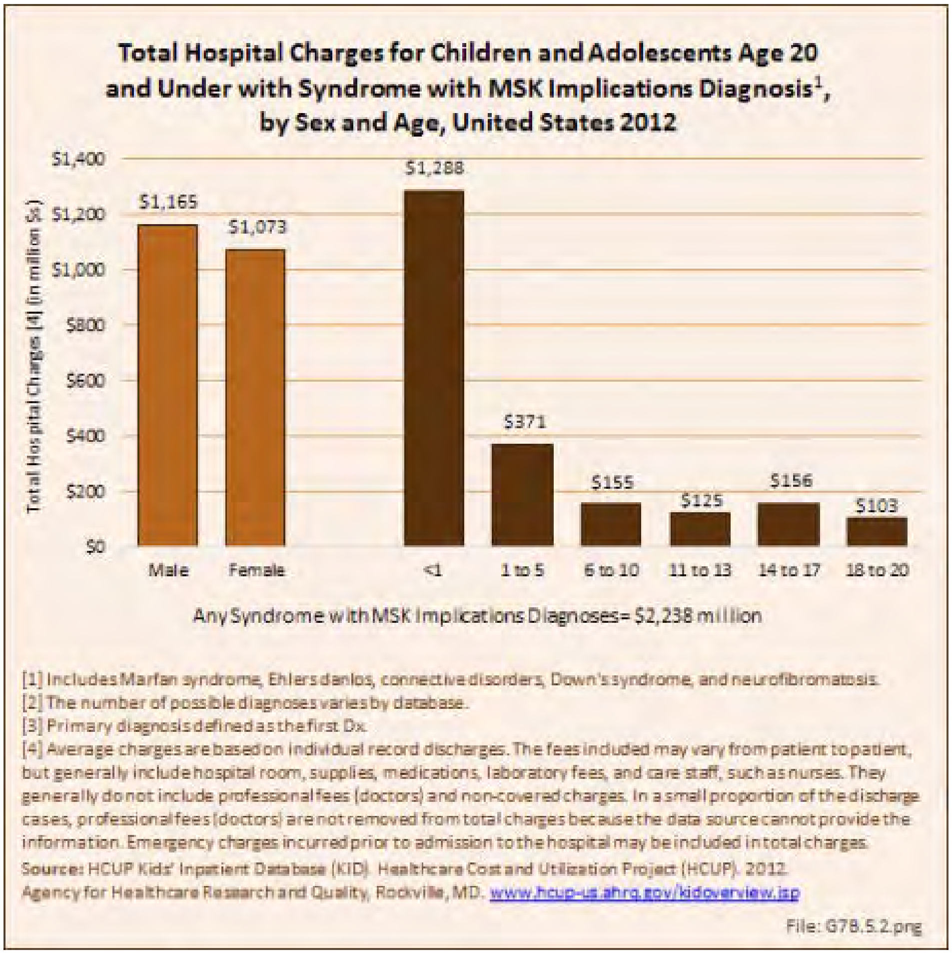
Males, more than females, had a hospital discharge with any syndrome with musculoskeletal implications diagnoses. Infants and young children under the age of 5 years had the highest rate of hospitalization for any diagnoses of syndromes with musculoskeletal implications. The number of hospitalizations with a primary diagnosis was too small for analysis by sex and age.



Any diagnoses of syndromes with musculoskeletal implications accounted for 6% of hospitalizations for any musculoskeletal condition diagnosis, and 0.4% of all hospitalizations for any health care condition. Hospitalizations with a primary diagnosis were 0.1% of all musculoskeletal diagnoses. (Reference Table 7.6 PDF CSV)

Hospital Charges: Syndromes, Children & Adolescents

Total charges averaged $75,100 for a mean 8.1-day stay when children and adolescents were hospitalized with a diagnosis of a syndrome with musculoskeletal implications condition along with other medical conditions. With a primary syndrome diagnosis, the stay was slightly longer (8.7 days), and mean charges were higher at $100,800. Mean charges and length of stay were highest for the youngest patients, those under 1 year of age. Total hospital charges for primary syndrome with musculoskeletal implications discharges in 2012 were $60.5 million. (Reference Table 7.6 PDF CSV)



Sports Injuries: Children & Adolescents

Athletic participation by children and adolescents increased dramatically between 1997 and 2008,[1] with participation declining slightly since the 2008 peak.[2] Since the late 1990's, athletic specialization has increased, resulting in earlier focus on single sports. As a result, there has been a commensurate increase in pediatric sports-related injuries, both acute and related to chronic overuse.[3] Pediatric and adolescent athletes are anatomically and physiologically different from adult athletes and therefore are at risk to sustain different injuries. Coordination and mechanics are less developed in pediatric athletes, placing them at greater risk for injuries related to falls and collisions. Growing athletes are at risk for most of the same injuries as adult athletes, but are uniquely susceptible to injuries about the physes and growth cartilage. Not only do these physeal (growth plate) and apophyseal injuries[4] require unique treatments, but they may also result in growth derangement that can have long-term consequences. Adolescent female athletes also have been shown to have a two- to nine-fold greater risk of knee injuries, which may be related to age and gender-specific differences in anatomy, neuromuscular control, and hormone levels.[5] Common pediatric sports-related injuries include anterior cruciate ligament (ACL) and meniscal tears, tibial eminence fractures, osteochondritis desiccans lesions, patellofemoral instability, Osgood Schlatter syndrome, little league shoulder and elbow, pelvic avulsion fractures, and distal radius epiphysitis.

1. National Council on Youth Sports (NCYS) Report on Trends and Participation in Organized Youth Sports Available at: http://www.ncys.org/publications/2008-sports-participation-study.php. Accessed February 21, 2015.

2. Physical Activity Council. 2014 Activity Report: The Physical Activity Council's annual study tracking sports, fitness and recreation participation in the USA. Available at: http://www.physicalactivitycouncil.com/pdfs/current.pdf. Accessed February21, 2015.

3. Caine D, Caine C, Maffulli N: Incidence and distribution of pediatric sport-related injuries. *Clin J Sport Med* 2006 Nov;16(6):500-513.

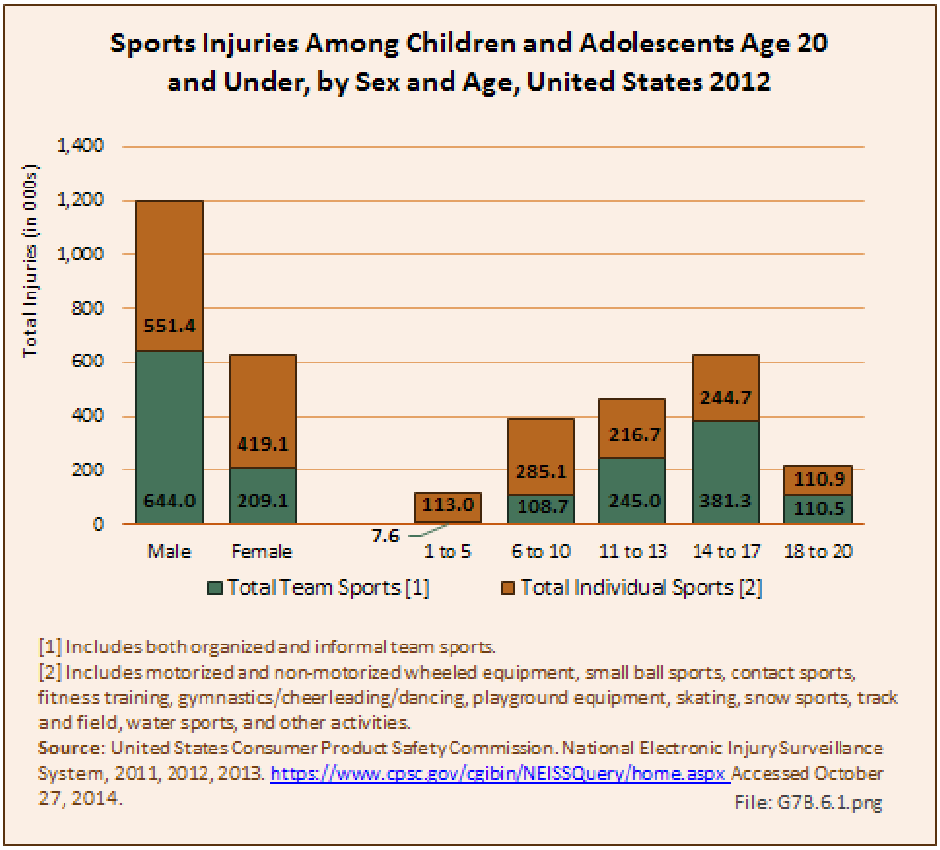
4. Apophyseal injuries, unique in the adolescent athlete, cause inflammation at the site of a major tendinous insertion onto a growing bony prominence.

5. Ireland ML: The female ACL: Why is it more prone to injury? *Ortho Clin NA* 2002 Oct;33(4):637-651.

Prevalence: Sports Injuries, Children & Adolescents

On average across the years from 2011 to 2013, 1.8 million injuries per year related to team or individual sport activities occurred to children and adolescents age 20 years and younger. Data reported is from consumer product-related injuries occurring in the United States from a statistically valid sample of emergency departments collected by the United States Consumer Product Safety Commission, National Electronic Injury Surveillance System. Data shown for sports injuries are not included in the overall total for musculoskeletal conditions among children and adolescents, on the assumption it duplicates numbers found in the emergency department database based on ICD-9-CM codes and used in the trauma injuries section.

Males report injuries at twice the number as females, with the highest number of injuries occurring in the junior high (11 to 13 years) and high school (14 to 17 years) ages. (Reference Table 7.7.1 PDF CSV)

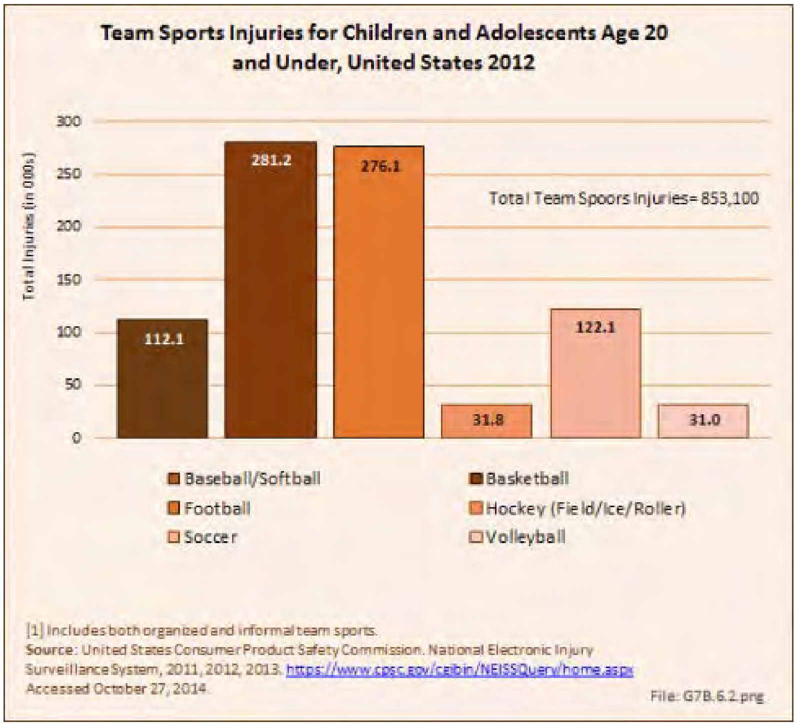


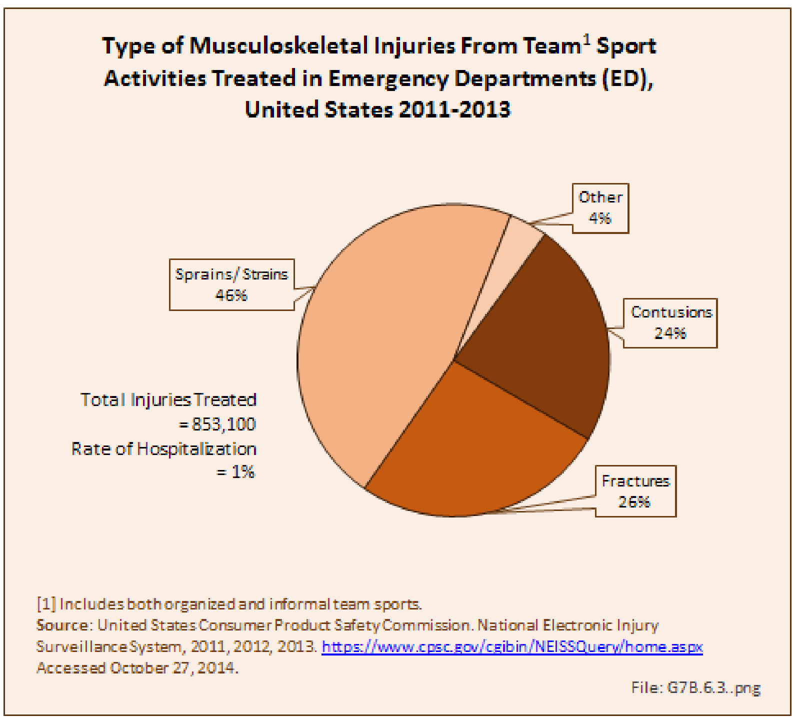
Team Sports Injuries: Sports Injuries, Children & Adolescents

Team sports, both organized and informal, accounted for just under one-half (47%, or 853,100 injuries) of all sports-related injuries reported. Basketball had the highest number of team sport related injuries at 33%, and was closely followed by football at 32%.

Team sport injuries to males were three times the number reported for females. The only sport in which female injuries outnumber male injuries is volleyball. Nearly half (45%) of team sport injuries to children and adolescents occurred during the high school years (age 14 to 17 years), with another 28% in the junior-high age range of 11 to 13 years. (Reference Table 7.7.1 PDF CSV)

The most common musculoskeletal injury incurred was a sprain or strain, accounting for 46% of team sport injuries. Volleyball had the highest proportion of sprains and strains, followed by basketball. Baseball led in contusion injuries, while fractures occurred most frequently in football, hockey (including field, ice, and roller hockey), and soccer. (Reference Table 7.7.2 PDF CSV)





Only 1% of team sport injuries were serious enough to result in hospitalization.

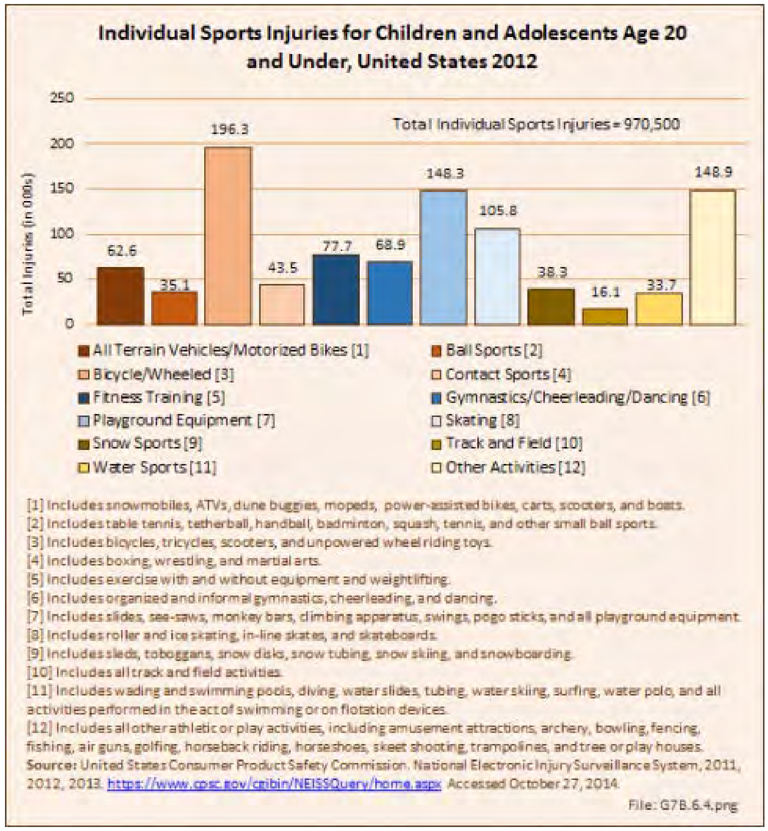
Individual Sports Injuries: Sports Injuries, Children & Adolescents

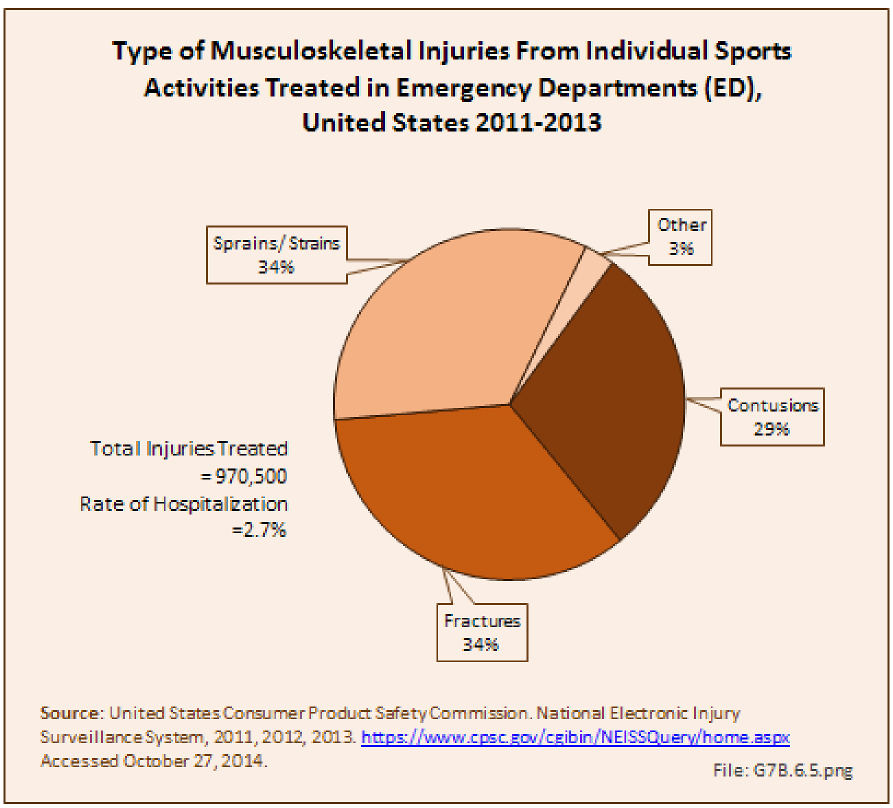
Individual sports injuries accounted for 53% of total injuries reported (970,500). One in five injuries occurred while riding bicycles or other nonmotorized wheeled equipment such as tricycles and scooters. These injuries occurred most frequently to children ages 6 to 10 years, but were common at all ages. Injuries on playground equipment were the second highest type of individual sport injuries, accounting for 15% of all injuries. Playground equipment injuries occurred almost exclusively to children age 10 years or younger. Skating injuries, which includes roller and ice skates, inline skates, and skateboards, were the cause of 11% of individual sport injuries.

Females accounted for a larger share of individual sport injuries (43%) than in team sports. Still, the only activity in which females had a significantly higher number of injuries than males was in gymnastics/cheerleading/dancing. (Reference Table 7.7.1 PDF CSV)

Fractures and sprains/strains each accounted for one-third of all individual sport activity injuries. However, the type of musculoskeletal injury varied substantially with the type of activity. Fractures resulted from playground equipment injuries one-half the time, and there were a higher share of fractures in snow sports and skating injuries as well. Sprains/strains occurred in two-thirds of track and field injuries, and there were a higher share of sprains/strains occurring in gymnastics/cheerleading/dancing and fitness training injury category as well. The most common type of injury reported from bicycle/wheeled equipment were contusions. (Reference Table 7.7.2 PDF CSV)

Nearly 3% of individual sport injuries resulted in hospitalization.





Skeletal Dysplasias: Children & Adolescents

Lead Author(s):
Scott B. Rosenfeld, MD

Supporting Author(s):
Ellen M. Raney, MD
Sylvia I. Watkins-Castillo, PhD

Skeletal dysplasias, also referred to as osteochondrodysplasias, are a heterogeneous group of disorders that affect the growth and development of bone and cartilage. There is great variability of severity and involvement ranging from neonatal lethality to mild growth differences noted incidentally in adulthood. Hundreds of such dysplasias have been described but most are so rare that true incidence is difficult to estimate.[1] The most common diagnoses included in this category are achondroplasia, hypochondroplasia, pseudoachondroplasia, multiple epiphyseal dysplasia, diastrophic dysplasia, multiple hereditary exostosis, enchondromatosis, osteogenesis imperfecta, and osteopetrosis. The overall incidence of skeletal dysplasias is two to five per 10,000 live births.[2] Despite their relative rarity, many patients with these disorders require extensive medical and surgical treatments throughout their childhood and into adulthood.

Because of the rarity of skeletal dysplasias, data on health care visits for these conditions is too small to be reported.

1. Kornak U, Mundlos S: Genetic disorders of the skeleton: A developmental approach. *Am J Hum Genet* 2003 Sep;73(3):447-774.

2. Frassier F, Hamdy RC: Arthrogrypotic Syndromes and Osteochondrodysplasias. In: Abel MF, ed. *Orthopaedic Knowledge Update Pediatrics*. 3rd ed. Rosemont, IL: American Academy of Orthopaedic Surgeons; 2006:137-151.

Neoplasms: Children & Adolescents

Lead Author(s):
Scott B. Rosenfeld, MD

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

Pediatric musculoskeletal neoplasms are relatively rare. They can be categorized as either benign or malignant, as has been done for this document. Musculoskeletal neoplasms are often also categorized by the type of tissue they produce or from which they are derived.

The most common types of tumors that affect the musculoskeletal system by tissue type are cysts, bone-producing tumors, cartilage tumors, fibrous tumors, soft tissue tumors, and peripheral neuroectodermal tumors. Most benign tumors, such as nonossifying fibromas, result in little or no disability and require no treatment. Other benign tumors may require surgical intervention. Painful or prominent osteochondromas may require surgical excision. Simple bone cysts can weaken the bone and increase fracture risk, and may require surgery treatment in order to resolve the cyst and prevent fracture. Other benign tumors include lipomas, fibrous dysplasia, enchondromas, osteoid osteoma, and osteoblastomas.

The most common malignant tumors of the pediatric musculoskeletal system are osteosarcoma, Ewing sarcoma/peripheral neuroectodermal tumor, rhabdomyosarcoma, and synovial cell sarcoma. Osteosarcoma is the most common malignant bone tumor in patients under 20 years of age, with an incidence of around 29 per 1 million people. Ewing sarcoma is the second most common pediatric malignant musculoskeletal tumor and is part of the Ewing family of tumors, which includes peripheral neuroectodermal tumors. Most of the tumors in the family have the genetic translocation.[1] Long-term survival of patients with both of these tumors has drastically improved with the routine use of adjuvant chemotherapy.

For additional information on musculoskeletal tumors in children you can refer to the Tumors section of this report.

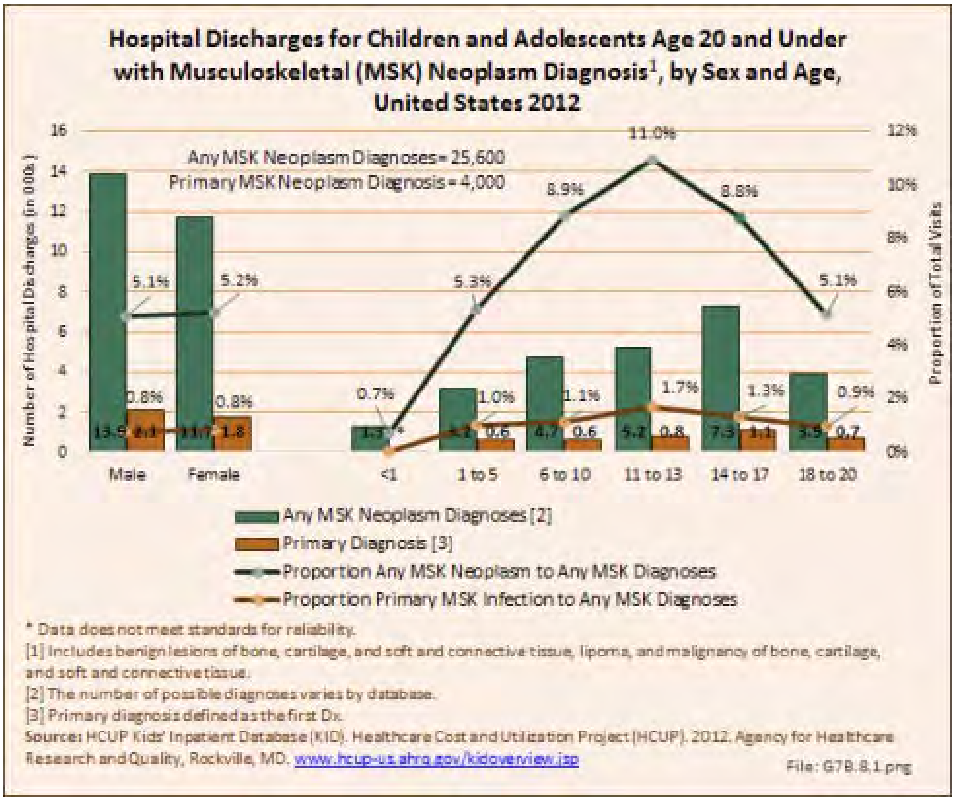
1. Genetic translocation is the process of exchange of genetic material between chromosomes. A balanced translocation results in no gain or loss of material, while an unbalanced translocation may result in trisomy or monosomy of a particular chromosome segment. A trisomy is a type of polysomy in which there are three instances of a particular chromosome, instead of the normal two—one from each parent. In a monosomy, one of the two normal chromosomes is missing.

Health Care Utilization: Neoplasms, Children & Adolescents

Neoplasms, including both benign and malignant, were diagnosed in 140,700 children and adolescent health care visits in 2012, of which 84,500 had a primary diagnosis of a neoplasm. About one in five (18%) of children and adolescents with any neoplasm diagnoses were hospitalized (25,600), but fewer than 5% (4,000) with a primary diagnosis of a neoplasm had a hospital discharge. (Reference Table 7.1.1 PDF CSV and Table 7.1.2 PDF CSV)

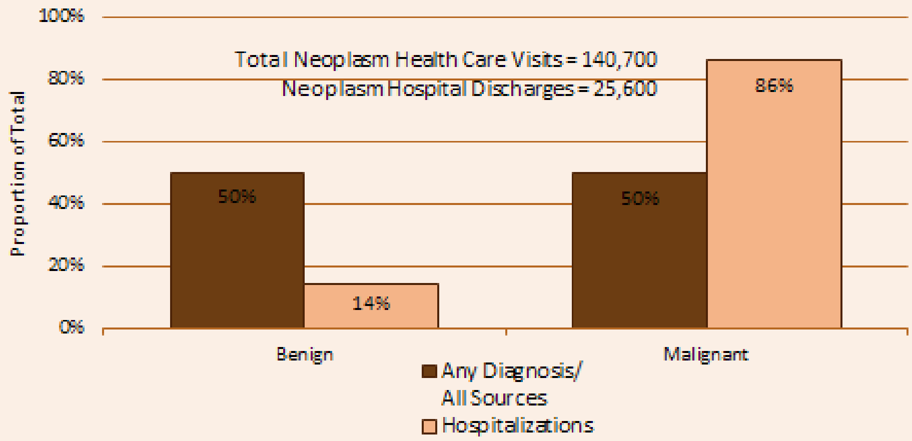
Slightly more males than females had a hospital discharge with any or a primary neoplasm diagnosis. As children age, there is a higher incidence of neoplasm prevalence resulting in hospitalization.

Any diagnoses of neoplasm accounted for 5% of hospitalizations for any musculoskeletal condition diagnosis, and 0.4% of all hospitalizations for any health care condition. Hospitalizations with a primary diagnosis of neoplasm were 0.8% of all musculoskeletal diagnoses and 0.1% of hospitalizations for any health condition diagnosis. (Reference Table 7.8 PDF CSV)



Neoplasm diagnoses are divided equally between benign and malignant neoplasm for any diagnoses and all sources, but 86% of hospitalized diagnoses are malignant.

Health Care Visits for Children and Adolescents Age 20 and Under with Neoplasm Diagnosis[1], by Type, United States 2012

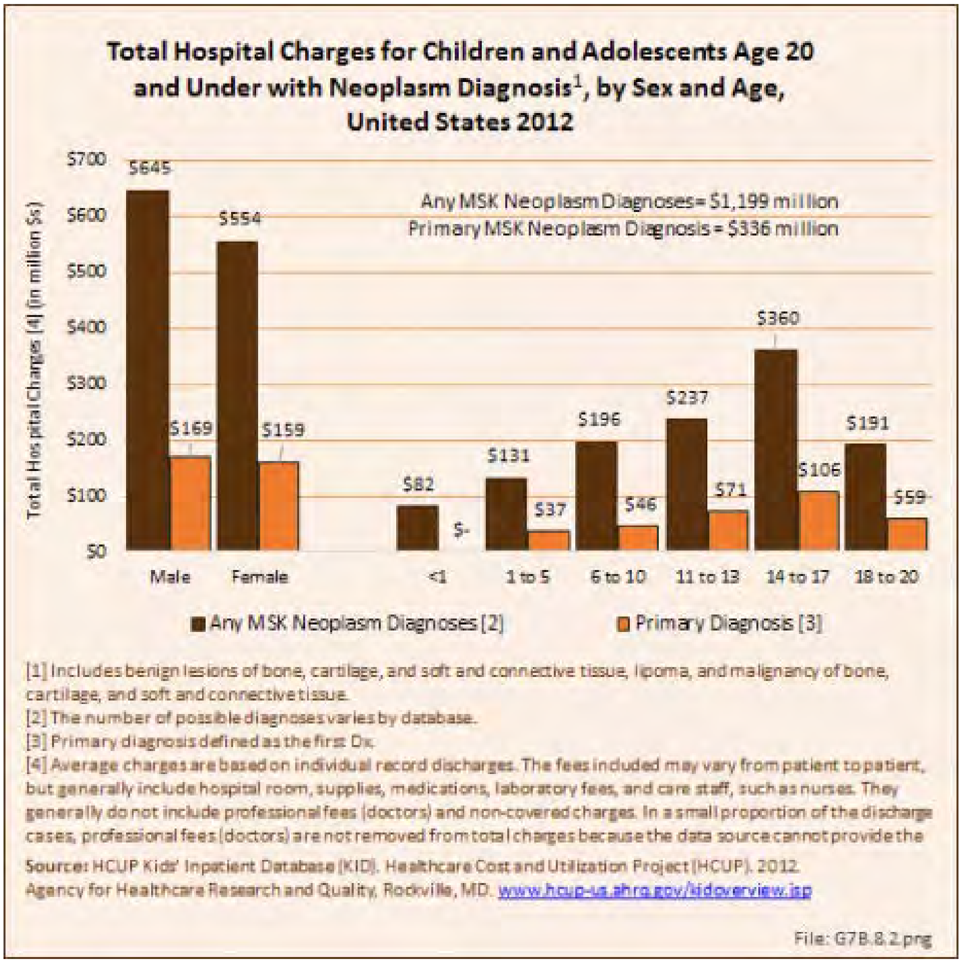


[1] Includes benign lesions of bone, cartilage, and soft and connective tissue, lipoma, and malignancy of bone, cartilage, and soft and connective tissue.
Sources: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp; HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp; National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.; National Ambulatory Medical Care Survey (NAMCS), 2008-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

File: G7B.8.3.png

Hospital Charges: Neoplasms, Children & Adolescents

Total charges averaged $46,900 for a mean 4.6-day stay when children and adolescents were hospitalized with any diagnosis of neoplasm along with other medical conditions. With a primary neoplasm diagnosis, the stay was slightly longer (6.2 days), and mean charges were higher at $84,100. Mean charges and length of stay were highest for children ages 14 to 17 years, but the increase rose steadily from the youngest patients. Total hospital charges for primary neoplasm diagnosis discharges in 2012 were $336.3 million. (Reference Table 7.8 PDF CSV)



Rheumatologic Conditions: Children & Adolescents

Lead Author(s):
Aimee O. Hersh, MD

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

An estimated 300,000 children in the Unites States are diagnosed with juvenile arthritis or another chronic rheumatologic condition such as systemic lupus erythematosus, juvenile dermatomyositis, or linear scleroderma.1 These chronic musculoskeletal conditions generally require chronic care, and without appropriate treatment can lead to significant disability.

Juvenile idiopathic arthritis (JIA) (formally called juvenile rheumatoid arthritis [JRA] or juvenile chronic arthritis [JCA]) is estimated to affect 1 in 1,000 children in the United States.2 JIA is diagnosed in a child younger than 16 years of age with at least six weeks of persistent arthritis. There are seven distinct subtypes, each having a different presentation and association to autoimmunity and genetics.3 Certain subtypes are associated with an increased risk of inflammatory eye disease (uveitis). Understanding the differences in the various forms of JIA, their causes, and methods to better diagnose and treat these conditions in children is important to future treatment and prevention. Among all subtypes, approximately half of children with JIA still have active disease after 10 years.4

There are several other causes of acute or chronic arthritis in children that do not meet the diagnostic criteria of JIA, including, but not limited to, rheumatic fever, Reiter syndrome/reactive arthritis, and the arthritis associated with inflammatory bowel disease.

Approximately 15% to 20% of cases of systemic lupus erythematosus (SLE) in the United States occur in children younger than 18 years of age. SLE is a chronic autoimmune condition characterized by the production of autoantibodies leading to immune complex formation and end organ damage. For reasons that remain unclear, pediatric SLE is associated with increased disease severity, increased short- and long-term morbidity, and mortality as compared to adult-onset SLE.5

Juvenile dermatomyositis is a chronic inflammatory condition characterized by inflammation of the skin and muscle. Estimated incidence of the disease in the United States is 0.5 per 100,000 people; the prevalence is not known.2

The sclerodermatous conditions are defined in part by the common clinical feature of tightening or hardening of the skin. Systemic scleroderma, also called diffuse cutaneous systemic scleroderma, is rare in childhood, accounting for only 2% to 3% of all cases of this condition, which has an estimated prevalence of 24 cases per 100,000 people. Linear scleroderma is the most common subtype of scleroderma diagnosed in the pediatric population. It is characterized by a linear streak of sclerosis typically involving an upper or lower extremity.2

In 2006, the CDC Arthritis Program finalized a case definition for ongoing surveillance of pediatric arthritis and other rheumatologic conditions (SPARC) using the current ICD-9-CM diagnostically -based data systems.6 In response to the variations in conditions that some felt should be included but were not, CDC generated estimates not included in the case definition.

1. Sacks JJ, Helmick CG, Luo YH, Ilowite NT, Bowyer S: Prevalence of and annual ambulatory health care visits for pediatric arthritis and other rheumatologic conditions in the United States in 2001–2004. *Arthritis Rheum* 2007;57(8):1439-1445.

2. a. b. c. Cassidy JT, Petty RE, Laxer RM, Lindsley CB: *Textbook of Pediatric Rheumatology*, 6th ed. 2010. Elsevier Inc, Philadelphia, PA.

3. Petty RE, Southwood TR, Manners P, et al: International League of Associations for Rheumatology classification of juvenile idiopathic arthritis: Second revision, Edmonton, 2001. *J Rheumatol* 2004;31(2):390-392.

4. Minden, K: Adult outcomes of patients with juvenile idiopathic arthritis. *Horm Res* 2009;72(Suppl 1)20-25.

5. Kamphuis S, Silverman ED: Prevalence and burden of pediatric-onset systemic lupus erythematosus. *Nat Rev Rheumatol* 2010;6(9):538-546.

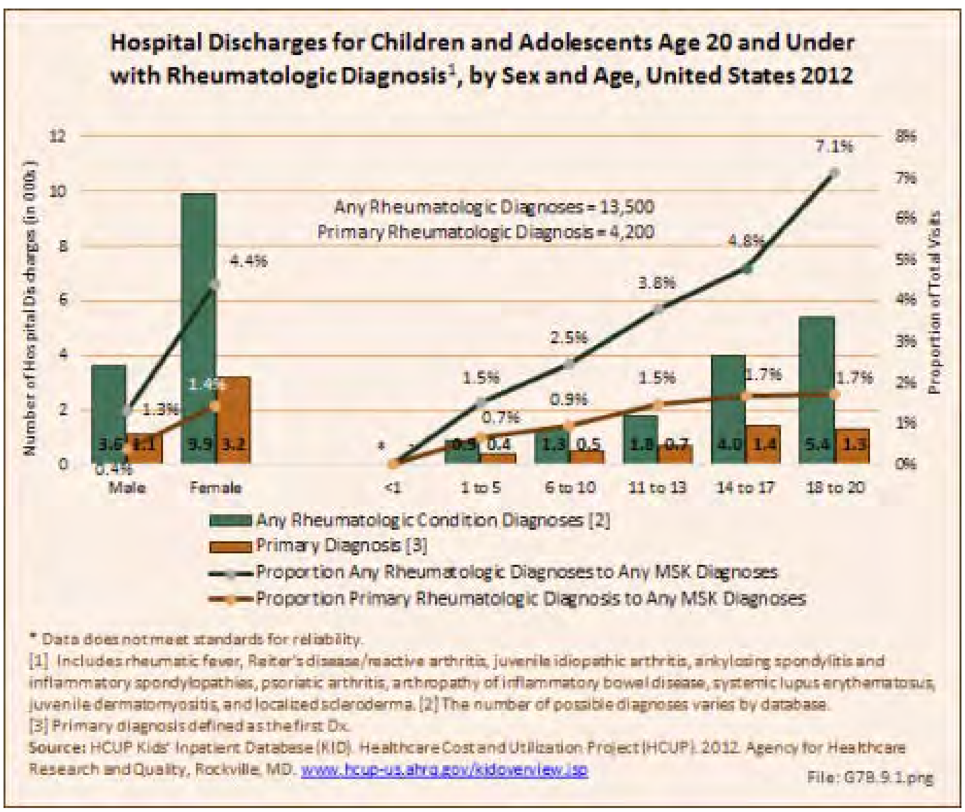
6. Centers for Disease Control and Prevention (CDC): Childhood arthritis. Available at: (http://www.cdc.gov/arthritis/basics/childhood.htm) Accessed February 19, 2015.

Health Care Utilization: Rheumatologic Conditions, Children & Adolescents

Using the SPARC definitions, rheumatologic conditions were diagnosed in 621,200 children and adolescent health care visits in 2012, of which 491,300 had a primary diagnosis of a rheumatologic condition. Only 2% of children and adolescents with any rheumatologic diagnoses were hospitalized (13,500), while less than 1% (4,200) with a primary diagnosis of a rheumatologic condition had a hospital discharge. The majority of children and adolescents with a rheumatologic condition diagnosis were seen in physicians' offices. (Reference Table 7.1.1 PDF CSV; and Table 7.1.2 PDF CSV)

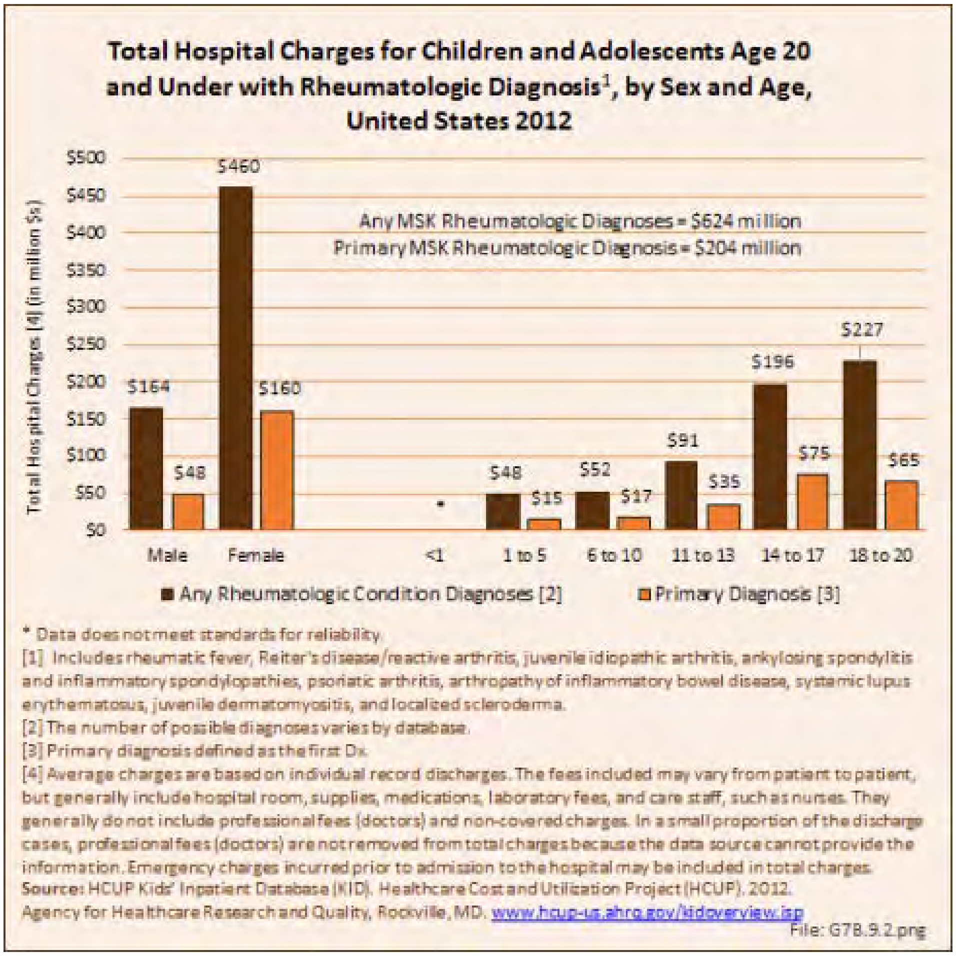
Females were hospitalized with a rheumatologic condition at nearly three times the rate of males, both for any diagnoses and as a primary diagnosis. As children age, there is a higher incidence of rheumatologic conditions diagnosis.

Any diagnoses of a rheumatologic condition accounted for just under 3% of hospitalizations for any musculoskeletal condition diagnosis, and 0.2% of all hospitalizations for any health care condition. Hospitalizations with a primary diagnosis of a rheumatologic condition were 0.8% of all musculoskeletal diagnoses and 0.1% of hospitalizations for any health condition diagnosis. (Reference Table 7.9 PDF CSV)



Hospital Charges: Rheumatologic Conditions, Children & Adolescents

Total charges averaged $46,200 for a mean 5.3-day stay when children and adolescents were hospitalized with any diagnosis of a rheumatologic condition along with other medical conditions. With a primary rheumatologic diagnosis, the stay was about the same (5.1 days), and mean charges only slightly higher at $48,500. Age and sex were not significant factors in length of hospital stay and average charges for a rheumatologic condition diagnosis. Total hospital charges for primary rheumatologic condition diagnosis discharges in 2012 were $203.8 million. (Reference Table 7.9 PDF CSV)



Medical Problems with Musculoskeletal Implications: Children & Adolescents

Lead Author(s):
Scott B. Rosenfeld, MD

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

Many medical problems have musculoskeletal implications. This section discusses some of the more common of those diagnoses, including hemophilia, sickle cell disease, and endocrine and metabolic disorders such as rickets and lysosomal storage disorders.

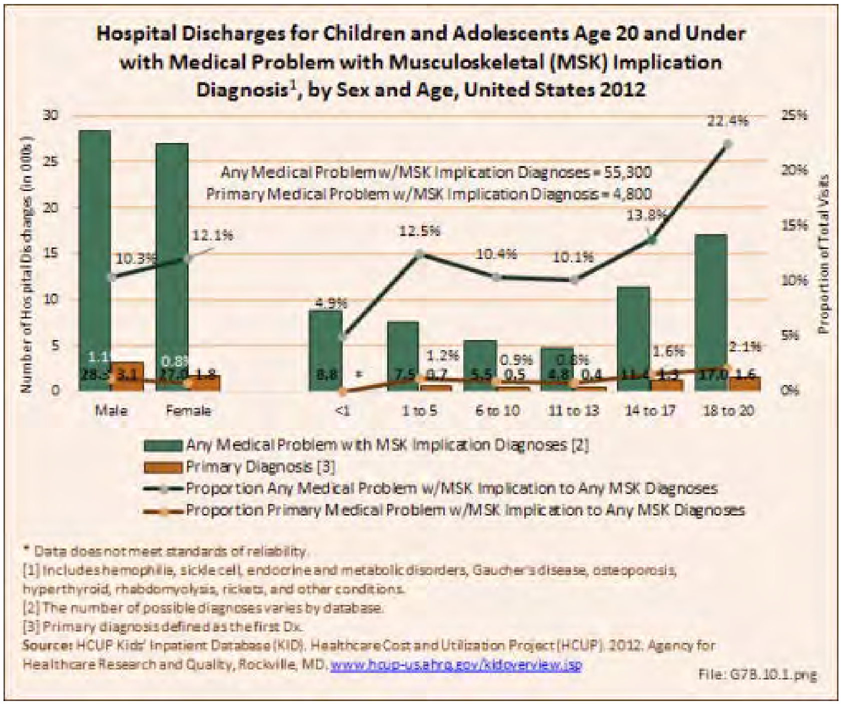
Hemophilia is a genetic disorder characterized by abnormal blood clotting secondary to congenital deficiency of clotting factors VIII and IX. It may result in musculoskeletal problems by way of hemophilic arthropathy and intramuscular hemorrhage. Hemophilic arthropathy occurs through spontaneous bleeding into a weight-bearing joint, resulting in cartilage degeneration and arthrosis as well as asymmetric growth stimulation and deformity. Sickle cell disease is inherited in an autosomal dominant fashion and is characterized by production of abnormal hemoglobin. This results in reduced oxygen delivery to tissues and can lead to multiple musculoskeletal manifestations, including painful bone infarcts, osteomyelitis, avascular necrosis, and vertebral compression fractures.

Metabolic bone diseases, such as rickets, occur due to abnormal calcium and phosphate metabolism. Rickets occurs in many forms, including vitamin D deficiency, vitamin D resistance, hypophosphatemic rickets, and renal osteodystrophy. Regardless of the cause, the result is inadequate calcification of bone and cartilage, resulting in bone pain and deformity.

The most common lysosomal storage disease is Gaucher’s disease, an autosomal recessive condition characterized by a deficiency in the enzyme beta-glucocerebrosidase. In Gaucher’s disease, there is an accumulation of glucocerebrosides, which contain glucose, in the tissues. This results in musculoskeletal manifestations that include bone deformity secondary to bone marrow infiltration, avascular necrosis, bone pain, pathologic fracture, and osteomyelitis.

Health Care Utilization: Medical Problems, Children & Adolescents

Medical problems with musculoskeletal implications were diagnosed in 455,800 children and adolescent health care visits in 2012, of which 45% (207,000) had a primary diagnosis of a medical problem with musculoskeletal

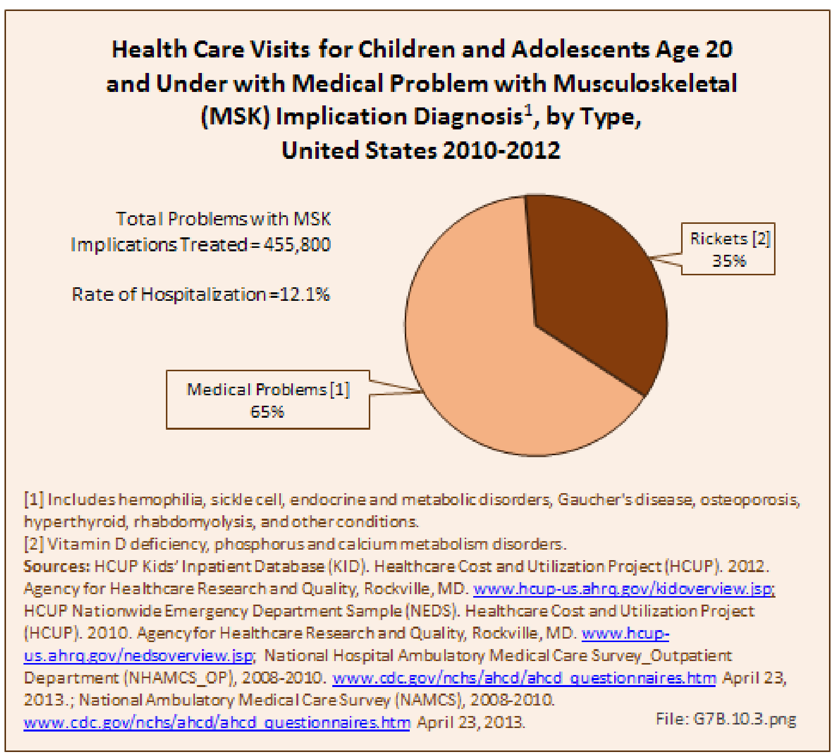


implications condition. More than one in ten (12%) children and adolescents with any medical problem diagnoses were hospitalized (55,300), while 2% (4,800) with a primary diagnosis had a hospital discharge. (Reference Table 7.1.1 PDF CSV and Table 7.1.2 PDF CSV)

Males and females were hospitalized with a medical problem with musculoskeletal implications in about the same numbers, but with a primary diagnosis, males were more likely to be hospitalized. The highest rate of hospitalization when compared to other MSK conditions, was for adolescents age 18 to 20 years of age, the ages just entering adulthood. However, this age group tends to have a higher rate of musculoskeletal hospitalizations overall.

Any diagnoses of a medical problem with musculoskeletal implications accounted for 11% of hospitalizations for any musculoskeletal condition diagnosis, and less than 1% of all hospitalizations for any health care condition. Hospitalizations with a primary diagnosis of a medical problem were 1% of all musculoskeletal diagnoses and 0.1% of hospitalizations for any health condition diagnosis. (Reference Table 7.10 PDF CSV)

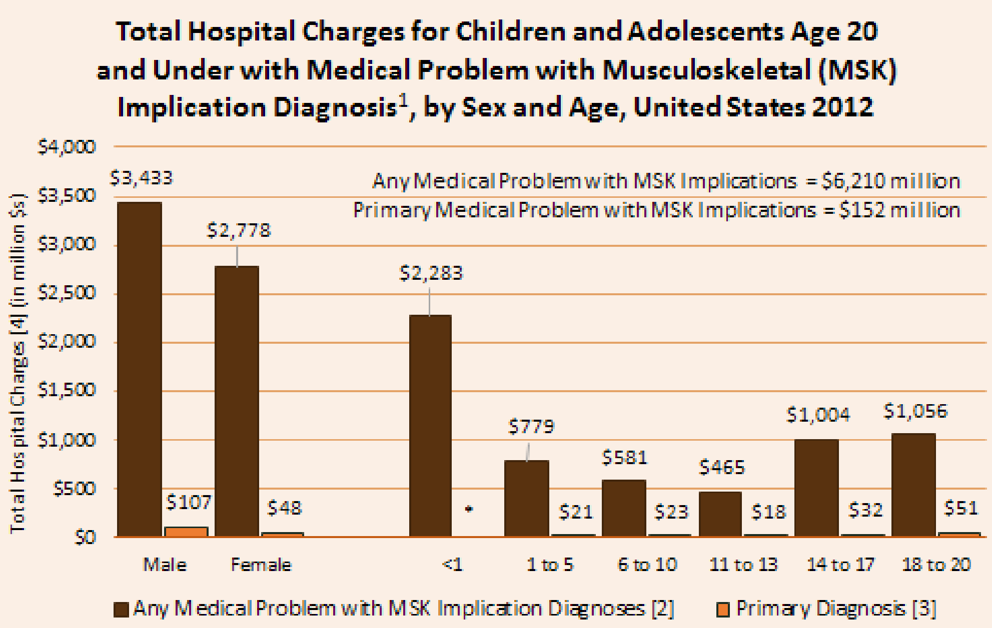
Rickets accounted for 35% of all health care visits for medical problems with musculoskeletal implications, but 69% of the hospitalized cases. (Reference Table 7.1.1 PDF CSV)



Hospital Charges: Medical Problems, Children & Adolescents

Total charges averaged $112,300 for a mean 11.5-day stay when children and adolescents were hospitalized with any diagnosis of a medical problem with musculoskeletal implications along with other medical conditions. With a primary medical problem diagnosis, the stay was shorter (3.5 days), and mean charges about a fourth that of medical problems as a contributing condition ($31,600).

When hospitalized with any diagnosis of a medical problem with musculoskeletal implications along with other medical conditions, males had slightly longer hospital stays and charges than females did. Infants under the age of 1 year had significantly longer stays and higher charges than other age groups, primarily due to cases of rickets. However, for primary medical diagnoses of musculoskeletal implications along with another medical condition, sex and age were not major factors in length of hospital stay and mean charges. Total hospital charges for primary medical problem with musculoskeletal implications diagnosis discharges in 2012 were $151.7 million. (Reference Table 7.10 PDF CSV)



* Data does not meet standards for reliability.
[1] Includes hemophilia, sickle cell, endocrine and metabolic disorders, Gaucher's disease, osteoporosis, hyperthyroid, rhabdomyolysis, rickets, and other conditions.
[2] The number of possible diagnoses varies by database.
[3] Primary diagnosis defined as the first Dx.
[4] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges.
[**Source:** HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp

File: G7B.10.2.png

Pain Syndromes: Children & Adolescents

Lead Author(s):
Aimee O. Hersh, MD

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

Musculoskeletal pain syndromes, including amplified musculoskeletal pain, juvenile primary fibromyalgia syndrome, reflex sympathetic dystrophy, benign hypermobility, and benign limb pains, are common diagnoses in the pediatric population. A systematic review examining the prevalence of chronic musculoskeletal pain found a range of prevalence rates between 4% and 40% in children. Rates were generally higher in girls and increased with age.[1] It is estimated that 5% to 8% of new patients presenting to North American pediatric rheumatologists have a musculoskeletal pain syndrome.[2]

Amplified musculoskeletal pain and juvenile fibromyalgia syndrome are related conditions with the common feature of diffuse pain involving at least three major body parts for at least 3 months. Patients also typically have sleep disturbance and other somatic complaints, such as headaches and abdominal pain. Reflex sympathetic dystrophy (RSD), now also called complex regional pain syndrome (CRPS), is a form of amplified pain in which autonomic dysfunction develops in an extremity, often following injury or trauma. The affected limb becomes swollen and discolored and the area can be very painful with light touch (allodynia). The recommended treatment for these conditions includes restoring normal sleep patterns, a therapy program with a focus on exercise and desensitization, and cognitive behavioral therapy. Some patients require treatment in an in-patient setting.[3]

Benign limb pains, also sometimes referred to as “growing pains,” are most common in children age 2 to 5 years. Children with benign limb pains tend to complain of pain at night, often awaking from sleep due to pain. These symptoms tend to resolve with age. Benign hypermobility is diagnosed in patients who have hypermobile joints[4], without an underlying connective disuse disorder. This condition is common, affecting 8% to 20% of White populations. Anterior knee pain and back pain are more common in hypermobile vs nonhypermobile individuals.[2]

1. King S, Chambers CT, Huquet A, et al: The epidemiology of chronic pain in children and adolescents revisited: A systematic review. *Pain* 2011;152(12):2729-2738.

2. a. b. Cassidy JT, Petty RE, Laxer RM, Lindsley CB: *Textbook of Pediatric Rheumatology*, 6th ed. 2010. Elsevier Inc, Philadelphia, PA.

3. Childhood RND Educational Foundation, Inc.: Available at: StopChildhoodPain.org. Accessed February 19, 2015.

4. Hypermobile joints extend easily and painlessly beyond the normal range of motion. Hypermobility of the joints occurs when the tissues holding a joint together—mainly ligaments—are too loose. Often, weak muscles around the joint also contribute to hypermobility. The joints most commonly affected are the knees, shoulders, elbows, wrists, and fingers. Hypermobility is a common condition, especially in children, since their connective tissues are not completely developed.

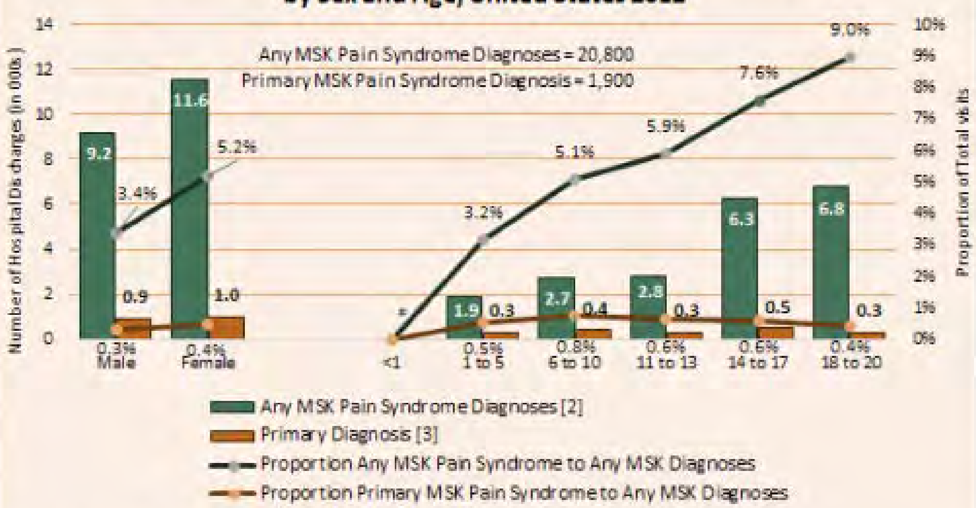
Health Care Utilization: Pain Syndromes, Children & Adolescents

Pain syndromes were diagnosed in more than 2.5 million children and adolescent health care visits in 2012, of which 66% (1.7 million) had a primary diagnosis of a pain syndrome. Less the 1% of children and adolescents with any pain syndrome diagnoses were hospitalized (20,800), while a tiny fraction (1,900) with a primary diagnosis had a hospital discharge. The majority of children and adolescents with a pain syndrome diagnosis were seen in physicians' offices. (Reference Table 7.1.1 PDF CSV and Table 7.1.2 PDF CSV)

Females were hospitalized with a pain syndrome diagnosis in slightly higher numbers than males, both for any diagnoses and as a primary diagnosis. Pain syndrome diagnoses increase as a contributing diagnosis in older children, but as a primary diagnosis age is not a factor.

Any diagnoses of pain syndrome accounted for just over 4% of hospitalizations for any musculoskeletal condition diagnosis, and 0.3% of all hospitalizations for any health care condition. Hospitalizations with a primary diagnosis pain syndrome were 0.4% of all musculoskeletal diagnoses and a tiny portion of hospitalizations for any health condition diagnosis. (Reference Table 7.11 PDF CSV)

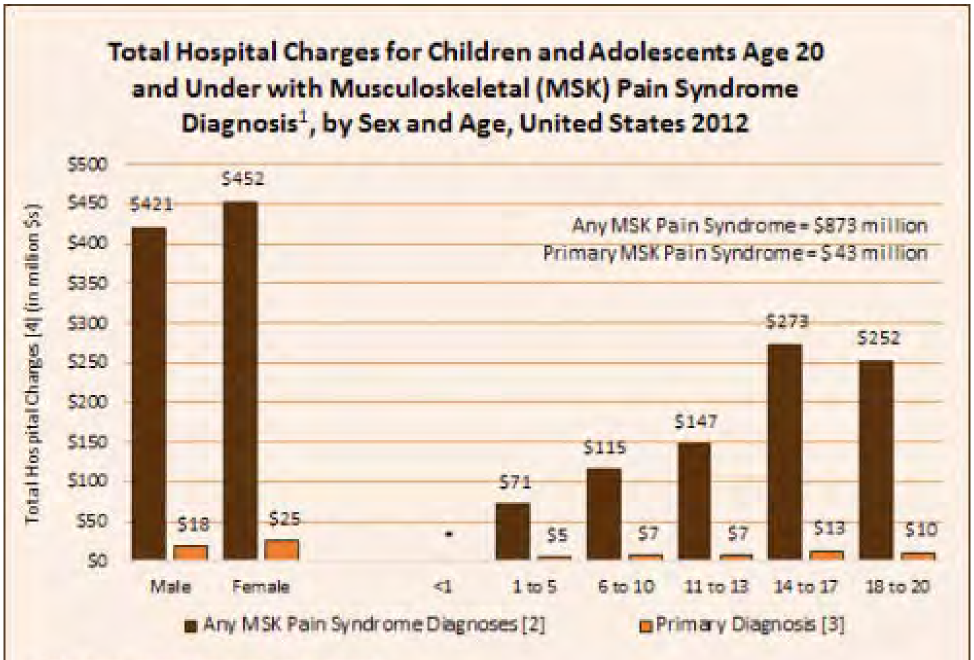
Hospital Discharges for Children and Adolescents Age 20 and Under with Musculoskeletal (MSK) Pain Syndrome Diagnosis[1], by Sex and Age, United States 2012



* Data does not meet standards for reliability.
[1] Includes amplified musculoskeletal pain, juvenile primary fibromyalgia syndrome, reflex sympathetic dystrophy, benign hypermobility syndrome, and benign limb pains.
[2] The number of possible diagnoses varies by database.
[3] Primary diagnosis defined as the first Dx.
Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp
File: G7B.11.1

Hospital Charges: Pain Syndromes, Children & Adolescents

Total charges averaged $42,000 for a mean 5.6-day stay when children and adolescents were hospitalized with any diagnosis of a pain syndrome along with other medical conditions. With a primary pain syndrome diagnosis, the stay was shorter (3.1 days), and mean charges about half that of pain syndrome as a contributing condition ($22,900). Age and sex were not significant factors in length of hospital stay and average charges for a medical problem diagnosis. Total hospital charges for primary pain syndrome diagnosis discharges in 2012 were $43.4 million. (Reference Table 7.11 PDF CSV)



* Data does not meet standards for reliability.
[1] Includes amplified musculoskeletal pain, juvenile primary fibromyalgia syndrome, reflex sympathetic dystrophy, benign hypermobility syndrome, and benign limb pains.
[2] The number of possible diagnoses varies by database.
[3] Primary diagnosis defined as the first Dx.
[4] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges.
[Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp File: G7B.11.2

Long Term Impacts: Children and Adolescent Conditions

Lead Author(s):
Ellen M. Raney, MD

Conditions commonly thought of as only affecting children, such as cerebral palsy, osteogenesis imperfecta, spina bifida, and juvenile inflammatory arthritis, are now being seen more than ever in adults thanks to the tremendous progress in care leading to longer life expectancy. Remarkably, some people with Duchenne's muscular dystrophy are now surviving into early adulthood. Concomitant with this success has come a host of new issues concerning the transition of care to adulthood and the aging process.

Adults with these conditions are disproportionately affected by the aging process. Some issues, such as mobility challenges making it difficult to participate in fitness regimens to prevent secondary conditions associated with sedentary lifestyles (e.g. obesity, diabetes and heart disease), are clear. Other issues are less clear. Adults with aftereffects of childhood musculoskeletal disorders have more difficulty accessing preventative care. Even more subtle, are issues related to lack of providers skilled in treating adults with the sequela of childhood issues and psychosocial challenges.

The medical community needs to investigate whether the needs of patients are being met, and they are reaching full potential as productive adults. The margin of function which allows individuals to live independently is often very small. Early or more pronounced reduction in function associated with aging may make the difference in whether a care giver is required for activities of daily living or there is independent living.

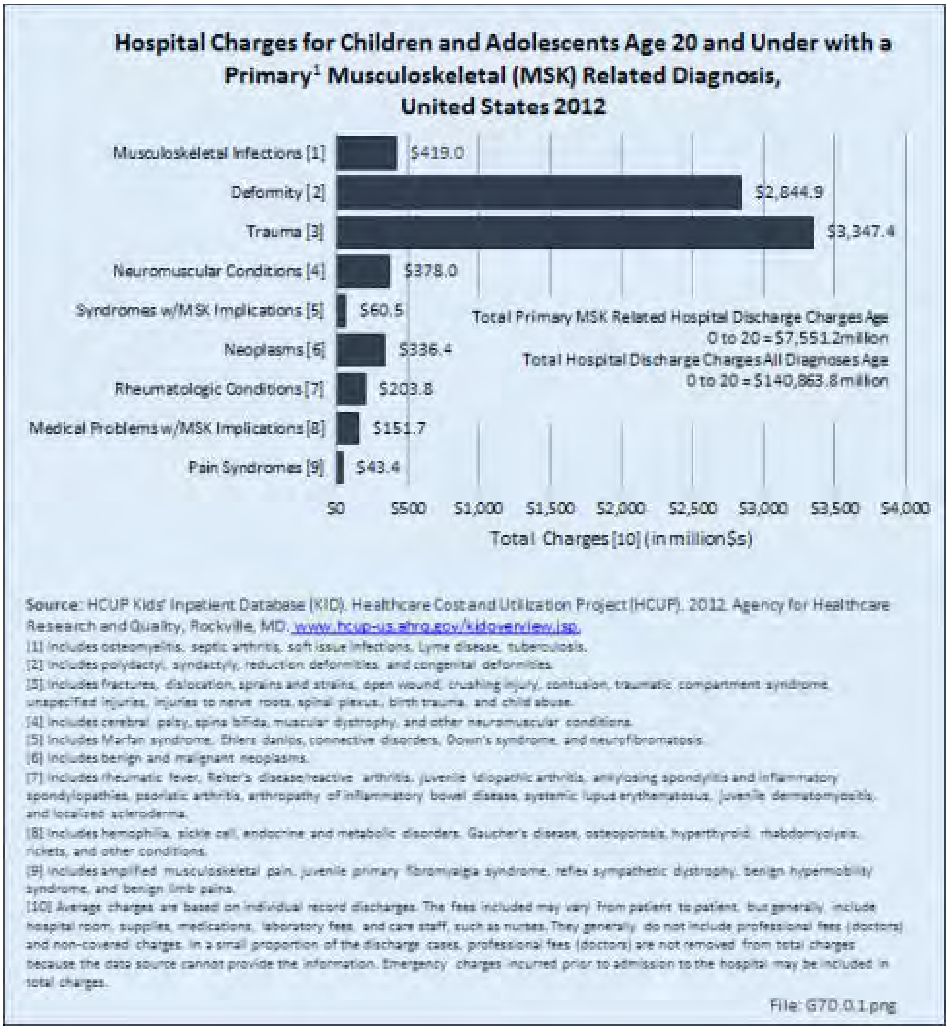
Research into the Health Related Quality of Life, prevalence of disease, potential to avoid disease, availability of care including preventative care is required.

Economic Burden: Children & Adolescents Musculoskeletal Conditions

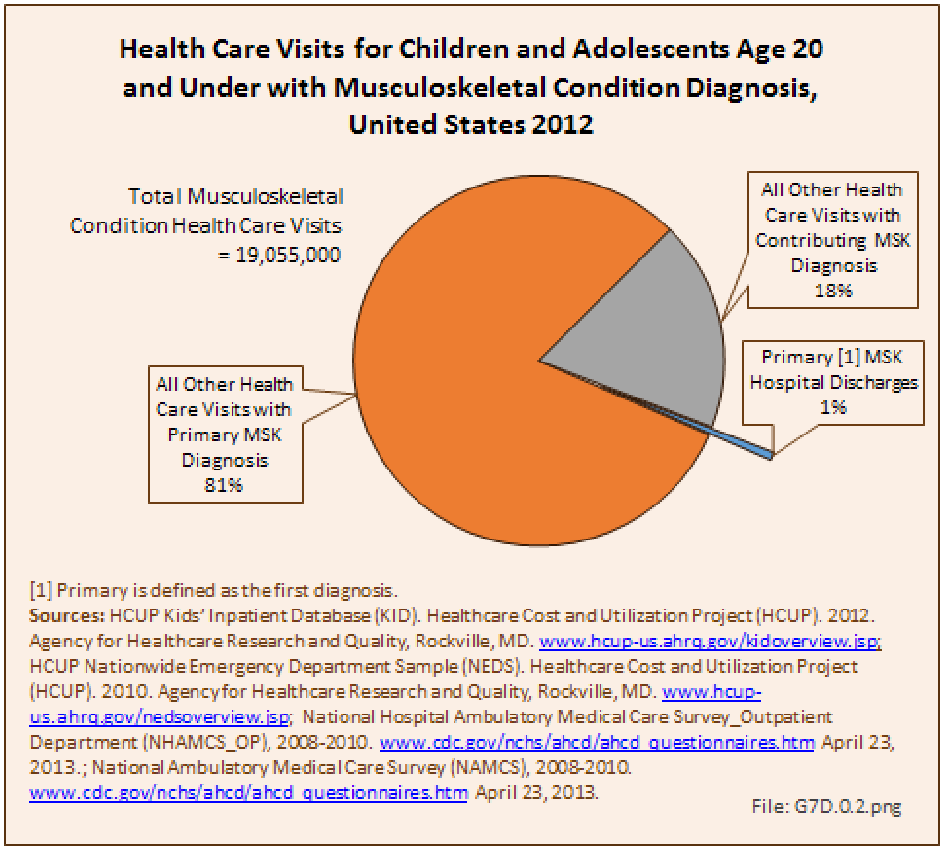
Lead Author(s):
Scott B. Rosenfeld, MD

Supporting Author(s):
Aimee O. Hersh, MD
Sylvia I. Watkins-Castillo, PhD

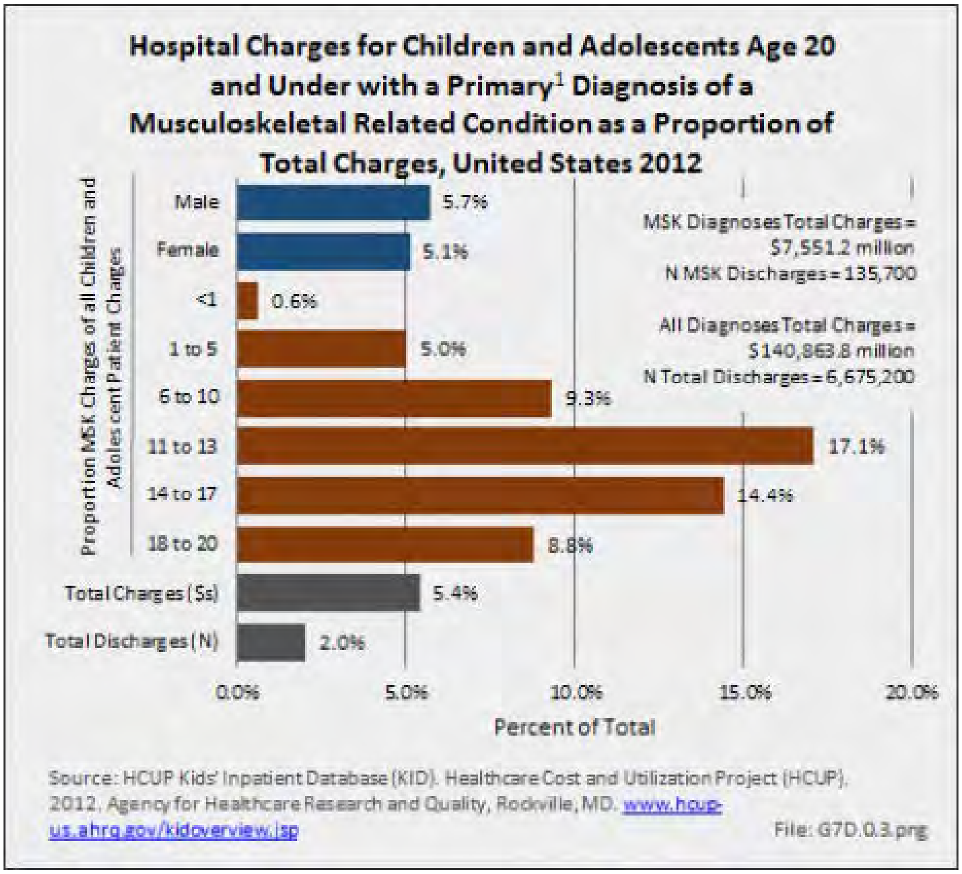
In 2012, total hospital charges for children and adolescents age 20 years and younger with a primary musculoskeletal-related diagnosis were $7.6 billion. Musculoskeletal trauma (injuries) (43%) and deformity (38%) were the major contributors to total hospital charges, but all conditions contribute to the overall economic impact of musculoskeletal conditions in this age group. Furthermore, while musculoskeletal condition hospital charges represent 5.4% of total charges for all medical conditions for the age 20 years and younger age group, the number of discharges represent only 2% of total hospital discharges for any medical condition in this age group, indicating that musculoskeletal conditions may be more expensive to treat than many other childhood conditions. (Reference Table 7.12 PDF CSV)



It is important to note that the overall cost of musculoskeletal conditions in the 20 years and younger population is much greater than just hospital charges. First, the $7.6 billion includes only hospitalizations with a primary, or first, diagnosis in the databases, representing less than 1% of 2012 health care visits with any musculoskeletal condition diagnosis. Not included in this burden are expenditures for visits to emergency departments, outpatient clinics, and physicians' office, as well as other medical care expenditures such as physical therapy, rehabilitation, and medications.



While gender is not a factor in the distribution of hospital charges, age is a major contributor. Children in the middle years of childhood, especially ages 11 to 13 years, have a higher share of total hospital charges (17%) due to musculoskeletal conditions than any other age group. Musculoskeletal condition hospital charges are also a higher share for those age 14 to 17 years (14%) and ages 6 to 10 years (9%).



Key Challenges to the Future: Children & Adolescents Musculoskeletal Conditions

Lead Author(s):
Scott B. Rosenfeld, MD
Ellen M. Raney, MD

Supporting Author(s):
Aimee O. Hersh, MD
Sylvia I. Watkins-Castillo, PhD

To fully understand the burden of musculoskeletal diseases on children and adolescents, it is mandatory that data be available on prevalence, health care needs, cost associated with treatment, limitations due to musculoskeletal conditions, and overall impact these conditions have on the lives of children and adolescents. The HCUP KID database provides a tremendous asset in understanding hospitalizations for this analysis, but it, too, has limitations. Primary among these is the inability to determine primary cause for visits, as multiple diagnosis codes may be included with each record, with no way of knowing which is the primary diagnosis. In addition, many health care visits are to a physician's office, and the database for these visits National Ambulatory Medical Care Survey (NAMCS) is small and often contains insufficient cases (<35) for reliable analysis even when merging several years of data. This is particularly true for the very young patients (0 to 5 years) and for rare conditions. Injuries occur in sufficient numbers that this is not a problem. However, many conditions had low numbers.

A second key challenge is ensuring that children with chronic medical and musculoskeletal problems have access to care, particularly for those with Medicaid or other government-funded insurance. Low physician reimbursement by government insurance results in fewer physicians who are willing or able to care for these patients, making access to needed specialty care difficult. Additionally, pediatric subspecialists who take care of musculoskeletal conditions are typically located at large children's hospital in large cities, further reducing access to care for those in rural areas. Because of the unique nature of pediatric musculoskeletal problems and treatments, many adult subspecialists who may be more accessible are unable or unwilling to treat pediatric patients.

A third challenge is the need to track pediatric patients into adulthood to determine lifelong burden of their pediatric musculoskeletal disease. Once a child turns 18 years, the system loses them because they become more mobile and move on to other caregivers. Further, they lose parental insurance or their Medicaid coverage. A better way to obtain long-term follow-up on their history and long-term outcomes of treatment of pediatric musculoskeletal disease is needed.

Poor bone health is being recognized as a key problem in pediatric musculoskeletal disease, one that will last a lifetime. Key factors leading to poor bone health are Vitamin D deficiency and childhood obesity. The current health care data system makes it very difficult to quantify the burden of these problems because they are rarely evaluated as the primary diagnosis. Additionally, patients are rarely admitted or discharged for treatment specific for these diagnoses. In the future, methods for estimating the incidence of these diagnoses more accurately and assessing their contribution to musculoskeletal disease is necessary. Education of the individual, family, and society about the burden of obesity and Vitamin D deficiency is necessary to improve overall bone health in the United States.

Unmet Needs: Children & Adolescents Musculoskeletal Conditions

Quality of life assessments in children and adolescents that allows better measure of the personal impact of pediatric musculoskeletal disease is lacking.

In assessment of musculoskeletal disease for adults, lost wages and lost workdays are used to quantify burden. There is no corresponding way to measure burden in children. Currently, it is quantified indirectly by measuring lost wages and lost workdays for the child's caregiver. Better methods for quantifying indirect burden of pediatric musculoskeletal disease is needed.

Better long-term follow-up data on pediatric musculoskeletal conditions is needed. Once patients reach adulthood, it becomes difficult for the physician who cared for their musculoskeletal conditions to keep track of them. This results in difficulty understanding adult manifestations of pediatric musculoskeletal conditions.

Recent international disasters such as the 2004 tsunami in the Indian Ocean and the 2010 earthquake in Haiti each affected hundreds of thousands of people. International disaster relief efforts need better planning for providing relief specific to children.

Children & Adolescent ICD-9-CM Codes

MUSCULOSKELETAL INFECTIONS

Osteomyelitis: 730.0, 730.1, 730.2, 730.8, 73090, 73091, 73092, 73093, 73094, 73095, 73096,73097
Septic arthritis: 711.0, 711.4
Soft tissue infections (infective myositis): 72800, 72886
Lyme disease: 08881
Tuberculosis: 015

DEFORMITY

Upper Extremity:
Polydactyly: 75500, 75501
Syndactyly: 75510, 75511, 75512
Reduction deformities: 755.2
Other congenital anomalies upper limb: 755.5, 736.0, 736.1, 736.2, 73690, 75489, 75681, 75689
Lower Extremity:
Polydactyly: 75502
Syndactyly: 75513, 75514
Reduction deformities: 755.3
Other congenital anomalies lower limb: 755.6
Congenital deformities: 754.4, 754.59, 754.6, 754.7, 72781, 73400, 736.7, 736.8
Hip and Pelvis:
Congenital deformity of hip joint: 75561, 75562, 75563
Hip joint acquired: 736.3, 73220, 73860
Developmental dysplasia: 754.3
Spine and Pelvis:
Of spinal cord: 742.5
Of vertebral column: 737, 73850, 73200, 75420, 756.1
Other and Unspecified:
Congenital deformities: 754.8, 75540, 75580, 75590, 75682, 75690, 75689

TRAUMA: Fractures, dislocation, sprains and strains, open wound, crushing injury, contusion, traumatic compartment syndrome, unspecified injuries, injuries to nerve roots and spinal plexus

Upper Extremity: 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 831, 832, 833, 834, 840, 841, 842, 880, 881, 882, 883, 884, 885, 886, 887, 90520, 923, 927, 95891, 95920, 95930, 95940, 95950

Lower Extremity: 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 836, 837, 838, 844, 845, 90530, 90540, 924, 928, 95960, 95970, 95892
Hip and Pelvis: 835, 843, 84850, 808, 959.1, 953
Spine and Trunk: 805, 806, 807, 846, 847, 809, 875, 876, 90510, 92200, 92210, 92230, 92231, 92232, 92233, 92280, 92290, 926.1, 92680, 92690, 952
Birth Trauma: 767
Child Abuse: 995.5

NEUROMUSCULAR CONDITIONS

Cerebral palsy (CP): 343
Spina bifida (SB): 741
Muscular dystrophy (MD): 359
Charcot-Marie-Tooth disease (CMT): 35610, 35620
Other: 334, 335, 33600, 336

SYNDROMES WITH MUSCULOSKELETAL IMPLICATIONS

Marfan sydrome/Ehlers Danlos syndrome/other connective tissue disorders: 75982, 75683
Down's syndrome: 75800
Neurofibromatosis (NF): 23770, 23771, 23772

SPORTS INJURIES (Sports injuries data is from NEISS and does not use ICD-9 codes.)

SKELETAL DYSPLASIAS

Dysplasias: 75989, 65580, 73399, 39330
Chondrodystrophy/achondroplasia/hypochondroplasia: 75640
Dwarfism (thanatophoric dysplasia): 25940, 75651
Congenital absence rib: 75630
Osteogenesis imperfecta: 75651
Osteopetrosis: 75652
Other: 75654, 75655, 75656, 75659

NEOPLASMS

Benign:
Benign lesion of bone/cartilage: 213
Lipoma: 21400, 21410, 21420, 21430, 21480, 21490
Benign lesion of CT/ST: 215
Malignant:
Malignancy of bone/cartilage: 170
Malignancy of CT/ST: 171

RHEUMATOLOGIC CONDITIONS

Rheumatic fever: 39000, 39092
Reactive arthritis/Reiter disease (underlying disease, no principal diagnosis): 711.1
Juvenile idiopathic arthritis: 714.3
Ankylosing spondylitis and inflammatory spondylopathies: 720
Psoriatic arthritis: 696
Arthropathy of inflammatory bowel disease: 71310
Systemic lupus erythematosus: 71000
Juvenile dermatomyositis: 71030
Localized scleroderma: 70100, 71010

MEDICAL PROBLEMS WITH MSK IMPLICATIONS

Hemophilia: 00286
Sickle cell: 28260
Endocrine and metabolic disorders: 75650
Gaucher disease (lipidoses/lysosomal storage disorders): 27270
Osteoporosis: 733.0
Hyperthyroid (thyrotosicosis w/wo goiter): 242
Rhabdomyolysis: 72888
Other conditions: 28610, 25890
Rickets (Vitamin D deficiency, phosphorus, and calcium metabolism disorders): 268, 275.3, 275.4

PAIN SYNDROMES

Amplified musculoskeletal pain/Juvenile primary fibromyalgia syndrome: 30789, 72910
Reflex sympathetic dystrophy (complex regional3722 pain syndrome/CRPS): 337.2
Benign hypermobility/hypermobility syndrome: 72850
Benign limb pains (“growing pains”): 719.4

Table 7.0: Parent-Reported Health Conditions for Children and Adolescents Under Age 18, by Age, United States 2012

	Number of Parent-Reported Children with Condition (in 000s)				
	Under 1 year	1 to 5 years	6 to 12 years	13 to 17 years	Total
Health Conditions					
Developmental Delay Condition [1]	*	1,267.2	4,057.6	3,218.8	8,604.1
Musculoskeletal Condition [2]	*	*	3,223.9	4,675.5	8,009.1
Respiratory Condition [3]	211.9	4,445.8	10,327.6	7,133.6	22,118.8
Circulatory Condition [4]	*	*	330.2	613.8	944.0
Frequent Severe Headaches [5]	*	*	2,175.1	2,841.5	5,144.9
Deaf or Trouble Hearing Without Aids/CI [6]	*	*	*	*	383.2
Blind or Trouble Seeing Without Glasses [7]	*	329.3	917.2	751.1	2,071.6
Musculoskeletal (MSK) Conditions					
Joint Pain/Aching/Stiffness Past 30 Days	*	*	1,365.4	1,744.4	3,109.9
Low Back Pain Past 12 Months	*	*	606.7	1,698.5	2,305.2
Neck Pain Past 12 Months	*	*	746.6	862.1	1,608.8
Muscle or Bone Pain Past 12 Months	*	*	1,410.5	1,895.6	3,306.1
Severe Sprain or Strain Past 12 Months	*	*	879.0	1,545.9	2,424.9
Total Bone or Joint Pain Past 12 Months	*	*	3,223.9	4,675.5	8,009.1
All Parent-Reported Children and Adolescents	3,885.2	20,441.9	28,652.9	20,681.4	73,661.4
Proportion MSK of all Children and Adolescents	NA	NA	11.3%	22.6%	10.9%

* Data does not meet standards for reliability.
[1] Includes mental retardation, ADHD/ADD, other developmental delay.
[2] Includes arthritis, joint pain, neck pain, low back pain, muscle/bone pain, severe strain/sprain in past 12 months.
[3] Includes asthma, sinusitis, strep throat/tonsillitis, hay fever, respiratory allergy episode past 12 months.
[4] Includes high blood pressure or medication for high blood pressure/cholesterol in past 12 months.
[5] Includes frequent, severe or recurring headaches in past 12 months.
[6] Includes moderate to deaf hearing loss.
[7] Includes blind or trouble seeing even with glasses.
Source: National Health Interview Survey (NHIS)_Child sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 7.0.1: Parent-Reported Missed School Days Due to Health Conditions for School Age Children and Adolescents, by Age, United States 2012

	With Condition			Without Condition				Total Lost	
	6 to 12 years	13 to 17 years	Total 6 to 17	6 to 12 years	13 to 17 years	Total 6 to 17	Number with Condition*	School Days (in millions)	% of Total Lost School Days
Health Conditions									
Developmental Delay Condition [1]	19.2	17.5	18.5	11.1	17.3	13.7	7,276.4	134.2	16.9%
Musculoskeletal Condition [2]	19.9	18.1	18.8	11.2	17.1	13.5	7,899.4	148.8	18.7%
Respiratory Condition [3]	14.9	16.8	15.6	10.8	17.6	13.8	17,461.2	273.7	34.4%
Circulatory Condition [4]	9.6	6.7	7.2	12.3	17.7	14.5	944.0	7.3	0.9%
Frequent Severe Headaches [5]	39.6	20.7	28.9	10.0	16.8	12.7	5,016.6	145.0	18.2%
Deaf or Trouble Hearing Without Aids/CI [6]	54.9	13.6	42.0	11.9	17.4	14.2	383.2	16.1	2.0%
Blind or Trouble Seeing Without Glasses [7]	48.2	36.1	42.8	11.0	16.6	13.4	1,668.3	71.3	9.0%
Musculoskeletal (MSK) Conditions									
Joint Pain/Aching/Stiffness Past 30 Days	37.2	13.2	23.8	10.6	17.7	13.5	3,109.8	73.8	
Low Back Pain Past 12 Months	56.3	21.1	30.4	11.0	17.0	13.4	2,305.2	70.0	
Neck Pain Past 12 Months	30.9	25.4	28.0	11.4	17.0	13.7	1,608.7	45.0	
Muscle or Bone Pain Past 12 Months	14.5	16.9	15.9	11.8	17.4	14.1	3,306.1	52.5	
Severe Sprain or Strain Past 12 Months	4.2	14.9	11.0	12.2	17.4	14.3	2,424.9	26.7	
	Total School Age Children								
	6 to 12 years	13 to 17 years	Total 6 to 17						
All Parent-Reported Children and Adolescents	12.2	17.3	14.4					707.4	

* Cases may be included in more than one condition.

[1] Includes mental retardation, ADHD/ADD, other developmental delay.

[2] Includes arthritis, joint pain, neck pain, low back pain, muscle/bone pain, severe strain/sprain in past 12 months.

[3] Includes asthma, sinusitis, strep throat/tonsillitis, hay fever, respiratory allergy episode past 12 months.

[4] Includes high blood pressure or medication for high blood pressure/cholesterol in past 12 months.

[5] Includes frequent, severe or recurring headaches in past 12 months.

[6] Includes moderate to deaf hearing loss.

[7] Includes blind or trouble seeing even with glasses.

Source: National Health Interview Survey (NHIS)_Child sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 7.0.2: Parent-Reported Limitations in Activities of Daily Living for Children and Adoleslcents Under Age 18 Due to Select Medical Conditions, United States 2012

Condition	**Total Persons With Limitation** (in 000s)	**Prevalence of Limitation Due to Select Medical Cause Per 100 Persons**
Musculoskeletal [1]	282	0.4
Emotional/Behavioral Problem.	1,142	1.6
Respiratory (Lung/Breathing Problem)	482	0.7
Epilepsy/Seizures.	115	0.2
Vision Problem	244	0.3
Hearing Problem	199	0.3
Birth Defect/Mental Retardation/ Developmental Problem	583	0.8
Other Condition/Disorder	3,974	5.4
Total All Conditions	6,274	8.5

[1] In 0-17 population defined as injury or bone/joint/muscle problem.

Source: National Health Interview Survey (NHIS), Person Sample.
http://www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 7.1.1: Health Care Visits for Children and Adolescents Age 20 and Under with a Musculoskeletal Related Diagnoses, United States 2012

	Number of Discharges/Visits for Musculoskeletal (MSK) Related Diagnoses [1] (in 000s)				
	Hospital Discharges [2]	Emergency Department [3]	Outpatient Clinic [4]	Physician Office Visits [5]	Total
Musculoskeletal Infections [6]	14.9	13.7	24.8	*	119.9
Deformity [7]	111.8	54.7	397.5	1,222.0	1,786.0
Upper extremity	*20.5*	*5.5*	*37.7*	*	167.6
Lower extremity	*32.4*	*6.6*	*113.5*	*	516.4
Hip and pelvis	*15.0*	*2.9*	*45.8*	*	163.7
Spine	*46.5*	*38.6*	*175.5*	*629.2*	889.8
Other and unspecified	*7.2*	*2.4*	*	*	117.5
Trauma [8]	226.7	4,519.4	1,432.4	6,715.7	12,894.2
Upper extremity	*56.9*	*2,625.4*	*761.1*	*2,960.3*	6,403.7
Lower extremity	*43.7*	*1,331.5*	*444.7*	*3,079.0*	4,898.9
Hip and pelvis	*9.4*	*102.3*	*	*	396.9
Spine and trunk	*24.6*	*599.8*	*67.6*	*411.1*	1,103.1
Birth trauma	*110.2*	*1.9*	*	*	135.9
Child abuse	*5.4*	*13.7*	*138.2*	*	200.1
Neuromuscular Conditions	67.2	79.9	159.0	306.0	612.1
Cerebral palsy	*44.1*	*56.3*	*91.8*	*	387.2
Spina bifida	*12.1*	*14.6*	*42.2*	*	159.3
Muscular dystrophy	*5.2*	*5.8*	*	*	44.1
Other	*7.1*	*4.0*	*	*	24.2
Syndromes with Musculoskeletal Implications [9]	29.8	32.3	77.3	*	328.6
Sports Injuries [10]	NA	1,819.8	NA	NA	1,819.8
Skeletal Dysplasias [11]	-	-	63.7	*	228.1
Neoplasms	25.6	7.1	48.6	*	140.7
Benign	*3.6*	*3.7*	*	*	70.5
Malignant	*22.0*	*3.4*	*35.3*	*	70.1
Rheumatologic Conditions [12]	13.5	34.5	133.2	440.0	621.2
Medical Problems with Musculoskeletal Implications	55.3	53.3	136.1	*	455.8
Medical Problems [13]	*18.2*	*38.0*	*119.7*	*	*295.1*
Rickets [14]	*38.1*	*15.7*	*16.5*	*91.9*	*162.2*
Pain Syndromes [15]	20.8	539.8	283.8	1,702.8	2,547.2

Table 7.1.1: Health Care Visits for Children and Adolescents Age 20 and Under with a Musculoskeletal Related Diagnoses, United States 2012

	Number of Discharges/Visits for Musculoskeletal (MSK) Related Diagnoses [1] (in 000s)				
	Hospital Discharges [2]	Emergency Department [3]	Outpatient Clinic [4]	Physician Office Visits [5]	Total
Total Children and Adolescent Musculoskeletal Related Diagnoses	519.4	5,095.6	2,645.4	10,794.6	19,055.0
Proportion of Total Visits	2.7%	26.7%	13.9%	56.6%	
All Children and Adolescent Patients	6,675.2	32,080.0	27,549.0	204,821.7	271,125.9
Proportion MSK of all Children and Adolescent Patients	7.8%	15.9%	9.6%	5.3%	7.0%

* Data does not meet standards for reliability
[1] The number of possible diagnoses varies by database: KID=25; NEDS=15,NHAMCS_OP=3; NAMCS=3.
[2] Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp
[3] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research
[4] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008-2010.
[5] Source: National Ambulatory Medical Care Survey (NAMCS), 2008-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.
[6] Includes osteomyelitis, septic arthritis, soft issue infections, Lyme disease, tuberculosis.
[7] Includes polydactyl, syndactyly, reduction deformities, and congenital deformities.
[8] Includes fractures, dislocation, sprains and strains, open wound, crushing injury, contusion, traumatic compartment syndrome, unspecified injuries, injuries to nerve roots, and spinal plexus.
[9] Includes Marfan syndrome, Ehlers danlos, connective disorders, Down's syndrome, and neurofibromatosis.
[10] Sports injuries are reported using the United States Consumer Product Safety Commission. National Electron Injury Surveillance System (NEISS). https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014. NEISS identifies only injuries treated in an emergency department. Includes injuries incurred during team sports and individual sports. Cases are not included in total diagnoses.
[11] Includes chondrodystrophy, achondroplasia, hypochondroplasia, dwarfism, congenital absence of rib, Osteogenesis imperfects, osteoporosis, and other dysplasia.
[12] Includes rheumatic fever, Reiter's disease/reactive arthritis, juvenile idiopathic arthritis, ankylosing spondylitis and inflammatory spondylopathies, psoriatic arthritis, arthropathy of inflammatory bowel disease, systemic lupus erythematosus, juvenile dermatomyositis, and localized scleroderma.
[13] Includes hemophilia, sickle cell, endocrine and metabolic disorders, Gaucher's disease, osteoporosis, hyperthyroid, rhabdomyolysis, and other conditions.
[14] Vitamin D deficiency, phosphorus and calcium metabolism disorders.
[15] Includes amplified musculoskeletal pain, juvenile primary fibromyalgia syndrome, reflex sympathetic dystrophy, benign hypermobility syndrome, and benign limb pains.

Table 7.1.2: Health Care Visits for Children and Adolescents Age 20 and Under with a Primary[1] Diagnosis of a Musculoskeletal Related Condition, United States 2012

	Number of Discharges/Visits for a Primary [1] Musculoskeletal (MSK) Related Condition Diagnosis (in 000s)				
	Hospital Discharges [2]	Emergency Department [3]	Outpatient Clinic [4]	Physician Office Visits [5]	Total
Musculoskeletal Infections [6]	9.1	7.7	*	*	78.8
Deformity [7]	30.1	5.5	297.6	610.6	943.8
Trauma [8]	76.6	4,093.9	1,323.3	6,106.5	11,600.3
Neuromuscular Conditions	4.5	2.0	90.4	*	255.3
Syndromes with Musculoskeletal Implications [9]	0.6	*	37.8	*	126.3
Sports Injuries [10]	NA	1,819.8	NA	NA	1,819.8
Skeletal Dysplasias [11]	*	*	37.3	*	98.4
Neoplasms	4.0	2.3	37.2	*	84.5
Rheumatologic Conditions [12]	4.2	15.9	99.4	*	491.3
Medical Problems with Musculoskeletal Implications [13]	4.8	10.3	97.5	*	207.0
Pain Syndromes [14]	1.9	217.9	222.4	1,232.5	1,674.7
Total Children and Adolescent Musculoskeletal Related Diagnoses	135.7	4,356.1	2,261.5	8,807.0	15,560.3
Proportion of Total Visits	0.9%	28.0%	14.5%	56.6%	
All Children and Adolescent Patients	6,675.2	32,080.0	27,549.0	204,821.7	271,125.9
Proportion MSK of all Children and Adolescent Patients	2.0%	13.6%	8.2%	4.3%	5.7%

* Data does not meet standards for reliability

[1] Primary is defined as the first diagnosis.

[2] Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp

[3] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[4] Source: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[5] Source: National Ambulatory Medical Care Survey (NAMCS), 2008-2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[6] Includes osteomyelitis, septic arthritis, soft issue infections, Lyme disease, tuberculosis.

Table 7.1.2: Health Care Visits for Children and Adolescents Age 20 and Under with a Primary[1] Diagnosis of a Musculoskeletal Related Condition, United States 2012

[7] Includes polydactyl, syndactyly, reduction deformities, and congenital deformities..
[8] includes fractures, dislocation, sprains and strains, open wound, crushing injury, contusion, traumatic compartment syndrome, unspecified injuries, injuries to nerve roots, and spinal plexus, plus diagnoses for birth trauma and child abuse.
[9] Includes Marfan syndrome, Ehlers danlos, connective disorders, Down's syndrome, and neurofibromatosis.
[10] Sports injuries are reported using the United States Consumer Product Safety Commission. National Electron Injury Surveillance System (NEISS). https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014. NEISS identifies only injuries treated in an emergency department. Includes injuries incurred during team sports and individual sports. Cases are not included in total diagnoses.
[11] Includes chondrodystrophy, achondroplasia, hypochondroplasia, dwarfism, congenital absence of rib, Osteogenesis imperfects, osteoporosis, and other dysplasia.
[12] Includes rheumatic fever, Reiter's disease/reactive arthritis, juvenile idiopathic arthritis, ankylosing spondylitis and inflammatory spondylopathies, psoriatic arthritis, arthropathy of inflammatory bowel disease, systemic lupus erythematosus, juvenile dermatomyositis, and localized scleroderma.
[13] Includes hemophilia, sickle cell, endocrine and metabolic disorders, Gaucher's disease, osteoporosis, hyperthyroid, rhabdomyolysis, and other conditions.
[14] Includes amplified musculoskeletal pain, juvenile primary fibromyalgia syndrome, reflex sympathetic dystrophy, benign hypermobility syndrome, and benign limb pains.

Table 7.2: Hospital Discharges, Length of Stay, and Charges for Children and Adolescents Age 20 and Under with Musculoskeletal (MSK) Infection Diagnosis[1], by Sex and Age, United States 2012

	Number of Hospital Discharges (in 000s)								
	Sex		Age in Years						
Hospital Discharges	Male	Female	<1	1 to 5	6 to 10	11 to 13	14 to 17	18 to 20	Total
Any MSK Infection Diagnoses [2]	9.3	5.5	0.8	3.2	3.4	2.3	2.6	2.5	14.9
Primary Diagnosis [3]	5.8	3.3	0.4	2.3	2.4	1.5	1.3	1.0	9.1
Discharges/Visits for Any MSK Diagnoses	274.2	223.9	178.0	59.9	53.0	47.4	82.8	75.8	498.2
Proportion Any MSK Infection to Any MSK Diagnoses	3.4%	2.5%	0.4%	5.3%	6.4%	4.9%	3.1%	3.3%	3.0%
Proportion Primary MSK Infection to Any MSK Diagnoses	2.1%	1.5%	0.2%	3.8%	4.5%	3.2%	1.6%	1.3%	1.8%
Discharges/Visits for All Diagnosis	3,194.5	3,478.3	4,270.0	550.4	305.8	221.0	503.0	816.0	6,675.2
Proportion Any MSK Infection to All Diagnoses	0.3%	0.2%	0.0%	0.6%	1.1%	1.0%	0.5%	0.3%	0.2%
Proportion Primary MSK Infection to All Diagnoses	0.2%	0.1%	0.0%	0.4%	0.8%	0.7%	0.3%	0.1%	0.1%
Hospital Charges	Mean LOS and Charges								
Any MSK Infection Diagnoses [2]									
Mean Length of Stay	8.2	8.9	25.4	6.9	6.6	7.4	8.1	9.3	8.5
Mean Charges [4] (in 1,000 $s)	$ 68.1	$ 75.0	$ 214.2	$ 52.2	$ 54.3	$ 68.5	$ 74.1	$ 71.9	$ 70.7
Total Charges (in million $s)	$ 633.3	$ 412.5	$ 171.4	$ 167.1	$ 184.7	$ 157.5	$ 192.6	$ 179.7	$ 1,053.0
Primary Diagnosis [3]									
Mean Length of Stay	6.2	6.4	9.4	5.6	5.8	6.0	6.7	7.5	6.3
Mean Charges [4] (in 1,000 $s)	$ 46.0	$ 46.1	$ 60.0	$ 38.9	$ 45.5	$ 46.6	$ 52.7	$ 48.2	$ 46.0
Total Charges (in million $s)	$ 266.7	$ 152.2	$ 24.0	$ 89.5	$ 109.2	$ 69.8	$ 68.5	$ 48.2	$ 419.0

[1] Includes osteomyelitis, septic arthritis, soft issue infections, Lyme disease, tuberculosis.

[2] The number of possible diagnoses varies by database: KID=25; NEDS=15,NHAMCS_OP=3; NAMCS=3.

[3] Primary diagnosis defined as the first Dx.

[4] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in

Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp

Table 7.3: Hospital Discharges, Length of Stay, and Charges for Children and Adolescents Age 20 and Under with Musculoskeletal (MSK) Deformity Diagnosis[1], by Sex and Age, United States 2012

	Number of Hospital Discharges (in 000s)								
	Sex		Age in Years						
	Male	Female	<1	1 to 5	6 to 10	11 to 13	14 to 17	18 to 20	Total
Hospital Discharges									
Any MSK Deformity Diagnoses [2]	54.2	57.6	45.5	11.3	11.1	13.6	19.7	10.2	111.8
Primary Diagnosis [3]	13.6	16.5	1.4	4.2	4.5	7.9	9.7	2.3	30.1
Discharges/Visits for Any MSK Diagnoses	274.2	223.9	178.0	59.9	53.0	47.4	82.8	75.8	498.2
Proportion Any MSK Deformity to Any MSK Diagnoses	19.8%	25.7%	25.6%	18.9%	20.9%	28.7%	23.8%	13.5%	22.4%
Proportion Primary MSK Deformity to Any MSK Diagnoses	5.0%	7.4%	0.8%	7.0%	8.5%	16.7%	11.7%	3.0%	6.0%
Discharges/Visits for All Diagnosis	3,194.5	3,478.3	4,270.0	550.4	305.8	221.0	503.0	816.0	6,675.2
Proportion Any MSK Deformity to All Diagnoses	1.7%	1.7%	1.1%	2.1%	3.6%	6.2%	3.9%	1.3%	1.7%
Proportion Primary MSK Deformity to All Diagnoses	0.4%	0.5%	0.0%	0.8%	1.5%	3.6%	1.9%	0.3%	0.5%
Hospital Charges	Mean LOS and Charges								
Any MSK Deformity Diagnoses [2]									
Mean Length of Stay	6.7	6.2	8.1	4.9	4.8	5.1	5.6	5.8	6.4
Mean Charges [4] (in 1,000 $s)	$ 52.6	$ 70.3	$ 56.4	$ 59.1	$ 64.2	$ 91.0	$ 91.5	$ 69.3	$ 69.3
Total Charges (in million $s)	$ 2,853.5	$ 4,049.4	$ 2,566.4	$ 668.2	$ 712.3	$ 1,238.2	$ 1,802.8	$ 706.5	$ 7,751.8
Primary Diagnosis [3]									
Mean Length of Stay	4.0	4.2	4.4	2.9	3.5	4.2	4.6	4.8	4.1
Mean Charges [4] (in 1,000 $s)	$ 82.2	$ 104.7	$ 54.9	$ 50.4	$ 66.6	$ 107.2	$ 117.1	$ 112.7	$ 94.5
Total Charges (in million $s)	$ 1,117.9	$ 1,727.6	$ 76.9	$ 211.7	$ 299.7	$ 846.9	$ 1,135.9	$ 259.2	$ 2,844.9
Any MSK Deformity Diagnoses [2]									
Upper extremity	11.7	8.8	16.7	1.7	0.8	0.4	0.5	0.3	20.5
Lower extremity	17.9	14.5	18.6	3.2	3.1	2.9	3.2	1.4	32.4
Hip and pelvis	5.7	9.3	6.9	2.1	1.9	2.1	1.5	0.6	15.0
Spine	19.2	27.3	4.8	5.2	6.2	8.8	13.8	7.7	46.5
Other and unspecified	5.0	2.3	2.8	0.8	0.5	0.6	1.9	0.6	7.2
Proportion of Total MSK Deformity Diagnoses [5]									
Upper extremity	21.6%	15.3%	36.7%	15.0%	7.2%	2.9%	2.5%	2.9%	18.3%
Lower extremity	33.0%	25.2%	40.9%	28.3%	27.9%	21.3%	16.2%	13.7%	29.0%
Hip and pelvis	10.5%	16.1%	15.2%	18.6%	17.1%	15.4%	7.6%	5.9%	13.4%
Spine	35.4%	47.4%	10.5%	46.0%	55.9%	64.7%	70.1%	75.5%	41.6%
Other and unspecified	9.2%	4.0%	6.2%	7.1%	4.5%	4.4%	9.6%	5.9%	6.4%

[1] Includes polydactyl, syndactyly, reduction deformities, and congenital deformities.
[2] The number of possible diagnoses varies by database: KID=25; NEDS=15,NHAMCS_OP=3; NAMCS=3.
[3] Primary diagnosis defined as the first Dx.
[4] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges.
[5] Total greater than 100% due to diagnoses for more than one deformity.
Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp

Table 7.4: Hospital Length of Stay and Charges for Children and Adolescents Age 20 and Under with Musculoskeletal (MSK) Trauma Diagnosis,[1] by Sex and Age, United States 2012

	Number of Hospital Discharges (in 000s)									
	Sex		Age in Years							
Hospital Discharges	Male	Female	<1	1 to 5	6 to 10	11 to 13	14 to 17	18 to 20	Total
Any MSK Trauma Diagnoses [2]	137.3	89.4	115.6	16.5	15.9	13.6	30.9	33.6	226.7
Primary Diagnosis [3]	51.3	25.2	4.0	13.2	12.7	9.6	18.1	18.7	76.6
Discharges/Visits for Any MSK Diagnoses	274.2	223.9	178.0	59.9	53.0	47.4	82.8	75.8	498.2
Proportion Any MSK Trauma to Any MSK Diagnoses	50.1%	39.9%	64.9%	27.5%	30.0%	28.7%	37.3%	44.3%	45.5%
Proportion Primary MSK Trauma to Any MSK Diagnoses	18.7%	11.3%	2.2%	22.0%	24.0%	20.3%	21.9%	24.7%	15.4%
Discharges/Visits for All Diagnosis	3,194.5	3,478.3	4,270.0	550.4	305.8	221.0	503.0	816.0	6,675.2
Proportion Any MSK Trauma to All Diagnoses	4.3%	2.6%	2.7%	3.0%	5.2%	6.2%	6.1%	4.1%	3.4%
Proportion Primary MSK Trauma to All Diagnoses	1.6%	0.7%	0.1%	2.4%	4.2%	4.3%	3.6%	2.3%	1.1%
Hospital Charges	Mean LOS and Charges								
Any MSK Trauma Diagnoses [2]									
Mean Length of Stay	4.2	4.1	4.0	3.2	2.9	3.8	4.7	5.2	4.2
Mean Charges [4] (in 1,000 $s)	$ 38.4	$ 31.1	$ 20.7	$ 35.3	$ 35.2	$ 40.4	$ 51.4	$ 68.4	$ 35.4
Total Charges (in million $s)	$ 5,272.3	$ 2,780.3	$ 2,392.9	$ 582.5	$ 559.7	$ 549.4	$ 1,588.3	$ 2,297.0	$ 8,025.2
Primary Diagnosis [3]									
Mean Length of Stay	3.1	3.2	5.5	2.2	2.1	2.6	3.3	4.2	3.2
Mean Charges [4] (in 1,000 $s)	$ 44.4	$ 42.2	$ 45.9	$ 26.9	$ 27.8	$ 34.1	$ 48.0	$ 65.8	$ 43.7
Total Charges (in million $s)	$ 2,277.7	$ 1,063.4	$ 183.6	$ 355.1	$ 353.1	$ 327.4	$ 869.3	$ 1,230.4	$ 3,347.4
Any MSK Trauma Diagnoses [2]									
Upper extremity	35.6	21.2	2.0	9.0	9.9	6.3	13.8	15.6	56.9
Lower extremity	30.0	13.8	1.9	5.7	4.8	6.0	12.5	12.6	43.7
Hip and pelvis	5.4	4.0	*	0.7	0.8	0.9	2.8	4.1	9.4
Spine and trunk	15.6	9.1	1.3	1.6	1.4	1.7	7.3	11.2	24.6
Child abuse	2.8	2.6	2.4	1.5	0.4	0.4	0.7	*	5.4
Birth trauma	62.4	47.8	110.2	*	*	*	*	*	110.2
Proportion of Total MSK Trauma Diagnoses [5]									
Upper extremity	25.9%	23.7%	1.7%	54.5%	62.3%	46.3%	44.7%	46.4%	25.1%
Lower extremity	21.8%	15.4%	1.6%	34.5%	30.2%	44.1%	40.5%	37.5%	19.3%
Hip and pelvis	3.9%	4.5%	*	4.2%	5.0%	6.6%	9.1%	12.2%	4.1%
Spine and trunk	11.4%	10.2%	1.1%	9.7%	8.8%	12.5%	23.6%	33.3%	10.9%
Child abuse	2.0%	2.9%	2.1%	9.1%	2.5%	2.9%	2.3%	*	2.4%
Birth trauma	45.4%	53.5%	95.3%	*	*	*	*	*	48.6%

* Data does not meet standards for reliability

[1] Includes fractures, dislocation, sprains and strains, open wound, crushing injury, contusion, traumatic compartment syndrome, unspecified injuries, injuries to nerve roots, spinal plexus, birth trauma, and child abuse.

