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# The Injury Fact Book

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Second Edition

Susan P. Baker   Brian O'Neill  
Marvin J. Ginsburg   Guohua Li

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Second Edition

SUSAN P. BAKER  
BRIAN O'NEILL  
MARVIN J. GINSBURG  
GUOHUA LI

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# Foreword

The United States has an injury problem. Each year, one in four Americans sustains an injury serious enough to warrant medical treatment or to restrict activity for at least a day. A conservative estimate of the lifetime cost of injuries sustained in a single year (1985) in the United States is \$158 billion dollars. Since publication of the first edition of *The Injury Fact Book* in 1984, those costs have exceeded one trillion dollars.

The first step in developing effective solutions to the injury problem is to provide an accurate description of what that problem is. We need clarity in the definition of terms, access to current and historical data, research findings with citations of sources, sufficient detail about risk factors and at-risk populations, and a simple, graphic presentation of facts. The “we” in this context are all of us who need injury facts and figures as the raw material of our daily work.

The injury problem presents a challenge to the organizer of its facts. Injuries have traditionally been categorized by intent (unintentional, homicidal, suicidal). Alternative categories are type of injury (e.g., spinal cord, brain, fracture) or cause (e.g., firearm, motor vehicle). Some researchers favor categories by population at risk (children, adolescents, the elderly, minorities). Because sources of data are different, descriptions sometimes are confined to a single level of severity, such as fatal injuries or injuries requiring hospitalization. Other descriptions focus on the setting of the injury event (e.g., work, recreation). The requirements of simplicity and clarity demand hard choices from those who describe the injury problem.

Professor Susan Baker makes these hard choices. She is the consummate describer of the fatal injury problem, dating back to the late 1960s and to her desk at the medical examiner’s office in Baltimore. Attracted by the wealth of information available in medical examiner reports, she was able to describe patterns in the causes of fatal injuries and make suggestions for preventive action, primarily focusing upon specific environmental changes.

During the 1970s and 1980s, Professor Baker and colleagues at The John Hopkins School of Public Health refined research in the injury field and enlarged the “pool” of injury researchers through the education of graduate students. At the same time, Dr. William Haddon, Jr., Brian O’Neill, and other colleagues at the Insurance Institute for Highway Safety worked to identify, evaluate, and develop ways to reduce human and economic damage associated with the use of motor vehicles.

Drawing on this combined experience, Susan Baker, Brian O'Neill, and Ronald Karpf compiled the first edition of *The Injury Fact Book*. Its graphs and tables, organized by cause of injury and based on mortality statistics, were supplemented with findings from research on both fatal and nonfatal injuries. Implications for prevention strategies were embedded in every chapter.

*The Injury Fact Book* became our "almanac," one of those dog-eared volumes kept in a sheltered place on the reference shelf, lest it disappear permanently in the arms of someone borrowing it "just for a second." It works for us. It provides material for media briefings, testimony before legislative committees, class lectures, and grant proposals. It is what it says it is—a compendium of injury facts, an invaluable asset to those who are asked constantly by mail or telephone about details of specific injury problems. It is a time-saver for those providing this extremely time-consuming service.

The second edition of *The Injury Fact Book* again teams Susan Baker with Brian O'Neill and adds two new authors, Marvin Ginsburg and Guohua Li. Maintaining the structure of the original, this edition presents mortality data for the years 1980–1986. The aggregation of seven years of data allows computation of rates for important subgroups, such as age-specific rates for Asians and Native Americans. When combined, the data in the two editions span a full decade. Time trends are analyzed and reported. In fact, for most categories of injury, the rates for 1984–1986, when compared to rates for 1977–1979, are lower. There are exceptions, however, such as a dramatic increase in the death rates for bicyclists over the age of twenty.

Chapters on sports and recreation, aviation, and large trucks have been added, and the chapter on machinery has been expanded to include all occupational injuries. Through its extensive references—double those of the previous edition—the second edition of *The Injury Fact Book* continues to be a treasure trove of references for investigators who wish to pursue questions addressed in published studies and reviews.

One measure of influence of a publication is the number of times a work is cited by other authors. This frequency of citation is documented in the *Science Citation Index* and the *Social Science Citation Index*. The titles of the fifty-two citations in the most recent annual indexes (1989) were reviewed, to get a measure of the relevance of *The Injury Fact Book* to the broad range of issues addressed by injury researchers.

The list of authors citing the book reads like a "who's who" in the injury field. The titles of the articles cover the full range of the injury problem. Some articles focus on high-risk populations (e.g., "Predicting traffic injuries in childhood: A cohort analysis," "Motor trauma in geriatric patients," "Injury mortality in New Mexico's American Indians, Hispanics, and non-Hispanic whites, 1968–1982"). Others focus on a type of injury (e.g., "Unusually low mortality of penetrating wounds of the

chest—12 years' experience," "Time trends in the incidence of hospitalized ocular trauma," "Epidemiology of chest trauma").

Many articles focus on a cause of injury in a specified state or region (e.g., "Unintentional firearm death in California," "Effects of the 65-MPH speed limit on rural interstate fatalities in New Mexico," "Employment status and the frequency and causes of burn injuries in New England"). The specificity of these articles is in line with the book's emphasis on state and regional differences. These are presented by means of U.S. maps with states shaded according to cause-specific injury rates. Evidence of the book's relevance to the international community of injury researchers is found in citations from abroad (e.g., "Injury mortality and morbidity in New Zealand," "Unintentional injuries among elderly people—incidence, causes, severity, costs" [Sweden]).

The variety of articles citing *The Injury Fact Book* bears testimony not only to the usefulness of the book but also to the way the injury research field itself has matured. Our research questions in the latter half of the 1980s have become more tightly framed, our research methods more sophisticated, our interventions more informed by data and previous experience, our evaluations less pro forma. The findings of many of the studies that cite the first edition of *The Injury Fact Book* are themselves discussed and referenced in its second edition. Thus, *The Injury Fact Book* has played a vital facilitating role in the evolution of injury research over the past six years. The cycle is sure to be repeated.

*Director*  
*San Francisco Injury Prevention*  
*Research Center*

Elizabeth McLoughlin, Sc.D.



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# Foreword to the First Edition

Injuries are the leading cause of death in the United States from the first year of life