[2] The number of possible diagnoses varies by database: KID=25; NEDS=15,NHAMCS_OP=3; NAMCS=3.

[3] Primary diagnosis defined as the first Dx.

[4] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in

[5] Total greater than 100% due to diagnoses for more than one trauma site/type.

Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp

Table 7.5: Hospital Length of Stay and Charges for Children and Adolescents Age 20 and Under with Neuromuscular Diagnoses,[1] by Sex and Age, United States 2012

	Number of Hospital Discharges (in 000s)								
	Sex		Age in Years						
Hospital Discharges	Male	Female	<1	1 to 5	6 to 10	11 to 13	14 to 17	18 to 20	Total
Any Neuromuscular Diagnoses [2]	49.1	23.6	4.6	15.7	14.9	10.1	12.8	9.1	67.2
Primary Diagnosis [3]	2.6	1.9	0.8	1.0	0.9	0.6	0.7	0.3	4.5
Discharges/Visits for Any MSK Diagnoses	274.2	223.9	178.0	59.9	53.0	47.4	82.8	75.8	498.2
Proportion Any Neuromuscular to Any MSK Diagnoses	17.9%	10.5%	2.6%	26.2%	28.1%	21.3%	15.5%	12.0%	13.5%
Proportion Primary Neuromuscular to Any MSK Diagnoses	0.9%	0.8%	0.4%	1.7%	1.7%	1.3%	0.8%	0.4%	0.9%
Discharges/Visits for All Diagnosis	3,194.5	3,478.3	4,270.0	550.4	305.8	221.0	503.0	816.0	6,675.2
Proportion Any Neuromuscular to All Diagnoses	1.5%	0.7%	0.1%	2.9%	4.9%	4.6%	2.5%	1.1%	1.0%
Proportion Primary Neuromuscular to All Diagnoses	0.1%	0.1%	0.0%	0.2%	0.3%	0.3%	0.1%	0.0%	0.1%
Hospital Charges	Mean LOS and Charges								
Any Neuromuscular Diagnoses [2]									
Mean Length of Stay	6.7	6.7	14.6	5.9	5.4	6.0	6.9	6.8	6.7
Mean Charges [4] (in 1,000 $s)	$ 69.8	$ 69.1	$ 138.4	$ 56.5	$ 56.0	$ 70.8	$ 78.3	$ 63.7	$ 69.5
Total Charges (in million $s)	$ 3,426.10	$ 1,630.19	$ 636.50	$ 886.34	$ 834.50	$ 715.14	$ 1,001.83	$ 579.72	$ 4,667.98
Primary Diagnosis [3]									
Mean Length of Stay	6.9	8.2	14.7	5.7	5.5	5.3	6.1	6.7	7.5
Mean Charges [4] (in 1,000 $s)	$ 82.7	$ 85.8	$ 135.5	$ 52.3	$ 67.5	$ 81.3	$ 87.1	$ 91.2	$ 84.0
Total Charges (in million $s)	$ 214.9	$ 163.0	$ 108.4	$ 52.3	$ 60.8	$ 48.8	$ 61.0	$ 27.3	$ 378.0
Any Neuromuscular Diagnoses [2]									
Cerebral palsy	25.3	18.7	0.7	10.9	10.9	7.2	8.6	5.7	44.1
Spina bifida	5.9	6.2	2.8	2.2	2.0	1.4	1.9	1.7	12.1
Muscular dystrophy	3.5	1.7	0.5	0.9	0.8	0.7	1.3	1.0	5.2
Other	3.6	3.6	0.6	1.8	1.4	1.0	1.4	0.9	7.1
Proportion of Total Neuromuscular Diagnoses [5]									
Cerebral palsy	51.5%	79.2%	15.2%	69.4%	73.2%	71.3%	67.2%	62.6%	65.6%
Spina bifida	12.0%	26.3%	60.9%	14.0%	13.4%	13.9%	14.8%	18.7%	18.0%
Muscular dystrophy	7.1%	7.2%	10.9%	5.7%	5.4%	6.9%	10.2%	11.0%	7.7%
Other	7.3%	15.3%	13.0%	11.5%	9.4%	9.9%	10.9%	9.9%	10.6%

[1] Includes cerebral palsy, spina bifida, muscular dystrophy, and other neuromuscular conditions.

[2] The number of possible diagnoses varies by database: KID=25; NEDS=15,NHAMCS_OP=3; NAMCS=3.

[3] Primary diagnosis defined as the first Dx.

[4] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory

Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp

Table 7.6: Hospital Length of Stay and Charges for Children and Adolescents Age 20 and Under with Diagnoses[1] of a Syndrome with Musculoskeletal (MSK) Implications, by Sex and Age, United States 2012

	Number of Hospital Discharges (in 000s)									
	Sex		Age in Years							
Hospital Discharges	Male	Female	<1	1 to 5	6 to 10	11 to 13	14 to 17	18 to 20		Total
Any Syndrome with MSK Implications Diagnoses [2]	16.0	13.8	11.9	7.9	3.3	1.9	2.6	2.0		29.8
Primary Diagnosis [3]	*	*	*	*	*	*	*	*		0.6
Discharges/Visits for Any MSK Diagnoses	274.2	223.9	178.0	59.9	53.0	47.4	82.8	75.8		498.2
Proportion Any Syndrome with MSK Implications to Any MSK Diagnoses	5.8%	6.2%	6.7%	13.2%	6.2%	4.0%	3.1%	2.6%		6.0%
Proportion Primary Syndrome with MSK Implications to Any MSK Diagnoses	*	*	*	*	*	*	*	*		0.1%
Discharges/Visits for All Diagnosis	3,194.5	3,478.3	4,270.0	550.4	305.8	221.0	503.0	816.0		6,675.2
Proportion Any Syndrome with MSK Implications to All Diagnoses	0.5%	0.4%	0.3%	1.4%	1.1%	0.9%	0.5%	0.2%		0.4%
Proportion Primary Syndrome with MSK Implications to All Diagnoses	*	*	*	*	*	*	*	*		0.0%
Hospital Charges	Mean LOS and Charges									
Any Syndrome with MSK Implications Diagnoses [2]										
Mean Length of Stay	8.0	8.2	12.1	5.3	4.7	5.4	5.5	5.6		8.1
Mean Charges [4] (in 1,000 $s)	$ 72.8	$ 77.7	$ 108.3	$ 47.0	$ 47.0	$ 65.8	$ 60.1	$ 51.7		$ 75.1
Total Charges (in million $s)	$ 1,165.3	$ 1,072.9	$ 1,288.2	$ 371.5	$ 155.2	$ 125.1	$ 156.3	$ 103.4		$ 2,238.1
Primary Diagnosis [3]										
Mean Length of Stay	*	*	*	*	*	*	*	*		8.7
Mean Charges [4] (in 1,000 $s)	*	*	*	*	*	*	*	*		$ 100.8
Total Charges (in million $s)	*	*	*	*	*	*	*	*		$ 60.5

* Data does not meet standards for reliability

[1] Includes Marfan syndrome, Ehlers danlos, connective disorders, Down's syndrome, and neurofibromatosis.

[2] The number of possible diagnoses varies by database: KID=25; NEDS=15,NHAMCS_OP=3; NAMCS=3.

[3] Primary diagnosis defined as the first Dx.

[4] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges.

Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp

Table 7.7.1: Average Number of Musculoskeletal Injuries From Sport Activities Treated Per Year in Emergency Departments by Activity, Sex, and Age, United States 2011-2013

	Total Musculoskeletal Injuries (in 000s)								Proportion
	Male	Female	1 to 5	6 to 10	11 to 13	14 to 17	18 to 20	Total	of Total
TEAM SPORTS [1]									
Baseball/Softball	66.7	45.4	2.2	20.6	35.1	44.0	10.2	112.1	13.1%
Basketball	214.9	66.3	1.5	24.6	72.4	129.4	53.4	281.2	33.0%
Football	261.4	14.7	1.9	39.6	86.5	121.3	26.7	276.1	32.4%
Hockey (Field/Ice/Roller)	23.9	7.9	*	2.0	7.8	17.1	4.8	31.8	3.7%
Soccer	70.4	51.7	1.9	20.7	35.9	51.9	11.7	122.1	14.3%
Volleyball	7.7	23.4	*	1.3	7.7	18.2	3.8	31.0	3.6%
Total Team Sports	644.0	209.1	7.6	108.7	245.0	381.3	110.5	853.1	
Proportion of Total	75.5%	24.5%	0.9%	12.7%	28.7%	44.7%	13.0%		
INDIVIDUAL SPORTS									
All Terrain Vehicles/Motorized Bikes [2]	44.6	18.0	3.8	11.2	12.3	20.0	15.4	62.6	6.5%
Ball Sports [3]	21.0	14.1	0.7	10.7	10.6	9.9	3.1	35.1	3.6%
Bicycle/Wheeled [4]	131.9	64.4	22.2	67.8	49.2	38.0	19.1	196.3	20.2%
Contact Sports [5]	38.4	5.1	*	5.4	9.4	22.1	6.2	43.5	4.5%
Fitness Training [6]	45.7	32.1	4.7	10.8	13.2	30.3	18.7	77.7	8.0%
Gymnastics/Cheerleading/Dancing [7]	7.5	61.4	2.0	13.8	18.4	27.6	7.0	68.9	7.1%
Playground Equipment [8]	73.9	74.3	50.7	77.9	13.7	4.3	1.7	148.3	15.3%
Skating [9]	67.7	38.1	1.9	26.0	30.8	30.4	16.5	105.8	10.9%
Snow Sports [10]	24.7	13.7	1.5	6.9	10.1	12.6	7.2	38.3	3.9%
Track and Field [11]	7.1	9.0	*	0.9	4.7	9.3	1.1	16.1	1.7%
Water Sports [12]	17.7	16.0	3.3	8.8	8.4	8.5	4.8	33.7	3.5%
Other Activities [13]	73.8	75.1	22.1	46.2	37.4	32.8	10.5	148.9	15.3%
Total Individual Sports	551.4	419.1	113.0	285.1	216.7	244.7	110.9	970.5	
Proportion of Total	56.8%	43.2%	11.6%	29.4%	22.3%	25.2%	11.4%		
Total Team and Individual Sports	1,192.5	627.2	120.6	393.1	460.5	624.6	221.0	1,819.8	
Proportion of Total	65.5%	34.5%	6.6%	21.6%	25.3%	34.3%	12.1%		

Table 7.7.1: Average Number of Musculoskeletal Injuries From Sport Activities Treated Per Year in Emergency Departments by Activity, Sex, and Age, United States 2011-2013

* Does not meet standards for reliability.
[1] Includes both organized and informal team sports.
[2] Includes snowmobiles, ATVs, dune buggies, mopeds, and other power-assisted bikes, carts, scooters, and boats.
[3] Includes table tennis, tetherball, handball, badminton, squash, tennis, and other sports played with a small ball.
[4] Includes bicycles, tricycles, scooters, and unpowered wheel riding toys.
[5] Includes boxing, wrestling, and martial arts.
[6] Includes exercise with and without equipment and weightlifting.
[7] Includes organized and informal gymnastics, cheerleading, and dancing.
[8] Includes slides, see-saws, monkey bars and climbing apparatus, swings, pogo sticks, and other playground equipment.
[9] Includes roller and ice skating, in-line skates, and skateboards.
[10] Includes sleds, toboggans, snow disks, snow tubing, snow skiing, and snowboarding.
[11] Includes all track and field activities.
[12] Includes wading and swimming pools, diving, water slides, tubing, water skiing, surfing, water polo, and all activities performed in the act of swimming or on flotation devices.
[13] Includes all other athletic or play activities, including amusement attractions, archery, bowling, fencing, fishing, air guns, golfing, horseback riding, horseshoes, skeet shooting, trampolines, and tree or play houses.
Source: United States Consumer Product Safety Commission. National Electronic Injury Surveillance System, 2011, 2012, 2013. https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014.

Table 7.7.2: Type of Musculoskeletal Injuries From Sport Activities Treated in Emergency Departments (ED) and Hospitalization Rate, United States 2011-2013

	Proportion of Musculoskeletal Injuries					Total
	Contusions	Fractures	Sprains/ Strains	Other	Hospitalization Rate	Injuries Seen in ED
TEAM SPORTS [1]						
Baseball/Softball	38.5%	26.9%	31.9%	2.7%	1.0%	112.1
Basketball	16.9%	22.3%	56.6%	4.2%	0.6%	281.2
Football	23.5%	29.5%	42.5%	4.5%	1.4%	276.1
Hockey (Field/Ice/Roller)	34.1%	29.2%	33.9%	2.8%	1.2%	31.8
Soccer	23.2%	29.8%	43.9%	3.1%	1.2%	122.1
Volleyball	16.8%	16.2%	61.8%	5.2%	*	31.0
Total Team Sports	23.4%	26.3%	46.3%	4.0%	1.0%	853.1
INDIVIDUAL SPORTS						
All Terrain Vehicles/Motorized Bikes [2]	41.2%	34.9%	21.2%	2.7%	5.4%	62.6
Ball Sports [3]	25.7%	27.3%	42.6%	4.4%	0.6%	35.1
Bicycle/Wheeled [4]	45.1%	33.8%	19.6%	1.5%	2.8%	196.3
Contact Sports [5]	21.2%	27.7%	44.4%	6.7%	1.4%	43.5
Fitness Training [6]	22.4%	16.2%	56.8%	4.6%	0.8%	77.7
Gymnastics/Cheerleading/Dancing [7]	15.0%	21.4%	58.6%	5.0%	1.1%	68.9
Playground Equipment [8]	26.3%	53.2%	18.4%	2.1%	4.4%	148.3
Skating [9]	23.8%	41.6%	32.7%	1.9%	2.4%	105.8
Snow Sports [10]	20.7%	44.6%	31.2%	3.5%	2.2%	38.3
Track and Field [11]	12.7%	20.2%	64.4%	2.7%	*	16.1
Water Sports [12]	35.1%	22.7%	36.9%	5.3%	1.8%	33.7
Other Activities [13]	24.0%	31.9%	41.0%	3.1%	2.8%	148.9
Total Individual Sports	29.1%	34.5%	33.6%	2.8%	2.7%	970.5
Total Team and Individual Sports	26.4%	30.7%	39.5%	3.4%	1.9%	1,819.8

* Does not meet standards for reliability.
[1] Includes both organized and informal team sports.
[2] Includes snowmobiles, ATVs, dune buggies, mopeds, and other power-assisted bikes, carts, scooters, and boats.
[3] Includes table tennis, tetherball, handball, badminton, squash, tennis, and other sports played with a small ball.
[4] Includes bicycles, tricycles, scooters, and unpowered wheel riding toys.
[5] Includes boxing, wrestling, and martial arts.
[6] Includes exercise with and without equipment and weightlifting.
[7] Includes organized and informal gymnastics, cheerleading, and dancing.
[8] Includes slides, see-saws, monkey bars and climbing apparatus, swings, pogo sticks, and other playground equipment.
[9] Includes roller and ice skating, in-line skates, and skateboards.
[10] Includes sleds, toboggans, snow disks, snow tubing, snow skiing, and snowboarding.
[11] Includes all track and field activities.
[12] Includes wading and swimming pools, diving, water slides, tubing, water skiing, surfing, water polo, and all activities performed in the act of swimming or on flotation devices.
[13] Includes all other athletic or play activities, including amusement attractions, archery, bowling, fencing, fishing, air guns, golfing, horseback riding, horseshoes, skeet shooting, trampolines, and tree or play houses.
Source: United States Consumer Product Safety Commission. National Electronic Injury Surveillance System, 2011, 2012, 2013. https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October 27, 2014.

Table 7.8: Hospital Length of Stay and Charges for Children and Adolescents Age 20 and Under with Musculoskeletal (MSK) Neoplasm Diagnoses,[1] by Sex and Age, United States 2012

	Number of Hospital Discharges (in 000s)								
	Sex		Age in Years						
Hospital Discharges	Male	Female	<1	1 to 5	6 to 10	11 to 13	14 to 17	18 to 20	Total
Any MSK Neoplasm Diagnoses [2]	13.9	11.7	1.3	3.2	4.7	5.2	7.3	3.9	25.6
Primary Diagnosis [3]	2.1	1.8	*	0.6	0.6	0.8	1.1	0.7	4.0
Discharges/Visits for Any MSK Diagnoses	274.2	223.9	178.0	59.9	53.0	47.4	82.8	75.8	498.2
Proportion Any MSK Neoplasm to Any MSK Diagnoses	5.1%	5.2%	0.7%	5.3%	8.9%	11.0%	8.8%	5.1%	5.1%
Proportion Primary MSK Neoplasm to Any MSK Diagnoses	0.8%	0.8%	*	1.0%	1.1%	1.7%	1.3%	0.9%	0.8%
Discharges/Visits for All Diagnosis	3,194.5	3,478.3	4,270.0	550.4	305.8	221.0	503.0	816.0	6,675.2
Proportion Any MSK Neoplasm to All Diagnoses	0.4%	0.3%	0.0%	0.6%	1.5%	2.4%	1.5%	0.5%	0.4%
Proportion Primary MSK Neoplasm to All Diagnoses	0.1%	0.1%	*	0.1%	0.2%	0.4%	0.2%	0.1%	0.1%
Hospital Charges	Mean LOS and Charges								
Any MSK Neoplasm Diagnoses [2]									
Mean Length of Stay	4.5	4.8	6.8	4.2	4.2	4.5	4.6	4.8	4.6
Mean Charges [4] (in 1,000 $s)	$ 46.4	$ 47.4	$ 63.0	$ 41.0	$ 41.8	$ 45.6	$ 49.3	$ 49.1	$ 46.9
Total Charges (in million $s)	$ 645.0	$ 554.4	$ 81.8	$ 131.1	$ 196.3	$ 237.2	$ 360.0	$ 191.4	$ 1,199.4
Primary Diagnosis [3]									
Mean Length of Stay	5.7	6.7	*	5.2	5.4	6.3	6.6	5.9	6.2
Mean Charges [4] (in 1,000 $s)	$ 80.5	$ 88.3	*	$ 61.3	$ 76.9	$ 89.2	$ 96.8	$ 84.4	$ 84.1
Total Charges (in million $s)	$ 169.0	$ 158.9	*	$ 36.8	$ 46.1	$ 71.4	$ 106.5	$ 59.1	$ 336.3
Any MSK Neoplasm Diagnoses [2]									
Benign	1.9	1.8	0.8	0.6	0.5	0.5	0.7	0.4	3.6
Malignant	12.1	9.9	0.4	2.6	4.2	4.8	6.5	3.5	22.0
Proportion of Total MSK Neoplasm Diagnoses [5]									
Benign	13.7%	15.4%	61.5%	*	*	*	*	*	14.1%
Malignant	87.1%	84.6%	30.8%	81.3%	89.4%	92.3%	89.0%	*	85.9%

Table 7.8: Hospital Length of Stay and Charges for Children and Adolescents Age 20 and Under with Musculoskeletal (MSK) Neoplasm Diagnoses,[1] by Sex and Age, United States 2012

* Data does not meet standards for reliability

[1] Includes benign lesions of bone, cartilage, and soft and connective tissue, lipoma, and malignancy of bone, cartilage, and soft and connective tissue.

[2] The number of possible diagnoses varies by database: KID=25; NEDS=15,NHAMCS_OP=3; NAMCS=3.

[3] Primary diagnosis defined as the first Dx.

[4] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in

Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp

Table 7.9: Hospital Length of Stay and Charges for Children and Adolescents Age 20 and Under with Rheumatologic Condition Diagnoses[1], by Sex and Age, United States 2012

	Number of Hospital Discharges (in 000s)									
	Sex		Age in Years							
Hospital Discharges	Male	Female	<1	1 to 5	6 to 10	11 to 13	14 to 17	18 to 20	Total
Any Rheumatologic Condition Diagnoses [2]	3.6	9.9	*	0.9	1.3	1.8	4.0	5.4	13.5
Primary Diagnosis [3]	1.1	3.2	*	0.4	0.5	0.7	1.4	1.3	4.2
Discharges/Visits for Any MSK Diagnoses	274.2	223.9	178.0	59.9	53.0	47.4	82.8	75.8	498.2
Proportion Any Rheumatologic Condition to Any MSK Diagnoses	1.3%	4.4%	*	1.5%	2.5%	3.8%	4.8%	7.1%	2.7%
Proportion Primary Rheumatologic Condition to Any MSK Diagnoses	0.4%	1.4%	*	0.7%	0.9%	1.5%	1.7%	1.7%	0.8%
Discharges/Visits for All Diagnosis	3,194.5	3,478.3	4,270.0	550.4	305.8	221.0	503.0	816.0	6,675.2
Proportion Any Rheumatologic Condition to All Diagnoses	0.1%	0.3%	*	0.2%	0.4%	0.8%	0.8%	0.7%	0.2%
Proportion Primary Rheumatologic Condition to All Diagnoses	0.0%	0.1%	*	0.1%	0.2%	0.3%	0.3%	0.2%	0.1%
			*						
Hospital Charges	Mean LOS and Charges								
Any Rheumatologic Condition Diagnoses [2]									
Mean Length of Stay	5.3	5.2	*	5.8	4.6	5.3	5.3	5.2	5.3
Mean Charges [4] (in 1,000 $s)	$ 45.6	$ 46.5	*	$ 53.4	$ 40.0	$ 50.7	$ 49.1	$ 42.0	$ 46.2
Total Charges (in million $s)	$ 164.2	$ 459.9	*	$ 48.0	$ 52.1	$ 91.3	$ 196.2	$ 226.9	$ 624.1
Primary Diagnosis [3]									
Mean Length of Stay	4.8	5.2	*	4.7	4.1	5.1	4.9	5.8	5.1
Mean Charges [4] (in 1,000 $s)	$ 43.5	$ 50.1	*	$ 38.3	$ 35.0	$ 50.5	$ 53.7	$ 49.8	$ 48.5
Total Charges (in million $s)	$ 47.9	$ 160.4	*	$ 15.3	$ 17.5	$ 35.4	$ 75.2	$ 64.7	$ 203.8

* Data does not meet standards for reliability

[1] Includes rheumatic fever, Reiter's disease/reactive arthritis, juvenile idiopathic arthritis, ankylosing spondylitis and inflammatory spondylopathies, psoriatic arthritis, arthropathy of inflammatory bowel disease, systemic lupus erythematosus, juvenile dermatomyositis, and localized scleroderma.

[2] The number of possible diagnoses varies by database: KID=25; NEDS=15,NHAMCS_OP=3; NAMCS=3.

[3] Primary diagnosis defined as the first Dx.

[4] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges.

Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-

Table 7.10: Hospital Length of Stay and Charges for Children and Adolescents Age 20 and Under with Medical Problems with Musculoskeletal (MSK) Implications Diagnosis[1], by Sex and Age, United States 2012

	Number of Hospital Discharges (in 000s)								
	Sex		Age in Years						
Hospital Discharges	Male	Female	<1	1 to 5	6 to 10	11 to 13	14 to 17	18 to 20	Total
Any Medical Problem with MSK Implication Diagnoses [2]	28.3	27.0	8.8	7.5	5.5	4.8	11.4	17.0	55.3
Primary Diagnosis [3]	3.1	1.8	*	0.7	0.5	0.4	1.3	1.6	4.8
Discharges/Visits for Any MSK Diagnoses	274.2	223.9	178.0	59.9	53.0	47.4	82.8	75.8	498.2
Proportion Any Medical Problem with MSK Implication to Any MSK Diagnoses	10.3%	12.1%	4.9%	12.5%	10.4%	10.1%	13.8%	22.4%	11.1%
Proportion Primary Medical Problem with MSK Implication to Any MSK Diagnoses	1.1%	0.8%	*	1.2%	0.9%	0.8%	1.6%	2.1%	1.0%
Discharges/Visits for All Diagnosis	3,194.5	3,478.3	4,270.0	550.4	305.8	221.0	503.0	816.0	6,675.2
Proportion Any Medical Problem with MSK Implication to All Diagnoses	0.9%	0.8%	0.2%	1.4%	1.8%	2.2%	2.3%	2.1%	0.8%
Proportion Primary Medical Problem with MSK Implication to All Diagnoses	0.1%	0.1%	*	0.1%	0.2%	0.2%	0.3%	0.2%	0.1%
Hospital Charges	Mean LOS and Charges								
Any Medical Problem with MSK Implication Diagnoses									
Mean Length of Stay	11.9	11.0	29.7	9.8	9.2	8.8	8.2	6.4	11.5
Mean Charges [4] (in 1,000 $s)	$ 121.3	$ 102.9	$ 259.4	$ 103.8	$ 105.7	$ 96.8	$ 88.1	$ 62.1	$ 112.3
Total Charges (in million $s)	$ 3,432.8	$ 2,778.3	$ 2,282.7	$ 778.5	$ 581.4	$ 464.6	$ 1,004.3	$ 1,055.7	$ 6,210.2
Primary Diagnosis [3]									
Mean Length of Stay	3.5	3.4	*	3.7	3.5	3.7	3.3	3.2	3.5
Mean Charges [4] (in 1,000 $s)	$ 34.4	$ 26.7	*	$ 30.4	$ 45.3	$ 44.1	$ 24.3	$ 31.9	$ 31.6
Total Charges (in million $s)	$ 106.6	$ 48.1	*	$ 21.3	$ 22.7	$ 17.6	$ 31.6	$ 51.0	$ 151.7
Any Medical Problem with MSK Implication Diagnoses									
Medical Problems [5]	10.4	7.7	1.3	2.5	1.9	1.3	4.0	6.9	18.2
Rickets [6]	18.4	19.7	7.6	5.0	3.7	3.6	7.7	10.5	38.1
Proportion of Total Medical Problem with MSK Implication Diagnoses									
Medical Problems [5]	36.7%	28.5%	14.8%	*	*	*	*	*	32.9%
Rickets [6]	65.0%	73.0%	86.4%	66.7%	67.3%	75.0%	67.5%	*	68.9%

* Data does not meet standards for reliability

[1] Includes hemophilia, sickle cell, endocrine and metabolic disorders, Gaucher's disease, osteoporosis, hyperthyroid, rhabdomyolysis, rickets, and other conditions.

[2] The number of possible diagnoses varies by database: KID=25; NEDS=15,NHAMCS_OP=3; NAMCS=3.

[3] Primary diagnosis defined as the first Dx.

[4] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges.

[5] Hemophilia, sickle cell, endocrine and metabolic disorders, Gaucher's disease, osteoporosis, hyperthyroid, rhabdomyolysis

[5] Vitamin D deficiency, phosphorus and calcium metabolism disorders.

Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp

Table 7.11: Hospital Length of Stay and Charges for Children and Adolescents Age 20 and Under with Musculoskeletal (MSK) Pain Syndromes Diagnoses,[1],by Sex and Age, United States 2012

	Number of Hospital Discharges (in 000s)									
	Sex		Age in Years							
Hospital Discharges	Male	Female	<1	1 to 5	6 to 10	11 to 13	14 to 17	18 to 20	Total
Any MSK Pain Syndrome Diagnoses [2]	9.2	11.6	*	1.9	2.7	2.8	6.3	6.8	20.8
Primary Diagnosis [3]	0.9	1.0	*	0.3	0.4	0.3	0.5	0.3	1.9
Discharges/Visits for Any MSK Diagnoses	274.2	223.9	178.0	59.9	53.0	47.4	82.8	75.8	498.2
Proportion Any MSK Pain Syndrome to Any MSK Diagnoses	3.4%	5.2%	*	3.2%	5.1%	5.9%	7.6%	9.0%	4.2%
Proportion Primary MSK Pain Syndrome to Any MSK Diagnoses	0.3%	0.4%	*	0.5%	0.8%	0.6%	0.6%	0.4%	0.4%
Discharges/Visits for All Diagnosis	3,194.5	3,478.3	4,270.0	550.4	305.8	221.0	503.0	816.0	6,675.2
Proportion Any MSK Pain Syndrome to All Diagnoses	0.3%	0.3%	*	0.3%	0.9%	1.3%	1.3%	0.8%	0.3%
Proportion Primary MSK Pain Syndrome to All Diagnoses	0.0%	0.0%	*	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%
Hospital Charges	Mean LOS and Charges								
Any MSK Pain Syndrome Diagnoses [2]									
Mean Length of Stay	5.7	5.6	*	4.5	5.0	6.1	6.3	5.3	5.6
Mean Charges [4] (in 1,000 $s)	$ 45.7	$ 39.0	*	$ 37.5	$ 42.7	$ 52.6	$ 43.3	$ 37.1	$ 42.0
Total Charges (in million $s)	$ 420.6	$ 452.5	*	$ 71.2	$ 115.2	$ 147.4	$ 272.7	$ 252.1	$ 872.9
Primary Diagnosis [3]									
Mean Length of Stay	2.6	3.5	*	2.1	2.9	3.4	3.4	3.4	3.1
Mean Charges [4] (in 1,000 $s)	$ 20.5	$ 25.0	*	$ 15.3	$ 17.5	$ 24.4	$ 25.8	$ 32.6	$ 22.9
Total Charges (in million $s)	$ 18.5	$ 25.0	*	$ 4.6	$ 7.0	$ 7.3	$ 12.9	$ 9.8	$ 43.4

* Data does not meet standards for reliability.

[1] Includes amplified musculoskeletal pain, juvenile primary fibromyalgia syndrome, reflex sympathetic dystrophy, benign hypermobility syndrome, and benign limb pains.

[2] The number of possible diagnoses varies by database: KID=25; NEDS=15,NHAMCS_OP=3; NAMCS=3.

[3] Primary diagnosis defined as the first Dx.

[4] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges.

Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-

Table 7.12: Summary Hospital Charges for Children and Adolescents Age 20 and Under with a Primary[1] Diagnosis of a Musculoskeletal Related Condition, by Sex and Age, United States 2012

	Total Hospital Charges 2012 for Musculoskeletal Related Condition (in 000 $s)										
	Sex		Age in Years						Total Charges	Proportion of Total Charges	Hospital Discharges [2]
	Male	Female	<1	1 to 5	6 to 10	11 to 13	14 to 17	18 to 20			
Musculoskeletal Infections [2]	$ 266.7	$ 152.2	$ 24.0	$ 89.5	$ 109.2	$ 69.8	$ 68.5	$ 48.2	$ 419.0	5.5%	9.1
Deformity [3]	$ 320.7	$ 330.8	$ 24.3	$ 119.5	$ 146.3	$ 297.1	$ 315.1	$ 56.1	$ 2,844.9	37.7%	30.1
Trauma [4]	$ 2,277.7	$ 1,063.4	$ 183.6	$ 355.1	$ 353.1	$ 327.4	$ 869.3	$ 1,230.4	$ 3,347.4	44.3%	72.7
Neuromuscular Conditions	$ 214.9	$ 163.0	$ 108.4	$ 52.3	$ 60.8	$ 48.8	$ 61.0	$ 27.3	$ 378.0	5.0%	4.5
Syndromes with Musculoskeletal Implications [5]	*	*	*	*	*	*	*	*	$ 60.5	0.8%	0.6
Sports Injuries [6]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Skeletal Dysplasias [7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Neoplasms	*	*	*	*	*	*	*	*	$ 336.3	4.5%	4.0
Rheumatologic Conditions [8]	$ 47.9	$ 160.4	*	$ 15.3	$ 17.5	$ 35.4	$ 75.2	$ 64.7	$ 203.8	2.7%	4.2
Medical Problems with Musculoskeletal Implications [9]	$ 106.6	$ 48.1	*	$ 21.3	$ 22.7	$ 17.6	$ 31.6	$ 51.0	$ 151.7	2.0%	4.2
Pain Syndromes [10]	$ 18.5	$ 25.0	*	$ 4.6	$ 7.0	$ 7.3	$ 12.9	$ 9.8	$ 43.4	0.6%	1.9
Total Children and Adolescent Musculoskeletal Related Diagnoses	$ 4,149.2	$ 3,440.2	$ 429.1	$ 774.8	$ 911.7	$ 1,398.7	$ 2,310.7	$ 1,725.4	$ 7,551.2		135.2
Proportion Total MSK Charges	54.7%	45.3%	5.7%	10.3%	12.1%	18.5%	30.6%	22.8%			
All Children and Adolescent Patients	$ 73,369.9	$ 68,023.6	$ 71,934.9	$ 15,378.3	$ 9,762.2	$ 8,175.6	$ 16,055.2	$ 19,550.9	$ 140,863.8		6,675.2
Proportion MSK Charges of all Children and Adolescent Patient Charges	5.7%	5.1%	0.6%	5.0%	9.3%	17.1%	14.4%	8.8%	5.4%		2.0%

* Data does not meet standards for reliability

NA: Not applicable (sports injuries) or not available (skeletal dysplasias).

[1] Primary is defined as the first diagnosis.

[2] Includes osteomyelitis, septic arthritis, soft issue infections, Lyme disease, tuberculosis.

[3] Includes polydactyl, syndactyly, reduction deformities, and congenital deformities..

[4] includes fractures, dislocation, sprains and strains, open wound, crushing injury, contusion, traumatic compartment syndrome, unspecified injuries, injuries to nerve roots, spinal plexus, birth trauma, and child abuse.

[5] Includes Marfan syndrome, Ehlers danlos, connective disorders, Down's syndrome, and neurofibromatosis.

[6] Sports injuries are reported using the United States Consumer Product Safety Commission. National Electron Injury Surveillance System (NEISS). https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx Accessed October

[7] Includes chondrodystrophy, achondroplasia, hypochondroplasia, dwarfism, congenital absence of rib, Osteogenesis imperfects, osteoporosis, and other dysplasia.

[8] Includes rheumatic fever, Reiter's disease/reactive arthritis, juvenile idiopathic arthritis, ankylosing spondylitis and inflammatory spondylopathies, psoriatic arthritis, arthropathy of inflammatory bowel disease,

[9] Includes hemophilia, sickle cell, endocrine and metabolic disorders, Gaucher's disease, osteoporosis, hyperthyroid, rhabdomyolysis, rickets, and other conditions.

[10] Includes amplified musculoskeletal pain, juvenile primary fibromyalgia syndrome, reflex sympathetic dystrophy, benign hypermobility syndrome, and benign limb pains.

Source: HCUP Kids' Inpatient Database (KID). Healthcare Cost and Utilization Project (HCUP). 2012. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp

Tumors

Lead Author(s):

William G. Ward Sr, MD
Robert M. Corey, MD

Supporting Author(s):

Sylvia I. Watkins-Castillo, PhD

Although somewhat uncommon by comparison to such diseases as lung, breast, and kidney cancers, musculoskeletal neoplasms cause significant morbidity and mortality in patients. This is especially true in young patients who are more likely to develop such cancers as osteosarcoma, Ewing sarcoma and rhabdomyosarcoma. Musculoskeletal neoplasms and sarcomas, in particular, usually require concerted treatment efforts by coordinated medical teams. These teams are typically led by a subspecialty of physicians known as orthopedic oncologists. Because of the relative infrequency of musculoskeletal sarcomas, few institutions gather sufficient numbers to provide thorough epidemiologic and descriptive data. Therefore, tumor registry data are necessary to gather enough cases to generate meaningful data.

The following discussion is based on concerted analysis that incorporates the two largest tumor registries in the United States, The National Cancer Data Base (NCDB) of the American College of Surgeons (ACS) and the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) program. Actual incidence, death rates, and survival statistics are difficult to determine. The two databases derive slightly different numbers, and the numbers change annually with newly reported data. Thus, a direct comparison of NCDB and SEER is not possible. Sources for data cited in tables and graphs are shown. Sources available at the time of analysis may no longer be available.

The NCDB is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The data used in this study and this report are derived from a de-identified NCDB file comprising over 1500 Commission-accredited cancer programs. The American College of Surgeons and the Commission on Cancer have not verified and are not responsible for the analytic or statistical methodology employed, or the conclusions drawn from these data by the investigator and authors of this chapter.

We also derived some tumor incidence estimates by analysis and extrapolation from one of the author's case series data derived from his practice experience. Dr. William Ward was the only orthopedic oncologist at Wake Forest University Baptist Medical Center in Winston Salem, NC, during the period between 1991 and 2005. Virtually all cases of osteosarcoma in North Carolina were treated by one of the very few orthopedic oncologists in North Carolina during that time. Dr. Ward's personal surgical database contains detailed incidence data regarding many musculoskeletal neoplasms. Comparing the incidence of osteosarcomas in the United States with that treated by Dr. Ward, we were able to extrapolate, using similar proportional estimates, to the national incidence of tumors for which there were no national registry data. Typically, aggressive benign bone and soft tissue tumors are most likely to be treated by orthopedic oncologists rather than by non-oncological–trained surgeons. However, because there is no way to estimate the numbers of patients treated by orthopedic surgeons not specifically trained in oncology, the derived national data estimates will be conservative because of the methodology used. All estimates in this chapter derived from the above methodology will be clearly identified as an extrapolation of incidence estimation.

Definitions

All tissues are made up of individual cells. Tumors, also known as neoplasms, are the result of excessive abnormal growths of cells that multiply and divide without control. In malignant tumors, the tumor cells multiply, divide, and spread. If unchecked, malignant tumors can cause death as they spread, or metastasize, to vital areas of the body. Benign tumors, on the other hand, do not spread or metastasize to other body locations. However, they can cause significant local injury or disease at the site of the primary tumor. Tumors, therefore, are growths of new tissue that are uncontrolled and progressive.

Muscle, bone, nerves, blood vessels, fat, and fibrous tissues are all connective tissues.

Primary bone and soft tissue tumors originate in bone or connective tissue rather than spread to bone or connective tissue from another site. Secondary tumors are those that began elsewhere and spread (metastasize) to the bone or connective tissues. Primary tumors can be benign, which means they do not spread through the body to other sites, or malignant (cancerous), meaning they can and do spread to other places in the body. Malignant tumors of the bone and connective tissue are also known as sarcomas, unlike cancers in other organs, which are generally referred to as carcinomas.

Most musculoskeletal cancers, or sarcomas, are named by the Latin root word for the type of malignant tissue they produce. Thus, osteosarcomas are malignant bone (osteo) cells, chondrosarcomas manufacture malignant cartilage (chondro) cells, liposarcomas make malignant fatty tissue (lipo) cells, rhabdomyosarcomas create malignant muscle tissue (rhabdomyo) cells, fibrosarcomas produce malignant connective tissue (fibro), and so on.

Secondary bone tumors are those that spread to the bone from malignancies in other organs such as lung, breast, and prostate cancers. These are known as metastatic cancers, and are far more numerous than primary bone cancers. Although metastatic cancers to bone cause extensive morbidity from pain and fractures caused by bone weakening, such cancers are not the primary focus of this chapter. However, a following section on secondary bone and joint cancers details some of the effects of this condition and its associated morbidity.

Benign tumors are neoplasms that do not tend to spread, or metastasize, to other sites and therefore are not cancerous. They rarely threaten the life of the patient although they can cause significant injury at the site of the tumor.

The incidence of cancer is defined as the number of new cancers of bone and connective tissue in a specific population during a year. The incidence rate is expressed as the number of cancers per 100,000 population at risk.

In general, it does not include recurrences. Because of the low number of new cases, the incidence rate in this report is expressed as the number per one million population at risk.

Prevalence is defined as the number of people alive on a certain date in a population who have the disease and have previously had a diagnosis of the disease. It includes new (incidence) cases and pre-existing cases, and is a function of past incidence and survival.

A cancer mortality rate is the number of deaths, with cancer as the underlying cause of death, occurring in a specific population during a year. It is calculated the same as the incidence rate.

Cancer survival statistics are typically expressed as the proportion of patients alive at some point subsequent to the diagnosis of their cancer.1 Relative survival is a net survival measure representing cancer survival in the absence of other causes of death. Relative survival is defined as the ratio of the proportion of observed survivors in a cohort of cancer patients to the proportion of expected survivors in a comparable set of cancer-free individuals.2 Observed survival is the actual percentage of patients still alive at some specified time after diagnosis of cancer. It considers deaths from all causes, cancer or otherwise. Lifetime risk is the probability of developing or dying from cancer in the course of one's lifetime.3

1. National Cancer Institute: *Surveillance, Epidemiology, and End Results Program: Where Can I Find Cancer Survival Statistics?* Available at: http://surveillance.cancer.gov/statistics/types/survival.html. Accessed February 10, 2015

2. National Cancer Institute: Division of Cancer Control and Population Sciences, Information Management Services, Inc., SEER*Stat. *Relative Survival.* Available at: http://seer.cancer.gov/seerstat/WebHelp/Relative_Survival.htm Accessed February 10, 2015.

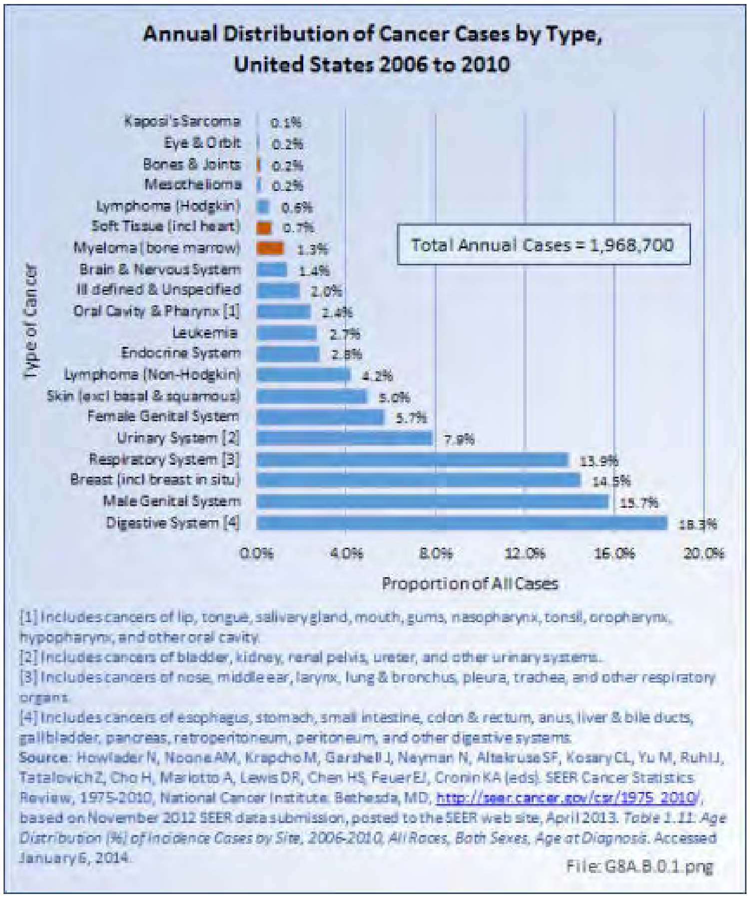
3. National Cancer Institute: Surveillance, Epidemiology, and End Results Program. *Defining Cancer Statistics.* Available at: http://seer.cancer.gov/statistics/types.html Accessed February 10, 2015.

Primary Malignant Bone and Connective Tissue Tumors

Bone and connective tissue neoplasms, which include bone and joint sarcoma, myeloma, and soft tissue sarcomas, are uncommon when compared with other cancers and with other musculoskeletal conditions, accounting for about 2.2% of annual cancer cases between 2006 and 2010 (approximately 43,000 cases). This is slightly higher than the rate of 1.9% reported previously for the years 2002 to 2006. The annual average number of new bone and joint cancer cases between 2006 and 2010 was 3,888, while during this same time an average of 1,360 deaths from bone and joint cancer occurred each year. (Reference Table 8A.1.1 PDF CSV, Table 8A.3.1 PDF CSV, and Table 8A.3.3 PDF CSV)

Data from the Surveillance Epidemiology and End Results (SEER) program of the National Cancer Institute, used to present the burden of bone and connective tissue neoplasms, is the most comprehensive source of information on cancer incidence, prevalence, mortality, survival, and lifetime risks. Data is currently available from 1974 to 2006. The SEER program is one of the most comprehensive sources of neoplasm data; it is based on data representing approximately 10% of the US population.

In addition, data from the American College of Surgeons' Commission on Cancer National Cancer Data Base (NCDB) was used in the analysis for staging and growth rates for common cancers. The NCDB is maintained by the American College of Surgeons, containing much of the same standardized data as that collected by the SEER database. Data are collected from all institutions wishing to be accredited by the American College of Surgeons Commission on Cancer. Each accredited institution is required to report all patients with cancer treated at their institution, including annual follow-up data. Site visits and interaction between American College of Surgeons cancer database personnel and the local reporting institutions verifies a minimum of 90% case capture and reporting for each institution. Multiple internal checks verify the data accuracy. It is estimated that the approximately 1,500 reporting institutions each year treat approximately 71% of all patients with malignancies in the United States. The primary author was granted research access to the database under the Participant User File (PUF) research program. However, accessible data was only for cases in patients 18 years old and older, showing the age-related aspects of the NCDB dataset.



Cancers of Bones and Joints: Primary Malignant Bone and Connective Tissue Tumors

The three most common primary cancers of bones and joints are osteosarcoma, Ewing sarcoma, and chondrosarcoma. Of the three, chondrosarcoma has the best prognosis. The ages at which these cancers most often occur vary. Osteosarcoma, a malignant bone tissue tumor commonly found near the growing end of the long bones, is the most common, and occurs most frequently in teens and young adults. Ewing sarcoma, a tumor often located in the shaft of long bones and in the pelvic bones, occurs most frequently in children and youth.

Chondrosarcoma, a sarcoma of malignant cartilage cells, often occurs as the result of malignant degeneration of pre-existing cartilage cells within bone, including chondromas (a benign tumor), and is primarily found among older adults. However, the vast majority of chondromas never undergo malignant change; therefore, the routine resection of benign chondromas is unwarranted.

Of these three, Ewing sarcoma is generally considered to have the worst prognosis, followed by osteosarcoma. However, this perception is largely due to the greater tendency for osteosarcomas to present as high-grade tumors and for chondrosarcomas to present as low-grade tumors. When analyzed by stage, a recent survivorship analysis revealed similar survivorship rates for low-grade chondrosarcoma compared to low-grade osteosarcoma, and similar survivorship rates for high-grade chondrosarcoma when compared to high grade osteosarcoma. By definition, all cases of Ewing sarcoma are high-grade, the most aggressive category of cancer, with full potential to metastasize and bring about death. Approximately 6% to 20% of osteosarcomas are of lower grade; chondrosarcoma has a higher proportion of low-grade cases than these other two bone and joint cancers.

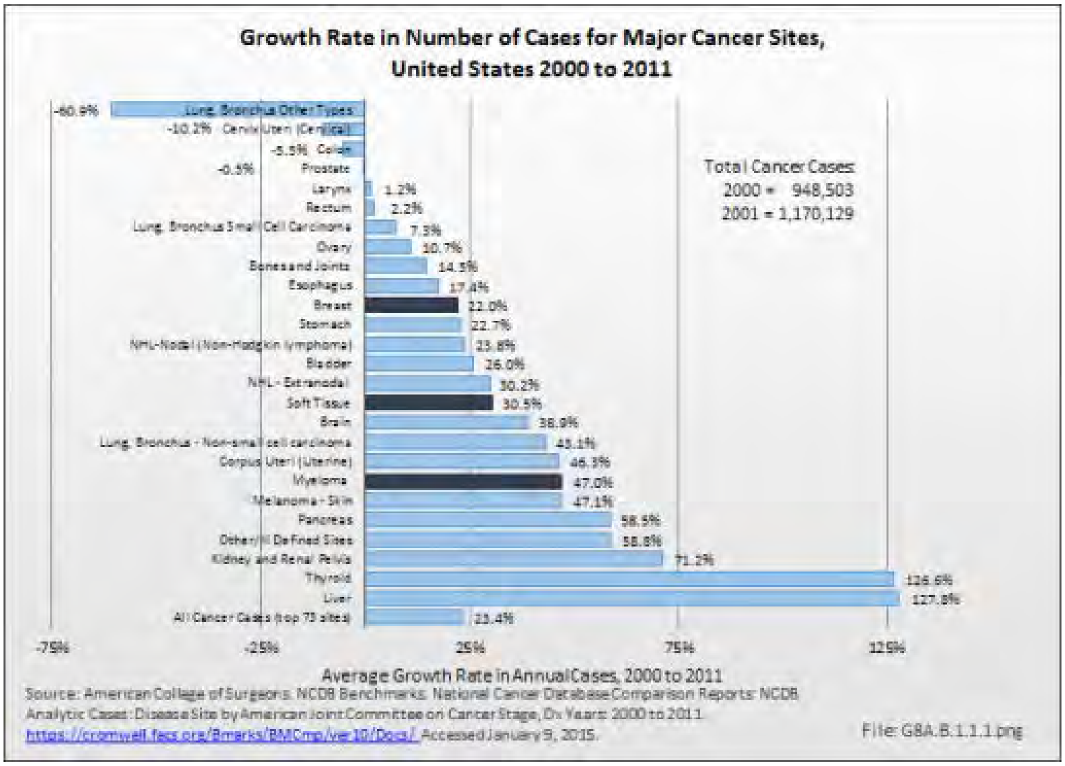
The fourth common "primary" cancer of the bone is myeloma, a malignant primary tumor of the bone marrow formed from a type of bone marrow cells called plasma cells (the cells that manufacture antibodies). This cancer and usually involves multiple bones simultaneously. The isolated single-bone version of myeloma is called plasmacytoma, but virtually all cases of isolated plasmacytoma evolve into full-fledged multiple myeloma within 5 to 10 years after diagnosis of the plasmacytoma. Like leukemia and lymphoma, myeloma is more properly considered a primary cancer of the hematopoietic bone marrow. Unlike leukemia, however, myeloma typically causes extensive changes or damage to the bone structure itself, causing fractures, pain, and hypercalcemia. Because of the associated bone destruction, myeloma is generally included in analysis of bone cancers; however, leukemia and lymphomas generally are not considered primary bone cancers, presumably because of the lower likelihood of structural bone destruction and associated complications. Non-Hodgkin's lymphomas, however, warrant some consideration due to the frequency of bone destruction and pathological fractures requiring operative intervention.

Incidence: Cancers of Bones and Joints

SEER estimated that in 2013, 3,010 people were newly diagnosed with cancer of the bones and joints. The number of new cases of bone and joint cancers is 0.9 per 100,000 people per year. In addition, 1,440 people will die annually from cancer of the bone and joints.[1] According to SEER statistics, the rates for new bone and joint cancer cases have been rising, on average, 0.4% each year over the last ten years. However, death rates have fallen on average 0.3% per year, with survival rates rising slightly. Incidence estimates derived from NCDB are slightly higher without an appreciable change in survival. There has been a gradual increase in the number of cases reported to the NCDB in the past 13 years. While the reason for this difference is unknown, it could reflect reporting changes rather than incidence changes.

Myeloma occurs five to six times as frequently as the other bone cancers. It will be diagnosed in 22,350 persons per year, an incidence rate of 5.9 per 100,000 persons per year. An expected 10,710 persons died of myeloma in 2013.[2]

Although annual cases included in the American College of Surgeons National Cancer Data Base (NCDB) show a slower rate of increase, proportionately, for bone and joint cancers than for cancer cases overall, the incidence of bone and joint cancers is increasing. Between 2000 and 2011, the annualized number of primary cases recorded increased by nearly 15%. Myeloma cases, however, increased at twice the rate of cancer cases overall, 47% to 23%, respectively. (Reference Table 8A.5.2 PDF CSV)



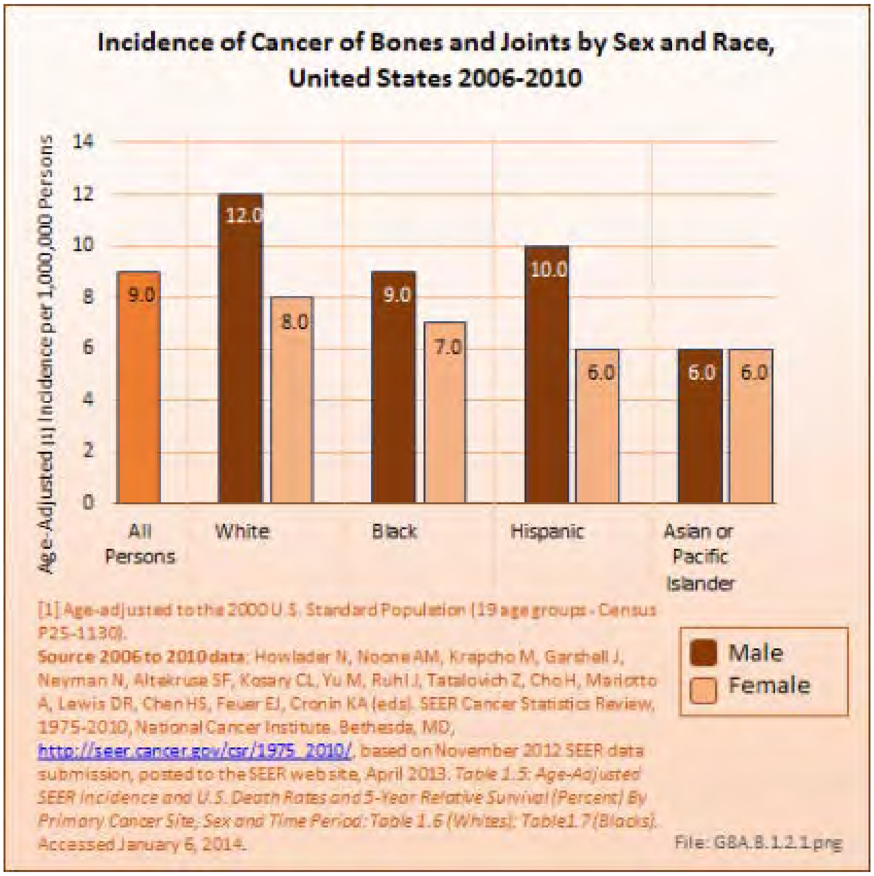
1. National Cancer Institute, Surveillance, Epidemiology, and End Results Program: *SEER Stat Fact Sheets: Bone and Joint Cancer.* Available at: http://seer.cancer.gov/statfacts/html/bones.html. Accessed February 10, 2015.

2. National Cancer Institute, Surveillance, Epidemiology, and End Results Program: *SEER Stat Fact Sheets: Myeloma.* Available at: http://seer.cancer.gov/statfacts/html/mulmy.html. Accessed February 10, 2015.

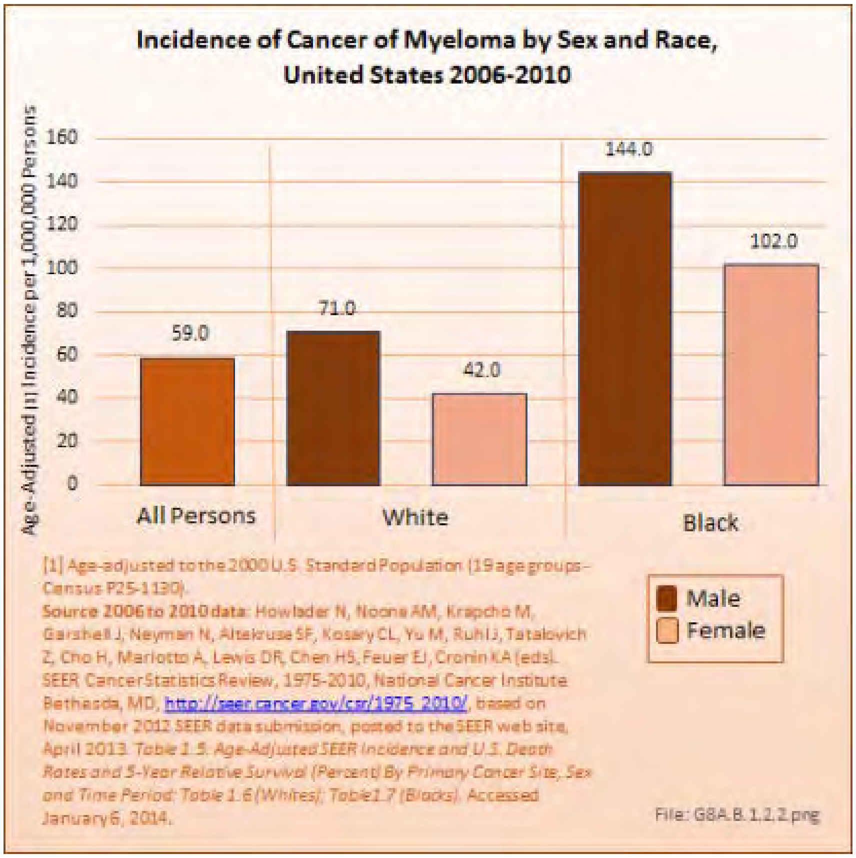
Demographics: Cancers of Bones and Joints

Gender and Race

Bone cancers and soft tissue sarcomas are found more frequently in males than females, and more frequently among Whites than those of any other race. However, rates have varied slightly for both genders and by race for the past decade. The average annual incidence of bone cancers between 2006 and 2010 was nine in one million, a rate that has remained constant for the last decade. The rate among White males was 12 in one million, while, among White females it was eight in one million. The lowest rate of six in one million was found for both males and females of the Asian or Pacific Islander race. The incidence of cancer of the bones and joints in the United States is comparable to several site-specific oral cancers (ie, lip, salivary gland, floor of the mouth), cancers of the bile duct, cancers of the eye, and Kaposi's sarcoma, which affects the skin and mucous membranes and is often associated with immunodeficient individuals with AIDS. (Reference Table 8A.1.1 PDF CSV)



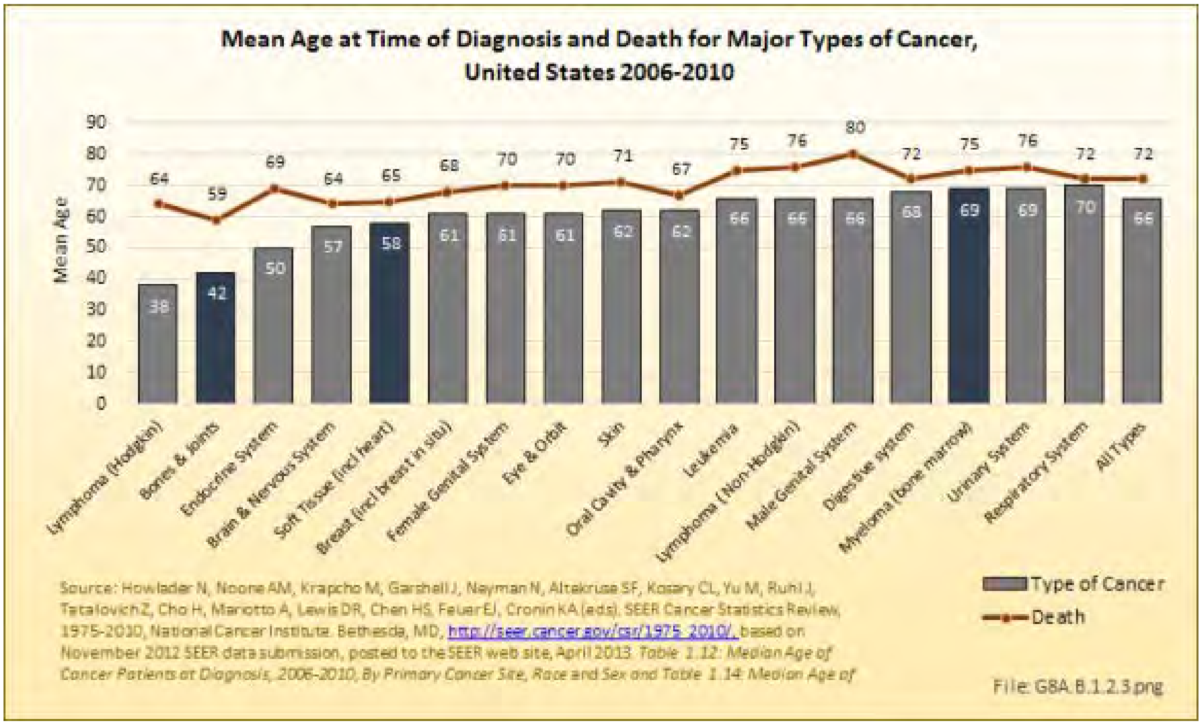
As with bone and joint cancers, males have a higher incidence of myeloma than do females, with an average of 71 cases in one million males to 42 cases in one million females. Blacks have a much higher incidence rate of myeloma than Whites. The incidence of myeloma in the United States is comparable to the incidence of esophageal, liver, cervical, ovarian, brain, and lymphocytic leukemia cancers. (Reference Table 8A.1.2 PDF CSV)



Age

The median age for cancers of the bones and joints has risen slightly, to age 42 years, in recent years. However, it remains the leading cause of cancer in young persons under the age of 20 years. More than one in four diagnoses of bone and joints cancer is in children and youth under the age of 20 years, with more than one-half (52%) of cases diagnosed in person younger than 45 years. Males are typically diagnosed with bone cancers, and die from bone cancer, at an age several years younger than females. (Reference Table 8A.2.1 PDF CSV and Table 8A.3.2 PDF CSV)

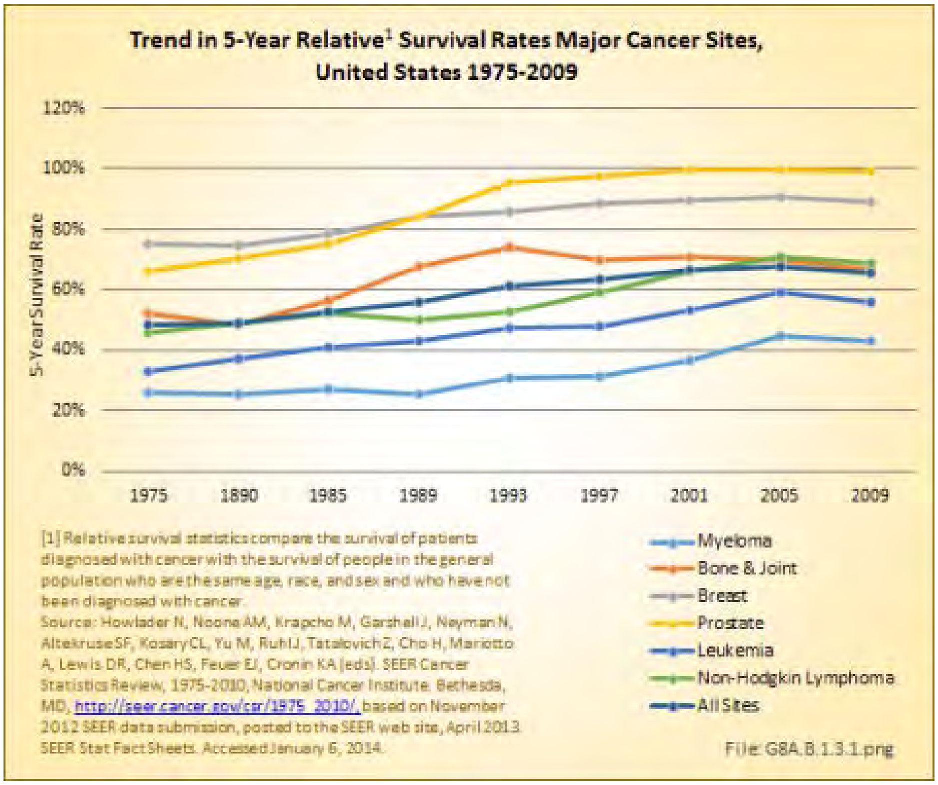
Myeloma, on the other hand, is primarily a cancer found among elderly persons, with a median age of 69 at the time of diagnosis. Eight-five percent of new myeloma cases are diagnosed in persons age 55 years and older. Again, males are typically diagnosed with myeloma at ages several years younger than females. (Reference Table 8A.2.1 PDF CSV, Table 8A.2.2 PDF CSV, and Table 8A.3.2 PDF CSV)



Mortality and Survival Rates: Cancers of Bones and Joints

Death from bone and joint cancer, at a median age of 59 years, occurs at a younger age than any other type of cancer. (Reference Table 8A.2.2 PDF CSV)

Annual population-based mortality rates due to cancers of bones and joints are low, averaging four deaths per one million people since the early 1990s.[1] While the mortality rate from bone and joint cancer dropped by approximately 50% from that of the late 1970s, no significant improvement in this rate has been observed over the past 20 years.[2] Males have a higher mortality rate than females for all races. (Reference Table 8A.4.3 PDF CSV)



The overall 5-year survival rate in 2006–2010 for bone and joint cancers was 66%, placing it roughly in the middle of all cancers for 5-year survival and comparable to a number of more common cancers such as non-Hodgkin lymphoma, urinary, cervical/ovarian, and soft tissue cancers. This is an increase of 14% since 1975, when the 5-year survival rate was 52%. The median number of years of survival after diagnosis is 17, with males averaging 16 years and females 18 years.

The overall 5-year survival rate for the primary types of bone and joint cancers is 54% for osteosarcoma, 75% for chondrosarcoma, and 51% for Ewing sarcoma. The osteosarcoma survival rate varies with age: The 5-year survival was 70% for children and youth under the age of 20 years,3 60% for people under 30 years of age, 50% for those aged 30 years to 49 years, and 30% for those 50 years old and older.2 If Ewing sarcoma is found before it metastasizes, the 5-year survival rate for children and youth is about 70%. However, if already metastasized when found, the 5-year survival rate drops to 15% to 30%.4 (Reference Table 8A.4.1 PDF CSV, Table 8A.4.2 PDF CSV, and Table 8A.4.3 PDF CSV)

The annual population-based mortality rate of myeloma was an average of 34 persons per one million population between 2006 and 2010.5 The mortality rate from myeloma has remained relatively constant since the mid-1970s. The 5-year survival rate for myeloma, 43%, is one of the lowest for all cancers; however, due to being primarily a cancer of older persons, this age-relatedness may well affect survival regardless of the presence or absence of myeloma. The median survival after diagnosis of myeloma is only 6 years. (Reference Table 8A.4.1 PDF CSV, Table 8A.4.2 PDF CSV, and Table 8A.4.3 PDF CSV)

Within the NCDB, no change in the overall survival rates for patients diagnosed and treated in the years 1985 to 1988 compared to patients between 1994 and 1998 was found. There have been no substantial changes in therapies utilized for osteosarcoma since 1998 and the overall 1998–2010 NCDB data reveals no significant improvement, with an approximate 50% five-year overall survival. However, the survival rate varies greatly with the histologic subtype of sarcoma. For instance, the 5-year relative survival rate is 53% for classic high-grade osteosarcoma, 87% for parosteal osteosarcoma and 18% for osteosarcoma associated with Paget's disease of the bone. (Reference Table 8A.8.1 PDF CSV)

1. National Cancer Institute, Surveillance, Epidemiology, and End Results Program: *SEER Stat Fact Sheets: Bone and Joint Cancer.* Available at: http://seer.cancer.gov/statfacts/html/bones.html. Accessed February 10, 2015.

2. a. b. Damron TA, Ward WG, Stewart A: Osteosarcoma, chondrosarcoma, and Ewing sarcoma: National Cancer Center Data Base Report. *Clin Orthop Relat Res* 2007;459:40-47.

3. Cancer.net: *Osteosarcoma–Childhood: Statistics*. Available at: http://www.cancer.net/cancer-types/osteosarcoma-childhood/statistics. Accessed February 10, 2015.

4. Cancer.net: *Ewing Sarcoma-Childhood: Statistics.* Available at: http://www.cancer.net/cancer-types/ewing-sarcoma-childhood/statistics Accessed February 10, 2015.

5. National Cancer Institute, Surveillance, Epidemiology, and End Results Program: *SEER Stat Fact Sheets: Myeloma.* Available at: http://seer.cancer.gov/statfacts/more.html.

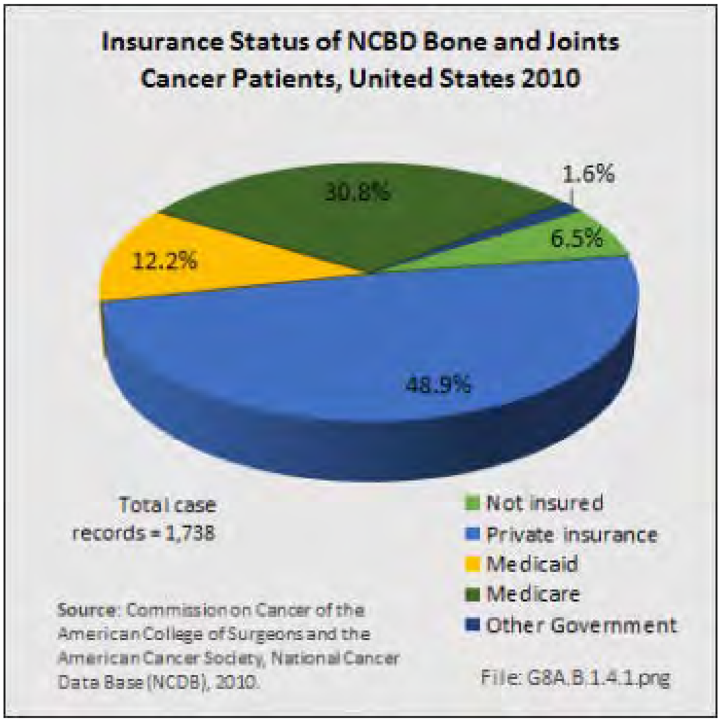
Economic Cost of Malignant Bone Tumors: Cancers of Bones and Joints

The economic burden of bone cancers can be great. The more advanced the disease, the worse the prognosis and, accordingly, the more expensive the treatments. It is likely that early detection, and, certainly, prevention if possible, could drastically reduce costs. A number of expensive treatments are required to address these tumors. In the 2007 report by Damron, Ward, and Stewart,[1] it was noted that the most frequent initial treatments varied widely based on the type of sarcoma. Although not reported, these treatments vary widely based on the stage of the disease as well.

Collectively, they reported that surgery alone was the most common initial treatment for chondrosarcomas (69%), whereas for Ewing sarcoma, treatments were divided between surgery and chemotherapy (24% of cases), radiation and chemotherapy (23%), and chemotherapy alone in 18%. With osteosarcoma, when initial treatment was known, the largest group received surgery and chemotherapy (46%). Surgery was reported as part of the initial treatment in 71% of osteosarcoma patients, 83% of chondrosarcoma patients, and 47% of Ewing sarcoma patients. The most frequent operations performed were limb-sparing radical resections and excisions. When the type of surgery was defined and known, limb-preservation surgery was performed in 69% of osteosarcomas, 79% of chondrosarcomas, and 81% of Ewing sarcomas.[1]

Radiation therapy was employed in 10% of osteosarcomas, 14% of chondrosarcomas, and 46% of Ewing sarcoma cases. In Dr. Ward's personal series of more than 100 osteosarcomas, amputation has been required in only 17% of patient, but almost all patients have had surgical resection, limb reconstruction, and chemotherapy.[1]

Multiple therapies may be needed later in the course of the patient's disease, especially in the more advanced cases. In later stages of the disease for those not cured with surgery alone, significant costs will accumulate as the patients develop pulmonary disease and, ultimately, die. Hormone therapy, immunotherapy, and bone marrow transplant/endocrine treatments each accounted for 1% or less of initial treatments. However, in severely affected individuals in whom standard treatments fail, these alternative treatments may be tried more frequently. Currently, the authors are not aware of any data source that reports the rate of utilization of such late treatments.



All of these treatments are costly to administer. Per-patient cost will vary widely depending on the treatments utilized, and the number and intensity of treatments. Over all, treatment for bone and joint cancers can easily exceed $100,000 for a single patient. This is particularly true if that patient receives surgery, chemotherapy, and radiation therapy. If one includes the cost of bone-replacing endoprostheses or the costs of artificial limbs used in those cases that required amputations, the cost will be much higher. In addition to the direct medical cost, there are extensive indirect and social costs from lost work time and disability. For some patients, healthcare costs associated with their bone and joint cancers will be ongoing.

The burden of paying the cost of treatment for bone and joint cancers is shifting. In the study cited above, from 1998 to 2010, managed care provided insurance coverage for the largest portion of patients (37%), following by Medicare with supplement (16%). Medicare and Medicaid were roughly equal at 8% and 8%, respectively. However, analysis of the NCDB insurance data available for 1,738 (95.7%) of 1,816 bone and joint cancer cases reported for 2010 show Medicare and Medicaid covering a much larger share.

1. a. b. c. Damron TA, Ward WG, Stewart A: Osteosarcoma, chondrosarcoma, and Ewing sarcoma: National Cancer Data Base Report. *Clinical Orthop Relat Res* 2007;(459):40-47.

Secondary Bone and Joint Cancers: Cancers of Bones and Joints

Almost all cancers have preferential sites to which they spread or metastasize, resulting in secondary cancers. Secondary bone cancer is much more common than primary bone cancers, and result in great morbidity and pain. The three most common sites of cancer metastasis are lung, liver, and bone. The skeleton is the most common organ affected by metastatic cancer, and the site of disease that produces the greatest morbidity. The most commonly encountered cancers that readily and frequently spread to bone are cancers of the breast, lung, kidney, prostate, gastrointestinal tract, and thyroid gland. The incidence of bone metastases in lung cancer patients is approximately 30% to 40%, and the median survival time (MST) of patients with such metastases is 6 to 7 months.[1] At postmortem examination, 70% of patients dying of breast and prostate cancer have evidence of metastatic bone disease. Cancers of the thyroid, kidney, and bronchus also commonly give rise to bone metastases, with an incidence at postmortem examination of 30% to 40%.[2] Brain and ovarian cancers rarely spread to bone. Many other cancers have intermediate rates of spread to bones.

A tumor formed by metastatic cancer cells is called a metastatic tumor or a metastasis. The cancer cells in their new metastatic site closely resemble the original or primary cancer from which the cancer initially arose. For example, breast cancer that spreads to the bone and forms a metastatic tumor is still considered metastatic breast cancer, not true bone cancer. It will still look like breast tissue and breast cancer when it is inspected or viewed under a microscope. Many lay people will now refer to it as bone cancer, but to the physician, bone cancer implies a cancer that started or originated in the bone, such as osteosarcoma, Ewing sarcoma, or myeloma, as discussed above.

Metastatic bone disease complications are termed skeletal-related events (SREs). SREs include pain, pathologic fracture, vertebral deformity and collapse, spinal cord compression, and hypercalcemia (overabundance of calcium in the blood) of malignancy. These complications result in impaired mobility and reduced quality of life (QOL) and have a significant negative impact on survival.[2] In addition, metastatic disease may remain confined to the skeleton, with the decline in quality of life and eventual death almost entirely due to skeletal complications and their treatment.

The prognosis of metastatic bone disease is dependent on the primary site, with breast and prostate cancers associated with a survival measured in years compared with lung cancer, where the average survival is only a matter of months. Survival rates for secondary bone cancer depend on patient factors such as age, overall health, treatment, and response to treatment. However, due to the advanced stage of cancer that has spread, survival rates are much lower than for primary cancer without such spread.

The fundamental treatment for bone metastasis from advanced cancer is disease control by systemic chemotherapy and radiation of the bone lesions. Prevention and treatment of bone metastases is highly dependent on an effective treatment being employed against the primary cancer. As a direct treatment for bone metastases themselves, radiation therapy, surgery, and bisphosphonates are the mainstays of treatment. Intravenous bisphosphonates, such as zoledronic acid have been shown to prevent or reduce pathologic fractures and may reduce these costs.[3] With FDA approval of the use of bisphosphonate medications to prevent such fractures in 1995, the incidence of fractures in treated patients has significantly decreased. The fracture rates reported in cases of metastatic disease and myeloma have been demonstrated in multiple studies to markedly diminish (roughly a 50% reduction in fracture rates in many studies). Although the tumors still metastasize to the bone, the associated bone destruction and consequent pathologic fracture rate is markedly less. The bisphosphonate medications work by interrupting a biochemical pathway required for bone breakdown by osteoclasts, the cells that normally remove bone in the process of bone remodeling. This bone breakdown step is overactivated in the presence of bony metastases, causing bone loss, bone destruction, and ultimately fractures from the weakening of the bone. Thus, the introduction of bisphosphonate medication has been a major advance over the past 20 years, one that had significant impact on the health of those with myeloma and metastatic cancer to the bone by preventing bone destruction, and thereby preventing bone weakening and subsequent fractures.

1. Tsuya A, Kurata T, Tamura K, Fukuoka M: Skeletal metastases in non-small cell lung cancer: a retrospective study. *Lung Cancer* 2007;57:229-232.

2. a. b. Coleman RE: Clinical features of metastatic bone disease and risk of skeletal morbidity. *Clin Cancer Res* 2006;12: 6243s-6249s.

3. Capalbo S, Delia M, Diomede D, et al: Jaw osteonecrosis associated with use of bisphosphonates and chemotherapy: Paradoxical complication of treatment of bone lesions in multiple myeloma patients. *Int J Hematol* 2006;83:439-442.

Measures Needed to Reduce Prevalence and Cost: Cancers of Bones and Joints

The economic burden of SREs in patients with bone metastases is substantial. A recent study showed that the estimated lifetime SRE-related cost per patient suffering from metastatic lung cancer was $11,979 USD, and that radiotherapy accounted for the greatest proportion of cost (61%) by SRE type.[1] Finding cures and effective treatments for all types of cancer can help reduce the prevalence and costs associated with bone and joint cancer.

Overall cancers metastatic to bone cause significant pain and morbidity—approximately 50% of patients with metastatic cancer of lung, breast, prostate, and kidney develop bony metastases prior to death. Untreated, these metastases can lead to pathological fractures and cause great pain and disability. Thus, the elucidation of the biochemical steps involved in bone destruction and the development of drugs to combat such steps, have been an example of tremendous scientific advancement and achievement in the field of cancer research and treatment.

1. Capalbo S, Delia M, Diomede D, et al: Jaw osteonecrosis associated with use of bisphosphonates and chemotherapy: Paradoxical complication of treatment of bone lesions in multiple myeloma patients. *Int J Hematol* 2006;83:439-442.

Soft Tissue Sarcomas: Primary Malignant Bone and Connective Tissue Tumors

Soft tissue tumors, which, like bone tumors, are also called sarcomas, are encountered more frequently than bone and joint tumors. These tumors originate in connective or non-glandular tissue, and can develop in any part of the body that contains fat, muscle, nerve, blood vessels, fibrous tissues, and in any deep tissues, including tissues surrounding joints, bones, or deep subcutaneous tissues. More than half of soft tissue sarcomas develop in the arms or legs. About one in five (20%) are found in the abdominal cavity and present with symptoms similar to other abdominal-based health problems. The rest begin in the head and neck area (about 10%), and in and on the chest or abdomen (about 10%).[1]

There also are a vast number of non-malignant soft tissue neoplasms and tumors such as lipomas. Also typically included are cystic lesions of the deep tissues. The differentiating feature of soft tissue tumors (sarcomas) is that they arise from these connective tissues and do not arise from organs such as kidneys lungs, intestines, breasts, or thyroid glands.

Additional information on soft tissue sarcomas can be found in Weiss and Goldblum's *Enzinger and Weiss's Soft Tissue Tumors*, 5th ed.[2]

1. National Cancer Society (NCS): *Sarcoma: Adult Soft Tissue Cancer?* Available at: http://www.cancer.org/cancer/sarcoma-adultsofttissuecancer/detailedguide/sarcoma-adult-soft-tissue-cancer-soft-tissue-sarcoma. Accessed March 19, 2014. Editorial revisions provided by William G. Ward, MD.

2. Weiss SW, Goldblum JR: *Enzinger and Weiss's Soft Tissue Tumors*. 5th ed. St. Louis, MO: Mosby–Elsevier; 2008.

Description of Soft Tissue Sarcomas: Soft Tissue Sarcomas

There are multiple soft tissue sarcomas with varying degrees of aggressive behavior, but virtually all have the capacity to metastasize and cause death. Treatment for high-grade soft tissue sarcomas is typically resection (removal) and radiation. Chemotherapy is playing an ever-increasing role, especially in high-grade (fast-growing) and metastatic cases.

The most common types of soft tissue sarcomas are described below.[1] Cancer cells are often referred to as differentiated versus undifferentiated. Differentiation describes how much or how little tumor tissue looks like the normal tissue it came from. Well-differentiated cancer cells look more like normal cells and tend to grow and spread more slowly than poorly differentiated or undifferentiated cancer cells. Differentiation is used in tumor grading systems, which are different for each type of cancer.[2]

Malignant Fibrous Histiocytomas (MFH)/Pleomorphic Sarcomas (PS) Not Otherwise Specified (NOS)
The most commonly encountered soft tissue sarcoma is malignant fibrous histiocytoma, a tumor of the fibrous tissue most often occurring in the arms or legs. The least differentiated of the sarcomas, in many cases it represents a poorly defined, high-grade soft tissue sarcoma that cannot be further defined pathologically (histologically). A recent trend is to classify these poorly differentiated sarcomas as pleomorphic sarcomas or spindle cell sarcomas not otherwise specified, (NOS) rather than the previous designation as malignant fibrous histiocytoma. Poorly differentiated sarcomas typically affect older individuals. Analysis of annual rates of MFH and PS reflect this evolving diagnostic trend.

Liposarcomas
The next most commonly encountered and reported soft tissue sarcoma is liposarcoma, which is a malignant tumor of the fatty (adipose) tissues. This sarcoma also is more common in older persons. There are several subtypes ranging from the low-grade lipoma-like liposarcoma that rarely metastasizes to high-grade pleomorphic liposarcomas and round cell liposarcomas, which have a prognosis similar to malignant fibrous histiocytoma. Liposarcomas can develop anywhere in the body, but they most often develop in the thigh, around the knee, and

inside the back of the abdomen. Seen in a wide range of patient ages, liposarcomas occur most frequently in adults between 50 years and 65 years old. Some liposarcomas grow very slowly, whereas others can grow quickly.

Synovial Sarcomas

The third most commonly encountered soft tissue sarcoma is synovial sarcoma, which is more likely to affect younger adults than previously mentioned sarcomas. The most common location is the thigh. Despite the name synovial sarcoma, most do not occur in joints or in the synovium of joints. It tends to occur mostly in young adults, but can also occur in children and in older people. Many of these cases respond very favorably to chemotherapy with significant shrinkage of the tumor, although resection (surgical removal) and radiation remain the cornerstones of current therapy. The prognosis is similar to malignant fibrous histiocytoma and the other high-grade soft tissue sarcomas mentioned above.

Tumors of Muscle Tissue

Leiomyosarcomas

Smooth muscle cells are found in internal organs such as stomach, intestines, blood vessels, or uterus. This muscle tissue gives these organs the ability to contract involuntarily. Leiomyosarcomas are malignant tumors of involuntary muscle tissue. They can occur almost anywhere in the body, but most often are found in the uterus. A second common site is the retroperitoneum (back of the abdomen) and in the internal organs and blood vessels where leiomyomas also arise. Less often, they develop in the deep soft tissues of the legs or arms. They tend to occur in adults, particularly the elderly. Since they often arise from arteries, resection of these tumors frequently requires an immediate vascular reconstruction.

Rhabdomyosarcomas

Skeletal muscles are the voluntary muscles that control and allow movement of arms and legs and other body parts. Rhabdomyosarcomas are malignant tumors of skeletal muscle. These tumors commonly grow in the arms or legs, but they can also begin in the head and neck area and in reproductive and urinary organs, such as the vagina or bladder. Rhabdomyosarcomas are primarily tumors of children. Clinically and behaviorally, they are in a class by themselves. They are treated with aggressive chemotherapy, as well as surgery and/or radiation in many cases. The aggressive treatments often cause permanent life-altering disability, even in survivors. For more information, see the American Cancer Society document "Rhabdomyosarcoma."

Malignant Peripheral Nerve Sheath Tumors

Malignant schwannomas, neurofibrosarcomas, or neurogenic sarcomas are malignant tumors of the cells that surround a nerve. The currently favored name for these sarcomas is malignant peripheral nerve sheath tumor.

Tumors of Blood Vessels and Lymph Vessels

Angiosarcomas

Malignant tumors can develop either from blood vessels (hemangiosarcomas) or from lymph vessels (lymphangiosarcomas). These tumors often develop in a part of the body that has been exposed to radiation.

Angiosarcomas are sometimes seen in the breast after radiation therapy for breast cancer or in the arm on the same side as a breast that has been irradiated or removed by mastectomy. They are difficult to cure as they spread through the bloodstream to other parts of the body and often spread extensively through the local tissues.

Hemangiopericytoma
These are tumors of perivascular tissue (tissue around blood vessels). They most often develop in the legs, pelvis, and retroperitoneum (the back of the abdominal cavity) and are most common in adults. These can be either benign or malignant. They do not often spread to distant sites, but tend to recur where they started, even after surgery, unless widely excised. Following recent research and further histologic, genetic, and clinical evaluations, these have recently been reclassified as one end of the spectrum of malignant solitary fibrous tumors, or possibly identical to malignant solitary fibrous tumors.1

Hemangioendothelioma
This is a less aggressive blood vessel tumor than Hemangiosarcoma, but still considered a low-grade cancer. It usually invades nearby tissues, and sometimes can metastasize to distant parts of the body. It may develop in soft tissues or in internal organs, such as the liver or lungs.

Kaposi Sarcoma
These cancers are composed of cells similar to those lining blood or lymph vessels. In the past, Kaposi's sarcoma was an uncommon cancer mostly seen in older people with no apparent immune system problems. It is now most common in people with human immunodeficiency virus (HIV) infection and the acquired immunodeficiency syndrome (AIDS), but can also develop in organ transplant patients who are taking medication to suppress their immune system. It is probably related to infection with a virus called human herpesvirus-8 (HHV-8).

Tumors of Fibrous Tissue

Fibrous tissue forms tendons and ligaments and covers bones, muscles and joint capsules, as well as other organs in the body.

Malignant fibrous histiocytoma (MFH)
MFH is found most often in the arms or legs. Less often, it can develop inside the back of the abdomen. This sarcoma is most common in older adults. Although it mostly tends to grow locally, it can spread to distant sites. It is the most commonly diagnosed soft tissue sarcoma, although now these are more often classified as pleomorphic sarcoma, not otherwise specified (NOS), as discussed above.

Fibrosarcoma
Fibrosarcomas are cancers of fibrous tissue. They have a characteristic herringbone cloth pattern when viewed under the microscope. Fibrosarcomas most commonly affect the legs, arms, or trunk. They are most common between the ages of 20 years and 60 years, but can occur at any age, even in infancy.

Dermatofibrosarcoma protuberans (DFSP)
These tumors are slow-growing cancers of the fibrous tissue beneath the skin, usually noted in the trunk or limbs. They invade nearby tissues but rarely metastasize. They primarily affect young adults. Due to their slow, insidious

growth; their uncommon occurrence; and their innocuous appearance, diagnosis is often delayed. The local recurrence rate is higher than many sarcomas, and has been reported to be as high as 50% in some studies. While death due to disease is uncommon (<5%), the local recurrences can cause significant local morbidity.

Fibromatosis/Desmoid tumors
Fibromatosis is one of the names given to neoplastic tumors with features in between fibrosarcomas and benign tumors, such as fibromas and superficial fibrous diseases like Dupytren's disease. They tend to grow slowly, but often steadily. These tumors are often referred to as desmoid tumors. Although they do not metastasize, they do form in response to genetic alterations identical to many cancers and can cause great disability and even death. These tumors can invade nearby tissues, causing great havoc and occasionally even death. Some doctors may consider these to be a type of low-grade fibrosarcomas; most, however, regard these as benign but locally aggressive. Certain hormones, particularly estrogen, may increase the growth of some desmoid tumors. Antiestrogen drugs are sometimes useful in treating desmoids that cannot be completely removed by surgery. Radiation therapy plays a role in treatment, especially in unresectable or recurrent cases. There are ongoing chemotherapeutic trials in place with newer agents that interrupt the various biological processes in the growth of these tumors; these hold great promise for future patients. Additional research into the biology and treatment of these and virtually all tumors is clearly indicated.

Tumors of Uncertain Tissue Type

Through microscopic examination and other laboratory tests, doctors can usually find similarities between most sarcomas and certain types of normal soft tissues, thus, allowing them to be classified based on this histologic appearance. However, some sarcomas have not been linked to a specific type of normal soft tissue due to their unique appearance that does not closely resemble any single tissue type.

Malignant mesenchymoma
These very uncommon sarcomas contain areas showing features of at least two types of sarcoma, including fibrosarcomatous tissue per the original description. Since all connective tissue derive from undifferentiated mesenchymal tissues in an embryologic sense, it has been termed Mesenchymoma. The term has fallen out of favor and it is now thought that many cases may be better classified as one of the subtypes of sarcomas based on the tissue type contained within the tumor.[3]

Alveolar soft-part sarcoma
This rare cancer primarily affects young adults. The legs are the most common location of these tumors. This is one of the most vascular (blood vessels) sarcomas because it induces an extensive network of vessels to grow in and around the tumor. Because of their very slow growth rate, a delay in diagnosis can occur. Unfortunately, it ultimately has a high mortality rate and can lead to death years after diagnosis. The rate of progression can be quite slow; late metastases are common.

Epithelioid sarcoma
This sarcoma often develops in tissues under the skin of the hands, forearms, feet, or lower legs. Adolescents and young adults are often affected. These are often misdiagnosed as infections and chronic infectious ulcers because

of their innocuous appearance and uncommon occurrence. This sarcoma has a much higher propensity for lymph node metastasis than most sarcomas, which usually preferentially metastasize to the lung.

Clear cell sarcoma
This rare cancer often develops in tissues of the arms or legs. It recently has been determined to be a variant of malignant melanoma, a type of cancer that develops from pigment-producing skin cells. How cancers with these features develop in parts of the body other than the skin is not known. As a melanoma, it behaves differently than sarcomas. It has a propensity to spread through the lymphatic system. Local recurrence is common; therefore wide resections are required for complete local eradication.

Other Types of Sarcoma

There are other types of soft tissue sarcomas, but they are less commonly encountered and not included in this discussion.

A recently published study, based on the National Cancer Database NCDB of the American College of Surgeons Commission on Cancers, reports the 13-year experience (1998–2010) with 34 of the most commonly encountered soft tissue sarcomas. This report provides a good overview of the US experience with these, including survival curves, the 2- and 5-year survivorship rate, and various demographic data. A current NCDB analysis of soft tissue sarcomas, including demographic data and survivorships are shown in Table 9A.9.1 to Table 9A.9.3. (Reference Table 8A.9.1 PDF CSV, Table 8A.9.2 PDF CSV, and Table 8A.9.3 PDF CSV)

1. a. b. Weiss SW, Goldblum JR: *Enzinger and Weiss's Soft Tissue Tumors*. 5th ed. St. Louis, MO: Mosby–Elsevier; 2008.

2. National Cancer Institute. *NCI Dictionary of Cancer Terms.* Available at: http://www.cancer.gov/dictionary?cdrid=46445 Accessed February 11, 2015.

3. Weiss SW, Goldblum JR: Malignant Mesenchymoma, in *Enzinger and Weiss's Soft Tissue Tumors*. 5th ed. St. Louis, MO: Mosby–Elsevier; 2008:1213-14.

Incidence: Soft Tissue Sarcomas

Soft tissue sarcomas account for less than 1% of all cancer cases diagnosed each year, and for a similar proportion of cancer deaths in a given year. Over the past decade, the overall incidence of soft tissue sarcomas showed a 31% increase in new cases diagnosed annually in the NCDB data, a slightly higher rate of increase than found for all the top 73 cancer sites reported. (Reference Table 8A.3.1 PDF CSV and Table 8A.5.2 PDF CSV)

In terms of case numbers, the musculoskeletal health burden in the United States from soft tissue sarcomas is three to four times greater than that of bone and joint sarcomas. For the period from 2006 to 2010, the annual average number of soft tissue neoplasms, including the heart, approximated 14,000 cases/year in the SEER database, a number similar to those for Hodgkin lymphoma.[1] Estimated new cases for 2014 by the American

Cancer Society are 12,000.2 Soft tissue sarcomas come in a wide variety of forms that affect different age groups, but the most frequently encountered soft tissue sarcomas affect older adults. (Reference Table 8A.3.1 PDF CSV)

As previously noted, the National Cancer Data Base (NCDB), a joint program of the Commission on Cancer and the American College of Surgeons, maintains the most thorough database on patients diagnosed with soft tissue sarcomas. Although the NCDB was not created to serve as an incidence-based registry, it currently gathers data on approximately 71% of the cancers treated in the United States. It should be noted this percentage varies from year to year based on the participation and reporting by hospitals to this voluntary database.

Over the 18-year period, 1985 to 2003, 86,355 soft tissue sarcomas of the extremities, shoulders ,and pelvic girdles and trunk were reported. This number excludes approximately 32,250 soft tissue sarcomas of the head and neck, thoracic, and abdominal areas; these patients are generally cared for by non-musculoskeletal specialists. Using a 20-year average and assuming 70% of the annual US cases are included in NCDB, more than 5,700 new cases of soft tissue sarcoma would have occurred annually. This compares to the estimated 12,020 cases predicted for 2014 by the American Cancer Society.2

A 2014 report by Corey, Swett, and Ward examined the adult cases reported to the NCDB of soft tissue sarcomas over a 13-year interval (1998–2010). In 2010, 5,070 soft tissue sarcomas were reported to the NCDB. While the numbers of soft tissue sarcomas reported to the NCDB increased by 19% over this 13-year period, the number of bone sarcomas reported to the NCDB increased by only 10.7% during this same time period.3

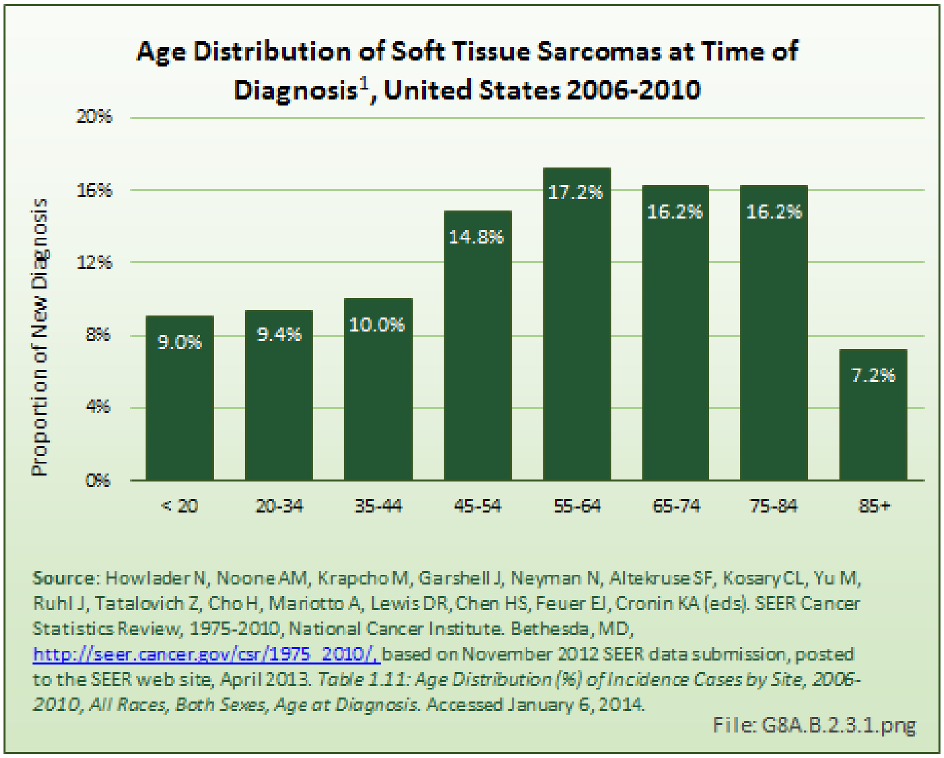
1. National Cancer Data Base (NCDB): *Site by Stage Distribution of Cases Reported to the NCDB: Diagnosis Year 2000 to 2004.* Chicago, IL: American College of Surgeons Commission on Cancer. Available at: http://www.facs.org/cancer/ncdb/publicaccess.html. Accessed October 10, 2007.

2. a. b. American Cancer Society. Sarcoma: Adult Soft Tissue Cancer, Key Statistics. Available at: http://www.cancer.org/cancer/sarcoma-adultsofttissuecancer/detailedguide/sarcoma-adult-soft-tissue-cancer-key-statistics Accessed January 10, 2014.

3. Corey RM, Swett K, Ward WG: Cancer medicine. Epidemiology and survivorship of soft tissue sarcomas in adults: A National Cancer Database Report. *Cancer Med* 2014;3(5):1404-1415. Epub 2014 Jul 8.

Demographics: Soft Tissue Sarcomas

While soft tissue sarcomas can be found among all ages, the incidence increases after the age of 55 years. Once a person reaches age 85 years or older, the incidence of diagnosis drops sharply. Males are diagnosed with soft tissue sarcomas at a slightly higher age than females. Blacks are diagnosed an average of 10 years earlier than those who are White. (Reference Table 8A.3.1 PDF CSV, Table 8A.3.2 PDF CSV, and Table 8A.2.1 PDF CSV)



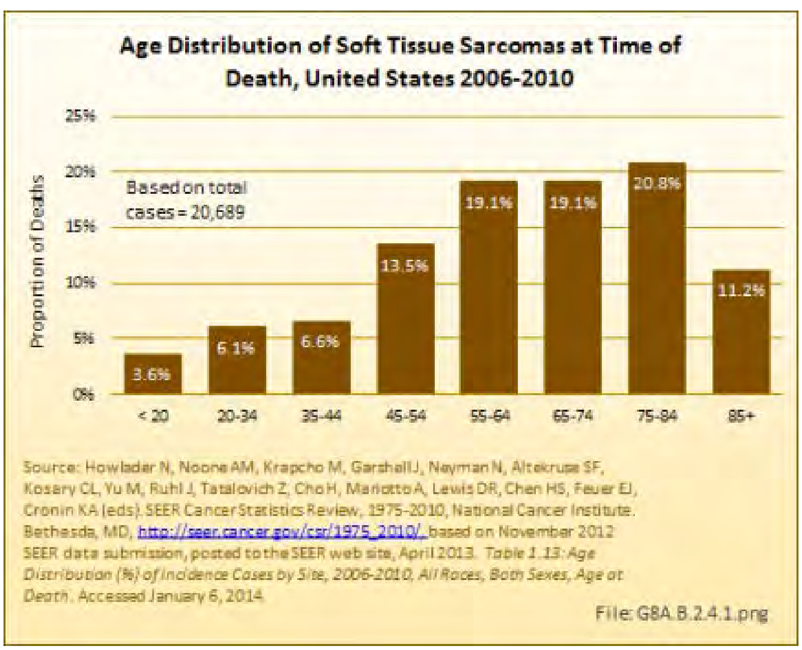
Age Distribution of Soft Tissue Sarcomas at Time of Diagnosis[1], United States 2006-2010

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.11: Age Distribution (%) of Incidence Cases by Site, 2006-2010, All Races, Both Sexes, Age at Diagnosis*. Accessed January 6, 2014.

File: G8A.B.2.3.1.png

Mortality and Survival Rates: Soft Tissue Sarcomas

The age distribution at time of death for persons diagnosed with soft tissue sarcomas reflects a relative survival rate that favors younger persons. (Reference Table 8A.3.4 PDF CSV)



Age Distribution of Soft Tissue Sarcomas at Time of Death, United States 2006-2010

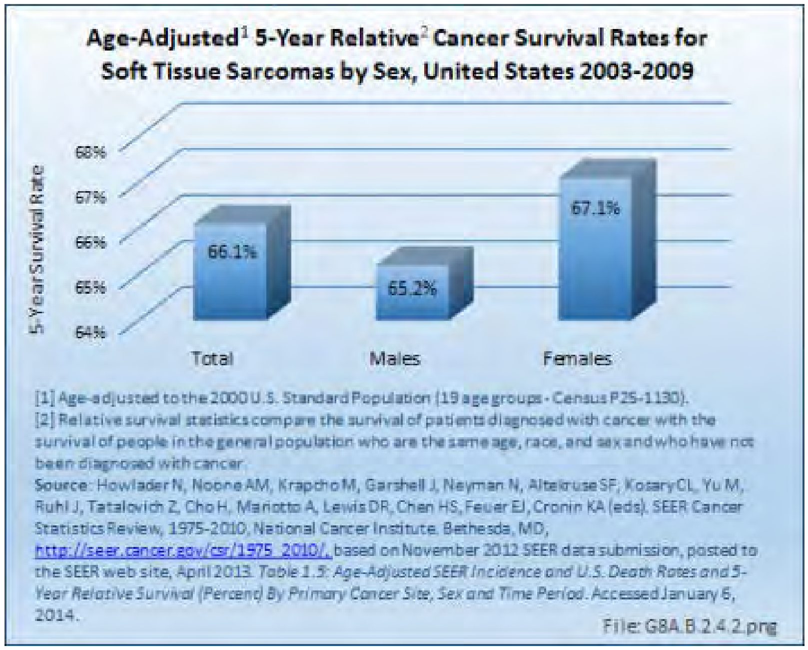
Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.13: Age Distribution (%) of Incidence Cases by Site, 2006-2010, All Races, Both Sexes, Age at Death*. Accessed January 6, 2014.

File: G8A.B.2.4.1.png

The 5-year survival rate for soft tissue sarcomas is reported at 66% by both the SEER database and the National Cancer Institute (NCI). This is a rate similar to that for bone and joint, uterine/ovarian, and non-Hodgkin lymphoma cancers. Average length of survival after diagnosis is 7 years, similar to that of breast, urinary, and nervous system cancers. White women have a slightly higher 5-year survival rate than do men, and live an average of 1 year longer after diagnosis. However, the reverse is true for

Black women, who die an average of 2 years sooner than Black men diagnosed with soft tissue sarcoma. (Reference Table 8A.4.1 PDF CSV, Table 8A.4.2 PDF CSV, and Table 8A.4.3 PDF CSV)

For high-grade soft tissue sarcomas, the most important prognostic factor is the stage at which the tumor is identified. Staging criteria for soft tissue sarcomas are primarily determined by whether the tumor has metastasized or spread elsewhere in the body. Size is highly correlated with risk of metastasis and survival. In general, the prognosis for a soft tissue sarcoma is poorer if the sarcoma is large. As a general rule, high-grade soft tissue sarcomas over 10 cm in diameter have an approximate 50% mortality rate and those over 15 cm in diameter have an approximate 75% mortality rate.



The NCI statistics staging classification of sarcomas is Stage 1, confined to the primary site (localized: 54% of sarcomas are diagnosed at this stage); Stage 2, spread to regional lymph nodes or directly beyond the primary site (regional: 22%); or Stage 3, metastasized (distant: 15%). For the remaining cases, the staging information was unknown. The corresponding 5-year relative survival rates reported are 84% for localized sarcomas, 62% for regional stage sarcomas, 16% for sarcomas with distant spread, and 54% for unstaged sarcomas. The 10-year relative survival rate is only slightly worse for these stages, meaning that most people who survive 5 years are cured.1

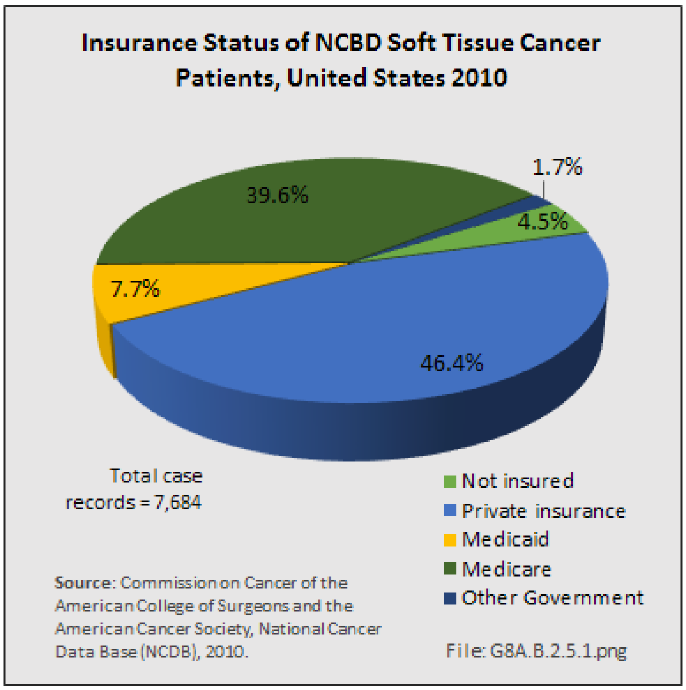
Using the staging criteria of soft tissue sarcomas of the American Joint Committee on Cancer (AJCC) produces similar results for sarcomas found in the limbs (arms or legs): 90% 5-year survival rate for Stage 1 sarcomas; 81% for Stage 2; and 56% for Stage 3. Sarcomas identified as Stage 4 have a very low 5-year survival rate. Sarcomas located in other than a limb also have lower survival rates.1

Sarcomas are often staged by orthopedic oncologists with a staging system established by Dr. William Enneking, and adopted and modified by surgical societies primarily consisting of orthopedic oncologists. That may have accounted for the lack of AJCC staging data in many cases of bone and soft tissue sarcomas reported to the NCDB. Nearly 40% of cases for 2000–2011 reported in the NCDB data have an unknown stage. This is a much higher proportion than found among other common cancer types, making it difficult to compare the severity of soft tissue sarcomas to other cancers. However, none of the cases was identified as Stage 1, with the majority at Stage 2 through Stage 4. (Reference Table 8A.5.1 PDF CSV)

1. a. b. National Cancer Society (NCS): *How Are Soft Tissue Sarcomas Staged?* Available at: http://www.cancer.org/cancer/sarcoma-adultsofttissuecancer/detailedguide/sarcoma-adult-soft-tissue-cancer-staging. Accessed February 16, 2015.

Economic Cost of Malignant Soft Tissue Cancer: Soft Tissue Sarcomas

From 1998–2010, information on insurance coverage was available for roughly 96% of patients treated with soft tissue sarcomas. The largest insurance payer was managed care (33%), followed by Medicare with supplement (25%). Private insurance accounted for 14%, while Medicare (11%) accounted for a larger percentile than Medicaid (5%). Detailed NCDB insurance data for 7,684 of 7,878 cases of soft tissue sarcoma reported from the year 2010 showed private insurance paying just over 46%, while Medicare/Medicaid paid a slightly larger share of 47%.1



The total economic costs of malignant soft tissue sarcoma are unknown. Surgery is often the first line of treatment for soft tissue sarcoma. Multiple therapies may be needed later in the course of the patient's disease, especially in the more advanced cases. In the later stages of the disease in those not cured with surgery alone, significant costs will accumulate as the patients develop pulmonary disease and ultimately die. Hormone therapy, immunotherapy, and bone marrow transplant/endocrine treatments are undertaken in a small number of cases that fail standard treatments. Overall, costs will vary with treatments utilized, number and intensity of treatments, and can easily top $100,000 for a single patient that receives surgery, chemotherapy, and radiation therapy.

Throughout the years 2005–2008, one study reported that the average professional charge for a primary excision was $9,700 and $12, 900 for re-excision. Although every 1-cm increase in size of the tumor results in an increase of $148 for a primary excision, size was not an independent factor affecting re-excision rates. The grade of the tumor was positively associated with professional charge, such that higher-grade tumors resulted in higher charges compared to lower-grade tumors. Analysis including professional technical and indirect charges revealed that, on average, patients undergoing definitive primary excision at their cancer treatment center were charged $40,230. This was compared to $44,770 for to patients receiving definitive re-excision of unsuccessful or incomplete previous resections at the same cancer treatment center. This higher cost did not include the charges and costs generated by their previous unsuccessful or incomplete previous attempt at resection.2

This analysis confirms that proper work-up, evaluation, and treatment are key to maintain costs, as well as, hopefully, improving the outcome for these patients. This cost analysis did not include the costs associated with chemotherapy or radiation therapy, or the costs of diagnostic and follow-up laboratory and radiographic studies, nor the actual costs of care.

1. Commission on Cancer of the American College of Surgeons and the American Cancer Society, National Cancer Data Base (NCDB), 2010.

2. Alamanda VK, Delisca GO, Mathis SL, et al: The financial burden of re-excising incompletely excised soft tissue sarcomas: A cost analysis. *Ann Surg Oncol* 2013:(9):2808-2814.

Measures Needed to Reduce Prevalence and Cost: Soft Tissue Sarcomas

The majority of sarcomas develop in people with no known risk factors: There is currently no known way to prevent these cases at this time. Whereas future developments in genomic research may allow genetic testing to identify persons with increased risk to develop soft tissue sarcomas, few such predictors are available at present. Reporting suspicious lumps and growths or unusual symptoms to a doctor, and appropriate evaluation of such abnormalities can help diagnose soft tissue cancer at an earlier stage. Treatment is thought to be more effective when detected early, as smaller-diameter sarcomas have been shown to have improved outcome compared to large sarcomas.

Cancers occasionally spread or metastasize to the soft tissues, such as the muscles and deep tissues of the body, including the thigh and leg. The most likely cancers to do so are cancers of the lung and kidney. As such, this fact must always be borne in mind whenever physicians examine a patient presenting with a new mass in the leg, thigh, or other soft tissues, especially if they have a history of a prior lung or kidney cancer.

Affects of Aging: Tumors of Bone and Connective Tissue

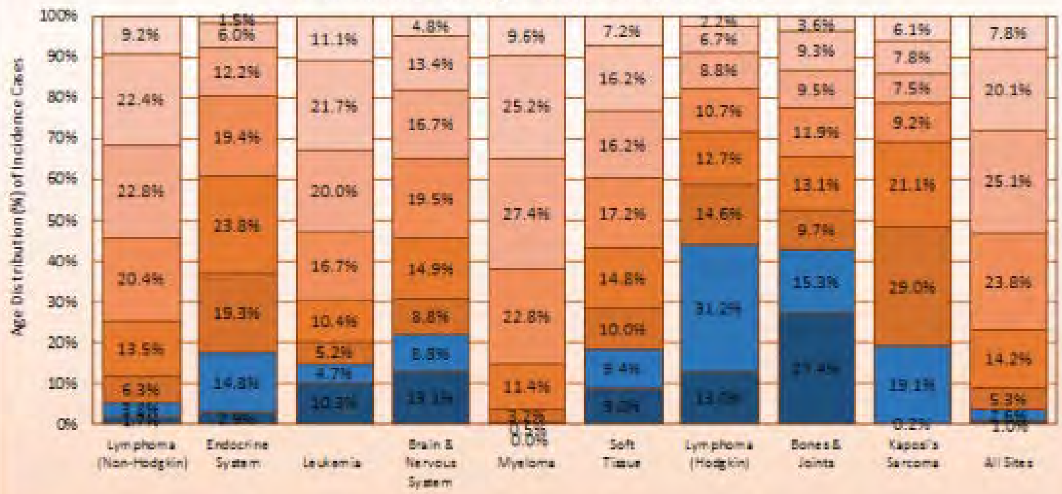
Cancers of the musculoskeletal system affect both children and adults, but virtually all tumors have different age-based frequency. Myeloma, the cancer of the bone marrow, affects older persons more, while other bone and joint tumors are more prevalent in children and young adults. Soft tissue sarcomas affect all ages, but most are more common as persons reach middle age and later years. See individual cancer discussions for further information.

Childhood Cancers: Tumors of Bone and Connective Tissue

Certain primary cancers of bones and joints (osteosarcoma and Ewing sarcoma) are found among those under the age of 30 years in higher proportion than expected for the overall incidence of most sarcomas. In 2006–2010, 43% of bone and joint cancers diagnosed were found in people under the age of 35 years, with more than 27%

occurring among children and adolescents under the age of 20. This compares to less than 4% of all cancer sites in people aged 35 years and younger, and only 1% in those younger than 20 years. Hodgkin lymphoma is the only other cancer to affect young people in similar numbers, with a higher percentage of cases diagnosed in the 20-year to 34-year age range. The average age at diagnosis for bone and joint cancers is 42 years, surpassed in youthfulness only by Hodgkin lymphoma, diagnosed at an average age of 38 years. (Reference Table 8A.2.1 PDF CSV and Table 8A.3.2 PDF CSV)

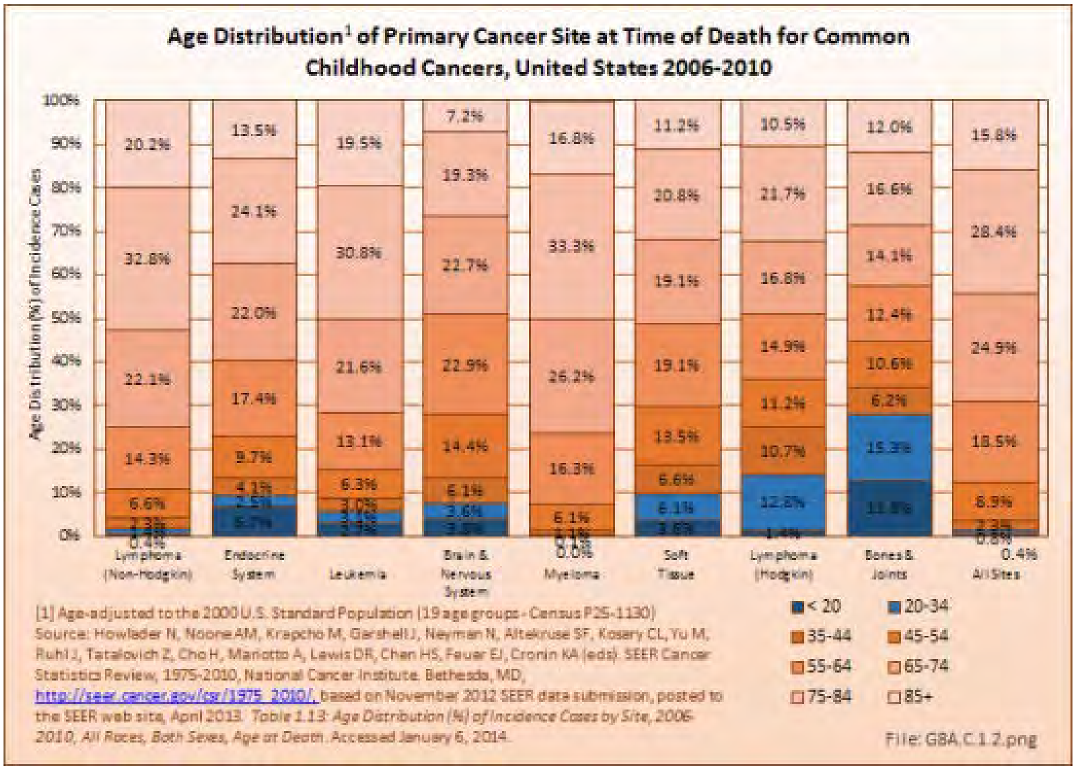
Age Distribution[1] of Primary Cancer Site at Time of Diagnosis for Common Childhood Cancers, United States 2006-2010



[1] Age-adjusted to the 2000 U.S. Standard Population (19 age groups - Census P25-1130)
Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.11: Age Distribution (%) of Incidence Cases by Site, 2006-2010, All Races, Both Sexes, Age at Diagnosis.* Accessed January 6, 2014.

File: G8A.C.1.1.png

Deaths from bone and joint cancer also are more common in people under the age of 35 years. Between 2006 and 2010, 13% of deaths from bone and joint cancer occurred in children and youth under the age of 20, and an additional 15% among young adults aged 20 years to 34 years. The mortality rate among younger persons from bone and joint cancer comprises only 0.2% of deaths from all types of cancer, but is 8% of cancer deaths in people under the age of 20 years and 5% of deaths among young people aged 20 to 34 years. The relative proportion of deaths from bones and joints cancer was higher in children, youth, and young adults than all other cancer types that disproportionately affect younger people, including brain and nervous system, leukemia, endocrine system, and soft tissue cancers. The average age at death for bone and joint cancer is 59 years, the youngest of all types of cancer. (Reference Table 8A.2.2 PDF CSV and Table 8A.3.4 PDF CSV)



In 2010, osteosarcoma accounted for 54% of the malignant bone tumors in survivors diagnosed with cancer as children and alive on January 1, 2010. The majority of the remaining bone tumors in survivors diagnosed as children and still alive had been diagnosed with Ewing sarcoma (29%). Among the childhood cancer survivors of all ages, 4% were survivors of bone tumors, a proportion that increased slightly with age. Males were a greater proportion of the osteosarcoma survivors than were females until survivors reached middle age, when females were a larger share. Nearly one in four (22%) of the survivors had been diagnosed some 35 years ago. This is comparable with childhood cancer survivors for all types of cancer, where 20% were diagnosed more than 35 years before death. (Reference Table 8A.6.1 PDF CSV and Table 8A.6.2 PDF CSV)

Although not considered a childhood cancer, soft tissue sarcomas, which affect all ages, accounted for 9% of new diagnoses in the years 2006 to 2010 in children and young adults under the age of 20. Another 9% were found in the population age 20 to 34. Deaths from soft tissue sarcomas in this time frame were slightly lower, but still accounted for a higher proportion of cancer deaths in the under 35 population (4% and 6%, respectively) than all except bone and joint cancers. (Reference Table 8A.3.2 PDF CSV and Table 8A.3.4 PDF CSV)

Rhabdomyosarcoma, a soft tissue sarcoma, accounts for 3% of all new childhood cancers each year. The 5-year survival rate when detected in children under the age of 14 is 64%.1

1. Cancer.net: *Rhabdomyosarcoma-Childhood: Statistics.* Available at: http://www.cancer.net/cancer-types/rhabdomyosarcoma-childhood/statistics. Accessed February 11, 2015.

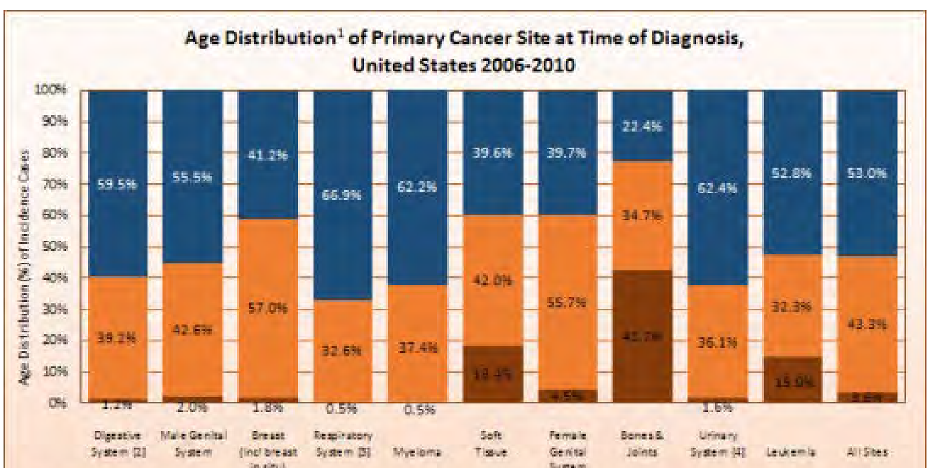
Burden of Childhood Musculoskeletal Cancers: Tumors of Bone and Connective Tissue

The high incidence and mortality rate of bone cancers among children, youth, and young adults creates a significant burden on the productivity and life of future generations. Apart from the financial costs, emotional toil, and lost lives from the initial treatments, survivors carry significant functional burdens and continuing care costs. At least 75% of surviving bone and joint cancer patients are treated with limb-salvaging surgery. These surgeries most often require implantation of massive bone-replacing endoprostheses that have limited life span and compromised function, requiring periodic surveillance and revision surgery to repair or replace worn parts. The amputated survivors will require prosthetic limbs, the function of which is clearly limiting in comparison to normal activity. Both procedures are expensive. The cost estimate nearly ten years ago was $25,000 per year for artificial limb replacement of an amputated limb in an active 20- to 30-year- old man in 1997 dollars. The cost estimate was $23,500 for implant, rehabilitation, monitoring, and replacement with limb salvaging endoprostheses.[1] More recent cost estimates are not available. Due to chronic pain and overall dysfunction, a large number of such survivors will end up on disability, requiring public support for the majority of their adult lifetime.

1. Grimer RJ, Carter SR, Pynsent PB: The cost-effectiveness of limb salvage bone tumors. *J Bone Joint Surg Br* 1997;79:558-561.

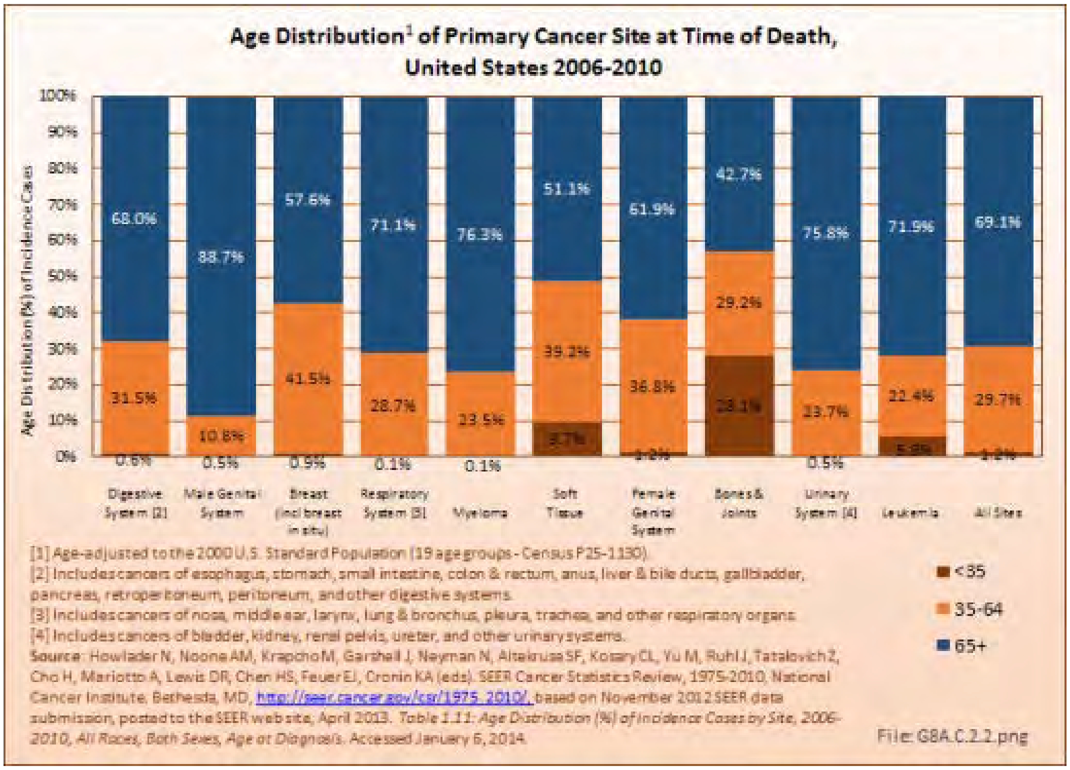
Musculoskeletal Cancers of the Aging: Tumors of Bone and Connective Tissue

More than 60% of myeloma cases are diagnosed in persons age 65 years and older. This is a similar rate to respiratory and urinary system cancers, both of which disproportionately affect older persons. Soft tissue cancers affect all ages, and in relatively equal proportion in the middle years (ages 35 to 64 years) and older population (65 years and older). As previously discussed, bone and joint cancers affect a disproportionate number of younger persons, and are not considered a major cancer of aging. (Reference Table 8A.3.2 PDF CSV)



[1] Age-adjusted to the 2000 U.S. Standard Population (19 age groups - Census P25-1130).
[2] Includes cancers of esophagus, stomach, small intestine, colon & rectum, anus, liver & bile ducts, gallbladder, pancreas, retroperitoneum, peritoneum, and other digestive systems.
[3] Includes cancers of nose, middle ear, larynx, lung & bronchus, pleura, trachea, and other respiratory organs.
[4] Includes cancers of bladder, kidney, renal pelvis, ureter, and other urinary systems.
Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.11: Age Distribution (%) of Incidence Cases by Site, 2006-2010, All Races, Both Sexes, Age at Diagnosis.* Accessed January 6, 2014.
File: G8A.C.2.1.png

Because of the advanced age of many myeloma patients, and the average survival rate of 6 years following diagnosis coupled with a less than 50% 5-year survival rate, 76% of deaths from myeloma occur to the 65 and older population. Soft tissue cancer deaths occur about equally in people under 65 years and those 65 years and older. Deaths from bone and joint cancers have a lower rate in the 65-year and older population than nearly all other cancers, primarily due to the higher rate of death in those under 35 years of age.(Reference Table 8A.3.4 PDF CSV)



Burden of Musculoskeletal Cancers of the Aging: Tumors of Bone and Connective Tissue

The average age of the population in the United States continues to rise. With age, the human body's ability to cope with stress and illness declines. As a result, poorer outcomes from cancers are expected in the aged due to greater decline in functional status, adaptability and an increase in co-morbid conditions, all of which have been shown to have an effect on survival.

Benign Musculoskeletal Tumors

In addition to the burden of malignant bone and soft tissue tumors, a plethora of benign tumors and tumor-like conditions disable thousands of Americans annually. No national databases on which to base estimates of the prevalence or incidence of such tumors exist.

Data for Benign Musculoskeletal Tumors

The relative frequency of more common benign bone tumors has been discerned from prior publications and extrapolation from the primary contributor's case registry of consecutive surgical cases treated between 1991 through 2004. It should be noted that although Dr. Ward's personal tumor registry has been updated since 2004, in 2005 additional providers joined his group and began to share care for this cohort of patients. With the resulting tempering in his experience, accurate incidence estimates could no longer be extrapolated from his personal tumor database. Table 9A.7.1 reflects the collected experience reported in the Mayo Clinic publication of 1986, the University of Florida publication from 1983, the J. Mirra experience reported in 1989, and the case series reflecting the practice of Dr. Ward, a full-time solo orthopaedic oncologist in practice from 1991 to 2004, at Wake Forest University Health Sciences in Winston-Salem, NC.

The experience of Dr. Ward during the stated time-period is believed to reflect roughly the general prevalence of bone and soft tissue tumors, since he treated a wide variety of benign and malignant bone tumors in a broad referral practice. All cases in his registry reflected his personally treated patients, ie, none were "consult cases" in which only radiographs or pathology slides were reviewed for outside consulting physicians, such as the Mayo and Mirra series included in their registries. The earlier data sets were accumulated during time periods prior to the full development of the subspecialty of orthopaedic oncology; thus, only the more unusual cases of bone tumors were referred to major medical centers, making estimates of their incidence less reliable. It is believed that, with the exception of bone cysts, general orthopaedic surgeons or other musculoskeletal specialists in North Carolina treated few bone tumors over the period the data was collected, as most were referred to orthopaedic oncologists. Practical experience has confirmed that osteosarcoma is the least likely sarcoma to be treated by anyone other than an orthopaedic oncologist. Dr. Ward and a small group of orthopaedic oncologists treated nearly all patients with an osteosarcoma in North Carolina for the past 22+ years.

As such, comparing the cases of benign bone tumors relative to the cases of osteosarcoma treated by Dr. Ward provides a relative index useful in generating a broad estimate of the prevalence of these benign tumors. By comparing this estimate with the national estimate for the annual occurrence of osteosarcoma, the most commonly encountered primary sarcoma of bone, a rough estimate of the incidence and prevalence of these benign bone tumor diseases was calculated. Because the records only included patients treated surgically, incidence and prevalence estimates also include only patients with these disease states that generally require surgical intervention. This selection process likely excludes small benign tumors, thereby artificially lowering the frequency estimates. (Reference Table 8A.7.1 PDF CSV)

Benign Tumors of Bone

Osteochondroma

The most commonly encountered benign tumor of bone is osteochondroma, which typically arises near the long ends of bones. Osteochondromas are often painful because of formation of bursae (small fluid-filled sac) overlying the lesion, tenting and irritation of overlying soft tissues, interference with neurovascular function due to tenting of such structures over the osteochondroma surface, and the potential for deformity in the involved and/or adjacent bones. Long-term complications are uncommon except for rare cases of dedifferentiation into a chondrosarcoma. There is no estimate of the number of patients seen with nonoperatively managed osteochondromas due to lack of records. An annual prevalence of >1,500 surgical cases is based on records kept by Dr. Ward; this is believed to be underestimated. Not included in this estimate are cases treated by general orthopaedic surgeons and pediatric orthopaedic surgeons, who, in addition to orthopaedic oncologists, provide surgical treatment of osteochondromas.

Unicameral Bone Cysts

Unicarmeral bone cysts are the second most commonly encountered benign bone lesions, with an estimated annual prevalence of more than 1,250 surgical cases. The etiology of these fluid-filled bone cysts, usually found in the growing ends of children's long bones such as the proximal humerus or femur, is unclear. Because they never metastasize and are usually quite characteristic on radiographs, many of these are treated by other orthopaedic surgeons, especially pediatric orthopaedic surgeons. The true incidence, therefore, is probably significantly higher than that estimated by extrapolation from Dr. Ward's practice experience. These cystic lesions cause weakening of the bone and the patients may require multiple surgeries to rebuild the bone with bone grafts, injections, and other techniques. They occur in children, and typically recur multiple times until skeletal maturity is achieved.

Giant Cell Tumor of Bone

Giant cell tumor of bone, with an estimated annual prevalence of more than 750 cases, is the third most commonly encountered benign bone neoplasm, and accounts for significant disability and dysfunction. This typically occurs near the end of the long bones, most commonly the lower femur or upper tibia, and causes destruction of the bone. The tumor may extend through the cortex of the bone into the soft tissues and, if large enough prior to treatment, can be associated with pathologic fracture of the involved bone. Smaller tumors can be treated with bone resection and reconstruction with bone grafts or cement filler. Cases that are more complicated require sophisticated reconstruction with massive joint replacements and/or massive allografts, and can cause severe long-term disability. On rare occasions, giant cell tumors metastasize to the lungs. In such cases, they typically respond poorly to chemotherapy and may cause death. These tumors are rarely treated by general orthopaedic surgeons. Although currently not considered the standard of care, many patients' tumors have had excellent responses to denosumab treatment, a monoclonal antibody directed against RANK ligand, the activator of osteoclasts (which are giant cells). This is very similar to the mechanism of action of bisphosphonates. Initial studies with denosumab have shown a very favorable response in the majority of tumors so treated, but presently, even with denosumab pretreatment, surgical resection appears to be ultimately required. With enhanced understanding of the underlying pathogenic mechanisms, non-surgical management may become possible in the near future.

Enchondroma

A fourth commonly encountered tumor that may require surgery is enchondroma, estimated at more than 725 annual surgical cases. Bones typically form as cartilage during the embryo stage of human development, and this cartilage model ultimately converts into bone structure. The cartilage-based growth plates add length to the bones from bone growth. Enchondromas are tumors derived from remnants of these cartilaginous tissues that abnormally remain in the skeleton as remnants or nodules from the normal pattern of maturation and development. If these achieve sufficient size, they can cause cortical bone erosion and pain or fracture, and may present diagnostic challenges requiring biopsy. They often require treatment by curettage and bone grafting. These lesions can dedifferentiate into malignant cartilage tumors called chondrosarcomas. Many small enchondromas are seen incidentally, cause no symptoms, and are treated with simple observation; thus, total incidence of enchondromas is much higher than shown in the surgical data. In addition, the burden of enchondromas requiring surgical treatment is very conservatively estimated, as many are treated by general orthopaedic surgeons.

Other Benign Bone Tumors

Multiple other benign tumors are commonly encountered.

- *Aneurysmal bone cysts (ABCs)* are aggressive cystic lesions similar to unicameral bone cysts. However, ABCs are more destructive, expanding and weakening the bone and causing greater bone destruction. They tend to fill with blood and tissue, not simple fluid. Usually, ABCs respond favorably to curettage and bone grafting, but recur in at least 20% of cases. Some ABCs arise secondarily in other bone lesions and conditions such as fibrous dysplasia.
- *Metaphyseal fibrous defects* are focal defects in normal bone that are filled with soft tissue. These occur in 2% to 3% of normal children. Most resolve without ever causing symptoms, and may never be detected unless the child receives an X-ray or MRI scan for another problem. Large ones may require surgery, such as bone grafting to prevent fracture and/or surgery to treat completed fractures that have already occurred.
- *Osteoid osteoma* is a small tumor typically occurring in children that is associated with severe, unrelenting night pain. It usually requires resection or radio frequency ablation and occasionally may require bone grafting. When located in the spine, it can cause a painful scoliosis. Recently, successful treatment with radio frequency ablation under radiographic guidance has become the treatment of choice for accessible lesions.
- *Chondroblastoma* is an unusual neoplasm that occurs in the ends of growing bones in teenagers and young adults. This requires resection of the lesion and bone grafting. If untreated, it can cause collapse and degenerative arthritis in the associated joint and, on rare occasion, can metastasize to the lung. Chondroblastomas usually are referred to orthopaedic oncologists.
- Numerous other less common benign bone tumors often are treated similarly to giant cell tumors, ABCs, or chondroblastomas with curettage, resection, and bone grafting. Most cause some degree of disability and dysfunction of the involved extremity.

Benign Soft Tissue Tumors

As with the benign bone tumors, there is no national registry of benign soft tissue tumors. By comparing Dr. Ward's 13 years of practice history from 1991 to 2004, and computing an incidence index relative to that of osteosarcoma, some estimate of the prevalence of surgically treated lesions may be obtained. From this index estimate, a baseline estimate of the national incidence can be calculated. However, benign soft tissue tumors are the most likely category of tumors to be treated by other surgeons, such as general orthopaedic surgeons and general surgeons; therefore, this national estimate is extremely conservative. The prevalence and burden in the United States from benign soft tissue tumors is significantly higher than estimated herein. (Reference Table 8A.7.2 PDF CSV)

Detection of the majority of benign soft tissue tumors is from local growth, and may require resection. Benign lesions rarely cause death, and it is rare that an amputation is necessary. However, depending on the site of involvement and size of the lesion, significant disability of the involved extremity and/or joint can occur. The true cost of these otherwise benign neoplasms can be high in terms of healthcare costs, lost work time, morbidity, emotional cost, and disability expenses.

Tumors of Fat Tissue

Lipomas: Benign tumors of fat tissue

Lipomas are the most common benign soft tissue tumor. Most are found under the skin, but they can develop anywhere in the body. Many lipomas are present for years and inactive, but those that are growing lesions and are probably the most commonly resected soft tissue benign tumor. Resection of growing lesions is usually performed in local community settings by multiple surgical specialists and even by primary care practitioners. Only patients with larger and more concerning lesions are typically referred to surgeons with a focus in surgical oncology. Not infrequently, a slow-growing sarcoma is mistakenly diagnosed as a lipoma, leading to a delay in the diagnosis of soft tissue sarcoma. This misdiagnosis can lead to suboptimal resection of the unappreciated sarcoma by the unsuspecting community surgeon.

Lipoblastomas

Lipoblastomas are benign fat tumors that occur in infants and young children.

Hibernomas

Hibernomas are benign fat tissue tumors that behave similarly to lipomas. They are so named because of their brownish coloration that resembles the appearance of the fatty tissue of bears, hence the name hibernomas. They are much less common than lipomas.

Tumors of Muscle Tissue

Smooth muscle benign tumors

Smooth muscle, found in internal organs such as stomach, intestines, blood vessels, or uterus, involuntarily contracts. Leiomyomas are benign tumors of smooth, or involuntary, muscle. Leiomyomas can arise almost anywhere in the body in either men or women because they start in tissues as widespread, for example, as blood vessels or intestine. The most common of these is the fibroid tumor that often develops in the uterus. It is really a leiomyoma (smooth muscle tumor) of the uterus.

Skeletal muscle benign tumors

Skeletal muscle is the muscle that allows movement of arms and legs and other body parts. These are voluntary muscles. Rhabdomyomas are benign tumors of skeletal muscle and are very rare.

Benign Tumors of Peripheral Nerve Tissue (Benign Peripheral Nerve Sheath Tumors)

Neurofibromas, *schwannomas* (neurilemmomas), and *neuromas* are benign tumors of nerves. These tumors can occur almost anywhere in the body. An inherited condition called neurofibromatosis, or von Recklinghausen disease, causes people to develop many neurofibromas throughout their body. Some of these may dedifferentiate and become malignant. These dedifferentiated malignant tumors usually form from large neurofibromas in the upper arms, neck, pelvis, or thigh. Patients with the dedifferentiated neural sarcomas have a very poor prognosis since the vast majority of patients ultimately succumb to the cancer.

Tumors of Joint Tissue

Joints are surrounded by tough tissue called synovium, which produces the fluid that lubricates the joint surfaces so they move smoothly. Joint tissue tumors typically arise from the synovium.

Pigmented villonodular synovitis (PVNS) is a benign tumor of joint tissue. It is most common in its nodular form in the hands, and is more common in women than in men. The nodular form rarely recurs following adequate and complete excision. PVNS also occurs in a diffuse form that typically will involve the entire joint lining and has a high recurrence rate after attempted resections. PVNS in its diffuse form is most commonly encountered in the knee joint, where it often causes recurrent bloody effusions (swollen knees filled with bloody fluid).

Tumors of Blood Vessels and Lymph Vessels

Hemangiomas are benign tumors of blood vessels. They are rather common, are often present at birth, and can affect the skin or internal organs. They sometimes disappear without treatment, but when located in muscles and other deep tissues, can be quite problematic and require surgical treatment.

Glomus tumors are benign perivascular (surrounding blood vessels) tumors. They usually are found under the skin and often under fingernails. They are usually small (<1 cm), but are exquisitely tender and painful. They may make the overlying skin sensitive to even light touch from clothing.

Hemangiopericytoma is a tumor of perivascular tissue. It most often develops in the legs, pelvis, and retroperitoneum (the back of the abdominal cavity) and is most common in adults. These can be either benign or malignant. They rarely spread to distant sites, but tend to recur locally following surgical resection unless very widely excised. They may be multifocal.

Lymphangiomas are benign lymph vessel tumors that are usually present at birth. Lymph is a type of fluid that circulates in every tissue of the body. Lymph fluid is collected and routed back into the venous system by the lymphatic system, and contains waste products from tissues and immune system cells. Lymphangiosarcomas are the malignant lymph vessel equivalents of angiosarcomas.

Tumors of Fibrous Tissue

Fibrous tissue forms tendons and ligaments and covers bones as well as other organs in the body.

Fibromas, *elastofibromas*, *extra-abdominal fibromatosis*, and *fibrous histiocytomas* are all benign soft tissue tumors. Fibromatosis is the most problematic of these tumors. They frequently recur following resection, and may require additional treatment with repeat surgery, radiation therapy, chemotherapy, or other therapies. Although these tumors do not metastasize, they can be challenging. Fibromatoses (desmoid tumors) were discussed at length under the malignant soft tissue section above where they are often grouped due to their aggressive nature.

Tumors of Uncertain Tissue Type

Through microscopic examination and other laboratory tests, doctors can usually find similarities between most soft tissue tumors and certain types of normal soft tissues. This is how soft tissue tumors are classified. However, some soft tissue tumors have not been linked to a specific type of normal soft tissue.

Myxoma is a benign tumor that usually is located in muscles but does not develop from muscle cells. The cells of a myxoma produce mucus-like material, a distinguishing feature of this tumor. They are usually found in adults, and rarely recur after treatment. Myxoma must be differentiated from myxofibrosarcoma, a malignant neoplasm that can appear very similar under the microscope as well as in gross appearance. The challenge for the treating physician is to avoid overtreating myxomas and undertreating myxofibrosarcomas, in terms of the extent of normal tissue margin around the tumor to be resected with the tumor to minimize the risk of recurrence.

Granular cell tumors are usually benign tumors of adults that often occur in the tongue, but can be found almost anywhere in the body. They are frequently multifocal.

Tumor-like Conditions of Soft Tissue

Some conditions of soft tissues are caused by inflammation or injury that forms a mass similar to a soft tissue tumor. Unlike a true tumor, they do not come from a single abnormal cell; they have limited capacity to grow or spread to nearby tissues, and never spread through the bloodstream or lymph system. Examples include *nodular fasciitis* and *myositis ossificans*, which involve tissues under the skin and muscle tissues, respectively.1

There can also be *deposition tumors.* The most commonly encountered ones are *tophi*, often seen in cases of poorly controlled gout. These tumors can achieve massive size, may be mistaken for true tumors, and erode through the skin, causing skin breakdown and infection that may require surgical treatment and antibiotics. *Calcium deposits* are often seen in renal failure and in poorly managed dialysis patients. They may be painful and may require difficult resection of deposits infiltrated into normal tissue. When not associated with diseases of abnormal calcium metabolism, such as renal failure and dialysis, the disease is termed tumoral calcinosis. It behaves essentially the same as the calcium deposition mentioned in association with renal disease. *Amyloid deposition* can rarely cause a soft tissue (or bony) mass. These are most often seen in poorly controlled dialysis patients. *Rheumatoid nodules* are soft tissue deposits of antibody-laden, inflammatory soft tissue masses that can be quite painful and may require resection for symptomatic relief. Adequate treatment of the underlying rheumatoid arthritis with current disease-modifying medications usually prevents the occurrence of such lesions.

1. National Cancer Society (NCS): *Sarcoma: Adult Soft Tissue Cancer?* Available at: http://www.cancer.org/cancer/sarcoma-adultsofttissuecancer/detailed guide/index. Accessed March 19, 2015.

Editorial revisions provided by William G. Ward, MD.

Musculoskeletal Tumors Data Sources and ICD-9-CM Codes

Unlike other content areas in this document, the incidence and burden of musculoskeletal tumors relies on the extensive cancer reports available from national cancer databases. ICD-9-CM codes for tumors are presented, but the national databases used in other sections were not analyzed for tumors.

DATA SOURCES

SEER Cancer Statistics Review

Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds): *SEER Cancer Statistics Review, 1975–2010, National Cancer Institute.* Bethesda, MD. Available at: http://seer.cancer.gov/csr/1975_2010/. Based on November 2012 SEER data submission, posted to the SEER web site, April 2013. Accessed February 12, 2015.

National Cancer Database Benchmark Reports, American College of Surgeons

American College of Surgeons: *NCDB Benchmarks. National Cancer Database Comparison Reports: NCDB Analytic Cases: Disease Site by American Joint Committee on Cancer Stage, Dx Years: 2000 to 2011.* Available at: https://cromwell.facs.org/Bmarks/BMCmp/ver10/Docs/ Accessed February 12, 2015.

American College of Surgeons National Cancer Database

The NCDB is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The data used in this study and this report are derived from a de-identified NCDB file. The American College of Surgeons and the Commission on Cancer have not verified and are not responsible for the analytic or statistical methodology employed, or the conclusions drawn from these data by the investigator and authors of this work.

Case Series, William G. Ward, MD

Case series reflecting the practice of William G. Ward, a full-time solo orthopaedic oncologist in practice from 1991 to 2004, at Wake Forest University Health Sciences in Winston-Salem, NC.

ICD-9-CM Codes

MALIGNANT NEOPLASM OF BONE AND ARTICULAR CARTILAGE

Malignant neoplasm of bone and articular cartilage: 170

- Malignant neoplasm of bones of skull and face except mandible: 170.0
- Malignant neoplasm of mandible: 170.1
- Malignant neoplasm of vertebral column excluding sacrum and coccyx: 170.2
- Malignant neoplasm of ribs sternum and clavicle: 170.3
- Malignant neoplasm of scapula and long bones of upper limb: 170.4
- Malignant neoplasm of short bones of upper limb: 170.5
- Malignant neoplasm of pelvic bones sacrum and coccyx: 170.6
- Malignant neoplasm of long bones of lower limb: 170.7
- Malignant neoplasm of short bones of lower limb: 170.8
- Site unspecified: 170.9

Malignant neoplasm of connective and other soft tissue: 171

- Of head face and neck: 171.1
- Of upper limb including shoulder: 171.2
- Of lower limb including hip: 171.3
- Of thorax: 171.4
- Of abdomen: 171.5
- Of pelvis: 171.6
- Of trunk unspecified: 171.7
- Malignant neoplasm of other specified sites of connective and other soft tissue: 171.8
- Site unspecified: 171.9

BENIGN TUMORS

Benign neoplasm of bone and articular cartilage: 213

Other benign neoplasm of connective and other soft tissue: 215

Table 8A.1.1: Incidence[1] of Cancer of Bones and Joints by Sex and Race, United States 1995-2010

Year	All Persons	White Males	White Females	Black Males	Black Females	Hispanic Males	Hispanic Females	American Indian/ Alaska Native Males	American Indian/ Alaska Native Females	Asian or Pacific Islander Males	Asian or Pacific Islander Females
	Age-Adjusted [2] Incidence per 1,000,000 Persons										
1995		11.6	7.8	10.2	6.8	9.6	8.9	-	-	9.5	4.1
1996		10.9	7.5	11.2	5.9	7.3	6.5	5.0	30.7	6.3	4.1
1997		11.5	9.3	9.9	5.6	7.5	7.3	-	20.0	8.4	4.2
1998		10.6	8.1	6.7	7.4	7.7	7.0	4.8	3.6	5.9	5.8
1999		10.4	8.2	5.9	5.5	8.7	7.3	-	-	6.8	2.8
2000		10.4	8.3	9.3	5.6	10.1	9.4	27.1	6.7	8.5	7.7
2001		11.8	8.3	7.3	5.9	10.0	7.9	4.1	13.4	6.8	2.5
2002		11.6	8.2	12.1	6.7	10.6	6.2	15.6	6.6	6.4	7.5
2003	9.0	10.6	8.1	7.9	6.6	10.1	8.0	15.7	2.6	6.9	7.1
2004	9.0	9.7	8.2	5.8	7.7	7.0	8.5	2.3	2.3	6.4	2.7
(based on 5-year averages per year)											
2001-2005	9.0	11.0	8.0	8.0	7.0	NA	NA	NA	NA	NA	NA
2002-2006	9.0	11.0	8.0	8.0	7.0	9.0	7.0	NA	NA	6.0	6.0
2006-2010	9.0	12.0	8.0	9.0	7.0	10.0	6.0	NA	NA	6.0	6.0

[1] A cancer incidence rate is the number of new cancers of a specific site/type occurring in a specified population during a year, usually expressed as the number of cancers per 100,000 population at risk. Because of the low number of new cases, incidence is expressed as the number per one million population at risk in this report.

[2] Age-adjusted to the 2000 US Standard Population (19 age groups - Census P25-1130).

Source 1995 to 2004 data: Ries LAG, Harkins D, Krapcho M, et. al. (eds): *SEER Cancer Statistics Review, 1975-2004, Overvie* w. Bethesda, MD: National Cancer Institute, 2007. Available at: http://seer.cancer.gov/csr/1975_2004/. Accessed June 19, 2007.

Source 2005 data: Ries LAG, Melbert D, Krapcho M, et. al. (eds). SEER Cancer Statistics Review, 1975-2005, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2005/, based on November 2007 SEER data submission, posted to the SEER web site, 2008. Accessed December 8, 2009.

Source 2006 data: Horner MJ, Ries LAG, Krapcho M, et. al. (eds). SEER Cancer Statistics Review, 1975-2006, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2006/, based on November 2008 SEER data submission, posted to the SEER web site, 2009. Accessed December 8, 2009.

Source 2007 to 2010 data: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. Accessed December 30,

Source 2006 to 2010 data: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.5: Age-Adjusted SEER Incidence and U.S. Death Rates and 5-Year Relative Survival (Percent) By Primary Cancer Site, Sex and Time Period: Table 1.6 (Whites); Table1.7 (Blacks).* Accessed January 6, 2014.

Table 8A.1.2: Incidence of Myeloma by Sex and Race, United States 1995-2010

	Age-Adjusted [1] Incidence per 1,000,000 Persons				
		White		Black	
Year	All Persons	Males	Females	Males	Females
1995	57.0	67.0	43.0	150.0	101.0
1996	58.0	68.0	43.0	134.0	119.0
1997	61.0	70.0	47.0	142.0	118.0
1998	59.0	70.0	44.0	129.0	105.0
1999	55.0	66.0	40.0	149.0	99.0
2000	59.0	73.0	43.0	106.0	103.0
2001	57.0	67.0	43.0	137.0	99.0
2002	57.0	73.0	40.0	139.0	85.0
2003	53.0	65.0	40.0	132.0	80.0
(based on 5-year average per year)					
2000-2004	56.0	66.0	41.0	140.0	95.0
2001-2005	56.0	66.0	41.0	144.0	98.0
2002-2006	56.0	66.0	41.0	143.0	100.0
2006-2010	59.0	71.0	42.0	144.0	102.0

[1] A cancer incidence rate is the number of new cancers of a specific site/type occurring in a specified population during a year, usually expressed as the number of cancers per 100,000 population at risk. Because of the low number of new cases, incidence is expressed as the number per one million population at risk in this report.

[1] Age-adjusted to the 2000 US Standard Population (19 age groups - Census P25-1130).

Source: Ries LAG, Harkins D, Krapcho M, et. al. (eds): *SEER Cancer Statistics Review, 1975-2004, Overview* . Bethesda, MD: National Cancer Institute, 2007. Available at: http://seer.cancer.gov/csr/1975_2004/. Accessed June 19, 2007.

Source 2005 data: Ries LAG, Melbert D, Krapcho M, et. al. (eds). SEER Cancer Statistics Review, 1975-2005, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2005/, based on November 2007 SEER data submission, posted to the SEER web site, 2008. Accessed December 8, 2009.

Source 2006 data: Horner MJ, Ries LAG, Krapcho M, et. al. (eds). SEER Cancer Statistics Review, 1975-2006, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2006/, based on November 2008 SEER data submission, posted to the SEER web site, 2009. Accessed December 8, 2009.

Source 2006 to 2010 data: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.5: Age-Adjusted SEER Incidence and U.S. Death Rates and 5-Year Relative Survival (Percent) By Primary Cancer Site, Sex and Time Period: Table 1.6 (Whites); Table1.7 (Blacks).* Accessed January 6, 2014.

Table 8A.2.1: Median Age of Patients at Diagnosis by Primary Cancer Site by Sex and Race, United States 2006-2010

	Median Age at Diagnosis								
	All Races			Whites			Blacks		
Site	Total	Males	Females	Total	Males	Females	Total	Males	Females
Lymphoma (Hodgkin)	38.0	40.0	36.0	39.0	41.0	37.0	36.0	37.0	34.0
Bones & Joints	**42.0**	**40.0**	**45.0**	**44.0**	**41.0**	**46.0**	**36.0**	**32.0**	**41.0**
Kaposi's Sarcoma	45.0	44.0	74.5	47.0	46.0	80.0	39.0	39.0	41.5
Endocrine System	50.0	54.0	49.0	50.0	54.0	49.0	51.0	53.0	50.0
Brain & Nervous System	57.0	56.0	58.0	58.0	57.0	59.0	50.0	50.0	49.0
Soft Tissue (incl heart)	**58.0**	**59.0**	**58.0**	**60.0**	**61.0**	**59.0**	**51.0**	**48.0**	**53.0**
Breast (incl breast in situ)	61.0	68.0	61.0	62.0	69.0	62.0	58.0	64.0	58.0
Female Genital System	61.0		61.0	61.0		61.0	60.0		60.0
Eye & Orbit	61.0	61.0	60.0	62.0	62.0	61.0	NA	NA	NA
Skin	62.0	65.0	58.0	62.0	65.0	58.0	56.0	56.0	55.0
Oral Cavity & Pharynx	62.0	61.0	64.0	62.0	61.0	66.0	58.0	58.0	57.0
Leukemia	66.0	65.0	67.0	67.0	66.0	68.0	60.0	59.0	62.0
Lymphoma (Non-Hodgkin)	66.0	65.0	68.0	67.0	66.0	69.0	57.0	55.0	60.0
Male Genital System	66.0	66.0		66.0	66.0		63.0	63.0	
Digestive system	68.0	66.0	71.0	69.0	67.0	72.0	64.0	63.0	66.0
Myeloma (bone marrow)	**69.0**	**68.0**	**70.0**	**70.0**	**69.0**	**71.0**	**66.0**	**65.0**	**66.0**
Urinary System	69.0	69.0	69.0	70.0	70.0	70.0	65.0	64.0	66.0
Respiratory System	70.0	69.0	71.0	71.0	70.0	71.0	66.0	65.0	66.0
Ill-defined & Unspecified	73.0	70.0	76.0	74.0	71.0	76.0	67.0	64.0	69.0
Mesothelioma	74.0	74.0	71.0	74.0	75.0	72.0	70.0	71.0	63.0
All Sites	66.0	66.0	65.0	66.0	67.0	65.0	62.0	63.0	62.0

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.12: Median Age of Cancer Patients at Diagnosis, 2006-2010, By Primary Cancer Site, Race and Sex*. Accessed January 6, 2014.

Table 8A.2.2: Median Age of Patients at Death by Primary Cancer Site by Sex and Race, United States 2006-2010

	Median Age at Death								
	All Races			Whites			Blacks		
Site	Total	Males	Females	Total	Males	Females	Total	Males	Females
Bones & Joints	**59.0**	**56.0**	**63.0**	**60.0**	**58.0**	**65.0**	**51.0**	**49.0**	**54.0**
Lymphoma (Hodgkin)	64.0	61.0	68.0	66.0	63.0	70.0	50.0	48.0	53.0
Brain & Nervous System	64.0	63.0	66.0	65.0	63.0	67.0	59.0	58.0	61.0
Soft Tissue (incl heart)	**65.0**	**65.0**	**65.0**	**66.0**	**66.0**	**67.0**	**57.0**	**55.0**	**58.0**
Oral Cavity & Pharynx	67.0	65.0	73.0	69.0	66.0	75.0	62.0	61.0	63.0
Breast (incl breast in situ)	68.0	71.0	68.0	70.0	72.0	70.0	61.0	65.0	61.0
Endocrine System	69.0	66.0	71.0	70.0	67.0	73.0	63.0	58.0	65.0
Female Genital System	70.0		70.0	70.0		70.0	66.0		66.0
Eye & Orbit	70.0	69.0	71.0	70.0	69.0	71.5	57.0	54.5	58.5
Skin	71.0	70.0	72.0	71.0	70.0	72.0	63.0	61.0	69.0
Digestive system	72.0	70.0	76.0	73.0	70.0	77.0	67.0	65.0	71.0
Respiratory System	72.0	71.0	72.0	72.0	72.0	73.0	67.0	67.0	69.0
Ill-defined & Unspecified	74.0	72.0	76.0	75.0	73.0	77.0	68.0	66.0	70.0
Leukemia	75.0	73.0	76.0	75.0	74.0	77.0	68.0	66.0	70.0
Myeloma (bone marrow)	**75.0**	**73.0**	**76.0**	**75.0**	**74.0**	**77.0**	**71.0**	**69.0**	**72.0**
Lymphoma (Non-Hodgkin)	76.0	73.0	76.0	75.0	74.0	77.0	71.0	69.0	72.0
Urinary System	76.0	75.0	78.0	76.0	75.0	78.0	71.0	68.0	74.0
Male Genital System	80.0	80.0		81.0	81.0		77.0	77.0	
Kaposi's Sarcoma	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mesothelioma	NA	NA	NA	NA	NA	NA	NA	NA	NA
All Sites	72.0	72.0	73.0	73.0	72.0	74.0	68.0	67.0	68.0

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.14: Median Age of Cancer Patients at Death, 2006-2010, By Primary Cancer Site, Race and Sex* . Accessed January 6, 2014.

Table 8A.3.1: Incidence Cases by Age Distribution[1] of Primary Cancer Site at Time of Diagnosis, United States 2006-2010

	Incidence Cases by Site by Age, 2006-2010								Total Cases,	% Total Cases,
Site	< 20	20-34	35-44	45-54	55-64	65-74	75-84	85+	All Ages	All Ages
Digestive System [2]	722	3,612	13,003	48,401	80,187	88,133	85,966	40,816	361,202	18.3%
Male Genital System	619	5,571	4,952	30,331	96,563	106,776	52,924	12,070	309,497	15.7%
Breast (incl breast in situ)	-	5,137	27,398	63,357	71,919	59,076	42,238	16,267	285,391	14.5%
Respiratory System [3]	275	1,098	4,118	25,534	59,853	85,386	74,953	23,337	274,554	13.9%
Urinary System [4]	930	1,550	5,270	17,203	33,477	41,071	39,521	16,119	154,986	7.9%
Female Genital System	452	4,629	10,387	21,678	30,823	22,694	15,468	6,661	112,905	5.7%
Skin (excl basal & squamous)	588	6,276	9,610	16,867	20,790	19,123	17,260	7,551	98,066	5.0%
Lymphoma (Non-Hodgkin)	1,413	3,158	5,236	11,219	16,953	18,948	18,616	7,646	83,105	4.2%
Endocrine System	1,613	8,230	10,733	13,235	10,789	6,785	3,337	834	55,611	2.8%
Leukemia	5,505	2,512	2,779	5,559	8,926	10,690	11,598	5,933	53,448	2.7%
Oral Cavity & Pharynx [5]	284	993	2,790	9,552	13,760	10,119	6,951	2,837	47,286	2.4%
Ill defined & Unspecified	154	346	921	3,686	6,949	8,524	10,559	7,218	38,395	2.0%
Brain & Nervous System	3,591	2,412	2,412	4,084	5,345	4,577	3,673	1,316	27,410	1.4%
Myeloma (bone marrow)	**-**	**125**	**801**	**2,853**	**5,706**	**6,858**	**6,307**	**2,403**	**25,028**	**1.3%**
Soft Tissue (incl heart)	**1,257**	**1,313**	**1,396**	**2,067**	**2,402**	**2,262**	**2,262**	**1,005**	**13,963**	**0.7%**
Lymphoma (Hodgkin)	1,531	3,674	1,719	1,495	1,260	1,036	789	259	11,775	0.6%
Mesothelioma	4	25	79	268	674	1,130	1,427	573	4,184	0.2%
Bones & Joints	**1,065**	**595**	**377**	**509**	**463**	**369**	**362**	**140**	**3,888**	**0.2%**
Eye & Orbit	446	110	216	514	693	693	542	213	3,429	0.2%
Kaposi's Sarcoma	5	436	662	482	210	171	178	139	2,283	0.1%
All Sites	19,687	51,186	104,341	279,556	468,551	494,144	395,709	153,559	1,968,702	

[1] Age-adjusted to the 2000 US Standard Population (19 age groups - Census P25-1130).

[2] Includes cancers of esophagus, stomach, small intestine, colon & rectum, anus, liver & bile ducts, gallbladder, pancreas, retroperitoneum, peritoneum, and other digestive systems.

[3] Includes cancers of nose, middle ear, larynx, lung & bronchus, pleura, trachea, and other respiratory organs.

[4] Includes cancers of bladder, kidney, renal pelvis, ureter, and other urinary systems.

[5] Includes cancers of lip, tongue, salivary gland, mouth, gums, nasopharynx, tonsil, oropharynx, hypopharynx, and other oral cavity.

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013.*Table 1.11: Age Distribution (%) of Incidence Cases by Site, 2006-2010, All Races, Both Sexes, Age at Diagnosis.* Accessed January 6, 2014.

Table 8A.3.2: Age Distribution[1] of Primary Cancer Site at Time of Diagnosis, United States 2006-2010

	Age Distribution (%) of Incidence Cases by Site, 2006-2010								Total Cases,	% Total Cases,
Site	< 20	20-34	35-44	45-54	55-64	65-74	75-84	85+	All Ages	All Ages
Digestive System [2]	0.2%	1.0%	3.6%	13.4%	22.2%	24.4%	23.8%	11.3%	361,202	18.3%
Male Genital System	0.2%	1.8%	1.6%	9.8%	31.2%	34.5%	17.1%	3.9%	309,497	15.7%
Breast (incl breast in situ)	0.0%	1.8%	9.6%	22.2%	25.2%	20.7%	14.8%	5.7%	285,391	14.5%
Respiratory System [3]	0.1%	0.4%	1.5%	9.3%	21.8%	31.1%	27.3%	8.5%	274,554	13.9%
Urinary System [4]	0.6%	1.0%	3.4%	11.1%	21.6%	26.5%	25.5%	10.4%	154,986	7.9%
Female Genital System	0.4%	4.1%	9.2%	19.2%	27.3%	20.1%	13.7%	5.9%	112,905	5.7%
Skin (excl basal & squamous)	0.6%	6.4%	9.8%	17.2%	21.2%	19.5%	17.6%	7.7%	98,066	5.0%
Lymphoma (Non-Hodgkin)	1.7%	3.8%	6.3%	13.5%	20.4%	22.8%	22.4%	9.2%	83,105	4.2%
Endocrine System	2.9%	14.8%	19.3%	23.8%	19.4%	12.2%	6.0%	1.5%	55,611	2.8%
Leukemia	10.3%	4.7%	5.2%	10.4%	16.7%	20.0%	21.7%	11.1%	53,448	2.7%
Oral Cavity & Pharynx [5]	0.6%	2.1%	5.9%	20.2%	29.1%	21.4%	14.7%	6.0%	47,286	2.4%
Ill defined & Unspecified	0.4%	0.9%	2.4%	9.6%	18.1%	22.2%	27.5%	18.8%	38,395	2.0%
Brain & Nervous System	13.1%	8.8%	8.8%	14.9%	19.5%	16.7%	13.4%	4.8%	27,410	1.4%
Myeloma (bone marrow)	**0.0%**	**0.5%**	**3.2%**	**11.4%**	**22.8%**	**27.4%**	**25.2%**	**9.6%**	**25,028**	**1.3%**
Soft Tissue (incl heart)	**9.0%**	**9.4%**	**10.0%**	**14.8%**	**17.2%**	**16.2%**	**16.2%**	**7.2%**	**13,963**	**0.7%**
Lymphoma (Hodgkin)	13.0%	31.2%	14.6%	12.7%	10.7%	8.8%	6.7%	2.2%	11,775	0.6%
Mesothelioma	0.1%	0.6%	1.9%	6.4%	16.1%	27.0%	34.1%	13.7%	4,184	0.2%
Bones & Joints	**27.4%**	**15.3%**	**9.7%**	**13.1%**	**11.9%**	**9.5%**	**9.3%**	**3.6%**	**3,888**	**0.2%**
Eye & Orbit	13.0%	3.2%	6.3%	15.0%	20.2%	20.2%	15.8%	6.2%	3,429	0.2%
Kaposi's Sarcoma	0.2%	19.1%	29.0%	21.1%	9.2%	7.5%	7.8%	6.1%	2,283	0.1%
All Sites	1.0%	2.6%	5.3%	14.2%	23.8%	25.1%	20.1%	7.8%	1,968,702	

[1] Age-adjusted to the 2000 US Standard Population (19 age groups - Census P25-1130).

[2] Includes cancers of esophagus, stomach, small intestine, colon & rectum, anus, liver & bile ducts, gallbladder, pancreas, retroperitoneum, peritoneum, and other digestive systems.

[3] Includes cancers of nose, middle ear, larynx, lung & bronchus, pleura, trachea, and other respiratory organs.

[4] Includes cancers of bladder, kidney, renal pelvis, ureter, and other urinary systems.

[5] Includes cancers of lip, tongue, salivary gland, mouth, gums, nasopharynx, tonsil, oropharynx, hypopharynx, and other oral cavity.

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.11: Age Distribution (%) of Incidence Cases by Site, 2006-2010, All Races, Both Sexes, Age at Diagnosis.* Accessed January 6, 2014.

Table 8A.3.3: Incidence Cases by Age Distribution[1] of Primary Cancer Site at Time of Death, United States 2006-2010

	Incidence Cases by Site by Age, 2006-2010								Total Cases, All Ages	Average Deaths Per	% Total Cases,
Site	< 20	20-34	35-44	45-54	55-64	65-74	75-84	85+	2006 thru 2010	Year	All Ages
Digestive System [2]	692	3,462	15,233	66,470	136,401	164,097	191,100	115,629	692,392	138,478	24.5%
Male Genital System	-	729	583	2,771	12,399	28,881	53,970	46,531	145,865	29,173	5.2%
Breast (incl breast in situ)	-	1,833	10,795	29,737	43,995	41,143	43,791	32,385	203,679	40,736	7.2%
Respiratory System [3]	-	815	8,969	64,411	160,619	247,858	243,782	88,055	815,324	163,065	28.8%
Urinary System [4]	277	415	1,660	9,267	21,854	31,536	43,293	30,015	138,317	27,663	4.9%
Female Genital System	-	1,680	5,739	16,378	29,397	33,317	33,737	19,598	139,987	27,997	4.9%
Skin (excl basal & squamous)	58	1,161	2,555	6,794	11,208	12,137	14,401	9,756	58,070	11,614	2.1%
Lymphoma (Non-Hodgkin)	409	1,430	2,350	6,743	14,611	22,580	33,512	20,639	102,172	20,434	3.6%
Endocrine System	852	318	522	1,234	2,214	2,799	3,066	1,717	12,722	2,544	0.4%
Leukemia	3,017	3,464	3,352	7,039	14,637	24,135	34,415	21,789	111,736	22,347	3.9%
Oral Cavity & Pharynx [5]	40	281	1,206	5,588	10,091	9,608	8,523	4,824	40,202	8,040	1.4%
Ill defined & Unspecified	422	1,476	4,218	17,085	36,700	49,355	61,800	39,653	210,920	42,184	7.5%
Brain & Nervous System	2,591	2,455	4,159	9,818	15,614	15,478	13,160	4,909	68,184	13,637	2.4%
Myeloma (bone marrow)	**-**	**54**	**593**	**3,288**	**8,786**	**14,122**	**17,949**	**9,056**	**53,902**	10,780	**1.9%**
Soft Tissue (incl heart)	**745**	**1,262**	**1,365**	**2,793**	**3,952**	**3,952**	**4,303**	**2,317**	**20,689**	4,138	**0.7%**
Lymphoma (Hodgkin)	88	800	669	700	931	1,050	1,356	656	6,250	1,250	0.2%
Mesothelioma	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bones & Joints	**873**	**1,044**	**423**	**723**	**846**	**962**	**1,132**	**819**	**6,821**	1,364	**0.2%**
Eye & Orbit	23	19	68	143	247	287	318	186	1,291	258	0.0%
Kaposi's Sarcoma	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
All Sites	11,322	22,644	65,103	251,920	523,653	704,809	803,879	447,228	2,830,559	566,112	

[1] Age-adjusted to the 2000 U.S. Standard Population (19 age groups - Census P25-1130).

[2] Includes cancers of esophagus, stomach, small intestine, colon & rectum, anus, liver & bile ducts, gallbladder, pancreas, retroperitoneum, peritoneum, and other digestive systems.

[3] Includes cancers of nose, middle ear, larynx, lung & bronchus, pleura, trachea, and other respiratory organs.

[4] Includes cancers of bladder, kidney, renal pelvis, ureter, and other urinary systems.

[5] Includes cancers of lip, tongue, salivary gland, mouth, gums, nasopharynx, tonsil, oropharynx, hypopharynx, and other oral cavity.

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.13: Age Distribution (%) of Incidence Cases by Site, 2006-2010, All Races, Both Sexes, Age at Death.* Accessed January 6, 2014.

Table 8A.3.4: Age Distribution[1] of Primary Cancer Site at Time of Death, United States 2006-2010

	Age Distribution (%) of Incidence Cases by Site, 2006-2010								Total Cases,	% Total Cases,
Site	< 20	20-34	35-44	45-54	55-64	65-74	75-84	85+	All Ages	All Ages
Digestive System [2]	0.1%	0.5%	2.2%	9.6%	19.7%	23.7%	27.6%	16.7%	692,392	24.5%
Male Genital System	0.0%	0.5%	0.4%	1.9%	8.5%	19.8%	37.0%	31.9%	145,865	5.2%
Breast (incl breast in situ)	0.0%	0.9%	5.3%	14.6%	21.6%	20.2%	21.5%	15.9%	203,679	7.2%
Respiratory System [3]	0.0%	0.1%	1.1%	7.9%	19.7%	30.4%	29.9%	10.8%	815,324	28.8%
Urinary System [4]	0.2%	0.3%	1.2%	6.7%	15.8%	22.8%	31.3%	21.7%	138,317	4.9%
Female Genital System	0.0%	1.2%	4.1%	11.7%	21.0%	23.8%	24.1%	14.0%	139,987	4.9%
Skin (excl basal & squamous)	0.1%	2.0%	4.4%	11.7%	19.3%	20.9%	24.8%	16.8%	58,070	2.1%
Lymphoma (Non-Hodgkin)	0.4%	1.4%	2.3%	6.6%	14.3%	22.1%	32.8%	20.2%	102,172	3.6%
Endocrine System	6.7%	2.5%	4.1%	9.7%	17.4%	22.0%	24.1%	13.5%	12,722	0.4%
Leukemia	2.7%	3.1%	3.0%	6.3%	13.1%	21.6%	30.8%	19.5%	111,736	3.9%
Oral Cavity & Pharynx [5]	0.1%	0.7%	3.0%	13.9%	25.1%	23.9%	21.2%	12.0%	40,202	1.4%
Ill defined & Unspecified	0.2%	0.7%	2.0%	8.1%	17.4%	23.4%	29.3%	18.8%	210,920	7.5%
Brain & Nervous System	3.8%	3.6%	6.1%	14.4%	22.9%	22.7%	19.3%	7.2%	68,184	2.4%
Myeloma (bone marrow)	**0.0%**	**0.1%**	**1.1%**	**6.1%**	**16.3%**	**26.2%**	**33.3%**	**16.8%**	**53,902**	**1.9%**
Soft Tissue (incl heart)	**3.6%**	**6.1%**	**6.6%**	**13.5%**	**19.1%**	**19.1%**	**20.8%**	**11.2%**	**20,689**	**0.7%**
Lymphoma (Hodgkin)	1.4%	12.8%	10.7%	11.2%	14.9%	16.8%	21.7%	10.5%	6,250	0.2%
Mesothelioma	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bones & Joints	**12.8%**	**15.3%**	**6.2%**	**10.6%**	**12.4%**	**14.1%**	**16.6%**	**12.0%**	**6,821**	**0.2%**
Eye & Orbit	1.8%	1.5%	5.3%	11.1%	19.1%	22.2%	24.6%	14.4%	1,291	0.0%
Kaposi's Sarcoma	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
All Sites	0.4%	0.8%	2.3%	8.9%	18.5%	24.9%	28.4%	15.8%	2,830,559	

[1] Age-adjusted to the 2000 US Standard Population (19 age groups - Census P25-1130).

[2] Includes cancers of esophagus, stomach, small intestine, colon & rectum, anus, liver & bile ducts, gallbladder, pancreas, retroperitoneum, peritoneum, and other digestive systems.

[3] Includes cancers of nose, middle ear, larynx, lung & bronchus, pleura, trachea, and other respiratory organs.

[4] Includes cancers of bladder, kidney, renal pelvis, ureter, and other urinary systems.

[5] Includes cancers of lip, tongue, salivary gland, mouth, gums, nasopharynx, tonsil, oropharynx, hypopharynx, and other oral cavity.

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.13: Age Distribution (%) of Incidence Cases by Site, 2006-2010, All Races, Both Sexes, Age at Death.* Accessed January 6, 2014.

Table 8A.4.1: Years of Survival Based on Median Age at Diagnosis and Death by Primary Cancer Site by Sex and Race, United States 2006-2010

	Median Years of Survival After Diagnosis								
	All Races			Whites			Blacks		
Site	Total	Males	Females	Total	Males	Females	Total	Males	Females
Ill-defined & Unspecified	1.0	2.0	0.0	1.0	2.0	1.0	1.0	2.0	1.0
Respiratory System	2.0	2.0	1.0	1.0	2.0	2.0	1.0	2.0	3.0
Digestive system	4.0	4.0	5.0	4.0	3.0	5.0	3.0	2.0	5.0
Oral Cavity & Pharynx	5.0	4.0	9.0	7.0	5.0	9.0	4.0	3.0	6.0
Myeloma (bone marrow)	**6.0**	**5.0**	**6.0**	**5.0**	**5.0**	**6.0**	**5.0**	**4.0**	**6.0**
Brain & Nervous System	7.0	7.0	8.0	7.0	6.0	8.0	9.0	8.0	12.0
Soft Tissue (incl heart)	**7.0**	**6.0**	**7.0**	**6.0**	**5.0**	**8.0**	**6.0**	**7.0**	**5.0**
Breast (incl breast in situ)	7.0	3.0	7.0	8.0	3.0	8.0	3.0	1.0	3.0
Urinary System	7.0	6.0	9.0	6.0	5.0	8.0	6.0	4.0	8.0
Female Genital System	9.0		9.0	9.0		9.0	6.0		6.0
Eye & Orbit	9.0	8.0	11.0	8.0	7.0	10.5	NA	NA	NA
Skin	9.0	5.0	14.0	9.0	5.0	14.0	7.0	5.0	14.0
Leukemia	9.0	8.0	9.0	8.0	8.0	9.0	8.0	7.0	8.0
Lymphoma (Non-Hodgkin)	10.0	8.0	8.0	8.0	8.0	8.0	14.0	14.0	12.0
Male Genital System	14.0	14.0		15.0	15.0		14.0	14.0	
Bones & Joints	**17.0**	**16.0**	**18.0**	**16.0**	**17.0**	**19.0**	**15.0**	**17.0**	**13.0**
Endocrine System	19.0	12.0	22.0	20.0	13.0	24.0	12.0	5.0	15.0
Lymphoma (Hodgkin)	26.0	21.0	32.0	27.0	22.0	33.0	14.0	11.0	19.0
Kaposi's Sarcoma	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mesothelioma	NA	NA	NA	NA	NA	NA	NA	NA	NA
All Sites	6.0	6.0	8.0	7.0	5.0	9.0	6.0	4.0	6.0

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.12 (2.14): Median Age of Cancer Patients at Diagnosis (Death), 2006-2010, By Primary Cancer Site, Race and Sex*. Accessed January 6, 2014.

Table 8A.4.2: Age-Adjusted[1] 5-Year Relative[2] Cancer Survival Rates by Sex, United States 2003-2009

Site	5-Year Relative Survival Rate (%, 2003-2009) Total	Males	Females
Male Genital System	98.9	98.9	
Endocrine System	95.6	91.0	97.2
Skin (excl basal and squamous cell)	90.8	88.9	93.3
Breast (incl breast *in situ*)	89.2	83.5	89.2
Lymphoma (Hodgkin)	85.1	84.3	86.0
Eye & Orbit	81.7	81.4	82.1
Urinary System	74.8	76.1	72.0
Kaposi Sarcoma	71.1	70.5	75.9
Lymphoma (Non-Hodgkin)	69.0	67.6	70.6
Female Genital System	68.1		68.1
Bones & Joints	**66.4**	**64.0**	**69.3**
Soft Tissue (incl heart)	**66.1**	**65.2**	**67.1**
Oral Cavity & Pharynx	62.2	61.4	64.0
Leukemia	56.0	56.7	55.2
Digestive system	44.6	42.8	46.6
Myeloma (bone marrow)	**43.2**	**44.1**	**42.1**
Brain & Nervous System	33.5	32.3	35.0
Respiratory System	19.6	18.8	20.6
Mesothelioma	8.4	6.6	13.8
All Sites	65.8	66.4	65.3

[1] Age-adjusted to the 2000 US Standard Population (19 age groups - Census P25-1130).

[2] Relative survival statistics compare the survival of patients diagnosed with cancer with the survival of people in the general population who are the same age, race, and sex and who have not been diagnosed with cancer.

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 1.5: Age-Adjusted SEER Incidence and U.S. Death Rates and 5-Year Relative Survival (Percent) By Primary Cancer Site, Sex and Time Period.* Accessed January 6, 2014.

Table 8A.4.3: Trend in 5-Year Relative[1] Survival Rates Bone & Joint Cancer, Myeloma, and Other Major Cancer Sites, United States 1975-2009

	5-Year Relative Survival Rate						
	Myeloma	Bone & Joint	Breast	Prostate	Leukemia	Non-Hodgkin Lymphoma	All Sites
1975	26.3%	52.2%	75.2%	66.0%	33.2%	45.9%	48.7%
1890	25.7%	48.3%	74.9%	70.2%	37.4%	49.2%	49.1%
1985	27.0%	56.4%	78.4%	75.0%	41.2%	52.4%	52.5%
1989	25.6%	67.6%	84.3%	84.4%	43.1%	49.9%	55.8%
1993	30.8%	74.2%	85.7%	95.2%	47.2%	52.9%	61.2%
1997	31.2%	69.9%	88.4%	97.5%	48.0%	59.4%	63.3%
2001	37.0%	70.9%	89.5%	99.8%	53.3%	66.0%	66.8%
2005	44.9%	70.1%	90.5%	99.6%	59.2%	71.1%	67.6%
2009	43.2%	66.4%	89.2%	99.2%	56.0%	69.0%	65.8%

[1] Relative survival statistics compare the survival of patients diagnosed with cancer with the survival of people in the general population who are the same age, race, and sex and who have not been diagnosed with cancer.

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *SEER Stat Fact Sheets* . Accessed January 6, 2014.

Table 8A.5.1: Average Annual Case Distribution by Stage for Top 24 Cancer Sites, Soft Tissue Cancers, and Bone and Joint Cancers, Diagnosis Years 2000 to 2011

Primary Site	Average Proportion of Total Cases with Known Stage, 2000-2011					Stage Unknown		% of Total
	Stage 0 [1]	Stage I [2]	Stage II [3]	Stage III [4]	Stage IV [5]	Cases	Total Cases	Cases
Breast	19.3%	38.4%	25.9%	8.4%	3.6%	4.4%	190,956	17.8%
Prostate	0.0%	4.8%	75.5%	8.3%	5.2%	6.2%	132,125	12.3%
Lung, Bronchus - Non-small cell carcinoma	0.2%	24.4%	7.4%	23.3%	35.9%	8.7%	114,977	10.7%
Colon	6.9%	20.2%	24.5%	22.8%	17.5%	8.2%	75,973	7.1%
Bladder	47.0%	21.3%	11.4%	5.0%	6.7%	8.5%	43,476	4.1%
Melanoma - Skin	23.1%	40.6%	12.5%	8.0%	3.9%	11.8%	39,710	3.7%
Kidney and Renal Pelvis	1.8%	51.1%	8.9%	12.5%	15.6%	10.2%	34,857	3.3%
Other/Ill Defined Sites	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	32,286	3.0%
Corpus Uteri (Uterine)	1.2%	63.4%	6.9%	11.3%	5.8%	11.4%	31,642	3.0%
NHL-Nodal (Non-Hodgkin lymphoma) [6]	0.0%	17.2%	14.8%	19.1%	33.5%	15.4%	27,868	2.6%
Thyroid	0.0%	60.1%	10.9%	11.7%	6.9%	10.4%	25,739	2.4%
Pancreas	0.6%	8.1%	19.2%	10.9%	46.2%	15.1%	25,287	2.4%
Rectum	7.2%	26.1%	18.8%	20.3%	13.0%	14.7%	23,034	2.1%
Lung, Bronchus Small Cell Carcinoma	0.2%	5.5%	3.5%	26.3%	54.5%	10.1%	20,872	1.9%
Brain	0.0%	3.1%	0.1%	0.0%	0.7%	96.1%	18,359	1.7%
Ovary	0.0%	20.6%	7.8%	37.5%	22.9%	11.2%	15,826	1.5%
Stomach	1.7%	16.3%	10.0%	14.2%	30.1%	27.8%	15,101	1.4%
Lung, Bronchus Other Types	0.3%	12.3%	3.4%	16.8%	46.2%	21.0%	12,167	1.1%
Esophagus	2.7%	11.6%	19.3%	19.6%	28.9%	17.8%	11,920	1.1%
Liver	0.0%	20.3%	15.3%	20.4%	19.5%	24.5%	11,867	1.1%
Myeloma [7]	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**100.0%**	**11,328**	**1.1%**
Larynx	5.9%	31.0%	15.5%	16.5%	25.0%	6.1%	10,343	1.0%
Cervix Uteri (Cervical)	0.7%	43.7%	16.7%	19.9%	11.0%	7.9%	10,183	1.0%
NHL - Extranodal [8]	0.0%	38.9%	13.8%	4.7%	24.0%	18.5%	10,055	0.9%
Soft Tissue [9]	**0.0%**	**18.7%**	**15.3%**	**15.7%**	**11.2%**	**39.1%**	**7,623**	**0.7%**
Bones and Joints [10]	**0.0%**	**28.8%**	**24.4%**	**2.0%**	**11.2%**	**33.6%**	**2,186**	**0.2%**
All Cancer Cases (top 73 sites)	7.5%	24.2%	22.0%	13.0%	15.2%	18.1%	1,071,787	

Table 8A.5.1: Average Annual Case Distribution by Stage for Top 24 Cancer Sites, Soft Tissue Cancers, and Bone and Joint Cancers, Diagnosis Years 2000 to 2011

[1] Carcinoma in situ: cancer cells present but have not spread to neighboring tissue,

[2] Cancers are localized to one part of the body. Stage I cancer can be surgically removed if small enough.

[3] Cancers are early locally advanced. Stage II cancer can be treated by chemo, radiation, or surgery.

[4] Cancers are late locally advanced. Whether a cancer is designated as Stage II or Stage III can depend on the specific type of cancer. Stage III can be treated by chemo, radiation, or surgery.

[5] The cancer has spread to distant tissues or organs (metastasized). Stage IV cancer can be treated by chemo, radiation, or surgery.

[6] Lymphoma in lymph nodes or other lymphatic tissues (e.g., spleen, thymus).

[7] Cancer of plasma cells, a type of white blood cell normally responsible for producing antibodies. In multiple myeloma, collections of abnormal plasma cells assimilate in the bone marrow and interfere wit the production of normal blood cells. Bone pain affects almost 70% of patients and is the most common symptom.

[8] Non-Hodgkin lymphoma in other organs than nodes.

[9] Sarcomas that develop in connective tissue (e.g., muscle, blood vessels, lymph vessels, synovial tissue, fat, cartilage and bone-forming tissue).

[10] Relatively rare, bone cancer includes only primary bone and joint sarcomas, with malignant tumors forming in the bone matrix or cartilage. Secondary bone cancer is much more common and results from metastasizing of cancer from another part of the body. Cancers of the bone marrow are classified as multiple myeloma.

Source: American College of Surgeons. NCDB Benchmarks. National Cancer Database Comparison Reports: NCDB Analytic Cases: Disease Site by American Joint Committee on Cancer Stage, Dx Years: 2000 to 2011. https://cromwell.facs.org/Bmarks/BMCmp/ver10/Docs/ Accessed January 7, 2014.

Table 8A.5.2: Growth Rate in Number of Cases for Top 24 Cancer Sites, Soft Tissue Cancers, and Bone and Joint Cancers, Diagnosis Years 2000 to 2011

Primary Site	Average Cases Per Year, 2000 to 2011	Growth Rate in Number of Cases, 2000 to 2011
Breast	191,172	22.0%
Prostate	132,363	-0.5%
Lung, Bronchus - Non-small cell carcinoma	115,105	43.1%
Colon	70,408	-5.5%
Bladder	43,522	26.0%
Melanoma - Skin	39,728	47.1%
Kidney and Renal Pelvis	34,898	71.2%
Other/Ill Defined Sites	32,316	58.8%
Corpus Uteri (Uterine)	31,700	46.3%
NHL-Nodal (Non-Hodgkin lymphoma) [1]	27,890	23.8%
Thyroid	25,760	126.6%
Pancreas	25,293	58.5%
Rectum	23,060	2.2%
Lung, Bronchus Small Cell Carcinoma	20,901	7.3%
Brain	16,904	38.9%
Ovary	15,855	10.7%
Stomach	15,128	22.7%
NHL - Extranodal [2]	12,775	30.2%
Lung, Bronchus Other Types	12,189	-60.9%
Esophagus	11,936	17.4%
Liver	11,884	127.8%
Myeloma [3]	**11,346**	**47.0%**
Larynx	10,358	1.2%
Cervix Uteri (Cervical)	10,201	-10.2%
Soft Tissue [4]	**7,624**	**30.5%**
Bones and Joints [5]	**2,188**	**14.5%**
All Cancer Cases (top 73 sites)	1,073,106	23.4%

[1] Lymphoma in lymph nodes or other lymphatic tissues (e.g., spleen, thymus).
[2] Non-Hodgkin lymphoma in other organs than nodes.
[3] Cancer of plasma cells, a type of white blood cell normally responsible for producing antibodies. In multiple myeloma, collections of abnormal plasma cells assimilate in the bone marrow and interfere wit the production of normal blood cells. Bone pain affects almost 70% of patients and is the most common symptom.
[4] Sarcomas that develop in connective tissue (e.g., muscle, blood vessels, lymph vessels, synovial tissue, fat, cartilage and bone-forming tissue).
[5] Relatively rare, bone cancer includes only primary bons and joints sarcomas, with malignant tumors forming in the bone matrix or cartilage. Secondary bone cancer is much more common and results from metastasizing of cancer from another part of
Source: American College of Surgeons. NCDB Benchmarks. National Cancer Database Comparison Reports: NCDB Analytic Cases: Disease Site by American Joint Committee on Cancer Stage, Dx Years: 2000 to 2011.
https://cromwell.facs.org/Bmarks/BMCmp/ver10/Docs/ Accessed January 9, 2015.

Table 8A.6.1: Prevalence Counts of People Previously Diagnosed with Cancer as Children[1], United States 2010

	Complete Prevalence Counts by Age							5-Year Relative Survival, 2003-2009 [15]					
	0-19	20-29	30-39	40-49	50-59	60 & Over	All Ages	Ages 0-19	< 1 Year	Ages 1-4	Ages 5-9	Ages 10-14	Ages 15-19
Malignant Bone Tumors [2]	3,766	4,194	3,184	2,489	2,320	815	16,768	68.7%	–	74.0%	73.3%	72.9%	63.0%
Osteosarcoma [3]	1,895	2,216	1,804	1,246	1,172	770	9,103	66.6%	–	–	66.7%	72.4%	60.7%
Ewing's Sarcoma [4]	1,394	1,377	946	670	405	94	4,886	67.3%	–	82.0%	82.4%	68.1%	56.4%
Soft Tissue & Other Extraosseous Sarcomas [5]	6,849	6,964	4,239	4,829	4,161	4,406	31,448	70.5%	65.4%	72.5%	76.6%	70.0%	68.4%
Leukemia [6]													
Acute Lymphocytic Leukemia [7]	30,171	16,529	9,420	3,992	375	2	60,489	86.6%	55.8%	93.1%	90.3%	80.6%	72.5%
Acute Myeloid Leukemia [8]	4,045	2,249	1,145	619	207	2	8,267	61.5%	62.5%	65.4%	65.3%	62.4%	55.2%
Lymphoma													
Hodgkin Lymphoma [9]	4,514	8,955	8,202	7,786	4,629	1,167	35,253	96.6%	–	96.5%	96.4%	97.1%	96.4%
Non-Hodgkin Lymphoma [10]	6,442	6,675	4,192	2,780	1,601	1,053	22,743	85.3%	–	92.4%	89.4%	84.4%	82.5%
Brain and Nervous Systems													
CNS and misc. Intracranial & Intraspinal Neoplasms [11]	20,430	15,174	8,801	8,415	4,806	1,457	59,083	73.0%	55.6%	72.4%	71.7%	77.0%	77.0%
Neuroblastoma & Other Peripheral Nervous Cell Tumor [12]	9,704	3,628	2,190	1,617	1,573	740	19,452	78.5%	91.1%	72.4%	69.3%	69.7%	87.6%
Renal Tumors [13]	7,831	4,651	3,801	4,192	2,323	740	23,538	88.8%	90.4%	89.6%	88.2%	81.4%	86.8%
Germ Cell & Trophoblastic Tumors & Neoplasms of Gonads [14]	5,219	7,632	5,531	6,273	6,614	6,468	37,737	92.1%	92.1%	94.1%	89.1%	94.2%	91.6%
All Sites Childhood Cancers	113,782	93,658	62,583	55,044	36,545	17,500	379,112	82.1%	77.5%	83.8%	81.7%	80.9%	82.8%

[1] Number of people diagnosed with cancer as children (ages 0-19) in the United States and Alive on January 1, 2010.

[2] Most bone cancers are formed somewhere else in the body and spread to the bones. These cancers retain the characteristics of the site from which they migrated. A primary bone tumor starts in the bone itself, and is called a sarcoma. Sarcomas can start in bone or soft tissue.

[3] The most common type of primary bone cancer that in the matrix that forms normal bones. Most osteosarcomas occur in children and young adults in areas where bone is growing rapidly. The most common sites for tumors are the arms, legs, and pelvis.

[4] Most Ewing tumors occur in bones, with the most common sites being the pelvis, chest wall (ribs or shoulder blades), and the legs, mainly the middle of the long bones. Most Ewing tumors occur in children and teens.

[5] Soft tissue sarcomas develop in soft tissue, such as fat, muscle, nerves, fibrous tissues, blood vessels, or deep skin tissue.

[6] There are many types of leukemia, which differ based on what types of cells they start in, how quickly they grow, which people they affect, and how they are treated. Leukemia is the most common cancer in children and teens. Most are acute lymphocytic leukemia. Of the remaining cases, most are acute myeloid leukemia.

[7] Cancer that starts from white blood cells in the bone marrow. The term "acute" means the leukemia can progress quickly, and if not treated, would probably be fatal within a few months.

[8] Cancer that starts in cells that would normally develop into different types of blood cells, other than lymphocytes. It is most common in older persons.

[9] Cancer of the lymph system. It can start anywhere, but is most common in the chest, neck, or under the arms. Both children and adults can develop Hodgkin disease.

Table 8A.6.1: Prevalence Counts of People Previously Diagnosed with Cancer as Children[1], United States 2010

[10] Non-Hodgkin lymphoma starts in the lymphocytes, a part of the body's immune system.

[11] Brain tumors can start in any part of the brain or nervous system, but in children are most likely to be in lower parts of the brain, such as the cerebellum or brain stem, and may be of a variety of tumors.

[12] Neuroblastoma is a form of cancer that starts in certain types of very primitive nerve cells found in an embryo or fetus. This type of cancer occurs in infants and young children, and is rarely found in children older than 10 years.

[13] Cancers of the kidneys. Renal cancer is much more common in adults than in children.

[14] Tumors that develop from germ cells, which may be cancerous or non-cancerous. Germ cells normally occur inside the gonads (ovary and testis).

[15] Relative survival statistics compare the survival of patients diagnosed with cancer with the survival of people in the general population who are the same age, race, and sex and who have not been diagnosed with cancer.

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 29.7: U.S. Childhood Cancer Survivors at January 1, 2010* and *Table 29.6: 5-Year Relative Survival (Percent), 2003-2009.* Accessed January 6, 2014.

Table 8A.6.2: Prevalence of Childhood[1] Bone Cancers by Sex, United States, 2010

	Prevalence by Ages			% of Total	
	Both Sexes	Females	Males	Females	Males
Osteosarcoma [2]					
0-19	1,895	833	1062	44%	56%
20-29	2,216	931	1285	42%	58%
30-39	1,804	787	1017	44%	56%
40-49	1,246	645	601	52%	48%
50-59	1,172	726	446	62%	38%
60 & Over	770	393	377	51%	49%
All Ages	9,103	4315	4788	47%	53%
Ewing's Sarcoma [3]					
0-19	1,394	534	860	38%	62%
20-29	1,377	581	796	42%	58%
30-39	946	484	462	51%	49%
40-49	670	347	323	52%	48%
50-59	405	194	211	48%	52%
60 & Over	94	60	34	64%	36%
All Ages	4,886	2200	2686	45%	55%
Total Malignant Bone Tumors [4]					
0-19	3,766	1514	2252	40%	60%
20-29	4,194	1761	2433	42%	58%
30-39	3,184	1429	1755	45%	55%
40-49	2,489	1252	1237	50%	50%
50-59	2,320	1311	1009	57%	43%
60 & Over	815	381	434	47%	53%
All Ages	16,768	7648	9120	46%	54%

[1] Number of people diagnosed with cancer as children (ages 0-19) in the United States and Alive on January 1, 2010.

[2] The most common type of primary bone cancer is found in the matrix that forms normal bones. Most osteosarcomas occur in children and young adults in areas where bone is growing rapidly. The most common sites for tumors are the arms, legs, and pelvis.

[3] Most Ewing tumors occur in bones, with the most common sites being the pelvis, chest wall (ribs or shoulder blades), and the legs, mainly the middle of the long bones. Most Ewing tumors occur in children and teens.

[4] Most bone cancers are formed somewhere else in the body and spread to the bones. These cancers retain the characteristics of the site from which they migrated. A primary bone tumor starts in the bone itself, and is called a sarcoma. Sarcomas can start in bone

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 29.7: U.S. Childhood Cancer Survivors at January 1, 2010.* Accessed January 6, 2014.

Table 8A.6.3: Age-Adjusted[1] Incidence Trends of Childhood Cancers, United States, 1975-2010

	% of Change, 1975-2010 , Ages 0-14			Annual % of	% of Change, 1975-2010 , Ages 0-19			Annual % of
	All	Females	Males	Change All	All	Females	Males	Change All
Primary Malignant Bone Tumors [2]	47.2%	73.6%	28.5%	0.1%	0.4%	4.4%	-2.9%	0.1%
Osteosarcoma [3]	[a]	[a]	[a]	[a]	44.4%	24.3%	[a]	0.4%
Ewing's Sarcoma [4]	38.1%	[a]	[a]	[a]	-8.1%	[a]	-21.9%	-0.3%
Soft Tissue & Other Extraosseous Sarcomas [5]	37.6%	43.5%	32.2%	0.7%	46.0%	58.6%	34.7%	0.7%
Leukemia [6]								
Acute Lymphocytic Leukemia [7]	66.5%	77.9%	58.7%	0.7%	56.4%	71.4%	46.1%	0.7%
Acute Myeloid Leukemia [8]	43.6%	70.3%	22.4%	1.2%	32.1%	71.3%	2.6%	1.1%
Lymphoma								
Hodgkin Lymphoma [9]	-30.7%	-24.9%	-35.0%	-0.8%	-16.9%	-16.4%	-17.5%	-0.7%
Non-Hodgkin Lymphoma [10]	29.3%	87.9%	9.2%	0.8%	47.5%	66.2%	38.5%	1.1%
Brain and Nervous Systems								
CNS and misc. Intracranial & Intraspinal Neoplasms [11]	81.0%	66.7%	96.3%	1.0%	66.0%	60.5%	71.9%	0.9%
Neuroblastoma & Other Peripheral Nervous Cell Tumor [12]	-12.9%	-31.4%	8.7%	0.3%	-11.1%	-28.4%	8.3%	0.3%
Renal Tumors [13]	38.8%	63.6%	17.1%	-0.1%	30.8%	60.2%	6.2%	0.0%
Germ Cell & Trophoblastic Tumors & Neoplasms of Gonads [1	84.6%	91.2%	78.3%	1.2%	49.2%	5.3%	101.9%	0.9%
All Sites Childhood Cancers	41.2%	47.1%	36.5%	0.6%	33.7%	37.8%	30.1%	0.6%

[a] Statistic cannot be calculated due to low number of cases.

[1] Age-adjusted to the 2000 U.S. Standard Population (19 age groups - Census P25-1130).

[2] Most bone cancers are formed somewhere else in the body and spread to the bones. These cancers retain the characteristics of the site from which they migrated. A primary bone tumor starts in the bone itself, and is called a sarcoma. Sarcomas can start in bone or soft tissue.

[3] The most common type of primary bone cancer is found in the matrix that forms normal bones. Most osteosarcomas occur in children and young adults in areas where bone is growing rapidly. The most common sites for tumors are the arms, legs, and pelvis.

[4] Most Ewing tumors occur in bones, with the most common sites being the pelvis, chest wall (ribs or shoulder blades), and the legs, mainly the middle of the long bones. Most Ewing tumors occur in children and teens.

[5] Soft tissue sarcomas develop in soft tissue, such as fat, muscle, nerves, fibrous tissues, blood vessels, or deep skin tissue.

Table 8A.6.3: Age-Adjusted[1] Incidence Trends of Childhood Cancers, United States, 1975-2010

[6] There are many types of leukemia, which differ based on what types of cells they start in, how quickly they grow, which people they affect, and how they are treated. Leukemia is the most common cancer in children and teens. Most are acute lymphocytic leukemia. Of the remaining cases, most are acute myeloid leukemia.

[7] Cancer that starts from white blood cells in the bone marrow. The term "acute" means the leukemia can progress quickly, and if not treated, would probably be fatal within a few months.

[8] Cancer that starts in cells that would normally develop into different types of blood cells, other than lymphocytes. It is most common in older persons.

[9] Cancer of the lymph system. It can start anywhere, but is most common in the chest, neck, or under the arms. Both children and adults can develop Hodgkin disease.

[10] Non-Hodgkin lymphoma starts in the lymphocytes, a part of the body's immune system.

[11] Brain tumors can start in any part of the brain or nervous system, but in children are most likely to be in lower parts of the brain, such as the cerebellum or brain stem, and may be of a variety of tumors.

[12] Neuroblastoma is a form of cancer that starts in certain types of very primitive nerve cells found in an embryo or fetus. This type of cancer occurs in infants and young children, and is rarely found in children older than 10 years.

[13] Cancers of the kidneys. Renal cancer is much more common in adults than in children.

[14] Tumors that develop from germ cells, which may be cancerous or non-cancerous. Germ cells normally occur inside the gonads (ovary and testis).

[15] Relative survival statistics compare the survival of patients diagnosed with cancer with the survival of people in the general population who are the same age, race, and sex and who have not been diagnosed with cancer.

Source: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. *Table 29.3/4/5: Age-Adjusted Cancer Incidence Trends, 1975-2010.* Accessed January 6, 2014.

Table 8A.7.1: Surgically Treated Benign Soft Tissue Tumor Incidence

Tumor	Number [1]	Incidence Relative to Osteosarcoma [2]	Minimal Estimated National Incidence [3]
Lipoma	182	2.43	2,226
Ganglion	95	1.27	1,163
Hemangioma	51	0.68	623
Pigmented Villonodular Synovitis/Giant Cell Tumor of Tendon Sheatl	45	0.60	550
Myxoma	38	0.51	467
Desmoid/Fibromatosis	39	0.52	476
Neurilemmoma	30	0.40	366
Neurofibroma	19	0.25	229
Myositis Ossificans	14	0.19	174
Fibroma	14	0.19	174
Other	293	3.91	3,582

[1] Ward WG: case series 1991-2004 by patients.

[2] Ward WG: Computation of relative prevalence based on n=75 cases of osteosarcoma (i.e., (number/75).

[3] Calculated as annual prevalence of cases relative to osteosarcoma (i.e., column 2 * national cases of osteosarcoma (n = 916)). This provides a gross underestimate of the US national burden of these tumors, as many (perhaps most) are treated by other physicians, including family physicians, general surgeons and general orthopaedic surgeons.

Table 8A.7.2: Neoplasms of the Bones, Joints and Soft Tissues, 20-Year Cumulative Case Counts, 1985-2004, National Cancer Data Base of the American College of Surgeons Commission on Cancer

Bone & Joint Tumors	**Number**
Total Bone Chondrosarcomas	11,585
Total Bone & Joint Osteosarcomas	14,191

Bone & Joint Tumors by Type	
Adamantinoma of Long Bones	196
Chondrosarcoma Dedifferentiated	238
Chondrosarcoma Juxtacortical	103
Chondrosarcoma Mesenchymal	251
Chondrosarcoma Myxoid	874
Chondrosarcoma, NOS	10,119
Chordoma	2,339
Ewing's Sarcoma	5,882
Fibrosarcoma, NOS	405
Giant Cell Tumor of Bone Malignant	606
Hemangioendothelioma Malignant	141
Hemangiosarcoma	322
Leiomyosarcoma	161
Malignant Fibrous Histiocytoma	1,266
Osteosarcoma Chondroblastic	1,564
Osteosarcoma Fibroblastic	676
Osteosarcoma in Pagets Disease of Bone	285
Osteosarcoma Parosteal	756
Osteosarcoma Small Cell	120
Osteosarcoma Telangiectatic	354
Osteosarcoma, NOS	10,436
Primitive Neuroectodermal Tumor	213
Sarcoma, NOS	668
Spindle Cell Sarcoma	338
Total	38,313

Soft Tissue Tumors	**Number**
Soft Tissue Malignant Hemangioendothelioma	333
Soft Tissue Chondrosarcomas	1,711
Soft Tissue Rhabdomyosarcomas	5,092
Soft Tissue Synovial Sarcomas	5,689
Soft Tissue Leiomyosarcomas*	14,622
Soft Tissue Liposarcomas	18,106

Soft Tissue Tumors (by Type)	
Alveolar Soft Part Sarcoma	517
Carcinosarcoma, NOS	187
Chondrosarcoma Mesenchymal	227
Chondrosarcoma Myxoid	750
Chondrosarcoma, NOS	734
Chordoma	303

Soft Tissue Tumors by Type (continued)	**Number**
Clear Cell Sarcoma	809
Dermatofibrosarcoma, NOS	2,956
Desmoplastic Small Round Cell Tumor	162
Epithelioid Sarcoma	1,271
Ewing's Sarcoma	1,113
Fibromyxosarcoma	1,523
Fibrosarcoma Infantile	193
Fibrosarcoma, NOS	3,421
Giant Cell Sarcoma	1,660
Giant Cell Tumor of Soft Parts Malignant	132
Granular Cell tumor Malignant	106
Hemangioendothelioma Malignant	162
Hemangioendothelioma Malignant Epithelioid	171
Hemangiopericytoma Malignant	986
Hemangiosarcoma	3,345
Kaposi Sarcoma	2,914
Leiomyosarcoma*	13,719
Leiomyosarcoma Epithelioid*	629
Leiomyosarcoma Myxoid*	274
Liposarcoma Mixed	627
Liposarcoma Myxoid	6,026
Liposarcoma Pleomorphic	2,288
Liposarcoma Round Cell	612
Liposarcoma Well Differentiated	3,989
Liposarcoma, NOS	3,551
Lipsosarcoma Dedifferentiated	1,013
Malignant Fibrous Histiocytoma	25,559
Mesenchymoma Malignant	253
Myxosarcoma	363
Neurilemmoma Malignant	1,343
Neurofibrosarcoma	1,583
Osteosarcoma, NOS	571
Peripheral Neuroectodermal Tumor	386
Primitive Neuroectodermal Tumor	581
Rhabdomyosarcoma Alveolar	1,419
Rhabdomyosarcoma Embryonal	1,801
Rhabdomyosarcoma, NOS	1,316
Rhabdomysarcoma Pleomorphic	556
Sarcoma Rhabdoid	140
Sarcoma, NOS	9,007
Small Cell Sarcoma	501
Spindle Cell Sarcoma	4,181
Synovial Sarcoma Biphasic	1,116
Synovial Sarcoma Spindle Cell	1,168
Synovial Sarcoma, NOS	3,405

* Totals include Gynecologic Leiomyosarcomas of the Uterus.
Source: American College of Surgeons National Cancer Data Base.

Table 8A.8.1: Bone Sarcoma 2- and 5-Year Survival Estimates by Type of Cancer, United States, 1998-2011

Type	Total N	2 Year Survival (95% CI)	5 Year Survival (95% CI)
Chondrosarcoma, NOS	3855	86.4% (85.3%, 87.5%)	77.7% (76.3%, 79.0%)
Osteosarcoma, NOS	2037	65.0% (62.8%, 67.1%)	49.0% (46.7%, 51.2%)
Ewing sarcoma	1146	62.0% (59.0%, 64.8%)	41.5% (38.4%, 44.5%)
Chondroblastic osteosarcoma	456	69.8% (65.3%, 73.9%)	53.0% (48.1%, 57.7%)
Myxoid chondrosarcoma	381	81.0% (76.5%, 84.7%)	66.7% (61.5%, 71.5%)
Sarcoma, Spindle Cell, Undifferentiated and NOS	347	43.3% (37.9%, 48.6%)	29.5% (24.5%, 34.6%)
Fibrous histiocytoma, malignant	317	60.2% (54.5%, 65.5%)	43.8% (38.0%, 49.4%)
Fibroblastic osteosarcoma	238	80.0% (74.3%, 84.6%)	61.5% (54.8%, 67.5%)
Dedifferentiated chondrosarcoma	223	31.9% (25.7%, 38.2%)	21.6% (16.3%, 27.5%)
Parosteal osteosarcoma	205	93.5% (88.8%, 96.2%)	88.1% (82.3%, 92.1%)
Hemangiosarcoma	153	33.8% (26.3%, 41.6%)	25.4% (18.5%, 32.8%)
Fibrosarcoma, NOS	96	66.1% (55.3%, 74.8%)	55.2% (44.2%, 64.9%)
Peripheral/Primitive neuroectodermal and Askin tumor	91	62.8% (51.7%, 72.1%)	42.8% (32.0%, 53.2%)
Mesenchymal chondrosarcoma	87	72.9% (62.1%, 81.1%)	56.8% (45.5%, 66.7%)
Telangiectatic osteosarcoma	86	65.0% (53.6%, 74.2%)	52.2% (40.8%, 62.4%)
Leiomyosarcoma, NOS	85	73.8% (62.7%, 82.1%)	46.2% (34.4%, 57.2%)
Adamantinoma of long bones	58	98.2% (88%, 99.7%)	91.8% (79.5%, 96.9%)
Juxtacortical chondrosarcoma	56	98.2% (87.8%, 99.7%)	96.3% (85.8%, 99.1%)
Periosteal osteosarcoma	40	89.7% (74.9%, 96%)	73.4% (56.1%, 84.8%)
Clear cell chondrosarcoma	40	94.7% (80.4%, 98.7%)	91.8% (76.7%, 97.3%)
Total	9,997		

Source: American College of Surgeons National Cancer Data Base (NCDB).
NOTE: NCDB Adult Bone Sarcoma Data Summary
Demographic data was available on adult (18 years old and older) cases diagnosed from 1998 – 2011. A total of 21,922 cases were available, of which we selected the 18,580 cases with the greatest frequency of diagnosis. Two- and 5-year mortality was only available for 11,684 cases from 1998 – 2006. We selected the following 9,997 cases to report in tabular form. The sample size by cancer type is provided in the tables. The difference in sample size is related to excluding cases without follow up data. Per NCDB, mortality data is not available for the last five years of collection (2007-2011). Also, per NCDB, cases were excluded if they had multiple cancer types.

The NCDB is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The data used in this study and this report are derived from a de-identified NCDB file. The American College of Surgeons and the Commission on Cancer have not verified and are not responsible for the analytic or statistical methodology employed, or the conclusions drawn from these data by the investigator and authors of this work.

Table 8A.8.2: Demographic Descriptive Statistics by Bone Cancer Type, by Age, United States, 1998-2011

		Age Category (N (% in Age Group))						
Type	Total N	18-29	30-39	40-49	50-59	60-69	70-79	80+
Chondrosarcoma, NOS	6993	620 (8.9%)	953 (13.6%)	1401 (20%)	1452 (20.8%)	1166 (16.7%)	920 (13.2%)	481 (6.9%)
Osteosarcoma, NOS	3876	1297 (33.5%)	501 (12.9%)	556 (14.3%)	506 (13.1%)	438 (11.3%)	358 (9.2%)	220 (5.7%)
Ewing sarcoma	1956	1240 (63.4%)	327 (16.7%)	208 (10.6%)	94 (4.8%)	51 (2.6%)	25 (1.3%)	11 (0.6%)
Chondroblastic osteosarcoma	920	364 (39.6%)	136 (14.8%)	128 (13.9%)	108 (11.7%)	94 (10.2%)	53 (5.8%)	37 (4%)
Sarcoma, Spindle Cell, Undifferentiated and NOS	882	71 (8%)	84 (9.5%)	101 (11.5%)	153 (17.3%)	172 (19.5%)	173 (19.6%)	128 (14.5%)
Myxoid chondrosarcoma	616	57 (9.3%)	85 (13.8%	115 (18.7%)	126 (20.5%	100 (16.2%)	90 (14.6%)	43 (7%)
Dedifferentiated chondrosarcoma	563	5 (0.9%)	17 (3%)	65 (11.5%)	101 (17.9%)	144 (25.6%)	134 (23.8%)	97 (17.2%)
Fibrous histiocytoma, malignant	543	26 (4.8%)	49 (9%)	74 (13.6%)	112 (20.6%)	119 (21.9%)	90 (16.6%)	73 (13.4%)
Fibroblastic osteosarcoma	422	129 (30.6%)	66 (15.6%)	85 (20.1%)	57 (13.5%	42 (10%)	27 (6.4%)	16 (3.8%)
Parosteal osteosarcoma	334	155 (46.4%)	79 (23.7%)	55 (16.5%)	27 (8.1%)	8 (2.4%)	4 (1.2%)	6 (1.8%)
Hemangiosarcoma	310	9 (2.9%)	14 (4.5%)	30 (9.7%	38 (12.3%)	77 (24.8%)	86 (27.7%)	56 (18.1%)
Leiomyosarcoma, NOS	187	12 (6.4%)	20 (10.7%)	30 (16%)	38 (20.3%)	38 (20.3%)	32 (17.1%)	17 (9.1%)
Fibrosarcoma, NOS	174	23 (13.2%)	18 (10.3%)	29 (16.7%	28 (16.1%	34 (19.5%)	26 (14.9%)	16 (9.2%)
Telangiectatic osteosarcoma	150	73 (48.7%)	27 (18%)	25 (16.7%	5 (3.3%)	8 (5.3%)	7 (4.7%)	5 (3.3%)
Peripheral/Primitive neuroectodermal and Askin tumor	150	80 (53.3%)	28 (18.7%)	20 (13.3%)	9 (6%)	6 (4%)	6 (4%)	1 (0.7%)
Mesenchymal chondrosarcoma	128	46 (35.9%)	28 (21.9%)	24 (18.8%)	12 (9.4%)	8 (6.3%)	6 (4.7%)	4 (3.1%)
Clear cell chondrosarcoma	104	16(15.4%)	18 (17.3%0)	28 (26.9%)	19 (18.3%)	16 (15.4%)	5 (4.8%)	2 (1.9%)
Adamantinoma of long bones	101	39 (38.6%)	21 (20.8%)	15 (14.9%)	16 (15.8%)	6 (5.9%)	3 (3%)	1 (1%)
Juxtacortical chondrosarcoma	97	14 (14.4%)	25 (25.8%)	24 (24.7%)	10 (10.3%)	11 (11.3%)	9 (9.3%)	4 (4.1%)
Periosteal osteosarcoma	74	40 (54.1%)	16 (21.6%)	10 (13.5%)	3 (4.1%)	2 (2.7%)	2 (2.7%)	1 (1.4%)
Total	18,580							

Source: American College of Surgeons National Cancer Data Base (NCDB).

NOTE: NCDB Adult Bone Sarcoma Data Summary

Demographic data was available on adult (18 years old and older) cases diagnosed from 1998 – 2011. A total of 21,922 cases were available, of which we selected the 18,580 cases with the greatest frequency of diagnosis. Two- and 5-year mortality was only available for 11,684 cases from 1998 – 2006. We selected the following 9,997 cases to report in tabular form. The sample size by cancer type is provided in the tables. The difference in sample size is related to excluding cases without follow up data. Per NCDB, mortality data is not available for the last five years of collection (2007-2011). Also, per NCDB, cases were excluded if they had multiple cancer types.

The NCDB is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The data used in this study and this report are derived from a de-identified NCDB file. The American College of Surgeons and the Commission on Cancer have not verified and are not responsible for the analytic or statistical methodology employed, or the conclusions drawn from these data by the investigator and authors of this work.

Table 8A.8.3: Demographic Descriptive Statistics by Bone Cancer Type, by Sex, United States, 1998-2011

		Sex (N (% in Sex Group))	
Type	Total N	Male	Female
Chondrosarcoma, NOS	6993	3537 (50.6%)	3456 (49.4%)
Osteosarcoma, NOS	3876	2163 (55.8%)	1713 (44.2%)
Ewing sarcoma	1956	1274 (65.1%)	682 (34.9%)
Chondroblastic osteosarcoma	920	527 (57.3%)	393 (42.7%)
Sarcoma, Spindle Cell, Undifferentiated and NOS	882	468 (53.1%)	414 (46.9%)
Myxoid chondrosarcoma	616	371 (60.2%)	245 (39.8%)
Dedifferentiated chondrosarcoma	563	284 (50.4%)	279 (49.6%)
Fibrous histiocytoma, malignant	543	290 (53.4%)	253 (46.6%)
Fibroblastic osteosarcoma	422	242 (57.3%)	180 (42.7%)
Parosteal osteosarcoma	334	128 (38.3%)	206 (61.7%)
Hemangiosarcoma	310	193 (62.3%)	117 (37.7%)
Leiomyosarcoma, NOS	187	89 (47.6%)	98 (52.4%)
Fibrosarcoma, NOS	174	102 (58.6%)	72 (41.4%
Telangiectatic osteosarcoma	150	100 (66.7%)	50 (33.3%)
Peripheral/Primitive neuroectodermal and Askin tumor	150	103 (68.7%)	47 (31.3%)
Mesenchymal chondrosarcoma	128	60 (46.9%)	68 (53.1%)
Clear cell chondrosarcoma	104	70 (67.3%)	34 (32.7%)
Adamantinoma of long bones	101	53 (52.5%)	48 (47.5%)
Juxtacortical chondrosarcoma	97	62 (63.9%)	35 (36.1%)
Periosteal osteosarcoma	74	41 (55.4%)	33 (44.6%)
Total	18,580		

Source: American College of Surgeons National Cancer Data Base (NCDB).
NOTE: NCDB Adult Bone Sarcoma Data Summary
Demographic data was available on adult (18 years old and older) cases diagnosed from 1998 – 2011. A total of 21,922 cases were available, of which we selected the 18,580 cases with the greatest frequency of diagnosis. Two- and 5-year mortality was only available for 11,684 cases from 1998 – 2006. We selected the following 9,997 cases to report in tabular form. The sample size by cancer type is provided in the tables. The difference in sample size is related to excluding cases without follow up data. Per NCDB, mortality data is not available for the last five years of collection (2007-2011). Also, per NCDB, cases were excluded if they had multiple cancer types.

The NCDB is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The data used in this study and this report are derived from a de-identified NCDB file. The American College of Surgeons and the Commission on Cancer have not verified and are not responsible for the analytic or statistical methodology employed, or the conclusions drawn from these data by the investigator and authors of this work.

Table 8A.9.1: Soft Tissue Cancer 2- and 5-Year Survival Estimates by Type of Cancer, United States, 1998-2011

Type	Total N	2 Year Survival (95% CI)	5 Year Survival (95% CI)
Fibrous histiocytoma, malignant	7890	71.6% (70.6%, 72.6%)	55.3% (54.2%, 56.5%)
Malignant Tumor, spindle cell type; Sarcoma, NOS; Spindle cell sarcoma; Undifferentiated sarcoma; Stromal sarcoma, NOS	6293	52.5% (51.2%, 53.7%)	41.0% (39.8%, 42.3%)
Liposarcoma Myxoid	2388	90.5% (89.2%, 91.6%)	80.5% (78.7%, 82.1%)
Synovial sarcoma (NOS, spindle cell epithelioid cell, biphasic)	2387	77.0% (75.2%, 78.7%)	58.8% (56.6%, 60.8%)
Liposarcoma, well differentiated	1892	94.2% (93.0%, 95.2%)	87.9% (86.2%, 89.3%)
Malignant peripheral nerve sheath tumor; Neurilemmoma, malignant; MPNST with rhabdomyoblastic differentiation	1833	63.1% (60.7%, 65.3%)	49.0% (46.6%, 51.4%)
Dermatofibrosarcoma, NOS; Pigmented dermatofibrosarcoma protuberans	1584	98.1% (97.3%, 98.7%)	95.3% (94.0%, 96.4%)
Liposarcoma, NOS	1478	84.0% (82.0%, 85.8%)	71.7% (69.2%, 74.1%)
Hemangiosarcoma	1277	43.0% (40.2%, 45.7%)	27.3% (24.8%, 29.9%)
Fibrosarcoma, NOS	1180	80.9% (78.4%, 83.1%)	67.1% (64.2%, 69.9%)
Fibromyxosarcoma	1128	90.3% (88.4%, 91.9%)	81.5% (78.9%, 83.7%)
Giant cell sarcoma	1096	60.9% (57.9%, 63.8%)	43.8% (40.7%, 46.8%)
Ewing sarcoma; Peripheral neuroectodermal tumor; Askin tumor; Primitive neuroectodermal tumor	840	63.7% (60.3%, 67.0%)	46.4% (42.7%, 49.9%)
Liposarcoma Pleomorphic	833	71.9% (68.6%, 74.9%)	52.6% (49.0%, 56.1%)
Liposarcoma Dedifferentiated	639	75.4% (71.8%, 78.6%)	57.2% (53.1%, 61.1%)
Epithelioid sarcoma	562	63.0% (58.7%, 66.9%)	51.1% (46.7%, 55.3%)
Chondrosarcoma Myxoid (extra-skeletal)	388	81.4% (76.9%, 85.1%)	70.8% (65.6%, 75.3%)
Hemangiopericytoma, malignant	324	81.5% (76.7%, 85.4%)	68.2% (62.6%, 73.2%)
Clear cell sarcoma, NOS (except of kidney)	291	68.0% (62.0%, 73.2%)	48.1% (41.9%, 54.0%)
Chondrosarcoma, NOS	282	82.0% (76.7%, 86.1%)	71.4% (65.3%, 76.7%)
Liposarcoma Round cell	255	81.1% (75.5%, 85.5%)	61.5% (54.9%, 67.4%)
Liposarcoma Mixed type	251	79.0% (73.2%, 83.7%)	67.2% (60.7%, 72.9%)
Pleomorphic rhabdomyosarcoma, adult type	250	43.2% (36.8%, 49.3%)	29.8% (24.1%, 35.8%)
Rhabdomyosarcoma, NOS	240	46.8% (40.2%, 53.1%)	30.2% (24.2%, 36.3%)
Osteosarcoma, NOS; Chondroblastic osteosarcoma; Fibroblastic osteosarcoma	239	62.1% (55.4%, 68.2%)	47.2% (40.3%, 53.8%)
Myxosarcoma	222	84.2% (78.5%, 88.5%)	72.9% (66.2%, 78.5%)
Rhabdomyosarcoma Alveolar	197	45.6% (38.2%, 52.6%)	23.5% (17.4%, 30.0%)
Alveolar soft part sarcoma	194	79.6% (73.0%, 84.8%)	51.2% (43.2%, 58.7%)

Table 8A.9.1: Soft Tissue Cancer 2- and 5-Year Survival Estimates by Type of Cancer, United States, 1998-2011

Type	Total N	2 Year Survival (95% CI)	5 Year Survival (95% CI)
Small cell sarcoma	155	54.9% (46.4%, 62.6%)	43.3% (35.0%, 51.4%)
Embryonal rhabdomyosarcoma	149	55.8% (47.1%, 63.6%)	43.4% (34.9%, 51.5%)
Desmoplastic small round cell tumor	140	47.7% (39.1%, 55.9%)	14.6% (9.2%, 21.3%)
Epithelioid hemangioendothelioma, malignant	111	75.3% (65.9%, 82.5%)	67.2% (57.3%, 75.4%)
Solitary fibrous tumor, malignant	97	83.7% (74.4%, 89.8%)	72.9% (62.3%, 81.0%)
Chondrosarcoma Mesenchymal	81	66.0% (54.0%, 75.6%)	43.5% (31.3%, 54.7%)
Mesenchymoma, malignant	66	57.9% (44.9%, 68.9%)	43.9% (31.3%, 55.9%)
Malignant myoepithelioma	40	94.9% (81.0%, 98.7%)	78.0% (60.7%, 88.4%)
Granular cell tumor, malignant	38	87.5% (70.0%, 95.1%)	77.8% (58.9%, 88.7%)
Merkel cell carcinoma	31	61.8% (39.8%, 77.8%)	50.6% (28.4%, 69.2%)

Source: American College of Surgeons National Cancer Data Base (NCDB).
NOTE: NCDB Adult Soft Tissue Sarcoma Data Summary
Demographic data is available on cases diagnosed from 1998 – 2011. A total of 91,163 cases were available. Mortality is only available from 44,065 cases reported 1998 – 2006. The sample size by cancer type is provided in the tables. The difference in sample size is related to excluding cases without followup data. Per NCDB, mortality data is not available for the last five years of collection (2007-2011). Also, per NCDB, cases were excluded if they had multiple cancer types. Note that this data set only included patients 18 years old and older. Data on children with cancer was not available for this analysis.

The NCDB is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The data used in this study and this report are derived from a de-identified NCDB file. The American College of Surgeons and the Commission on Cancer have not verified and are not responsible for the analytic or statistical methodology employed, or the conclusions drawn from these data by the investigator and authors of this work.

Table 8A.9.2: Demographic Descriptive Statistics by Soft Tissue Cancer Type, by Age, United States, 1998-2011

		Age Category (N (% in Age Group))						
Type	Total N	18-29	30-39	40-49	50-59	60-69	70-79	80+
Malignant Tumor, spindle cell type; Sarcoma, NOS; Spindle cell sarcoma; Undifferentiated sarcoma; Stromal sarcoma, NOS	13979	833 (6.0%)	1043 (7.5%)	1733 (12.4%)	2457 (17.6%)	2592 (18.5%)	2874 (20.6%)	2447 (17.5%)
Fibrous histiocytoma, malignant	13289	281 (2.1%)	590 (4.4%)	1312 (9.9%)	2136 (16.1%)	2640 (19.9%)	3379 (25.4%)	2951 (22.2%)
Liposarcoma Myxoid	4349	381 (8.8%)	810 (18.6%)	1082 (24.9%)	856 (19.7%)	579 (13.3%)	409 (9.4%)	232 (5.3%)
Liposarcoma, well differentiated	4304	62 (1.4%)	187 (4.3%)	604 (14%)	953 (22.1%)	1081 (25.1%)	913 (21.2%)	504 (11.7%)
Synovial sarcoma (NOS, spindle cell epithelioid cell, biphasic)	4175	1112 (26.6%)	877 (21%)	904 (21.7%)	620 (14.9%)	358 (8.6%)	207 (5.0%)	97 (2.3%)
Giant cell sarcoma	4141	89 (2.1%)	189 (4.6%)	413 (10%)	810 (19.6%)	919 (22.2%)	945 (22.8%)	776 (18.7%)
Malignant peripheral nerve sheath tumor; Neurilemmoma, malignant; MPNST with rhabdomyoblastic differentiation	3827	691 (18.1%)	680 (17.8%)	723 (18.9%)	646 (16.9%)	471 (12.3%)	376 (9.8%)	240 (6.3%)
Hemangiosarcoma	3471	92 (2.7%)	138 (4.0%)	261 (7.5%)	472 (13.6%)	684 (19.7%)	932 (26.9%)	892 (25.7%)
Liposarcoma, NOS	2876	48 (1.7%)	163 (5.7%)	380 (13.2%)	604 (21%)	639 (22.2%)	641 (22.3%)	401 (13.9%)
Dermatofibrosarcoma, NOS; Pigmented dermatofibrosarcoma protuberans	2776	459 (16.5%)	684 (24.6%)	693 (25%)	515 (18.6%)	221 (8.0%)	147 (5.3%)	57 (2.1%)
Fibromyxosarcoma	2356	204 (6.1%)	289 (8.6%)	459 (13.7%)	642 (19.1%)	664 (19.8%)	593 (17.7%)	505 (15%)
Fibrosarcoma, NOS	2102	202 (9.6%)	264 (12.6%)	366 (17.4%)	374 (17.8%)	314 (14.9%)	352 (16.7%)	230 (10.9%)
Liposarcoma Dedifferentiated	1768	16 (0.9%)	47 (2.7%)	180 (10.2%)	342 (19.3%)	452 (25.6%)	429 (24.3%)	302 (17.1%)
Liposarcoma Pleomorphic	1711	33 (1.9%)	71 (4.1%)	179 (10.5%)	342 (20%)	403 (23.6%)	428 (25%)	255 (14.9%)
Ewing sarcoma; Peripheral neuroectodermal tumor; Askin tumor; Primitive neuroectodermal tumor	1496	666 (44.5%)	309 (20.7%)	242 (16.2%)	141 (9.4%)	70 (4.7%)	49 (3.3%)	19 (1.3%)
Epithelioid sarcoma	1155	241 (20.9%)	198 (17.1%)	207 (17.9%)	195 (16.9%)	124 (10.7%)	115 (10%)	75 (6.5%)
Chondrosarcoma Myxoid	854	34 (4.0%)	93 (10.9%)	165 (19.3%)	200 (23.4%)	186 (21.8%)	114 (13.3%)	62 (7.3%)
Chondrosarcoma, NOS	581	41 (7.1%)	70 (12.0%)	82 (14.1%)	121 (20.8%)	108 (18.6%)	113 (19.4%)	46 (7.9%)
Hemangiopericytoma, malignant	566	27 (4.8%)	70 (12.4%)	100 (17.7%)	132 (23.3%)	112 (19.8%)	88 (15.5%)	37 (6.5%)
Pleomorphic rhabdomyosarcoma, adult type	566	24 (4.2%)	38 (6.7%)	69 (12.2%)	102 (18%)	134 (23.7%)	111 (19.6%)	88 (15.5%)
Osteosarcoma, NOS; Chondroblastic osteosarcoma; Fibroblastic osteosarcoma	562	49 (8.7%)	42 (7.5%)	75 (13.3%)	122 (21.7%)	112 (19.9%)	98 (17.4%)	64 (11.4%)
Myxosarcoma	558	14 (2.5%)	36 (6.5%)	88 (15.8%)	105 (18.8%)	109 (19.5%)	109 (19.5%)	97 (17.4%)
Rhabdomyosarcoma, NOS	555	130 (23.4%)	65 (11.7%)	51 (9.2%)	89 (16.0%)	80 (14.4%)	86 (15.5%)	54 (9.7%)
Liposarcoma Mixed Type	550	22 (4.0%)	72 (13.1%)	113 (20.5%)	120 (21.8%)	99 (18.0%)	79 (14.4%)	45 (8.2%)

Table 8A.9.2: Demographic Descriptive Statistics by Soft Tissue Cancer Type, by Age, United States, 1998-2011

		Age Category (N (% in Age Group))						
Type	Total N	18-29	30-39	40-49	50-59	60-69	70-79	80+
Clear cell sarcoma, NOS (except of kidney)	542	116 (21.4%)	111 (20.5%)	105 (19.4%)	89 (16.4%)	51 (9.4%)	44 (8.1%)	26 (4.8%)
Liposarcoma Round cell	460	29 (6.3%)	94 (20.4%)	126 (27.4%)	92 (20.0%)	59 (12.8%)	42 (9.1%)	18 (3.9%)
Rhabdomyosarcoma Alveolar	384	226 (58.9%)	52 (13.5%)	40 (10.4%)	26 (6.8%)	17 (4.4%)	16 (4.2%)	7 (1.8%)
Alveolar soft part sarcoma	340	209 (61.5%)	69 (20.3%)	30 (8.8%)	20 (5.9%)	6 (1.8%)	6 (1.8%)	15 (4.5%)
Small cell sarcoma	310	78 (25.2%)	50 (16.1%)	57 (18.4%)	60 (19.4%)	31 (10.0%)	18 (5.8%)	16 (5.2%)
Solitary fibrous tumor, malignant	305	12 (3.9%)	19 (6.2%)	39 (12.8%)	64 (21.0%)	68 (22.3%)	69 (22.6%)	34 (11.1%)
Desmoplastic small round cell tumor	296	169 (57.1%)	72 (24.3%)	36 (12.2%)	9 (3.0%)	4 (1.4%)	5 (1.7%)	1 (0.3%)
Rhabdomyosarcoma Embryonal	277	107 (38.6%)	44 (15.9%)	40 (14.4%)	31 (11.2%)	28 (10.1%)	14 (5.1%)	13 (4.7%)
Epithelioid hemangioendothelioma, malignant	213	23 (10.8%)	35 (16.4%)	53 (24.9%)	43 (20.2%)	28 (13.1%)	26 (12.2%)	5 (2.3%)
Mesenchymal chondrosarcoma	134	36 (26.9%)	33 (24.6%)	20 (14.9%)	16 (11.9%)	12 (9.0%)	11 (8.2%)	6 (4.5%)
Malignant myoepithelioma	108	17 (15.7%)	20 (18.5%)	20 (18.5%)	18 (16.7%)	10 (9.3%)	11 (10.2%)	12 (11.1%)
Mesenchymoma, malignant	90	15 (16.7%)	10 (11.1%)	14 (15.6%)	15 (16.7%)	10 (11.1%)	15 (16.7%)	11 (12.2%)
Merkel cell carcinoma	79	0 (0.0%)	1 (1.3%)	9 (11.4%)	10 (12.7%)	19 (24.1%)	18 (22.8%)	22 (27.8%)
Granular cell tumor, malignant	71	8 (11.3%)	9 (12.7%)	14 (19.7%)	18 (25.4%)	15 (21.1%)	5 (7.0%)	2 (2.8%)

Source: American College of Surgeons National Cancer Data Base (NCDB).
NOTE: NCDB Adult Soft Tissue Sarcoma Data Summary
Demographic data is available on cases diagnosed from 1998 – 2011. A total of 91,163 cases were available. Mortality is only available from 44,065 cases reported 1998 – 2006. The sample size by cancer type is provided in the tables. The difference in sample size is related to excluding cases without followup data. Per NCDB, mortality data is not available for the last five years of collection (2007-2011). Also, per NCDB, cases were excluded if they had multiple cancer types. Note that this data set only included patients 18 years old and older. Data on children with cancer was not available for this analysis.

The NCDB is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The data used in this study and this report are derived from a de-identified NCDB file. The American College of Surgeons and the Commission on Cancer have not verified and are not responsible for the analytic or statistical methodology employed, or the conclusions drawn from these data by the investigator and authors of this work.

Table 8A.9.3: Demographic Descriptive Statistics by Soft Tissue Cancer Type, by Sex, United States, 1998-2011

		Sex (N (% in Sex Group))	
Type	Total N	Male	Female
Malignant Tumor, spindle cell type; Sarcoma, NOS; Spindle cell sarcoma; Undifferentiated sarcoma; Stromal sarcoma, NOS	13979	7444 (53.3%)	6535 (46.7%)
Fibrous histiocytoma, malignant	13289	7473 (56.2%)	5816 (43.8%)
Liposarcoma Myxoid	4349	2565 (59%)	1784 (41%)
Liposarcoma, well differentiated	4304	2504 (58.2%)	1800 (41.8%)
Synovial sarcoma (NOS, spindle cell epithelioid cell, biphasic)	4175	2169 (52%)	2006 (48%)
Giant cell sarcoma	4141	2379 (57.4%)	1762 (42.6%)
Malignant peripheral nerve sheath tumor; Neurilemmoma, malignant; MPNST with rhabdomyoblastic differentiation	3827	2041 (53.3%)	1786 (46.7%)
Hemangiosarcoma	3471	1614 (46.5%)	1857 (53.5%)
Liposarcoma, NOS	2876	1614 (56.1%)	1262 (43.9%)
Dermatofibrosarcoma, NOS; Pigmented dermatofibrosarcoma protuberans	2776	1390 (50.1%)	1386 (49.9%)
Fibromyxosarcoma	2356	1788 (53.3%)	1568 (46.7%)
Fibrosarcoma, NOS	2102	1091 (51.9%)	1011 (48.1%)
Liposarcoma Dedifferentiated	1768	1145 (64.8%)	623 (35.2%)
Liposarcoma Pleomorphic	1711	1001 (58.5%)	710 (41.5%)
Ewing sarcoma; Peripheral neuroectodermal tumor; Askin tumor; Primitive neuroectodermal tumor	1496	845 (56.5%)	651 (43.5%)
Epithelioid sarcoma	1155	715 (61.9%)	440 (38.1%)
Chondrosarcoma Myxoid	854	541 (63.3%)	313 (36.7%)
Chondrosarcoma, NOS	581	360 (62%)	221 (38.0%)
Hemangiopericytoma, malignant	566	257 (45.4%)	309 (54.6%)
Pleomorphic rhabdomyosarcoma, adult type	566	367 (64.8%)	199 (35.2%)
Osteosarcoma, NOS; Chondroblastic osteosarcoma; Fibroblastic osteosarcoma	562	289 (51.4%)	273 (48.6%)
Myxosarcoma	558	282 (50.5%)	276 (49.5%)
Rhabdomyosarcoma, NOS	555	293 (52.8%)	262 (47.2%)
Liposarcoma Mixed Type	550	333 (60.5%)	217 (39.5%)
Clear cell sarcoma, NOS (except of kidney)	542	264 (48.7%)	278 (51.3%)
Liposarcoma Round cell	460	274 (59.6%)	186 (40.4%)
Rhabdomyosarcoma Alveolar	384	209 (54.4%)	175 (45.6%)
Alveolar soft part sarcoma	340	173 (50.9%)	167 (49.1%)
Small cell sarcoma	310	166 (53.5%)	144 (46.5%)
Solitary fibrous tumor, malignant	305	160 (52.5%)	145 (47.5%)
Desmoplastic small round cell tumor	296	245 (82.8%)	51 (17.2%)
Rhabdomyosarcoma Embryonal	277	177 (63.9%)	100 (36.1%)
Epithelioid hemangioendothelioma, malignant	213	99 (46.5%)	114 (53.5%)
Mesenchymal chondrosarcoma	134	80 (59.7%)	54 (40.3%)
Malignant myoepithelioma	108	58 (53.7%)	50 (46.3%)
Mesenchymoma, malignant	90	43 (47.8%)	47 (52.2%)
Merkel cell carcinoma	79	51 (64.6%)	28 (35.4%)
Granular cell tumor, malignant	71	14 (19.7%)	57 (80.3%)

Table 8A.9.3: Demographic Descriptive Statistics by Soft Tissue Cancer Type, by Sex, United States, 1998-2011

Source: American College of Surgeons National Cancer Data Base (NCDB).

NOTE: NCDB Adult Soft Tissue Sarcoma Data Summary
Demographic data is available on cases diagnosed from 1998 – 2011. A total of 91,163 cases were available. Mortality is only available from 44,065 cases reported 1998 – 2006. The sample size by cancer type is provided in the tables. The difference in sample size is related to excluding cases without followup data. Per NCDB, mortality data is not available for the last five years of collection (2007-2011). Also, per NCDB, cases were excluded if they had multiple cancer types. Note that this data set only included patients 18 years old and older. Data on children with cancer was not available for this analysis.

The NCDB is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The data used in this study and this report are derived from a de-identified NCDB file. The American College of Surgeons and the Commission on Cancer have not verified and are not responsible for the analytic or statistical methodology employed, or the conclusions drawn from these data by the investigator and authors of this work.

Sex and Gender

Lead Author(s):
Kimberly J. Templeton, MD

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

The term “women’s health” has historically referred to conditions affecting the reproductive organs. It was assumed that there were minimal differences between men and women in conditions related to other organ systems. However, expanding research in women’s health over the past several decades has identified major differences in etiology, incidence, presentation, prevention, and response to treatment for almost all health conditions. These differences are impacted by both sex and gender, and are particularly manifest in the musculoskeletal system. Thus differences and similarities in musculoskeletal health related to sex and gender are inadequately covered in the term "women's health."

Inadequate research of health conditions in women contributed to limitations in this area. In 1977, the Food and Drug Administration (FDA) barred women of childbearing potential from participating in most early-phase clinical research. In 1985, the Public Health Service Task Force on Women's Health Issues noted that the exclusion of women as subjects in clinical research was detrimental to women’s health. In 1986, the National Institutes of Health (NIH) urged that more women be included in clinical investigations where appropriate, and in 1990 established the Office of Research on Women’s Health. The FDA reversed its 1977 edict, excluded women from clinical trials in 1993, and in 1998, stated they would refuse to file any new drug application that did not include a sufficient number of female subjects to assess safety and efficacy by sex.

Despite this new direction, there are concerns that sufficient numbers of women still are not being included in studies. This is particularly true for pharmaceutical trials, where recent research has shown differences in effect and assimilation of drugs between men and women, resulting in questions related to the safety and efficacy of medications used to treat conditions in both sexes. Recent recommendations for differing doses between the sexes for some medications have highlighted these sex differences.

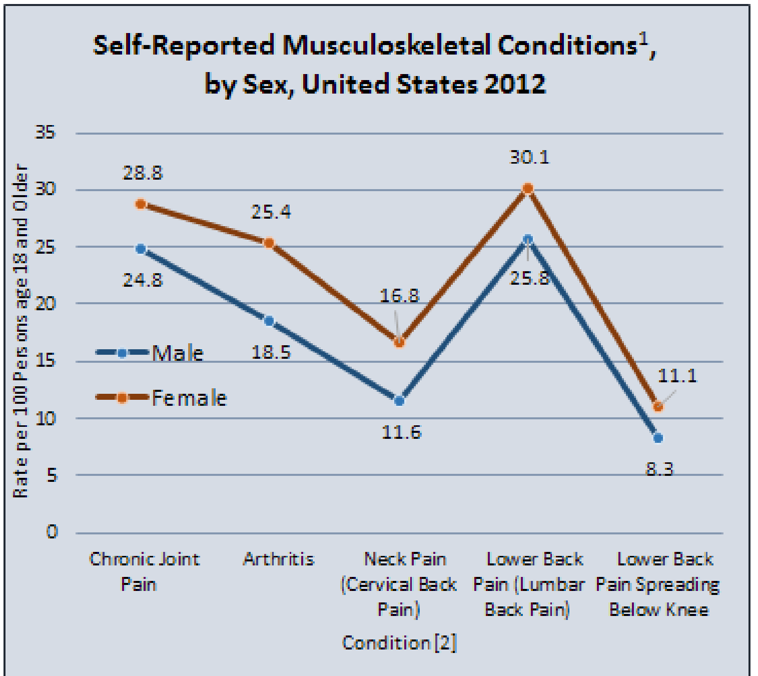
The current focus is a movement away from terms such as “women’s health” to a more inclusive discussion of sex and gender differences. The words “sex” and “gender,” although frequently use interchangably, have differing meanings. The Institute of Medicine attempted to clarify the difference in their 2001 publication, noting that sex reflects the genetic, or gonadal, complement and that “every cell has a sex,” while gender refers to social interactions and the ability to access resources. Both sex and gender have an impact on health conditions, including those of the musculoskeletal system.

Overview

Women self-report slightly higher rates of musculoskeletal conditions, joint pain, limitations in activities of daily living, bed days, and lost workdays due to musculoskeletal conditions than men do. The etiology of the differences noted between women in men in these conditions is multifactorial and is not solely or consistently attributable to differences in sex hormones.

Self-Reported Musculoskeletal Conditions

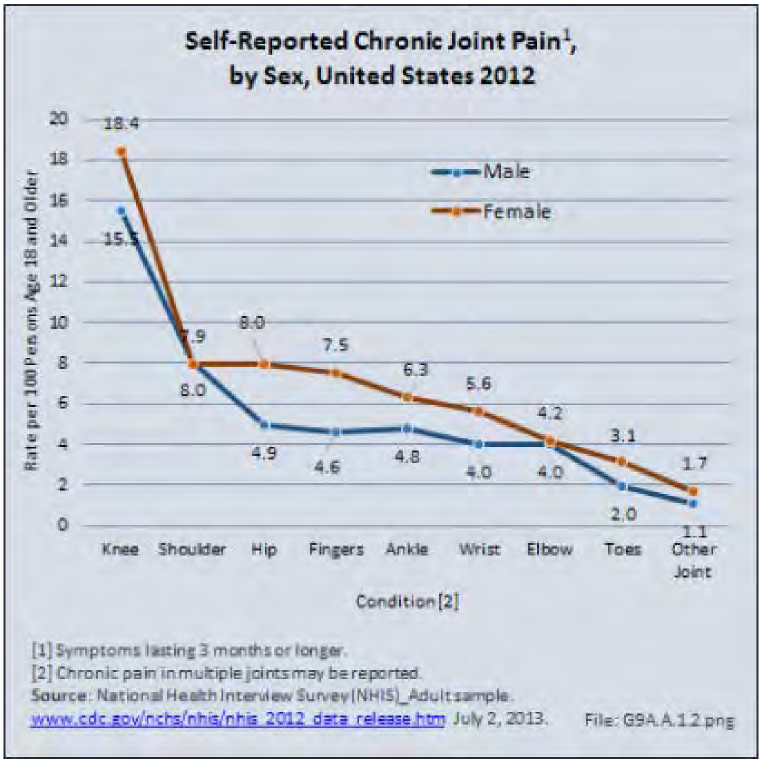
Women report musculoskeletal and chronic joint pain at slightly higher rates than men do. The greatest difference is in self-reported rates for arthritis, with more than 25 women in 100 over the age of 18 years reporting they have arthritis, compared to 19 men. However, more than half of both men (51%) and women (56%) report they have musculoskeletal pain, in either the back, neck, or joints. (Reference Table 9A.1 PDF CSV)



[1] Symptoms lasting 3 months or longer.
[2] Multiple conditions may be reported.
Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.
File: G9A.A.1.1.png

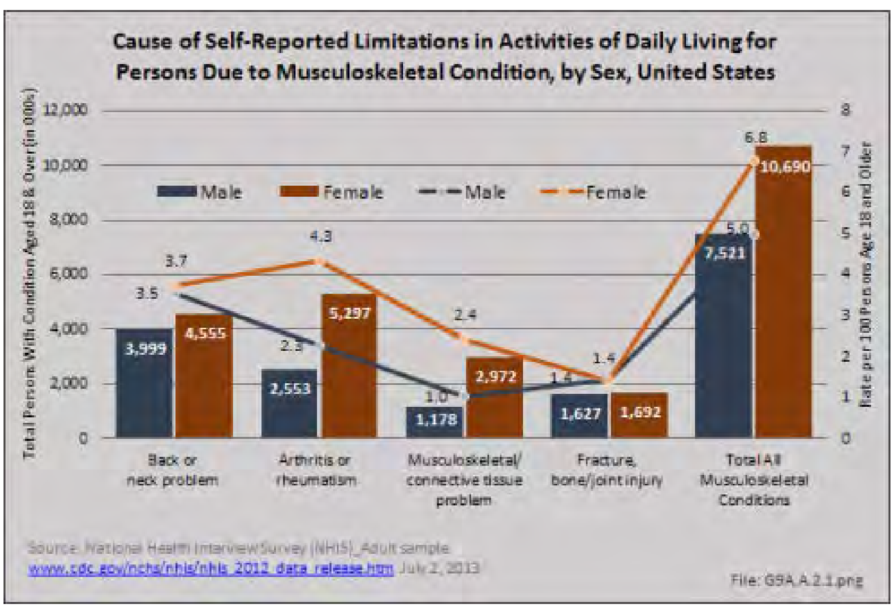
The knee is the most common joint with chronic pain reported by both men and women, followed by the shoulder. Women are much more likely than men to complain of issues related to their patellofemoral joint and to present with anterior knee pain syndrome. Several etiologies have been suggested for this, including sex-based differences in anatomic alignment, such as larger Q-angle; tendency toward foot pronation; increased femoral anteversion, genu valgum, external tibial torsion, and tibia vara; as well as a variety of other anatomic differences such as patella alta, shallower femoral notch, narrower patellae, patellar ligamentous hypermobility, insufficient VMO versus vastus lateralis, generalized ligamentous laxity, tight lateral patellar retinaculum, and tighter IT band.

Shoulder and elbow joint pain is reported at similar rates by men and women. For all other joints, women are slightly more likely to report chronic joint pain. (Reference Table 9A.1 PDF CSV)



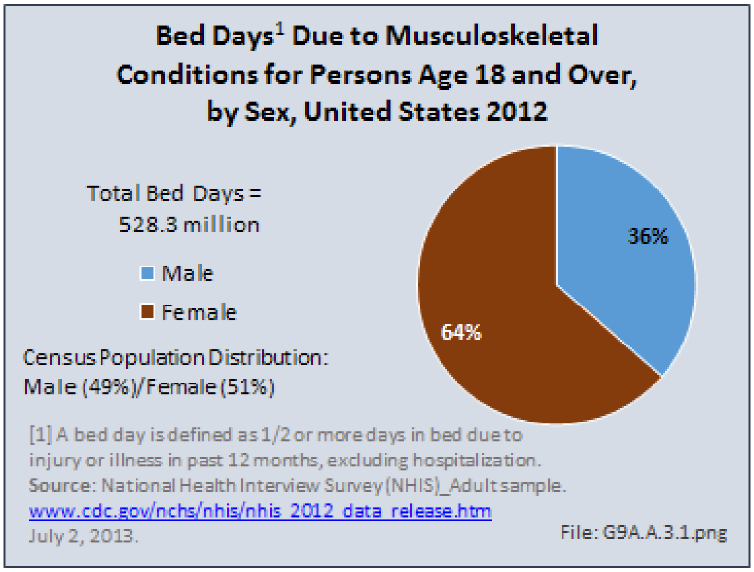
Limitations

Women also report they experience limitations in activities of daily living (ADL) in higher rates for musculoskeletal conditions, with the exception of fractures or bone/joint injuries, than men do. Again, arthritis is identified as the most common cause of ADL limitations due to musculoskeletal conditions. In 2012, nearly 10.7 million women reported ADL due to musculoskeletal conditions, while 7.5 million men did so. (Reference Table 9A.1 PDF CSV)

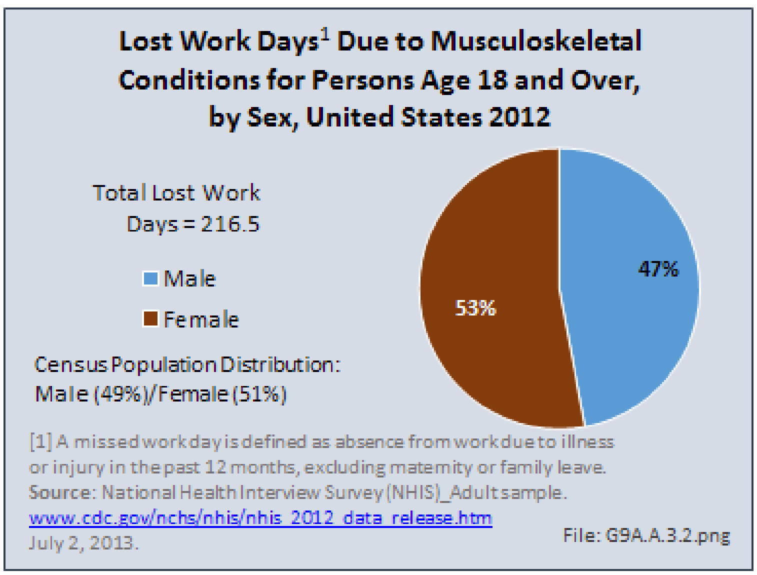


Bed and Lost Work Days

Women account for nearly two-thirds (64%) of the 528.3 million bed days reported in 2012 due to a musculoskeletal condition. A bed day is defined as one-half or more days in bed due injury or illness, excluding hospitalization. The greater number of total bed days reported by women is due to both a higher number with musculoskeletal-caused bed days, and a higher mean number of days in bed (9.9 days versus 8.2 days for men).



Women also account for slightly more than half (53%) of the 216.5 million lost work days due to musculoskeletal conditions, because of the greater number of women reporting lost work days (15.4 million versus 12.7 million men). However, men reported a mean of 8.0 lost workdays due to musculoskeletal conditions, while women reported a mean of 7.5 days. (Reference Table 9A.1 PDF CSV)



Spine

Sex-based differences in incidence and presentation have been described for some, but not all, conditions of the spine. For example, adolescent idiopathic scoliosis, one of the most common diseases of the spine in adolescence, is somewhat more common in females, and females are much more likely to present with larger curves. The incidence of scoliosis among adults, which includes a wider range of diagnoses than adolescent idiopathic scoliosis, does not appear to differ by sex, and there appears to be no sex-based differences in magnitude of curves.[1] Ankylosing spondylitis is diagnosed more frequently in men. However, women who present with this condition tend to be older than their male counterparts, have a shorter duration of disease, be more likely to have thoracic spine involvement, and be less likely to be HLA-B27 positive.[2]

Among the common conditions of the spine, data are often conflicting regarding any sex-based differences in incidence, most likely reflecting their multifactorial etiology. Degenerative disc disease and lumbar radiculopathy, for example, have been reported to be more common in men, more common in women, or equal in lifetime sex-based risk. Women with degenerative disc disease have been noted to present with this condition when they are approximately 10 years older than men,[3] perhaps reflecting differences in activity and mechanical loading. Among a young active military population, degenerative disc disease[4] and lumbar radiculopathy[5] were found to be more common among women, although female sex was less of a risk factor than older age for both conditions.

A variety of risk factors have been described to account for any noted sex-based differences among spine conditions. The most obvious difference would be the influence of sex hormones. Studies related to hormones and spinal deformity, which is more common in women, have shown no clear relationship, while in cases of ankylosing spondylitis, which is more common in men, studies have shown no differences in adrenal or gonadal sex hormones[6] to explain this predominance.

As with other conditions, any sex-based differences are likely multifactorial. Schoenfeld[5] postulated that these differences might reflect hormonal influences as well as differing responses of the spine to loading and physical activity. Among a cohort of asymptomatic young adults,[7] it was found that the spine from T1-L5/S1 as a whole, and the individual high thoracic and lumbar vertebrae, were more dorsally inclined in women than in men. The authors hypothesized that this could make the spine less rotationally stable in women, in certain circumstances resulting in the initiation and/or progression of spinal conditions, such as scoliosis.

The potential impact of sex on other spine conditions has also been studied, without conclusive results. Increased paraspinous muscle degeneration has been suggested to correlate with incidence of low back pain,[8,9] and in studying a cohort of symptomatic adult patients, it was found that women were more likely than men to demonstrate fatty infiltration of their paraspinous muscles on MRI. Sex-based differences have also been identified in paraspinous muscle fiber and type.[10] However, the impact of sex on the development of low back pain. and any cause-and-effect relationship between low back pain or other spine conditions and changes in paraspinous muscle composition, has not been elucidated.

1. Kebaish KM, Neubauer PR, Voros GD, et al: Scoliosis in adults aged forty years and older: Prevalence and relationship to age, race, and gender. *Spine* 2011 Apr 20;36(9):731-736. doi: 10.1097/BRS.0b013e3181e9f120.

2. van der Horst-Bruinsma IE1, Zack DJ, Szumski A, Koenig AS: Female patients with ankylosing spondylitis: Analysis of the impact of gender across treatment studies. *Ann Rheum Dis* 2013 Jul;72(7):1221-1224. Epub 2012 Dec 22.

3. Battie MC, Videman T: Lumbar disc degeneration: Epidemiology and genetics. *JBJS-A* 2006;88(Supple 2):3-9.

4. Schoenfeld AJ, Nelson JH, Burks R, Belmont PJ Jr: Incidence and risk factors for lumbar degenerative disc disease in the United States military 1999-2008. *Mil Med* 2011 Nov;176(11):1320-1324.

5. a. b. Schoenfeld AJ, George AA, Bader JO, Caram PM Jr: Incidence and epidemiology of cervical radiculopathy in the United States military: 2000 to 2009. *J Spinal Disord Tech* 2012 Feb;25(1):17-22. doi: 10.1097/BSD.0b013e31820d77ea.

6. Straub RH, Struhárová S, Schölmerich J, Härle P: No alterations of serum levels of adrenal and gonadal hormones in patients with ankylosing spondylitis. *Clin Exp Rheumatol* 2002 Nov-Dec;20(6 Suppl 28):S52-S59.

7. Janssen MM, Drevelle X, Humbert L, et al: Differences in male and female spino-pelvic alignment in asymptomatic young adults: A three-dimensional analysis using upright low-dose digital biplanar X-rays. *Spine* 2009 Nov 1;34(23):E826-E832.

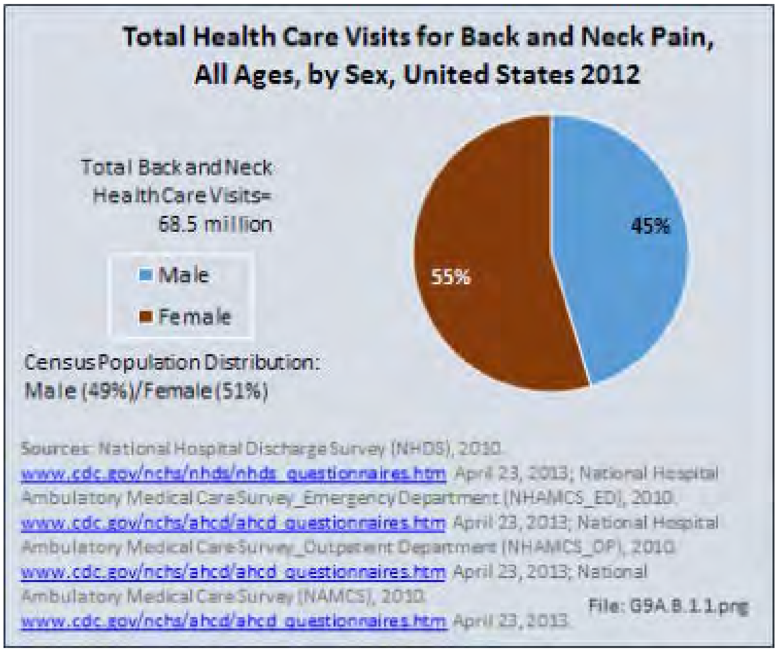
8. Mengiardi B, Schmid MR, Boos N, et al: Fat content of lumbar paraspinal muscles in patients with chronic low back pain and in asymptomatic volunteers: Quantification with MR spectroscopy. *Radiology* 2006 Sep;240(3):786-792.

9. Nam WD, Chang BS, Lee, CK, Cho JH: Clinical and radiological predictive factors to be related with the degree of lumbar back muscle degeneration: Difference by gender. *Clinics in Orthopedic Surgery* 2014;6:318-332. doi: 10.4055/cios.2014.6.3.318. Epub 2014 Aug 5.

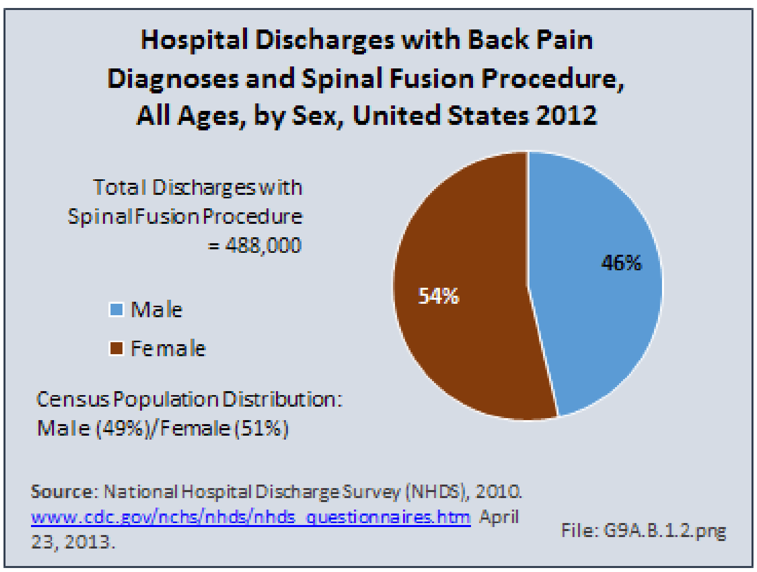
10. Doherty TJ: The influence of aging and sex on skeletal muscle mass and strength. *Curr Opin Clin Nutr Metab Care* 2001;4(6):503-508.

Health Care Visits: Spine

Women accounted for 55% of the 68.5 million total health care visits for back or neck pain in 2010, slightly more than the 51% of the population they represent. Total health care visits include hospital discharges, ED and outpatient clinic visits, and physician office visits. (Reference Table 9A.2 PDF CSV)



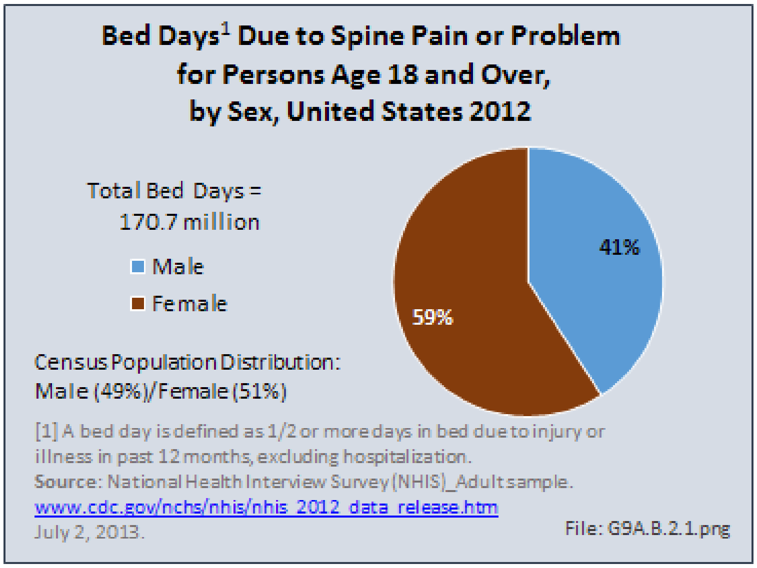
Women also accounted for 54% of 488,000 hospital discharges for back pain that involved a spinal fusion procedure. (Reference Table 9A.2 PDF CSV)



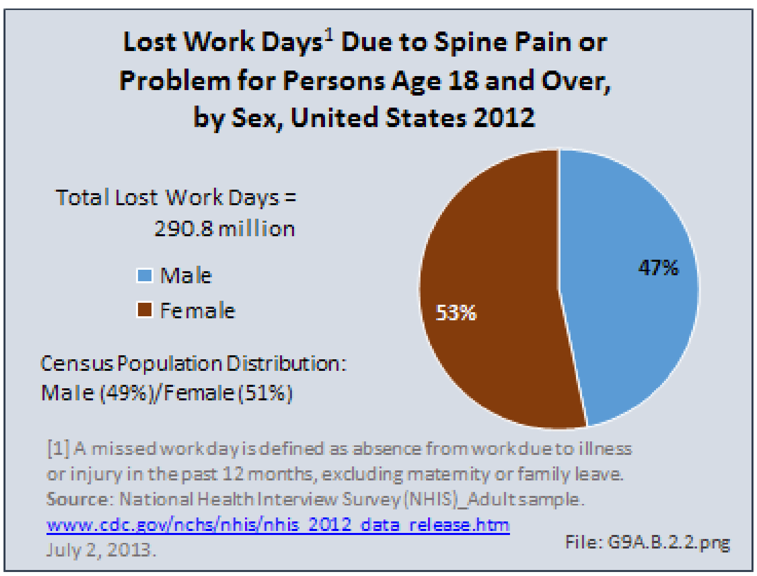
Bed and Lost Work Days: Spine

Women reported taking bed days for back and neck pain in higher numbers than men do. They also reported an average bed stay of about one-half day longer, 7.8 days in the previous 12 months, compared to a mean of 7.4

days for men. Overall, women accounted for 58% of total bed days in a previous 12-month period. (Reference Table 9A.2 PDF CSV)



Men, however, report losing more workdays in a 12-month period than women do, accounting for 59% of lost workdays reported in 2012. Although slightly fewer numbers of men reported lost workdays than did women, they lost an average of one day of work more than women did, 11.9 days versus11.0 days lost. (Reference Table 9A.2 PDF CSV)



Spinal Deformity

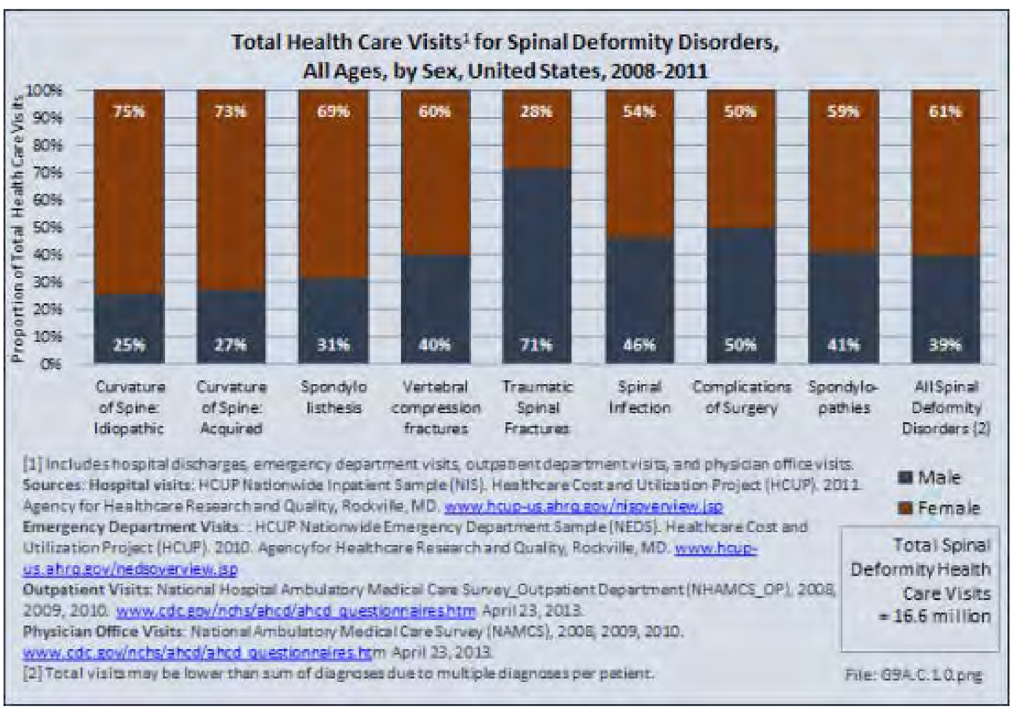
Women are more likely to demonstrate scoliosis, especially adolescent idiopathic scoliosis, than are men. Although a variety of explanations have been presented to account for this, no single sex-based risk factor has been identified. However, females with adolescent idiopathic scoliosis tend to present with larger curves, and the potential role of estrogen in the development and progression of this condition, especially considering the impact of estrogen on bone metabolism and development,1 has been extensively studied. Still, no clear-cut influence on the onset or progression of idiopathic scoliosis has been identified. Older age at the onset of menarche has been found to be associated with an increased likelihood of presenting with a more significant curve among patients with adolescent scoliosis. However, specific estrogen polymorphisms have not been consistently correlated with age at menarche or curve severity.2

1. Leboeuf D, Letellier K, Alos N, et al: Do estrogens impact adolescent idiopathic scoliosis? *Trends Endocrinol Metab* 2009 May;20(4):147-152. doi: 10.1016/j.tem.2008.12.004. Epub 2009 Apr 6.

2. Janusz P, Kotwicka M, Andrusiewicz M, et al: Estrogen receptors genes polymorphisms and age at menarche in idiopathic scoliosis. *BMC Musculoskelet Disord* 2014 Nov 19;15:383. doi: 10.1186/1471-2474-15-383.

Health Care Visits: Spinal Deformity

Although women represent 51% of the total population, they have a greater than expected rate of health care visits for the majority of spinal deformity disorders. This is particularly true for both idiopathic (75%) and acquired spinal curvature (73%), and for spondylolisthesis (69%), a spinal condition that causes one of the lower vertebra to slip forward onto the bone directly beneath it. Traumatic spinal fractures occur at a greater extent to men, while vertebral compression fractures, often due to osteoporosis, occur much more frequently in women. Spinal infections and complications from surgery related to spinal deformity occur about equally between men and women.



Spondylopathies, which refer to any disease of the vertebrae associated with compression of peripheral nerve roots and spinal cord, causing pain and stiffness, were diagnosed more frequently (59%) in health care visits by women than by men (41%).

Overall, on an annual average, 16.6 million health care visits for spinal deformity conditions were made each year in the years 2008 to 2011. Of these visits, 61% of those treated were women. (Reference Table 9A.3 PDF CSV)

Arthritis

Arthritis is a condition impacted by both sex and gender. Women are more likely to present with inflammatory arthritis and osteoarthritis than are men as reflected by both self-report and radiographic studies. Specific joints appear to be at particular risk of sex-based disparities in incidence. Sodha noted in a study of hand radiographs that, after the age of 40 years, women were significantly more likely than men to have incidentally noted radiographic osteoarthritis of the hand, especially the first carpometacarpal joint.1 This incidence increased with age, especially for women, with more than 90% of women over the age of 80 years having this finding.

The increased risk of inflammatory arthritis likely reflects the overall higher rate of inflammatory conditions found in all organ systems among women. This may reflect an impact of sex hormones, especially alterations in estrogen levels, as estrogen has been found to impact B and T cell homeostasis, as well as to impact interferon regulation.2 A variety of etiologies have also been proposed, but contradictions remain in the available evidence.

The etiology of the higher rate of osteoarthritis among women also is still under debate and appears to be multifactorial. There is some indication that osteoarthritis in women has a different course than seen in men. Maillefert 3 followed 508 patients with osteoarthritis of the hip and noted that women are more likely to have polyarticular disease (pain in multiple joints), superolateral migration of femoral head, more severe symptoms, and more rapid loss of joint space. Some conditions that may increase the risk of osteoarthritis are more common, or differ in presentation in women. For example, the rates of acetabular dysplasia and pincer-type femoroacetabular impingment are higher in women. Potential explanations for differences in osteoarthritis of the knee, one of the more commonly involved joints, includes a higher lower-extremity–injury rate, differing lower-extremity alignment, lower muscle strength, and the impact of estrogen loss after menopause.

As will be discussed in another section, women are significantly more likely to sustain non-contact anterior cruciate ligament (ACL) injuries. Roos4 noted that women who had sustained an anterior cruciate ligament (ACL) injury were not only significantly more likely to have osteoarthritis of the knee than other women of the same age, they were also more likely to have osteoarthritis than men who had sustained an ACL injury at a similar age. This may reflect differing inflammatory responses at the time of injury or other factors that affect the risk of developing osteoarthritis.

Women with radiographic findings of osteoarthritis of the knee, including those without self-reported symptoms, have been noted to have weaker quadriceps than those without such changes; this relationship has not been investigated among men.5 This relative muscular weakness may translate into greater rate and degree of loading or force transmission to articular cartilage.

The impact of estrogen loss on articular cartilage and the consequent development of osteoarthritis has not been clearly defined. Estrogen receptors have been identified on chondrocytes and synoviocytes. Estrogen appears to inhibit production of matrix metalloproteinases and, thus, may help to inhibit cartilage degradation. Articular cartilage defects appear to progress more rapidly in ovariectomized (OVX) rats than they do in native rats; these defects progress more slowly in OVX rats treated with estrogen or SERMs. There are limited clinical studies in humans, and the relative impact of estrogen loss on developing osteoarthritis has not been identified. Estrogen also influences ligamentous laxity, and its loss may represent one of the many factors leading to an increased risk of osteoarthritis among women.

1. Sodha S, Ring D, Zurakowski D, Jupiter JB: Prevalence of osteoarthritis of the trapeziometacarpal joint. *J Bone Joint Surg Am* 2005;87(12):2614–2618.

2. Pennell LN, Galligan CL, Fish EN. Sex affects immunity. *J of Autoimmunity* 2012; 38:282-291.

3. Maillefert JF, Gueguen A, Monreal M, et al: Sex differences in hip osteoarthritis: Results of a longitudinal study in 508 patients. *Ann Rheum Dis* 2003 Oct;62(10):931-934. doi: 10.1136/ard.62.10.931.

4. Roos, M: Joint injury causes knee osteoarthritis in young adults. *Curr Opin Rheumato*. 2005 Mar;17(2):195-200.

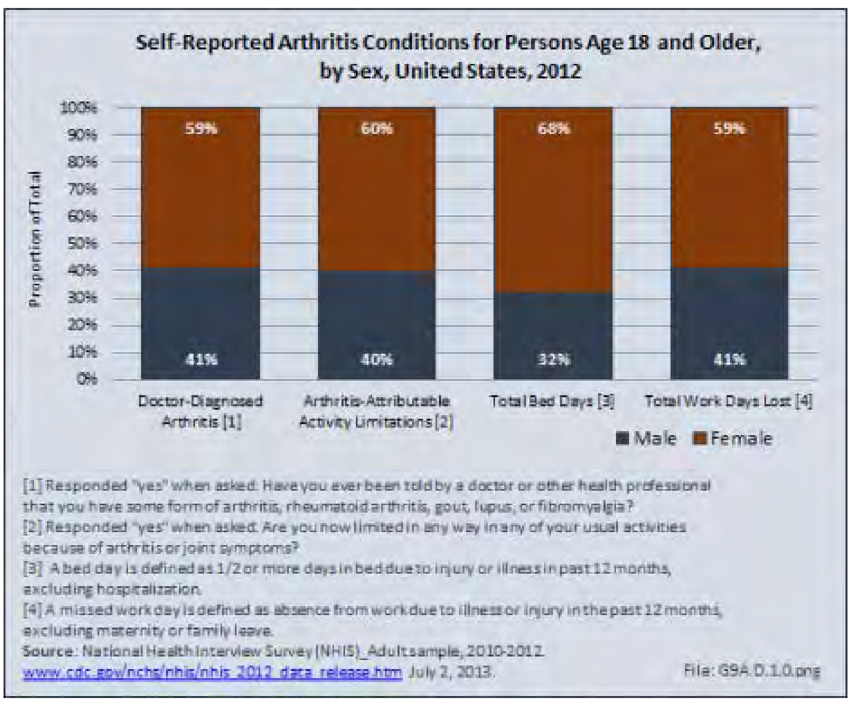
5. Palmieri-Smith RM, Thomas AC, Karvonen-Gutierrez C, Sowers MF: Isometric quadriceps strength in women with mild, moderate, and severe knee osteoarthritis. *AM J Phys Med Rehabil* 2010 Jul;89(7):541-548.

Self-Reported Arthritis

Women are affected by arthritis at a higher rate than are men. Three out of five persons who self-report they have been told by a doctor that they have some form of arthritis are women. Women also are 50% more likely to report they have limitations with activities of daily living because of their arthritis.

Women also report in higher numbers they spent at least one-half day in bed in the previous 12 months due to an arthritis condition, and they reported a higher mean number of days spent in bed (25.7 versus 21.2 days for men). As a result, women accounted for 68% of all bed days attributed to arthritis conditions in 2012.

Although women reported missing work in the previous 12 months due to arthritis in higher numbers than men did, they reported a similar mean number of days lost. Still, women accounted for 59% of total lost workdays in 2012, attributable, at least in part, to an arthritic condition. (Reference Table 9A.4.1 PDF CSV)

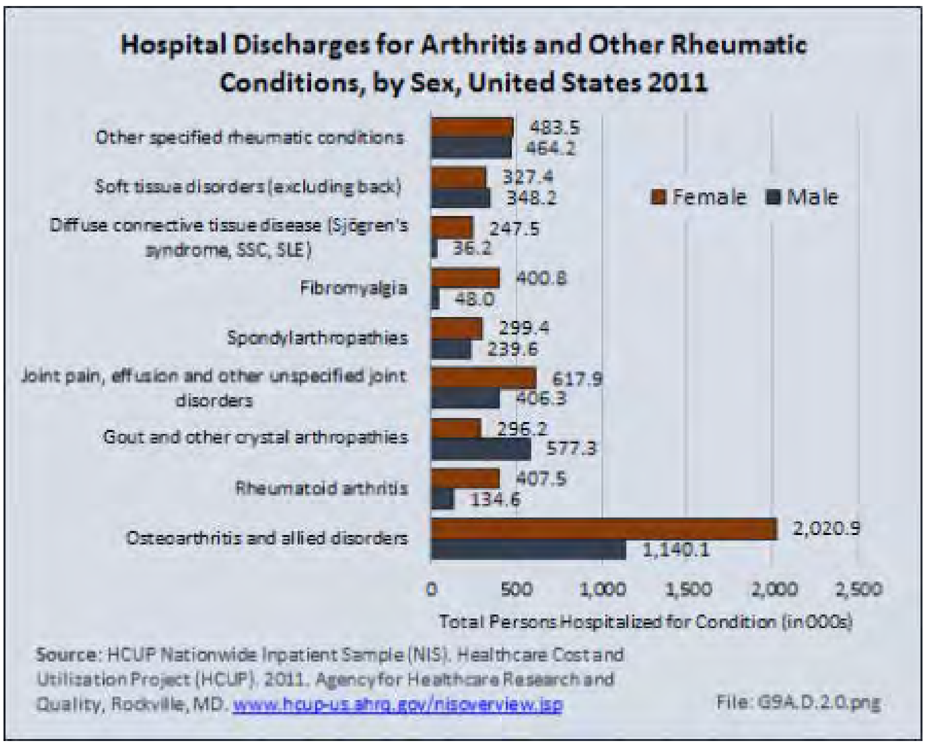


Health Care Visits: Arthritis

In spite of the frequency and pain severity related to arthritis and other rheumatologic conditions (AORC), AORC account for only a small portion of hospital discharges. Visits to a physician's office or alternative type of care account for the majority of health care related to AORC. However, among the 6.6 million hospital discharges for an AORC in 2011, 60% were women.

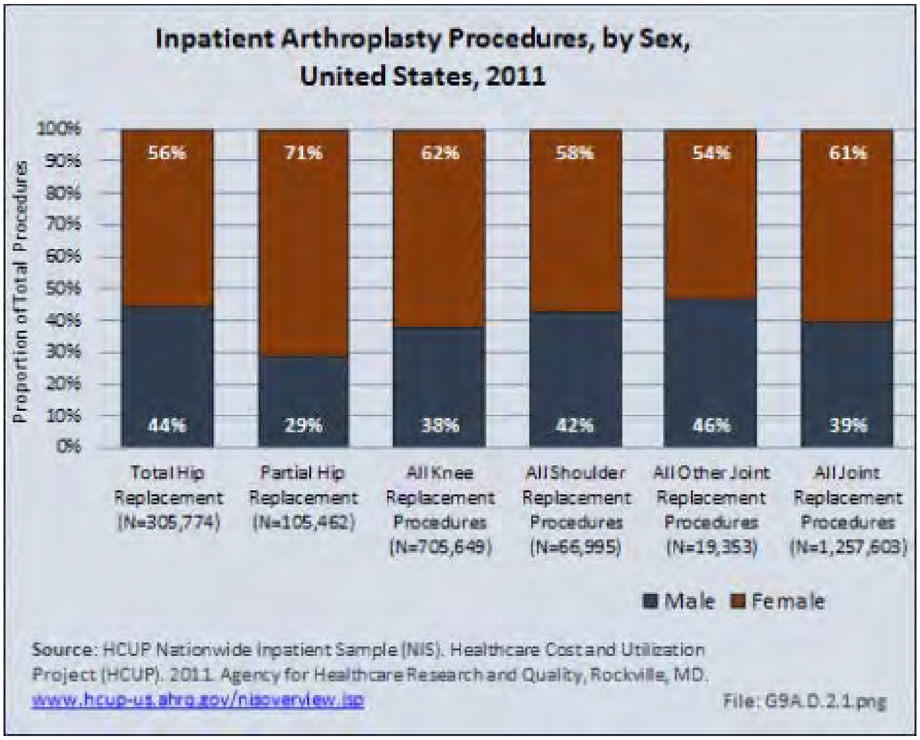
Among the nine major conditions defined by the Centers for Disease Control (CDC) Arthritis Division as AORC, gout is the only condition where men are affected at a higher rate than women (66% of discharges versus 34%). Soft tissue disorders are found in about equal numbers between men and women.

Women are far more likely to have a diagnosis of fibromyalgia (89%) or diffuse connective tissue diseases (Sjögren's syndrome, SSC, SLE) (87%), than are men. Women also accounted for three-fourth (75%) of discharges with a diagnosis of rheumatoid arthritis, and two-thirds (64%) of discharges diagnosed with osteoarthritis. (Reference Table 9A.4.2 PDF CSV)



Arthroplasty Procedures: Arthritis

Joint replacement (arthroplasty) procedures are usually performed when osteoarthritis and associated disorders have damaged joints to a point where it is extremely painful to walk and function is impacted. However, there are no objective indications for arthroplasty. Because of the higher rate of osteoarthritis found in women than in men, women are somewhat more likely to receive a joint replacement. (Reference Table 9A.4.2 PDF CSV)



Although women receive more joint arthroplasty than do men, some studies have indicated that women are receiving arthroplasty procedures at a lower rate than anticipated, frequently reflecting the impact of gender on health.[1] Hawker et al noted that women and men were equally likely to be willing to undergo arthroplasty. They also noted that women were less likely than men to have spoken to a physician regarding joint arthroplasty.[1] Other studies noted that women were less likely than men to be referred by their primary care physician for consideration of joint arthroplasty, after controlling for other medical conditions.[2,3] These potential delays in joint arthroplasty have significant impact. Katz et al noted that women were significantly more disabled than men by the time they underwent the procedure,[4] and Ackerman et al noted that women had a significantly worse quality of life than did men during the time they were waiting for their joint arthroplasty.[5] Holtzman et al noted that prior to surgery, more women than men have reported severe pain with walking, needing assistance with walking, needing help with housework, and issues walking across room or less distance; these findings were unrelated to age or comorbidities.[6] Although both sexes improve when they have joint arthroplasty, some studies have indicated that women continue to have lower functional scores after surgery than men, potentially reflecting poorer function prior to the procedure and the older age of female patients undergoing arthroplasty. [7,8]

1. a. b. Hawker GA, Wright JG, Coyte PC, et al. Differences between men and women in the rate of use of hip and knee arthroplasty. *N Engl J Med* 2000 April;342:1016-1022.

2. Rahman MM, Kopec JA, Sayre EC, et al. Effect of sociodemographic factors on surgical consultations and hip or knee replacements among patients with osteoarthritis in British Columbia, Canada. *J Rheumatol* 2011;38:503-509.doi: 10.3899/jrheum.100456. Epub 2010 Nov 15.

3. Borkhoff CM1, Hawker GA, Kreder HJ, Glazier RH, Mahomed NN, Wright JG: The effect of patients' sex on physicians' recommendations for total knee arthroplasty. *CMAJ* 2008 Mar 11;178(6):681-687. doi:10.1503/cmaj.071168.

4. Katz JN, Wright EA, Guadagnoli E, Liang MH, Karlson EW, Cleary PD: Differences between men and women undergoing major orthopedic surgery for degenerative arthritis. *Arthritis Rheum* 1994 May;37(5):687-694.

5. Ackerman IN, Graves SE, Wicks IP, Bennell KL, Osborne RH: Severely compromised quality of life in women and those of lower socioeconomic status waiting for joint replacement surgery. *Arthritis Rheum* 2005 Oct 15;53(5):653-658.

6. Holtzman J, Saleh K, Kane R: Gender differences in functional status and pain in a Medicare population undergoing elective total hip arthroplasty. *Med Care* 2002 Jun;40(6):461-470.

7. Lavernia CJ, Alcerro JC, Contreras JS, Rossi MD: Patient perceived outcomes after primary hip arthroplasty: Does gender matter? *Clin Orthop Relat Res* 2011 Feb;469(2):348-354. doi: 10.1007/s11999-010-1503-5.

8. Parsley BS, Bertolusso R, Harrington M, Brekke A, Noble PC: Influence of gender on age of treatment with TKA and functional outcome. *Clin Orthop Relat Res* 2010 Jul;468(7):1759-1764. doi: 10.1007/s11999-010-1348-y.

Osteoporosis

Osteoporosis was traditionally thought of as a condition affecting only women. Although approximately 80% of patients with the condition are female, it is being increasingly diagnosed among men. This increased incidence may reflect a greater awareness of the condition among men, rather than a true increase in incidence.

There are significant sex-based differences in osteoporosis. Osteoporosis in men tends to occur at an older age, unless another health condition intervenes. Osteoporosis in women is more likely primary and a result of estrogen loss, while osteoporosis in men is more likely to be secondary to another health condition, especially alcohol over-consumption, loss of testosterone, and use of corticosteroids.

Low impact, or fragility, fractures, frequently occurring as the result of a simple fall, are more common among women, reflecting the higher incidence of osteopenia or osteoporosis. In 2011, 71% of partial hip replacements, most commonly performed to treat hip fractures, were performed on women. (Reference Table 9A.4.2 PDF CSV) For both sexes, the initial fragility fracture is the most significant risk factor for additional fractures and represents an opportunity for secondary prevention. Unfortunately, the likelihood of evaluation and attempts at secondary prevention measures are low for both sexes. However, men, more than women, are even less likely to be evaluated and treated for osteoporosis after the initial fragility fracture.1

For both men and women, low-impact fractures related to poor bone health have significant impact on function, morbidity, and mortality. Vertebral fractures, the most common fracture related to low bone mass, can lead to chronic pain, reduced subjective health status, and limitation in activities. The incidence of vertebral fractures increases with age for both sexes, although this is more pronounced among women.2 After adjusting for age and bone mineral density, sex-based risk for sustaining a vertebral fracture tends to be no longer significant.1 Smoking, alcohol consumption, and physical activity are known to impact bone health. However, studies examining their association with the risk of vertebral fractures have provided inconclusive evidence of sex-based differences in degrees of impact.3 The rate of mortality also is increased among those sustaining a vertebral fracture. However, Hasserius et al noted that the pattern of differences in mortality differed by sex: increased mortality in women was noted during the first decade after the fracture, especially the first 5 years; the greatest divergence in mortality among men was most significant during the first 3 years after the fracture.4 This is similar to the data available for outcome after fragility fractures of the hip. Hip fractures also lead to increased rates of disability and mortality; however, mortality is substantially higher among men sustaining a hip fracture, especially during the first year after the fracture. These differences in mortality after low-impact fracture, especially in the first few years after fracture, may reflect the differences in etiology of osteoporosis. Men, as previously noted, are more likely to have secondary osteoporosis and be older at the time of fracture; both of these most likely contribute to increased rates of mortality.

1. a. b. Rozental TD, Makhni EC, Day CS, Bouxsein ML: Improving evaluation and treatment for osteoporosis following distal radius fractures. *JBJS (A)* 2008;90(5):953-961.

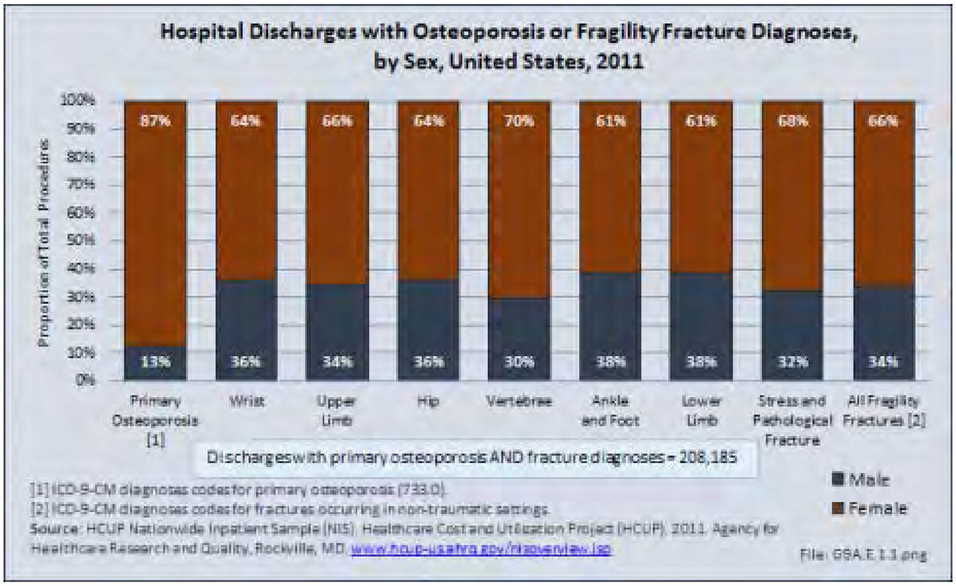
2. Van Der Klift M, De Laet CEDH, Mccloskey EV, Hofman A, Pols HA: The incidence of vertebral fracture in men and women: The Rotterdam Study. *J Bone Miner Res* 2002;17:1051-1056.

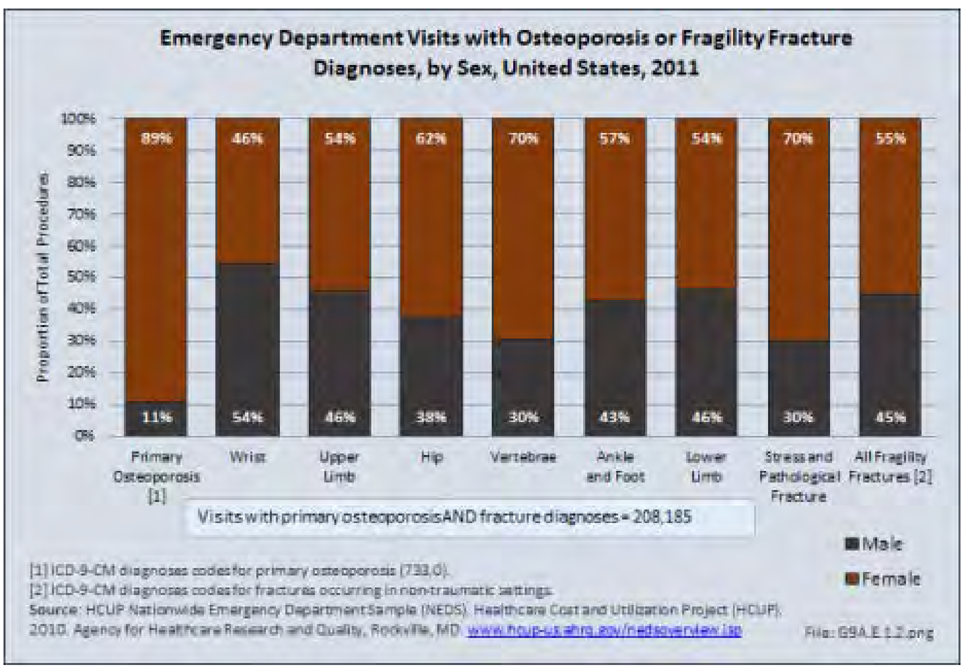
3. Samelson EJ, Hannan MT, Zhang Y, et al. Incidence and risk factors for vertebral fracture in women and men: 25-year follow-up results from the population-based Framingham Study. *J Bone Miner Res* 2006;21(8):1207-1214.

4. Hasserius R, Karlsson MK, Jónsson B, et al: Long-term morbidity and mortality after a clinically diagnosed vertebral fracture in the elderly—a 12- and 22-year follow-up of 257 patients. *Calcif Tissue Int* 2005 Apr;76(4):235-242. Epub 2005 Apr 11.

Health Care Visits: Osteoporosis

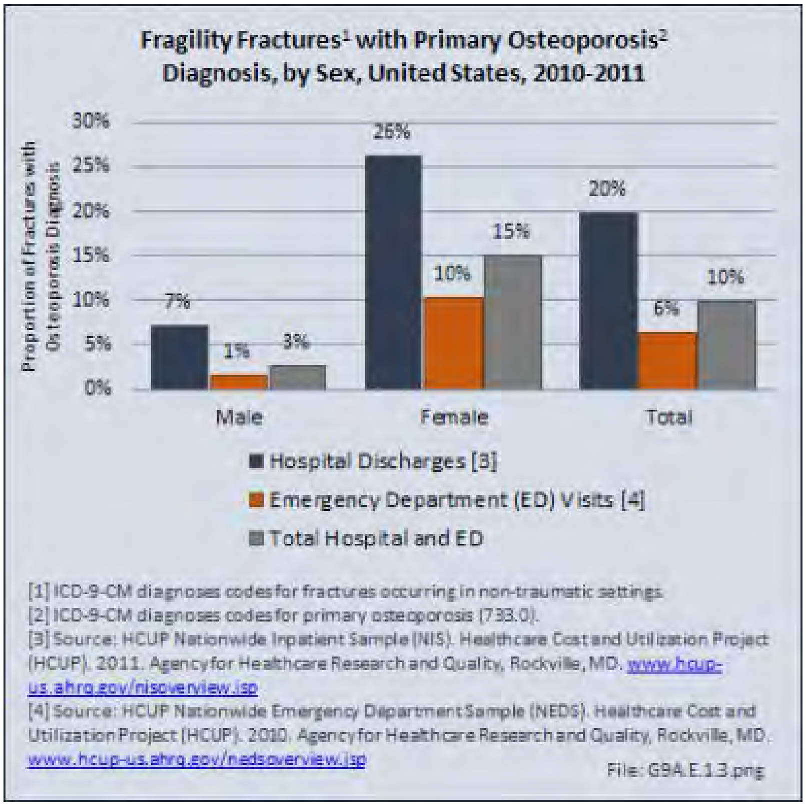
Osteoporosis is often not the principal diagnosis code related to a health care visit, as the condition is usually an underlying cause of another condition, in particular, fragility fractures that often occur after a fall or other seemingly minor incident. Many times in such health care visits, osteoporosis may not even be listed as a condition. Still, in 2011, primary osteoporosis was listed in 2.3 million hospital discharges and emergency department visits as a reason for the visit. Fragility fractures occurred in 4.0 million visits. For 395,500 visits or discharges for fragility fractures, or 10%, primary osteoporosis was also listed as a condition for the visit. The highest proportion of fractures to the vertebrae and stress fractures were diagnosed in women.





Two-thirds of hospital discharges for fragility fractures occurred in women, while 87% of primary osteoporosis diagnoses were in women. Primary osteoporosis was found in a similar proportion of emergency department visits (89%) for women; however, fragility fractures were split 45% males to 55% females.

Women also were more likely to have a primary osteoporosis diagnosis with a fragility fracture, accounting for 26% of hospital discharges and 10% of emergency department visits. Among men, both diagnoses were found in 7% of hospital discharges and only 1% of emergency department visits. The noted incidence of osteoporosis among men in this situation is most likely underreported as, noted above, men are less likely than women to be evaluated for osteoporosis, even after sustaining a low impact fracture. Evaluation of bone health in men and women after sustaining a low impact fracture and initiation of secondary fracture prevention measures are areas that require significant attention and improvement. (Reference Table 9A.5 PDF CSV)



Injuries

The most common causes of injury among women are falls, violence, and those related to motor vehicle collisions.1 Men, are more likely than women to present with high impact injuries, such as well as penetrating wounds and open fractures. This most likely reflects the impact of gender on differing levels of exposure to specific high-risk activities. For men and women exposed to the same level of injury, however, sex-based differences have been noted. For example, among athletes exposed to the same degree of head impact, women were more likely than men to sustain a concussion. This has been attributed to differences in strength of the neck muscles and reaction times of the neck muscles.2

The etiology and incidence of some sports-related injuries have been identified between women and men and reflect the impact of sex and gender. Women are more likely than men to present with non-contact injuries, especially those of the ACL. The increased risk of non-contact ACL injuries in women has been attributed to sex-based differences in lower-extremity anatomy and hormonal influences. However, the most likely explanation relates to sex-based differences in neuromuscular control and landing mechanics.[3] There may also be gender-based differences in access to appropriate training resources. Sex-based differences in other injuries have been suggested, although significant data has not consistently supported this. Among sports injuries, differing levels of incidence of injury can also be attributed to gender-based differences in the types of sports played or differing rule or mandated safety equipment.

The impact of gender is also noted when assessing the risk of injuries related to intimate partner (domestic) violence (IPV). Women are more likely than men to be victims of IPV. Although physical abuse in this setting is less common than emotional or psychologic abuse, musculoskeletal injuries may bring these women into the health care system, as one-third of women presenting to orthopaedic fracture clinics were found by the PRAISE Investigators to have been victims of IPV of some type within the preceding 12 months.[4] This incidence may be underestimated, as most studies in this area rely on self-report and only include those who present for treatment. Among a group of female victims of intimate partner violence, musculoskeletal injuries were the second most common type of injury, following injuries of the head and neck.[1] The most common injuries in this setting included contusions, sprains, and fractures/dislocations. Victims of intimate partner violence span all ages, races, ethnicities, and socioeconomic backgrounds.

1. a. b. Bhandari M, Dosanjh S, Tornetta P, Matthews D. Musculoskeletal manifestations of physical abuse after intimate partner violence. *J of Trauma* 2006;61:1473-1479.

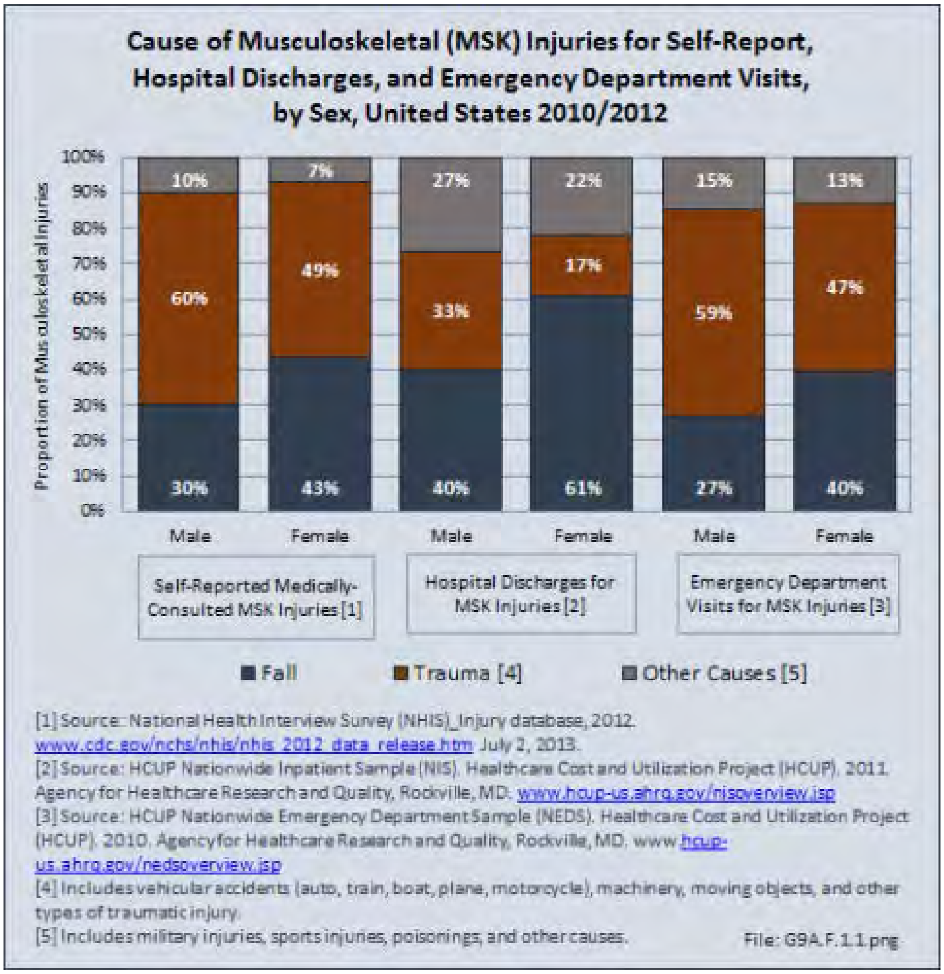
2. Brainard LL, Beckwith JG, Chu JJ. Gender differences in head impacts sustained by collegiate ice hockey players. *Med Sci Sports Exerc* 2012;44(2): 297-304.

3. Kercher JS, Hammond KE, Griffin EY. Meniscal tears and anterior cruciate ligament injuries, in *Women's Sports Injuries*, Templeton K, ed. AAOS 2013. Rosemont, IL.

4. P.R.A.I.S.E. Investigators. The prevalence of intimate partner violence across orthopaedic fracture clinics in Ontario. *JBJS(A)* 2011;93:132-141.

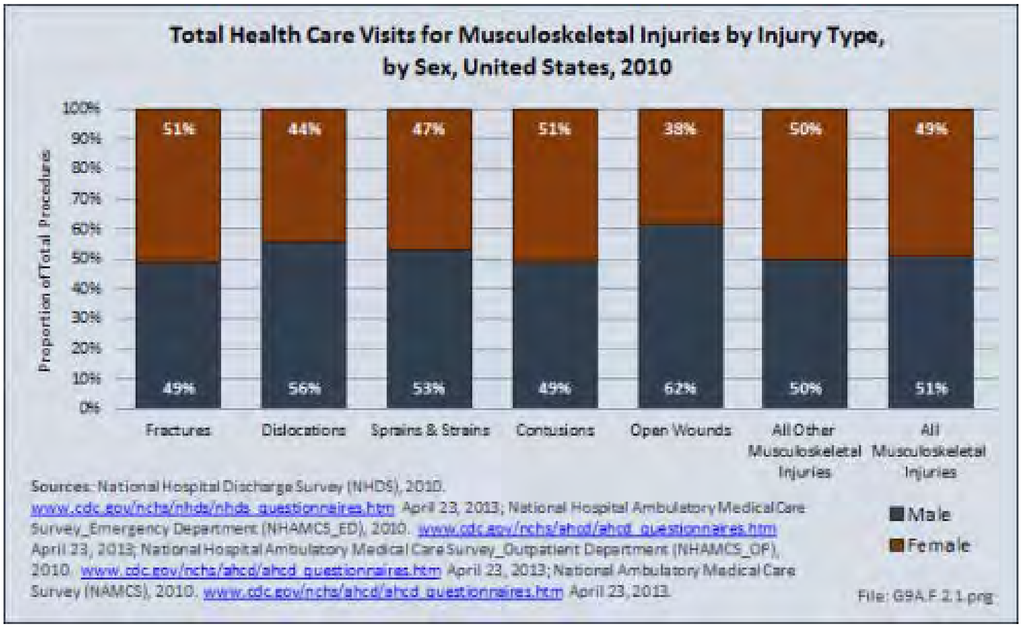
Prevalence: Musculoskeletal Injuries

Women are more likely to seek medical care for musculoskeletal injuries that occur from a fall, accounting for as much as 60% of hospital discharges for musculoskeletal injuries. Musculoskeletal injuries to men are more likely to be the result of trauma or an accident, accounting for about 60% of emergency department visits by men. Sports injuries and other causes of injuries occur in relatively similar proportions to both men and women. (Reference Table 9A.6 PDF CSV)



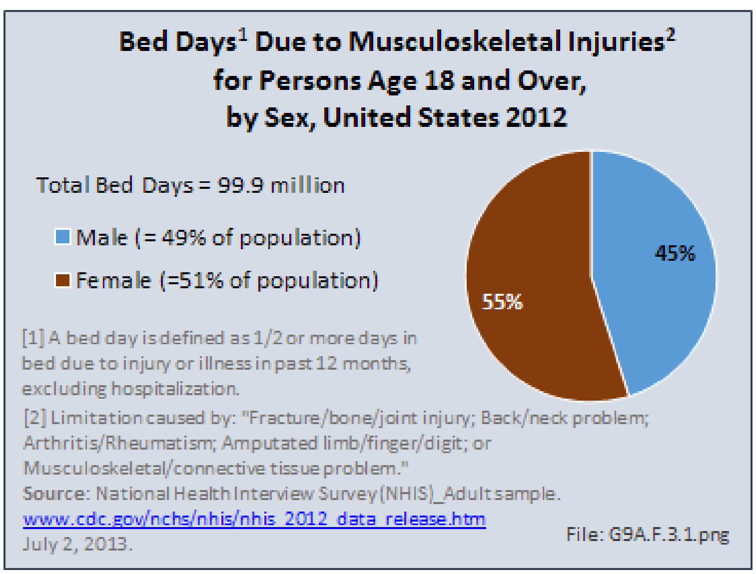
Health Care Visits: Injuries

In 2010, 65.8 million health care visits were made to hospitals, emergency departments, outpatient clinics, and physician's offices for musculoskeletal injuries. These visits were split nearly evenly between women and men (49% to 51%, compared to US census population of 51% to 49%, females to males). This distribution differed only a few percentage points for all types of musculoskeletal injuries, with the exception of open wounds, with 62% occurring to men. (Reference Table 9A.6 PDF CSV)

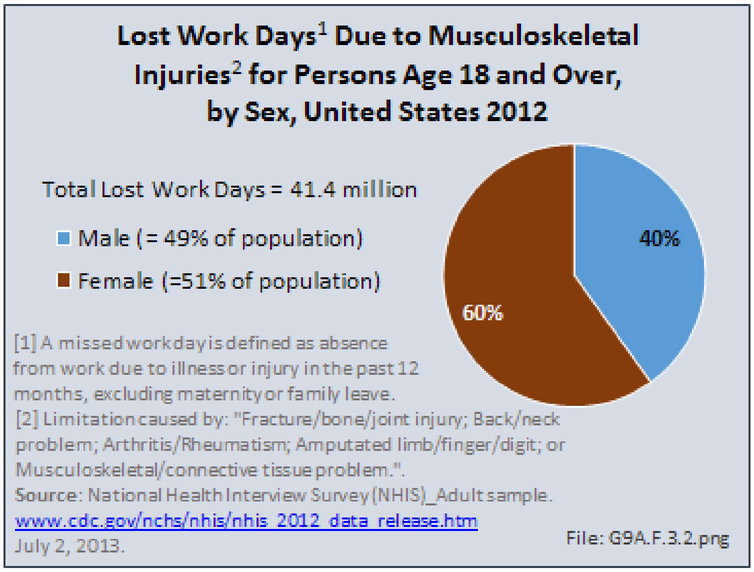


Bed and Lost Work Days: Injuries

Women report more bed days due to musculoskeletal injuries than men do, both in number of women with bed days and the mean number of bed days reported. In 2012, women self-reported a mean of 10.5 bed days versus a mean of 8.0 days for men. Overall, women accounted for 55% of the 99.9 million bed days reported for musculoskeletal injuries in 2012.



Although a lower number of women than men reported lost workdays due to musculoskeletal injuries in 2012, they reported a mean of 11.5 days lost versus the 7.4 mean days lost reported by men. As a result, women accounted for 60% of the 41.4 million self-reported lost workdays in 2012 due to musculoskeletal injuries. (Reference Table 9A.6 PDF CSV)



Tumors

Primary sarcomas represent the least common malignancies in bone, although osteosarcoma represents the most common nonhemoapoietic primary tumor of bone. Slightly higher incidences of males have been reported for osteosarcoma (53% male versus 47% female) and Ewing sarcoma, the second most common bone and soft tissue sarcoma of young patients (55% male versus 45% female); neither is statistically significant. However, in the more common malignant lesions in bone—metastatic disease and myeloma—various studies have noted differing incidences and/or differences in outcome between the sexes.

Survival among patients with cancers continues to improve, increasing the risk for metastases. Bone is a common site of metastasis for most malignancies, and metastatic carcinoma represents the most common malignancy in bone. These typically are harbingers for poor prognosis. In addition, related skeletal events (hypercalcemia, pathologic fracture, bone pain necessitating radiation therapy, surgical intervention, spinal cord compression) lead to significant morbidity and impact on patient function, as well as shorter median survival times. Carcinomas that occur in both men and women and have a propensity for skeletal metastasis, including lung, breast, and renal cell carcinoma, have reported differing incidences between men and women of risk, location, and outcome of bone metastasis. For example, men are almost twice as likely to develop acrometastasis,1 with more than half representing metastatic lung carcinoma, reflecting the higher incidence of lung cancer among men.2

Lung cancer is a leading cancer globally, and the leading cause of cancer-related deaths. Men are more likely to develop lung cancer; however, women tend to be younger and less likely to be smokers, than men with lung cancer are. It has also been noted that men are more likely to have squamous cell subtype of lung carcinoma.3 Sex-based differences have not been consistently identified in the risk of metastasis or skeletal-related events (SRE), including among patients initially presenting with extensive disease,4 perhaps reflecting the shorter life expectancy among these patients.[3,5] In some studies of patients with bone metastasis, women have been noted to have longer average survival than men; however, sex does not consistently remain an independent predictor of survival after accounting for younger age at diagnosis, non-smoker status, and adenocarcinoma cell type, all factors associated with improved survival and more commonly noted among women.

Breast cancer is the most common cancer among women; only 1% of cases of breast cancer are diagnosed in men. Men tend to be older at the time of initial diagnosis. Approximately 5% of women will present with metastatic disease at the time of initial diagnosis, with another 4% developing bone metastasis during follow-up. In contrast, more than 40% of men present with stage III or IV disease.[6] Presentation of men at later stages of disease may reflect the impact of screening programs and greater awareness of the disease in women. For both sexes, bone is the most common location of metastasis, with approximately half of women sustaining a skeletal-related event during the course of their disease. Similar data for SREs are not available for men. Bone metastases and SREs have significant impact on survival.[7] Sex has been found to be an independent risk factor for prognosis, with women having better survival. However, this may reflect the more advanced stage at the time of initial diagnosis among men because, after controlling for stage, men have been reported to have similar rates of survival as women.[8] In contrast, others have suggested that the tumor biology differs between the sexes because men have been noted to have worse survival than women among those with early stage or lymph-node–negative tumors and among those with estrogen-receptor–positive tumors.[6] The relative impact on survival of different tumor biology and greater awareness and screening needs to be further elucidated.

Renal cell carcinoma represents approximately 4% of new cancer diagnoses each year in the United States.[9] Approximately one-third of patients will present with metastatic disease, with another one-third developing metastases later. Bone is the second most common site of metastasis, after lung; between 20% and 35% of patients will have bone metastases during the course of their disease, with 85% eventually developing an SRE.[10] Although there is a higher incidence of renal cell carcinoma among men (male:female, 1.5:1), the male:female ratio increases among those with metastases at other sites (2.0) and is even higher among those with bone metastases (2.4).[10] However, sex has not been identified as an independent risk factor for survival,[11] including among patients with bone metastases.[9]

Myeloma is the most common malignancy arising in bone. Changes in bone arising from myeloma can result in osteolytic lesions, osteopenia, bone pain, and hypercalcemia. The incidence of myeloma increases with age. Men are more often diagnosed with myeloma than are women, with this sex difference initially noted at the age of 40 years. The male:female ratio increases with each decade, and is highest among those 85 years of age and older. Myeloma is also more common among Blacks for both men and women. A possible impact of female hormones on the immune system and secondary impact on the incidence of myeloma has been suggested.[12] Older studies noted that males with myeloma had an increased estrogen:androgen ratio and women with myeloma had a decreased estrogen:androgen ratio, compared to controls.[13] More recent studies have attempted to investigate the impact of sex hormones on the development of myeloma by correlating reproductive history with subsequent myeloma risk; results of these studies has been inconsistent, with some suggesting that increased parity is associated with increased risk of developing myeloma.[12]

Anthropometric characteristics[14] have also been investigated in incidence of myeloma. The impact of height was found to be correlated to myeloma risk in women but not in men,[15] or to have no effect on risk for either sex.[16] Body mass index was reported to be related to myeloma risk in men but not women.[15] However, other studies have noted that a higher BMI is related to poorer prognosis among women but not men.[16] Sex-based differences in the prevalence of genetic mutations in myeloma have also been reported; immunoglobulin heavy chain gene (IGH) translocations were found to be more common in women, and hyperdiploidy was more common in men. There were also differences in secondary genetic events with del(13q) and +1q being found more frequently in female myeloma patients.[16] It has been suggested that mutations associated with poor prognosis may explain, in part, the lower overall survival noted among women with myeloma.

1. Malignant secondary lesions of the bones located in the hands and/or feet.

2. Mavrogenis AF, Mimidis G, Kokkalis ZT, et al: Acrometastases. *Eur J Orthop Surg Traumatol* 2014 Apr;24(3):279-283. Epub 2013 Sep 8

3. a. b. Riihimäki M1, Hemminki A, Sundquist K, Hemminki K: Causes of death in patients with extranodal cancer of unknown primary: Searching for the primary site. *BMC Cancer* 2014 Jun 14;14:439. doi: 10.1186/1471-2407-14-439.

4. Katakami N, Kunikane H, Takeda K, et al: Prospective study on the incidence of bone metastasis (BM) and skeletal-related events (SREs) in patients with stage IIIB and IV lung cancer. *J Thorac Oncol* 2014 Feb;9(2):231-238. doi: 10.1097/JTO.0000000000000051.

5. Cetin K, Christiansen CF, Jacobsen JB, *et al*. Bone metastasis, skeletal-related events, and mortality in lung cancer patients: a Danish population-based cohort study. *Lung Cancer*. 2014 Nov;86(2):247-254. doi: 10.1016/j.lungcan.2014.08.022. Epub 2014 Sep 10.

6. a. b. Nahleh ZA, Srikantiah R, Safa M, et al: Male breast cancer in the veterans affairs population: A comparative analysis. *Cancer* 2007 Apr 15;109(8):1471-1477.

7. Yong C, Onukwugha E, Mullins CD: Clinical and economic burden of bone metastasis and skeletal-related events in prostate cancer. *Curr Opin Oncol* 2014 May;26(3):274-283. doi: 10.1097/CCO.0000000000000071.

8. Miao H, Verkooijen HM, Chia KS, et al: Incidence and outcome of male breast cancer: An international population-based study. *J Clin Oncol* 2011 Nov 20;29(33):4381-4386. Epub 2011 Oct 3.

9. a. b. Kume H, Kakutani S, Yamada Y, et al: Prognostic factors for renal cell carincoma with bone metastasis: Who are the long-term survivors? *J Urology* 2011;185:1611-1624. Epub 2011 Mar 17.

10. a. b. Woodward E, Jagdev S, McParland L, et al: Skeletal complications and survival in renal cancer patients with bone metastases. *Bone* 2011 Jan;48(1):160-166. Epub 2010 Sep 18.

11. Fottner A, Szalantzy M, Wirthmann L, *et al*. Bone metastases from renal cell carcinoma: patient survival after surgical treatment. *BMC Musculoskelet Disord*. 2010 Jul 3;11:145. doi: 10.1186/1471-2474-11-145.

12. a. b. Wang S, Voutsinas J, Chang E, et al: Anthropometric, behavioral, and female reproductive factors and risk of multiple myeloma: A pooled analysis. *Cancer Causes Control* 2013;24:1279-1289. doi: 10.1007/s10552-013-0206-0.

13. Everaus H, Hein M, Zilmer K: Possible imbalance of the immuno-hormonal axis in multiple myeloma. *Leuk Lymphoma* 1993 Nov;11(5-6):453-458.

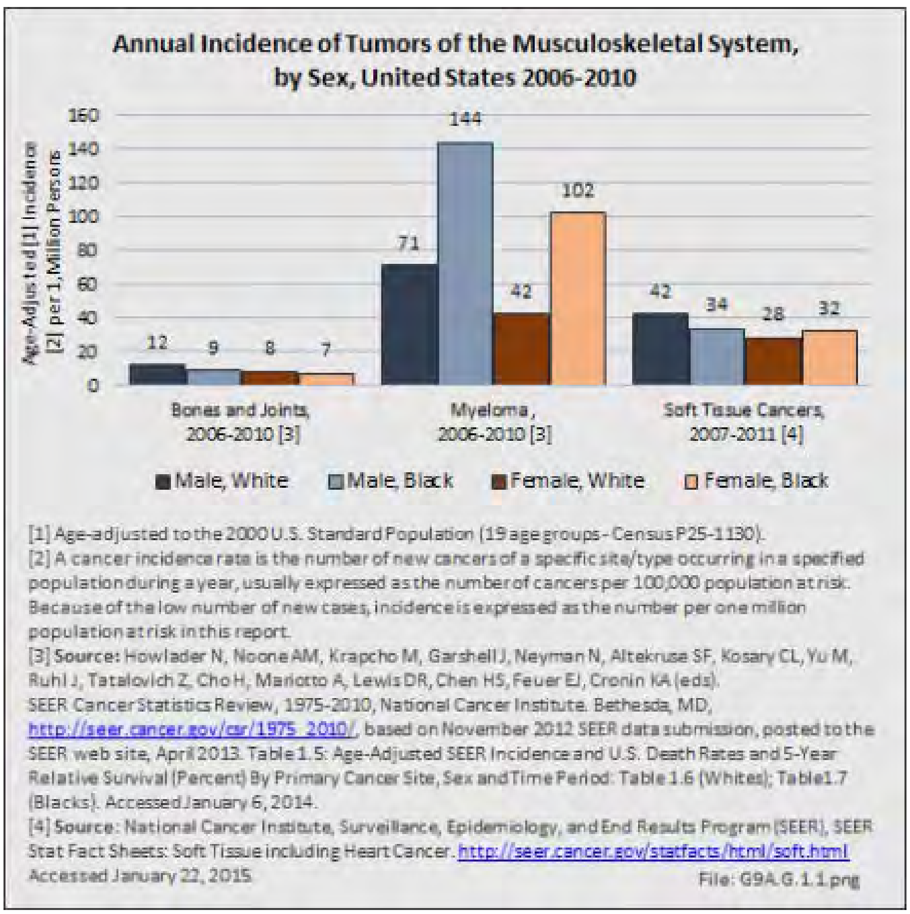
14. Measurement of the size and proportions of the human body.

15. a. b. Britton JA, Khan AE, Rohrmann S, et al: Anthropometric characteristics and non-Hodgkin's lymphoma and multiple myeloma risk in the European Prospective Investigation into Cancer and Nutrition (EPIC). *Haematologica* 2008 Nov;93(11):1666-1677. doi: 10.3324/haematol.13078. Epub 2008 Oct 2.

16. a. b. c. Teras LR, Kitahara CM, Birmann BM, et al: Body size and multiple myeloma mortality: A pooled analysis of 20 prospective studies. *Br J Haematol* 2014 Sep;166(5):667-676. doi: 10.1111/bjh.12935. Epub 2014 May 23.

Incidence: Tumors

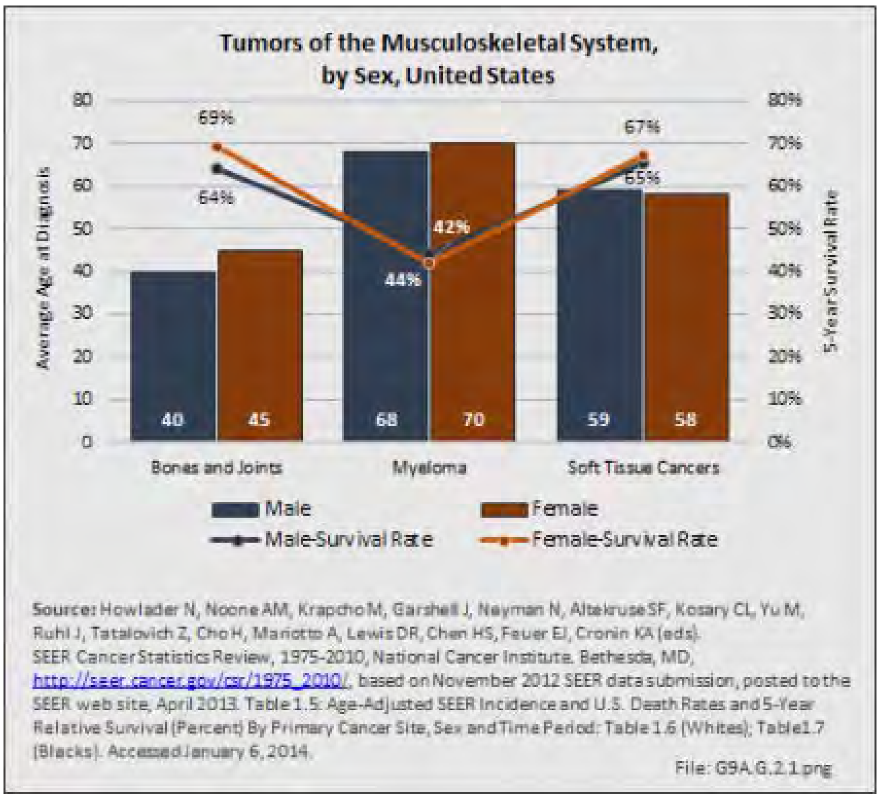
Men have a higher incidence of all types of musculoskeletal system tumors than women do. The difference is particularly noticeable in the incidence of myeloma, with both White and Black men being 30% to 40% more likely to have myeloma than White or Black Women. (Reference Table 9A.7 PDF CSV)



Survival: Tumors

In addition to higher incidence rates, men also are likely to be diagnosed with all types of musculoskeletal system tumors a few years younger than women. Myeloma, the most common of the musculoskeletal system cancers, is primarily a disease of the elderly, while soft tissue cancers in middle age, and cancers of bones and joints in children and young adults.

Men have a slightly lower 5-year survival rate for bone and joint cancers and soft-tissue cancers, both of which have a survival rate of 64% to 70%. Women have a slightly lower 5-year survival rate for myeloma, which has a rate of 42% to 44%. (Reference Table 9A.7 PDF CSV)



Key Challenges to Future

The relative impacts of sex and gender on etiology and responses to treatment need to be defined for all musculoskeletal conditions. Evidence at this point indicates that women experience musculoskeletal conditions in higher numbers than men do for all conditions except traumatic injuries and cancers of the musculoskeletal system. The smaller differences such as those found in musculoskeletal injuries and spine conditions are moderate. Differences in incidence for some conditions, such as osteoporosis, spinal deformity, and arthritis, are sufficient to warrant exploration into reasons why these differences occur.

The impact of sex on musculoskeletal conditions may reflect differences in levels of or response to sex hormones. However, the relative impact of these hormones between the sexes and during different phases of the menstrual cycle have not been clearly elucidated, and although it is likely sex hormones impact on most, if not all, musculoskeletal conditions, additional factors need to be investigated. As the Institute of Medicine says, "every cell has a sex,"[1] and these cell-based differences reflect much more than response to sex hormones. Identification of sex-based factors related to causes of disease will be key to prevention. Sex-based differences in responses to treatment may indicate a need to tailor treatment options to individual patients. The latter is exemplified by the significant differences between the sexes in outcome of metal-on-metal hip arthroplasty,[2] which may also be influenced by sex-based genetic differences.[3] In addition, the impact of gender needs to be clarified. Although prevention and treatment options are available, if there is not awareness that these conditions occur in all patients, and patients of either gender are less able or not encouraged to access these resources, the outcome of their treatment is less likely to be delayed, impacting function, and raising the societal costs of these conditions.

1. Institute of Medicine. *Exploring the Biological Contributions to Human Health: Does Sex Matter?* Washington, DC, The National Academy Press, 2001, pp. 24-44. Available at http://www.nap.edu/catalog/10028/exploring-the-biological-contributions-to-human-health-does-sex-matter. Accessed March 11, 2011. ISBN: 978-0-309-07281-6.

2. Latteier MJ, Berend KR, Lombardi AV Jr, et al: Gender is a significant factor for failure of metal-on-metal total hip arthroplasty. *J Arthroplasty* 2011;26(6):19-23. doi: 10.1016/j.arth.2011.04.012. Epub 2011 Jun 8.

3. Bachmann HS, Hanenkamp S, Komacki B, et al. Gender-dependent association of GNSS1 T393C polymorphism with early aseptic loosening after total hip arthroplasty. *J Orthop Res* 2008 Dec;26(12):1562-1568. doi: 10.1002/jor.20699.

Unmet Needs

While significant data exists regarding sex-based differences in some musculoskeletal health conditions, the presence of these differences should be assessed for all conditions. Where differences are noted, additional research is needed to identify how sex- and gender-based differences may influence etiology and presentation of conditions. This would facilitate diagnosis, as well as tailor prevention and treatment modalities to individual patients, decrease incidence of these conditions, improve outcome, and lead to enhanced function.

Table 9A.1: Self-Reported Musculoskeletal Conditions, by Sex, United States 2012

	Total Persons With Condition Aged 18 & Over (in millions)			**Prevalence Per 100 Persons in Sex Group**		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**
Prevalence and Age-Adjusted Rate of Self-Reported Select Medical Conditions [1]						
Musculoskeletal	58.023	68.624	126.647	51.3	56.3	53.9
Chronic Joint Pain	28.044	35.041	63.085	24.8	28.8	26.9
Arthritis	20.878	30.951	51.830	18.5	25.4	22.1
Neck Pain (Cervical Back Pain)	13.102	20.414	33.515	11.6	16.8	14.3
Lower Back Pain (Lumbar Back Pain)	29.124	36.699	65.823	25.8	30.1	28.0
Lower Back Pain Spreading Below Knee	9.374	13.516	22.890	8.3	11.1	9.7
Prevalence of Chronic Joint Pain [1] by Joint						
Knee	17.552	22.442	39.994	15.5	18.4	17.0
Shoulder	9.057	9.685	18.742	8.0	7.9	8.0
Hip	5.577	9.726	15.303	4.9	8.0	6.5
Fingers	5.224	9.169	14.393	4.6	7.5	6.1
Ankle	5.413	7.683	13.096	4.8	6.3	5.6
Wrist	4.529	6.842	11.370	4.0	5.6	4.8
Elbow	4.558	5.103	9.661	4.0	4.2	4.1
Toes	2.221	3.804	6.026	2.0	3.1	2.6
Other Joint	1.225	2.114	3.339	1.1	1.7	1.4
All Chronic Joint [2]	28.044	35.041	63.085	24.8	28.8	26.9

	Total Persons With Condition Aged 18 & Over (in 000s)			**Prevalence Per 100 Persons in Sex Group**		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**
Self-Reported Limitations in Activities of Daily Living for Persons Due to Select Medical Conditions						
Musculoskeletal [3]	7,521	10,690	18,211	5.0	6.8	5.9
Cause of Self-Reported Limitations in Activities of Daily Living for Persons Due to Musculoskeletal Condition						
Back or Neck Problem [4]	3,999	4,555	8,554	3.5	3.7	3.6
Arthritis or Rheumatism [4]	2,553	5,297	7,850	2.3	4.3	3.3
Musculoskeletal/Connective Tissue Problem [4]	1,178	2,972	4,150	1.0	2.4	1.8
Fracture, Bone/Joint Injury [4]	1,627	1,692	3,319	1.4	1.4	1.4
Missing or Amputated Limb/Finger/Digit [4]	276	98	374	0.2	0.1	0.2
Bone, Joint, or Muscle Problem [5]	134	*	217	0.4	*	0.3
Total All Musculoskeletal Conditions	7,521	10,690	18,211	5.0	6.8	5.9

Table 9A.1: Self-Reported Musculoskeletal Conditions, by Sex, United States 2012

	Male	Female	Total
Bed Days [6] Due to Musculoskeletal Injuries or Conditions [7] for Persons Age 18 and Over			
Persons Reporting Bed Days (in 000s)	23,477	34,077	57,554
Mean Bed Days	8.2	9.9	9.2
Total Bed Days (in millions)	192.0	336.3	528.3
Lost Work Days [8] Due to Musculoskeletal Injuries or Conditions for Persons Age 18 and Over			
Persons Reporting Lost Work Days (in 000s)	12,698	15,378	28,076
Mean Work Days Lost	8.0	7.5	7.7
Total Work Days Lost (in millions)	102.0	114.6	216.5

* Data does not meet standards for reliability.

[1] Symptoms lasting 3 months or longer.

[2] Chronic pain in multiple joints may be reported.

[3] Includes arthritis/rheumatism condition, back or neck problem, fracture/bone/joint injury, musculoskeletal/connective tissue condition, missing or amputated limb/finger/digit; in 0-17 population defined as injury or bone/joint/muscle problem.

[4] Question asked for persons aged 18 years and older.

[5] Question asked for persons aged 0 thru 17 years.

[6] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[7] Caused by: "Fracture/bone/joint injury; Back/neck problem; Arthritis/rRheumatism; Amputated limb/finger/digit; or Musculoskeletal /connective tissue problem."

[8] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 9A.2: Spine Conditions, by Sex, United States

	Male	Female	Total
Total Number of Health Care Visits for Low Back Disorders, all Ages, 2010 (in 000s) [1,2]			
Back Disorders	17,394.8	22,209.3	39,603.9
Disc Disorders	4,950.5	4,755.8	9,706.4
Back Injury	3,625.6	3,865.8	7,491.5
All Lumbar/Low Back Pain (3)	23,669.1	28,509.0	52,178.2
% of Total Visits	45%	55%	
Rate per 100 Persons	15.6	18.1	16.9
Total Health Care Visits for Neck and Cervical Spine Disorders, All Ages, 2010 (in 000s) [2,4]			
Cervical Disorders	4,542.6	6,012.2	10,554.8
Cervical Disc Disorders	1,387.3	1,060.4	2,447.7
Neck Injury	2,051.4	2,141.5	4,192.9
All Cervical/Neck Pain [3]	7,317.5	8,992.9	16,310.5
% of Total Visits	45%	55%	
Rate per 100 Persons	4.8	5.7	5.3
Bed Days [5] Due to Spine Pain or Problems [6] for Persons Aged 18 and Over [7]			
Persons Reporting Bed Days (in 000s)	9,418	13,049	22,467
% of Workforce with Bed Days	11.3%	17.2%	14.2%
Mean Bed Days	7.4	7.8	7.6
Total Bed Days (in millions)	69.7	101.8	170.7
% of Total Bed Days	41%	60%	
Lost Work Days [8] Due to Spine Pain or Problems [9] for Persons Aged 18 and Over [7]			
Persons Reporting Lost Work Days (in 000s)	11,424	14,089	25,513
% of Workforce with Lost Work Days	13.8%	18.6%	16.1%
Mean Work Days Lost	11.9	11.0	11.4
Total Work Days Lost (in millions)	135.9	155.0	290.8
% of Total Lost Work Days	47%	53%	
Hospital Discharges with Back Pain Diagnoses Where Discharge Included Surgical Procedure [10]			
All Back Pain Discharges	1,367	1,816	3,186
Discharges with Spine Fusion Procedure [14]	226	262	488
% Diagnoses with Spinal Fusion Procedure	16.5%	14.4%	15.3%

[1] Back disorders include inflammatory spine conditions, spondylosis, spinal stenosis, lumbago, sciatica, backache, and disorders of the sacrum (ICD-9-CM codes 720, 721, and 724). Disc disorders include herniation, disc degeneration, and post laminectomy syndromes (ICD-9-CM code 722). Back injuries include fractures, dislocation, and sprains (ICD-9-CM codes 805, 806, 839, 846, and 847). This division, while useful in analyzing the databases, may not always accurately reflect the primary diagnosis. Further, there is some overlap.

[2] **Sources**: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013; National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013; National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013; National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[3] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient. Visits also do not include those made to other types of medical care providers, such as chiropractic or physical therapy.

Table 9A.2: Spine Conditions, by Sex, United States

[4] In presenting health care resource utilization for cervical pain, three categories of cervical pain are addressed. One is labeled cervical disc disorders, and includes disc displacement, herniation, and disc degeneration (ICD-9-CM code 722). A second group is cervical injuries, and includes sprains, strains, and fractures (ICD-9-CM codes 805, 806, 839, and 847). A third group, referred to as cervical disorders, includes pain caused by other disease entities, including cervical spondylosis and stenosis (ICD-9-CM codes 721 and 723).

[5] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[6] Replied "yes" when ask "During the PAST THREE MONTHS, did you have …Low back pain?/ Neck pain?"

[7] **Source**: National Health Interview Survey (NHIS)_Adult sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

[8] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

[9] **Source**: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[10] ICD-9-CM codes 8100 thru 8108; 8130 thru 8138.

Table 9A.3: Health Care Visits for Spinal Deformity Conditions, by Sex, United States

	Total Visits (in 000s)			% of Total	
	Total	Male	Female	Male	Female
Total Health Care Visits for Spinal Deformity Disorders [1]					
Curvature of spine	2,273.5	595.8	1,677.5	26%	74%
Idiopathic	1,811.3	458.7	1,352.4	25%	75%
Acquired	419.0	114.3	304.7	27%	73%
Secondary	83.8	24.1	59.7	29%	71%
Spondylolisthesis	778.7	242.9	535.8	31%	69%
Spinal fractures	933.0	388.7	544.0	42%	58%
Vertebral compression fractures	895.4	361.6	533.5	40%	60%
Traumatic fractures	42.4	30.2	12.0	71%	28%
Spinal infection	1,871.5	864.3	1,007.3	46%	54%
Tuberculosis of spine	4.7	3.8	1.0	81%	21%
Intraspinal abscess	25.9	15.7	10.2	61%	39%
Acute osteomylitis	23.9	8.1	15.8	34%	66%
Chronic osteomylitis	51.8	33.1	18.6	64%	36%
Discitis	1,779.6	812.5	967.1	46%	54%
Complications of surgery	261.9	130.2	131.6	50%	50%
Spondylopathies	10,990.1	4,462.7	6,527.0	41%	59%
All Spinal Deformity Disorders (2)	16,592.4	6,538.7	10,052.6	39%	61%
Rate Per 100 Patient Visits	1.3	1.2	1.4		
Diagnoses Per 100 U.S. Population [3]	5.4	4.3	6.4		

[1] Includes hospital discharges, emergency department visits, outpatient department visits, and physician office visits.

Sources: **Hospital visits**: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Emergency Department Visits: : HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

Outpatient Visits: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

Physician Office Visits: National Ambulatory Medical Care Survey (NAMCS), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[2] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient.

[3] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 9A.4.1: Self-Reported Arthritis Conditions, by Sex, United States

	Total Persons (in 000s)			**Rate Per 100 Persons** [1]		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**
Prevalence of Self-Reported Arthritis Conditions Among Adults Age 18 & Older, 2010-2012 [2]						
Doctor-Diagnosed Arthritis [3]	21,400	31,100	52,500	18.6	23.9	21.4
Arthritis-Attributable Activity Limitations [4]	9,000	13,700	22,700	7.8	10.5	9.2
Limitations of Daily Living and Activity Attributed to Arthritis by Persons with Self-Reported Doctor-Diagnosed Arthritis [3,4,5]						
Any limitation	2,412.1	5,153.7	7,565.9	2.1	4.3	3.2
Need help with routine needs	593.7	1,991.5	2,585.2	0.5	1.6	1.1
Help with personal care	328.7	971.9	1,300.6	0.3	0.8	0.6
Difficulty walking without equipment	1,265.4	3,960.8	4,226.2	1.1	3.3	1.8
Unable to work NOW due to health	1,215.4	2,623.0	3,838.3	1.1	2.2	1.6
Limited in kind or amount of work	685.4	1,375.9	2,061.3	0.6	1.1	0.9

Proportion of Adults With Limitations Due to Self-Reported Doctor-Diagnosed Arthritis [3,4,5]

	Proportion of Total Population		
Any limitation	12%	24%	19%
Need help with routine needs	17%	33%	27%
Help with personal care	15%	31%	24%
Difficulty walking without equipment	24%	50%	32%
Unable to work NOW due to health [4]	15%	27%	22%
Limited in kind or amount of work	15%	26%	21%

Bed Days [6] Due to Arthritis Conditions [3] for Persons Aged 18 and Over [5]				**Proportion of Adults Reporting Any Medical Condition**		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**
Persons Reporting Bed Days (in 000s)	8,101	14,301	22,402	28.0%	35.0%	32.1%
Mean Bed Days	21.2	25.7	24.0			
Total Bed Days (in millions)	171.7	367.5	537.6	45.4%	57.7%	53.0%
Lost Work Days [7] Due to Arthritis Conditions [3] for Persons Aged 18 and Over [6]						
Persons Reporting Lost Work Days (in 000s)	4,973	7,063	12,036	20.0%	24.9%	28.2%
Mean Work Days Lost	14.1	14.4	14.3			
Total Work Days Lost (in millions)	70.1	101.7	172.1	28.2%	36.6%	32.7%

* Estimates do not meet standards for reliability.

[1] Age-adjusted by direct method to US Census adult population estimate using 2000 U.S. Census estimates for the years 2010-2011, and 2010 U.S. Census estimates for 2012. Describes the relative population burden when comparing groups.

[2] **Source**: Barbour KE, Helmick CG, Theis KA, et al. Prevalence of Doctor-Diagnosed Arthritis and Arthritis-Attributable Activity Limitation-United States, 2010-2012. *MMWR* 2013:62(44):869-873. Prevalence calculated by the Burden of Musculoskeletal Diseases project analyst using the same databases and variables reported by MMWR.

[3] Responded "yes" when asked: Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?

[4] Responded "yes" when asked: Are you now limited in any way in any of your usual activities because of arthritis or joint symptoms?

[5] Source: National Health Interview Survey (NHIS)_Adult sample, 2010-2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

[6] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[7] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

Table 9A.4.2: Hospital Discharges for Arthritis Conditions, by Sex, United States 2011

	Total Persons (in 000s)			Rate Per 100 Persons [1]		
	Male	Female	Total	Male	Female	Total
Hospitalizations for Arthritis and Other Rheumatic Conditions (AorC) Among Adults Age 18 and Older, 2011 [2]						
Osteoarthritis and allied disorders	1,140.1	2,020.9	3,161.1	1.0	1.7	1.3
Rheumatoid arthritis	134.6	407.5	542.2	0.1	0.1	0.2
Gout and other crystal arthropathies	577.3	296.2	873.4	0.5	0.2	0.4
Joint pain, effusion and other unspecified joint disorders	406.3	617.9	1,024.4	0.4	0.5	0.4
Spondylarthropathies	239.6	299.4	539.0	0.2	0.2	0.2
Fibromyalgia	48.0	400.8	448.8	< 0.1	0.3	0.2
Diffuse connective tissue disease (Sjögren's syndrome, SSC, SLE)	36.2	247.5	283.6	< 0.1	0.2	0.2
Carpal tunnel syndrome	*	*	39.3	*	*	*
Soft tissue disorders (excluding back)	348.2	327.4	675.5	0.3	0.3	0.3
Other specified rheumatic conditions	464.2	483.5	947.7	0.4	0.4	0.4
Total AORC Diagnoses	2,631.8	3,982.1	6,614.0	2.3	3.3	2.8

	Male	Female	Total
Hospitalizations, Length of Stay, and Average Patient Charges, 2011 [2]			
Osteoarthritis and allied disorders (number in 1,000s)	1,140.1	2,020.9	3,161.1
Mean LOS (days)	4.5	4.7	4.6
Mean hospital charges (in 000s) [3]	$ 45.28	$ 41.09	$ 42.62
Total hospital charges (in billions)	$ 51.6	$ 83.0	$ 134.7
Rheumatoid arthritis (number in 1,000s)	134.6	407.5	542.2
Mean LOS (days)	5.2	5.2	5.2
Mean hospital charges (in 000s) [3]	$ 45.26	$ 41.70	$ 42.59
Total hospital charges (in billions)	$ 6.1	$ 17.0	$ 23.1
Gout and other crystal arthropathies (number in 1,000s)	577.3	296.2	873.4
Mean LOS (days)	5.4	5.5	5.4
Mean hospital charges (in 000s) [3]	$ 45.64	$ 39.48	$ 43.54
Total hospital charges (in billions)	$ 26.3	$ 11.7	$ 38.0
Joint pain, effusion and other unspecified joint disorders (number in 1,000s)	406.3	617.9	1,024.2
Mean LOS (days)	5.2	5.0	5.1
Mean hospital charges (in 000s) [3]	$ 41.16	$ 36.26	$ 38.55
Total hospital charges (in billions)	$ 16.7	$ 22.4	$ 39.5
Spondylarthropathies (number in 1,000s)	239.6	299.4	539.0
Mean LOS (days)	4.8	4.5	4.6
Mean hospital charges (in 000s) [3]	$ 58.33	$ 50.49	$ 53.98
Total hospital charges (in billions)	$ 14.0	$ 15.1	$ 29.1
Fibromyalgia (number in 1,000s)	48.0	400.8	448.8
Mean LOS (days)	5.1	4.5	4.6
Mean hospital charges (in 000s) [3]	$ 39.06	$ 35.88	$ 36.23
Total hospital charges (in billions)	$ 1.9	$ 14.4	$ 16.3
Total AORC Diagnoses (number in 1,000s)	2,631.8	3,982.1	6,614.0
Mean LOS (days)	5.2	4.9	5.0
Mean hospital charges (in 000s) [3]	$ 47.72	$ 41.49	$ 44.00
Total hospital charges (in billions)	$ 125.6	$ 165.2	$ 291.0
Proportion Total Hospital Charges Attributed to AORC Hospital Stays	21%	25%	23%

Table 9A.4.2: Hospital Discharges for Arthritis Conditions, by Sex, United States 2011

Inpatient Arthroplasty Procedures [2]

	Total Procedures			% of Total Procedures		% of Total Procedures Performed All Discharges
	Male	**Female**	**Total**	**Male**	**Female**	
All Hip Replacement Procedures [4]	190,663	274,943	465,606	41%	59%	1.2%
Total Hip Replacement	135,018	170,756	305,774	44%	56%	0.8%
Partial Hip Replacement	30,487	74,975	105,462	29%	71%	0.3%
Revision Hip Replacement	21,521	29,004	50,525	43%	57%	0.1%
All Knee Replacement Procedures [5]	267,476	438,173	705,649	38%	62%	1.8%
Total Knee Replacement	241,892	401,840	643,732	38%	62%	1.7%
Revision Knee Replacement	25,878	36,682	62,560	41%	59%	0.2%
All Shoulder Replacement Procedures [6]	28,240	38,755	66,995	42%	58%	0.2%
All Other Joint Replacement Procedures [7]	8,973	10,380	19,353	46%	54%	< 0.1%
All Joint Replacement Procedures [8]	495,352	762,251	1,257,603	39%	61%	3.3%

* Estimates do not meet standards for reliability.

[1] Age-adjusted by direct method to US Census adult population estimate using 2000 U.S. Census estimates for the years 2010-2011, and 2010 U.S. Census estimates for 2012. Describes the relative population burden when comparing groups.

[2] **Source**: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[3] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and non-covered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges. Medicare requires a bundled bill for Medicare patients admitted to the hospital through the emergency department; other payers may or may not have similar requirements.

[4] Includes ICD-9-CM procedure codes for total, partial, revision, and hip repair procedures.

[5] Includes ICD-9-CM procedure codes for total, revision, and knee repair procedures.

[6] Includes ICD-9-CM procedure codes for primary and revision shoulder arthroplasty.

[7] Includes ICD-9-CM procedure codes spine, finger, wrist, hand, elbow, toe, foot, ankle, and lower extremity.

[8] Includes ICD-9-CM procedure codes for all above procedures and may include cases with multiple procedures.

Table 9A.5: Osteoporosis and Fragility Fractures, by Sex, United States, 2010-2011

	Hospital Discharges (in 000s) [1]			Emergency Department Visits (in 000s) [2]			Total Hospital Discharges/ ED Visits (in 000s)		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Primary Osteoporosis [3]	152.8	1,061.8	1,214.7	115.9	958.6	1,074.5	268.7	2,020.4	2,289.2
Fragility Fractures [4]									
Wrist	28.4	49.9	78.5	533.4	452.6	986.2	561.8	502.5	1,064.7
Upper Limb	38.6	74.4	113.5	206.7	245.7	452.5	245.3	320.1	566.0
Vertebrae	77.5	137.3	215.0	125.5	207.3	332.9	203.0	344.6	547.9
Hip	97.1	230.7	328.0	95.2	217.7	312.9	192.3	448.4	640.9
Ankle and Foot	45.3	72.1	117.9	262.1	347.6	609.8	307.4	419.7	727.7
Lower Limb	46.1	73.7	120.2	115.1	134.9	250.0	161.2	208.6	370.2
Stress and Pathological Fracture	52.3	111.2	163.5	41.7	96.9	138.6	94.0	208.1	302.1
All Fragility Fractures	357.4	697.1	1,056.5	1,342.3	1,643.3	2,985.9	1,699.7	2,340.4	4,042.4
	Proportion of Total			Proportion of Total			Proportion of Total		
Primary Osteoporosis	13%	87%		11%	89%		12%	88%	
Fragility Fractures									
Wrist	36%	64%		54%	46%		53%	47%	
Upper Limb	34%	66%		46%	54%		43%	57%	
Hip	36%	64%		38%	62%		37%	63%	
Vertebrae	30%	70%		30%	70%		30%	70%	
Ankle and Foot	38%	61%		43%	57%		42%	58%	
Lower Limb	38%	61%		46%	54%		44%	56%	
Stress and Pathological Fracture	32%	68%		30%	70%		31%	69%	
All Fragility Fractures	34%	66%		45%	55%		42%	58%	
Diagnoses of BOTH Primary Osteoporosis and Fragility Fracture	25.6	182.6	208.2	19.8	167.4	187.3	45.4	350.0	395.5
Proportion of Total Diagnoses	7%	26%	20%	1%	10%	6%	3%	15%	10%

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[3] ICD-9-CM diagnoses codes for primary osteoporosis (733.0).

[4] ICD-9-CM diagnoses codes for fractures occurring in non-traumatic settings.

Table 9A.6: Musculoskeletal Injuriy Episodes, by Sex, United States

	Self-Reported, Medically-Consulted Musculoskeletal Injuries [1, 2]			Hospital Discharges, 2010 [3]			Emergency Department Visits, 2010 [4]		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Musculoskeletal Injuries									
Fall	30.1%	43.4%	37.0%	40%	61%	52%	27%	40%	33%
Trauma [5]	60.0%	49.4%	54.5%	33%	17%	24%	59%	47%	53%
Other Causes [6]	9.9%	7.1%	8.5%	27%	22%	24%	15%	13%	14%
Total Injury/Poisoning Episodes (in 000s) [7]	4,260.5	4,626.0	8,864.5	752.0	953.0	1,705.0	9,720.5	9,288.0	19,008.5

	Self-Reported, Medically-Consulted Musculoskeletal Injuries [1, 2]			Hospital Discharges, 2010 [8]			Emergency Department Visits, 2010 [9]		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Type of Musculoskeletal Injury									
Fracture	15.6%	16.0%	15.8%	468.1	676.2	1,144.2	2,006.1	1,961.4	3,964.5
Dislocation	2.5%	*	2.2%	28.7	15.0	43.7	365.4	175.0	540.4
Sprains & Strains	24.8%	32.3%	28.7%	42.3	48.8	91.1	1,986.0	2,344.4	4,330.4
Contusion	10.5%	16.7%	13.7%	91.0	123.9	214.9	2,265.1	2,682.6	4,947.7
Open Wounds	15.9%	10.6%	13.1%	119.9	93.5	213.4	2,509.1	1,381.5	3,890.6
All Other Musculoskeletal Injuries (7)	4.3%	4.2%	4.2%	110.0	109.2	219.2	1,875.9	1,612.3	3,488.2
All Musculoskeletal Injuries	69.3%	75.0%	72.2%	726.9	967.0	1,693.9	9,263.2	10,158.3	19,421.6
Non-Musculoskeletal Injuries	30.7%	25.0%	27.8%						
Total Injury/Poisoning Episodes	4,260.5	4,626.0	8,864.5						
% of Injuries By Demographic Group	48%	52%		43%	57%		48%	52%	

	Total Persons (in 000s)			Proportion of Total by Sex	
	Male	Female	Total	Male	Female
Total Health Care Visits for Musculoskeletal Injuries, 2010 [10]					
Fractures	8,982.9	9,333.6	18,313.4	49%	51%
Dislocations	3,649.5	2,885.7	6,535.1	56%	44%
Sprains & Strains	9,059.2	8,006.4	17,065.6	53%	47%
Contusions	4,462.0	4,650.0	9,112.0	49%	51%
Open Wounds	5,067.2	3,138.2	8,205.4	62%	38%
All Other Musculoskeletal Injuries	5,564.5	5,560.3	11,124.8	50%	50%
All Musculoskeletal Injuries	33,516.3	32,254.3	65,770.8	51%	49%
Rate Per 100 Persons [11]	22.0	20.5	21.3		

Table 9A.6: Musculoskeletal Injuriy Episodes, by Sex, United States

Bed Days [12] Due to Fracture/Bone/Joint Injury [13] for Persons Aged 18 and Over [2]				**Proportion Total by Sex**	
	Male	**Female**	**Total**	**Male**	**Female**
Persons Reporting Bed Days (in 000s)	3,916	4,300	8,216	48%	52%
Mean Bed Days	8.0	10.5	9.4		
Total Bed Days (in millions)	45.1	54.8	99.9	45%	55%
Lost Work Days [14] Due to Fracture/Bone/Joint Injury [13] for Persons Aged 18 and Over [2]					
Persons Reporting Lost Work Days (in 000s)	2,255	2,163	4,418	51%	49%
Mean Work Days Lost	7.4	11.5	9.4		
Total Work Days Lost (in millions)	16.6	24.8	41.4	40%	60%

[1] All medically-consulted injury/poisoning episodes that reportedly occurred during the past 3 months, based on ICD-9-CM codes recorded for 8 possible diagnosis.

[2] Source: National Health Interview Survey (NHIS)_Injury database, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

[3] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[4] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[5] Includes vehicular accidents (auto, train, boat, plane, motorcycle), machinery, moving objects, and other types of traumatic injury.

[6] Includes military injuries, sports injuries, poisonings, and other causes.

[7] Includes derangement, crushing injuries, open wounds, traumatic amputation, and late effect of musculoskeletal injuries.

[8] Source: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013; National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010.

[9] Source: National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013

[10] Sources: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013; National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013; National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013; National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[11] Adjusted to 2010 U.S. Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

[12] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[13] Limitation caused by: "Fracture/bone/joint injury; Back/neck problem; Arthritis/Rheumatism; Amputated limb/finger/digit; or Musculoskeletal/connective tissue problem."

[14] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

Table 9A.7: Tumors of the Musculoskeketal System, by Sex, United States

	Age-Adjusted [1] Incidence [2] per 1,000,000 Persons			Median Age (Years) at Diagnosis [3]			Median Age (Years) at Death [3]		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Incidence of Cancer of Bones and Joints, 2006-2010 [3]									
White	12	8		41	46	44	58	65	60
Black	9	7		32	41	36	49	54	51
All Races			9	40	45	42	56	63	59
Incidence of Myeloma, 2006-2010 [3]									
White	71	42		69	71	70	74	77	75
Black	144	102		65	66	66	69	72	71
All Races			59	68	70	69	73	76	75
Incidence of Soft Tissue Cancers, 2007-2011 [4]									
White	42	28		61	59	60	66	67	66
Black	34	32		48	53	51	55	58	57
All Races	40	28		59	58	58	65	65	65

	Median Years Survival After Diagnosis [3]			5-Year Survival Rate [3]		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**
Cancer of Bones and Joints	16	18	17	64.0%	69.3%	66.4%
Myeloma	5	6	6	44.1%	42.1%	43.2%
Soft Tissue Cancers	6	7	7	65.2%	67.1%	66.1%

[1] Age-adjusted to the 2000 U.S. Standard Population (19 age groups - Census P25-1130).

[2] A cancer incidence rate is the number of new cancers of a specific site/type occurring in a specified population during a year, usually expressed as the number of cancers per 100,000 population at risk. Because of the low number of new cases, incidence is expressed as the number per one million population at risk in this report.

[3] **Source**: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. Table 1.5: Age-Adjusted SEER Incidence and U.S. Death Rates and 5-Year Relative Survival (Percent) By Primary Cancer Site, Sex and Time Period: Table 1.6 (Whites); Table1.7 (Blacks). Accessed January 6, 2014.

[4] National Cancer Institute, Surveillance, Epidemiology, and End Results Program (SEER), SEER Stat Fact Sheets: Soft Tissue including Heart Cancer. http://seer.cancer.gov/statfacts/html/soft.html Accessed January 22, 2015.

Aging

Lead Author(s):
Beatrice J. Edwards, MD

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

Demographic changes have created an urgent need. The growth in the number and proportion of older adults is unprecedented in the history of the United States. Two factors—longer life spans and aging boomers (those born between 1946 and 1964)—will combine to double the population of Americans age 65 years or older during the next 25 years to about 72 million. By 2030, older adults will account for roughly 20% of the US population.

Overview

Chronic conditions present a strong economic incentive for action. During the past century, a major shift occurred in the leading causes of death for all age groups, including older adults, from infectious diseases and acute illnesses to chronic diseases and degenerative illnesses. More than a quarter of all Americans, and two of every three older Americans, have multiple chronic conditions. Treatment for this chronic-conditions population accounts for 66% of the country's healthcare budget.[1]

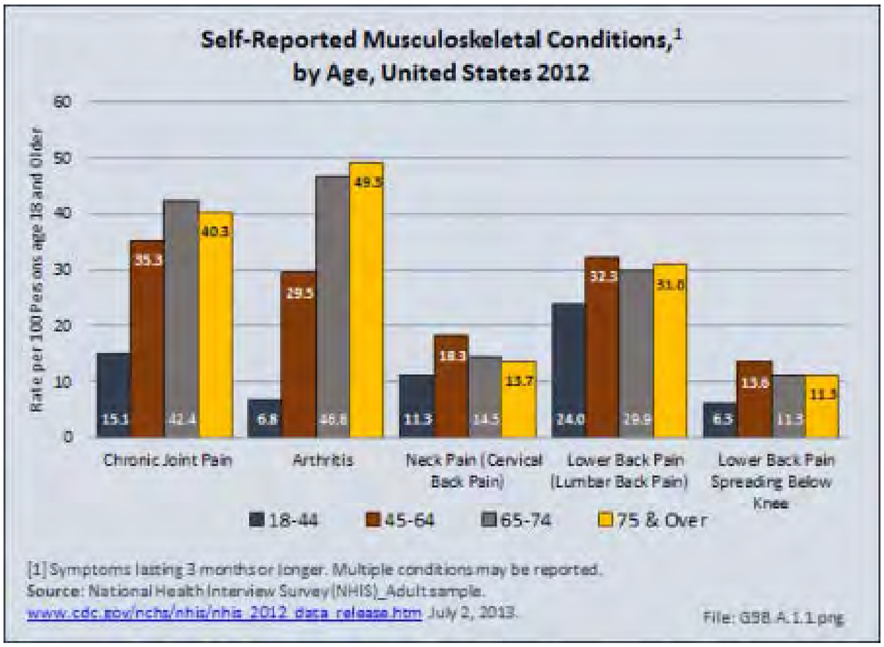
Mobility is fundamental to everyday life and central to an understanding of health and well-being among older populations. Impaired mobility is associated with a variety of adverse health outcomes. As the age of the US population continues to increase, aging and public health professionals have a growing role to play in improving mobility for older adults. There are critical gaps in the assessment and measurement of mobility among older adults who live in the community, particularly those who have physical disabilities or cognitive impairments. By changing the physical environment in which older people live and creating unique integrated interventions across various disciplines, we can improve mobility for older adults.

As expected, the aging population is prone to higher rates of nearly all musculoskeletal conditions than those found in younger people. In large part, these conditions can be attributed to wear and tear on bones and joints over a lifetime. However, some musculoskeletal conditions such as back pain are equally prominent in younger age populations, particularly those in their middle ages.

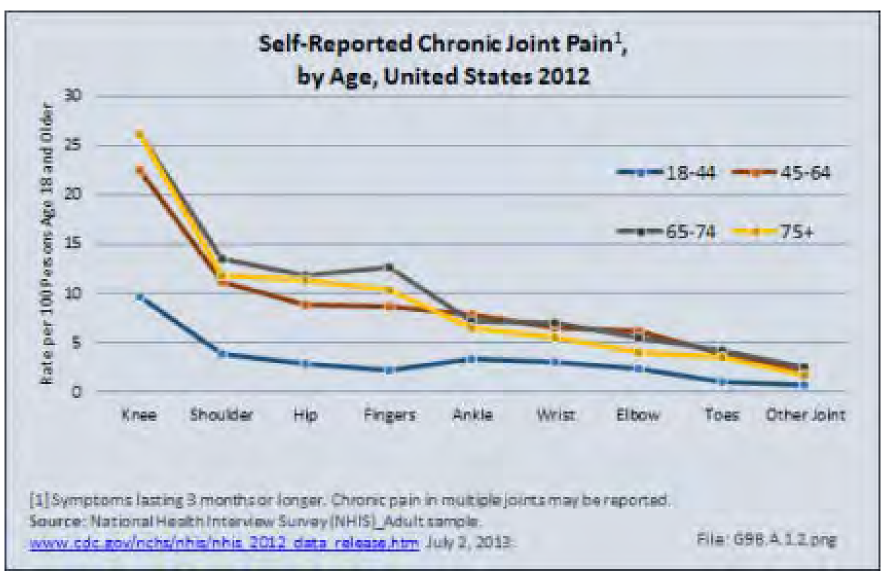
1. National Institute of Aging: *NIH Seeking Strategies For Multiple Chronic Conditions In Older People.* http://www.nia.nih.gov/newsroom/features/nih-seeking-strategies-multiple-chronic-conditions-older-people. Accessed March 2, 2015.

Self-Reported Musculoskeletal Conditions

Arthritis is self-reported in 2012 at the highest among persons aged 75 years and older (49%), but by nearly as many in the 65- to 74-year age range (47%). Only 30% of ages 45 to 64 years self-report they have a form of arthritis. Chronic joint pain, however, is reported at the highest rate by the 65- to 74-year age group, with both those aged 75 years and older and 45 to 64 years reporting rates of chronic joint pain at close to this rate. Low back pain, on the other hand, was self-reported at the highest rate by persons aged 45 to 64 years, closely followed by all persons age 65 years and older. Overall, 126.6 million people age 18 years and older self-reported one or more types of musculoskeletal conditions in 2012. (Reference Table 9B.1 PDF CSV)

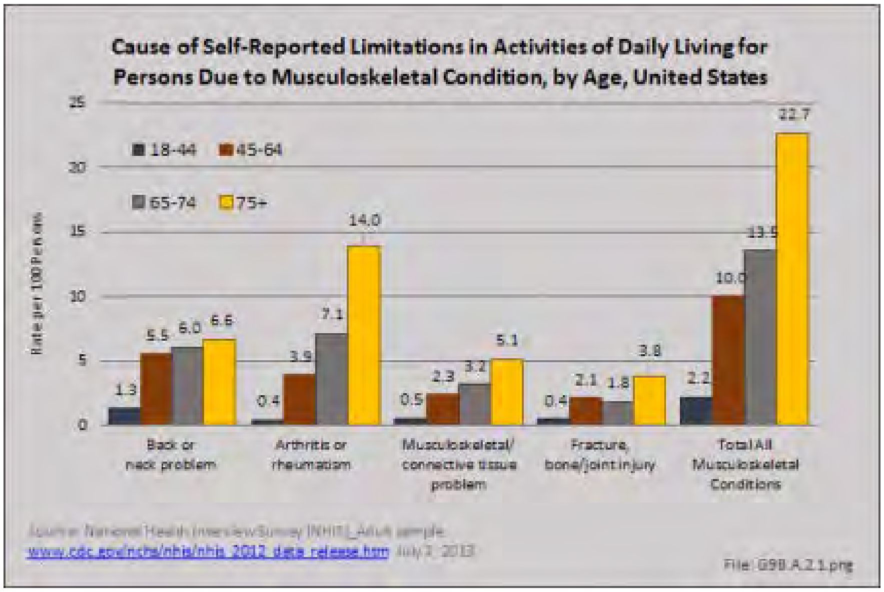


The most common chronic joint pain reported by the 63.1 million people of all ages is knee pain, followed by shoulder pain. However, the rate per 100 people reporting chronic pain in specific joints varies by age. Knee pain is reported by 22% to 26% of people age 45 years and older, with these age groups reporting shoulder pain at rates of 11% to 13.5%. Hip and finger joint pain are both reported at higher rates by people age 65 years and older, while ankle pain has the highest rate among people aged 45 to 64 years. Joint pain in the ankle, wrist, elbow, and toes is lower among those in the oldest age group, compared to those 45 to 74 years of age, possibly due to being less active and placing lower stress on these joints. (Reference Table 9B.1 PDF CSV)



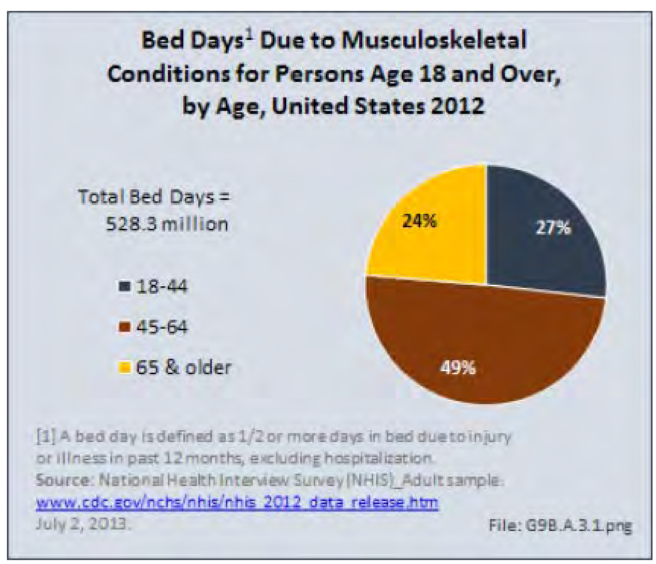
Limitations: Aging Population

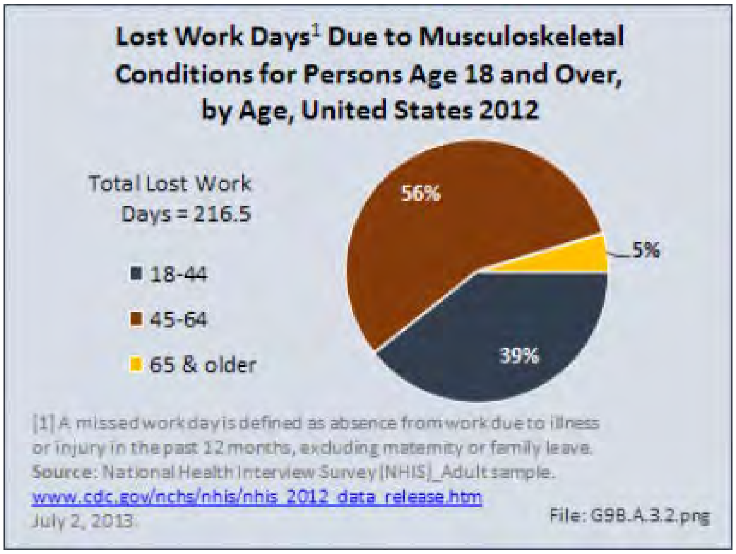
An estimated 6 in 100 persons report they have limitations performing activities of daily living such as dressing, bathing and walking due to musculoskeletal conditions. However, the rate with limitations rises steadily as the population ages, from just over 2 in 100 for those age 18 to 44 years, to 23 in 100 for people who have reached the age of 75 years. The highest rate of limitation is due to arthritis in the oldest group, but due to back or neck problems in the younger ages. (Reference Table 9B.1 PDF CSV)



Bed and Lost Work Days

People age 45 to 64 years accounted for one-half (49%) of the 528.3 million bed days from a musculoskeletal condition that were reported in 2012 by people age 18 years and older. A bed day is defined as one-half or more days in bed due to injury or illness, excluding hospitalization. The greater number of total bed days reported by this age group is due to a high mean of 10.4 days combined with close to half the population reporting bed days because of a musculoskeletal condition. (Reference Table 9B.1 PDF CSV)





This same age group also accounted for slightly more than half (56%) of the 216.5 million lost work days due to musculoskeletal conditions reported by people age 18 years and older and in the workforce. People aged 65 years and older reported only 5% of total lost work days because of the low number that are still in the workforce. (Reference Table 9B.1 PDF CSV)

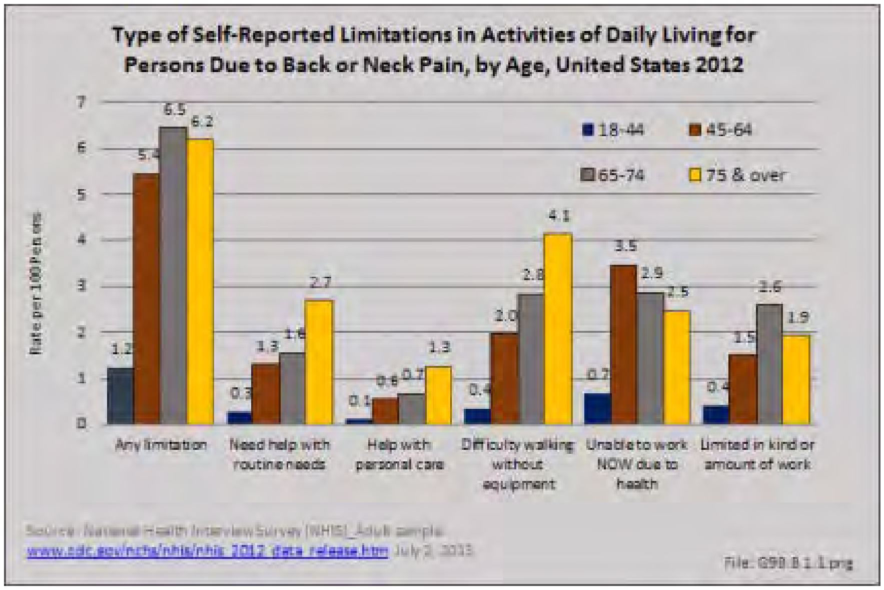
Spine: Aging Population

Older adults will often experience musculoskeletal diseases affecting the spine, with spondyloarthritis and osteoporosis with vertebral fractures often the cause of pain and functional decline. Seniors with such problems may find themselves unable to push or pull large objects, or at times even reach above their heads. They may have problems lifting groceries from the floor, and bending at the waist may increase the risk for vertebral fractures in people with osteoporosis. Additionally, thoracic vertebral fractures (middle back) will result in decreasing functional vital capacity, predisposing older adults to chronic lung disease and pneumonias.

Self-Reported Back Pain

Self-reported back and neck pain rates peaked in the age range of 45 to 64 in 2012, and were reported at slightly lower rates for persons age 65 years and older. Roughly one in three people aged 45 years and older reported back or neck pain.

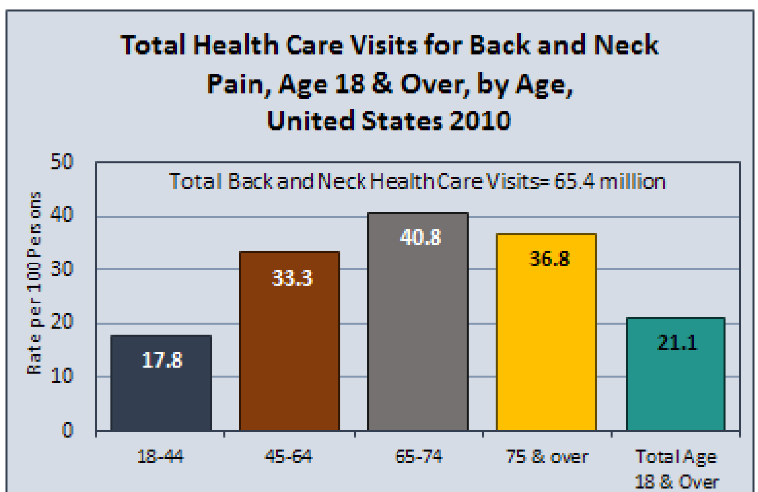
About 4 in 100 persons reported limitations with activities of daily living due to a chronic back or neck problem, with the highest rate (6.5 in 100) among people aged 65 to 74 years. The oldest population, those aged 75 years and older, have most difficulty walking without equipment (4.1 in 100) due to back pain. People aged 45 to 64 years reported the highest rate (3.5 in 100) of being unable to work because of chronic back and neck problems, while people aged 65 to 74 years reported the highest rate (2.6 in 100) with limitations in kind or amount of work. (Reference Table 9B.2.1 PDF CSV)



Health Care Visits: Spine

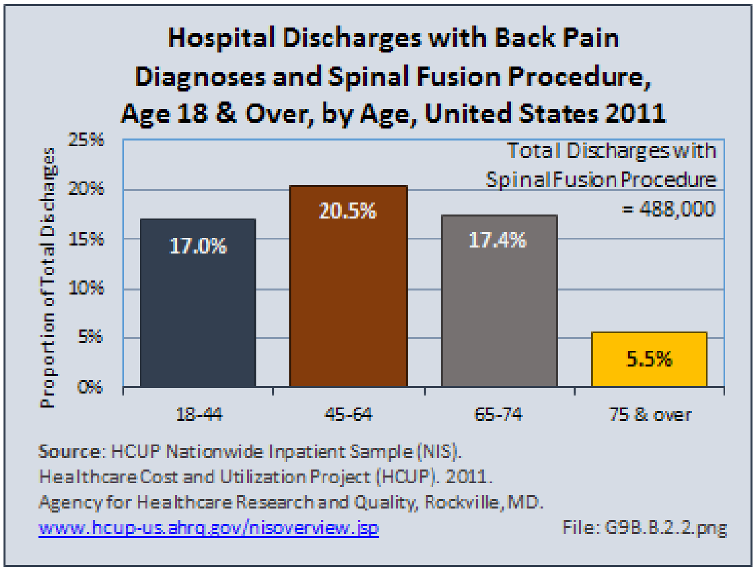
People aged 65 to 74 years had the highest rate of healthcare visits for back and neck pain (40.8 per 100 persons), but accounted for only 14% of the 65.4 million total healthcare visits made by adults for back or neck pain in 2010, due to their smaller share of the total population. The rate of healthcare visits was similar for people aged 75 years and older (36.8 per 100) and those aged 45 to 64 years (33.3 per 100). While only 17.8 in 100 people ages 18 to 44 years had a healthcare visit in 2010 for back and neck pain, this age group comprised 31% of all visits. Total healthcare visits included hospital discharges, emergency department (ED) and outpatient clinic visits, and physician office visits.

Those aged 45 to 64 years had the highest rate of spinal fusion procedures performed for back or neck pain. One in five, or 20.5%, of hospital discharges in this age group with a back or neck pain diagnosis had a spinal fusion procedure performed.



Sources: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013; National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013; National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013; National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.
File: G9B.B.2.1.png

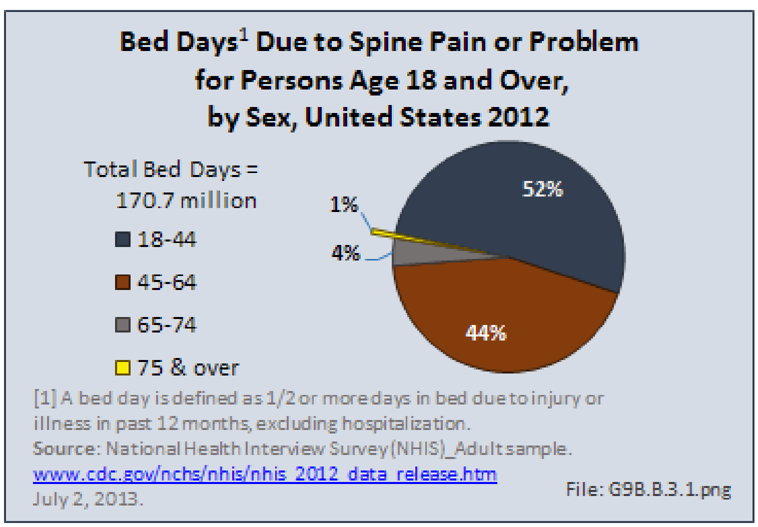
People aged 75 years and older have a low rate of spinal fusion procedures (5.5%). (Reference Table 9B.2.2 PDF CSV)

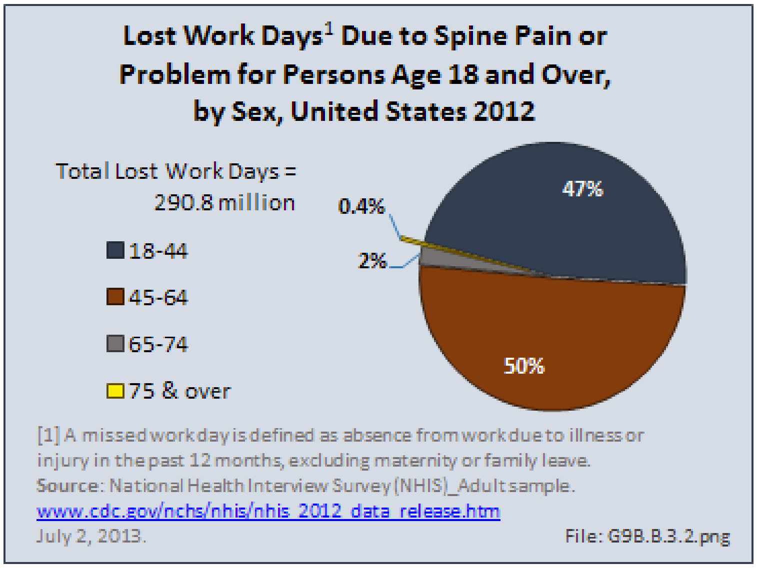


Bed and Lost Work Days: Spine

People aged 65 years and older account for only a small share (0.7%) of people who report taking a bed day due to spinal pain or problems, in spite of the number who report having pain. Younger people, aged 18 to 45 years, account for slightly more than half (52%) of the total 170.7 million bed days taken in 2012 due to back pain. (Reference Table 9B.2.1 PDF CSV)

Lost work days due to spine pain or problems in 2012 were taken primarily by people aged 18 to 64 years, the prime workforce ages, and split nearly equally between those under and over the age of 45 years. In 2012, 290.8 million work days were reported lost due to back pain. (Reference Table 9B.2.1 PDF CSV)





Spinal Deformity: Aging Population

This report includes a range of deformity conditions that affect the spine. The most common spinal deformity in older adults is acquired through multiple vertebral fractures resulting in kyphosis. For each thoracic vertebral fracture, it is estimated there is an estimated decline of 7% in functional vital capacity1, which is compounded by additional fractures. Vertebral fractures are often clinically unrecognized, and may show merely as height loss. Nonetheless, vertebral fractures greatly increase the likelihood of future fractures and mortality.2,3

The most familiar spinal deformity condition is that of curvature of the spine, which includes scoliosis, kyphosis, and lordosis. In addition to curvature of the spine, other spinal deformity conditions include spondylolisthesis, spinal infections, complications of surgery, and spondylopathies. Of the 15.5 million health care visits for spinal deformity, 10.5 million had a diagnosis of spondylopathy, which refers to any disease of the vertebrae or spinal column associated with compression of peripheral nerve roots and spinal cord, causing pain and stiffness.

1. Ability to breathe in and out with sufficient capacity to perform normal functions

2. Lindsay R, Silverman SL, Cooper C, et al.: Risk of new vertebral fracture in the year following a fracture. *JAMA* 2001;285(3):320-323.

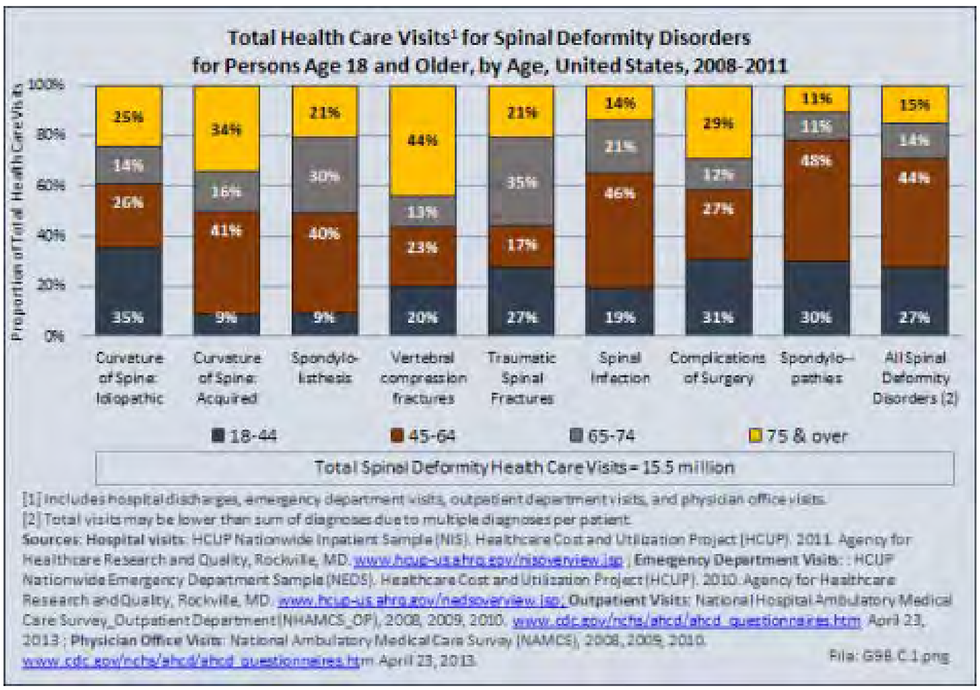
3. Browner WS, Pressman AR, Nevitt MC, Cummings SR: Mortality following fractures in older women. The study of osteoporotic fractures. *Arch Intern Med* 1996;156(14):1521-1525.

Health Care Visits: Spinal Deformity

The oldest age group, people aged 75 years and older, account for the largest share of vertebral compression fractures (44%) and a major portion (34%) of acquired curvature of the spine, even though they represent only 8% of the population aged 18 years and older. They also account for a large share (29%) of spondylopathy diagnosis as well as 25% of idiopathic curvature of spine diagnosis; this is overall a larger share of all spinal deformity diagnoses than expected for the size of this age group.

People aged 65 to 74 years comprise 9% of the population over 18 years of age. This group also has a higher than expected share of healthcare visits for all spinal deformity diagnoses. The two conditions that stand out in this age group are traumatic spinal fractures (35% of total visits) and spondylolisthesis (30% of all visits).

On an annual average, 15.5 million healthcare visits were made between the years 2008 and 2011 by people aged 18 years and older. Those aged 45 to 64 years, 35% of the population aged 18 years and older, were treated in 44% of these visits. (Reference Table 9B.3 PDF CSV)

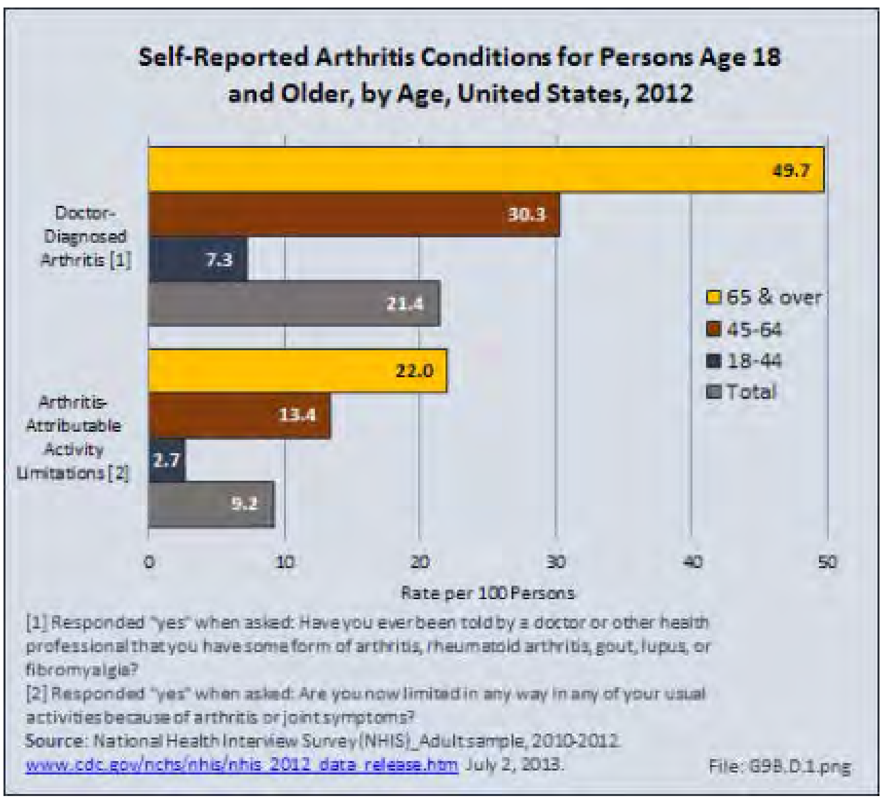


Arthritis: Aging Population

Arthritis is one of the most common chronic conditions found in the US population. It currently affects 46 million US adults and is projected to increase 45% by 2030. It is the most common cause of disability in the United States, substantially affecting a person's quality of life due to pain causing work and activity limitations, which subsequently affects the economy.

Self-Reported Arthritis

Arthritis and other rheumatic conditions (AORC) affect people in higher numbers as they age. Only 7 in 100 persons between the ages of 18 and 44 years report they have doctor-diagnosed arthritis. By the age of 65 years and older, this rate has increased to one in two with some form of arthritis. Although the rates of persons reporting limitations in performing activities of daily living are lower, there is a large disparity between younger persons and the aging. (Reference Table 9B.4.1 PDF CSV)



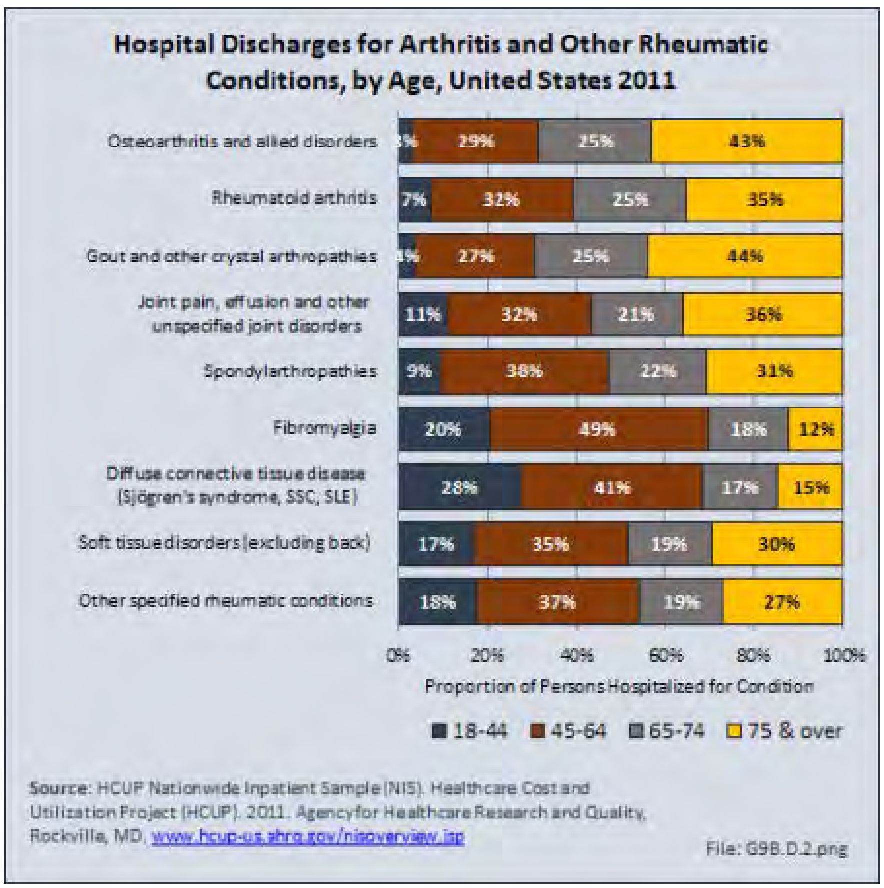
Bed days occur when a person spends at least one-half day in bed in the previous 12 months due to a health condition. In 2012, 537.6 million bed days were reported by persons age 18 years and older due to arthritis. Only 4% of people aged 18 to 44 years reported arthritis-caused bed days. For all people aged 45 years and older, the rate was between 14% and 16%.

Arthritis is most likely to be the cause of lost work days among people between the ages of 45 and 64 years, with nearly 1 in 10 reporting work days lost. In 2012, 172.1 million work days were reported lost due to arthritis, with 65% lost by people in the 45- to 64-year age group. Likely, this higher share of lost work days for this group is due to the much higher participation in the workforce for this prime working age cohort. (Reference Table 9B.4.1 PDF CSV)

Health Care Visits: Arthritis

In spite of the frequency and severe pain often experienced with arthritis and other rheumatic conditions, these illnesses account for only a small portion of hospital discharges. Visits to a physician's office or alternative types of care account for the majority of health care related to AORC, with more than 100 million ambulatory visits in 2010. Among the 6.6 million hospital discharges for an AORC in 2011, age was a factor in increasing rates of hospitalization. Fewer than 1 in 100 persons ages 18 to 44 years had a hospital discharge with a diagnosis of an AORC, while 13 in 100 aged 75 years and older were discharged with an AORC diagnosis.

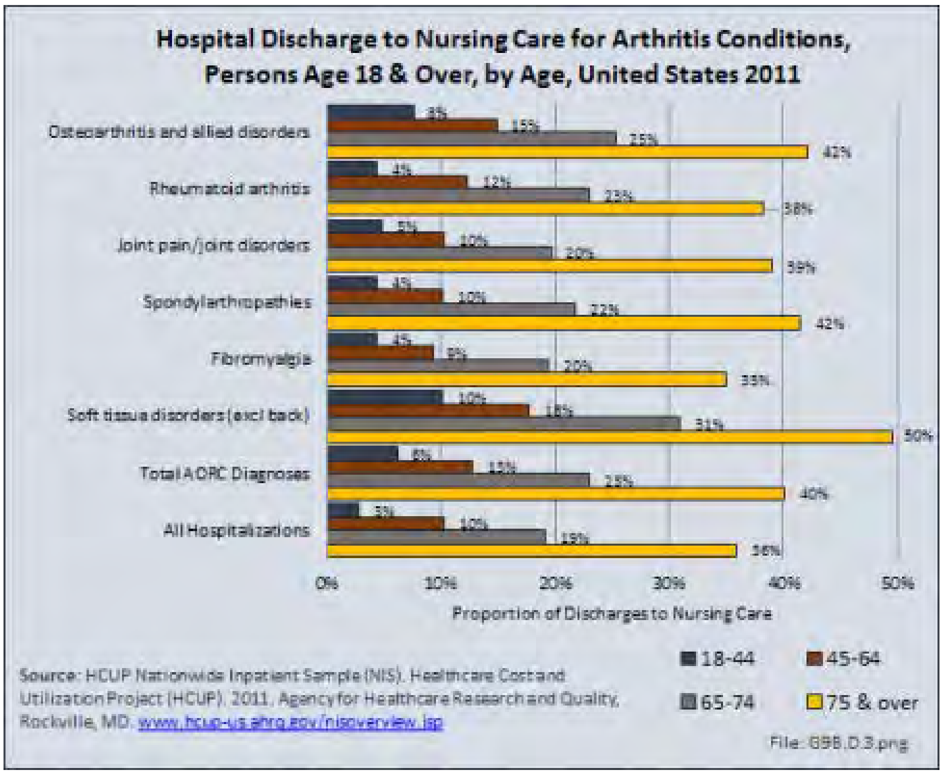
Osteoarthritis is the primary form of arthritis to affect older persons, and begins to show increasing rates for people in their 60s. By the age of 75 years, multiple forms of arthritis are often diagnosed and categorized as other rheumatic conditions. (Reference Table 9B.4.2 PDF CSV)



Age is not a factor in the length of hospital stay or mean charges with a diagnosis of an AORC. In general, the type of AORC is also not a factor in length of stay or charges, with the exception of a diagnosis of spondylarthropathy, which results in slightly higher mean hospital charges. Hospital charges are a rough estimate of hospital cost, and do not include doctor's fees. (Reference Table 9B.4.2 PDF CSV)

Hospital Discharge Status: Arthritis

Discharge from a hospital to short- or long-term care is a major healthcare cost. The frequency of this increases significantly with age, and is more likely to occur with an AORC diagnosis than for all causes of hospitalization. One in eight people age 45 to 64 years discharged from a hospital with a diagnosis of an AORC is sent to intermediate-term or skilled nursing care. This increases to one in four for persons aged 65 to 74 years, and two in five for ages 75 years and older. The most likely AORC to result in nursing care is a soft tissue disorder, but all causes of AORC result in nursing home care for 35% or more of discharges among patients aged 75 years and older. (Reference Table 9B.4.3 PDF CSV)



Osteoporosis: Aging Population

Osteoporosis means "porous bone." It is a condition that develops when more bone calcium is absorbed than is replaced in the normal bone remodeling process. Several factors contribute to the development of osteoporosis, but the exact reason why the remodeling process becomes unbalanced is unknown. Factors that often lead to osteoporosis include aging, physical inactivity, reduced levels of estrogen, excessive cortisone or thyroid hormone, smoking, and excessive alcohol intake. Loss of bone calcium accelerates in women after menopause.

Bone loss occurs most frequently in the spine, lower forearm above the wrist, and upper femur or thigh, the site where hip fractures usually occur.

Standard Definitions for Osteoporosis Diagnosis:

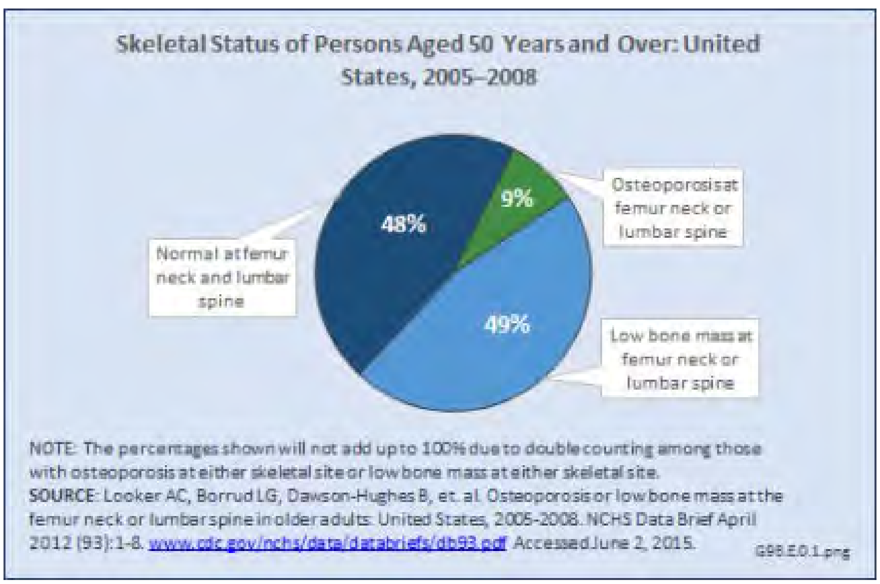
Low bone mass: A value for bone mineral density more than 1 standard deviation (SD) below the young female adult mean but less than 2.5 SD below this value.1

Osteoporosis: A value for bone mineral density 2.5 SD or more below the young female adult mean.2

Young female adult mean and standard deviation (SD): For the femoral neck, the mean and SD were based on data for 20- to 29-year-old non-Hispanic white females from the Third National Health and Nutrition Examination Survey (NHANES III).3 For the lumbar spine, the mean and SD were based on data for 30-year-old white women from the dual-energy x-ray absorptiometry (DEXA) densitometer manufacturer.4

Other races: People from racial and ethnic groups other than non-Hispanic white, non-Hispanic black, or Mexican American. This group consists primarily of Hispanic descent other than Mexican American, Asian, Native American, and multiracial persons, among others.

Nine percent of people aged 50 years and older had osteoporosis at either the femur neck or lumbar spine from 2005 to 2008 (Figure 1). Roughly one-half of older adults in the population had low bone mass at either the femoral neck or lumbar spine. Forty-eight percent of older adults in the United States had normal bone density at both the femur neck and lumbar spine.



1. National Institute of Aging: *NIH Seeking Strategies For Multiple Chronic Conditions in Older People.* http://www.nia.nih.gov/newsroom/features/nih-seeking-strategies-multiple.... Accessed March 2, 2015.

2. National Institute of Aging. NIH seeking strategies for multiple chronic conditions in older people. 2012; http://www.nia.nih.gov/newsroom/features/nih-seeking-strategies-multiple.... Accessed March 2, 2015.

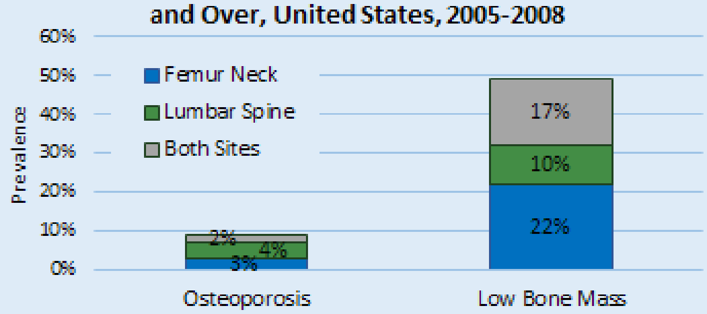
3. Kilgore ML, Morrisey MA, Becker DJ, et al.: Health care expenditures associated with skeletal fractures among Medicare beneficiaries, 1999–2005. *J Bone Miner Res* 2009;24(12):2050-2055.

4. Huddleston JM, Gullerud RE, Smither F, et al.: Myocardial infarction after hip fracture repair: A population-based study. *J Am Geriatr Soc* 2012;60(11):2020-2026.

Prevalence: Osteoporosis

From 2005 to 2008, the prevalence of osteoporosis in women aged 50 years and older at either the femur neck or lumbar spine was 9%, with 4% with osteoporosis at the lumbar spine only, 3% with osteoporosis at the femur neck only, and 2% with osteoporosis at both the lumbar spine and femur neck. The prevalence of low bone mass at either skeletal site was 49%, with 10% having low bone mass at the lumbar spine, 22% with low bone mass at the femur neck, and 17% with low bone mass at both the lumbar spine and femur neck.

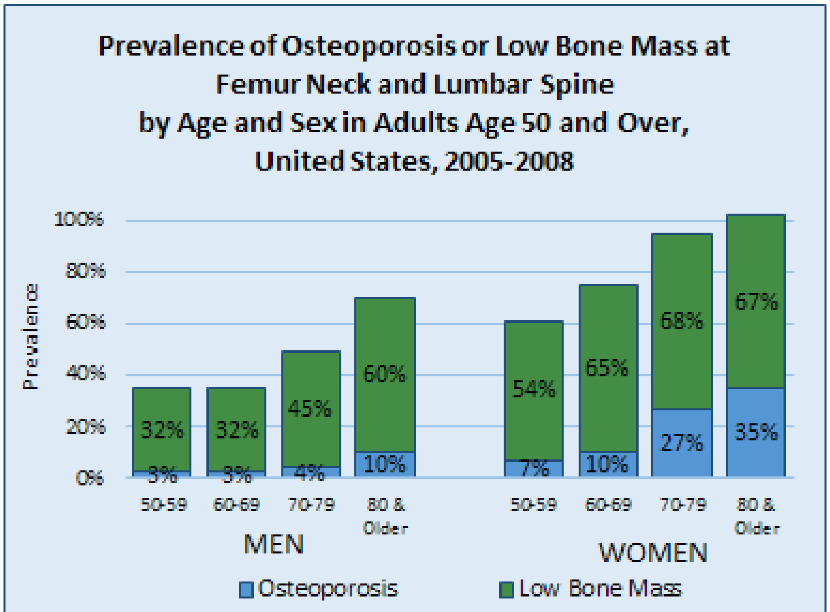
Prevalence of Osteoporosis or Low Bone Mass at Femur Neck and Lumbar Spine in Adults Age 50 and Over, United States, 2005-2008



SOURCE: Looker AC, Borrud LG, Dawson-Hughes B, et. al. Osteoporosis or low bone mass at the femur neck or lumbar spine in older adults: United States, 2005-2008. NCHS Data Brief April 2012 (93):1-8. www.cdc.gov/nchs/data/databriefs/db93.pdf Accessed June 2, 2015.

G9B.E.1.1.png

Age is a significant factor in the presence of osteoporosis and low bone mass in both men and women, but particularly in women. By the age of 70 years, virtually all women have low bone mass, with 27% or more having osteoporosis. In men, the prevalence of osteoporosis does not begin to increase until the age of 80 years, although low bone mass begins to climb for men in their 70s.



[1] $p < 0.05$ for trend by age group within sex for both osteoporosis and low bone mass.

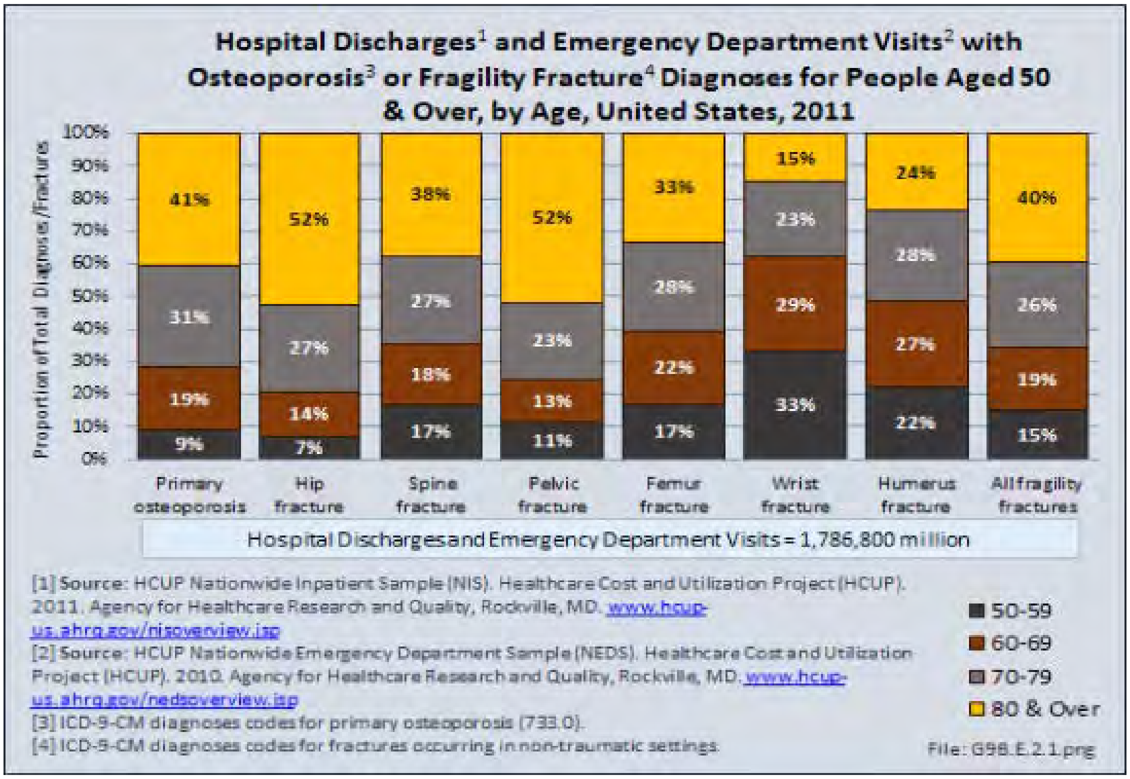
SOURCE: Looker AC, Borrud LG, Dawson-Hughes B, et. al. Osteoporosis or low bone mass at the femur neck or lumbar spine in older adults: United States, 2005-2008. NCHS Data Brief April 2012 (93):1-8. www.cdc.gov/nchs/data/databriefs/db93.pdf Accessed June 2, 2015.

G9B.E.1.2.png

Health Care Visits: Osteoporosis

Osteoporosis often is not the principal diagnosis code related to a healthcare visit because the condition is usually an underlying cause of another condition, in particular, fragility fractures that often occur after a fall or other seemingly minor incident. Many times in such healthcare visits, osteoporosis may not even be listed as a condition. Still, in 2011, primary osteoporosis was listed in 1.8 million hospital discharges and emergency department visits as a reason for the visit in the population aged 50 and over. Fragility fractures occurred in 1.2 million visits for people aged 50 years and older. (Reference Table 9B.5 PDF CSV)

Age is a factor in both primary osteoporosis diagnosis and in the occurrence of fragility fractures with most occurring in people after the age of 70. Nearly three-fourths (72%) of primary osteoporosis diagnoses were for people ages 70 years and older. However, in 2011, 9% of osteoporosis diagnoses was for people aged 50 to 59 years, and 19% of those aged 60 to 69 years. Among fragility fractures, 66% were for people aged 70 years and older, with the remainder split among those aged 50 to 69. The site of the fracture was particularly important with respect to age. The oldest group, those 70 years and older, were prone to fractures of the hip and vertebrae, as well as stress and pathological fractures. Fractures of the wrist and ankle or foot occurred across all people over the age of 50.



For 340,400 emergency department visits or hospital discharges for fragility fractures, or 16%, primary osteoporosis was also listed as a condition. The rate at which both diagnoses were made rose steadily as the population aged. Hospital discharge visits were more likely to include both primary osteoporosis and a fragility diagnosis than were visits to an emergency department.

Impact of Hip Fractures:Osteoporosis

Fractures are associated with significant increases in health services utilization compared to prefracture levels. Relative to the prior 6-month period, rates of acute hospitalization are between 19.5 (distal radius/ulna) and 72.4 (hip) percentage points higher in the 6 months after fractures. Average acute inpatient days are 1.9 (distal radius/ulna) to 8.7 (hip) higher in the postfracture period. Fractures are associated with large increases in all forms of postacute care, including postacute hospitalizations (13.1% to 71.5%), postacute inpatient days (6.1% to 31.4%), home health care hours (3.4% to 8.4%), and hours of physical (5.2% to 23.6%) and occupational (4.3% to 14.0%) therapy. Among patients who were initially community dwelling at the time of the initial fracture, 0.9% to 1.1% were living in a nursing home 6 months after the fracture. These rates rose by 2.4% to 4.0% one year after the fracture.1

INSTITUTIONALIZATION

Since 1980, there has been a nearly 15% decrease in the prevalence of chronic disability and institutionalization among people aged 65 years and older. A drop in disability translates directly into cost savings since it is seven times more expensive to care for a disabled senior versus a healthy one. Major activity limitations are a common cause of nursing home admissions. While the most common cause of limitations is arthritis, affecting nearly 50% of people older than 65 years and an estimated 60 million by 2020.[2] Hip fractures are a second source of immobility, and are projected to reach 289,000 in the year 2030, nearly all fall-related.[3]

FRACTURES AND MORTALITY

Vertebral and hip osteoporotic fractures result in a 20% increase in mortality, usually observed in the 12 months after the fracture. Men, who are generally older at the time of the hip fracture, have a 30% mortality rate after the fracture. Moreover, comorbidities such as cardiovascular disease contribute to a higher mortality rate.

A population-based study in Olmsted County, MN, found that within the first seven days after hip fracture repair, 116 (10.4%) of participants experienced myocardial infarction and 41 (3.7%) subclinical myocardial ischemia. Overall, the 1-year mortality was 22%, with no difference between those with subclinical myocardial ischemia and those with no myocardial ischemia. One-year mortality for those with a myocardial infraction was significantly higher (35.8%) than for the other two groups.[4] The relative mortality after vertebral fracture varies from 1.2 to 1.9 in different reports,[5,6] but the excess deaths occur late, rather than early, after vertebral fractures.[5]

1. Kilgore ML, Morrisey MA, Becker DJ, et al.: Health care expenditures associated with skeletal fractures among Medicare beneficiaries, 1999–2005. *J Bone Miner Res* 2009;24(12):2050-2055.

2. National Academy on An Aging Society: Arthritis: A leading cause of disability in the United States. *Chronic and Disabling Conditions*. 2000;5. http://www.agingsociety.org/agingsociety/publications/chronic/index.html Accessed June 22, 2015.

3. Centers for Disease Control and Prevention: *Hip Fractures Among Older Adults.* http://www.cdc.gov/HomeandRecreationalSafety/Falls/adulthipfx.html Accessed June 22, 2015.

4. Huddleston JM, Gullerud RE, Smither F, et al.: Myocardial infarction after hip fracture repair: A population-based study. *J Am Geriatr Soc* 2012;60(11):2020-2026.

5. a. b. Kado DM, Browner WS, Palermo L, et al.: Vertebral fractures and mortality in older women: A prospective study. *Arch Intern Med* 1999;159(11):1215-1220.

6. Center JR, Nguyen TV, Schneider D, Sambrook PN, Eisman JA: Mortality after all major types of osteoporotic fracture in men and women: An observational study. *Lancet* 1999;353(9156):878-882.

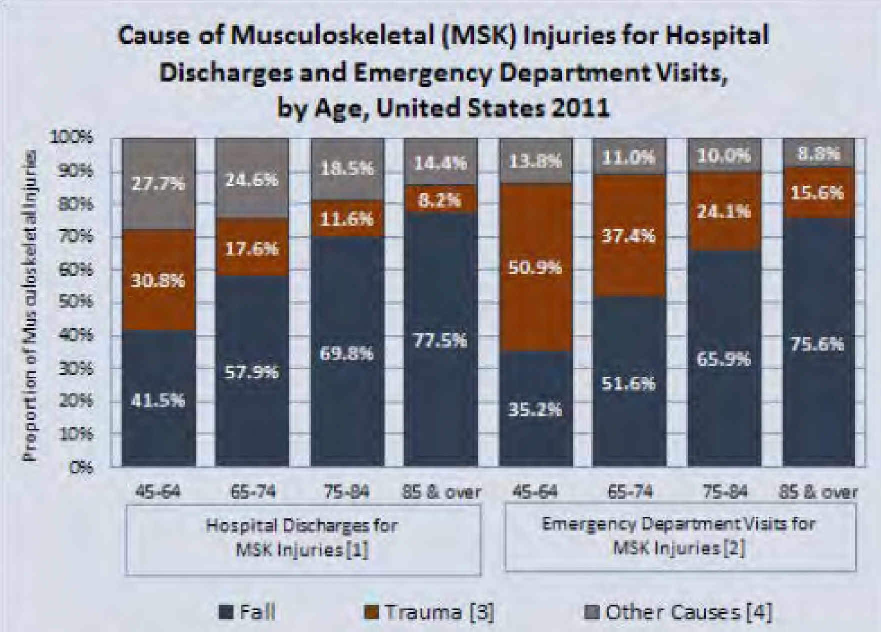
Injuries: Aging Population

For older adults, falls and associated injuries threaten health, independence, and quality of life. More than a third of people aged 65 years and older who live independently fall each year; falls are the leading cause of injury-related deaths and hospital emergency department visits.

While numerous fall risk factors have been identified, limited information is available about the detailed circumstances surrounding falls among community-dwelling older adults. Several studies have used survey data to analyze falls, while other studies have limited their analysis to falls seen in emergency departments, in older women, or falls that resulted in fracture or hip fracture.

Prevalence: Musculoskeletal Injuries

More than 6.8 million injury episodes for which people sought medical treatment were self-reported by individuals in 2012. The majority of injuries occurred to people between the ages of 18 and 64 years, the ages that comprised 83% of the over-18-year population in the United States. Sprains and strains was the most frequent injury type for which medical care was sought, but 16% suffered fractures, 14% severe contusions, and 13% open wounds.



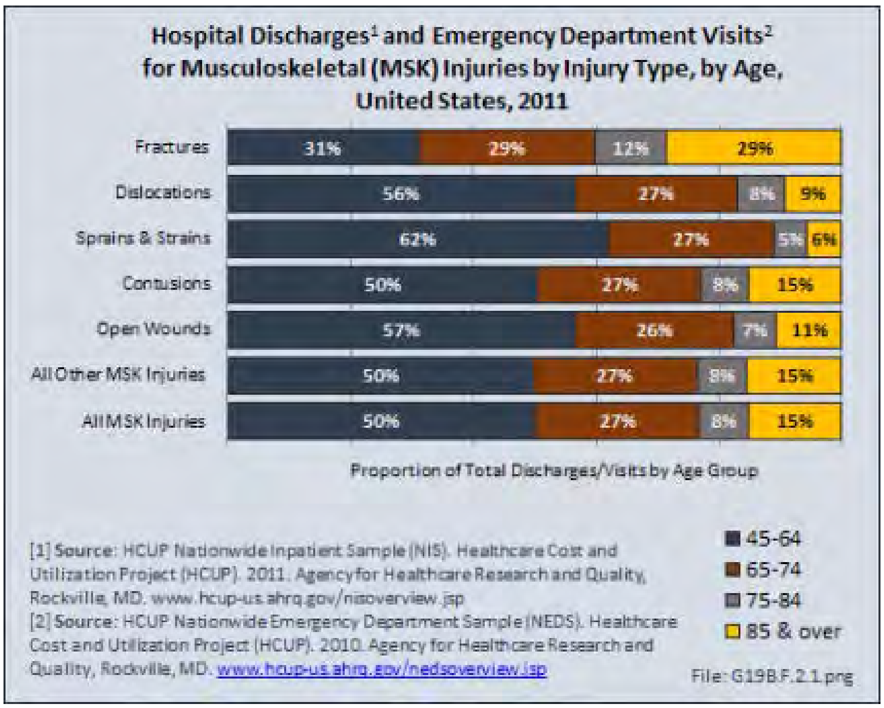
[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp
[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp
[3] Includes vehicular accidents (auto, train, boat, plane, motorcycle), machinery, moving objects, and other types of traumatic injury.
[4] Includes military injuries, sports injuries, poisonings, and other causes.

File: G98.F.1.1.png

Falls are the primary cause of musculoskeletal injuries as the population ages. Approximately three out of four injuries among people aged 85 years and older for which a person is hospitalized or visits an emergency department is the result of a fall. Falls are also the primary cause of injury for anyone aged 65 years and older. Trauma such as auto accidents and other accidents involving machinery or moving objects is a major cause of musculoskeletal injuries among people ages 45 to 64 years, particularly for injuries where care is received in an emergency department. Other causes of injuries, including sports injuries, are seen in more than one in four (28%) injuries to people aged 45 to 64 years with a hospital discharge. (Reference Table 9B.6.1 PDF CSV and Table 9B.6.2 PDF CSV)

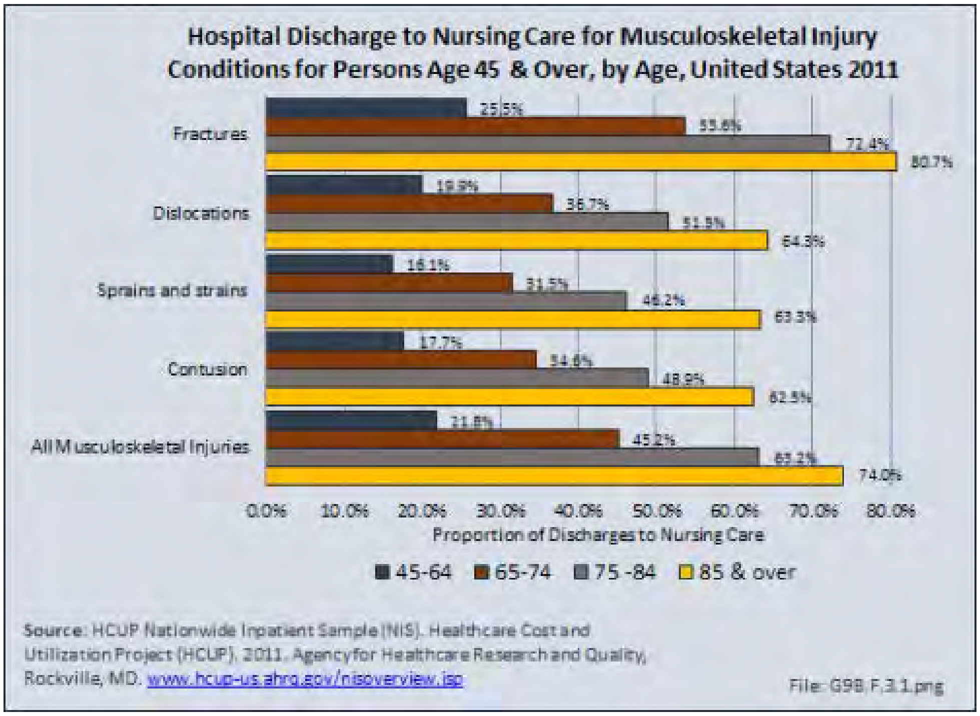
Health Care Visits: Injuries

In 2011, 1.6 million hospital discharges and 14.7 million emergency department visits were made by people aged 18 years and older for treatment of a musculoskeletal injury. Another 35.5 million musculoskeletal injuries were serious enough to receive outpatient treatment. The most frequent type of injury involving hospitalization was a fracture, with people aged 85 years and older accounting for 45% of hospitalizations for fractures. Injuries seen in emergency departments were distributed across all types of musculoskeletal injuries (fractures, dislocations, sprains and strains, contusions, open wounds, and other types of musculoskeletal injuries). The youngest and oldest age groups (18 to 44 years and 85 years and older) had the highest rate of injury seen in the ED (6.9/100 persons and 9.9/100, respectively). Because of the large size of the 18- to 44-year age group (48% of the US population is over age 18), this group constituted a majority of all injury cases seen, with the exception of fractures. (Reference Table 9B.6.2 PDF CSV and Table 6A.2.2.2 PDF CSV)



Hospital Discharge Status: Injuries

For all types of musculoskeletal injuries resulting in hospitalization, three of four people ages 85 years and older were discharged to intermediate-term nursing care, while two in three aged 75 to 84 years went to nursing care. Fractures were the most likely type of injury to result in discharge to intermediate-term nursing care for all ages, followed by dislocations. (Reference Table 9B.6.3 PDF CSV)



Discharge to intermediate-term or skilled nursing care greatly increases the economic burden of musculoskeletal injuries. In 2011, 40% of hospital discharge patients with a musculoskeletal injury, or 690,000, were sent to long-term or skilled nursing facilities.

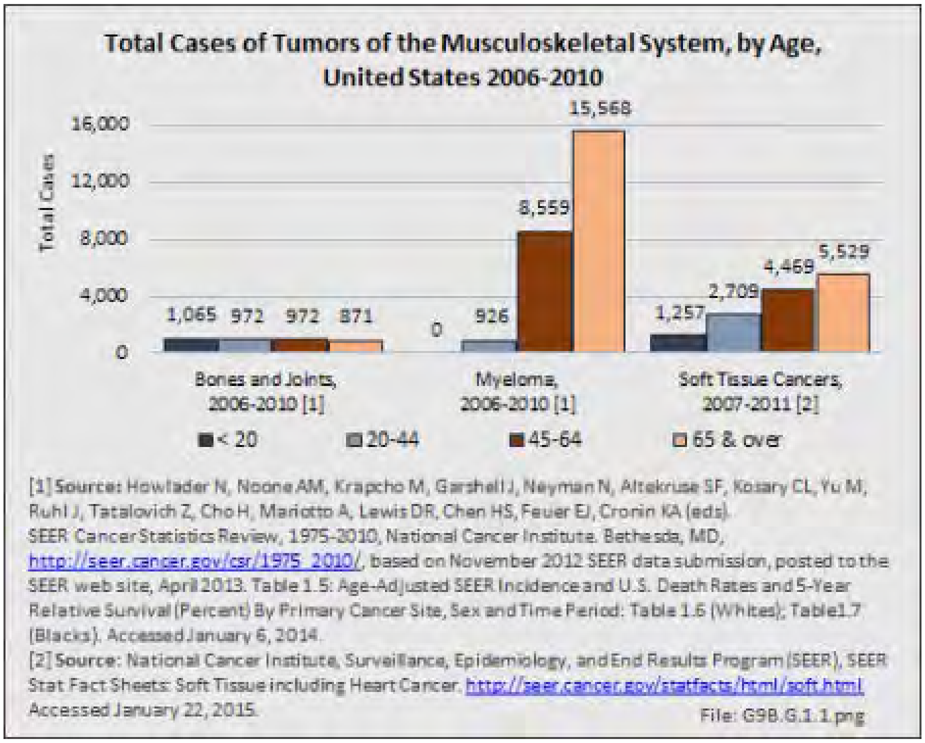
Tumors: Aging Population

Osteogenic sarcoma exhibits a bimodal distribution, with the significant second peak in incidence occuring in the seventh and eighth decades of life. Osteosarcoma in the elderly can also be attributed to Paget's disease or previous radiotherapy. The expectation that these elderly patients may not tolerate aggressive modern chemotherapy means that those who develop OS over the age of 40 years are excluded from current treatment trials. As a result, remarkably little is known about the outcome for this age group.[1]

1. Grimer RJ, Cannon SR, Taminiau AM, et al.: Osteosarcoma over the age of forty. *Eur J Cancer* 2003;39(2):157-163.

Incidence: Tumors

The overall incidence of tumors of the musculoskeletal system is lower than many types of cancers. This is particularly true for primary cancers of the bones and joints, although bones and joints are frequently a site of secondary, or metastasized, cancers. The occurrence of cancers of the bones and joints affects all ages and is one



of the primary cancers in young people. Myeloma, cancer of the bone marrow, is a disease of the elderly, with nearly two-thirds of cases found in people ages 65 years and older. Soft tissue cancers affect all ages, but the occurrence increases with age. (Reference Table 9B.7 PDF CSV)

Key Challenges to Future: Aging Population

Key challenges in the area of musculoskeletal health in older adults are considerable because we have a dramatic increase in older adults and prolonged life expectancy, greatly increasing the likelihood of development of arthritis, osteoporosis, and other musculoskeletal disorders.

Unmet Needs: Aging Population

A growing body of work on health-related knowledge translation reveals significant gaps between what is known to improve health and what is done to improve health. The costs of ignoring these gaps are increasingly apparent: suboptimal or unnecessary care, overuse or premature adoption of treatments, and new research that may not be based on the latest evidence or may not adequately address patient needs.

A gap in medical care occurs after an osteoporosis-related fracture in older adults. Furthermore, decreasing rate of treatment for osteoporosis after hip fracture is noted in the US by Solomon and colleagues.[1] The latest quality measures by the National Commission on Quality Assessment indicate that treatment for osteoporosis after a fracture in an older woman is merely 23%; thus, thousands of individuals are at an elevated risk for recurrent fractures. New quality indicators by the Centers for Medicare and Medicaid Services (CMS), namely Physician

Quality Reporting System (PQRS), are expected to promote clinical changes. PQRS measure 40, which addresses osteoporosis management after distal radius, vertebral, and hip fractures in women over the age of 50 years, will be used to assess performance for physicians. The Joint Commission is considering similar measures for hospitals. Quality improvement programs have been successful in increasing treatment rates for osteoporosis after a fracture, but as of yet, they are not widely available in the United States.[2,3,4]

Prevention of falls is another area with a gap in medical care. Falls are common in older individuals, affecting as many as 30% of older women. Injuries from falls include fractures and blunt head trauma, and may result in increased mortality. Women with self-reported osteoarthritis (OA), in particular, have an increased risk of falls and, in spite of elevated bone mass, remain at risk of fractures.[5] In 2012, the cost of fall injuries totaled more than $36 billion. As the population ages, the financial toll for older-adult falls is projected to reach $59.6 billion by 2020.[6]

Falls result in more than 2.4 million injuries treated in ERs annually, including more than 772,000 hospitalizations and more than 21,700 deaths. Every 15 seconds, an older adult is treated in the ER for a fall. Every 29 minutes, an older adult dies after a fall.[7]

Musculoskeletal disorders are prevalent, and often of serious consequences in older adults. A greater awareness in the medical community and dissemination of effective interventions will result in a higher quality of life and prevention of disability among America’s seniors.

1. Solomon DH, Johnston SS, Boytsov NN, McMorrow D, Lane JM, Krohn KD: Osteoporosis medication use after hip fracture in U.S. patients between 2002 and 2011. *J Bone Miner Res* 2014;29(9):1929-1937.

2. Edwards BJ, Bunta AD, WB M, et al.: Own the Bone®: A system-based intervention to improve osteoporosis care after fragility fractures. American Society of Bone and Mineral Research; 2013; Baltimore, MD.

3. Edwards BJ, Koval K, Bunta AD, et al.: Addressing secondary prevention of osteoporosis in fracture care: Follow-up to "own the bone." *J Bone Joint Surg Am* 2011;93(15):e87.

4. Dell R, Greene D, Schelkun SR, Williams K: Osteoporosis disease management: the role of the orthopaedic surgeon. *J Bone Joint Surg Am* 2008;90 Suppl 4:188-194.

5. Arden NK, Nevitt MC, Lane NE, et al.: Osteoarthritis and risk of falls, rates of bone loss, and osteoporotic fractures. Study of Osteoporotic Fractures Research Group. *Arthritis Rheum* 1999;42(7):1378-1385.

6. American Geriatrics Society: *Falls Prevention in Older Adults.* http://www.uspreventiveservicestaskforce.org/Page/Document/Recommendatio.... Accessed June 22, 2015.

7. National Center for Injury Prevention and Control: *Preventing Falls: How to Develop Community-based Fall Prevention Programs for Older Adult*s. Atlanta, GA: Centers for Disease Control and Prevention, 2008. http://www.cdc.gov/homeandrecreationalsafety/Falls/community_preventfall... Accessed June 22, 2015.

Table 9B.1: Self-Reported Musculoskeletal Conditions for Persons Age 18 and Over, by Age, United States 2012

PREVALENCE

	Total Persons With Condition Aged 18 & Over (in millions)					Prevalence Per 100 Persons in Sex Group					Age-Adjusted Rate [3] Per 100 Total Population
	18-44	45-64	65-74	75+	Total	18-44	45-64	65-74	75+	Total	
Prevalence and Age-Adjusted Rate of Self-Reported Select Medical Conditions [1]											
Musculoskeletal	46.188	51.156	16.655	12.648	126.647	41.6	62.4	70.1	69.9	53.9	52.8
Chronic Joint Pain	16.734	28.984	10.076	7.291	63.085	15.1	35.3	42.4	40.3	26.9	26.3
Arthritis	7.582	24.223	11.110	8.914	51.830	6.8	29.5	46.8	49.3	22.1	21.6
Neck Pain (Cervical Back Pain)	12.528	15.053	3.452	2.482	33.515	11.3	18.3	14.5	13.7	14.3	14.0
Lower Back Pain (Lumbar Back Pain)	26.611	26.495	7.104	5.613	65.823	24.0	32.3	29.9	31.0	28.0	27.4
Lower Back Pain Spreading Below Knee	7.023	11.139	2.686	2.042	22.890	6.3	13.6	11.3	11.3	9.7	9.5
Prevalence of Chronic Joint Pain [1] **by Joint**											
Knee	10.678	18.363	6.223	4.730	39.994	9.6	22.4	26.2	26.1	17.0	16.7
Shoulder	4.248	9.133	3.209	2.152	18.742	3.8	11.1	13.5	11.9	8.0	7.8
Hip	3.190	7.241	2.812	2.050	15.303	2.9	8.8	11.8	11.3	6.5	6.4
Fingers	2.368	7.161	3.001	1.864	14.393	2.1	8.7	12.6	10.3	6.1	6.0
Ankle	3.802	6.389	1.723	1.182	13.096	3.4	7.8	7.3	6.5	5.6	5.4
Wrist	3.316	5.386	1.674	0.994	11.370	3.0	6.6	7.0	5.5	4.8	4.7
Elbow	2.558	5.066	1.315	0.723	9.661	2.3	6.2	5.5	4.0	4.1	4.0
Toes	1.137	3.224	1.016	0.649	6.026	1.0	3.9	4.3	3.6	2.6	2.5
Other Joint	0.812	1.610	0.594	0.323	3.339	0.7	2.0	2.5	1.8	1.4	1.4
All Chronic Joint [2]	16.734	28.984	10.076	7.291	63.085	15.1	35.3	42.4	40.3	26.9	26.3

LIMITATIONS

	Total Persons With Condition Aged 18 & Over (in 000s)					Rate Per 100 Persons in Age Group				
	18-44	45-64	65-74	75+	Total	18-44	45-64	65-74	75+	Total
Self-Reported Limitations in Activities of Daily Living for Persons Due to Select Medical Conditions										
Musculoskeletal [4]	2,424	8,196	3,213	4,096	17,929	2.2	10.0	13.5	22.7	5.9
Cause of Self-Reported Limitations in Activities of Daily Living for Persons Due to Musculoskeletal Condition										
Back or Neck Problem	1,415	4,509	1,435	1,194	8,554	1.3	5.5	6.0	6.6	3.6
Arthritis or Rheumatism	466	3,169	1,693	2,522	7,850	0.4	3.9	7.1	14.0	3.3
Musculoskeletal/Connective Tissue Problem	556	1,924	752	918	4,150	0.5	2.3	3.2	5.1	1.8
Fracture, Bone/Joint Injury	487	1,716	425	690	3,319	0.4	2.1	1.8	3.8	1.4
Missing or Amputated Limb/Finger/Digit	*	213	*	*	374	*	0.3	*	*	0.2
Total All Musculoskeletal Conditions	2,424	8,196	3,213	4,096	18,211	2.2	10.0	13.5	22.7	5.9

Table 9B.1: Self-Reported Musculoskeletal Conditions for Persons Age 18 and Over, by Age, United States 2012

BED & LOST WORK DAYS	18-44	45-64	65 & older	Total
Bed Days [5] **Due to Musculoskeletal Injuries or Conditions** [6] **for Persons Age 18 and Over**				
Persons Reporting Bed Days (in 000s)	13,623	25,226	18,705	57,554
Mean Bed Days	10.4	10.4	6.7	9.2
Total Bed Days (in millions)	141.4	261.8	125.1	528.3
Lost Work Days [7] **Due to Musculoskeletal Injuries or Conditions for Persons Age 18 and Over**				
Persons Reporting Lost Work Days (in 000s)	9,984	15,087	3,005	28,076
Mean Work Days Lost	8.5	8.1	3.4	7.7
Total Work Days Lost (in millions)	85.2	121.5	10.1	216.5

* Data does not meet standards for reliability.

[1] Symptoms lasting 3 months or longer.

[2] Chronic pain in multiple joints may be reported.

[3] Age-adjusted by direct method to US Census population estimate for July 1, 2012. Accessed October 26, 2013. NOTE: Due to sample weighting to approximate the age distribution of the U.S. population, the crude (unadjusted) and age-adjusted rates of reported conditions are very close.

[4] Includes arthritis/rheumatism condition, back or neck problem, fracture/bone/joint injury, musculoskeletal/connective tissue condition, missing or amputated limb/finger/digit; in 0-17 population defined as injury or bone/joint/muscle problem.

[5] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[6] Caused by: "Fracture/bone/joint injury; Back/neck problem; Arthritis/Rheumatism; Amputated limb/finger/digit; or Musculoskeletal /connective tissue problem."

[7] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

Source: National Health Interview Survey (NHIS)_Adult sample. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

Table 9B.2.1: Self-Reported Spine Conditions for Persons Age 18 and Over, by Age, United States 2012

SELF-REPORTED BACK PAIN [1]	18-44	45-64	65-74	75 & over	Total Age 18 & Over
Lower Back [2]	24.5	32.7	31.8	31.3	
Neck [3]	12.2	19.2	15.8	14.0	
Back w/ Radiating Leg Pain [4]	6.8	14.1	12.6	12.2	

LIMITATIONS IN ADL [1, 5]	18-44	45-64	65-74	75 & over	Total Age 18 & Over
	Persons Reporting Limitation Due to Chronic Back or Neck Problems (in 000s)				
Any limitation	1,388.2	4,452.2	1,409.9	1,151.5	8,401.8
Need help with routine needs	314.5	1,072.1	339.7	500.4	2,226.7
Help with personal care	141.9	454.4	145.5	233.2	975.0
Difficulty walking without equipment	402.0	1,607.5	619.7	770.3	3,399.5
Unable to work NOW due to health	752.9	2,838.8	627.4	460.4	4,679.4
Limited in kind or amount of work	457.2	1,223.3	567.3	359.5	2,607.4
	Rate of Limitation Due to Chronic Back or Neck Problem Per 100 Population [6]				
Any limitation	1.2	5.4	6.5	6.2	3.6
Need help with routine needs	0.3	1.3	1.6	2.7	0.9
Help with personal care	0.1	0.6	0.7	1.3	0.4
Difficulty walking without equipment	0.4	2.0	2.8	4.1	1.4
Unable to work NOW due to health	0.7	3.5	2.9	2.5	2.0
Limited in kind or amount of work	0.4	1.5	2.6	1.9	1.1
	Proportion of All Persons With Limitations Where Limitations Are Due to Chronic Back or Neck Problems				
Any limitation	21%	31%	24%	15%	21%
Need help with routine needs	20%	36%	24%	14%	23%
Help with personal care	20%	29%	19%	12%	18%
Difficulty walking without equipment	35%	36%	26%	16%	26%
Unable to work NOW due to health	21%	33%	25%	17%	27%
Limited in kind or amount of work	23%	33%	29%	16%	27%

Table 9B.2.1: Self-Reported Spine Conditions for Persons Age 18 and Over, by Age, United States 2012

BED AND LOST WORK DAYS [1]	**18-44**	**45-64**	**65-74**	**75 & over**	**Total Age 18 & Over**
Bed Days [7] **Due to Spine Pain or Problems** [8] **for Persons Aged 18 and Over**					
Persons Reporting Bed Days (in 000s)	12,647	8,890	838	93	22,467
% of Workforce with Bed Days	14.2%	14.6%	11.9%	6.3%	14.2%
Mean Bed Days	7.0	8.4	7.9	12.7	7.6
Total Bed Days (in millions)	88.5	74.7	6.6	1.2	170.7
% of Total Bed Days	51.8%	43.7%	3.9%	0.7%	
Lost Work Days [9] **Due to Spine Pain or Problems** [8] **for Persons Aged 18 and Over**					
Persons Reporting Lost Work Days (in 000s)	14,253	10,422	758	80	25,513
% of Workforce with Lost Work Days	16.0%	17.1%	10.8%	5.5%	16.1%
Mean Work Days Lost	9.5	14.0	8.8	14.2	11.4
Total Work Days Lost (in millions)	135.4	145.9	6.7	1.1	290.8
% of Total Lost Work Days	46.6%	50.2%	2.3%	0.4%	

[1] **Source**: National Health Interview Survey (NHIS)_Adult sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

[2] "During the PAST THREE MONTHS, did you have ...Low back pain?"

[3] "During the PAST THREE MONTHS, did you have ...Neck pain?"

[4] If low back pain, "Did this pain spread down either leg to areas below the knees?" Rate in population is found by multiplying lower back pain rate by radiating leg pain rate.

[5] Activities of Daily Living (ADL)

[6] Based on U.S. Census of Population estimate for July 1, 2010, for age group. Adjusted to working age population aged 18 and older.

[7] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[8] Replied "yes" when ask "During the PAST THREE MONTHS, did you have ...Low back pain?/ Neck pain?"

[9] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

Table 9B.2.2: Health Care Visits for Spine Conditions for Persons Age 18 and Over, by Age, United States, 2010

HEALTH CARE VISITS [1]	Total Number of Visits (in 000s) 18-44	45-64	65-74	75 & over	Total Age 18 & Over
Total Number of Health Care Visits with Low Back Disorder Diagnoses, 2010 [2]					
Back Disorders	11,955.8	16,485.9	5,602.8	4,484.1	38,528.6
Disc Disorders	2,492.4	4,309.4	1,482.2	1,287.6	9,571.6
Back Injury	3,567.2	2,647.7	488.0	542.6	7,245.5
All Lumbar/Low Back Pain [3]	16,354.6	21,430.9	7,289.6	5,777.0	50,852.1
% of Total Visits	32%	42%	14%	11%	100%
Rate Per 100 Patient Visits	4.6	5.9	4.7	3.7	4.1
Rate per 100 Persons	14.5	26.2	33.4	31.0	16.9
Total Health Care Visits with Neck and Cervical Spine Disorder Diagnosiss, All Ages, 2010 [4]					
Cervical Disorders	2,664.6	4,863.9	1,701.2	1,054.4	10,284.1
Cervical Disc Disorders	651.5	1,420.5	111.9	130.3	2,314.2
Neck Injury	2,102.5	1,377.0	217.9	208.9	3,906.3
All Cervical/Neck Pain [3]	5,068.5	7,413.5	1,892.9	1,253.2	15,628.1
% of Total Visits	32%	47%	12%	8%	100%
Rate Per 100 Patient Visits	1.4	2.1	1.2	0.8	1.3
Rate per 100 Persons	4.5	9.1	8.7	6.7	5.3
Total Back Pain (Lumbar and Cervical) Diagnoses					
Hospital Discharges	470.9	910.0	452.6	680.0	2,561.8
Emergency Department Visits	4,338.4	2,384.5	*	*	8,276.3
Hospital Outpatient Visits	1,037.6	1,673.8	449.9	395.9	3,927.1
Physician Office Visits	14,265.7	22,298.8	7,472.0	5,315.3	50,656.9
All Back Pain Diagnoses [5]	20,112.6	27,267.1	8,907.6	6,843.3	65,422.1
Rate Per 100 Patient Visits	5.7	7.5	5.7	4.4	5.1
Diagnoses Per 100 US Population	17.8	33.3	40.8	36.8	21.1

Table 9B.2.2: Health Care Visits for Spine Conditions for Persons Age 18 and Over, by Age, United States, 2010

SURGICAL PROCEDURES [6]	Total Number of Spinal Diagnosis (in 000s) 18-44	45-64	65-74	75 & over	Total Age 18 & Over
Hospital Discharges with Back Pain Diagnoses Where Discharge Included Spinal Fusion Procedure [6]					
All Back Pain Diagnoses Discharges	542	1,158	579	866	3,186
Discharges with Spine Fusion Procedure	92	237	101	48	488
% Diagnoses with Spinal Fusion Procedure	17.0%	20.5%	17.4%	5.5%	15.3%
Hospital Discharges with Back Pain Diagnoses Where Discharge Included Spinal Diskectomy Procedure [7]					
All Back Pain Diagnoses Discharges	542	1,158	579	866	3,186
Discharges with Spinal Diskectomy Procedure	91	183	66	28	370
% Diagnoses with Spinal DiskectomyProcedure	16.7%	15.8%	11.4%	3.3%	11.6%

* Estimate does not meet standards for reliability.

[1] **Sources**: National Hospital Discharge Survey (NHDS), 2010. www.cdc.gov/nchs/nhds/nhds_questionnaires.htm April 23, 2013; National Hospital Ambulatory Medical Care Survey_Emergency Department (NHAMCS_ED), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013; National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013; National Ambulatory Medical Care Survey (NAMCS), 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[2] Back disorders include inflammatory spine conditions, spondylosis, spinal stenosis, lumbago, sciatica, backache, and disorders of the sacrum (ICD-9-CM codes 720, 721, and 724). Disc disorders include herniation, disc degeneration, and post-laminectomy syndromes (ICD-9-CM code 722). Back injuries include fractures, dislocation, and sprains (ICD-9-CM codes 805, 806, 839, 846, and 847). This division, while useful in analyzing the databases, may not always accurately reflect the primary diagnosis. Further, there is some overlap.

[3] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient. Visits also do not include those made to other types of medical care providers, such as chiropractic or physical therapy.

[4] In presenting health care resource utilization for cervical pain, three categories of cervical pain are addressed. One is labeled cervical disc disorders, and includes disc displacement, herniation, and disc degeneration (ICD-9-CM code 722). A second group is cervical injuries, and includes sprains, strains, and fractures (ICD-9-CM codes 805, 806, 839, and 847). A third group, referred to as cervical disorders, includes pain caused by other disease entities, including cervical spondylosis and stenosis (ICD-9-CM codes 721 and 723).

[5] ICD-9-CM procedure codes 8100 through 8108; 8130 through 8138.

[6] **Source**: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[7] ICD-9-CM procedure codes: 805.00, 805.10

Table 9B.3: Health Care Visits for Spinal Deformity Conditions for Persons Age 18 and Over, by Age, United States 2010/2011

HEALTH CARE VISITS

	Total Visits (in 000s)					% of Total			
	Total	18-44	45-64	65-74	75 & over	18-44	45-64	65-74	75 & over
Total Health Care Visits for Spinal Deformity Disorders [1]									
Curvature of spine	1,609.5	460.7	464.1	232.4	452.3	29%	29%	14%	28%
Idiopathic	1,201.5	424.0	310.1	171.8	295.6	35%	26%	14%	25%
Acquired	368.9	32.2	151.6	58.4	126.7	9%	41%	16%	34%
Secondary	79.4	5.4	4.0	2.9	67.1	7%	5%	4%	85%
Spondylolisthesis	764.3	72.6	302.2	231.1	158.4	9%	40%	30%	21%
Spinal fractures	906.6	184.9	206.9	124.7	390.1	20%	23%	14%	43%
Vertebral compression fractures	870.2	175.5	201.4	110.9	382.4	20%	23%	13%	44%
Traumatic fractures	41.0	11.2	6.9	14.4	8.5	27%	17%	35%	21%
Spinal infection	1,857.8	359.2	847.8	398.5	252.3	19%	46%	21%	14%
Tuberculosis of spine	2.1	0.3	0.7	0.2	0.9	14%	33%	10%	43%
Intraspinal abscess	25.6	4.1	12.6	5.4	3.5	16%	49%	21%	14%
Acute osteomylitis	23.6	2.0	15.5	3.1	3.0	8%	66%	13%	13%
Chronic osteomylitis	51.3	11.4	19.7	15.2	5.0	22%	38%	30%	10%
Discitis	1,770.0	343.3	805.9	377.7	243.1	19%	46%	21%	14%
Complications of surgery	181.6	56.7	49.7	21.8	53.4	31%	27%	12%	29%
Spondylopathies	10,533.4	3,149.7	5,084.4	1,187.5	1,111.8	30%	48%	11%	11%
All Spinal Deformity Disorders [2]	15,502.7	4,210.1	6,790.4	2,149.6	2,352.6	27%	44%	14%	15%
Rate Per 100 Patient Visits	1.2	1.2	1.9	1.4	1.5				
Diagnoses Per 100 U.S. Population [3]	5.0	3.7	8.3	9.8	12.6				

CURVATURE OF SPINE

	Total Visits (in 000s)						% Total
	TOTAL [2]	18-44	45-64	65-74	75 & over	Ave Age	Diagnoses
NIS-Hospitalizations [1A]							
Curvature of spine	208.8	40.7	50.0	37.1	81.0	59.6	
Idiopathic	139.8	34.4	33.8	23.7	47.9	56.2	67%
Acquired	62.4	5.8	14.9	12.2	29.5	67.0	30%
Secondary	9.6	0.8	2.1	1.9	4.8	66.0	5%
NEDS -Emergency Departments [1B]							
Curvature of spine	227.4	88.1	48.2	22.1	69.0	51.9	
Idiopathic	182.3	79.1	40.4	16.5	46.3	48.9	80%
Acquired	39.3	7.9	6.7	4.7	20.0	65.0	17%
Secondary	7.5	1.7	1.4	1.0	3.4	61.4	3%
Total All Source Visits [2]							
Curvature of spine	436.2	128.8	98.2	59.2	150.0		
Idiopathic	322.1	113.5	74.2	40.2	94.2		74%
Acquired	101.7	13.7	21.6	16.9	49.5		23%
Secondary	17.1	2.5	3.5	2.9	8.2		4%
Diagnoses Per 100 U.S. Population [3]							
Curvature of spine	0.2	0.1	0.1	0.3	0.8		
Idiopathic	0.1	0.1	0.1	0.2	0.5		
Acquired	0.0	0.0	0.0	0.1	0.3		
Secondary	0.0	0.0	0.0	0.0	0.0		

Table 9B.3: Health Care Visits for Spinal Deformity Conditions for Persons Age 18 and Over, by Age, United States 2010/2011

HOSPITAL DISCHARGE STATUS [1A]

	Total Discharges (in 000s)				
	TOTAL	18-44	45-64	65-74	75 & over
All Spinal Deformity Disorders	1,141.7	184.4	368.7	205.9	342.1
Routine/discharge home	53%	77%	66%	48%	27%
Discharge/transferred to short-term facility	2%	2%	3%	3%	2%
Discharge/transferred to long-term care institution	27%	10%	15%	29%	49%
Home health care	15%	9%	14%	18%	18%
Other discharge status	2%	3%	2%	2%	3%
All Diagnoses Discharges	38,526.8	9,370.2	9,680.0	5,365.6	8,425.6
Routine/discharge home	70%	90%	72%	57%	38%
Discharge/transferred to short-term facility	2%	1%	3%	3%	2%
Discharge/transferred to long-term care institution	14%	3%	10%	19%	36%
Home health care	11%	4%	12%	17%	19%
Other discharge status	3%	2%	3%	3%	5%
Ratio Spinal Deformity Disorder Disposition to All Diagnoses Discharge Dispositions					
Routine/discharge home	0.76	0.86	0.92	0.83	0.70
Discharge/transferred to short-term facility	1.14	1.83	1.00	0.90	0.96
Discharge/transferred to long-term care institution	1.92	3.38	1.50	1.51	1.37
Home health care	1.38	2.21	1.16	1.06	0.97
Other discharge status	0.86	1.19	0.64	0.69	0.73

[1] Includes hospital discharges, emergency department visits, outpatient department visits, and physician office visits.

Sources: **1A**: **Hospital visits**: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

1B: Emergency Department Visits: : HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

1C: Outpatient Visits: National Hospital Ambulatory Medical Care Survey_Outpatient Department (NHAMCS_OP), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

1D: Physician Office Visits: National Ambulatory Medical Care Survey (NAMCS), 2008, 2009, 2010. www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm April 23, 2013.

[2] Total visits may be lower than sum of diagnoses due to multiple diagnoses per patient.

[3] Adjusted to 2010 US Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

Table 9B.4.1: Self-Reported Arthritis Conditions for Persons Age 18 and Over, by Age, United States 2012

SELF-REPORTED ARTHRITIS [1]

	Total Persons (in 000s)				Rate Per 100 Persons [2]			
	18-44	45-64	65 & over	Total	18-44	45-64	65 & over	Total
Prevalence of Self-Reported Arthritis Conditions Among Adults Age 18 & Older, 2010-2012 [3]								
Doctor-Diagnosed Arthritis	8,100	24,600	20,600	52,500	7.3	30.3	49.7	21.4
Arthritis-Attributable Activity Limitations	3,000	10,800	8,800	22,700	2.7	13.4	22.0	9.2

LIMITATIONS [1]

	Limitations Due to Self-Reported Doctor-Diagnosed Arthritis (in 000s)					Rate Per 100 Population [2]				
	18-44	45-64	65-74	75 & over	Total	18-44	45-64	65-74	75 & over	Total
Limitations of Daily Living and Activity Attributed to Arthritis by Persons with Self-Reported Doctor-Diagnosed Arthritis [4]										
Any limitation	472.8	3,040.3	1,625.1	2,427.7	7,565.9	0.4	3.7	7.4	13.0	3.2
Need help with routine needs	148.8	858.9	446.9	1,130.6	2,585.2	0.1	1.1	2.0	6.1	1.1
Help with personal care	69.4	411.0	206.6	613.7	1,300.6	0.1	0.5	0.9	3.3	0.6
Difficulty walking without equipment	170.8	1,398.4	889.9	1,767.1	4,226.2	0.2	1.7	4.1	9.5	1.8
Unable to work NOW due to health	273.8	1,979.4	649.5	935.7	3,838.3	0.2	2.4	3.0	5.0	1.6
Limited in kind or amount of work	141.5	695.1	546.5	678.2	2,061.3	0.1	0.9	2.5	3.6	0.9

Proportion of Adults With Limitations Due to Self-Reported Doctor-Diagnosed Arthritis

	Proportion of Total Population				
Any limitation	7%	21%	28%	31%	19%
Need help with routine needs	9%	29%	31%	32%	27%
Help with personal care	10%	27%	27%	32%	24%
Difficulty walking without equipment	15%	31%	37%	36%	32%
Unable to work NOW due to health [4]	8%	23%	26%	34%	22%
Limited in kind or amount of work	7%	19%	28%	31%	21%

BED AND LOST WORK DAYS [1]

	18-44	45-64	65-74	75 & over	Total	Proportion of Population with Bed Days Due to Arthritis Condition 18-44	45-64	65-74	75 & over	Total
Bed Days [5] **Due to Arthritis Condition** [3] **for Persons Aged 18 and Over**										
Persons Reporting Bed Days (in 000s)	4,485	11,704	3,522	2,691	22,402	4.0%	14.3%	16.1%	14.5%	9.5%
Mean Bed Days	23.7	23.8	22.2	28.1	24.0					
Total Bed Days (in millions)	106.3	278.6	78.2	75.6	537.6					
Lost Work Days [6] **Due to Arthritis Conditions** [3] **for Persons Aged 18 and Over**										
Persons Reporting Lost Work Days (in 000s)	3,364	7,651	862	159	12,036	3.0%	9.4%	3.9%	0.9%	5.1%
Mean Work Days Lost	12.7	14.6	17.0	16.6	14.3					
Total Work Days Lost (in millions)	42.7	111.7	14.7	2.6	172.1					

[1] **Source**: National Health Interview Survey (NHIS)_Adult sample, 2010-2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm Accessed July 2, 2013.

[2] Age-adjusted by direct method to US Census adult population estimate using 2000 US Census estimates for the years 2010-2011, and 2010 US Census estimates for 2012. Describes the relative population burden when comparing groups.

[3] Responded "yes" when asked: Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?

[4] Responded "yes" when asked: Are you now limited in any way in any of your usual activities because of arthritis or joint symptoms?

[5] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

[6] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

Table 9B.4.2: Hospital Discharges for Arthritis Conditions for Persons Age 18 and Over, by Age, United States 2011

HOSPITALIZATIONS [1] for Arthritis and Other Rheumatic Conditions (AORC) Among Adults Age 18 and Older, 2011

	Total Persons (in 000s)					Rate Per 100 Persons [2]				
	18-44	45-64	65-74	75 & over	Total	18-44	45-64	65-74	75 & over	Total
Osteoarthritis and allied disorders	87.2	917.6	798.0	1,360.2	3,161.1	0.1	1.1	3.7	7.3	1.3
Rheumatoid arthritis	39.5	174.2	137.7	190.9	542.2	< 0.1	0.2	0.6	1.0	0.2
Gout and other crystal arthropathies	33.8	234.7	221.6	383.4	873.4	< 0.1	0.3	1.0	2.1	0.4
Joint pain, effusion, and other unspecified joint disorders	115.1	329.2	211.7	368.4	1,024.4	0.1	0.4	1.0	2.0	0.4
Spondylarthropathies	50.8	204.3	117.5	166.5	539.0	< 0.1	0.2	0.5	0.9	0.2
Fibromyalgia	91.5	221.8	81.0	54.6	448.8	0.1	0.3	0.1	0.3	0.2
Diffuse connective tissue disease (Sjögren's syndrome, SSC, SL	78.5	115.3	48.4	41.5	283.6	0.1	0.3	0.4	0.3	0.2
Carpal tunnel syndrome	*	*	*	*	39.4	*	*	*	*	0.0
Soft tissue disorders (excluding back)	112.6	237.0	126.1	200.1	675.5	0.1	0.3	0.6	1.1	0.3
Other specified rheumatic conditions	166.2	348.2	177.3	256.3	947.7	0.1	0.4	0.8	6.2	0.4
Total AORC Diagnoses	582.5	2,135.2	1,502.5	2,396.4	6,614.0	0.5	2.6	6.9	12.9	2.8

MEAN LENGTH HOSPITAL STAY AND AVERAGE PATIENT CHARGES [1]

	18-44	45-64	65-74	75 & over	Total
Osteoarthritis and allied disorders (number in 1,000s)					
Mean LOS (days)	4.0	4.2	4.4	5.1	4.6
Mean hospital charges (in 000s) [3]	$ 39.59	$ 45.81	$ 46.43	$ 38.43	$ 42.62
Total hospital charges (in billion $s)	$ 3.5	$ 42.0	$ 37.1	$ 52.3	$ 134.7
Rheumatoid arthritis (number in 1,000s)					
Mean LOS (days)	4.3	5.0	5.3	5.4	5.2
Mean hospital charges (in 000s) [3]	$ 34.57	$ 45.28	$ 46.70	$ 38.86	$ 42.59
Total hospital charges (in billion $s)	$ 1.4	$ 7.9	$ 6.4	$ 7.4	$ 23.1
Gout and other crystal arthropathies (number in 1,000s)					
Mean LOS (days)	4.8	5.3	5.4	5.5	5.4
Mean hospital charges (in 000s) [3]	$ 40.07	$ 46.79	$ 46.98	$ 39.87	$ 43.54
Total hospital charges (in billion $s)	$ 1.4	$ 11.0	$ 10.4	$ 15.3	$ 38.0
Joint pain, effusion and other unspecified joint disorders (number in 1,000s)					
Mean LOS (days)	4.8	4.9	5.0	5.3	5.1
Mean hospital charges (in 000s) [3]	$ 35.35	$ 40.74	$ 42.75	$ 35.18	$ 38.55
Total hospital charges (in billion $s)	$ 4.1	$ 13.4	$ 9.1	$ 13.0	$ 39.5

Table 9B.4.2: Hospital Discharges for Arthritis Conditions for Persons Age 18 and Over, by Age, United States 2011

	Total Persons (in 000s)					**Rate Per 100 Persons** [2]				
	18-44	**45-64**	**65-74**	**75 & over**	**Total**	**18-44**	**45-64**	**65-74**	**75 & over**	**Total**
Spondylarthropathies (number in 1,000s)										
Mean LOS (days)	3.7	4.2	4.9	5.3	4.6					
Mean hospital charges (in 000s) [3]	$ 54.45	$ 58.78	$ 60.14	$ 43.54	$ 53.98					
Total hospital charges (in billions)	$ 2.8	$ 12.0	$ 7.1	$ 7.2	$ 29.1					
Fibromyalgia (number in 1,000s)										
Mean LOS (days)	4.3	4.5	4.8	5.0	4.6					
Mean hospital charges (in 000s) [3]	$ 29.78	$ 37.55	$ 40.04	$ 36.11	$ 36.23					
Total hospital charges (in billion $s)	$ 2.7	$ 8.3	$ 3.2	$ 2.0	$ 16.3					
Total AORC Diagnoses (number in 1,000s)										
Mean LOS (days)	4.9	4.8	5.0	5.3	5.0					
Mean hospital charges (in 000s) [3]	$ 42.19	$ 47.38	$ 47.75	$ 39.09	$ 44.00					
Total hospital charges (in billion $s)	$ 24.6	$ 101.2	$ 71.7	$ 93.7	$ 291.0					
Proportion Total Hospital Charges Attributed to AORC Hospital Stays	10%	23%	28%	28%	23%					

* Estimates do not meet standards for reliability.

[1] **Source**: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Age-adjusted by direct method to US Census adult population estimate using 2000 U.S. Census estimates for the years 2010-2011, and 2010 US Census estimates for 2012. Describes the relative population burden when comparing groups.

[3] Average charges are based on individual record discharges. The fees included may vary from patient to patient, but generally include hospital room, supplies, medications, laboratory fees, and care staff, such as nurses. They generally do not include professional fees (doctors) and noncovered charges. In a small proportion of the discharge cases, professional fees (doctors) are not removed from total charges because the data source cannot provide the information. Emergency charges incurred prior to admission to the hospital may be included in total charges. Medicare requires a bundled bill for Medicare patients admitted to the hospital through the emergency department; other payers may or may not have similar requirements.

Table 9B.4.3: Hospital Discharge Status for Arthritis Conditions for Persons Age 18 and Over, by Age, United States 2011

DISCHARGE STATUS [1]	18-44	45-64	65-74	75 & over	Total
Osteoarthritis and allied disorders (number in 1,000s)	87.2	917.6	798.0	1,360.2	3,161.1
Routine/discharge home	71%	55%	45%	33%	43%
Discharge/transferred to short-term facility	1%	2%	2%	2%	2%
Transferred to skilled nursing/intermediate care	8%	15%	25%	42%	29%
Home health care	19%	28%	27%	21%	24%
Other discharge status	2%	1%	1%	3%	2%
Rheumatoid arthritis (number in 1,000s)	39.5	174.2	137.7	190.9	542.2
Routine/discharge home	81%	66%	52%	35%	53%
Discharge/transferred to short-term facility	2%	2%	3%	2%	2%
Discharge/transferred to long-term care institution	4%	12%	23%	38%	24%
Home health care	10%	17%	20%	20%	19%
Other discharge status	3%	2%	3%	4%	3%
Gout and other crystal arthropathies (number in 1,000s)	33.8	234.7	221.6	383.4	873.4
Routine/discharge home	81%	69%	57%	39%	54%
Discharge/transferred to short-term facility	2%	3%	3%	2%	3%
Discharge/transferred to long-term care institution	5%	10%	19%	34%	23%
Home health care	9%	15%	19%	21%	19%
Other discharge status	2%	2%	2%	3%	3%
Joint pain, effusion and other unspecified joint disorders (number in 1,000s)	115.1	329.2	211.7	368.4	1,024.2
Routine/discharge home	83%	71%	57%	37%	57%
Discharge/transferred to short-term facility	2%	2%	2%	2%	2%
Discharge/transferred to long-term care institution	5%	10%	20%	39%	22%
Home health care	8%	15%	19%	20%	17%
Other discharge status	3%	2%	2%	2%	2%
Spondylarthropathies (number in 1,000s)	50.8	204.3	117.5	166.5	539.0
Routine/discharge home	86%	75%	58%	35%	60%
Discharge/transferred to short-term facility	1%	2%	2%	2%	2%
Discharge/transferred to long-term care institution	4%	10%	22%	42%	22%
Home health care	7%	12%	17%	20%	15%
Other discharge status	1%	1%	1%	1%	2%
Fibromyalgia (number in 1,000s)	91.5	221.8	81.0	54.6	448.8
Routine/discharge home	85%	73%	59%	42%	69%
Discharge/transferred to short-term facility	2%	2%	2%	2%	2%
Discharge/transferred to long-term care institution	4%	9%	20%	35%	13%
Home health care	6%	14%	18%	19%	14%
Other discharge status	2%	2%	1%	2%	2%

Table 9B.4.3: Hospital Discharge Status for Arthritis Conditions for Persons Age 18 and Over, by Age, United States 2011

DISCHARGE STATUS [1]	**18-44**	**45-64**	**65-74**	**75 & over**	**Total**
Diffuse connective tissue disease (Sjögren's syndrome, SSC, SLE) (number in 1,000s)	78.5	115.3	48.4	41.5	283.6
Routine/discharge home	81%	68%	53%	38%	64%
Discharge/transferred to short-term facility	3%	3%	3%	2%	3%
Discharge/transferred to long-term care institution	5%	11%	21%	34%	14%
Home health care	9%	16%	20%	21%	15%
Other discharge status	3%	3%	3%	5%	3%
Soft tissue disorders (excluding back) (number in 1,000s)	112.6	237.0	126.1	200.1	675.5
Routine/discharge home	72%	58%	42%	25%	47%
Discharge/transferred to short-term facility	3%	3%	3%	2%	3%
Discharge/transferred to long-term care institution	10%	18%	31%	50%	28%
Home health care	10%	17%	21%	19%	17%
Other discharge status	5%	4%	4%	4%	4%
Other specified rheumatic conditions (number in 1,000s)	166.2	348.2	177.3	256.3	947.7
Routine/discharge home	72%	58%	42%	26%	49%
Discharge/transferred to short-term facility	3%	3%	3%	2%	3%
Discharge/transferred to long-term care institution	9%	17%	30%	48%	27%
Home health care	11%	18%	21%	19%	18%
Other discharge status	4%	4%	3%	4%	4%
Total AORC Diagnoses (number in 1,000s)	582.5	2,135.2	1,502.5	2,396.4	6,614.0
Routine/discharge home	79%	64%	50%	35%	52%
Discharge/transferred to short-term facility	2%	2%	2%	2%	2%
Discharge/transferred to long-term care institution	6%	13%	23%	40%	24%
Home health care	10%	20%	23%	20%	20%
Other discharge status	3%	2%	2%	3%	2%
All Hospitalizations (number in 1,000s)	9,385.3	9,694.0	5,374.3	8,442.3	32,896.3
Routine/discharge home	90%	72%	57%	38%	66%
Discharge/transferred to short-term facility	1%	3%	3%	2%	2%
Discharge/transferred to long-term care institution	3%	10%	19%	36%	16%
Home health care	4%	12%	17%	19%	12%
Other discharge status	2%	3%	3%	5%	3%

[1] **Source**: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 9B.5: Health Care Visits with Primary Diagnosis[1] or Osteoporotic Fracture[2] in Hospitals and Emergency Rooms for Persons Age 50 and Over, by Sex and Age, United States 2011

HEALTH CARE VISITS	Hospital Discharges (in 000s) [3]					Emergency Department Visits (in 000s) [4]					Total Hospital Discharges/ ED Visits (in 000s)				
	50-59	60-69	70-79	80 & Over	Total	50-59	60-69	70-79	80 & over	Total	50-59	60-69	70-79	80 & over	Total
Primary Osteoporosis [5]	82.5	187.0	308.3	379.5	957.3	81.1	151.3	251.0	346.1	829.5	163.6	338.3	559.3	725.6	1,786.8
Osteoporotic Fractures [2]															
Hip fracture [6]	16.5	32.8	65.6	125.8	240.7	16.0	31.3	61.2	119.8	228.3	32.5	64.1	126.8	245.6	469.0
Spine fracture [7]	13.3	17.0	25.2	35.9	91.4	23.9	23.4	34.8	47.2	129.3	37.2	40.4	60.0	83.1	220.7
Pelvic fracture [8]	3.8	4.9	9.1	21.1	38.9	6.7	7.5	12.8	27.3	54.3	10.5	12.4	21.9	48.4	93.2
Femur (thigh) fracture [9]	5.1	7.0	8.7	10.5	31.3	5.8	7.5	9.1	11.0	33.4	10.9	14.5	17.8	21.5	64.7
Wrist fracture [10]	3.6	3.7	3.6	3.6	14.5	45.8	40.2	30.5	18.8	135.3	49.4	43.9	34.1	22.4	149.8
Humerus (arm) fracture [11]	7.4	10.4	12.5	12.3	42.6	29.9	34.3	34.2	27.4	125.8	37.3	44.7	46.7	39.7	168.4
Total all OP fracture discharges	49.7	75.8	124.8	209.2	459.5	128.1	144.1	182.6	251.5	706.3	177.8	219.9	307.4	460.7	1,165.8
Diagnoses per 100 US population [12]	0.1	0.3	0.8	1.9	0.5	0.3	0.5	1.1	2.2	0.7	0.4	0.8	1.9	4.1	1.2
	Proportion of Total					Proportion of Total					Proportion of Total				
Primary Osteoporosis [5]	9%	20%	32%	40%	100%	10%	18%	30%	42%	100%	9%	19%	31%	41%	100%
Osteoporotic Fractures [2]															
Hip fracture [6]	7%	14%	27%	52%	100%	7%	14%	27%	52%	100%	7%	14%	27%	52%	100%
Spine fracture [7]	15%	19%	28%	39%	100%	18%	18%	27%	37%	100%	17%	18%	27%	38%	100%
Pelvic fracture [8]	10%	13%	23%	54%	100%	12%	14%	24%	50%	100%	11%	13%	23%	52%	100%
Femur (thigh) fracture [9]	16%	22%	28%	34%	100%	17%	22%	27%	33%	100%	17%	22%	28%	33%	100%
Wrist fracture [10]	25%	26%	25%	25%	100%	34%	30%	23%	14%	100%	33%	29%	23%	15%	100%
Humerus (arm) fracture [11]	17%	24%	29%	29%	100%	24%	27%	27%	22%	100%	22%	27%	28%	24%	100%
Total all OP fracture discharges	11%	16%	27%	46%	100%	18%	20%	26%	36%	100%	15%	19%	26%	40%	100%

[1] Primary diagnosis is based on first listed diagnosis in potential of 25 (NIS) or 15 (NEDS) diagnoses. May unde estimate total numbers due to first diagnosis listed not always indicative of the primary diagnosis.

[2] Excludes injuries from high impact ICD-9-CM diagnostic codes E880, 733.81, 733.82, and joint replacement ICD-9-CM procedure codes 00.71, 81.53, 78.60.

[3] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[4] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nedsoverview.jsp

[5] ICD-9-CM codes 73300, 73301, 73302, 73303, 73309

[6] ICD-9-CM codes 820.0, 820.2, 73314

[7] ICD-9-CM codes 805.0, 805.2, 805.4, 805.8, 806.0, 806.2, 806.4, 806.8, 733.13

[8] ICD-9-CM codes 808.0, 808.2, 808.4, 808.8

[9] ICD-9-CM codes 821.0, 821.2, 733.15

[10] ICD-9-CM codes 813.4, 733.12

[11] ICD-9-CM codes 812.0, 812.2, 812.4, 733.1

[12] Adjusted to 2010 US Census Population. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml. Accessed April 13, 2015.There is the potential for multiple diagnoses per person which is not accounted for.

Table 9B.6.1: Musculoskeletal Injuriy Episodes for Persons Age 18 and Over, by Age, United States

SELF-REPORTED INJURIES [1]

	Medically-Consulted Musculoskeletal Injuries [2]				
	18-44	**45-64**	**65-74**	**75 +**	**Total**
Musculoskeletal Injuries					
Fall	23.1%	36.8%	50.8%	74.3%	37.0%
Trauma [3]	65.9%	55.4%	45.1%	22.5%	54.5%
Other Causes [4]	10.9%	7.8%	*	*	8.5%
Total Injury/Poisoning Episodes (in 000s)	2,969.7	2,468.5	736.1	662.8	6,815.1

	Medically-Consulted Musculoskeletal Injuries [2]				
	18-44	**45-64**	**65-74**	**75 +**	**Total**
Type of Musculoskeletal Injury					
Fracture	12.6%	15.8%	18.4%	20.4%	15.8%
Dislocation	*	*	*	*	2.2%
Sprains & Strains	31.1%	29.4%	35.2%	20.5%	28.7%
Contusion	11.3%	15.5%	*	25.5%	13.7%
Open Wounds	15.7%	13.8%	*	*	13.1%
All Other Musculoskeletal Injuries (5)	4.1%	4.9%	*	*	4.2%
All Musculoskeletal Injuries	2,969.7	2,468.5	736.1	662.8	6,815.1
% of Injuries By Demographic Group	44%	36%	11%	10%	

CAUSE OF INJURY [6]

	Rate of Nonfatal Injuries by Cause/1000 Population					Total Nonfatal Unintentional Injuries (in 000s)
	45-64	**65-74**	**75-84**	**85+**	**All Ages**	
Falls	22.9	32.7	64.9	141.6	29.7	9,256
Struck By/Against	8.5	5.8	6.5	9.1	14.8	4,620
Overexertion	9.1	5.2	4.5	4.6	11.0	3,440
Motor Vehicle Occupant	7.5	5.1	4.5	3.5	8.6	2,687
Cut/Pierce	5.9	4.1	3.1	2.6	6.9	2,165
Bicyclist Injury	1.0	0.5	0.3	*	1.7	534
Total All Causes	76.5	66.8	96.6	176.3	96.4	30,023

BED AND LOST WORK DAYS [7]

	18-44	**45-64**	**65 & Over**	**Total**
Bed Days [8] **Due to Musculoskeletal Injury** [9] **for Persons Aged 18 and Over**				
Persons Reporting Bed Days (in 000s)	13,623	25,226	18,705	57,554
Mean Bed Days	10.4	10.4	6.7	9.2
Total Bed Days (in millions)	141.4	261.8	125.1	528.3
Lost Work Days [10] **Due to Musculoskeletal Injury** [9] **for Persons Aged 18 and Over**				
Persons Reporting Lost Work Days (in 000s)	9,984	15,087	3,005	28,076
Mean Work Days Lost	8.5	8.1	3.4	7.7
Total Work Days Lost (in millions)	85.2	121.5	10.1	216.5

Table 9B.6.1: Musculoskeletal Injuriy Episodes for Persons Age 18 and Over, by Age, United States

[1] Source: National Health Interview Survey (NHIS)_Injury database, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

[2] All medically consulted injury/poisoning episodes that reportedly occurred during the past 3 months, based on ICD-9-CM codes recorded for eight possible diagnosis.

[3] Includes vehicular accidents (auto, train, boat, plane, motorcycle), machinery, moving objects, and other types of traumatic injury.

[4] Includes military injuries, sports injuries, poisonings, and other causes.

[5] Includes derangement, crushing injuries, open wounds, traumatic amputation, and late effect of musculoskeletal injuries.

[6] Source: Centers for Disease Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. (2011) National Center for Injury Prevention and Control (producer). Available from URL: www.cdc.gov/nicpc/wisqars. [October 21, 2013]. Age adjusted to 2000 standard population.

[7] Source: National Health Interview Survey (NHIS)_Adult sample, 2012. www.cdc.gov/nchs/nhis/nhis_2012_data_release.htm July 2, 2013.

[8] A bed day is defined as 1/2 or more days in bed due to injury or illness in past 12 months, excluding hospitalization.

9] Limitation caused by: "Fracture/bone/joint injury; Back/neck problem; Arthritis/Rheumatism; Amputated limb/finger/digit; or Musculoskeletal/connective tissue problem."

[10] A missed work day is defined as absence from work due to illness or injury in the past 12 months, excluding maternity or family leave.

Table 9B.6.2: Musculoskeletal Injury Health Care Visits for Persons Age 18 and Over, by Age, United States

HEALTH CARE VISITS

	Hospital Discharges, 2011 [1]					Emergency Department Visits, 2010 [2]				
	45-64	65-74	75-84	85 & over	Total	45-64	65-74	75-84	85 & over	Total
Musculoskeletal Injuries by Cause										
Fall	41.5%	57.9%	69.8%	77.5%	47.1%	35.2%	51.6%	65.9%	75.6%	31.3%
Trauma [3]	30.8%	17.6%	11.6%	8.2%	27.1%	50.9%	37.4%	24.1%	15.6%	53.5%
Other Causes [4]	27.7%	24.6%	18.5%	14.4%	25.7%	13.8%	11.0%	10.0%	8.8%	15.1%
Total Injury/Poisoning Episodes (in 000s)	408.2	236.7	335.1	338.8	2,506.3	3,967.5	1,066.1	1,027.2	820.1	26,638.3
Type of Musculoskeletal Injury										
Fracture	172.1	248.7	150.5	476.6	1,048.9	1,116.7	934.7	335.5	707.6	3,094.8
Dislocation	14.9	14.3	5.6	8.0	42.9	217.4	94.7	26.3	30.1	368.4
Sprains & Strains	22.7	31.2	15.9	27.3	97.2	2,128.0	914.4	170.5	170.0	3,383.1
Contusion	34.0	49.2	32.5	105.8	221.6	2,146.1	1,103.1	304.8	547.3	4,101.8
Open Wounds	88.9	56.0	20.7	56.4	222.2	1,773.0	793.0	197.6	303.1	3,066.8
All Other Musculoskeletal Injuries (5)	51.8	69.4	35.5	61.3	218.4	1,260.5	630.8	181.0	347.4	2,420.1
All Musculoskeletal Injuries	314.2	411.1	209.9	637.8	1,630.6	7,796.4	3,967.5	1,066.1	1,847.2	14,678.7
Rate Per 100 Patient Visits	3.3	4.2	4.4	8.0	4.4	14.9	13.6	12.0	14.0	17.0
Diagnoses Per 100 US Population [6]	0.3	0.5	1.1	3.6	0.6	6.9	4.9	4.9	9.9	6.1
% of Injuries By Demographic Group	19%	25%	13%	39%		53%	27%	7%	13%	

MEAN LENGTH HOSPITAL STAY AND AVERAGE PATIENT CHARGES [7]

	Age at Admission					
	18-44	45-64	65-74	75-84	85+	Total
Fractures						
Total Hospital Diagnoses (in 000s)	172.1	248.7	150.5	229.7	246.9	1094.4
Proportion of Age Group Hospital Discharges	1.8%	2.6%	2.8%	4.5%	7.5%	2.8%
Average LOS (in days), 2011	5.3	5.6	5.5	5.4	5.4	5.4
Average Total Hospital Charges (in 000 $s)	$70.7	$60.0	$54.3	$42.5	$44.1	$54.4
Total Hospital Charges (in 000 $s)	$12,172.6	$14,909.6	$8,176.7	$9,762.3	$10,888.3	$59,515.7
All Musculoskeletal Injuries						
Total Hospital Diagnoses (in 000s)	310.3	408.2	236.7	335.1	338.8	1,707.0
Proportion of Age Group Hospital Discharges	3.3%	4.2%	4.4%	6.5%	10.3%	4.4%
Average LOS (in days), 2011	4.9	5.5	5.5	5.6	5.4	5.3
Average Total Hospital Charges (in 000 $s)	$55.3	$53.0	$50.7	$46.2	$40.8	$48.7
Total Hospital Charges (in 000 $s)	$17,168.9	$21,650.9	$11,996.0	$15,488.3	$13,822.0	$83,149.7

Table 9B.6.2: Musculoskeletal Injury Health Care Visits for Persons Age 18 and Over, by Age, United States

[1] Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

[2] Source: HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). 2010. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov

[3] Includes vehicular accidents (auto, train, boat, plane, motorcycle), machinery, moving objects, and other types of traumatic injury.

[4] Includes military injuries, sports injuries, poisonings, and other causes.

[5] Includes derangement, crushing injuries, open wounds, traumatic amputation, and late effect of musculoskeletal injuries.

[6] Adjusted to 2010 US Census Population Estimates. There is the potential for multiple diagnoses per person which is not accounted for.

[7] Generally, total charges in the HCUP databases do not include professional fees and non-covered charges. If the source provides total charges with professional fees, then the professional fees are removed from the charge during HCUP processing. In a small number of HCUP databases, professional fees cannot be removed from total charges because the data source cannot provide the information. Emergency department charges incurred prior to admission to the hospital may be included in total charges. Medicare requires a bundled bill for Medicare patients admitted to the hospital through the emergency department. Other payers may or may not have similar requirements.

Table 9B.6.3: Hospital Discharges and Disposition of Musculoskeletal Injuries for Persons Age 18 and Over, by Type and Age, United States 2011

DISCHARGE STATUS

		Disposition (% of Total Patients with Injury Type)					
	Incidence (in 000s)	Routine	Transferred to Another Short-Term Care Facility (Hospital)	Transfer to Skilled Nursing, Intermediate Care, Another Facility	Home Health Care	Died	Other
18 to 44 years							
Fractures	172.1	75.9%	2.2%	10.3%	9.5%	1.2%	0.9%
Dislocations	14.9	74.2%	2.1%	11.3%	10.6%	0.7%	1.1%
Sprains and strains	22.7	82.6%	1.2%	6.6%	8.3%	0.0%	1.3%
Contusion	34.0	89.9%	1.2%	2.9%	3.9%	0.4%	1.7%
Open Wound	88.9	79.2%	2.1%	9.4%	6.3%	0.8%	2.2%
Other Musculoskeletal Injury	51.8	76.6%	2.0%	9.2%	9.5%	0.7%	2.0%
All Musculoskeletal Injuries	310.3	78.1%	2.0%	9.1%	8.1%	0.9%	1.8%
45 to 64 years							
Fractures	248.7	54.6%	2.6%	25.5%	15.1%	1.4%	0.8%
Dislocations	14.3	61.6%	2.5%	19.9%	14.4%	0.5%	1.1%
Sprains and strains	31.2	67.6%	1.4%	16.1%	14.0%	0.3%	0.6%
Contusion	49.2	63.2%	3.1%	17.7%	12.7%	1.4%	1.9%
Open Wound	56.0	65.4%	3.1%	15.2%	13.2%	1.4%	1.7%
Other Musculoskeletal Injury	69.4	56.5%	1.9%	19.6%	19.7%	0.8%	1.5%
All Musculoskeletal Injuries	408.2	57.8%	2.5%	21.8%	15.6%	1.2%	1.1%
65 to 74 years							
Fractures	150.5	25.8%	2.8%	53.6%	15.6%	1.9%	0.3%
Dislocations	5.6	40.4%	2.6%	36.7%	19.4%	0.8%	0.1%
Sprains and strains	15.9	46.1%	1.5%	31.5%	20.2%	0.4%	0.3%
Contusion	32.5	41.3%	2.7%	34.6%	18.8%	1.9%	0.7%
Open Wound	20.7	44.7%	3.1%	29.7%	19.2%	2.7%	0.6%
Other Musculoskeletal Injury	35.5	38.4%	2.2%	35.0%	22.3%	1.5%	0.6%
All Musculoskeletal Injuries	236.7	32.2%	2.6%	45.2%	17.8%	1.8%	0.4%
75 to 84 years							
Fractures	229.7	11.7%	2.7%	72.4%	10.6%	2.5%	0.1%
Dislocations	5.0	27.3%	2.0%	51.5%	17.6%	1.3%	0.3%
Sprains and strains	16.1	31.8%	1.3%	46.2%	20.0%	0.5%	0.2%
Contusion	52.8	27.6%	2.3%	48.9%	18.2%	2.7%	0.3%
Open Wound	27.4	28.8%	3.3%	43.7%	20.4%	3.4%	0.4%
Other Musculoskeletal Injury	34.8	26.5%	2.4%	47.8%	20.7%	2.2%	0.4%
All Musculoskeletal Injuries	335.1	17.7%	2.6%	63.2%	13.9%	2.5%	0.1%
85 years and over							
Fractures	246.9	5.9%	2.0%	80.7%	7.5%	3.8%	0.1%
Dislocations	3.0	16.0%	2.8%	64.3%	13.7%	2.9%	0.3%
Sprains and strains	11.2	18.1%	1.0%	63.3%	16.2%	1.4%	0.0%
Contusion	53.0	16.8%	1.6%	62.5%	16.1%	2.8%	0.2%
Open Wound	29.0	17.9%	2.0%	57.3%	17.9%	4.5%	0.4%
Other Musculoskeletal Injury	26.5	17.8%	1.8%	59.0%	17.4%	3.6%	0.4%
All Musculoskeletal Injuries	338.7	9.7%	1.9%	74.0%	10.5%	3.6%	0.3%
All Ages							
Fractures	1,095.3	35.6%	2.4%	48.3%	11.1%	2.2%	0.4%
Dislocations	44.9	57.5%	2.3%	24.9%	13.7%	0.8%	0.8%
Sprains and strains	99.9	56.9%	1.3%	26.2%	14.7%	0.4%	0.5%
Contusion	229.1	44.7%	2.3%	35.7%	14.2%	2.0%	1.1%
Open Wound	238.2	60.3%	2.5%	22.0%	12.0%	1.9%	1.3%
Other Musculoskeletal Injury	232.5	51.3%	2.1%	27.3%	16.8%	1.4%	1.1%
All Musculoskeletal Injuries	1,708.6	42.0%	2.3%	40.4%	12.6%	2.0%	0.7%

Source: HCUP Nationwide Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). 2011. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/nisoverview.jsp

Table 9B.7: Tumors of the Musculoskeketal System, by Age, United States

Total Cases by Site	**< 20**	**20-44**	**45-64**	**65 & over**	**Total**
Bones and Joints, 2006-2010 [1]	1,065	972	972	871	3,888
Myeloma, 2006-2010 [1]	0	926	8,559	15,568	25,028
Soft Tissue Cancers, 2007-2011 [2]	1,257	2,709	4,469	5,529	13,963
Proportion of Total Cases 2006-2010					
Bones and Joints, 2006-2010 [3]	27%	25%	25%	22%	100%
Myeloma, 2006-2010 [3]	0%	4%	34%	62%	100%
Soft Tissue Cancers, 2007-2011 [4]	9%	19%	32%	40%	100%

[1] **Source**: Howlader N, Noone AM, Krapcho M, Garshell J, Neyman N, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2010, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER web site, April 2013. Table 1.5: Age-Adjusted SEER Incidence and U.S. Death Rates and 5-Year Relative Survival (Percent) By Primary Cancer Site, Sex and Time Period: Table 1.6 (Whites); Table1.7 (Blacks). Accessed January 6, 2014.

[2] National Cancer Institute, Surveillance, Epidemiology, and End Results Program (SEER), SEER Stat Fact Sheets: Soft Tissue including Heart Cancer. http://seer.cancer.gov/statfacts/html/soft.html Accessed January 22, 2015.

Economic Cost

Lead Author(s):
Edward H. Yelin, PhD
Miriam Cisternas, MA

Supporting Author(s):
Sylvia I. Watkins-Castillo, PhD

The health care utilization and economic cost of musculoskeletal diseases section looks at the overall impact of musculoskeletal conditions on the US health care sector and the overall economy.

Definitions

Musculoskeletal diseases included in the analysis encompass all conditions discussed in other sections of this website, plus a large number of less common musculoskeletal conditions.

The economic impact includes total and incremental direct and indirect costs due to musculoskeletal conditions.

Direct medical costs include expenditures to doctors and other health care providers, hospitalization or visits to other health care facilities, and medications taken for all causes for patients with a musculoskeletal condition.

Indirect costs are primarily associated with lost wages for persons ages 18 to 64 years, which are considered the typical ages for persons in the workforce. Previous editions of BMUS reported the number of persons in the workforce and was not subset to those between the ages of 18 and 64 years. Retroactively applying this subset to previous years resulted in low numbers of persons in the workforce, as well as lower indirect costs for these years than previously reported.

Incremental costs are those costs most likely attributable to a musculoskeletal disease, and are calculated as the difference in costs between those patients with and without a musculoskeletal condition when matched by similar demographic and health characteristics. Incremental costs are calculated for both direct medical and indirect costs. The methodology for calculating incremental costs was revised in this edition of *The Burden of Musculoskeletal Diseases in the United States* (BMUS). Comparison with previous editions of BMUS will show smaller cost figures than presented in the past. The new methodology more accurately reflects estimated costs.

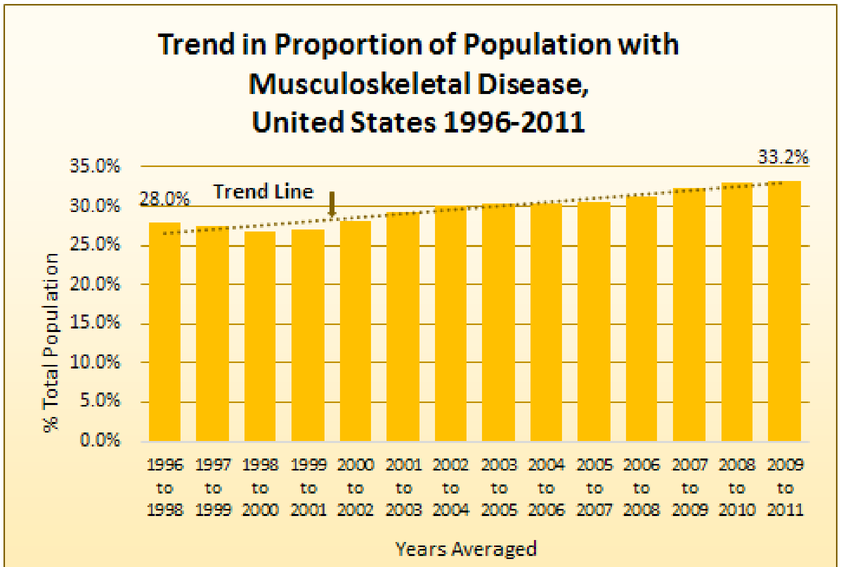
Aggregate costs for both direct and indirect costs are the sum of mean costs across all individuals with the condition. Aggregate costs are provided for all forms of musculoskeletal conditions (total) as well as specific conditions, including low back and neck pain (spine), arthritis and joint pain, osteoporosis, musculoskeletal injuries, and a category of "other" for all remaining conditions.

All costs and estimates presented in the economic impact discussion utilize the Medical Expenditures Panel Survey (MEPS) from the Agency for Healthcare Research and Quality, US Department of Health and Human Services (http://meps.ahrq.gov/mepsweb/), and are based on data smoothed over a three-year period to increase the reliability of estimates for small subsets, for example, children with musculoskeletal diseases. **Data smoothing** is the use of an algorithm to remove noise (data outliers) from a data set, allowing important patterns to stand out and predict trends. The MEPS is a set of large-scale surveys of families and individuals, their medical providers, and employers across the United States. MEPS is the most complete source of data on the cost and use of health care and health insurance coverage.

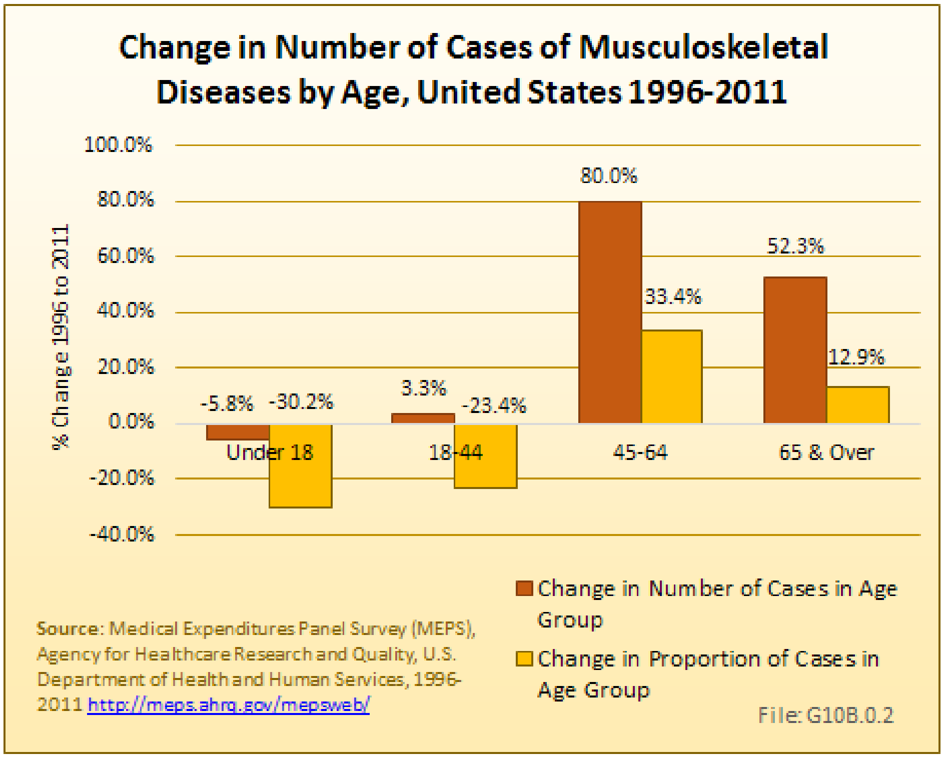
Gross Domestic Product (GDP), released by the United States Bureau of Economic Analysis (www.bea.gov/national/index.htm#gdp) each year, is the market value of all goods and services produced by labor and property located in the United States. It is the sum of personal expenditures, private investment, government spending (both consumption and investment), and net exports. The GDP is the best known of the national income and product accounts (NIPA), and is often used to create a comparison measure across years.

Musculoskeletal Disease Prevalence

Over the period of 2009 to 2011, an estimated 102.5 million persons annually reported a musculoskeletal disease in the Medical Expenditures Panel Survey (MEPS). The annual average proportion of the United States population with a musculoskeletal disease has increased by more than five percentage points between 1996 to 1998 and 2009 to 2011, from 28.0% to 33.2%. Musculoskeletal disease now includes about one-third of the population. The growth in the number of cases of musculoskeletal disease is more a function of the number of persons in the ages of increased incidence than in overall increase in all age groups. (Reference Table 10.1 PDF CSV)



Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011
http://meps.ahrq.gov/mepsweb/
File: G10B.0.1

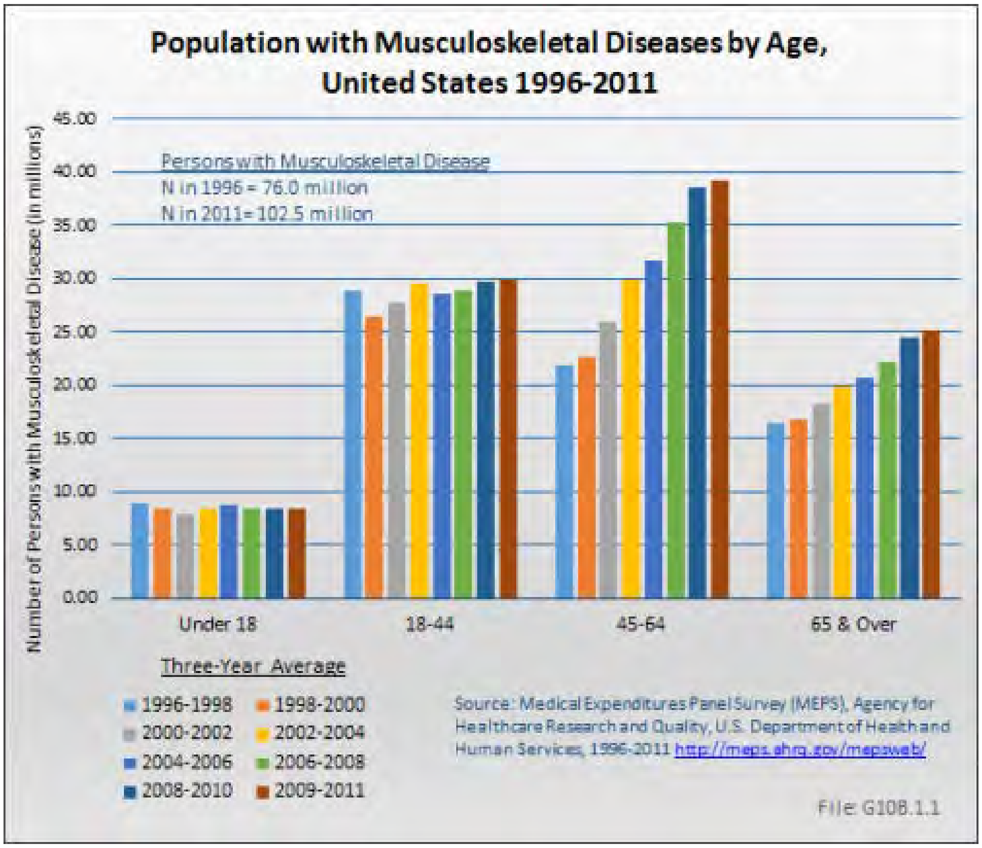


Number of Cases: Prevalence

Between 1996 to 1998 and 2009 to 2011, the number of persons reporting a musculoskeletal disease increased by 26.5 million from the 76.0 million reported in 1996 to 1998 to the 102.5 million reported in 2009 to 2011.

The impact of musculoskeletal disease on the aging population is evident in the shifting burden carried by older persons. Among the population under the age of 18 years, the prevalence of musculoskeletal conditions is reported in 7.9 to 8.8 persons each year between 1996 and 2011. For the same years, persons age 18 to 44 years account for 26.4 to 29.8 million persons with the condition each year. However, as the population in the two older age groups has grown, the number of individuals with musculoskeletal diseases in those groups has increased substantially. In the years 1996 to 1998, an average of 21.7 million persons age 45 to 64 years reported a musculoskeletal disease condition, while 16.5 million of those 65 years and older did so. By 2009 to 2011, these numbers had risen to 39.2 million and 25.1 million, respectively. (Reference Table 10.1.1 PDF CSV)

The 94.2 million persons age 18 years and older reporting a musculoskeletal disease in the MEPS is a substantially lower number than the 126.6 million musculoskeletal diseases self-reported by adults age 19 years and older in the National Health Interview Survey in 2012, and reported in the Big Picture section of this report.

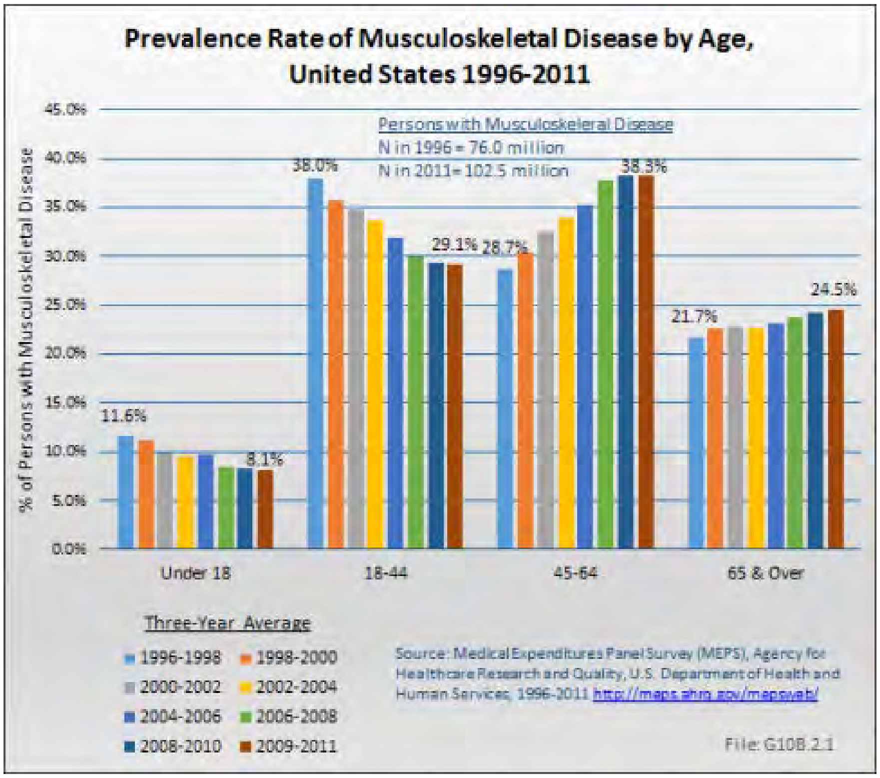


A more expansive definition of musculoskeletal diseases includes persons with musculoskeletal diseases as a primary health concern, as well as persons in whom the musculoskeletal disease is a by-product of another condition (eg, bone metastases from cancer) or is overshadowed by a life-threatening disease, and, therefore, is often not the primary diagnosis (Dx1). The more expansive definition codes can be found in the ICD-9-CM codes section.

Using this more expansive definition of musculoskeletal diseases, an average of 156.6 million persons of all ages, or 50.7% of the population, reported a musculoskeletal disease annually for the years of 2009 to 2011. This compares to 52.8% of persons age 18 years and older reported in the Big Picture section.

Proportion by Age: Prevalence

Approximately 8% of all persons reporting musculoskeletal diseases in MEPS for the years 2009 to 2011 are under the age of 18 years. Roughly one in four (24.5%) musculoskeletal diseases occurs in persons age 65 years and older. Almost 40% of musculoskeletal diseases occur among persons age 45 to 64 years. Overall, more than 75% of musculoskeletal diseases are reported by persons under the age of 65 years.

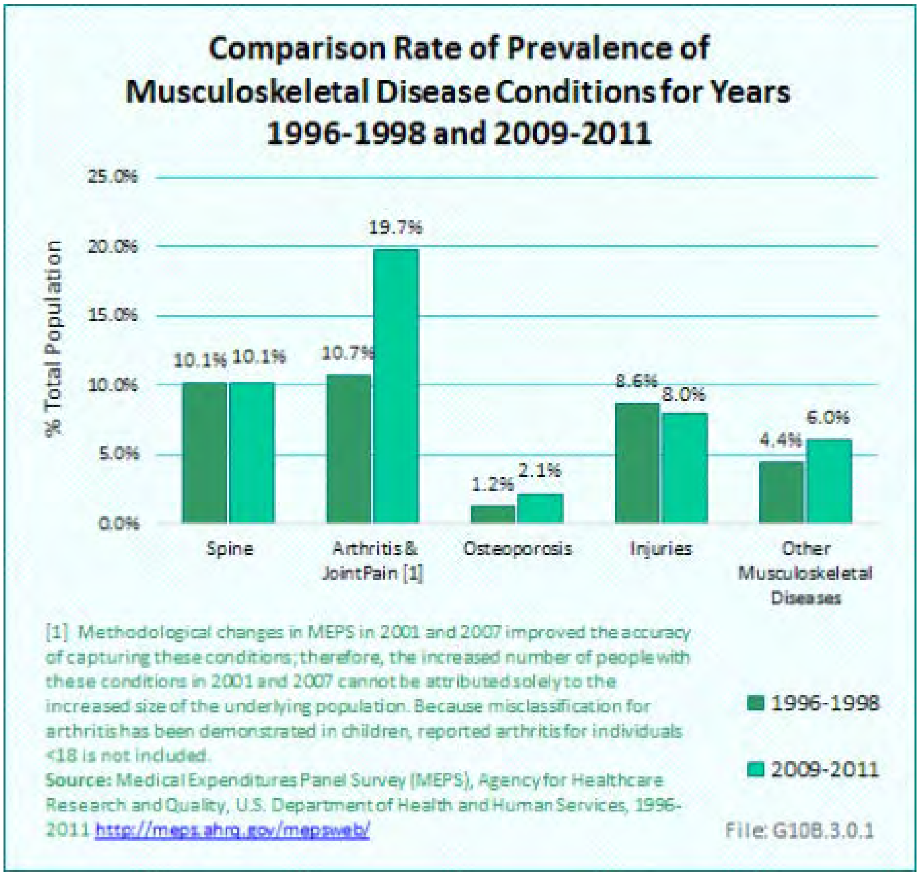


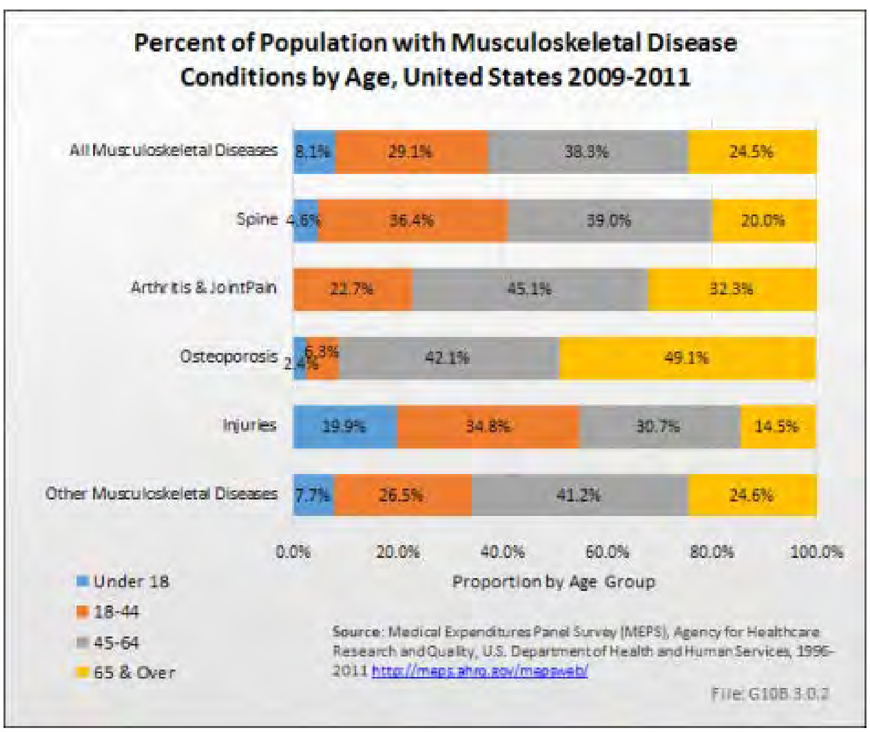
The fastest rate of growth in musculoskeletal diseases between 1996 and 2011, by age group, was among persons age 45 to 64 years. (Reference Table 10.1 PDF CSV)

Prevalence by Condition

Arthritis and joint pain showed the largest change in rate reported for musculoskeletal disease conditions between 1996 to 1998 and 2009 to 2011, but much of this increase is probably due to methodological changes in MEPS in 2001 and 2007 that improved the accuracy of capturing these conditions. Spine conditions remained the same, while injuries showed a slight decline in rate, consistent with other reported numbers in this report. Osteoporosis and other musculoskeletal conditions showed slight rate increases. (Reference Table 10.1 PDF CSV)

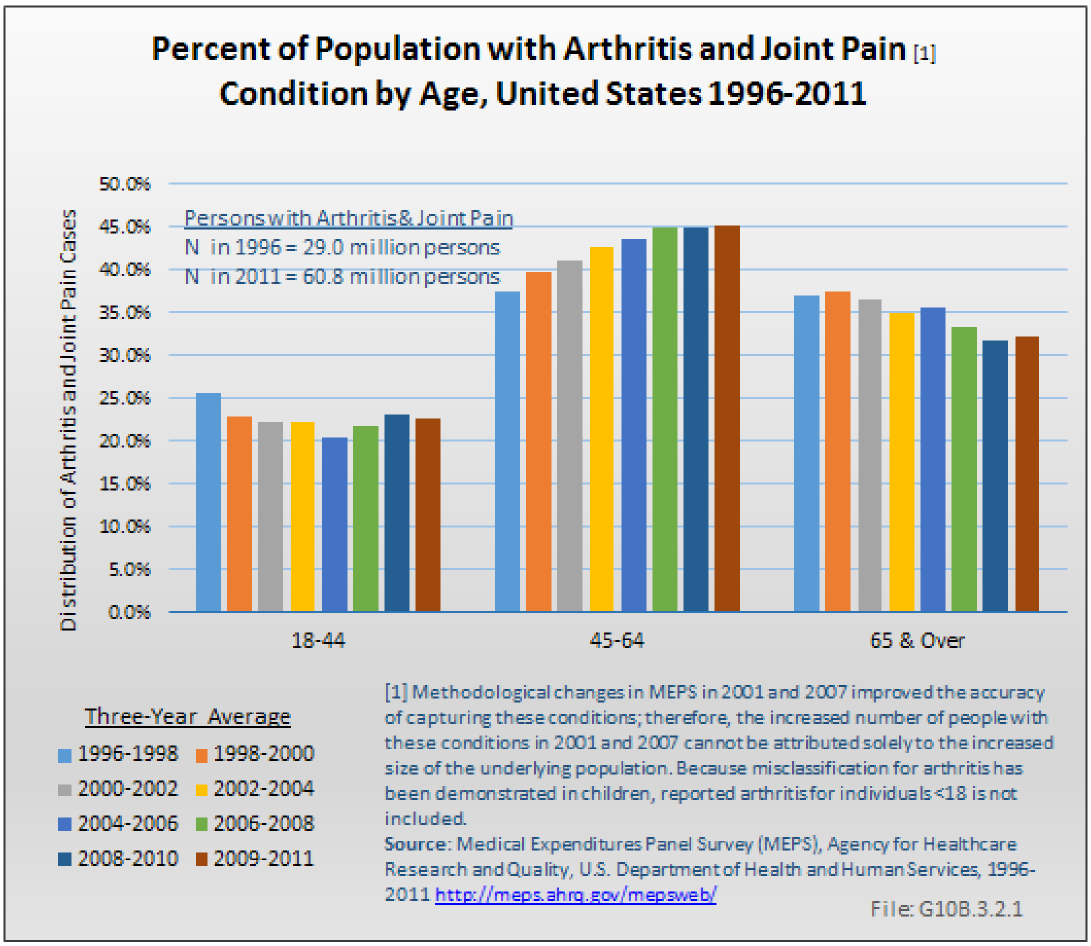
While one in four persons in the "all musculoskeletal diseases" category is older than age 65 years, nearly one-half of osteoporosis cases occur among persons 65 years and older. Only about 15% of persons reporting injuries are in this age range. (Reference Table 10.1.1 PDF CSV)


Comparison Rate of Prevalence of Musculoskeletal Disease Conditions for Years 1996-1998 and 2009-2011
% Total Population
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
10.1% 10.1%
10.7% 19.7%
1.2% 2.1%
8.6% 8.0%
4.4% 6.0%
Spine
Arthritis & Joint Pain [1]
Osteoporosis
Injuries
Other Musculoskeletal Diseases
[1] Methodological changes in MEPS in 2001 and 2007 improved the accuracy of capturing these conditions; therefore, the increased number of people with these conditions in 2001 and 2007 cannot be attributed solely to the increased size of the underlying population. Because misclassification for arthritis has been demonstrated in children, reported arthritis for individuals <18 is not included.
Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011 http://meps.ahrq.gov/mepsweb/
1996-1998
2009-2011
File: G108.3.0.1


Percent of Population with Musculoskeletal Disease Conditions by Age, United States 2009-2011
All Musculoskeletal Diseases 8.1% 29.1% 38.3% 24.5%
Spine 4.6% 36.4% 39.0% 20.0%
Arthritis & Joint Pain 22.7% 45.1% 32.3%
Osteoporosis 2.4% 6.3% 42.1% 49.1%
Injuries 19.9% 34.8% 30.7% 14.5%
Other Musculoskeletal Diseases 7.7% 26.5% 41.2% 24.6%
0.0% 20.0% 40.0% 60.0% 80.0% 100.0%
Proportion by Age Group
Under 18
18-44
45-64
65 & Over
Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011 http://meps.ahrq.gov/mepsweb/
File: G108.3.0.2

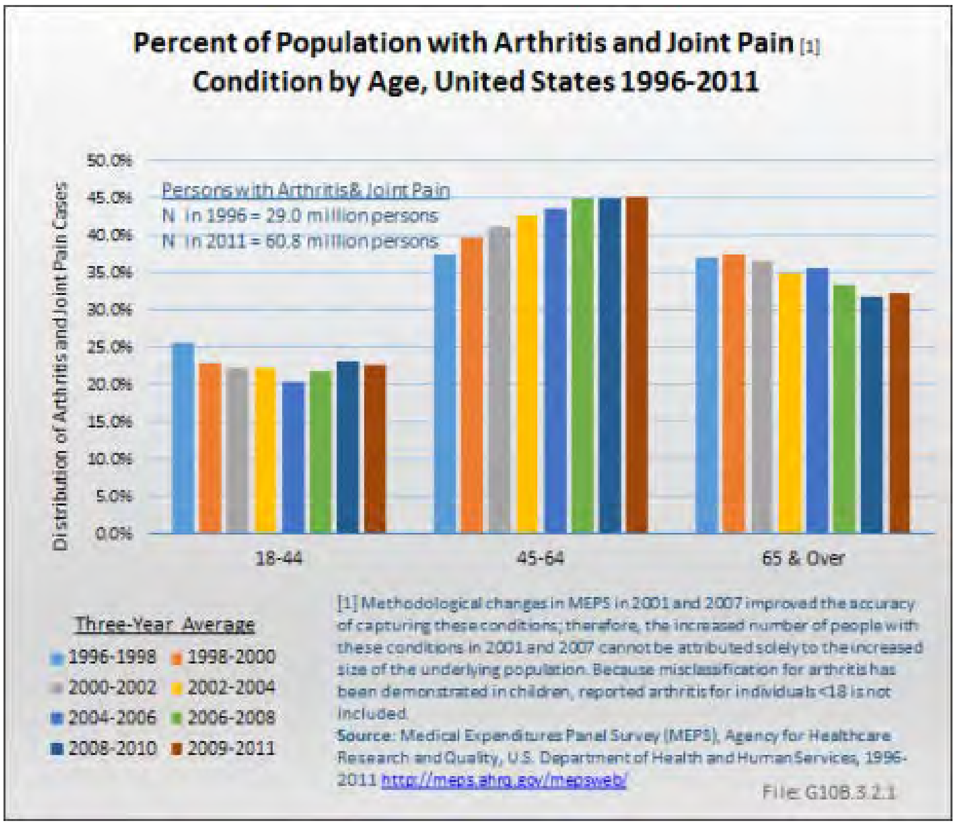
Spine: Prevalence

The number of persons reporting a spine condition increased by 3.6 million, from 27.4 million in 1996 to 1998 to 31.0 million in 2009 to 2011, while the prevalence, at 10.1%, was unchanged. The majority of spine conditions occur in working age people, with about 36% among persons age 18 to 44 years and another 39% among those age 45 to 64 years. The higher prevalence among working-age persons is reflected in the prominence of spine conditions in workers' compensation and disability claims. Nevertheless, one in five spine conditions (20%) occurs among persons 65 years and older, with the rate increasing over the years in this age group. (Reference Table 10.1.1 PDF CSV)



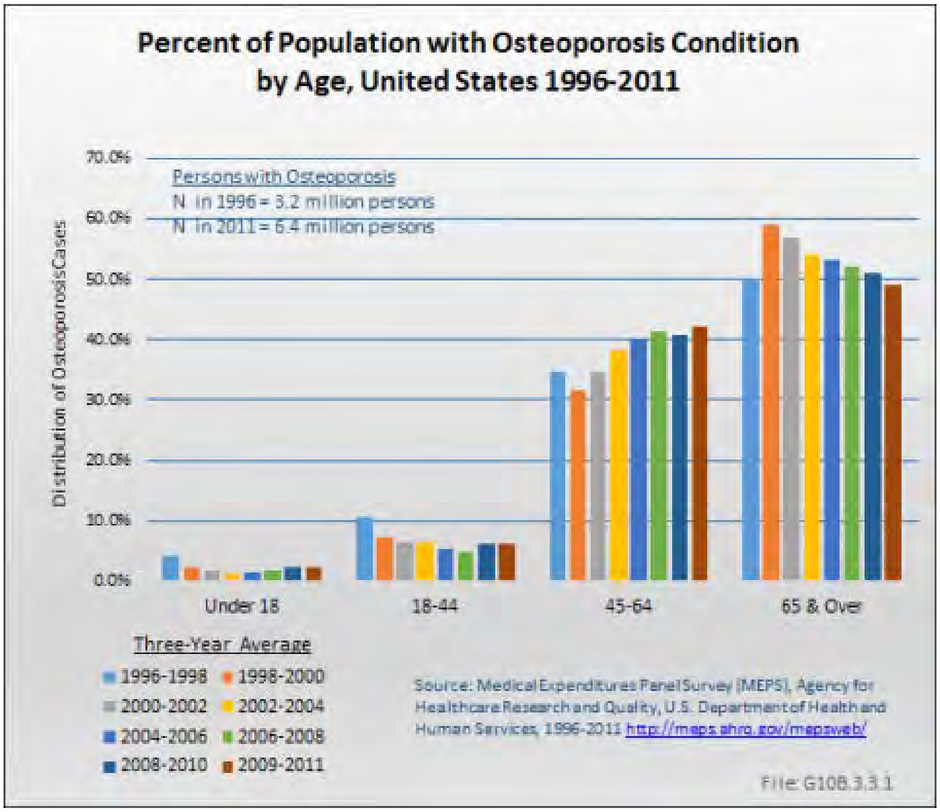
Arthritis and Joint Pain: Prevalence

Among the major subgroups of musculoskeletal diseases, arthritis and joint pain have the highest prevalence, reflecting the overall aging population. In 1996 to 1998, 29 million persons (10.7%) reported one or more conditions related to arthritis and joint pain; by 2009 to 2011, 60.8 million persons (19.7%) reported one or more such conditions. However, methodological changes in MEPS in 2001 and 2007 improved the accuracy of capturing these conditions; therefore, the increased number of people with these conditions in 2001 and 2007 cannot be attributed solely to the increased size of the underlying population. The effect of the baby-boom generation aging has resulted in an increase in the proportion of arthritis cases among those age 45 to 64 years as they reach the typical onset age for arthritis. As this wave ages, the proportion of persons with arthritis in the 65-year and older group will increase as well. In 1996 to 1998, 25.6% of persons reporting arthritis were age 18 to 44 years; 37.5% were age 45 to 64 years. By 2009 to 2011, the proportions had changed to 22.7% and 45.1%, respectively. In the next decade, a higher proportion of arthritis and joint pain is expected to occur in persons age 65 years and older. (Reference Table 10.1.1 PDF CSV)



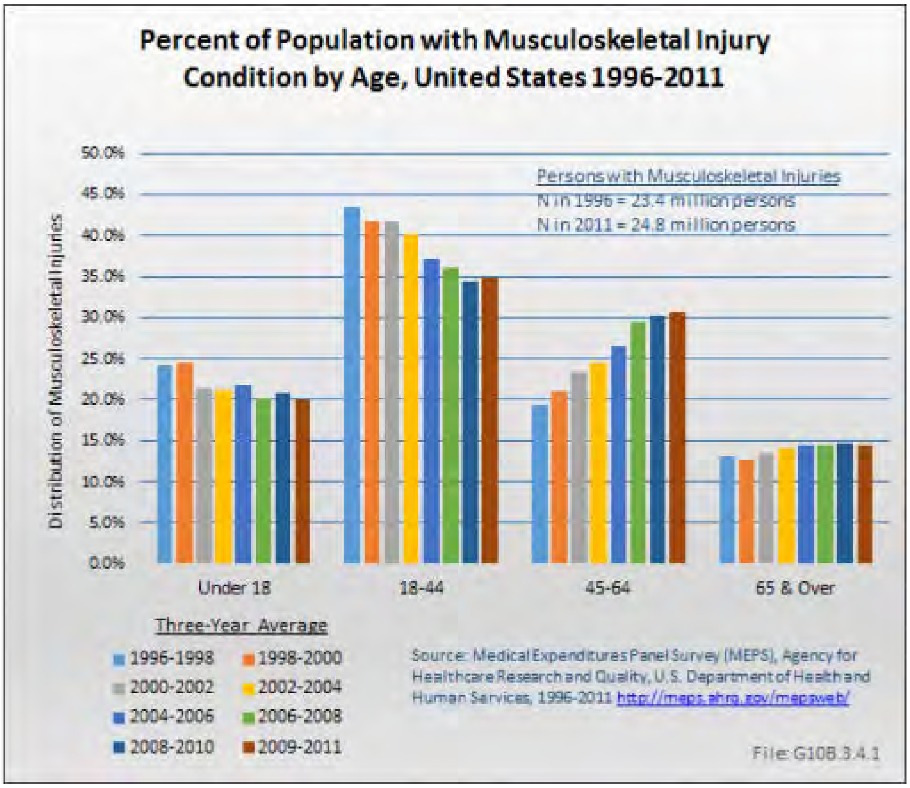
Osteoporosis: Prevalence

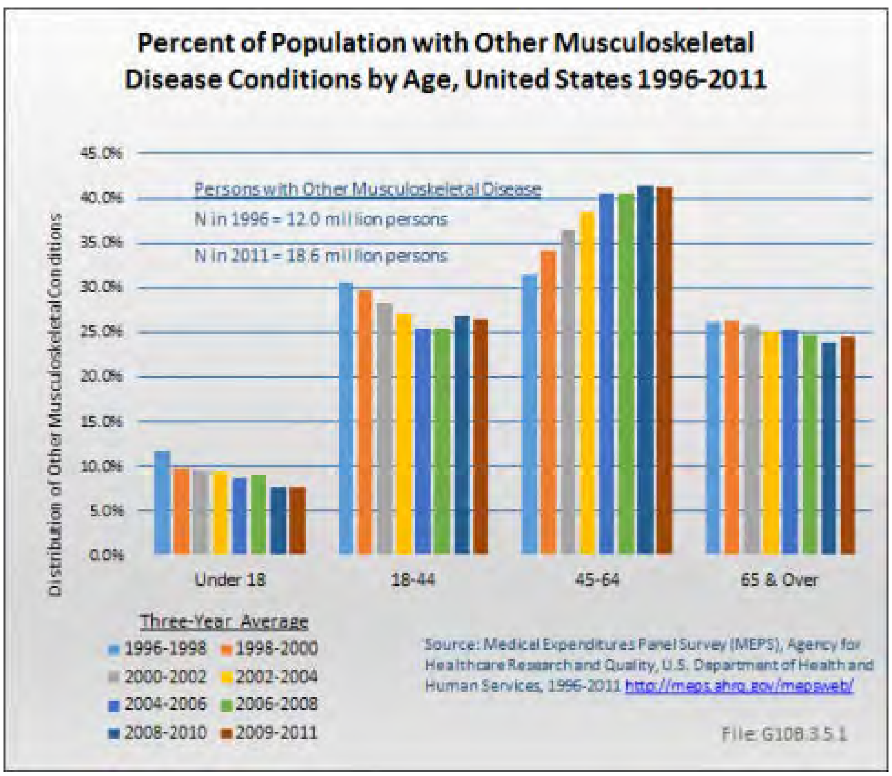
Population aging has also led to a dramatic increase in the number of individuals with osteoporosis. In the period 1996 to 1998, 3.2 million people (1.2% of the population) indicated they had these conditions, but by 2009 to 2011, 6.4 million (2.1% of the population) reported having them. These numbers are substantially lower than numbers reported in other sources, even though the category in this chapter is not limited to osteoporosis-related conditions. In 2002, the National Osteoporosis Foundation projected 44 million persons had osteoporosis. More than two-fifths of persons in the MEPS with these conditions are age 45 to 64 years, increasing the likelihood that these individuals will suffer from falls and fractures for the relatively long future they can expect to live with this condition. (Reference Table 10.1.1 PDF CSV)



Injuries: Prevalence

In contrast to spine conditions, arthritis and joint pain, and osteoporosis, the prevalence of musculoskeletal injuries actually decreased slightly although the number of individuals reporting injuries has increased slightly. In 1996 to 1998, 23.4 million persons reported a musculoskeletal injury, while 24.8 million reported such an injury in 2009 to 2011. The prevalence of musculoskeletal injuries remained relatively constant at 8.6% and 8.0% of the population, respectively. Age distribution of injuries may explain why the prevalence hasn't increased. More than half of injuries occur among persons younger than 45 years, a population segment growing more slowly than those who are older. It is possible improvements in the safety of automobiles and other public health prevention activities have also played a role. Although the MEPS reporting of musculoskeletal injury trends supports trend data previously reported, the overall prevalence is substantially lower than the 65.8 million injury treatment episodes reported in the Injuries section of this report. Injury treatment episodes include total cases treated in doctors' offices, outpatient clinics, emergency rooms, and inpatient admissions in 2010. (Reference Table 10.1 PDF CSV)





Other Musculoskeletal Conditions: Prevalence

The percentage of the population reporting other musculoskeletal diseases, which include a broad range of conditions of less frequent prevalence, increased from 4.4% to 6.0% between 1996 to 1998 and 2009 to 2011. The total number of persons reporting one or more such conditions increased from about 12 million to 18.6 million. Persons in the age range of 45 to 64 years are the most likely to report other musculoskeletal disease conditions. Reference Table 10.1.1 PDF CSV)

Expansive Definition by Condition

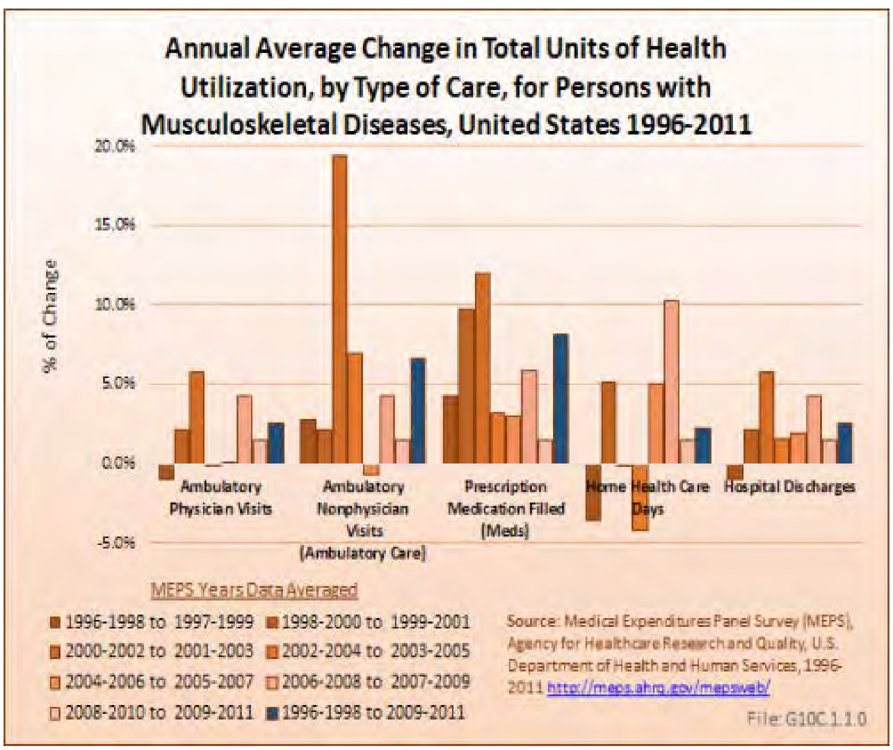
Using the more expansive definition of musculoskeletal diseases, in the period of 2009 to 2011, 87.7 million persons (versus 31.0 million using the more conservative definition) reported one or more spine conditions and 64.0 million (versus 60.8 million) reported arthritis and joint pain. The base and expansive definitions for osteoporosis are identical, so the number of cases for both definitions are also identical, but substantially lower than reported in the Osteoporosis section of this report, as previously noted. The number reporting musculoskeletal injuries was slightly higher than in the more conservative definition (28.3 versus 24.8 million). The increased prevalence in the "other" musculoskeletal diseases category was also substantial, with 71.0 million in the expansive definition versus 18.6 million, as discussed above.

Musculoskeletal Health Care Utilization

Musculoskeletal health care utilization is examined for the MEPS for the following types of care: ambulatory physician visits, ambulatory nonphysician visits, prescription medications filled, home health care days, and hospital discharges for all musculoskeletal conditions and by type of condition.

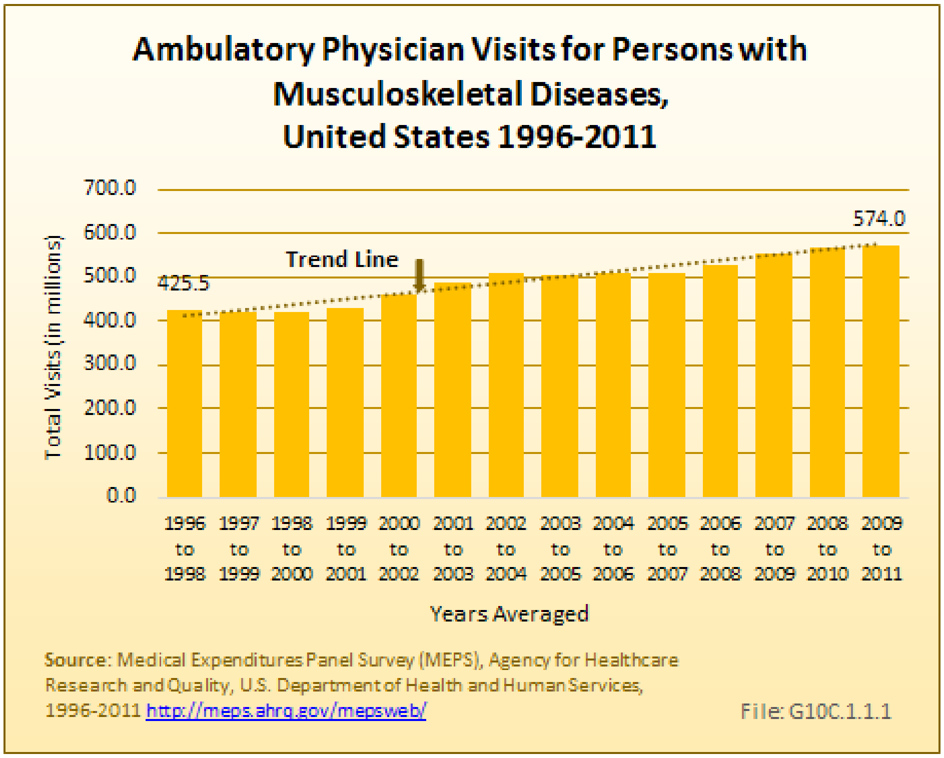
Utilization by Care Type

Over the 13 3-year average periods, 1996 to 1998 to 2009 to 2011, for which the MEPS data is analyzed, prescription medications and ambulatory nonphysician care visits increased more than other categories of health care percentage-wise. The former showed an average annual increase of more than 8%, while the latter showed an increase of 6.6%. Of note, however, the increases for all services were much slower in the most recent three-year period, at 1.4% across the board. (Reference Table 10.3 PDF CSV)



Ambulatory Visits

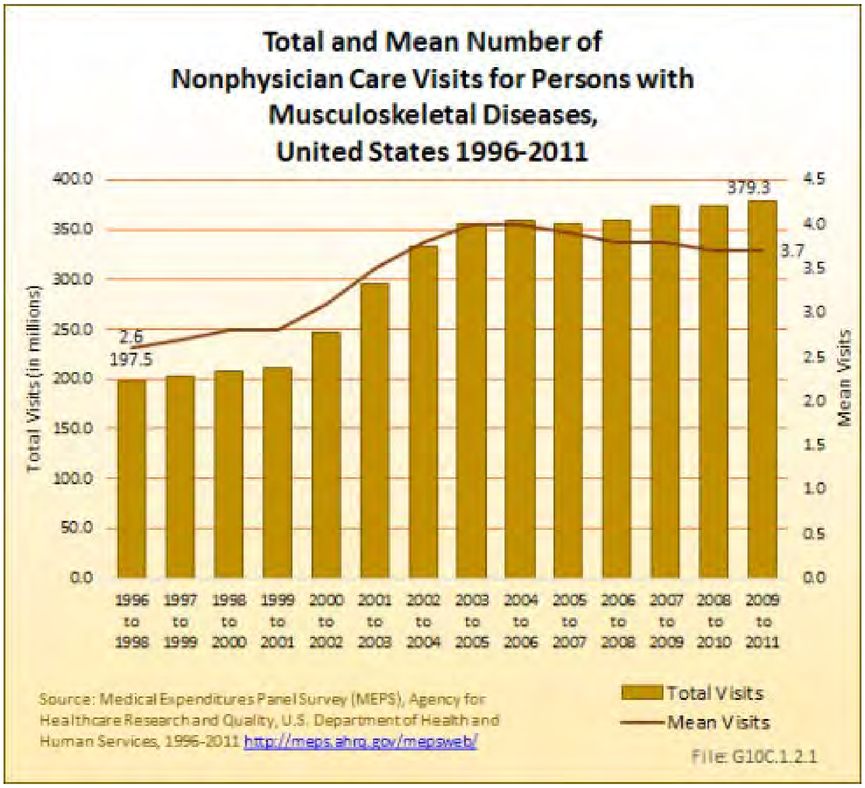
Persons with musculoskeletal diseases account for a large and growing share of health care utilization. In any given year, about 85% of persons with musculoskeletal diseases have at least one ambulatory care visit to a physician's office, averaging just under six such visits per year. Between 1996 to 1998 and 2009 to 2011, ambulatory physician visits for these individuals increased from 425.5 million to 574.0 million. Growth in the number of persons with musculoskeletal diseases, rather than an increase in the number of visits by individuals, is primarily responsible for this increase. (Reference Table 10.2 PDF CSV)

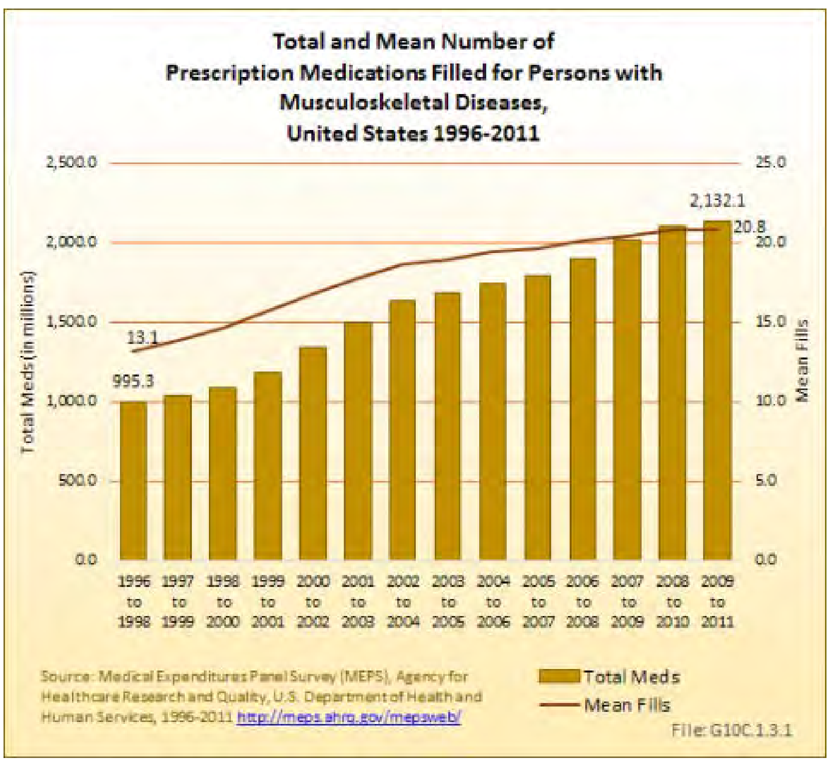


Nonphysician Care Visits

In contrast to the relatively stable number of physician office visits, there was an increase in the proportion of the US population with visits to ambulatory providers other than medical physicians; the average number of visits to nonphysician providers by persons with musculoskeletal diseases also increased. Nonphysician ambulatory health care providers include physical therapists, occupational therapists, chiropractors, social workers, physician assistants, nurse practitioners, and other related health care workers. In 1996 to 1998, approximately 40% of persons with musculoskeletal diseases visited a nonphysician health care provider at least once; by 2009 to 2011 the proportion had jumped to nearly 52%. At the same time, the average number of such visits increased from 2.6 per person to 3.7. The result was a 92% increase, from 197.5 million to 379.3 million, in total nonphysician ambulatory care visits between 1996 to 1998 and 2009 to 2011. (Reference Table 10.2 PDF CSV)

The aggregate total for all ambulatory care visits, including those to physicians and nonphysicians, thus increased over the 13-year period by 53%, from 623.0 million visits to 953.3 million visits.



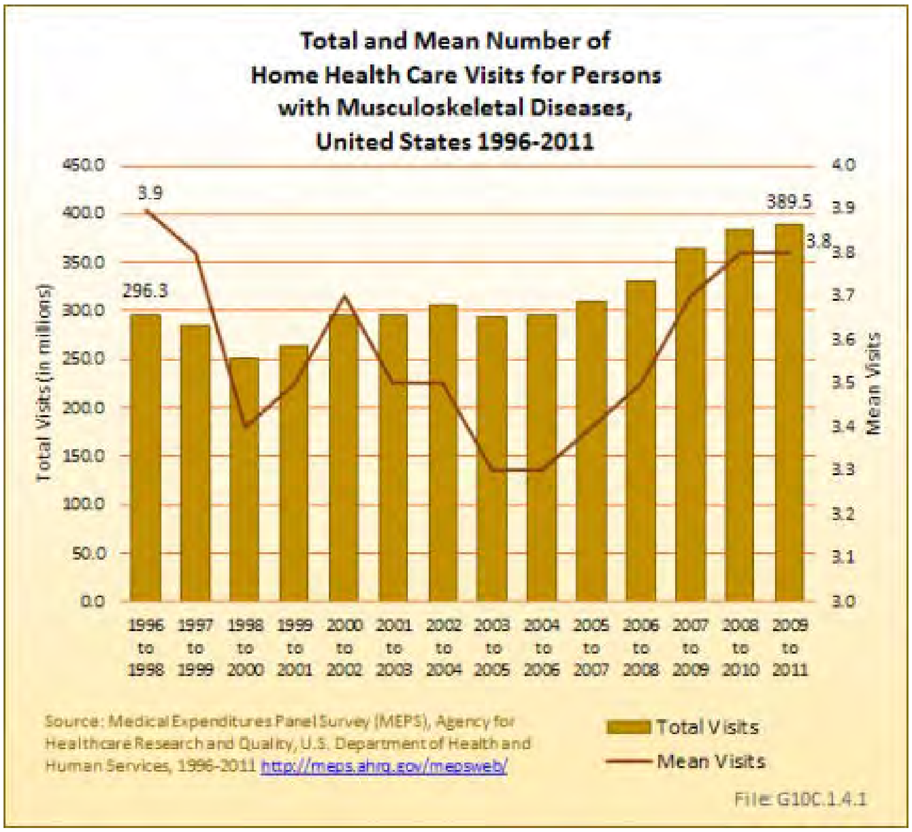


Prescription Medications Filled

During this same time frame of 1996 to 2011, the use of prescription medications among persons with musculoskeletal diseases rose substantially. While the proportion of persons with a musculoskeletal disease who filled at least one prescription changed only slightly, from 81.3% to 83.7%, the mean number of prescriptions filled per person increased from 13.1 to 20.8. The result was a 142% increase, from 995.3 million in 1996 to 1998 to more than 2.1 billion in 2009 to -2011, in the number of prescription medications filled by persons with a musculoskeletal disease. (Reference Table 10.2 PDF CSV)

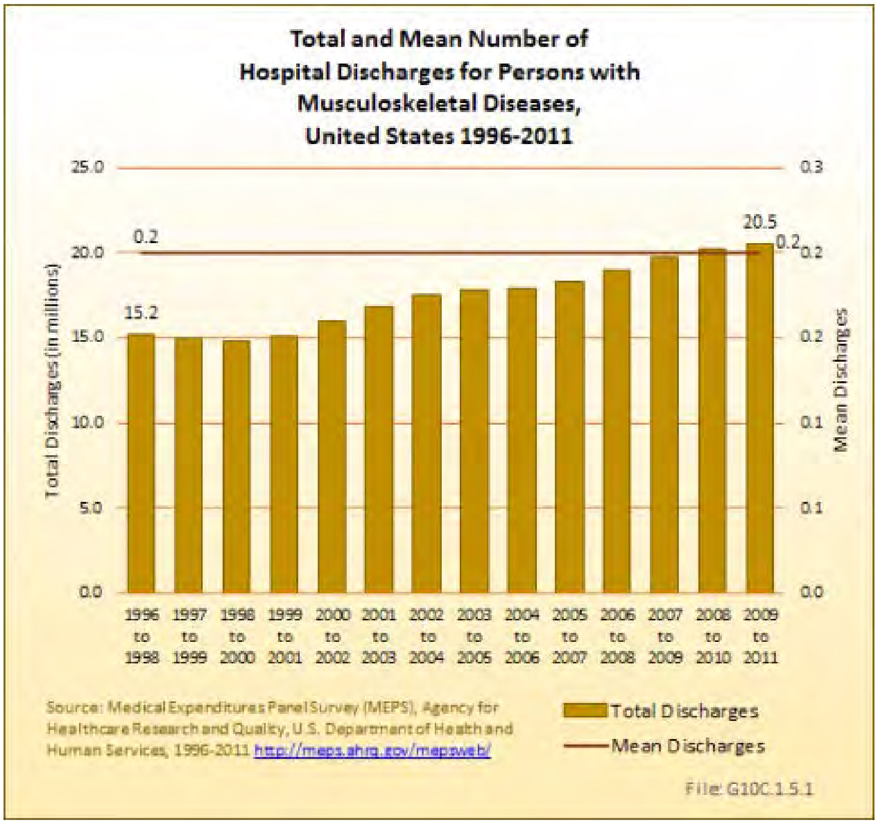
Home Health Care Visits

Despite widespread concerns that an aging population would use an increasing amount of home health care, there is no evidence that this is occurring. Both the proportion of persons with a musculoskeletal disease using home health care and the average number of home health care visits declined slightly in the past 13 years. Only 4.9% of persons reported any home health care visits in 2009 to 2011, with an average of 3.8 visits incurred. The total number of home health care visits to persons with a musculoskeletal disease rose from 296.3 million to 389.5 million, entirely due to population increase. (Reference Table 10.2 PDF CSV)



Hospital Discharges

An increase of 35%, from 15.2 to 20.5 million, in the number of hospital discharges for persons with a musculoskeletal disease occurred in the periods 1996 to 1998 to 2009 to 2011. This may be due to the aging population. The percentage of persons with a musculoskeletal disease who were hospitalized one or more times in a year was roughly stable, with 11.1% and 11.0% of persons in 1996 to 1998 and 2009 to 2011 hospitalized, respectively. The average number of hospitalizations per person, at 0.2, did not change. (Reference Table 10.2)

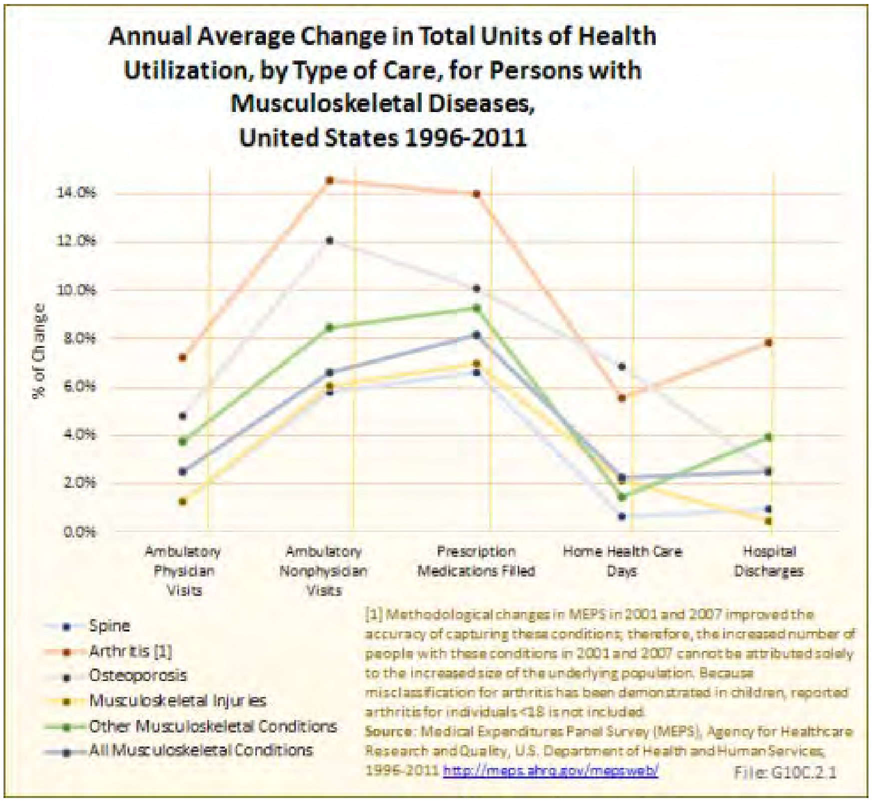


Expansive Definition Health Care Utilization

Using the more expansive definition of musculoskeletal diseases, in 2009 to 2011 there were an estimated 767.3 million visits to physicians among persons with these diseases, as well as 469.8 million ambulatory visits to providers other than physicians, 2.8 billion prescriptions filled, 438.4 million home care visits, and 15.7 million hospital discharges. It should be noted that in this expansive definition, the number of ambulatory visits per person to providers other than physicians and the number of medications per person has risen dramatically. The number of hospital discharges per person and overall has declined, reflecting the increase in management of these conditions on an ambulatory basis.

Utilization by Condition

Utilization of health care services increased in several service categories for musculoskeletal disease conditions. The largest increase was found for persons with arthritis and joint pain in the service categories of physician visits, nonphysician visits, prescription medications, and hospital discharges. However, a large proportion of these increases are due to the increase in the numbers of individuals with arthritis and joint pain, which is due at least in part to changes in MEPS methodology in 2001 and 2007. Home health care days increased fastest among those with osteoporosis and related conditions, but this was closely followed by persons with arthritis and joint pain. The lowest increase in hospital discharges occurred among those reporting musculoskeletal injuries, while those with spine conditions experienced the lowest growth in the remaining services. (Reference Table 10.3 PDF CSV)



Musculoskeletal Medical Care Expenditures

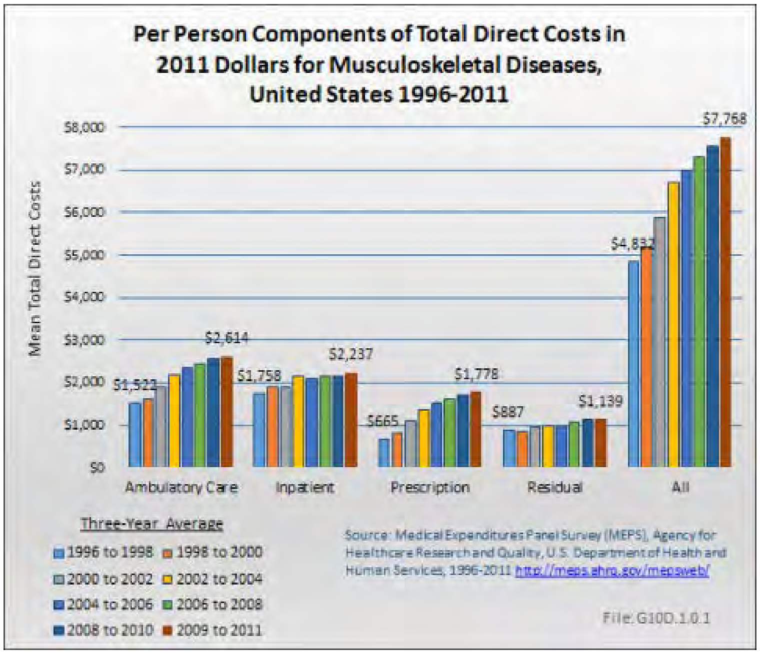
Musculoskeletal medical care expenditures are presented in two ways: (1) for all persons with a musculoskeletal disease, regardless of whether the musculoskeletal disease was the reason for the expenditure (total direct cost), and (2) as a measure of the expenditures beyond those expected for persons of similar characteristics but who do not have a musculoskeletal disease (incremental cost). Incremental cost is that share estimated to be directly related to the musculoskeletal condition. Both total and incremental costs are expressed as the average cost per person with a musculoskeletal disease and as the aggregate cost (sum) for all persons with a musculoskeletal disease.

Mean costs are presented for ambulatory care, inpatient care, prescription costs, and a residual for other costs, as well as the total cost. Medical care costs are expressed in both the current year dollars (ie, the year the data was collected) and in 2011 dollars to provide a standard of comparison across years.

Total and incremental costs for all musculoskeletal conditions and five subconditions are summarized in Table 10.6 PDF CSV.

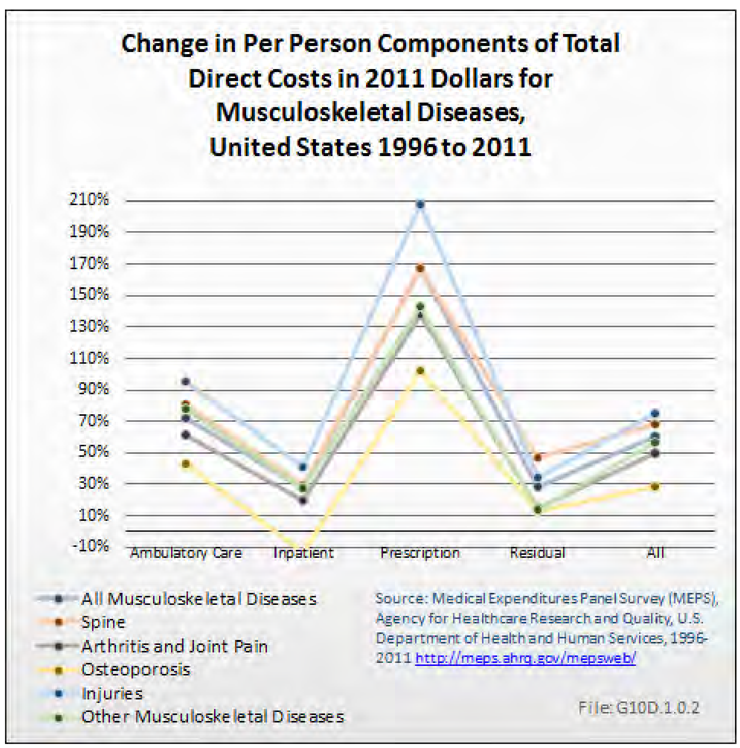
Per Person Expenditures

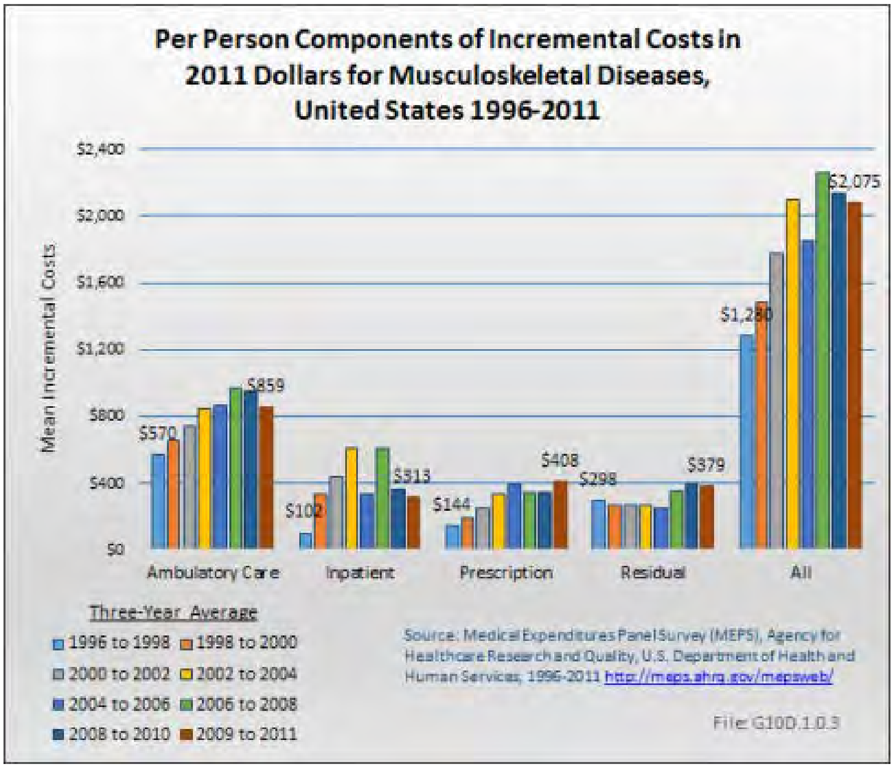
Overall, total average expenditures for persons with musculoskeletal diseases increased from $4,832 in 1996 to 1998 to $7,768 in 2009 to 2011, in 2011 dollars, a 60% increase. Ambulatory care had the largest share of total average per person costs for musculoskeletal diseases. (Reference Table 10.4 PDF CSV)



Per-person average expenditures for prescriptions had the largest increase among all components of musculoskeletal diseases, ranging from an increase of 102% for osteoporosis to an increase of 208% for injuries. Overall, prescription per person costs rose by 167% for all musculoskeletal diseases. Inpatient and residual costs showed the lowest increase between 1996 and 2011.

Incremental average expenditures for persons with musculoskeletal diseases almost doubled in real terms between 1996 to 1998 and 2009 to 2011, in 2011 dollars, from $1,280 in the earlier three-year period to $2,075 in the later one. Incremental costs for inpatient services for musculoskeletal diseases increased the most in relative terms, rising by 207% between 1996 and 2011. (Reference Table 10.5 PDF CSV)



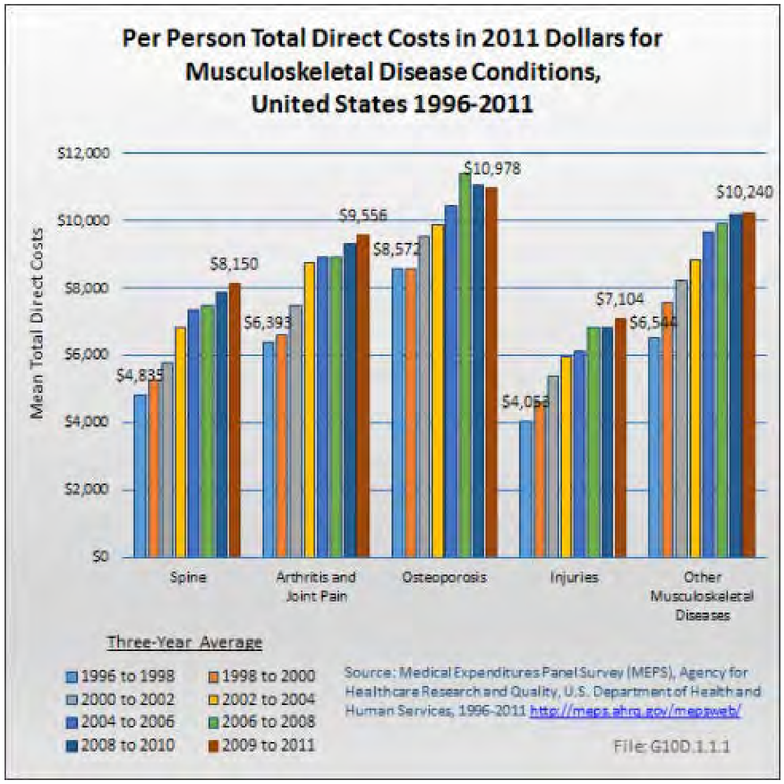


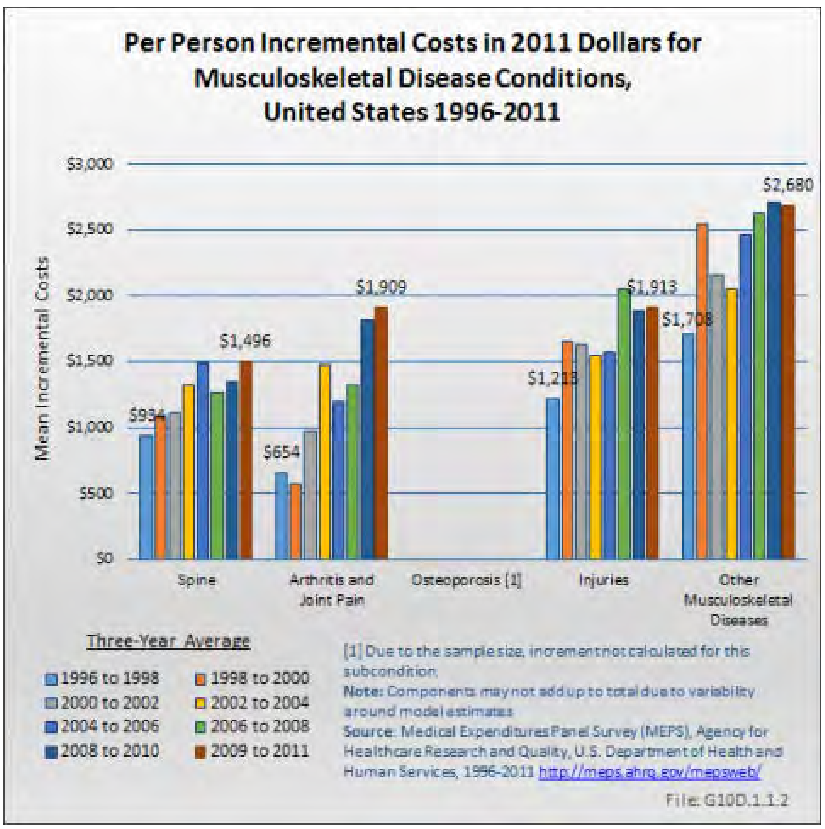
Overall, total average expenditures for persons with musculoskeletal diseases increased from $4,832 in 1996 to 1998 to $7,768 in 2009 to 2011, in 2011 dollars, a 60% increase. Ambulatory care had the largest share of total average per person costs for musculoskeletal diseases. (Reference Table 10.4 PDF CSV)

By Condition

Data for specific musculoskeletal conditions has been analyzed through the 2009 to 2011 time period, and is shown in 2011 dollars. Total per person medical care expenditures rose for each of the major subconditions between 1996-1998 and 2009-2011. Osteoporosis, which rose from $8,572 to $10,978 per person had the lowest increase at 28%. Costs for injuries rose by 75%, from $4,053 to $7,104 per person, and was the largest relative due to increase. (Reference Table 10.4 PDF CSV and Table 10.7 PDF CSV)

Incremental costs for arthritis and joint pain rose by 192% between 1996 and 2011, nearly four times the rate of increase for spine, injuries, and other musculoskeletal diseases. Incremental costs were not calculated for osteoporosis due to insufficient sample size. (Reference Table 10.5 PDF CSV)

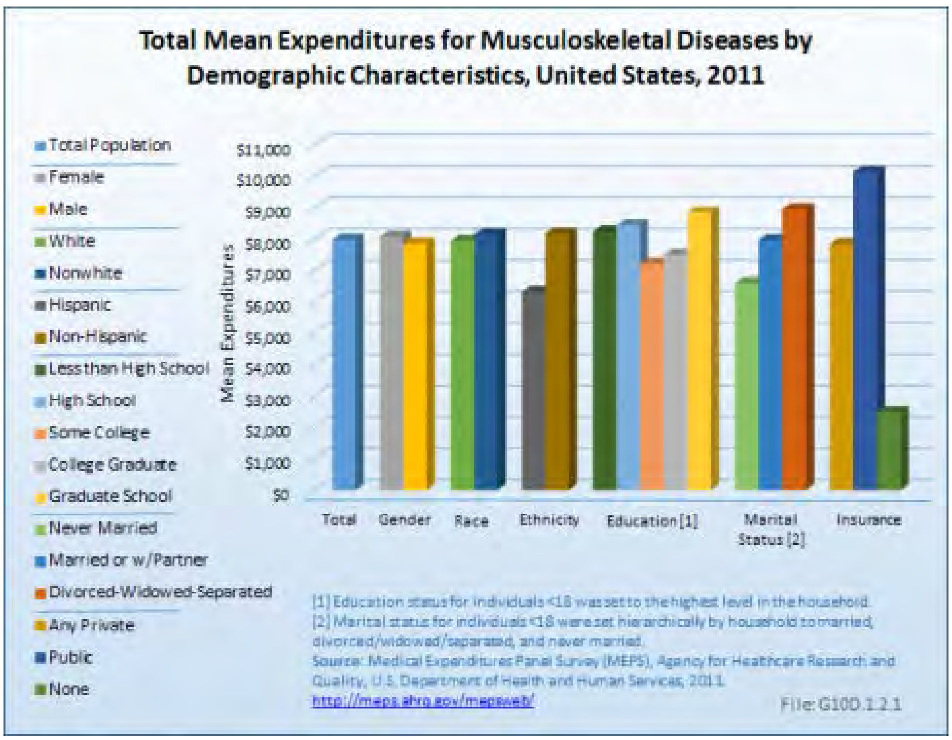




By Demographics

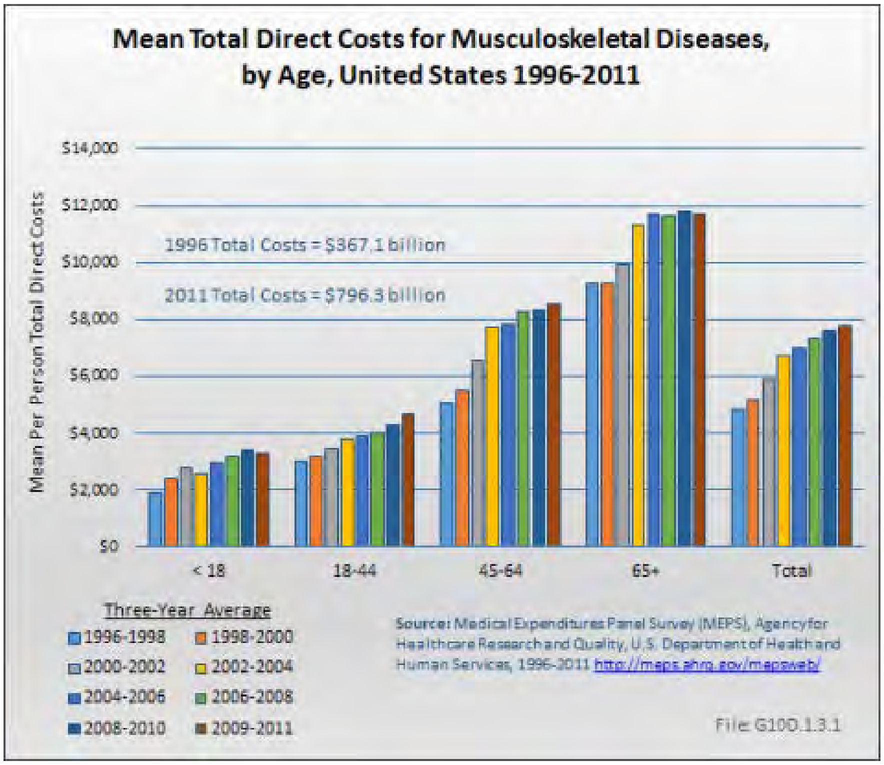
Expenditures for musculoskeletal diseases did not differ substantially by gender, race, and education level in 2011. On an unadjusted basis, women with musculoskeletal diseases had only 3% higher average expenditures than men. Nonwhites also had 3% higher expenditures than whites. On the other hand, non-Hispanics report 30% higher expenditures than Hispanics, and those who are married or divorced, separated, or widowed had substantially higher expenditures than those who have never married (presumably due to age). Persons who are divorced, widowed, or separated, at $8,951, had the highest unadjusted mean expenditures for musculoskeletal diseases.

Lack of insurance had the most profound impact on health expenditures for persons with musculoskeletal conditions. Expenditures on behalf of those without insurance, at $2,479, were only a third as large as those with private insurance ($7,842) and a quarter as much as those with public insurance ($10,142). Thus, lack of health insurance is associated with dramatically lower expenditure levels, inconsistent with the belief that persons who lack insurance are somehow able to obtain care. (Reference Table 10.8 PDF CSV)

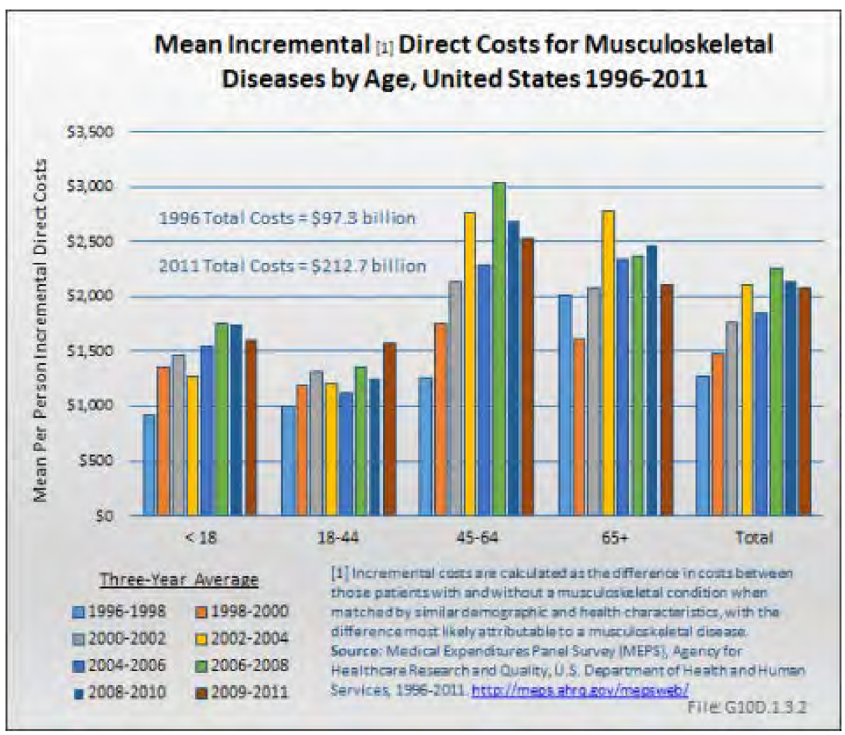


By Age

Total medical care expenditures for musculoskeletal diseases are disproportionately higher for persons 65 years of age or older, with a per-person cost of $11,708 in 2009 to 2011 compared to a per-person cost of $3,288 for persons less than 18 years, $4,658 for those 18 to 44 years, and $8,658 for those 45 to 64 years. (Reference Table 10.9 PDF CSV)



Although in the years 1996-1998, mean incremental costs for musculoskeletal disease were highest for the oldest cohort, age 65 years and older, by 1998 to 2000 costs for those ages 44 to 64 years were the highest. They have remained so since that time, and in 2009 to 2011 were 20% higher for this age group than the age 65 years and over group. (Reference Table 10.9 PDF CSV and Table 10.10 PDF CSV)

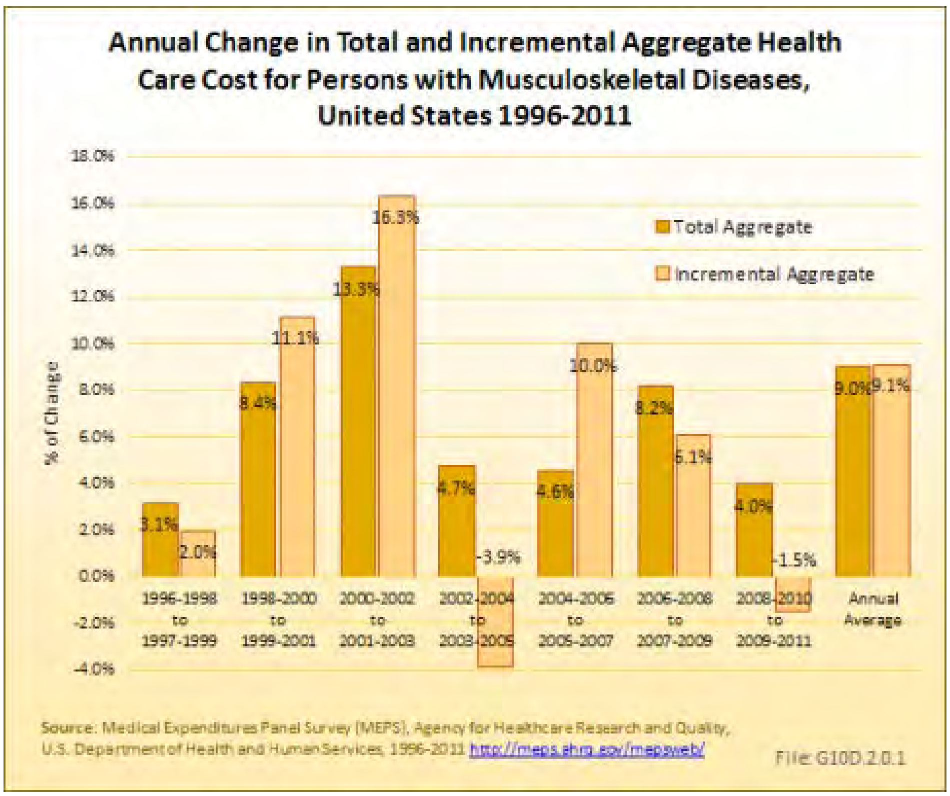


Aggregate Expenditures

Aggregate total expenditures increased from $367.1 billion to $796.3 billion, in 2011 dollars, during this time frame, or more than doubling. In 1996 to 1998, aggregate total expenditures for persons with a musculoskeletal disease, whether for musculoskeletal disease or other conditions, represented 3.2% of the GDP in 2011 dollars. By 2009 to 2011, the proportion had grown to 5.2% of the GDP.

Aggregate incremental expenditures, due to the higher number of persons with a musculoskeletal condition and the increased incremental expenditures per person, increased from $97.3 billion in 1996-1998 to $212.7 billion, in 2009 to 2011 when expressed in constant (2011) dollars, or by about 119%. Incremental cost associated with a musculoskeletal condition represented the equivalent of 0.25% and 0.5% of the GDP in 2011 dollars, for the respective time frames.

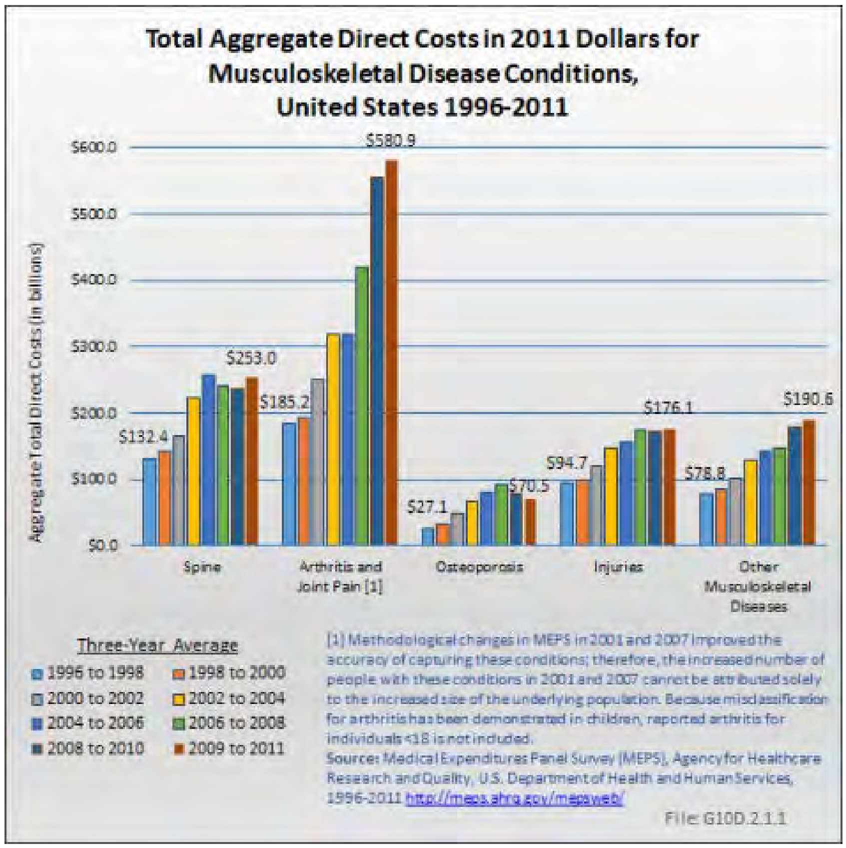
Over the full time range of 1996 to 1999 through 2009 to 2011, the annual average rate of increase in total and incremental costs for musculoskeletal diseases has been 9%. (Reference Table 10.7 PDF CSV; Table 10.9 PDF CSV; Table 10.11 PDF CSV; Table 10.14 PDF CSV)



By Condition

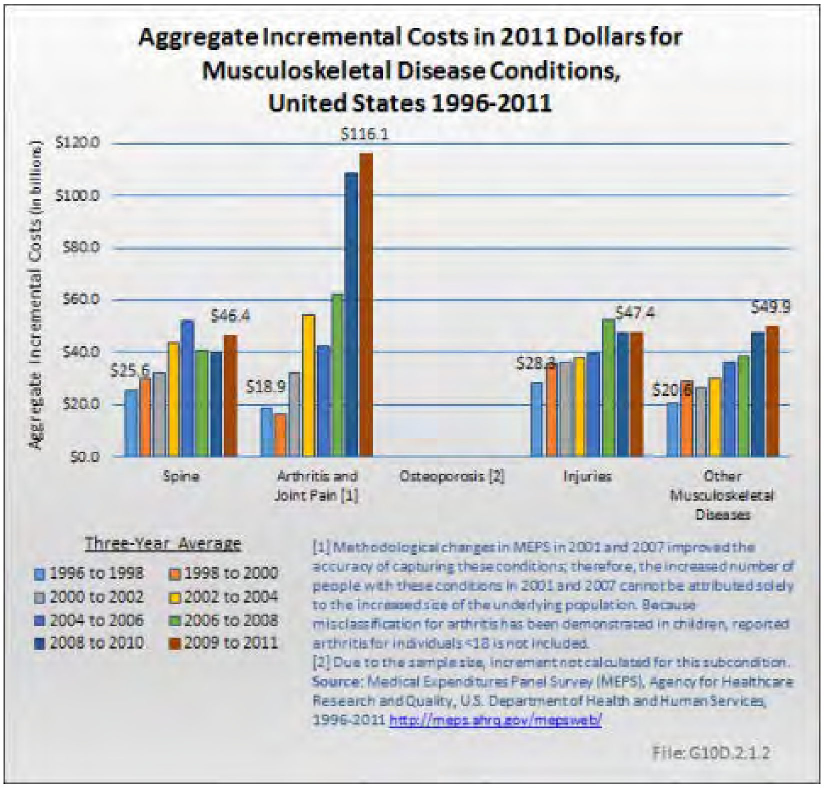
Because of the higher prevalence and relatively high level of expenditures per person, aggregate expenditures have consistently been greatest for arthritis and joint pain, accounting for $580.9 billion in health care costs in 2009 to 2011. Spine conditions, with an estimated $253.0 billion aggregate cost in 2009 to 2011, have held steady as the second most expensive musculoskeletal health care condition. Aggregate costs for injuries and other musculoskeletal conditions were $176.1 and $190.6, respectively, in 2009 to 2011. (Reference Table 10.6 PDF CSV)

The magnitude of increase in aggregate total expenditures between 1996 to 1998 and 2009 to 2011 is greatest for the diseases within the category including osteoporosis (about 160%), but was substantial for all musculoskeletal diseases. The aggregate total cost of health care for spine conditions increased by more than 91%; musculoskeletal injuries by 86%; and other musculoskeletal diseases by about 142% over the period 1996 to 1991 through 2009 to 2001. (Reference Table 10.7 PDF CSV)



Sampling variability limits inference about time trends in incremental expenditures associated with the subcondition groups. However, while estimates do not have the same precision as those for all musculoskeletal diseases, it is fair to conclude that 2009 to 2011 aggregate incremental expenditures, at $116.1 billion, were largest for arthritis and joint pain. (Reference Table 10.6 PDF CSV)

Using the more expansive definition of musculoskeletal diseases, aggregate total medical care expenditures on behalf of persons with a musculoskeletal disease were $1.068 trillion in 2009 to 2011.

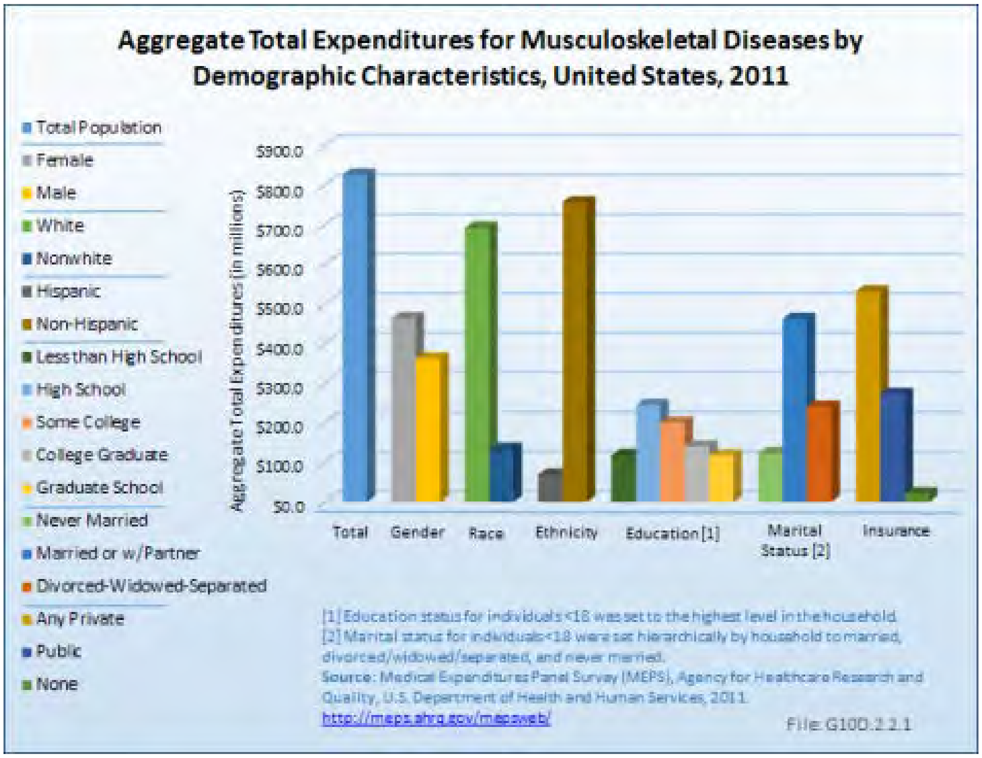


By Demographics

Women account for both a higher proportion of the population with musculoskeletal disease and more than half of total costs. With 36% of women reporting musculoskeletal diseases compared to 30% of men, women accounted for 56% of aggregate costs in 2011.

Whites and non-Hispanics account for the majority of cost, with 84% and 92%, respectively. Although a similar share of one-third of all persons in all education levels report musculoskeletal diseases, due to lower numbers with higher education, these groups represent a smaller share of aggregate total cost.

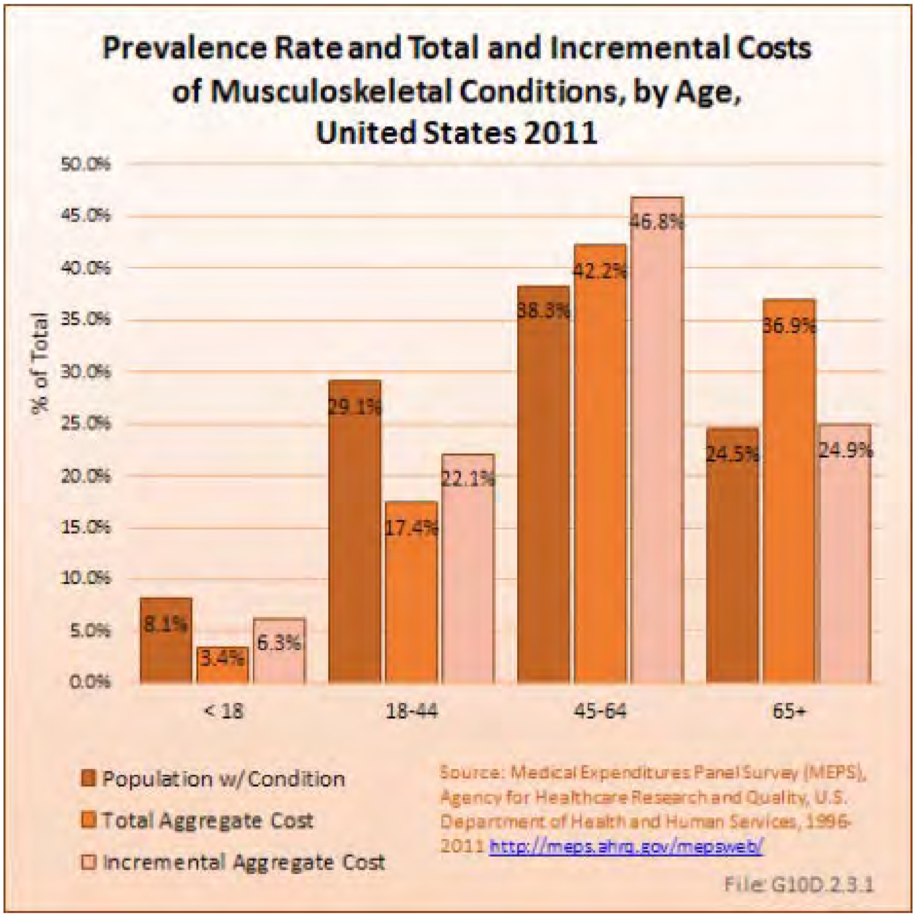
About one in four persons with no insurance report musculoskeletal disease, but the much lower cost and smaller group of persons means that only 3% of aggregate total cost is represented by the uninsured. (Reference Table 10.8 PDF CSV)



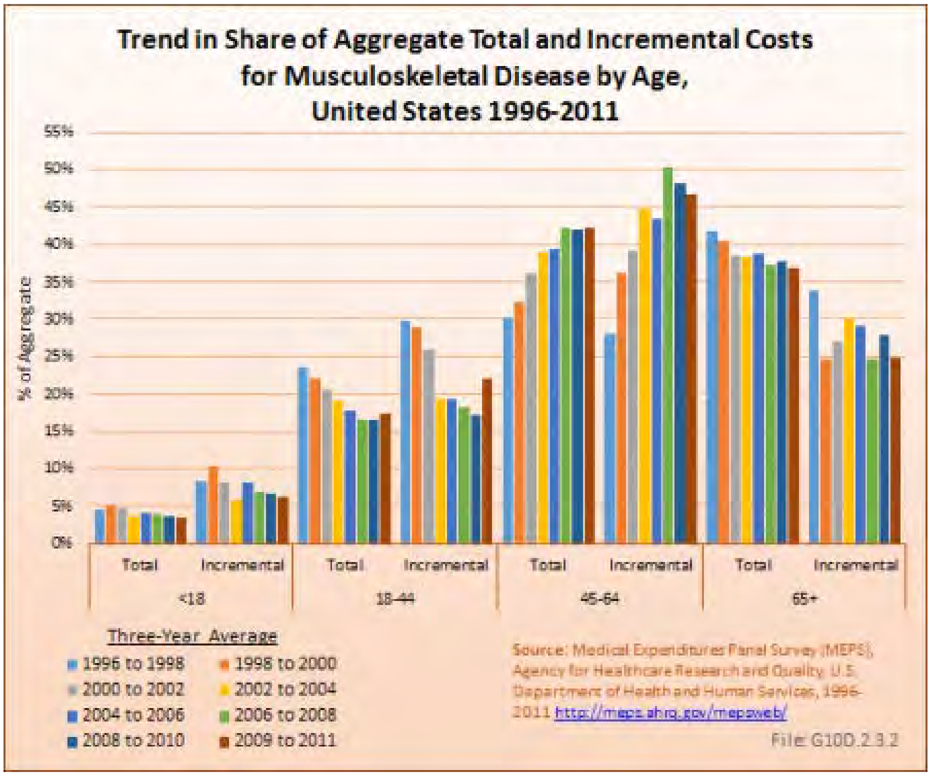
By Age

While persons age 65 years and older represent about 25% of all persons with a musculoskeletal disease, this age group accounted for 37%, or $294.1 billion, of total aggregate health care costs for musculoskeletal diseases in 2009 to 2011. However, incremental aggregate musculoskeletal health care for the 65 years and older population is estimated to comprise 25%, or $53.0 billion, of the total $212.7 billion aggregate incremental cost of these conditions, in part because in this age group, high medical care costs become the norm. Persons age 45 to 64 years represent 38% of persons these ages with musculoskeletal conditions, but 42% of aggregate medical care costs and 47% of aggregate incremental costs. (Reference Table 10.9 PDF CSV and Table 10.10 PDF CSV)

Estimated 2009 to 2011 aggregate total expenditures for persons age 18 to 64 years were $474.9 billion, or 60% of aggregate total health care expenditures for musculoskeletal diseases in that year. Thus, although musculoskeletal conditions are more prevalent with age, because of the size of the group 18 to 64 years, a majority of medical costs occur in the adult, nonelderly population. Only $27.4 billion of total aggregate musculoskeletal health care costs, or less than 4% of the total, went for persons under the age of 18 years.



The share of aggregate total and incremental costs accounted by persons 45 to 64 years has been growing over time, by 40% in relative terms for aggregate total costs (from 30% in 1996 to 1998 to 42% in 2009 to 2011) and by 68% in relative terms for incremental aggregate costs (from 28% in the first three years to 47% in the last three years). The share of total and incremental aggregate costs for all other age groups has been falling over this same period of time. The cumulative increase in aggregate cost has been 204% and 262%, respectively, for total and incremental costs from 1996 to 2011 for the 45- to 64-year age group, while all other age groups have increased between 60% and 92%. This reflects the importance of the size of the baby boom generation in overall musculoskeletal costs. However, that large cohort will soon be concentrated among the elderly and aggregate costs are likely to increase as a share of the total among those 65 years and older in the years to come. (Reference Table 10.10 PDF CSV; Table 10.11 PDF CSV)



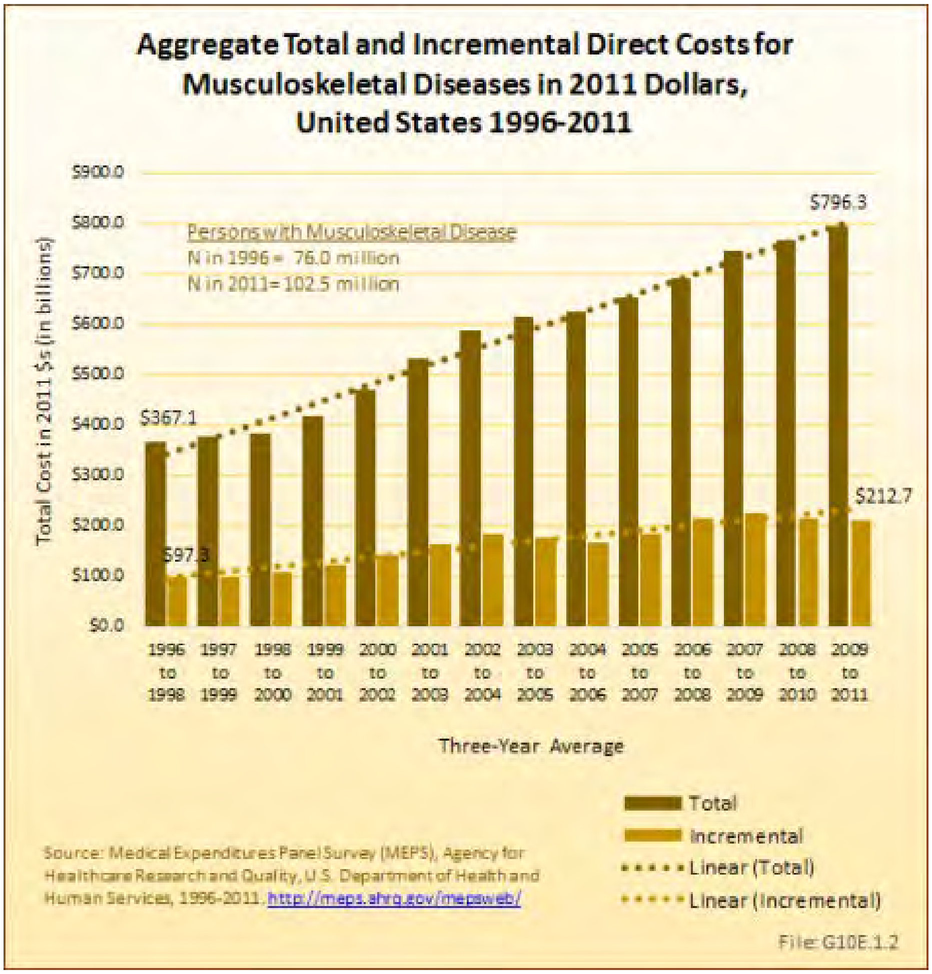
Total Economic Impact

Two factors affect the cost of treating musculoskeletal diseases in the United States. The first is the cost of medical services, which include inpatient and outpatient care, prescriptions, home health care, and a residual or “other” category including such items as medical devices. The second is the number of persons in this country with musculoskeletal disease conditions. Both will be explored in the associated web pages in this topic, and together, they will establish a baseline against which to assess future needs. It will be shown that both ongoing costs to treat these conditions and a high prevalence of musculoskeletal conditions in the aging population in relation to other medical conditions results in a huge, and growing, economic impact in the United States each year.

Cost to Treat Musculoskeletal Diseases

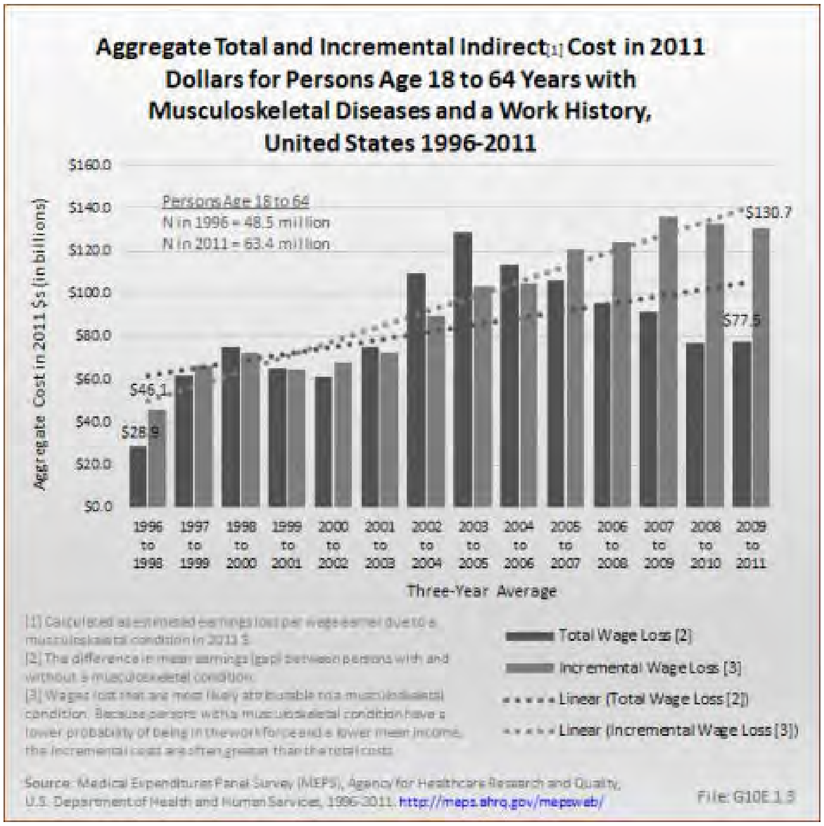
The mean direct cost per year per individual patient with a musculoskeletal disease has increased nearly 61% between the years 1996 to 1998 and 2009 to 2011, rising from just over $4,800 to nearly $7,800 per person in this time frame. Incremental costs, those cost most likely attributable to a musculoskeletal disease, rose from about $1,300 to $2,075. (Reference Table 10.4 PDF CSV, Table 10.5 PDF CSV)

At the same time, with the increasing number of individuals with musculoskeletal diseases in a growing and aging population, aggregate total direct cost to treat persons with a musculoskeletal disease between the years 1996 to 1998 and 2009 to 2011 increased by about 117%. For the years 2009 to 2011, the annual aggregate total direct cost, in 2011 dollars, is estimated to be $796.3 billion. Aggregate incremental medical cost is estimated to be $212.7 billion in 2009 to 2011, an increase of about 119% from the earlier time period. (Reference Table 10.6 PDF CSV, Table 10.7 PDF CSV)



Indirect total cost, as the difference in wages for persons age 18 to 64 years with a work history, and with and without musculoskeletal conditions, add another $77.5 billion to the aggregate cost for all persons with a musculoskeletal disease. Incremental indirect costs attributable to musculoskeletal disease alone are estimated to amount to $130.7 billion, indicating that wage losses attributable to musculoskeletal conditions are greater than the mean difference in wages between the two groups. Aggregate total indirect cost increased by 168% from the estimate in 1996 to 1998 to that of 2009 to 2011; aggregate incremental indirect costs rose by about 184%. (Reference Table 10.12 PDF CSV)

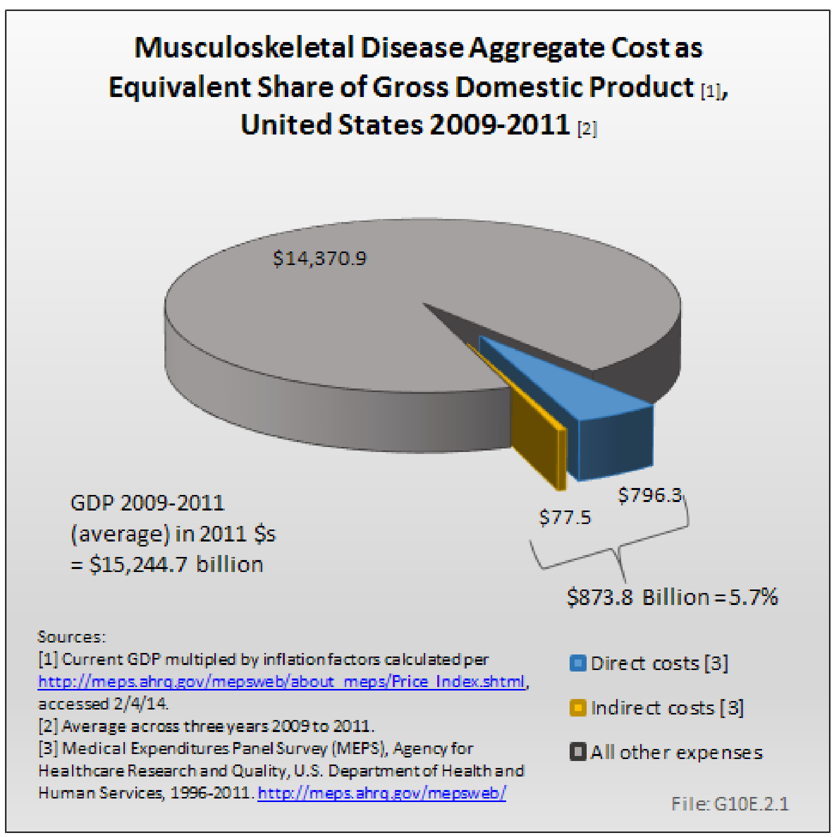
Taking into account all costs for persons with a musculoskeletal disease, including other comorbid conditions, the total aggregate cost of treating these individuals, plus the cost to society in the form of decreased or lost wages (indirect cost), is estimated to be $873.8 billion per year. (Reference Table 10.14 PDF CSV)



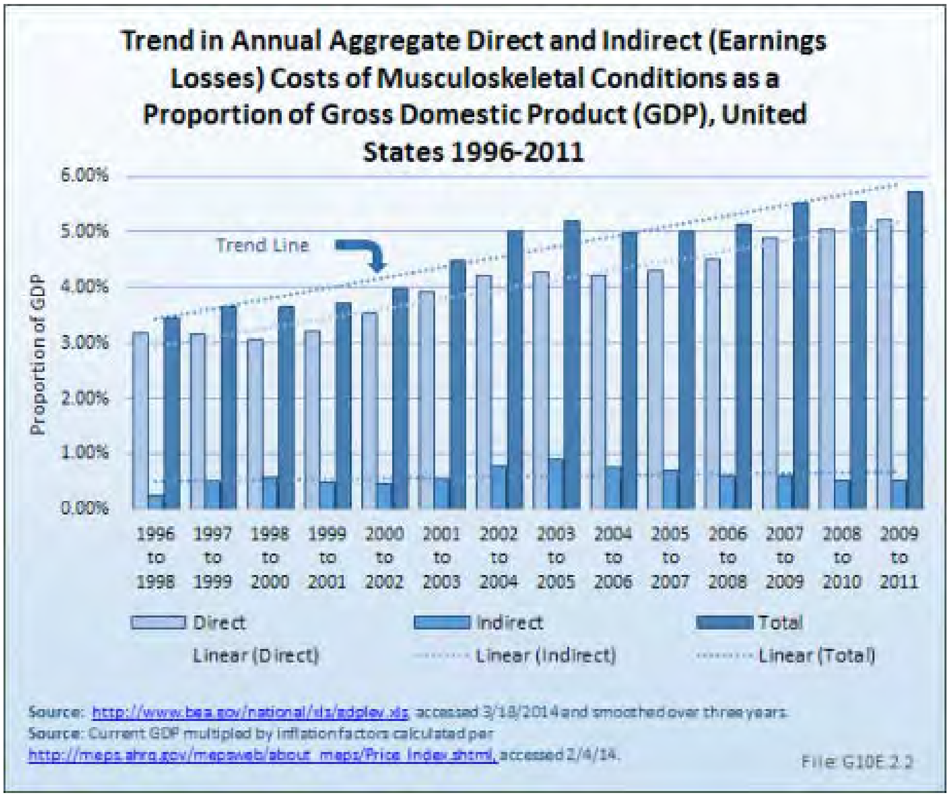
Share of GDP

Between the years 1996 to 1998 and 2009 to 2011, the Gross Domestic Product (GDP), in constant 2011 dollars, has risen from $11.5 trillion to $15.2 trillion, an increase of 32%.1 Over the same two time frames, total direct and indirect costs of musculoskeletal conditions rose from $396.1 billion to $873.8 billion. This is an increase of 121%, or nearly four times the rate of increase as the GDP.

As a share of GDP, using the same 2011 dollars base, total direct and indirect costs for musculoskeletal



conditions increased by 67%, from 3.43% to 5.73%. Indirect costs saw a sharper rate of increase of slightly more than 100%. However, indirect cost are a much smaller share of total cost than direct costs, constituting 0.25% of GDP in 1996 to 1998 and 0.51% in 2009 to 2011. Direct costs rose from a 3.18% share to a 5.22% share over the same time period. (Reference Table 10.14 PDF CSV)



To provide a basis for comparison, the economy is said to be in a recession when GDP declines by at least 1% for two or more consecutive quarters. Accordingly, the aggregate economic impact of the medical expenditures attributable to persons with musculoskeletal diseases is far in excess of the amount used to define a recession and, unlike a recession, occurs in perpetuity.

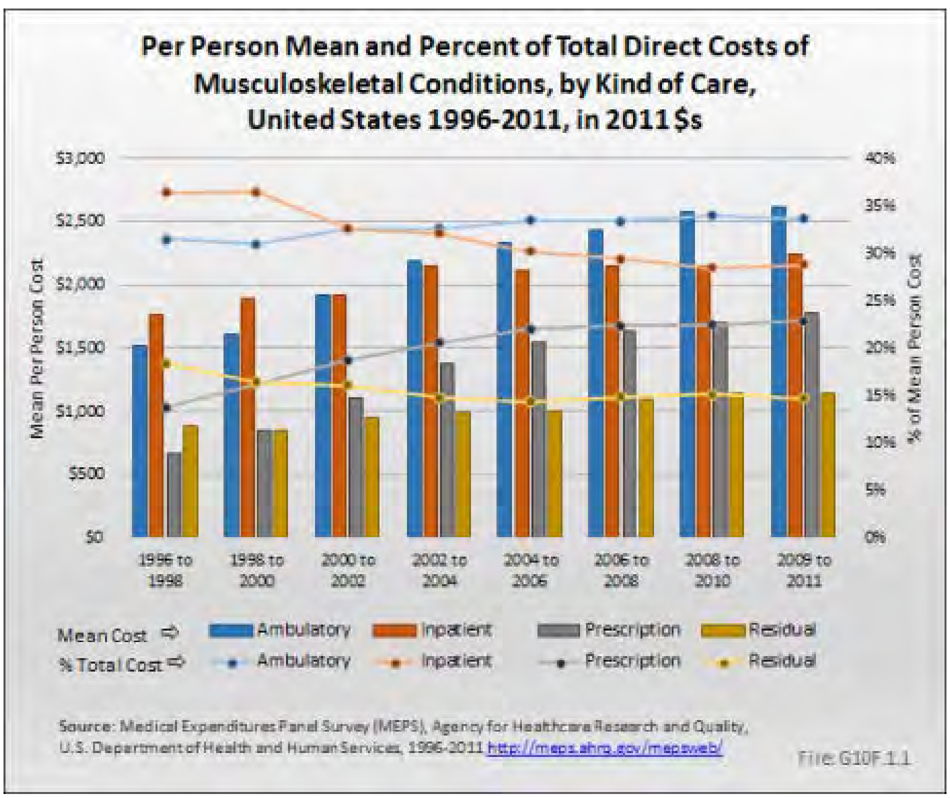
1. Agency for Healthcare Research and Quality: Medical Expenditure Panel Survey. Available at:Current GDP multiplied by inflation factors calculated per http://meps.ahrq.gov/mepsweb/about_meps/Price_Index.shtml. Accessed November 11, 2014.

Impact of Musculoskeletal Diseases on the US Economy

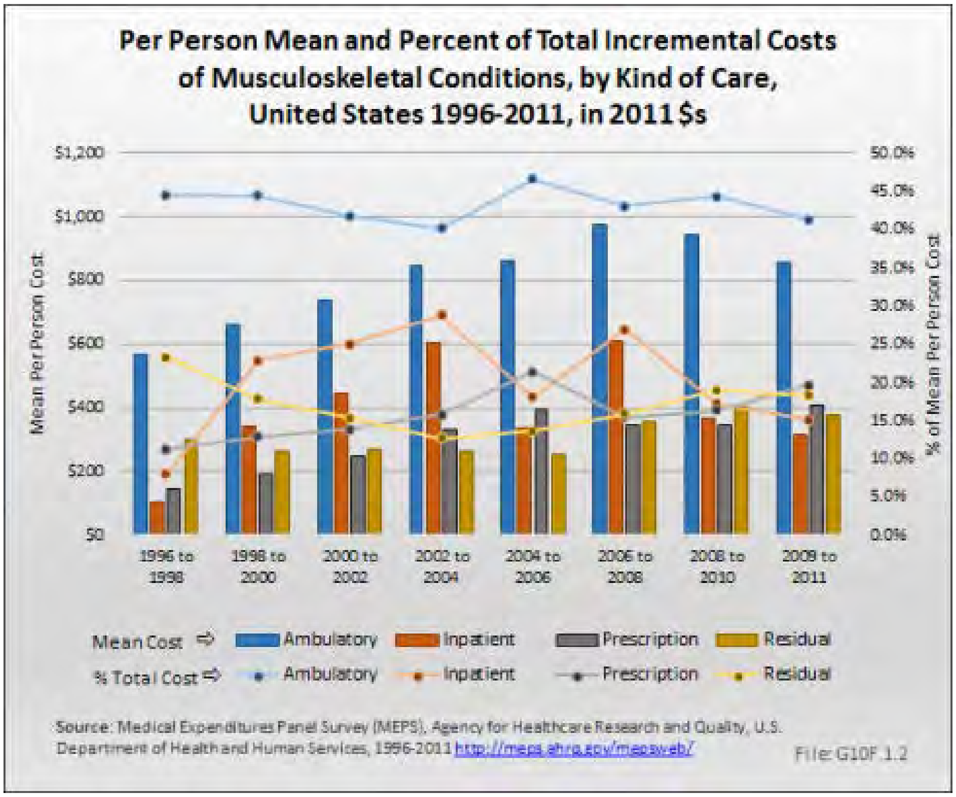
Musculoskeletal diseases affect the US economy through direct medical costs and through lost wages. Changes in medical care, new methods of treatment, new drugs, and the overall economy all affect the impact of musculoskeletal diseases. Musculoskeletal diseases are a major burden on the overall economy.

Overall Change in Musculoskeletal Diseases Health Care Cost

Over the period 1996 to 1998 through 2009 to 2011, slight changes in the proportion of total medical care expenditures devoted to ambulatory physicians visits (from 31% to 34% of total) and to inpatient care (from 36% to 29%) occurred. However, the share of musculoskeletal health care costs devoted to prescription medications increased the most, growing by more than 60%, from 14% to 23% of total cost. Computed in 2011 dollars, the mean annual prescription cost per person increased 167%, from $665 to $1,778. During this time, development of biologic agents for several inflammatory conditions, particularly rheumatoid arthritis, occurred, as well as the widespread use of the cox-2 inhibitors (coxibs) for musculoskeletal pain, and may have accounted for some of the rapid increase. However, the growth in per-person total expenditures for prescription drugs has slowed. From 1998 to 2000 through 2002 to 2004, annual growth in expenditures for prescription drugs averaged 15%, but since 2004 has averaged about 3% a year. (Reference Table 10.4 PDF CSV)



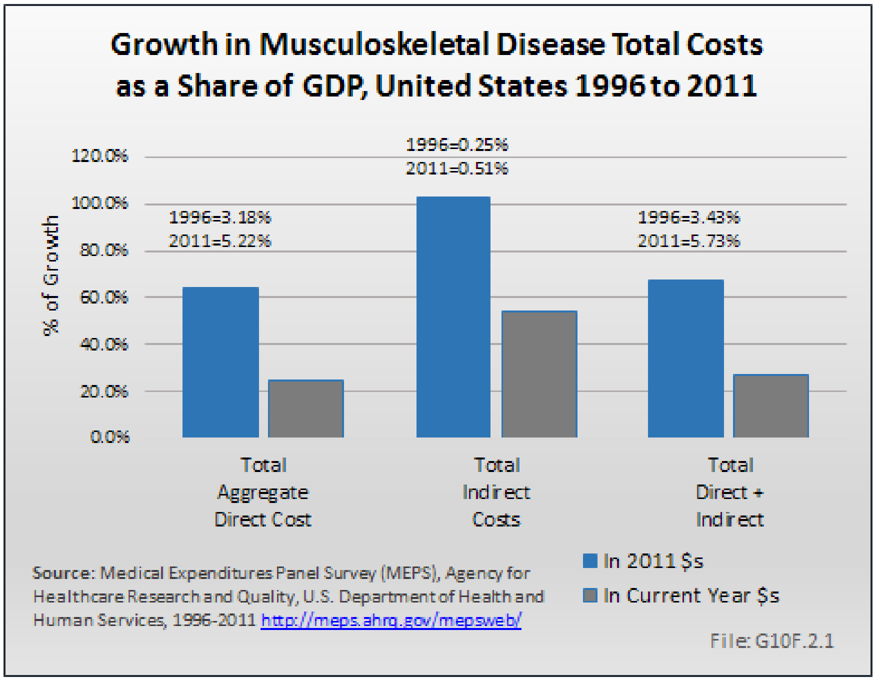
The per person increment in ambulatory care expenditures for musculoskeletal diseases grew by 51% between 1996 to 1998 and 2009 to 2011, from $570 to $859 in 2011 dollars. The increment for inpatient care more than doubled, from $102 in the 1996 to 1998 to $313 in 2009 to 2011. Ambulatory care represents the largest component of the increment in expenditures, indicative of the importance of ambulatory care in musculoskeletal diseases relative to other condition groups. (Reference Table 10.5 PDF CSV)



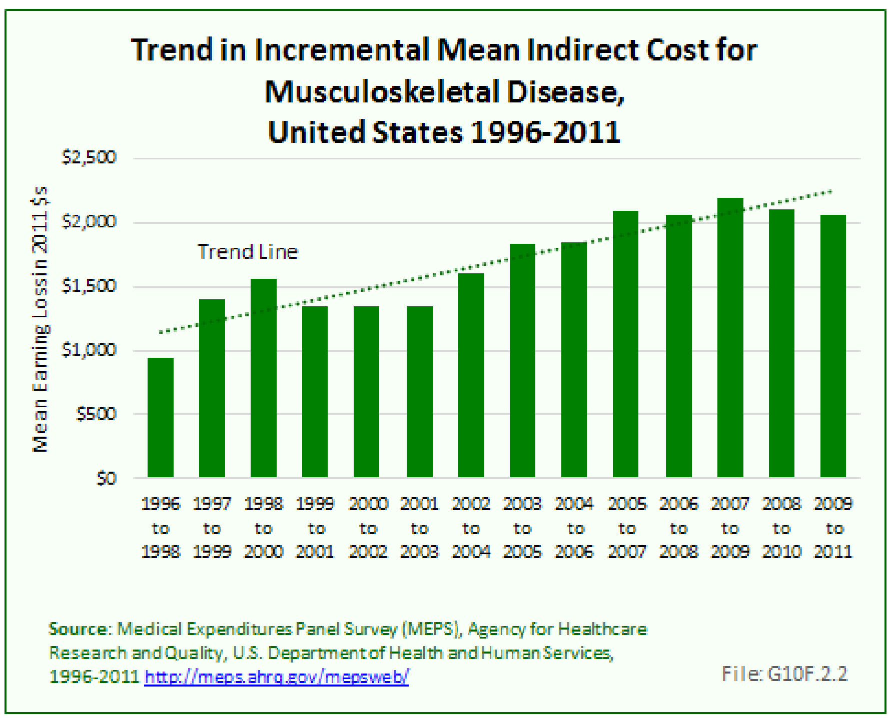
Indirect Cost Related to Musculoskeletal Diseases

In the studies conducted by Rice and colleagues starting in the early 1960s, indirect cost associated with earnings losses due to musculoskeletal diseases constituted between 38% and 59% of the total cost of these diseases.[1,2,3,4,5] The percentage shifted because in various eras, medical costs were rapidly escalating while earnings stagnated (1970s) and in other times wage growth exceeded the increase in medical costs (1960s and late 1990s). Analysis of the Medical Expenditures Panel Survey to estimate direct and indirect cost (ie, the cost of lost wages due to musculoskeletal conditions for persons age 18 to 64 years with a work history) as a proportion of GDP shows a slow but steady increase in the share of GDP accounted for by musculoskeletal conditions, from about 3.4% of GDP in 1996 to 1998 to about 5.7% in 2009 to -2011, an increase of 67%.[6,7] (Reference Table 10.14 PDF CSV)

The method to estimate earnings losses is based on the notion that presence of musculoskeletal conditions is one among many factors affecting employment. Thus, estimates of total earnings losses, grew from 1996 to 1998 through the mid 2000s, then declined substantially with the recession because it became more difficult to differentiate the employment situation of persons with musculoskeletal conditions from that of similar individuals. However, when other characteristics of individuals were taken into account, the estimate of incremental earnings losses continued to trend upward, despite the recession. Overall, the average increment in earnings losses grew from $949 in 1996 to 1998 to $2,063 in 2009 to 2011, or by more than 100%. (Reference Table 10.12 PDF CSV)



Estimates of earnings losses are limited to persons age 18 to 64 years, both because the number of workers older than 65 years in MEPS is too small to permit statistically reliable estimates in this age group and because in the United States, most workers retire by that age. However, it is probable that some individuals with musculoskeletal diseases would continue working past the age of 65 years in the absence of the condition. Similarly, the tabulation of earnings losses is limited to those who have established a work history either prior to or after the onset of disease. There may be some among those without a work history who would have begun to work in the absence of a musculoskeletal disease, but who never had the opportunity to do so. Thus, the magnitude of earnings losses shown should be considered a conservative estimate.



As of 1996 to 1998, about 48.5 million persons with a musculoskeletal disease had established a work history. On average, these individuals earned $596 in 2011 dollars less than those without musculoskeletal conditions; their earnings losses aggregated to $28.9 billion. By 2009 to 2011, the number of persons with musculoskeletal diseases and a work history had grown to over 63.3 million. On average, these workers had earnings losses of $1,224 each, or roughly a doubling. Aggregate total earnings losses grew to $77.5 billion, despite the decline associated with the recession.

Some of the estimated earnings losses of persons with musculoskeletal diseases might have occurred in the absence of these conditions because of other factors. For example, older workers and women, two groups with high rates of musculoskeletal diseases, have lower employment rates and earnings than the average US worker. The incremental earnings loss measure takes into consideration many of the factors that might cause persons to have lower earnings even without the presence of the musculoskeletal disease. Earnings losses using the incremental measure grew substantially between 1996 to 1998 and 2009 to 2011. In the earlier triad of years, the 48.5 million persons with musculoskeletal diseases and a work history sustained average incremental earnings losses of $949, or $46.1 billion overall, in 2011 dollars. Average incremental earnings losses more than doubled by 2009 to 2011, to $2,063; aggregate incremental earnings losses increased almost three-fold to $130.7 billion.

Using the more expansive definition of musculoskeletal diseases, average earnings losses rose from 1996 to 1998 through 1998 to 2000, but have been falling ever since; as of 2006 to 2008, earnings were actually greater among those included within the more expansive definition of musculoskeletal conditions than among the remainder of the working age population. In parallel, aggregate earnings losses have been falling since 1998 to 2000, turning negative in 2006 to 2008 and reaching -$158.6 billion in 2009 to 2011. (Note: Data on earnings losses of persons meeting the expansive definition of musculoskeletal diseases are not included in the tables.) Estimates of aggregate total earnings losses using the base case definition for this publication have declined from their peak in 2003 to 2005, but still are indicative of an adverse impact on earnings. It follows that the more expansive definition of conditions must necessarily include conditions which are not associated with work loss and resultant earnings losses.

1. Rice D: *Estimating the Cost of Illness.* Hyattsville, MD: National Center for Health Statistics, *Health Economic Series*, 1966, No. 6.

2. Cooper B, Rice D: The economic cost of illness revisited. Health Economics Series No. 6. *Social Security Bulletin* 1979;39:21-35.

3. Rice D, Hodgson T, Kopstein A: The economic costs of illness: A replication and update. *Health Care Fin Rev* 1985;7:61-80.

4. Rice D: Cost of musculoskeletal conditions, in Praemer A, Furner S, Rice D, eds: *Musculoskeletal Conditions in the US.* Rosemont, IL, American Academy of Orthopaedic Surgeons, 1992.

5. Rice D: Cost of musculoskeletal conditions, in Praemer A, Furner S, Rice D, eds: *Musculoskeletal Conditions in the US*, ed 2. Rosemont, IL, American Academy of Orthopaedic Surgeons, 1999.

6. The National Arthritis Data Task Force concluded that about half of the increase between the 1972 and 1980 studies by Rice and colleagues was due to improvements in the data sources available to Rice and colleagues, but the remainder represented a real increase.

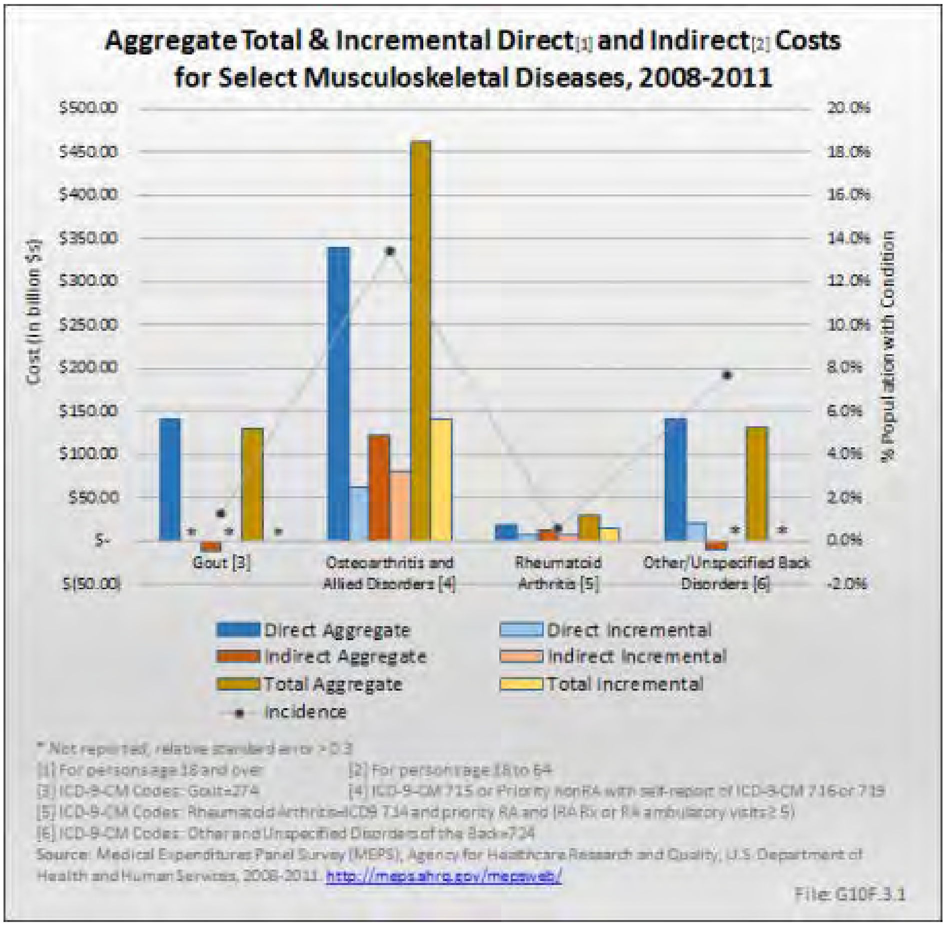
7. Lawrence R, Helmick C, Arnett FC, et al: Estimates of the prevalence of arthritis and selected musculoskeletal disorders in the United States. *Arthritis Rheum* 1998;41:788-799.

Medical Care Expenditures and Earnings Losses for Select Musculoskeletal Diseases

Medical conditions in MEPS are self-reported and may result in misreporting of some conditions. With respect to musculoskeletal diseases, under-reporting might occur when physicians do not provide patients with a discrete diagnosis. For example, osteoarthritis may not be reported because it may be too mild to be recognized or treatment is included with other conditions and not distinct. Over-reporting of a condition could occur when respondents indicate they have a specific form of arthritis, for example, rheumatoid arthritis, even though their physician did not so indicate it. It should be noted that self-reporting of discrete medical conditions is lower than would be expected on the basis of epidemiological studies.[1] As a result of differences in reporting, the measures of the aggregate economic impacts of discrete conditions summarized in Table 10.14 and select graphs throughout these pages may differ from those presented in the discussion of specific conditions in prior chapters. These discussions are based on larger samples, such as all musculoskeletal disease, or major subcategories, such as all forms of arthritis. Nevertheless, the data on expenditures do indicate, in broad stroke, the average economic impact for self-recognized disease and for conditions likely to be under-reported, such as osteoarthritis, a conservative estimate of aggregate economic impact. Estimates for discrete musculoskeletal diseases merged four years of MEPS data (2008-2011) to provide more stable estimates given the relatively few cases of each condition reported in individual years.

Average total direct cost for all four conditions studied—disorders of the back, rheumatoid arthritis, osteoarthritis and allied disorders, and gout—are relatively large. Over the period 2008 to 2011, per-person direct costs exceeded $12,000 a year for gout, $11,000 a year for osteoarthritis, $17,000 a year for rheumatoid arthritis, and just under $8,000 for disorders of the back. These costs aggregate to about $141.5 billion for gout, $339.7 for osteoarthritis, $17.8 billion for rheumatoid arthritis, and $141.5 billion for disorders of the back.

Average total earnings losses were highest for rheumatoid arthritis, $13,886 per year, followed by osteoarthritis at $7,548 per year. However, because of the lower prevalence of rheumatoid arthritis, the aggregate impact of the earnings losses for these two conditions were $12.3 billion and $121.8 billion, respectively. Persons with both gout and back disorders actually had higher earnings than the corresponding populations without those conditions. (Reference Table 10.13 PDF CSV)



[1.](#) Lawrence R, Helmick C, Arnett F, et al: Estimates of the prevalence of arthritis and selected musculoskeletal disorders in the United States. *Arthritis Rheum* 1998;41:788-799.

Impact of Aging

The aging of the population has increased the prevalence and prevalence rate of musculoskeletal conditions as well as health care expenditures. In the years 1996 to 1998, an average of 22 million persons age 45 to 64 years reported a musculoskeletal condition, while 16.5 million of those 65 years and older did so. By 2009 to 2011, these numbers had increased to about 39 million and 25 million, respectively. The prevalence rate of musculoskeletal conditions among persons 45 to 64 years increased from about 29% in 1996 to 1998 to about 38% in 2009 to 2011, while it increased from about 22% to about 25% among those 65 years and older.

Total aggregate medical care expenditures among persons with musculoskeletal conditions have risen substantially due to population aging as well as the general increase in medical care costs. In 2011 dollars, total aggregate expenditures increased between 1996 to 1998 and 2009 to 2011 among persons 45 to 54 years from about $111 billion to $336 billion, while they increased among those 65 years and older from about $153 billion to about $294 billion during this time. Although total per person costs increase with age, the magnitude of the increase was greater in relative terms among persons 45 to 64 years with musculoskeletal conditions (from $5,078 to $8,568, or by 69%) than among such persons 65 years and older (from $9,286 to $11,708, or by 29%).

Key Challenges To Future

Society has the option of passively accepting the increasing economic impact of musculoskeletal diseases, or it can seek to alleviate this impact by the use of primary, secondary, and tertiary preventive measures with strong evidence of effectiveness. Such measures run the gamut from weight loss and exercise programs to reduce the prevalence of arthritic conditions, to self-management classes designed to reduce the impact of existing conditions, to surgical and medical interventions that return the individual to higher levels of functioning and quality of life.[1,2,3,4,5]

In the discussion of demographic variations, disparities in medical care expenditures were identified, especially those associated with lack of health insurance. This suggests the need for equal access to effective interventions and treatment modalities to keep individuals participating in society through work and other meaningful activities. It also suggests that if health reform reduces the ranks of the uninsured, there may be benefits in reduced health care expenditures for services like total joint replacement, as well as reduced earnings losses if functional status does not decrease as profoundly after onset of musculoskeletal conditions.

1. Yelin E, Callahan L: The economic cost and social and psychological impact of musculoskeletal conditions. *Arthritis Rheum* 1995;38:1351-1362.

2. Yelin E, Katz P: Labor force participation among persons with musculoskeletal conditions, 1970-1987: National estimates derived from a series of cross-sections. *Arthritis Rheum* 1991;34:1361-1370.

3. Kruger J, Helmick C, Callahan L, Haddix A: Cost-effectiveness of the arthritis self-help course. *Arch Int Med* 1998;158:1245-1249.

4. Minor M: 2002 Exercise and Physical Activity Conference, St. Louis, Missouri: Exercise and arthritis “We know a little bit about a lot of things". *Arth Rheum* 2003;49:1-2

5. Redelmeier D, Lorig K: Assessing the clinical importance of symptomatic improvements: An illustration in rheumatology. *Arch Int Med* 1993;153:1337-1342.

Unmet Needs

The increased prevalence and increased costs associated with musculoskeletal conditions that accompany the aging of the population pose several problems for society. Clearly, at a time of cost constraints in health care, society cannot continue to devote an ever-growing share of scarce resources to the treatment of these conditions.

Research Funding for Care and Prevention: Unmet Needs

Much of the increase in the economic impact of treating musculoskeletal conditions is due to the increased prevalence and increased cost per case. As to the latter, the increase is due to increased use of surgical interventions and the expansion in the number and cost of prescription medicines. However, research has indicated that the prevalence rate need not increase in exact proportion as the increase in the overall population. There are preventive measures that have been discovered, such as the impact of weight loss on the prevalence of many musculoskeletal conditions, and of environmental agents in several of the conditions. In addition, researchers have uncovered several behavioral interventions that reduce the impact of the conditions once they arise, such as evidence-based exercise programs and self-management. However, relatively few resources are devoted to discovering additional behavioral interventions to reduce the prevalence and impact of these diseases. In addition, research into the causes of many of the conditions, which made substantial progress in treatment over the last several decades, has been adversely affected by the decrease in Federal basic science funding. An example is the biological agents for the treatment of autoimmune conditions such as rheumatoid arthritis.

Access to Care: Unmet Needs

As noted, there is likely to be a dramatic increase in the number of persons with musculoskeletal conditions seeking access to health care as a result of the ACA. This may result in increased use of mechanisms to limit access to select providers. It may also result in increased cost sharing required of those with insurance to limit their use.

Availability of Health Care Providers: Unmet Needs

The dramatic increase in the prevalence of musculoskeletal conditions would provide a challenge to the health care system even in the absence of the major changes in health care occurring as a result of the Affordable Care Act (ACA). Earlier in the chapter, it was noted there were almost 9 million persons with musculoskeletal conditions who lacked health insurance. As many of these individuals obtain insurance through the ACA, it will place additional strain the existing care system. Presently, health care expenditures for the uninsured are only about a quarter of the cost of those with public insurance, and about a third the cost of those with private insurance. As medical care access increases for the previously uninsured, result will be greater utilization of health care resources. Health insurers may respond by making it more burdensome for patients to access some resources such as specialists or they may increase the amount the insured have to pay out of pocket.

Workforce Implications: Unmet Needs

The pipeline to expand the number of health care providers able to serve persons with musculoskeletal conditions is a long one. For someone to be trained as an orthopedic surgeon may require 15 years or more, including medical school; it may take only slightly fewer years for someone to be trained as a rheumatologist. The increased access to health insurance as a result of the ACA may, therefore, strain the existing workforce.

Summary and Conclusions

The economic impact of musculoskeletal diseases is increasing due to a combination of factors. These factors include:

- The aging of the US population
- The concomitant increase in the prevalence of musculoskeletal diseases
- The growth in average total expenditures to treat musculoskeletal diseases
- The average total and incremental earnings losses that result from these conditions (although there was a dip in the total aggregate earnings losses associated with the recession)

Between 1996 to 1998 and 2009 to 2011, the number of persons with one or more musculoskeletal diseases grew from 76.0 million, or 28.0% of the population, to 102.5 million, or 33.2% of the population. Over this time period, average total expenditures for health care for persons with a musculoskeletal disease grew from $4,832 to $7,768 in 2011 dollars, while aggregate total expenditures grew from $367.1 billion to $796.3 billion. Average incremental expenditures for persons of similar characteristics but without a musculoskeletal disease grew from $1,280 to $2,075, but due to population growth and increased prevalence of the conditions, aggregate incremental expenditures grew from $97.3 to $212.7 billion, all in 2011 dollars.

Average per-person earnings losses between 1996 to 1998 and 2009 to 2011 due to musculoskeletal diseases increased from $596 to $1,224, while aggregate total earnings losses grew from $28.9 billion to $77.5 billion in constant 2011 dollars, even after a dip in earnings associated with the recession. Incremental earnings losses increased dramatically, from $949 to $2,063 per person and from $46.1 to $130.7 billion on an aggregate basis.

Comparing the cost of musculoskeletal diseases to the national gross domestic product (GDP) provides a perspective on these total costs. Earlier estimates summarize the evidence from the studies conducted by Dorothy Rice and colleagues, the last two of which were from prior editions of the present study.[1,2] More recent comparisons for 1996 to 1998 through 2009 to 2011 summarize the data from the present analysis in 2011 constant dollars. Notwithstanding the different methods of the studies by Rice and colleagues and the analysis of MEPS from the present volume, there is no question that the direct cost of musculoskeletal diseases has a profound economic impact on the nation, now at 5.73% of GDP, or nearly doubling in less than two decades.

1. The National Arthritis Data Task Force concluded that about half of the increase between the 1972 and 1980 studies by Rice and colleagues was due to improvements in the data sources available to Rice and colleagues, but the remainder represented a real increase.

2. Lawrence R, Helmick C, Arnett F, et al: Estimates of the prevalence of arthritis and selected musculoskeletal disorders in the United States. *Arthritis Rheum* 1998;41:788-799.

Background and Methodology: Health Care Utilization and Economic Cost of Musculoskeletal Diseases

Economic cost for musculoskeletal-related health care diseases presented in this book are based on data from the Medical Expenditures Panel Survey (MEPS) using a methodology developed by the principal author and colleagues at the US Centers for Disease Control (CDC).[1,2,3,4,5] The MEPS is a comprehensive data source designed for cost of illness studies.[6,7,8,9] The MEPS uses a complex multistage probability sample of the US population and queries this sample three times annually about their medical conditions, health care utilization, and employment status, and provides information on the charges and expenditures associated with medical utilization. The authors use expenditure information to produce two types of cost estimates. The first, total cost, is an indication of all medical care costs and earnings losses incurred by persons with a musculoskeletal disease, regardless of the condition for which the cost was incurred. The second, incremental cost, is an estimate of the magnitude of cost that would be incurred beyond those experienced by persons of similar demographic and health characteristics but who do not have one or more musculoskeletal disease. Cost estimates are produced as the mean per-person medical care cost and as the aggregate, or sum of mean costs overall, associated with all persons with musculoskeletal diseases.

Early editions of this book based estimates of the economic impact of musculoskeletal diseases on the Rice cost of illness methodology.[10,11] The Rice model utilized the National Hospital Discharge Survey (NHDS) and other available national health care data sources such as the National Health Interview Survey.[12] All costs associated with hospitalizations or treatments for persons with a musculoskeletal disease listed as the primary, or first, diagnosis were included in the model. The Rice model defines direct cost as those associated with all components of medical care (ie, inpatient and outpatient care, medications, devices, and costs associated with procuring medical care), and indirect cost such as those associated with wage loss due to morbidity or mortality, plus an estimate of intangible costs.

In the Rice model, mortality accounted for 7% of total indirect medical cost for all conditions. The MEPS data do not provide a comparable method for calculating wage loss associated with mortality. Hence, total cost presented here represents an under-count by a similar percentage. Because musculoskeletal diseases have a smaller impact on mortality than most other major categories of illness, the under-count will be an unknown, but smaller, percentage.

Comparing total cost for 1995 (the last year that Rice updated her estimates)[11] updated to 1996 terms (the first year for which MEPS data is available), and omitting cost associated with mortality, the current analysis results in $207 billion in total cost associated with musculoskeletal diseases using the Rice method and about $143 billion using the MEPS database. The difference may be due to allocating a higher proportion of diagnoses to the musculoskeletal classification in the Rice study. The difference suggests that inferring time changes between the Rice studies and those using MEPS should be done with caution.

A series of papers provide a detailed description of the methods of estimating total and incremental direct and indirect cost of conditions, and outline the regression model used to adjust for differences of persons with and without musculoskeletal diseases due to demographic characteristics and health status.[2,4] As in our previous work, we applied a two-stage model to estimate musculoskeletal condition-attributable costs for ambulatory, inpatient, prescription, and other expenditures, and a four-stage model for overall expenditures. However, the present analysis differs from prior analysis due to the use of a generalized linear model with a gamma distribution and a log-link, as opposed to a log transformation with a smearing estimate applied to back-transformed predicted values, in the stages predicting costs among individuals with any positive expenditures.

Although generally prevalence and cost associated with musculoskeletal diseases increase over time, sampling variability in the MEPS does not reflect this in each successive year. The impact of sampling variability is partially mitigated by smoothing, or averaging, data across 3-year periods.

1. Cisternas MG, Murphy LB, Yelin EH, Foreman AJ, Pasta DJ, Helmick CG: Trends in medical care expenditures of US adults with arthritis and other rheumatic conditions 1997 to 2005. *J Rheumatol* 2009;36(11):2531-2538. Epub 2009 Oct 1.

2. Yelin E, Cisternas M, Pasta D, et al: Medical care expenditures and earnings losses of persons with arthritis and other rheumatic conditions in the United States in 1997: Total and incremental estimates. *Arthritis Rheum* 2004;50(7):2317-2326.

3. Yelin E, Herrndorf A, Trupin L, Sonneborn D: A national study of medical care expenditures for musculoskeletal conditions: The impact of health insurance and managed care. *Arthritis Rheum* 2001;44:1160-1169.

4. Yelin E, Murphy L, Cisternas MG, et al: Medical care expenditures and earnings losses among persons with arthritis and other rheumatic conditions in 2003, and comparisons with 1997. *Arthritis Rheum* 2007;56(5):1397-1407.

5. Yelin E, Trupin L, Cisternas M: *Direct and Indirect Costs of Musculoskeletal Conditions in 1997: Absolute and Incremental Estimates.* Atlanta, GA, Centers for Disease Control, 2002.

6. Cohen J, Monheit A, Beauregard K. The Medical Expenditure Panel Survey: A national information resource. *Inquiry* 1996-1997;33:373-389.

7. Cohen S: *Sample Design of the 1996 Medical Expenditure Panel Survey Household Component.* Washington, DC, Agency for Health Care Policy and Research: US Department of Health and Human Services, 1997.

8. Cohen S: *Sample Design of the 1997 Medical Expenditure Panel Survey Household Component.* Washington, DC, Agency for Health Care Policy and Research: US Department of Health and Human Services, 2000.

9. Cohen S, DiGaetano R, Goksel H: *Estimation Procedures in the 1996 Medical Expenditure Panel Survey Household Component.* Washington, DC, Agency for Health Care Policy and Research: US Department of Health and Human Services, 1999.

10. Rice D: Cost of musculoskeletal conditions, in Praemer A, Furner S, Rice D, eds: *Musculoskeletal Conditions in the US*. Rosemont, IL, American Academy of Orthopaedic Surgeons, 1992.

11. Rice D: Cost of musculoskeletal conditions, in Praemer A, Furner S, Rice D, eds: *Musculoskeletal Conditions in the US*, ed 2. Rosemont, IL, American Academy of Orthopaedic Surgeons, 1999.

12. Yelin E, Katz P: Labor force participation among persons with musculoskeletal conditions, 1970-1987: National estimates derived from a series of cross-sections. *Arthritis Rheum* 1991;34:1361-1370.

Economic Cost ICD-9-CM Codes

The ICD-9-CM codes used in the economic impact analysis by musculoskeletal diseases fall into the two categories of base codes and expansive codes.

Conditions included in the base musculoskeletal disease rubric include spine conditions, arthritis and joint pain, the category that includes osteoporosis (other diseases of bone and cartilage), injuries, and an inclusive “other” category for the remaining conditions. Conditions selected for the cost analysis presented are based on condition topics included in this site. Data are reported primarily for base case ICD-9-CM codes, or those codes for which musculoskeletal disease is the principal cause of the condition rather than a consequence of another major health condition (eg, bone cancer metastases from another primary cancer site).

Estimates are also provided for a more expansive list of codes of musculoskeletal-related diseases that include conditions for which musculoskeletal diseases are either the primary and secondary cause of the condition. This more expansive list of conditions yields a vastly larger prevalence estimate than the base case list. However, it is reasonable to assume the cost of musculoskeletal diseases probably exceeds the conservative estimates presented here. For example, a person with bone metastases would incur costs to treat the bone manifestation, even though the cancer, not the bone condition, is the primary etiology.

ICD-9-CM codes included in each subcategory for the base and expansive conditions are listed in subsections.

Base Case ICD-9-CM Codes

Spine
- Special Symptoms or Syndromes, NEC : 307
- Migraine: 346
- Trigeminal Nerve Disorders : 350
- Nerve Root and Plexus Disorders : 353
- Dentofacial Anomalies, Including Malocclusion : 524
- Pain and Other Symptoms Associated with Female Genital Organs : 625
- Menopausal and Postmenopausal Disorders : 627
- General Symptoms : 780
- Symptoms Involving Skin and Other Integumentary Tissue : 782
- Symptoms Involving Head and Neck : 784
- Symptoms Involving Respiratory System and Other Chest Symptoms : 786
- Symptoms Involving Digestive System : 787
- Other Symptoms Involving Abdomen and Pelvis : 789
- Injury to Other Cranial Nerve(s) : 951
- Injury to Nerve Roots and Spinal Plexus : 953

Arthritis and Joint Pain
- Gonococcal Infections : 098
- Other Venereal Diseases : 099
- Other and Unspecified Infectious and Parasitic Diseases : 136
- Other and Unspecified Disorders of Metabolism : 277
- Purpura and Other Hemorrhagic Conditions : 287
- Other Paralytic Syndromes : 344
- Mononeuritis of Upper Limb and Mononeuritis Multiplex : 354
- Inflammatory and Toxic Neuropathy : 357
- Other and Ill-defined Cerebrovascular Disease : 437
- Other Peripheral Vascular Disease : 443
- Polyarteritis Nodosa and Allied Conditions : 446
- Other Disorders of Arteries and Arterioles : 447
- Psoriasis and Similar Disorders : 696

Osteoporosis
- Other Disorders of Bone and Cartilage : 733

Musculoskeletal Injuries
- Open Wound of Neck : 874
- Open Wound of Other and Unspecified Sites, Except Limbs : 879
- Contusion of Trunk : 922
- Contusion of Upper Limb : 923
- Contusion of Lower Limb and of Other and Unspecified Sites : 924
- Crushing Injury of Trunk : 926

Other Musculoskeletal Conditions

Other Salmonella Infections : 3
Rat-bite Fever : 26
Meningococcal Infection : 36
Rubella : 56
Other Arthropod-borne Diseases : 88
Early Syphilis, Symptomatic : 91
Other Forms of Late Syphilis, with Symptoms : 95
Yaws : 102
Late Effects of Tuberculosis : 137
Malignant Neoplasm of Other and Ill-defined Sites : 195
Secondary Malignant Neoplasm of Other Specified Sites : 198
Other Malignant Neoplasms of Lymphoid and Histiocytic Tissue : 202
Multiple Myeloma and Immunoproliferative Neoplasms : 203
Other Benign Neoplasm of Connective and Other Soft Tissue : 215
Neoplasm of Uncertain Behavior of Other and Unspecified Sites and Tissues : 238
Neoplasms of Unspecified Nature : 239
Disorders of Parathyroid Gland : 252
Disorders of Lipoid Metabolism : 272
Disorders of Mineral Metabolism : 275
Hereditary Hemolytic Anemias : 282
Organic Sleep Disorders : 327
Mononeuritis of Lower Limb and Unspecified Site : 355
Peritonitis and Retroperitoneal Infections : 567
Other Cellulitis and Abscess : 682
Other and Unspecified Congenital Anomalies : 759
Late Effects of Injuries to Skin and Subcutaneous Tissues : 906
Certain Early Complications of Trauma : 958
Complications Peculiar to Certain Specified Procedures : 996
Personal History of Other Diseases : V13
Organ or Tissue Replaced By Transplant : V42
Organ or Tissue Replaced By Other Means : V43
Other Postprocedural States : V45
Problems with Head, Neck, and Trunk : V48
Fitting and Adjustment of Other Device : V53
Convalescence and Palliative Care : V66
Follow-up Examination : V67
Special Screening Examination for Bacterial and Spirochetal Diseases : V74

Expansive Case ICD-9-CM Codes

Spine
- Special Symptoms or Syndromes, NEC : 307
- Migraine : 346
- Trigeminal Nerve Disorders : 350
- Nerve Root and Plexus Disorders : 353
- Dentofacial Anomalies, Including Malocclusion : 524
- Pain and Other Symptoms Associated with Female Genital Organs : 625
- Menopausal and Postmenopausal Disorders : 627
- General Symptoms : 780
- Symptoms Involving Skin and Other Integumentary Tissue : 782
- Symptoms Involving Head and Neck : 784
- Symptoms Involving Respiratory System and Other Chest Symptoms : 786
- Symptoms Involving Digestive System : 787
- Other Symptoms Involving Abdomen and Pelvis : 789
- Injury to Other Cranial Nerve(s) : 951
- Injury to Nerve Roots and Spinal Plexus : 953

Arthritis and Joint Pain
- Gonococcal Infections : 098
- Other Venereal Diseases : 099
- Other and Unspecified Infectious and Parasitic Diseases : 136
- Other and Unspecified Disorders of Metabolism : 277
- Purpura and Other Hemorrhagic Conditions : 287
- Other Paralytic Syndromes : 344
- Mononeuritis of Upper Limb and Mononeuritis Multiplex : 354
- Inflammatory and Toxic Neuropathy : 357
- Other and Ill-defined Cerebrovascular Disease : 437
- Other Peripheral Vascular Disease : 443
- Polyarteritis Nodosa and Allied Conditions : 446
- Other Disorders of Arteries and Arterioles : 447
- Psoriasis and Similar Disorders : 696

Osteoporosis
- Due to small sample sizes, no additional codes were included in the expansive analysis.

Musculoskeletal Injuries
- Open Wound of Neck : 874
- Open Wound of Other and Unspecified Sites, Except Limbs : 879
- Contusion of Trunk : 922
- Contusion of Upper Limb : 923
- Contusion of Lower Limb and of Other and Unspecified Sites : 924
- Crushing Injury of Trunk : 926

Other Musculoskeletal Conditions

Other Salmonella Infections : 3
Rat-bite Fever : 26
Meningococcal Infection : 36
Rubella : 56
Other Arthropod-borne Diseases : 88
Early Syphilis, Symptomatic : 91
Other Forms of Late Syphilis, with Symptoms : 95
Yaws : 102
Late Effects of Tuberculosis : 137
Malignant Neoplasm of Other and Ill-defined Sites : 195
Secondary Malignant Neoplasm of Other Specified Sites : 198
Other Malignant Neoplasms of Lymphoid and Histiocytic Tissue : 202
Multiple Myeloma and Immunoproliferative Neoplasms : 203
Other Benign Neoplasm of Connective and Other Soft Tissue : 215
Neoplasm of Uncertain Behavior of Other and Unspecified Sites and Tissues : 238
Neoplasms of Unspecified Nature : 239
Disorders of Parathyroid Gland : 252
Disorders of Lipoid Metabolism : 272
Disorders of Mineral Metabolism : 275
Hereditary Hemolytic Anemias : 282
Organic Sleep Disorders : 327
Mononeuritis of Lower Limb and Unspecified Site : 355
Peritonitis and Retroperitoneal Infections : 567
Other Cellulitis and Abscess : 682
Other and Unspecified Congenital Anomalies : 759
Late Effects of Injuries to Skin and Subcutaneous Tissues : 906
Certain Early Complications of Trauma : 958
Complications Peculiar to Certain Specified Procedures : 996
Personal History of Other Diseases : V13
Organ or Tissue Replaced By Transplant : V42
Organ or Tissue Replaced By Other Means : V43
Other Postprocedural States : V45
Problems with Head, Neck, and Trunk : V48
Fitting and Adjustment of Other Device : V53
Convalescence and Palliative Care : V66
Follow-up Examination : V67
Special Screening Examination for Bacterial and Spirochetal Diseases : V74

Table 10.1: Number and Percent of Population with Musculoskeletal Diseases by Age, United States 1996-2011

				Persons with Condition		Age Distribution			
Condition	Year	Sample N (annual)	Total Population (in millions)	# Individuals (in millions)	% Total Population	Under 18	18-44	45-64	65 & Over
	1996-1998	6,964	271.2	76.0	28.0%	11.6%	38.0%	28.7%	21.7%
	1997-1999	7,004	273.7	75.2	27.5%	11.4%	36.7%	29.5%	22.4%
	1998-2000	6,025	276.1	74.1	26.8%	11.2%	35.7%	30.5%	22.6%
	1999-2001	6,814	279.7	75.6	27.0%	10.5%	35.0%	31.6%	22.9%
	2000-2002	8,252	283.6	79.7	28.1%	9.8%	34.8%	32.5%	22.8%
	2001-2003	9,166	287.7	84.3	29.3%	9.5%	34.3%	33.4%	22.7%
All Musculoskeletal Diseases	2002-2004	9,337	290.8	87.6	30.1%	9.5%	33.7%	34.0%	22.7%
	2003-2005	8,874	293.4	88.9	30.3%	9.7%	32.7%	34.6%	23.0%
	2004-2006	8,947	296.3	89.7	30.3%	9.7%	31.8%	35.3%	23.1%
	2005-2007	8,791	298.9	91.3	30.5%	9.4%	31.1%	36.2%	23.3%
	2006-2008	8,812	301.7	94.6	31.3%	8.8%	30.5%	37.3%	23.4%
	2007-2009	9,181	304.1	98.6	32.4%	8.4%	30.0%	37.8%	23.8%
	2008-2010	9,323	306.5	101.1	33.0%	8.3%	29.3%	38.2%	24.2%
	2009-2011	9,522	308.8	102.5	33.2%	8.1%	29.1%	38.3%	24.5%
	1996-1998	2,510	271.2	27.4	10.1%	5.4%	47.5%	31.0%	16.1%
	1997-1999	2,580	273.7	27.9	10.2%	5.4%	45.8%	32.0%	16.8%
	1998-2000	2,199	276.1	27.2	9.9%	5.6%	44.6%	33.0%	16.9%
	1999-2001	2,411	279.7	27.3	9.7%	5.6%	44.4%	33.6%	16.4%
	2000-2002	2,927	283.6	28.8	10.2%	5.2%	44.1%	34.0%	16.7%
	2001-2003	3,258	287.7	30.6	10.6%	4.7%	42.8%	35.5%	17.0%
	2002-2004	3,408	290.8	32.7	11.3%	4.5%	41.5%	36.7%	17.3%
Spine	2003-2005	3,312	293.4	34.0	11.6%	4.4%	40.5%	37.4%	17.7%
	2004-2006	3,415	296.3	34.9	11.8%	4.3%	39.6%	37.7%	18.4%
	2005-2007	3,263	298.9	34.4	11.5%	4.2%	38.7%	38.1%	19.0%
	2006-2008	2,964	301.7	32.2	10.7%	4.2%	38.0%	38.7%	19.1%
	2007-2009	2,763	304.1	30.6	10.1%	4.5%	37.6%	38.7%	19.2%
	2008-2010	2,654	306.5	30.1	9.8%	4.5%	36.8%	39.3%	19.3%
	2009-2011	2,727	308.8	31.0	10.1%	4.6%	36.4%	39.0%	20.0%

Table 10.1: Number and Percent of Population with Musculoskeletal Diseases by Age, United States 1996-2011

Condition	Year	Sample N (annual)	Total Population (in millions)	Persons with Condition: # Individuals (in millions)	Persons with Condition: % Total Population	Age Distribution: Under 18	Age Distribution: 18-44	Age Distribution: 45-64	Age Distribution: 65 & Over
Arthritis and Joint Pain [1]	1996-1998	2,710	271.2	29.0	10.7%	[1]	25.6%	37.5%	36.9%
	1997-1999	2,759	273.7	29.1	10.6%	[1]	24.0%	38.6%	37.4%
	1998-2000	2,414	276.1	29.2	10.6%	[1]	22.8%	39.8%	37.4%
	1999-2001	2,837	279.7	31.1	11.1%	[1]	22.2%	40.3%	37.5%
	2000-2002	3,514	283.6	33.6	11.8%	[1]	22.3%	41.2%	36.5%
	2001-2003	3,931	287.7	35.9	12.5%	[1]	22.7%	42.0%	35.3%
	2002-2004	3,979	290.8	36.6	12.6%	[1]	22.3%	42.8%	34.9%
	2003-2005	3,702	293.4	36.1	12.3%	[1]	21.5%	43.2%	35.4%
	2004-2006	3,683	296.3	35.8	12.1%	[1]	20.5%	43.7%	35.7%
	2005-2007	3,813	298.9	38.9	13.0%	[1]	20.6%	44.3%	35.1%
	2006-2008	4,379	301.7	46.9	15.5%	[1]	21.8%	44.9%	33.4%
	2007-2009	5,153	304.1	55.0	18.1%	[1]	23.0%	44.7%	32.2%
	2008-2010	5,539	306.5	59.6	19.4%	[1]	23.2%	45.0%	31.8%
	2009-2011	5,725	308.8	60.8	19.7%	[1]	22.7%	45.1%	32.3%
Osteoporosis	1996-1998	299	271.2	3.2	1.2%	4.3%	10.7%	34.8%	50.1%
	1997-1999	321	273.7	3.4	1.2%	3.1%	8.6%	32.8%	55.5%
	1998-2000	308	276.1	3.8	1.4%	2.3%	7.3%	31.5%	58.9%
	1999-2001	395	279.7	4.4	1.6%	2.2%	6.5%	32.1%	59.2%
	2000-2002	537	283.6	5.3	1.9%	1.9%	6.5%	34.7%	56.9%
	2001-2003	645	287.7	6.1	2.1%	1.7%	6.3%	37.5%	54.5%
	2002-2004	705	290.8	6.8	2.3%	1.3%	6.5%	38.2%	54.0%
	2003-2005	716	293.4	7.4	2.5%	1.2%	6.3%	39.0%	53.5%
	2004-2006	773	296.3	7.9	2.7%	1.4%	5.5%	39.9%	53.2%
	2005-2007	774	298.9	8.2	2.7%	1.7%	4.8%	40.9%	52.7%
	2006-2008	723	301.7	8.1	2.7%	1.7%	4.9%	41.3%	52.1%
	2007-2009	654	304.1	7.6	2.5%	1.9%	5.7%	40.6%	51.8%
	2008-2010	594	306.5	7.0	2.3%	2.2%	6.3%	40.7%	50.9%
	2009-2011	552	308.8	6.4	2.1%	2.4%	6.3%	42.1%	49.1%

Table 10.1: Number and Percent of Population with Musculoskeletal Diseases by Age, United States 1996-2011

				Persons with Condition		Age Distribution			
Condition	Year	Sample N (annual)	Total Population (in millions)	# Individuals (in millions)	% Total Population	Under 18	18-44	45-64	65 & Over
Injuries	1996-1998	2,093	271.2	23.4	8.6%	24.2%	43.4%	19.4%	13.0%
	1997-1999	2,047	273.7	22.5	8.2%	24.8%	41.8%	20.0%	13.3%
	1998-2000	1,698	276.1	21.6	7.8%	24.5%	41.8%	21.0%	12.7%
	1999-2001	1,869	279.7	21.4	7.7%	23.0%	41.8%	22.4%	12.8%
	2000-2002	2,235	283.6	22.3	7.9%	21.4%	41.8%	23.4%	13.4%
	2001-2003	2,492	287.7	23.6	8.2%	21.0%	41.1%	24.1%	13.8%
	2002-2004	2,545	290.8	24.7	8.5%	21.2%	40.2%	24.6%	14.0%
	2003-2005	2,442	293.4	25.2	8.6%	22.0%	38.6%	25.2%	14.3%
	2004-2006	2,438	296.3	25.4	8.6%	21.8%	37.2%	26.5%	14.5%
	2005-2007	2,369	298.9	25.5	8.5%	20.9%	36.5%	28.1%	14.6%
	2006-2008	2,289	301.7	25.6	8.5%	20.2%	36.0%	29.4%	14.4%
	2007-2009	2,269	304.1	25.6	8.4%	20.2%	35.4%	29.9%	14.4%
	2008-2010	2,198	306.5	25.1	8.2%	20.7%	34.5%	30.2%	14.6%
	2009-2011	2,173	308.8	24.8	8.0%	19.9%	34.8%	30.7%	14.5%
Other Musculoskeletal Conditions	1996-1998	1,173	271.2	12.0	4.4%	11.8%	30.6%	31.5%	26.1%
	1997-1999	1,174	273.7	11.8	4.3%	10.4%	30.4%	32.9%	26.3%
	1998-2000	983	276.1	11.3	4.1%	9.7%	29.7%	34.2%	26.4%
	1999-2001	1,098	279.7	11.5	4.1%	9.7%	28.6%	35.5%	26.2%
	2000-2002	1,345	283.6	12.4	4.4%	9.6%	28.3%	36.4%	25.7%
	2001-2003	1,546	287.7	13.6	4.7%	9.8%	27.8%	37.1%	25.3%
	2002-2004	1,618	290.8	14.5	5.0%	9.5%	27.0%	38.4%	25.1%
	2003-2005	1,559	293.4	14.8	5.0%	9.0%	26.0%	39.5%	25.5%
	2004-2006	1,564	296.3	14.7	5.0%	8.8%	25.5%	40.5%	25.2%
	2005-2007	1,465	298.9	14.3	4.8%	8.9%	25.5%	40.0%	25.6%
	2006-2008	1,438	301.7	14.8	4.9%	9.1%	25.5%	40.6%	24.7%
	2007-2009	1,514	304.1	15.8	5.2%	8.9%	26.1%	40.6%	24.5%
	2008-2010	1,643	306.5	17.6	5.7%	7.7%	26.9%	41.5%	23.8%
	2009-2011	1,744	308.8	18.6	6.0%	7.7%	26.5%	41.2%	24.6%

Table 10.1: Number and Percent of Population with Musculoskeletal Diseases by Age, United States 1996-2011

				Persons with Condition		Age Distribution			
Condition	Year	Sample N (annual)	Total Population (in millions)	# Individuals (in millions)	% Total Population	Under 18	18-44	45-64	65 & Over

[1] Methodological changes in MEPS in 2001 and 2007 improved the accuracy of capturing these conditions; therefore, the increased number of people with these conditions in 2001 and 2007 cannot be attributed solely to the increased size of the underlying population. Because misclassification for arthritis has been demonstrated in children, reported arthritis for individuals <18 is not included.

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011 http://meps.ahrq.gov/mepsweb/ / SAS source: 008Table1_series.sas

Table 10.1.1: Number of Persons with Musculoskeletal Diseases by Age, United States 1996-2011

Condition	Year	Sample N (annual)	Total Population (in millions)	Persons with Condition (in millions): Total	Under 18	18-44	45-64	65 & Over
All Musculoskeletal Diseases	1996-1998	6,964	271.2	76.0	8.82	28.88	21.81	16.49
	1997-1999	7,004	273.7	75.2	8.57	27.60	22.18	16.84
	1998-2000	6,025	276.1	74.1	8.30	26.45	22.60	16.75
	1999-2001	6,814	279.7	75.6	7.94	26.46	23.89	17.31
	2000-2002	8,252	283.6	79.7	7.81	27.74	25.90	18.17
	2001-2003	9,166	287.7	84.3	8.01	28.91	28.16	19.14
	2002-2004	9,337	290.8	87.6	8.32	29.52	29.78	19.89
	2003-2005	8,874	293.4	88.9	8.62	29.07	30.76	20.45
	2004-2006	8,947	296.3	89.7	8.70	28.52	31.66	20.72
	2005-2007	8,791	298.9	91.3	8.58	28.39	33.05	21.27
	2006-2008	8,812	301.7	94.6	8.32	28.85	35.29	22.14
	2007-2009	9,181	304.1	98.6	8.28	29.58	37.27	23.47
	2008-2010	9,323	306.5	101.1	8.39	29.62	38.62	24.47
	2009-2011	9,522	308.8	102.5	8.30	29.83	39.26	25.11
Spine	1996-1998	2,510	271.2	27.4	1.48	13.02	8.49	4.41
	1997-1999	2,580	273.7	27.9	1.51	12.78	8.93	4.69
	1998-2000	2,199	276.1	27.2	1.52	12.13	8.98	4.60
	1999-2001	2,411	279.7	27.3	1.53	12.12	9.17	4.48
	2000-2002	2,927	283.6	28.8	1.50	12.70	9.79	4.81
	2001-2003	3,258	287.7	30.6	1.44	13.10	10.86	5.20
	2002-2004	3,408	290.8	32.7	1.47	13.57	12.00	5.66
	2003-2005	3,312	293.4	34.0	1.50	13.77	12.72	6.02
	2004-2006	3,415	296.3	34.9	1.50	13.82	13.16	6.42
	2005-2007	3,263	298.9	34.4	1.44	13.31	13.11	6.54
	2006-2008	2,964	301.7	32.2	1.35	12.24	12.46	6.15
	2007-2009	2,763	304.1	30.6	1.38	11.51	11.84	5.88
	2008-2010	2,654	306.5	30.1	1.35	11.08	11.83	5.81
	2009-2011	2,727	308.8	31.0	1.43	11.28	12.09	6.20

Table 10.1.1: Number of Persons with Musculoskeletal Diseases by Age, United States 1996-2011

				Persons with Condition (in millions)				
Condition	Year	Sample N (annual)	Total Population (in millions)	Total	Under 18	18-44	45-64	65 & Over
Arthritis and Joint Pain [1]	1996-1998	2,710	271.2	29.0	[1]	7.42	10.88	10.70
	1997-1999	2,759	273.7	29.1	[1]	6.98	11.23	10.88
	1998-2000	2,414	276.1	29.2	[1]	6.66	11.62	10.92
	1999-2001	2,837	279.7	31.1	[1]	6.90	12.53	11.66
	2000-2002	3,514	283.6	33.6	[1]	7.49	13.84	12.26
	2001-2003	3,931	287.7	35.9	[1]	8.15	15.08	12.67
	2002-2004	3,979	290.8	36.6	[1]	8.16	15.66	12.77
	2003-2005	3,702	293.4	36.1	[1]	7.76	15.60	12.78
	2004-2006	3,683	296.3	35.8	[1]	7.34	15.64	12.78
	2005-2007	3,813	298.9	38.9	[1]	8.01	17.23	13.65
	2006-2008	4,379	301.7	46.9	[1]	10.22	21.06	15.66
	2007-2009	5,153	304.1	55.0	[1]	12.65	24.59	17.71
	2008-2010	5,539	306.5	59.6	[1]	13.83	26.82	18.95
	2009-2011	5,725	308.8	60.8	[1]	13.80	27.42	19.64
Osteoporosis	1996-1998	299	271.2	3.2	0.14	0.34	1.11	1.60
	1997-1999	321	273.7	3.4	0.11	0.29	1.12	1.89
	1998-2000	308	276.1	3.8	0.09	0.28	1.20	2.24
	1999-2001	395	279.7	4.4	0.10	0.29	1.41	2.60
	2000-2002	537	283.6	5.3	0.10	0.34	1.84	3.02
	2001-2003	645	287.7	6.1	0.10	0.38	2.29	3.32
	2002-2004	705	290.8	6.8	0.09	0.44	2.60	3.67
	2003-2005	716	293.4	7.4	0.09	0.47	2.89	3.96
	2004-2006	773	296.3	7.9	0.11	0.43	3.15	4.20
	2005-2007	774	298.9	8.2	0.14	0.39	3.35	4.32
	2006-2008	723	301.7	8.1	0.14	0.40	3.35	4.22
	2007-2009	654	304.1	7.6	0.14	0.43	3.09	3.94
	2008-2010	594	306.5	7.0	0.15	0.44	2.85	3.56
	2009-2011	552	308.8	6.4	0.15	0.40	2.69	3.14

Table 10.1.1: Number of Persons with Musculoskeletal Diseases by Age, United States 1996-2011

Condition	Year	Sample N (annual)	Total Population (in millions)	Persons with Condition (in millions): Total	Under 18	18-44	45-64	65 & Over
Injuries	1996-1998	2,093	271.2	23.4	5.66	10.16	4.54	3.04
	1997-1999	2,047	273.7	22.5	5.58	9.41	4.50	2.99
	1998-2000	1,698	276.1	21.6	5.29	9.03	4.54	2.74
	1999-2001	1,869	279.7	21.4	4.92	8.95	4.79	2.74
	2000-2002	2,235	283.6	22.3	4.77	9.32	5.22	2.99
	2001-2003	2,492	287.7	23.6	4.96	9.70	5.69	3.26
	2002-2004	2,545	290.8	24.7	5.24	9.93	6.08	3.46
	2003-2005	2,442	293.4	25.2	5.54	9.73	6.35	3.60
	2004-2006	2,438	296.3	25.4	5.54	9.45	6.73	3.68
	2005-2007	2,369	298.9	25.5	5.33	9.31	7.17	3.72
	2006-2008	2,289	301.7	25.6	5.17	9.22	7.53	3.69
	2007-2009	2,269	304.1	25.6	5.17	9.06	7.65	3.69
	2008-2010	2,198	306.5	25.1	5.20	8.66	7.58	3.66
	2009-2011	2,173	308.8	24.8	4.94	8.63	7.61	3.60
Other Musculoskeletal Conditions	1996-1998	1,173	271.2	12.0	1.42	3.67	3.78	3.13
	1997-1999	1,174	273.7	11.8	1.23	3.59	3.88	3.10
	1998-2000	983	276.1	11.3	1.10	3.36	3.86	2.98
	1999-2001	1,098	279.7	11.5	1.12	3.29	4.08	3.01
	2000-2002	1,345	283.6	12.4	1.19	3.51	4.51	3.19
	2001-2003	1,546	287.7	13.6	1.33	3.78	5.05	3.44
	2002-2004	1,618	290.8	14.5	1.38	3.92	5.57	3.64
	2003-2005	1,559	293.4	14.8	1.33	3.85	5.85	3.77
	2004-2006	1,564	296.3	14.7	1.29	3.75	5.95	3.70
	2005-2007	1,465	298.9	14.3	1.27	3.65	5.72	3.66
	2006-2008	1,438	301.7	14.8	1.35	3.77	6.01	3.66
	2007-2009	1,514	304.1	15.8	1.41	4.12	6.41	3.87
	2008-2010	1,643	306.5	17.6	1.36	4.73	7.30	4.19
	2009-2011	1,744	308.8	18.6	1.43	4.93	7.66	4.58

Table 10.1.1: Number of Persons with Musculoskeletal Diseases by Age, United States 1996-2011

Condition	Year	Sample N (annual)	Total Population (in millions)	Persons with Condition (in millions) Total	Under 18	18-44	45-64	65 & Over

[1] Methodological changes in MEPS in 2001 and 2007 improved the accuracy of capturing these conditions; therefore, the increased number of people with these conditions in 2001 and 2007 cannot be attributed solely to the increased size of the underlying population. Because misclassification for arthritis has been demonstrated in children, reported arthritis for individuals <18 is not included.

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011 http://meps.ahrq.gov/mepsweb/ SAS source: 008Table1_series.sas

Table 10.2: Health Care Utilization, by Type, for Persons with Musculoskeletal Diseases, United States 1996-2011

		Ambulatory Physician Visits			Ambulatory Non-Physician Care Visits			Prescription Medication Filled			Home Health Care Visits			Hospital Discharges		
Condition	Year	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Fills	Total Meds (in millions)	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Visits	Total Discharges (in millions)
All Musculoskeletal Diseases	1996-1998	84.8%	5.6	425.5	39.7%	2.6	197.5	81.3%	13.1	995.3	5.1%	3.9	296.3	11.1%	0.2	15.2
	1997-1999	84.9%	5.6	421.0	40.9%	2.7	203.0	81.3%	13.8	1,037.4	5.0%	3.8	285.7	11.6%	0.2	15.0
	1998-2000	85.3%	5.7	422.2	41.0%	2.8	207.4	82.5%	14.6	1,081.5	4.6%	3.4	251.9	11.6%	0.2	14.8
	1999-2001	85.9%	5.7	430.9	42.0%	2.8	211.7	83.8%	15.7	1,186.9	4.6%	3.5	264.6	11.8%	0.2	15.1
	2000-2002	86.0%	5.8	462.5	45.1%	3.1	247.2	84.5%	16.8	1,339.8	4.7%	3.7	295.1	11.7%	0.2	16.0
	2001-2003	85.8%	5.8	488.9	49.2%	3.5	295.0	84.5%	17.8	1,500.5	4.8%	3.5	295.0	11.8%	0.2	16.9
	2002-2004	85.1%	5.8	507.9	51.5%	3.8	332.8	83.5%	18.6	1,628.9	4.7%	3.5	306.5	11.7%	0.2	17.5
	2003-2005	84.6%	5.7	507.0	52.2%	4.0	355.8	83.2%	18.9	1,681.1	4.7%	3.3	293.5	11.8%	0.2	17.8
	2004-2006	84.3%	5.7	511.0	52.4%	4.0	358.6	82.9%	19.4	1,739.3	4.6%	3.3	295.9	11.5%	0.2	17.9
	2005-2007	84.3%	5.6	511.4	52.6%	3.9	356.1	82.6%	19.6	1,789.9	4.7%	3.4	310.5	11.6%	0.2	18.3
	2006-2008	84.6%	5.6	529.7	52.4%	3.8	359.4	82.8%	20.1	1,901.1	4.8%	3.5	331.0	11.6%	0.2	18.9
	2007-2009	84.5%	5.6	552.2	52.0%	3.8	374.7	83.0%	20.4	2,011.6	4.9%	3.7	364.8	11.7%	0.2	19.7
	2008-2010	84.5%	5.6	566.0	52.0%	3.7	374.0	83.4%	20.8	2,102.3	5.0%	3.8	384.1	11.3%	0.2	20.2
	2009-2011	84.8%	5.6	574.0	51.8%	3.7	379.3	83.7%	20.8	2,132.1	4.9%	3.8	389.5	11.0%	0.2	20.5
Spine	1996-1998	83.2%	6.2	169.7	46.7%	3.7	101.3	80.3%	12.9	353.2	4.1%	2.7	73.9	10.7%	0.2	5.5
	1997-1999	83.0%	6.1	170.2	48.4%	3.9	108.8	80.3%	13.3	371.0	3.9%	3.0	83.7	11.0%	0.2	5.6
	1998-2000	84.0%	6.2	168.7	49.1%	4.1	111.5	81.5%	14.2	386.3	3.6%	2.8	76.2	11.1%	0.2	5.4
	1999-2001	84.6%	6.2	169.0	49.5%	4.2	114.5	82.9%	15.4	419.9	3.5%	2.5	68.2	11.5%	0.2	5.5
	2000-2002	84.7%	6.2	178.7	52.4%	4.5	129.7	83.5%	16.7	481.4	3.7%	2.2	63.4	11.4%	0.2	5.8
	2001-2003	84.3%	6.1	186.7	56.1%	4.9	150.0	83.6%	17.8	544.8	3.9%	2.2	67.3	11.5%	0.2	6.1
	2002-2004	83.6%	6.1	199.7	58.6%	5.3	173.5	82.6%	18.6	609.0	4.0%	2.3	75.3	11.6%	0.2	6.5
	2003-2005	83.2%	6.1	207.2	59.3%	5.5	186.8	82.8%	19.3	655.6	4.2%	2.6	88.3	12.1%	0.2	6.8
	2004-2006	82.8%	6.1	213.2	60.0%	5.4	188.7	82.8%	20.0	698.9	4.4%	2.9	101.3	12.2%	0.2	7.0
	2005-2007	83.0%	6.1	210.0	60.6%	5.3	182.5	82.7%	20.4	702.3	4.5%	3.2	110.2	12.3%	0.2	6.9
	2006-2008	83.8%	6.2	199.7	60.9%	5.4	173.9	82.7%	20.9	673.1	4.3%	3.1	99.8	12.0%	0.2	6.4
	2007-2009	84.6%	6.3	193.0	61.2%	5.6	171.6	83.1%	21.3	652.5	4.6%	3.1	95.0	12.2%	0.2	6.1
	2008-2010	85.0%	6.4	192.7	62.3%	5.8	174.7	83.6%	21.8	656.5	4.5%	2.7	81.3	11.8%	0.2	6.0
	2009-2011	85.3%	6.4	198.7	62.7%	5.9	183.2	84.5%	21.9	679.9	4.6%	2.6	80.7	11.8%	0.2	6.2

Table 10.2: Health Care Utilization, by Type, for Persons with Musculoskeletal Diseases, United States 1996-2011

		Ambulatory Physician Visits			Ambulatory Non-Physician Care Visits			Prescription Medication Filled			Home Health Care Visits			Hospital Discharges		
Condition	Year	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Fills	Total Meds (in millions)	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Visits	Total Discharges (in millions)
Arthritis and Joint Pain [1]	1996-1998	90.0%	6.9	199.9	42.7%	2.7	78.2	89.8%	19.4	561.9	8.1%	6.5	188.3	13.7%	0.2	5.8
	1997-1999	90.4%	6.9	200.6	43.6%	2.6	75.6	89.7%	20.6	598.8	7.9%	6.4	186.0	14.5%	0.2	5.8
	1998-2000	90.1%	6.9	201.8	43.4%	2.6	76.0	90.3%	21.6	631.8	7.1%	5.8	169.6	14.3%	0.2	5.9
	1999-2001	90.3%	6.9	214.7	44.8%	2.8	87.1	91.1%	22.9	712.5	7.0%	5.5	171.1	14.8%	0.2	6.2
	2000-2002	90.5%	7.0	235.1	48.0%	3.3	110.8	91.9%	24.0	806.2	7.1%	5.4	181.4	14.7%	0.2	6.7
	2001-2003	90.8%	7.1	254.9	52.7%	3.8	136.4	91.7%	25.3	908.3	7.2%	5.2	186.7	14.9%	0.2	7.2
	2002-2004	90.3%	7.2	263.7	55.3%	4.2	153.8	91.2%	26.6	974.2	7.1%	5.3	194.1	14.8%	0.2	7.3
	2003-2005	90.0%	7.2	260.2	56.0%	4.3	155.4	90.9%	27.0	975.8	7.1%	5.0	180.7	15.0%	0.2	7.2
	2004-2006	89.6%	7.1	253.9	55.8%	4.4	157.4	90.6%	27.6	987.0	7.0%	4.9	175.2	14.4%	0.2	7.2
	2005-2007	89.1%	6.9	268.7	55.3%	4.3	167.4	90.0%	27.3	1,063.0	7.1%	4.9	190.8	14.5%	0.2	7.8
	2006-2008	88.4%	6.7	314.6	54.4%	4.2	197.2	89.3%	27.4	1,286.4	7.1%	5.1	239.4	14.4%	0.2	9.4
	2007-2009	87.5%	6.5	357.2	53.3%	4.1	225.3	89.0%	27.2	1,494.8	7.0%	5.4	296.8	14.6%	0.2	11.0
	2008-2010	87.1%	6.5	387.4	52.6%	3.9	232.5	89.1%	27.4	1,633.2	6.9%	5.6	333.8	14.0%	0.2	11.9
	2009-2011	87.4%	6.6	401.2	52.4%	3.9	237.1	89.5%	27.3	1,659.6	6.7%	5.5	334.4	13.4%	0.2	12.2
Osteoporosis	1996-1998	96.4%	9.5	30.0	54.1%	3.4	10.7	95.6%	27.8	87.8	10.3%	7.7	24.3	19.2%	0.3	0.9
	1997-1999	97.3%	9.5	32.4	54.7%	4.0	13.6	95.5%	28.0	95.4	10.4%	8.5	28.9	18.5%	0.3	1.0
	1998-2000	97.2%	9.2	34.8	54.6%	4.0	15.1	95.5%	27.9	105.7	8.7%	7.4	28.0	17.8%	0.3	1.1
	1999-2001	96.6%	8.9	39.6	56.3%	3.6	16.0	95.9%	29.3	130.2	8.9%	7.8	34.7	17.2%	0.2	0.9
	2000-2002	95.9%	8.8	46.3	58.9%	3.7	19.5	96.6%	31.4	165.3	9.4%	8.2	43.2	17.1%	0.2	1.1
	2001-2003	95.2%	8.7	53.4	63.5%	4.2	25.8	97.2%	32.2	197.6	10.3%	8.6	52.8	17.1%	0.3	1.8
	2002-2004	95.6%	8.4	57.3	64.8%	4.4	30.0	97.1%	31.3	213.5	9.7%	7.6	51.8	15.4%	0.2	1.4
	2003-2005	95.0%	8.2	60.5	66.3%	4.6	34.0	97.7%	31.0	228.9	8.3%	5.9	43.6	15.3%	0.2	1.5
	2004-2006	95.6%	8.0	63.0	66.2%	4.7	37.0	97.8%	32.7	257.5	7.9%	4.9	38.6	15.3%	0.2	1.6
	2005-2007	95.5%	8.2	67.1	66.9%	4.8	39.3	98.0%	33.5	274.1	7.8%	4.8	39.3	16.3%	0.2	1.6
	2006-2008	96.1%	8.5	68.5	67.0%	4.6	37.1	97.8%	33.8	272.5	8.9%	5.9	47.6	16.9%	0.2	1.6
	2007-2009	95.3%	8.3	63.1	67.1%	4.4	33.5	97.2%	32.7	248.8	8.9%	6.5	49.4	15.7%	0.2	1.5
	2008-2010	94.7%	8.1	57.1	67.0%	4.3	30.3	97.4%	33.5	236.1	8.8%	7.2	50.7	14.0%	0.2	1.4
	2009-2011	94.1%	7.8	50.1	65.8%	4.5	28.9	97.2%	33.0	211.9	8.2%	7.4	47.5	13.4%	0.2	1.3

Table 10.2: Health Care Utilization, by Type, for Persons with Musculoskeletal Diseases, United States 1996-2011

		Ambulatory Physician Visits			Ambulatory Non-Physician Care Visits			Prescription Medication Filled			Home Health Care Visits			Hospital Discharges		
Condition	Year	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Fills	Total Meds (in millions)	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Visits	Total Discharges (in millions)
Injuries	1996-1998	83.0%	4.8	112.1	36.2%	2.3	53.7	76.3%	8.6	200.9	4.2%	2.7	63.1	10.3%	0.1	2.3
	1997-1999	82.9%	4.9	110.2	37.4%	2.6	58.5	76.4%	9.3	209.2	4.1%	3.1	69.7	10.8%	0.1	2.3
	1998-2000	83.5%	5.0	108.0	37.3%	2.8	60.5	77.6%	10.0	215.9	4.1%	3.2	69.1	11.1%	0.1	2.2
	1999-2001	84.0%	5.2	111.5	37.9%	2.8	60.0	78.7%	11.0	235.9	4.0%	3.3	70.8	11.4%	0.2	4.3
	2000-2002	83.8%	5.3	118.1	40.3%	3.0	66.9	79.1%	12.1	269.7	4.2%	3.6	80.2	11.4%	0.2	4.5
	2001-2003	83.6%	5.3	124.9	44.2%	3.3	77.8	78.5%	13.2	311.1	4.4%	3.4	80.1	11.3%	0.2	4.7
	2002-2004	82.7%	5.2	128.3	46.3%	3.7	91.3	77.8%	13.8	340.6	4.3%	3.2	79.0	10.7%	0.2	4.9
	2003-2005	82.2%	5.2	131.1	46.9%	3.9	98.4	77.3%	13.8	348.0	4.2%	2.8	70.6	10.8%	0.2	5.0
	2004-2006	82.1%	5.2	131.9	47.3%	3.9	98.9	77.1%	14.0	355.1	3.8%	2.8	71.0	10.6%	0.1	2.5
	2005-2007	82.6%	5.2	132.7	48.2%	3.9	99.5	76.7%	14.5	370.1	4.0%	2.6	66.4	11.1%	0.2	5.1
	2006-2008	83.0%	5.2	132.9	48.8%	3.8	97.1	76.9%	14.7	375.7	3.8%	2.3	58.8	10.6%	0.1	2.6
	2007-2009	82.7%	5.2	133.0	49.6%	3.9	99.7	77.4%	14.8	378.4	4.0%	2.4	61.4	10.4%	0.1	2.6
	2008-2010	82.9%	5.3	133.0	49.6%	4.0	100.4	78.1%	15.4	386.5	4.3%	2.8	70.3	9.8%	0.1	2.5
	2009-2011	83.3%	5.3	131.4	49.4%	4.0	99.2	78.5%	16.0	396.6	4.5%	3.3	81.8	10.0%	0.1	2.5
Other Musculoskeletal Conditions	1996-1998	89.8%	7.5	90.3	44.4%	3.4	41.0	86.6%	18.8	226.5	8.3%	6.7	80.7	14.0%	0.2	2.4
	1997-1999	90.6%	7.6	89.8	45.5%	3.6	42.5	87.7%	19.9	235.0	8.1%	6.5	76.8	14.9%	0.2	2.4
	1998-2000	90.8%	7.5	84.9	44.8%	3.4	38.5	88.4%	21.2	240.0	7.4%	6.0	67.9	16.2%	0.3	3.4
	1999-2001	90.8%	7.5	86.4	46.7%	3.4	39.2	89.6%	22.5	259.3	7.4%	6.5	74.9	16.3%	0.3	3.5
	2000-2002	90.6%	7.6	93.9	49.4%	3.7	45.7	89.8%	24.1	297.6	7.0%	6.8	84.0	16.0%	0.2	2.5
	2001-2003	89.9%	7.7	105.1	54.4%	4.5	61.4	90.0%	25.4	346.5	6.7%	6.0	81.9	15.0%	0.2	2.7
	2002-2004	90.2%	7.8	113.2	56.4%	4.9	71.1	89.5%	26.4	383.3	6.5%	5.8	84.2	15.3%	0.2	2.9
	2003-2005	90.0%	7.8	115.5	57.9%	5.2	77.0	89.0%	27.5	407.3	7.2%	5.7	84.4	15.7%	0.2	3.0
	2004-2006	90.1%	7.9	116.4	58.2%	5.3	78.1	88.3%	28.2	415.6	7.2%	5.6	82.5	15.3%	0.2	2.9
	2005-2007	89.9%	7.7	109.7	59.4%	5.4	77.0	87.5%	28.2	401.9	7.3%	6.0	85.5	15.0%	0.2	2.9
	2006-2008	90.2%	7.6	112.2	60.1%	5.5	81.2	87.6%	27.7	408.9	6.9%	5.3	78.2	13.8%	0.2	3.0
	2007-2009	90.2%	7.5	118.3	60.4%	5.4	85.1	87.4%	27.4	432.1	7.3%	5.5	86.7	14.2%	0.2	3.2
	2008-2010	90.4%	7.5	132.0	59.9%	5.3	93.3	87.9%	27.9	491.0	7.4%	5.2	91.5	14.1%	0.2	3.5
	2009-2011	90.4%	7.4	137.7	59.1%	4.8	89.3	88.6%	27.9	519.3	7.0%	5.2	96.8	13.9%	0.2	3.7

Table 10.2: Health Care Utilization, by Type, for Persons with Musculoskeletal Diseases, United States 1996-2011

		Ambulatory Physician Visits			Ambulatory Non-Physician Care Visits			Prescription Medication Filled			Home Health Care Visits			Hospital Discharges		
Condition	Year	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Fills	Total Meds (in millions)	% With Any	Mean Visits	Total Visits (in millions)	% With Any	Mean Visits	Total Discharges (in millions)

[1] Methodological changes in MEPS in 2001 and 2007 improved the accuracy of capturing these conditions; therefore, the increased number of people with these conditions in 2001 and 2007 cannot be attributed solely to the increased size of the underlying population. Because misclassification for arthritis has been demonstrated in children, reported arthritis for individuals <18 is not included.

Note: Totals may differ by orders of magnitude, e.g. prescriptions filled vs. hospital discharges

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011 http://meps.ahrq.gov/mepsweb/

Table 10.3: Annual Average Change in Total Units of Health Utilization, by Type of Care, for Persons with Musculoskeletal Diseases, United States 1996-2011

MEPS Data Years Averaged			Ambulatory Physician Visits	Ambulatory Non-physician Visits	Prescription Medication Filled (Meds)	Home Health Care Visits	Hospital Discharges
1996-1998	to	1997-1999	-1.1%	2.7%	4.2%	-3.6%	-1.1%
1997-1999	to	1998-2000	0.3%	2.2%	4.3%	-11.8%	-1.5%
1998-2000	to	1999-2001	2.1%	2.1%	9.7%	5.1%	2.1%
1999-2001	to	2000-2002	7.3%	16.8%	12.9%	11.5%	5.5%
2000-2002	to	2001-2003	5.7%	19.3%	12.0%	0.0%	5.7%
2001-2003	to	2002-2004	3.9%	12.8%	8.6%	3.9%	3.9%
2002-2004	to	2003-2005	-0.2%	6.9%	3.2%	-4.2%	1.6%
2003-2005	to	2004-2006	0.8%	0.8%	3.5%	0.8%	0.8%
2004-2006	to	2005-2007	0.1%	-0.7%	2.9%	4.9%	1.9%
2005-2007	to	2006-2008	3.6%	0.9%	6.2%	6.6%	3.6%
2006-2008	to	2007-2009	4.3%	4.3%	5.8%	10.2%	4.3%
2007-2009	to	2008-2010	2.5%	-0.2%	4.5%	5.3%	2.5%
2008-2010	to	2009-2011	1.4%	1.4%	1.4%	1.4%	1.4%
1996-1998	to	2009-2011	2.5%	6.6%	8.2%	2.2%	2.5%
Annual Average Change for Select Musculoskeletal Diseases, 1996-1998 to 2009-2011							
Spine			1.2%	5.8%	6.6%	0.7%	1.0%
Arthritis [1]			7.2%	14.5%	14.0%	5.5%	7.8%
Osteoporosis			4.8%	12.1%	10.1%	6.8%	2.5%
Musculoskeletal Injuries			1.2%	6.0%	7.0%	2.1%	0.4%
Other Musculoskeletal Conditions			3.7%	8.4%	9.2%	1.4%	3.9%

[1] Methodological changes in MEPS in 2001 and 2007 improved the accuracy of capturing these conditions; therefore, the increased number of people with these conditions in 2001 and 2007 cannot be attributed solely to the increased size of the underlying population. Because misclassification for arthritis has been demonstrated in children, reported arthritis for individuals <18 is not included.

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011 http://meps.ahrq.gov/mepsweb/

Table 10.4: Per Person Components of Total Direct Costs in 2011 Dollars for Musculoskeletal Diseases, United States 1996-2011

		Total Mean and % of All Costs (2011 $s)								
Condition	Year	Ambulatory Care		Inpatient		Prescription		Other		All
		Mean	% All Costs	Mean	% All Costs	Mean	% All Costs	Mean	% All Costs	Mean
	1996-1998	$1,522	31%	$1,758	36%	$665	14%	$887	18%	$4,832
	1997-1999	$1,544	31%	$1,852	37%	$754	15%	$887	18%	$5,037
	1998-2000	$1,609	31%	$1,894	36%	$843	16%	$852	16%	$5,197
	1999-2001	$1,725	31%	$1,896	34%	$979	18%	$918	17%	$5,518
	2000-2002	$1,914	33%	$1,919	33%	$1,103	19%	$947	16%	$5,883
	2001-2003	$2,058	33%	$2,001	32%	$1,265	20%	$982	16%	$6,306
All Musculoskeletal Diseases	2002-2004	$2,189	33%	$2,151	32%	$1,380	21%	$995	15%	$6,715
	2003-2005	$2,246	32%	$2,209	32%	$1,483	21%	$986	14%	$6,924
	2004-2006	$2,333	33%	$2,107	30%	$1,539	22%	$1,004	14%	$6,984
	2005-2007	$2,379	33%	$2,175	30%	$1,590	22%	$1,026	14%	$7,169
	2006-2008	$2,439	33%	$2,149	29%	$1,631	22%	$1,087	15%	$7,306
	2007-2009	$2,551	34%	$2,209	29%	$1,671	22%	$1,150	15%	$7,581
	2008-2010	$2,575	34%	$2,155	28%	$1,702	22%	$1,146	15%	$7,578
	2009-2011	$2,614	34%	$2,237	29%	$1,778	23%	$1,139	15%	$7,768
	1996-1998	$1,704	35%	$1,755	36%	$650	13%	$726	15%	$4,835
	1997-1999	$1,672	34%	$1,751	35%	$725	15%	$809	16%	$4,958
	1998-2000	$1,790	34%	$1,835	35%	$810	15%	$808	15%	$5,243
	1999-2001	$1,895	34%	$1,920	34%	$939	17%	$833	15%	$5,586
	2000-2002	$2,089	36%	$1,818	31%	$1,074	19%	$804	14%	$5,785
	2001-2003	$2,150	35%	$1,949	32%	$1,253	20%	$833	13%	$6,185
Spine	2002-2004	$2,333	34%	$2,193	32%	$1,384	20%	$924	14%	$6,834
	2003-2005	$2,413	34%	$2,292	32%	$1,508	21%	$967	13%	$7,179
	2004-2006	$2,530	34%	$2,173	30%	$1,621	22%	$1,020	14%	$7,343
	2005-2007	$2,484	34%	$2,162	29%	$1,710	23%	$1,025	14%	$7,381
	2006-2008	$2,563	34%	$2,123	28%	$1,769	24%	$1,046	14%	$7,501
	2007-2009	$2,823	36%	$2,147	27%	$1,757	22%	$1,095	14%	$7,822
	2008-2010	$2,975	38%	$2,075	26%	$1,740	22%	$1,072	14%	$7,862
	2009-2011	$3,077	38%	$2,267	28%	$1,736	21%	$1,069	13%	$8,150

Table 10.4: Per Person Components of Total Direct Costs in 2011 Dollars for Musculoskeletal Diseases, United States 1996-2011

		Total Mean and % of All Costs (2011 $s)								
Condition	Year	Ambulatory Care		Inpatient		Prescription		Other		All
		Mean	% All Costs	Mean	% All Costs	Mean	% All Costs	Mean	% All Costs	Mean
Arthritis and Joint Pain [1]	1996-1998	$1,910	30%	$2,364	37%	$986	15%	$1,133	18%	$6,393
	1997-1999	$1,926	29%	$2,549	38%	$1,124	17%	$1,150	17%	$6,749
	1998-2000	$1,890	29%	$2,421	37%	$1,250	19%	$1,064	16%	$6,624
	1999-2001	$2,043	29%	$2,398	34%	$1,437	21%	$1,096	16%	$6,975
	2000-2002	$2,324	31%	$2,533	34%	$1,579	21%	$1,037	14%	$7,473
	2001-2003	$2,618	32%	$2,649	32%	$1,817	22%	$1,080	13%	$8,165
	2002-2004	$2,793	32%	$2,854	33%	$1,985	23%	$1,111	13%	$8,743
	2003-2005	$2,873	32%	$2,877	32%	$2,088	23%	$1,124	13%	$8,962
	2004-2006	$2,910	33%	$2,732	31%	$2,119	24%	$1,141	13%	$8,901
	2005-2007	$2,897	32%	$2,736	31%	$2,130	24%	$1,167	13%	$8,930
	2006-2008	$2,869	32%	$2,655	30%	$2,154	24%	$1,248	14%	$8,926
	2007-2009	$2,990	32%	$2,775	30%	$2,186	24%	$1,302	14%	$9,254
	2008-2010	$3,035	33%	$2,741	29%	$2,217	24%	$1,316	14%	$9,310
	2009-2011	$3,084	32%	$2,828	30%	$2,343	25%	$1,302	14%	$9,556
Osteoporosis	1996-1998	$2,629	31%	$3,099	36%	$1,477	17%	$1,367	16%	$8,572
	1997-1999	$2,692	31%	$3,012	35%	$1,625	19%	$1,311	15%	$8,639
	1998-2000	$2,648	31%	$3,004	35%	$1,704	20%	$1,230	14%	$8,586
	1999-2001	$2,897	33%	$2,691	31%	$1,906	22%	$1,320	15%	$8,815
	2000-2002	$3,067	32%	$2,853	30%	$2,142	23%	$1,446	15%	$9,508
	2001-2003	$3,127	31%	$2,966	30%	$2,362	24%	$1,518	15%	$9,973
	2002-2004	$3,205	32%	$2,866	29%	$2,406	24%	$1,390	14%	$9,868
	2003-2005	$3,112	32%	$2,830	29%	$2,543	26%	$1,324	13%	$9,809
	2004-2006	$3,448	33%	$3,013	29%	$2,673	26%	$1,292	12%	$10,426
	2005-2007	$3,418	31%	$3,356	30%	$2,937	26%	$1,454	13%	$11,164
	2006-2008	$3,467	30%	$3,334	29%	$3,048	27%	$1,556	14%	$11,405
	2007-2009	$3,560	32%	$2,755	25%	$3,097	28%	$1,598	15%	$11,011
	2008-2010	$3,708	34%	$2,731	25%	$3,040	28%	$1,562	14%	$11,041
	2009-2011	$3,758	34%	$2,681	24%	$2,989	27%	$1,551	14%	$10,978

Table 10.4: Per Person Components of Total Direct Costs in 2011 Dollars for Musculoskeletal Diseases, United States 1996-2011

Condition	Year	Ambulatory Care Mean	Ambulatory Care % All Costs	Inpatient Mean	Inpatient % All Costs	Prescription Mean	Prescription % All Costs	Other Mean	Other % All Costs	All Mean
Musculoskeletal Injuries	1996-1998	$1,356	33%	$1,367	34%	$427	11%	$902	22%	$4,053
	1997-1999	$1,467	33%	$1,535	35%	$503	11%	$897	20%	$4,403
	1998-2000	$1,530	33%	$1,658	36%	$572	12%	$866	19%	$4,627
	1999-2001	$1,684	34%	$1,657	33%	$680	14%	$971	19%	$4,992
	2000-2002	$1,786	33%	$1,723	32%	$794	15%	$1,071	20%	$5,373
	2001-2003	$1,939	33%	$1,850	32%	$944	16%	$1,109	19%	$5,841
	2002-2004	$1,984	33%	$1,829	31%	$1,035	17%	$1,097	18%	$5,946
	2003-2005	$2,094	34%	$1,882	30%	$1,150	19%	$1,046	17%	$6,172
	2004-2006	$2,164	35%	$1,750	28%	$1,164	19%	$1,075	17%	$6,153
	2005-2007	$2,375	35%	$2,157	32%	$1,214	18%	$1,095	16%	$6,841
	2006-2008	$2,508	37%	$2,067	30%	$1,154	17%	$1,118	16%	$6,847
	2007-2009	$2,654	37%	$2,057	29%	$1,203	17%	$1,193	17%	$7,108
	2008-2010	$2,638	39%	$1,795	26%	$1,240	18%	$1,176	17%	$6,849
	2009-2011	$2,648	37%	$1,928	27%	$1,314	18%	$1,213	17%	$7,104
Other Musculoskeletal Conditions	1996-1998	$1,952	30%	$2,475	38%	$931	14%	$1,187	18%	$6,544
	1997-1999	$2,112	30%	$2,731	39%	$1,070	15%	$1,177	17%	$7,090
	1998-2000	$2,189	29%	$3,083	41%	$1,190	16%	$1,096	15%	$7,557
	1999-2001	$2,349	30%	$2,998	38%	$1,383	17%	$1,212	15%	$7,942
	2000-2002	$2,460	30%	$2,859	35%	$1,570	19%	$1,310	16%	$8,199
	2001-2003	$2,697	32%	$2,557	30%	$1,812	22%	$1,339	16%	$8,404
	2002-2004	$2,821	32%	$2,754	31%	$1,974	22%	$1,289	15%	$8,838
	2003-2005	$3,033	32%	$2,980	32%	$2,143	23%	$1,266	13%	$9,423
	2004-2006	$3,203	33%	$2,834	29%	$2,313	24%	$1,294	13%	$9,645
	2005-2007	$3,258	33%	$3,124	31%	$2,331	23%	$1,305	13%	$10,019
	2006-2008	$3,385	34%	$2,927	29%	$2,328	23%	$1,297	13%	$9,937
	2007-2009	$3,466	34%	$3,233	31%	$2,208	21%	$1,394	14%	$10,301
	2008-2010	$3,465	34%	$3,085	30%	$2,222	22%	$1,397	14%	$10,169
	2009-2011	$3,473	34%	$3,147	31%	$2,265	22%	$1,354	13%	$10,240

Total Mean and % of All Costs (2011 $s)

[1] Methodological changes in MEPS in 2001 and 2007 improved the accuracy of capturing these conditions; therefore, the increased number of people with these conditions in 2001 and 2007 cannot be attributed solely to the increased size of the underlying population. Because misclassification for arthritis has been demonstrated in children, reported arthritis for individuals <18 is not included.

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011 http://meps.ahrq.gov/mepsweb/

Table 10.5: Per Person Components of Incremental Direct Costs in 2011 Dollars for Musculoskeletal Diseases, United States 1996-2011

Condition	Year	Mean Increment (in 2011 $s) Ambulatory	Inpatient	Prescription	Other	All
	1996-1998	$570	$102	$144	$298	$1,280
	1997-1999	$609	$101	$180	$300	$1,319
	1998-2000	$659	$339	$191	$264	$1,482
	1999-2001	$679	$390	$225	$279	$1,614
	2000-2002	$740	$443	$246	$271	$1,772
	2001-2003	$787	$562	$293	$264	$1,950
All	2002-2004	$845	$605	$332	$266	$2,102
Musculoskeletal Diseases	2003-2005	$847	$531	$352	$245	$1,989
	2004-2006	$864	$334	$395	$253	$1,854
	2005-2007	$893	$489	$382	$276	$2,002
	2006-2008	$974	$610	$348	$358	$2,260
	2007-2009	$998	$550	$349	$389	$2,299
	2008-2010	$947	$367	$348	$405	$2,136
	2009-2011	$859	$313	$408	$379	$2,075
	1996-1998	$581	$255	$84	$21	$934
	1997-1999	$515	$238	$97	$85	$858
	1998-2000	$606	$349	$94	$96	$1,095
	1999-2001	$635	$486	$120	$89	$1,276
	2000-2002	$672	$348	$142	$35	$1,111
	2001-2003	$574	$381	$174	$39	$1,062
Spine	2002-2004	$649	$496	$188	$93	$1,328
	2003-2005	$678	$436	$191	$136	$1,453
	2004-2006	$709	$360	$234	$169	$1,483
	2005-2007	$580	$420	$285	$164	$1,300
	2006-2008	$592	$410	$309	$123	$1,264
	2007-2009	$792	$404	$250	$111	$1,384
	2008-2010	$919	$223	$181	$68	$1,344
	2009-2011	$971	$401	$87	$80	$1,496

Table 10.5: Per Person Components of Incremental Direct Costs in 2011 Dollars for Musculoskeletal Diseases, United States 1996-2011

		Mean Increment (in 2011 $s)				
Condition	Year	Ambulatory	Inpatient	Prescription	Other	All
Arthritis and Joint Pain [1]	1996-1998	$488	-$429	$146	$236	$654
	1997-1999	$452	-$238	$168	$254	$776
	1998-2000	$346	-$298	$194	$208	$568
	1999-2001	$353	-$148	$248	$190	$786
	2000-2002	$478	$24	$266	$100	$969
	2001-2003	$647	$118	$329	$78	$1,292
	2002-2004	$663	$267	$360	$78	$1,476
	2003-2005	$662	$250	$300	$76	$1,411
	2004-2006	$564	$151	$290	$71	$1,194
	2005-2007	$533	$120	$177	$115	$1,117
	2006-2008	$511	$208	$202	$238	$1,320
	2007-2009	$659	$332	$251	$284	$1,710
	2008-2010	$689	$332	$288	$327	$1,821
	2009-2011	$662	$274	$426	$316	$1,909
Osteoporosis [2]	1996-1998	[2]	[2]	[2]	[2]	[2]
	1997-1999	[2]	[2]	[2]	[2]	[2]
	1998-2000	[2]	[2]	[2]	[2]	[2]
	1999-2001	[2]	[2]	[2]	[2]	[2]
	2000-2002	[2]	[2]	[2]	[2]	[2]
	2001-2003	[2]	[2]	[2]	[2]	[2]
	2002-2004	[2]	[2]	[2]	[2]	[2]
	2003-2005	[2]	[2]	[2]	[2]	[2]
	2004-2006	[2]	[2]	[2]	[2]	[2]
	2005-2007	[2]	[2]	[2]	[2]	[2]
	2006-2008	[2]	[2]	[2]	[2]	[2]
	2007-2009	[2]	[2]	[2]	[2]	[2]
	2008-2010	[2]	[2]	[2]	[2]	[2]
	2009-2011	[2]	[2]	[2]	[2]	[2]

Table 10.5: Per Person Components of Incremental Direct Costs in 2011 Dollars for Musculoskeletal Diseases, United States 1996-2011

Condition	Year	Mean Increment (in 2011 $s)				
		Ambulatory	Inpatient	Prescription	Other	All
Musculoskeletal Injuries	1996-1998	$470	$455	$23	$363	$1,213
	1997-1999	$570	$619	$38	$335	$1,452
	1998-2000	$605	$759	$63	$304	$1,653
	1999-2001	$663	$602	$64	$353	$1,656
	2000-2002	$617	$524	$84	$421	$1,627
	2001-2003	$662	$512	$122	$426	$1,670
	2002-2004	$606	$477	$136	$397	$1,543
	2003-2005	$680	$522	$207	$325	$1,662
	2004-2006	$677	$460	$167	$335	$1,567
	2005-2007	$892	$759	$165	$344	$2,098
	2006-2008	$1,005	$706	$80	$362	$2,057
	2007-2009	$1,093	$646	$147	$406	$2,185
	2008-2010	$1,004	$393	$164	$382	$1,884
	2009-2011	$945	$511	$182	$417	$1,913
Other Musculoskeletal Conditions	1996-1998	$550	$650	$179	$322	$1,708
	1997-1999	$748	$892	$235	$325	$2,145
	1998-2000	$793	$1,365	$226	$296	$2,549
	1999-2001	$803	$1,040	$289	$330	$2,444
	2000-2002	$671	$758	$353	$386	$2,157
	2001-2003	$789	$362	$422	$329	$1,979
	2002-2004	$784	$483	$454	$279	$2,055
	2003-2005	$926	$626	$475	$260	$2,361
	2004-2006	$1,019	$511	$568	$314	$2,463
	2005-2007	$1,027	$809	$502	$299	$2,693
	2006-2008	$1,132	$759	$489	$226	$2,623
	2007-2009	$1,055	$1,110	$389	$253	$2,864
	2008-2010	$1,001	$1,030	$418	$232	$2,708
	2009-2011	$980	$1,028	$454	$214	$2,680

[1] Methodological changes in MEPS in 2001 and 2007 improved the accuracy of capturing these conditions; therefore,
[2] Due to the sample size, increment not calculated for this subcondition.
Note: Due to estimation errors, increment components do not always equal the total; percentages were not calculated
Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of
SAS source: 031Table4a_series_2stage_interact_bonferroni.sas

Table 10.6: Total and Incremental Aggregate Direct Costs for Musculoskeletal Diseases in Current and 2011 Dollars, United States 1996-2011

		Persons with condition		Total				Incremental			
				Mean		Aggregate [1]		Mean		Aggregate [1]	
Condition	Year	Sample N (annual)	Total Population	Current $s [2]	2011 $s [2]	Current $s (in billions)	2011 $s (in billions)	Current $s [2]	2011 $s [2]	Current $s (in billions)	2011 $s (in billions)
		Column A	Column B	Column C	Column D	Column E	Column F	Column G	Column H	Column I	Column J
All Musculoskeletal Diseases	1996-1998	6,964	75,978,133	$3,600	$4,832	$273.5	$367.1	$952	$1,280	$72.3	$97.3
	1997-1999	7,004	75,173,840	$3,808	$5,037	$286.3	$378.7	$998	$1,319	$75.0	$99.2
	1998-2000	6,025	74,077,194	$3,993	$5,197	$295.8	$385.0	$1,141	$1,482	$84.5	$109.8
	1999-2001	6,814	75,600,394	$4,323	$5,518	$326.8	$417.2	$1,263	$1,614	$95.5	$122.0
	2000-2002	8,252	79,748,298	$4,704	$5,883	$375.1	$469.2	$1,416	$1,772	$112.9	$141.3
	2001-2003	9,166	84,297,419	$5,142	$6,306	$433.5	$531.6	$1,593	$1,950	$134.3	$164.4
	2002-2004	9,337	87,575,871	$5,594	$6,715	$489.9	$588.1	$1,749	$2,102	$153.2	$184.1
	2003-2005	8,874	88,946,833	$5,925	$6,924	$527.0	$615.9	$1,696	$1,989	$150.9	$176.9
	2004-2006	8,947	89,652,587	$6,160	$6,984	$552.3	$626.1	$1,635	$1,854	$146.6	$166.2
	2005-2007	8,791	91,320,095	$6,529	$7,169	$596.2	$654.7	$1,828	$2,002	$166.9	$182.8
	2006-2008	8,812	94,582,366	$6,836	$7,306	$646.6	$691.0	$2,118	$2,260	$200.3	$213.8
	2007-2009	9,181	98,605,506	$7,230	$7,581	$712.9	$747.5	$2,191	$2,299	$216.0	$226.7
	2008-2010	9,323	101,070,151	$7,334	$7,578	$741.2	$765.9	$2,064	$2,136	$208.6	$215.9
	2009-2011	9,522	102,504,820	$7,628	$7,768	$781.9	$796.3	$2,039	$2,075	$209.0	$212.7
Spine	1996-1998	2,510	27,376,436	$3,600	$4,835	$98.6	$132.4	$692	$934	$18.9	$25.6
	1997-1999	2,580	27,893,654	$3,749	$4,958	$104.6	$138.3	$650	$858	$18.1	$23.9
	1998-2000	2,199	27,203,474	$4,030	$5,243	$109.6	$142.6	$845	$1,095	$23.0	$29.8
	1999-2001	2,411	27,263,245	$4,376	$5,586	$119.3	$152.3	$999	$1,276	$27.2	$34.8
	2000-2002	2,927	28,825,976	$4,623	$5,785	$133.3	$166.8	$884	$1,111	$25.5	$32.0
	2001-2003	3,258	30,607,329	$5,044	$6,185	$154.4	$189.3	$866	$1,062	$26.5	$32.5
	2002-2004	3,408	32,740,018	$5,700	$6,834	$186.6	$223.7	$1,114	$1,328	$36.5	$43.5
	2003-2005	3,312	33,967,851	$6,142	$7,179	$208.6	$243.9	$1,240	$1,453	$42.1	$49.4
	2004-2006	3,415	34,946,321	$6,475	$7,343	$226.3	$256.6	$1,303	$1,483	$45.5	$51.8
	2005-2007	3,263	34,428,534	$6,722	$7,381	$231.4	$254.1	$1,186	$1,300	$40.8	$44.8
	2006-2008	2,964	32,206,033	$7,015	$7,501	$225.9	$241.6	$1,179	$1,264	$38.0	$40.7
	2007-2009	2,763	30,634,043	$7,461	$7,822	$228.6	$239.6	$1,321	$1,384	$40.5	$42.4
	2008-2010	2,654	30,115,457	$7,609	$7,862	$229.1	$236.8	$1,301	$1,344	$39.2	$40.5
	2009-2011	2,727	31,043,437	$8,002	$8,150	$248.4	$253.0	$1,468	$1,496	$45.6	$46.4

Table 10.6: Total and Incremental Aggregate Direct Costs for Musculoskeletal Diseases in Current and 2011 Dollars, United States 1996-2011

		Persons with condition		Total				Incremental			
				Mean		Aggregate [1]		Mean		Aggregate [1]	
Condition	Year	Sample N (annual)	Total Population	Current $s [2]	2011 $s [2]	Current $s (in billions)	2011 $s (in billions)	Current $s [2]	2011 $s [2]	Current $s (in billions)	2011 $s (in billions)
		Column A	Column B	Column C	Column D	Column E	Column F	Column G	Column H	Column I	Column J
Arthritis and Joint Pain [2]	1996-1998	2,710	28,965,733	$4,765	$6,393	$138.0	$185.2	$487	$654	$14.1	$18.9
	1997-1999	2,759	29,066,656	$5,101	$6,749	$148.3	$196.2	$586	$776	$17.0	$22.6
	1998-2000	2,414	29,249,499	$5,087	$6,624	$148.8	$193.7	$436	$568	$12.8	$16.6
	1999-2001	2,837	31,113,119	$5,465	$6,975	$170.0	$217.0	$616	$786	$19.2	$24.5
	2000-2002	3,514	33,590,017	$5,977	$7,473	$200.8	$251.0	$779	$969	$26.2	$32.5
	2001-2003	3,931	35,899,908	$6,658	$8,165	$239.0	$293.1	$1,054	$1,292	$37.8	$46.4
	2002-2004	3,979	36,624,629	$7,283	$8,743	$266.7	$320.2	$1,229	$1,476	$45.0	$54.1
	2003-2005	3,702	36,140,453	$7,668	$8,962	$277.1	$323.9	$1,206	$1,411	$43.6	$51.0
	2004-2006	3,683	35,762,636	$7,846	$8,901	$280.6	$318.3	$1,045	$1,194	$37.4	$42.7
	2005-2007	3,813	38,937,037	$8,128	$8,930	$316.5	$347.7	$1,017	$1,117	$39.6	$43.5
	2006-2008	4,379	46,949,584	$8,351	$8,926	$392.1	$419.1	$1,243	$1,320	$58.4	$62.0
	2007-2009	5,153	54,957,251	$8,825	$9,254	$485.0	$508.6	$1,634	$1,710	$89.8	$94.0
	2008-2010	5,539	59,605,953	$9,010	$9,310	$537.0	$554.9	$1,761	$1,821	$105.0	$108.5
	2009-2011	5,725	60,792,116	$9,383	$9,556	$570.4	$580.9	$1,876	$1,909	$114.0	$116.1
Osteoporosis	1996-1998	299	3,158,916	$6,391	$8,572	$20.2	$27.1	[3]	[3]	[3]	[3]
	1997-1999	321	3,405,501	$6,529	$8,639	$22.2	$29.4	[3]	[3]	[3]	[3]
	1998-2000	308	3,787,044	$6,587	$8,586	$24.9	$32.5	[3]	[3]	[3]	[3]
	1999-2001	395	4,444,849	$6,914	$8,815	$30.7	$39.2	[3]	[3]	[3]	[3]
	2000-2002	537	5,264,938	$7,605	$9,508	$40.0	$50.1	[3]	[3]	[3]	[3]
	2001-2003	645	6,136,560	$8,121	$9,973	$49.8	$61.2	[3]	[3]	[3]	[3]
	2002-2004	705	6,819,738	$8,212	$9,868	$56.0	$67.3	[3]	[3]	[3]	[3]
	2003-2005	716	7,383,562	$8,394	$9,809	$62.0	$72.4	[3]	[3]	[3]	[3]
	2004-2006	773	7,874,086	$9,213	$10,426	$72.5	$82.1	[3]	[3]	[3]	[3]
	2005-2007	774	8,182,144	$10,177	$11,164	$83.3	$91.3	[3]	[3]	[3]	[3]
	2006-2008	723	8,062,507	$10,660	$11,405	$85.9	$92.0	[3]	[3]	[3]	[3]
	2007-2009	654	7,607,212	$10,491	$11,011	$79.8	$83.8	[3]	[3]	[3]	[3]
	2008-2010	594	7,047,281	$10,689	$11,041	$75.3	$77.8	[3]	[3]	[3]	[3]
	2009-2011	552	6,422,543	$10,778	$10,978	$69.2	$70.5	[3]	[3]	[3]	[3]

Table 10.6: Total and Incremental Aggregate Direct Costs for Musculoskeletal Diseases in Current and 2011 Dollars, United States 1996-2011

		Persons with condition		Total				Incremental			
				Mean		Aggregate [1]		Mean		Aggregate [1]	
Condition	Year	Sample N (annual)	Total Population	Current $s [2]	2011 $s [2]	Current $s (in billions)	2011 $s (in billions)	Current $s [2]	2011 $s [2]	Current $s (in billions)	2011 $s (in billions)
		Column A	Column B	Column C	Column D	Column E	Column F	Column G	Column H	Column I	Column J
Injuries	1996-1998	2,093	23,358,073	$3,021	$4,053	$70.6	$94.7	$905	$1,213	$21.1	$28.3
	1997-1999	2,047	22,495,891	$3,329	$4,403	$74.9	$99.0	$1,099	$1,452	$24.7	$32.7
	1998-2000	1,698	21,590,412	$3,555	$4,627	$76.8	$99.9	$1,271	$1,653	$27.4	$35.7
	1999-2001	1,869	21,442,353	$3,912	$4,992	$83.9	$107.0	$1,295	$1,656	$27.8	$35.5
	2000-2002	2,235	22,285,775	$4,297	$5,373	$95.8	$119.7	$1,299	$1,627	$28.9	$36.3
	2001-2003	2,492	23,570,429	$4,763	$5,841	$112.3	$137.7	$1,363	$1,670	$32.1	$39.4
	2002-2004	2,545	24,680,193	$4,947	$5,946	$122.1	$146.7	$1,280	$1,543	$31.6	$38.1
	2003-2005	2,442	25,219,257	$5,283	$6,172	$133.2	$155.7	$1,423	$1,662	$35.9	$41.9
	2004-2006	2,438	25,362,266	$5,433	$6,153	$137.8	$156.1	$1,388	$1,567	$35.2	$39.7
	2005-2007	2,369	25,524,062	$6,234	$6,841	$159.1	$174.6	$1,915	$2,098	$48.9	$53.5
	2006-2008	2,289	25,557,412	$6,407	$6,847	$163.7	$175.0	$1,926	$2,057	$49.2	$52.6
	2007-2009	2,269	25,567,588	$6,774	$7,108	$173.2	$181.7	$2,080	$2,185	$53.2	$55.9
	2008-2010	2,198	25,098,882	$6,629	$6,849	$166.4	$171.9	$1,823	$1,884	$45.8	$47.3
	2009-2011	2,173	24,787,860	$6,977	$7,104	$172.9	$176.1	$1,878	$1,913	$46.6	$47.4
Other Musculoskeletal Conditions	1996-1998	1,173	12,046,200	$4,876	$6,544	$58.7	$78.8	$1,273	$1,708	$15.3	$20.6
	1997-1999	1,174	11,809,322	$5,362	$7,090	$63.3	$83.7	$1,626	$2,145	$19.2	$25.3
	1998-2000	983	11,322,533	$5,811	$7,557	$65.8	$85.6	$1,960	$2,549	$22.2	$28.9
	1999-2001	1,098	11,524,129	$6,217	$7,942	$71.6	$91.5	$1,906	$2,444	$22.0	$28.2
	2000-2002	1,345	12,350,398	$6,550	$8,199	$80.9	$101.3	$1,719	$2,157	$21.2	$26.6
	2001-2003	1,546	13,643,094	$6,853	$8,404	$93.5	$114.7	$1,615	$1,979	$22.0	$27.0
	2002-2004	1,618	14,518,291	$7,359	$8,838	$106.8	$128.3	$1,709	$2,055	$24.8	$29.8
	2003-2005	1,559	14,809,681	$8,073	$9,423	$119.6	$139.6	$2,027	$2,361	$30.0	$35.0
	2004-2006	1,564	14,737,632	$8,514	$9,645	$125.5	$142.1	$2,178	$2,463	$32.1	$36.3
	2005-2007	1,465	14,250,915	$9,113	$10,019	$129.9	$142.8	$2,445	$2,693	$34.8	$38.4
	2006-2008	1,438	14,762,365	$9,296	$9,937	$137.2	$146.7	$2,456	$2,623	$36.3	$38.7
	2007-2009	1,514	15,768,331	$9,826	$10,301	$154.9	$162.4	$2,734	$2,864	$43.1	$45.2
	2008-2010	1,643	17,599,650	$9,838	$10,169	$173.1	$179.0	$2,618	$2,708	$46.1	$47.7
	2009-2011	1,744	18,612,358	$10,052	$10,240	$187.1	$190.6	$2,629	$2,680	$48.9	$49.9

Table 10.6: Total and Incremental Aggregate Direct Costs for Musculoskeletal Diseases in Current and 2011 Dollars, United States 1996-2011

				Total				Incremental			
		Persons with condition		Mean		Aggregate [1]		Mean		Aggregate [1]	
Condition	Year	Sample N (annual)	Total Population	Current $s [2]	2011 $s [2]	Current $s (in billions)	2011 $s (in billions)	Current $s [2]	2011 $s [2]	Current $s (in billions)	2011 $s (in billions)
		Column A	Column B	Column C	Column D	Column E	Column F	Column G	Column H	Column I	Column J

[1] All aggregates (including total) are created by multiplying smoothed means by smoothed population in year.

[2] Methodological changes in MEPS in 2001 and 2007 improved the accuracy of capturing these conditions; therefore, the increased number of people with these conditions in 2001 and 2007 cannot be attributed solely to the increased size of the underlying population. Because misclassification for arthritis has been demonstrated I children, reported arthritis for individuals <18 is not included.

[3] Total all individuals with osteoporosis had expenditures and total increment that could not be calculated.

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011.
http://meps.ahrq.gov/mepsweb/

Table 10.7: Change in Annual Average and Aggregate Total Health Care Costs for Persons with Musculoskeletal Diseases, United States, 1996-2011

	Average Annual Increase			
	All-Cause		Incremental	
MEPS Data Years Averaged	Mean	Aggregate [1]	Mean	Aggregate [1]
1996-1998 to 1997-1999	4.2%	3.1%	3.0%	2.0%
1997-1999 to 1998-2000	3.2%	1.7%	12.4%	10.7%
1998-2000 to 1999-2001	6.2%	8.4%	8.9%	11.1%
1999-2001 to 2000-2002	6.6%	12.5%	9.8%	15.8%
2000-2002 to 2001-2003	7.2%	13.3%	10.0%	16.3%
2001-2003 to 2002-2004	6.5%	10.6%	7.8%	12.0%
2002-2004 to 2003-2005	3.1%	4.7%	-5.4%	-3.9%
2003-2005 to 2004-2006	0.9%	1.7%	-6.8%	-6.0%
2004-2006 to 2005-2007	2.6%	4.6%	8.0%	10.0%
2005-2007 to 2006-2008	1.9%	5.6%	12.9%	16.9%
2006-2008 to 2007-2009	3.8%	8.2%	1.7%	6.1%
2007-2009 to 2008-2010	0.0%	2.5%	-7.1%	-4.8%
2008-2010 to 2009-2011	2.5%	4.0%	-2.9%	-1.5%
1996-1998 to 2009-2011	4.7%	9.0%	4.8%	9.1%
Total Increase 1996-1998 to 2002-201	60.8%	116.9%	62.1%	118.7%
Change in Annual Average Total and Incremental Costs for Select Musculoskeletal Diseases, 1996-1998 to 2002-2011				
Spine	5.3%	7.0%	4.6%	6.3%
Osteoporosis	2.2%	12.3%	[2]	[2]
Musculoskeletal Injuries	5.8%	6.6%	4.4%	5.2%
Other Musculoskeletal Conditions	4.3%	10.9%	4.4%	11.0%
Cumulative Increase in Total and Incremental Health Care Cost for Select Musculoskeletal Diseases, 1996-1998 to 20(				
Spine	68.6%	91.1%	60.2%	81.6%
Osteoporosis	28.1%	160.4%	[2]	[2]
Musculoskelekal Injuries	75.3%	86.0%	57.7%	67.4%
Other Musculoskeletal Conditions	56.5%	141.8%	56.9%	142.4%

[1] All aggregates (including total) are created by multiplying smoothed means by smoothed population in year. Data smoothing involves the use of an algorithm to remove noise from a data set, allowing important patterns to stand out. Data smoothing can be done in a variety of different ways, and is used to help predict trends.

[2] All individuals with the conditions within the category including osteoporosis had all-cause and incremental expenditures that could not be calculated.

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011. http://meps.ahrq.gov/mepsweb/

Percentages derived using data from Table 10.5 to calculate change.

Table 10.8: Total and Incremental Expenditures for Musculoskeletal Diseases by Demographic Characteristics, United States, 2011

	Number of Respondents		Estimated Population (in 000s)			Total Expenditures		
Demographic Characteristics	Total	With Musculoskeletal Diseases	Total	With Musculoskeletal Diseases	% Population with Musculoskeletal Diseases	Mean	Standard Error (±)	Aggregate (in millions)
Total Population	33,622	9,456	311,126	103,628	33%	$7,982	$277	$827.1
Gender								
Female	17,554	5,430	159,073	57,534	36%	$8,075	$261	$464.6
Male	16,068	4,026	152,053	46,093	30%	$7,865	$516	$362.5
Race								
White	23,307	6,895	248,341	87,213	35%	$7,949	$282	$693.3
Nonwhite	10,315	2,561	62,784	16,414	26%	$8,154	$913	$133.8
Ethnicity								
Hispanic	9,705	1,709	52,717	10,963	21%	$6,305	$492	$69.1
Nonhispanic	23,917	7,747	258,409	92,665	36%	$8,180	$299	$758.0
Education [1]								
Less than High School	6,610	1,900	40,733	14,352	35%	$8,245	$429	$118.3
High School	10,143	2,893	82,775	29,046	35%	$8,438	$575	$245.1
Some College	8,113	2,249	82,364	27,774	34%	$7,218	$330	$200.5
College Graduate	5,103	1,399	61,153	18,635	30%	$7,488	$612	$139.5
Graduate School	3,324	942	42,044	13,297	32%	$8,849	$1,085	$117.7
Marital status [2]								
Never Married	8,925	1,796	73,668	18,564	25%	$6,612	$772	$122.7
Married or w/Partner	18,035	4,988	177,996	58,103	33%	$7,970	$373	$463.1
Divorced-Widowed-Separated	6,621	2,671	59,211	26,941	46%	$8,951	$390	$241.2
Insurance								
Any Private	17,220	5,295	196,927	67,863	34%	$7,842	$333	$532.2
Public	10,768	3,112	75,243	26,921	36%	$10,142	$628	$273.0
None	5,634	1,049	38,957	8,843	23%	$2,479	$250	$21.9

[1] Education status for individuals <18 was set to the highest level in the household.

[2] Marital status for individuals <18 were set hierarchically by household to married, div/wid/sep, and never married.

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 2011. http://meps.ahrq.gov/mepsweb/

Table 10.9: Age Distribution of Average and Aggregate Total and Incremental Direct Costs in 2011 Dollars for Musculoskeletal Diseases, United States 1996-2011

		Years Averaged													
	Age	1996-1998	1997-1999	1998-2000	1999-2001	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2019	2008-2010	2009-2011
SAMPLE N AND POPULATION ESTIMATES															
Persons with Condition (Annual Sample N)	< 18	858	849	715	762	893	989	1,002	958	947	911	868	879	873	859
	18-44	2,481	2,419	2,020	2,252	2,715	3,012	3,030	2,800	2,715	2,595	2,599	2,734	2,751	2,781
	45-64	2,118	2,171	1,922	2,243	2,765	3,102	3,179	3,065	3,171	3,194	3,282	3,463	3,562	3,640
	65+	1,506	1,564	1,368	1,557	1,879	2,063	2,127	2,052	2,113	2,090	2,062	2,105	2,137	2,242
	Total	6,963	7,003	6,025	6,814	8,252	9,166	9,338	8,875	8,946	8,790	8,811	9,181	9,323	9,522
Persons with Condition (Total Population in 000s)	< 18	8,838	8,588	8,271	7,910	7,813	8,015	8,340	8,661	8,713	8,571	8,281	8,311	8,347	8,343
	18-44	28,857	27,582	26,466	26,435	27,765	28,915	29,523	29,073	28,552	28,431	28,793	29,561	29,648	29,823
	45-64	21,794	22,136	22,574	23,931	25,952	28,209	29,802	30,758	31,635	33,061	35,355	37,249	38,649	39,219
	65+	16,489	16,867	16,766	17,325	18,219	19,158	19,911	20,454	20,753	21,257	22,152	23,485	24,427	25,120
	Total	75,978	75,174	74,077	75,600	79,748	84,297	87,576	88,947	89,653	91,320	94,582	98,606	101,070	102,505
Total Costs															
Mean in 2011 $	< 18	$ 1,911	$ 2,108	$ 2,401	$ 2,785	$ 2,791	$ 2,656	$ 2,580	$ 2,839	$ 2,945	$ 3,157	$ 3,183	$ 3,434	$ 3,424	$ 3,288
	18-44	$ 2,995	$ 3,124	$ 3,202	$ 3,338	$ 3,472	$ 3,635	$ 3,778	$ 3,837	$ 3,882	$ 3,893	$ 3,983	$ 4,167	$ 4,264	$ 4,658
	45-64	$ 5,078	$ 5,234	$ 5,528	$ 6,032	$ 6,543	$ 7,233	$ 7,707	$ 7,955	$ 7,806	$ 8,086	$ 8,264	$ 8,479	$ 8,335	$ 8,568
	65+	$ 9,286	$ 9,400	$ 9,271	$ 9,374	$ 9,942	$ 10,484	$ 11,304	$ 11,486	$ 11,693	$ 11,731	$ 11,661	$ 11,938	$ 11,823	$ 11,708
	Total	$ 4,832	$ 5,037	$ 5,197	$ 5,518	$ 5,883	$ 6,306	$ 6,715	$ 6,924	$ 6,984	$ 7,169	$ 7,306	$ 7,581	$ 7,578	$ 7,768
Aggregate in 2011 $ (in billions)	< 18	$ 16.9	$ 18.1	$ 19.9	$ 22.0	$ 21.8	$ 21.3	$ 21.5	$ 24.6	$ 25.7	$ 27.1	$ 26.4	$ 28.5	$ 28.6	$ 27.4
	18-44	$ 86.4	$ 86.2	$ 84.7	$ 88.2	$ 96.4	$ 105.1	$ 111.5	$ 111.6	$ 110.8	$ 110.7	$ 114.7	$ 123.2	$ 126.4	$ 138.9
	45-64	$ 110.7	$ 115.9	$ 124.8	$ 144.3	$ 169.8	$ 204.0	$ 229.7	$ 244.7	$ 246.9	$ 267.3	$ 292.2	$ 315.8	$ 322.1	$ 336.0
	65+	$ 153.1	$ 158.6	$ 155.4	$ 162.4	$ 181.1	$ 200.9	$ 225.1	$ 234.9	$ 242.7	$ 249.4	$ 258.3	$ 280.4	$ 288.8	$ 294.1
	Total	$ 367.1	$ 378.7	$ 385.0	$ 417.2	$ 469.2	$ 531.6	$ 588.1	$ 615.9	$ 626.1	$ 654.7	$ 691.0	$ 747.5	$ 765.9	$ 796.3

Table 10.9: Age Distribution of Average and Aggregate Total and Incremental Direct Costs in 2011 Dollars for Musculoskeletal Diseases, United States 1996-2011

INCREMENTAL COST

	Age	1996-1998	1997-1999	1998-2000	1999-2001	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2019	2008-2010	2009-2011
Mean in 2011 $	< 18	$ 921	$ 1,123	$ 1,355	$ 1,602	$ 1,463	$ 1,293	$ 1,269	$ 1,468	$ 1,546	$ 1,715	$ 1,749	$ 1,812	$ 1,750	$ 1,596
	18-44	$ 1,007	$ 1,147	$ 1,196	$ 1,275	$ 1,319	$ 1,291	$ 1,199	$ 1,093	$ 1,121	$ 1,247	$ 1,355	$ 1,371	$ 1,247	$ 1,575
	45-64	$ 1,261	$ 1,452	$ 1,755	$ 2,050	$ 2,132	$ 2,677	$ 2,766	$ 2,763	$ 2,282	$ 2,649	$ 3,045	$ 3,073	$ 2,692	$ 2,539
	65+	$ 2,007	$ 1,517	$ 1,613	$ 1,532	$ 2,087	$ 2,132	$ 2,785	$ 2,329	$ 2,342	$ 2,111	$ 2,369	$ 2,406	$ 2,468	$ 2,109
	Total	$ 1,280	$ 1,319	$ 1,482	$ 1,614	$ 1,772	$ 1,950	$ 2,102	$ 1,989	$ 1,854	$ 2,002	$ 2,260	$ 2,299	$ 2,136	$ 2,075
Aggregate in 2011 $ (in billions)	< 18	$ 8.1	$ 9.6	$ 11.2	$ 12.7	$ 11.4	$ 10.4	$ 10.6	$ 12.7	$ 13.5	$ 14.7	$ 14.5	$ 15.1	$ 14.6	$ 13.3
	18-44	$ 29.1	$ 31.6	$ 31.7	$ 33.7	$ 36.6	$ 37.3	$ 35.4	$ 31.8	$ 32.0	$ 35.5	$ 39.0	$ 40.5	$ 37.0	$ 47.0
	45-64	$ 27.5	$ 32.1	$ 39.6	$ 49.1	$ 55.3	$ 75.5	$ 82.4	$ 85.0	$ 72.2	$ 87.6	$ 107.7	$ 114.5	$ 104.0	$ 99.6
	65+	$ 33.1	$ 25.6	$ 27.0	$ 26.5	$ 38.0	$ 40.8	$ 55.5	$ 47.6	$ 48.6	$ 44.9	$ 52.5	$ 56.5	$ 60.3	$ 53.0
	Total	$ 97.3	$ 99.2	$ 109.8	$ 122.0	$ 141.3	$ 164.4	$ 184.1	$ 176.9	$ 166.2	$ 182.8	$ 213.8	$ 226.7	$ 215.9	$ 212.7

(Column headings: Years Averaged)

[1] In 2011 $.

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011. http://meps.ahrq.gov/mepsweb/

Table 10.10: Distribution of Total and Incremental Aggregate Direct Costs for Musculoskeletal Diseases by Age, United States 1996-2011

	% Total Aggregate Cost (in 2011 $)			
	<18	18-44	45-64	65+
1996-1998	5%	24%	30%	42%
1997-1999	5%	23%	31%	42%
1998-2000	5%	22%	32%	40%
1999-2001	5%	21%	35%	39%
2000-2002	5%	21%	36%	39%
2001-2003	4%	20%	38%	38%
2002-2004	4%	19%	39%	38%
2003-2005	4%	18%	40%	38%
2004-2006	4%	18%	39%	39%
2005-2007	4%	17%	41%	38%
2006-2008	4%	17%	42%	37%
2007-2009	4%	16%	42%	37%
2008-2010	4%	17%	42%	38%
2009-2011	3%	17%	42%	37%

	% Incremental Aggregate Cost (in 2011 $)			
	<18	18-44	45-64	65+
1996-1998	8%	30%	28%	34%
1997-1999	10%	32%	32%	26%
1998-2000	10%	29%	36%	25%
1999-2001	10%	28%	40%	22%
2000-2002	8%	26%	39%	27%
2001-2003	6%	23%	46%	25%
2002-2004	6%	19%	45%	30%
2003-2005	7%	18%	48%	27%
2004-2006	8%	19%	43%	29%
2005-2007	8%	19%	48%	25%
2006-2008	7%	18%	50%	25%
2007-2009	7%	18%	51%	25%
2008-2010	7%	17%	48%	28%
2009-2011	6%	22%	47%	25%

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011. http://meps.ahrq.gov/mepsweb/

Table 10.11: Annual Change in Total and Incremental Aggregate Health Care Cost for Persons with Musculoskeletal Diseases by Age, United States 1996-2011

MEPS Data Years Averaged			Total Aggregate Cost				
			<18	18 to 44	45 to 64	65 & Over	Total
1996-1998	to	1997-1999	7.2%	-0.3%	4.7%	3.6%	3.1%
1997-1999	to	1998-2000	9.7%	-1.7%	7.7%	-2.0%	1.7%
1998-2000	to	1999-2001	10.9%	4.1%	15.7%	4.5%	8.4%
1999-2001	to	2000-2002	-1.0%	9.2%	17.6%	11.5%	12.5%
2000-2002	to	2001-2003	-2.4%	9.0%	20.2%	10.9%	13.3%
2001-2003	to	2002-2004	1.1%	6.1%	12.6%	12.1%	10.6%
2002-2004	to	2003-2005	14.3%	0.0%	6.5%	4.4%	4.7%
2003-2005	to	2004-2006	4.4%	-0.6%	0.9%	3.3%	1.7%
2004-2006	to	2005-2007	5.5%	-0.1%	8.3%	2.8%	4.6%
2005-2007	to	2006-2008	-2.6%	3.6%	9.3%	3.6%	5.6%
2006-2008	to	2007-2009	8.3%	7.4%	8.1%	8.5%	8.2%
2007-2009	to	2008-2010	0.1%	2.6%	2.0%	3.0%	2.5%
2008-2010	to	2009-2011	-4.0%	9.9%	4.3%	1.8%	4.0%
Annual Average Increase			4.8%	4.7%	15.7%	7.1%	9.0%
Cumulative Increase			62.4%	60.7%	203.6%	92.1%	116.9%

MEPS Data Years Averaged			Incremental Aggregate Cost				
			<18	18 to 44	45 to 64	65 & Over	Total
1996-1998	to	1997-1999	18.5%	8.9%	17.0%	-22.7%	2.0%
1997-1999	to	1998-2000	16.2%	0.1%	23.3%	5.7%	10.7%
1998-2000	to	1999-2001	13.1%	6.5%	23.8%	-1.9%	11.1%
1999-2001	to	2000-2002	-9.8%	8.7%	12.8%	43.3%	15.8%
2000-2002	to	2001-2003	-9.3%	1.9%	36.5%	7.4%	16.3%
2001-2003	to	2002-2004	2.1%	-5.2%	9.2%	35.8%	12.0%
2002-2004	to	2003-2005	20.1%	-10.2%	3.1%	-14.1%	-3.9%
2003-2005	to	2004-2006	5.9%	0.7%	-15.1%	2.0%	-6.0%
2004-2006	to	2005-2007	9.1%	10.8%	21.3%	-7.7%	10.0%
2005-2007	to	2006-2008	-1.5%	10.0%	22.9%	16.9%	16.9%
2006-2008	to	2007-2009	4.0%	3.9%	6.3%	7.7%	6.1%
2007-2009	to	2008-2010	-3.0%	-8.8%	-9.1%	6.7%	-4.8%
2008-2010	to	2009-2011	-8.8%	27.0%	-4.3%	-12.1%	-1.5%
Annual Average Increase			4.9%	4.7%	20.2%	4.6%	9.1%
Cumulative Increase			63.6%	61.6%	262.3%	60.1%	118.7%

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011. http://meps.ahrq.gov/mepsweb/

Table 10.12: Total and Incremental Indirect Cost [1] in 2011 Dollars for Persons Age 18 to 64 with Musculoskeletal Diseases and a Work History, United States 1996-2011

Year	Population with Musculoskeletal Disease Who Ever Worked	Indirect Cost (Earnings Loss, in 2011 $): Total (raw) [2] Mean	Total (raw) [2] Aggregate (in billion $)	Incremental [3] Mean	Incremental [3] Aggregate (in billion $)
1996-1998	48,543,437	$596	$28.9	$949	$46.1
1997-1999	47,301,563	$1,299	$61.4	$1,407	$66.6
1998-2000	46,510,805	$1,612	$75.0	$1,560	$72.6
1999-2001	47,704,950	$1,365	$65.1	$1,348	$64.3
2000-2002	50,671,431	$1,207	$61.2	$1,340	$67.9
2001-2003	53,944,453	$1,394	$75.2	$1,346	$72.6
2002-2004	55,846,431	$1,966	$109.8	$1,603	$89.5
2003-2005	56,393,394	$2,280	$128.6	$1,837	$103.6
2004-2006	56,718,078	$2,003	$113.6	$1,847	$104.8
2005-2007	57,733,126	$1,841	$106.3	$2,089	$120.6
2006-2008	60,071,064	$1,593	$95.7	$2,068	$124.2
2007-2009	61,990,379	$1,474	$91.4	$2,196	$136.1
2008-2010	63,057,991	$1,226	$77.3	$2,099	$132.4
2009-2011	63,353,998	$1,224	$77.5	$2,063	$130.7
Annual Increase 1996-1998 to 2009-2011		8.1%	12.9%	9.0%	14.1%
Total Increase 1996-1998 to 2009-2011		105.4%	168.0%	117.4%	183.7%

[1] Calculated as estimated earnings loss per wage earner due to a musculoskeletal condition in 2011 $.

[2] The difference in mean earnings (gap) between persons with and without a musculoskeletal condition, with persons with a musculoskeletal condition earning less. There is also a 4% gap in the probablility of working between persons with and without a musculoskeletal condition.

[3] Wages lost that are most likely attributable to a musculoskeletal condition. Because persons with a musculoskeletal condition have a low probablility of being in the work force and a lower mean income, the incremental costs are often greated than the raw costs.

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011. http://meps.ahrq.gov/mepsweb/

Table 10.13: Mean and Aggregate Total and Incremental Direct (for persons 18 and over) and Indirect Costs for Select Musculoskeletal Diseases, 2008-2011

			Musculoskeletal Disease		
		Gout [1]	Osteoarthritis and Allied Disorders [2]	Rheumatoid Arthritis [3]	Other and Unspecified Disorders of the Back [4]
ANNUAL DIRECT COSTS					
Sample N	Age 18+	1,074	11,230	463	6,428
# individuals		2,893,640	30,800,978	1,043,593	17,762,998
% total pop		1.3%	13.4%	0.6%	7.7%
Total	Mean	$ 12,166	$ 11,030	$ 17,010	$ 7,968
	Aggregate (in billions)	$ 141.5	$ 339.7	$ 17.8	$ 141.5
Incremental	Mean	*	$ 2,017	$ 6,428	$ 1,102
	Aggregate (in billions)	*	$ 62.1	$ 6.7	$ 19.6
ANNUAL EARNINGS LOSSES (Indirect)					
Sample N	Age 18-64	527	5,783	370	4,717
# individuals		1,398,046	16,132,638	888,430	13,011,977
% total pop		0.8%	9.3%	0.6%	7.5%
Total	Mean	$ (7,767)	$ 7,548	$ 13,886	$ (749)
	Aggregate (in billions)	$ (10.9)	$ 121.8	$ 12.3	$ (9.7)
Incremental	Mean	*	$ 4,951	$ 8,684	*
	Aggregate (in billions)	*	$ 79.9	$ 7.7	*
ANNUAL TOTAL COSTS					
Total	Aggregate (in billions)	$ 130.7	$ 461.5	$ 30.1	$ 131.8
Incremental	Aggregate (in billions)	*	$ 142.0	$ 14.4	*

* Not reported; relative standard error > 0.3

[1] ICD-9-CM Codes: Gout=274

[2] ICD-9-CM 715 or Priority nonRA with self-report of ICD-9-CM 716 or 719

[3] ICD-9-CM Codes: Rheumatoid Arthritis = 714 and priority RA and (RA Rx or RA ambulatory visits ≥5)

[4] ICD-9-CM Codes: Other and Unspecified Disorders of the Back = 724

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 2008-2011. http://meps.ahrq.gov/mepsweb/. Dollars reported are average across the four years.

Table 10.14: Aggregate Annual Total Direct and Indirect (Earnings Losses) Costs of Musculoskeletal Conditions and as a Proportion of Gross Domestic Product, United States 1996-2011

(in billions $s)

			Aggregate Values in 2011 $			% of GDP in 2011 $			
	GDP [1] current $	GDP [1] 2011 $	Total (raw) Aggregate Direct Cost	Total (raw) Indirect Costs	Total Direct + Indirect	Total (raw) Aggregate Direct Cost	Total (raw) Indirect Costs	Total Direct + Indirect	
1996-1998	$8,599.3	$11,538.7	$367.1	$28.9	$396.1	3.18%	0.25%	3.43%	
1997-1999	$9,121.1	$12,063.7	$378.7	$61.4	$440.1	3.14%	0.51%	3.65%	
1998-2000	$9,681.5	$12,602.3	$385.0	$75.0	$460.0	3.05%	0.59%	3.65%	
1999-2001	$10,193.6	$13,014.3	$417.2	$65.1	$482.3	3.21%	0.50%	3.71%	
2000-2002	$10,631.7	$13,308.9	$469.2	$61.2	$530.3	3.53%	0.46%	3.98%	
2001-2003	$11,039.2	$13,547.8	$531.6	$75.2	$606.8	3.92%	0.56%	4.48%	
2002-2004	$11,589.8	$13,915.9	$588.1	$109.8	$697.9	4.23%	0.79%	5.01%	
2003-2005	$12,294.9	$14,363.8	$615.9	$128.6	$744.4	4.29%	0.90%	5.18%	
2004-2006	$13,076.8	$14,815.0	$626.1	$113.6	$739.7	4.23%	0.77%	4.99%	
2005-2007	$13,811.2	$15,172.5	$654.7	$106.3	$761.0	4.31%	0.70%	5.02%	
2006-2008	$14,352.8	$15,347.6	$691.0	$95.7	$786.7	4.50%	0.62%	5.13%	
2007-2009	$14,539.5	$15,249.3	$747.5	$91.4	$838.9	4.90%	0.60%	5.50%	
2008-2010	$14,698.8	$15,190.6	$765.9	$77.3	$843.2	5.04%	0.51%	5.55%	*
2009-2011	$14,970.0	$15,244.7	$796.3	$77.5	$873.8	5.22%	0.51%	5.73%	
1996-1998 to 2009-2011 (2011 $s)									
Annual Increase	5.7%	2.5%	9.0%	12.9%	9.3%	4.9%	7.9%	5.2%	
Total Increase	74.1%	32.1%	116.9%	168.0%	120.6%	64.2%	102.9%	67.0%	

* An error in calculating percentage of GDP in the BMUS, Ed2, resulted in lower percentages than previously reported.

[1] Source: http://www.bea.gov/national/xls/gdplev.xls, accessed 3/18/2014 and smoothed over three years.

[2] Source: Current GDP multipled by inflation factors calculated per http://meps.ahrq.gov/mepsweb/about_meps/Price_Index.shtml, accessed 2/4/14.

Table 10.15: Summary Annual Average Economic Impact for All Musculoskeletal Diseases, United States 2009-2011

Total Persons with Musculoskeletal Disease	Total	Under 18	18-44	45-64	65 & Over
Sample N (annual)	9,522	859	2,781	3,640	2,242
Total Population (in millions)	308.8	78.0	110.9	80.6	39.2
Persons with Condition (in millions)	102.5	8.3	29.8	39.2	25.1
% Total Population	33.2%	25.3%	35.9%	26.1%	12.7%
Age Distribution		Distribution Total by Age			
		8.1%	29.1%	38.3%	24.5%
TOTAL DIRECT COSTS					
Mean Cost Per Person	$ 7,768	$ 3,288	$ 4,658	$ 8,568	$ 11,708
Aggregate (in billions)	$ 796.3	$ 27.4	$ 138.9	$ 336.0	$ 294.1
INCREMENTAL COSTS					
Mean Cost Per Person	$ 2,075	$ 1,596	$ 1,575	$ 2,539	$ 2,109
Aggregate (in billions)	$ 212.7	$ 13.3	$ 47.0	$ 99.6	$ 53.0

INDIRECT COSTS

		Total	Incremental Share $s Lost
Total with Condition In Workforce (in millions)	63.4		
Mean		$1,224	$2,063
Aggregate (in billion $)		$77.5	$130.7

SUMMARY TOTAL ECONOMIC IMPACT DUE TO MUSCULOSKELETAL DISEASE, 2009-2011

	Costs in 2011 $s (in billions)		Share GDP	
Total	Aggregate	Incremental	Aggregate	Incremental
Direct Costs	$ 796.3	$212.7	5.22%	1.40%
Indirect Costs	$ 77.5	$130.7	0.51%	0.86%
Total All Costs	$ 873.8	$343.4	5.73%	2.25%

HEALTH RESOURCE VISITS FOR ALL PERSONS WITH MUSCULOSKELETAL DISEASE

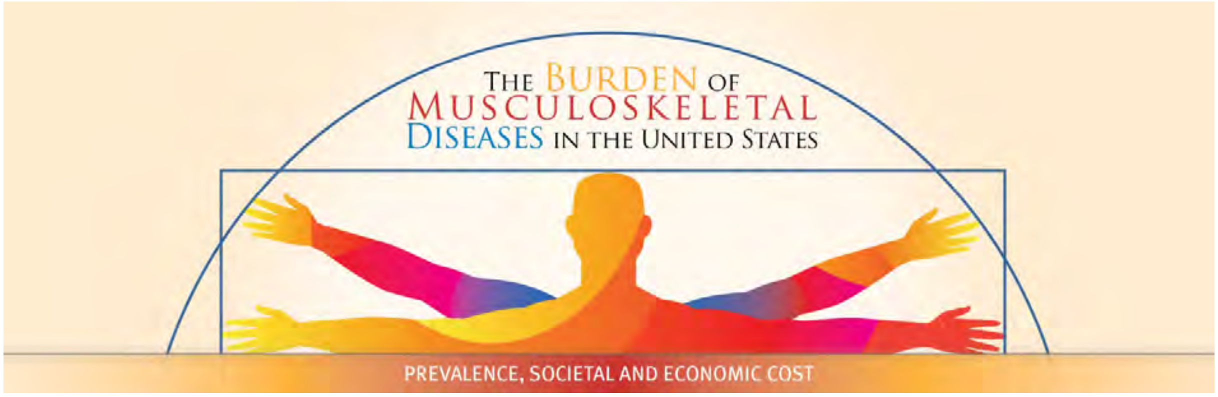
	% With Any Visits	Number with Visits (in millions)	Mean Visits	Total Visits (in millions)	% Total Visits
Ambulatory Care	84.8%	86.9	5.6	574.0	18.4%
Inpatient	11.0%	11.3	0.2	20.5	0.7%
Prescription	83.7%	85.8	20.8	2,132.1	68.4%
Residual	4.9%	5.0	3.8	389.5	12.5%
Total All Visits	100.0%	102.5	NA	3,116.1	100.0%

Table 10.15: Summary Annual Average Economic Impact for All Musculoskeletal Diseases, United States 2009-2011

SHARE OF COSTS BY HEALTH RESOURCE FOR ALL PERSONS WITH MUSCULOSKELETAL DISEASE

	Aggregate Costs in 2011 $s			Incremental Cost Share in 2011 $s		
	Mean Cost Per Person	Aggregate (in billions)	% All Costs	Mean	Aggregate (in billions)	% All Costs
Ambulatory Care	$2,614	$227.2	34%	$859	$ 74.7	41%
Inpatient	$2,237	$25.2	29%	$313	$ 3.5	15%
Prescription	$1,778	$152.5	23%	$408	$ 35.0	20%
Residual	$1,139	$5.7	15%	$379	$ 1.9	18%
Total All Visits	$7,768	$796.3	100%	$2,075	$ 212.7	94%

Source: Medical Expenditures Panel Survey (MEPS), Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011 http://meps.ahrq.gov/mepsweb/



Data Sources

The primary sources of data used in this publication were the Healthcare Cost and Utilization Project (HCUP) National Databases from the Agency for Healthcare Research and Quality (AHRQ), and the National Health Care Surveys (NHCS) family of provider-based surveys conducted by the National Center for Health Statistics (NCHS). Additional data ysed came from the United States Census Bureau on population counts; The Bureau of Labor Statistics on injuries; Centers for Disease Control (CDC) Web-based Injury Statistics Query and Reporting Systems (WISQARS) on injuries; The SEER Cancer Statistics Review and the National Cancer Database on tumors. The Economic Cost section utilized the Medical Expenditures Panel Survey, Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, 1996-2011 SAS source: 008Table1_series.

Photos and images were purchased from CanStock Photos for public Internet use in conjunction with Section 4: Permitted Uses.

The small size of some databases precludes analysis at a detailed level. In general, ICD-9-CM codes were combined into major musculoskeletal disease classifications to provide sufficient sample size for reliable estimates.

Extensive use was also made of published studies in scientific and epidemiological journals as secondary sources of data.

It is important to recognize that no one source of data provides a complete view of the frequency and impact of a disease or condition. Interview surveys, for instance, generally underestimate the frequency of most musculoskeletal diseases. However, information obtained through the use of interviews is essential when assessing the impact of musculoskeletal disease on individuals, knowing that these individuals react differently to symptoms and pain. In addition, for some conditions, this may be the only means available to collect data on specific diseases.

In contrast, the use of objective methods such as physical examination, laboratory measurements, and radiographs for the detection and diagnosis of disease and injury is not dependent on the subjective reporting of symptoms. However, the objective evidence used to establish the presence or absence of a condition does not always correlate with reported symptoms. It is known that some individuals who report symptoms do not have evidence of disease upon examination and, conversely, some individuals who have objective evidence of disease do not experience symptoms. Thus, although objective measures are valuable tools, they may yield an incomplete picture of the impact of a given disease. This type of study is also more expensive, involves a smaller number of individuals, and may under-represent less frequently occurring disorders.

Data obtained from medical records are also subject to certain limitations. Many persons affected with certain musculoskeletal diseases do not seek medical care. Although records of visits to physicians and hospitals provide estimates of the volume of visits, these records do not include those who do not seek medical care. Therefore, data based on existing records will yield only a partial representation of how various musculoskeletal diseases affect the population.

Medical records do not necessarily indicate the underlying musculoskeletal condition. For instance, fractures at various sites, especially hip fractures, are a major consequence of osteoporosis. When admitted to the hospital, a fracture diagnosis is usually listed rather than osteoporosis. Medical records may also be subject to “upcoding” to maximize reimbursement and may overstate the frequency of more severe conditions.

Through the analysis and inclusion of data from a wide range of sources, each with its own strength and weaknesses, it is our goal to present an integrated and comprehensive understanding of the impact of musculoskeletal diseases on the United States population.

ICD Codes

ICD-9-CM and ICD-10-CM codes are available free from Alkaline Software, a publisher of medical, financial and social databases. Conversion of medical codes to ICD-10-CM codes will be required by October 1, 2015, for everyone covered by the Health Insurance Portability Accountability Act (HIPAA). Assistance with making the transition is available at the Centers for Medicare & Medical Services (CMS) and through the ICD-10-CM website.

Global Burden of Disease

The World Health Organization (WHO) global burden of disease (GBD) measures burden of disease using the disability-adjusted-life-year (DALY). This time-based measure combines years of life lost due to premature mortality and years of life lost due to time lived in states of less than full health. The DALY metric was developed in the original GBD 1990 study to assess the burden of disease consistently across diseases, risk factors and regions.

Several web sites offer articles from the most recent GBD report. These include:

The Lancet, Global Burden of Diseases, Injuries, and Risk Factors Study 2013 http://www.thelancet.com/global-burden-of-disease Accessed December 23, 2014.

Institute for Health Metrics and Evaluation, Global Burden of Disease (GBD) http://www.healthdata.org/gbd Accessed December 23, 2014.

Specifically addressing GDB in the United States:

Institute for Health Metrics and Evaluation, The state of US health, 1990-2010: burden of diseases, injuries, and risk factors. http://www.healthdata.org/research-article/state-us-health-1990-2010-burden-diseases-injuries-and-risk-factors Accessed December 23, 2014.

Other Resources

Measuring the Value of Orthopaedics

Patient Stories

BMUS is intended primarily to present prevalence, societal and economic cost data. However, users have expressed an interest in learning about how advances to date in science have led to the success of treatments and procedures.

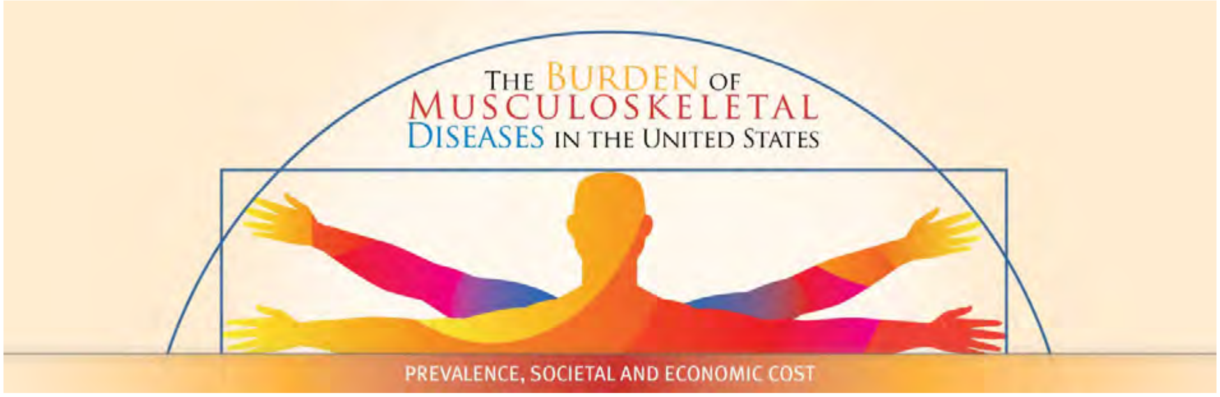
In this section there are links to stories in which patients recount their experiences, illustrating how debilitating bone and joint disorders can be, but also how advances in science have led to remedies that mean they can get their mobility back and return to normal or more normal lives, at home, in the workplace, while relaxing, undertaking exercise, or any of the things they normally do during their day.

Further advances in science and evidence-based treatments are still needed to improve the treatment of people with musculoskeletal disorders, and to reduce costs (or…make them more accessible).

A Nation in Motion: This campaign from the American Academy of Orthopaedic Surgeons contains hundreds of patient stories. You can find them by clicking on links to the region of the body that has been affected (ex. Leg, Foot & Ankle), or by topic areas (ex. Sports, Children, Pain).

OrthoInfo Patient Stories: This section of the American Academy of Orthopaedic Surgeons website contains links to patient stories by population-type (ex. Children) and by condition (ex. Arthritis) and region of the body (ex. Neck & Back). And more stories can be read at The Faces of Orthopaedics.

Scoliosis: These stories are provided by the patients of members the Scoliosis Research Society.

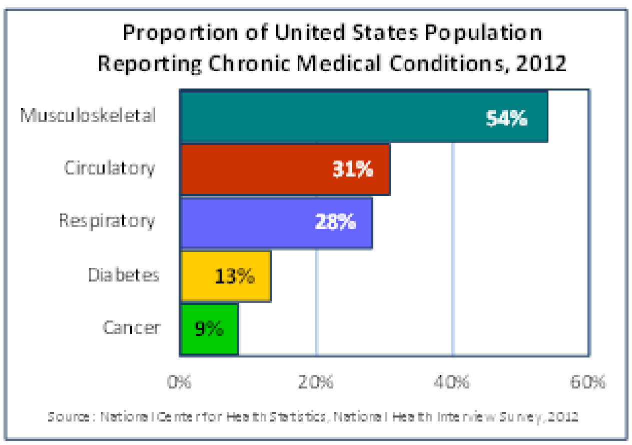


Facts-in-Brief

These and more key facts about musculoskeletal disorders (bones, joints, muscles) are available on the following **By The Numbers** sheets which can be downloaded.

The Big Picture - Leading Cause of Disability / Health Care Cost

- **1 in 2** (126.6 million) adults are affected, twice the rate of chronic heart and lung conditions
- **$7,800:** Average annual cost per person for treatment
- **$874 billion (5.7% GDP):** Annual U.S. cost for treatment and lost wages



By The Numbers - Musculoskeletal Conditions (Big Picture)

Back Pain

- **1 in 4** (58.8 million) adults suffer from chronic low back pain; for 40%, pain radiates down the leg.
- **$253 billion**: Annual U.S. cost for treatment and lost wages due to back pain.

By The Numbers - Back Pain.pdf

Children and Adolescents

- **19 million**: Children and adolescent health care visits for a musculoskeletal related condition
- **$140.8 million**: Hospital charges to treat musculoskeletal conditions in children and adolescents

By The Numbers - Children & Adolescents.pdf

Bone and Joint Initiative USA

www.boneandjointburden.org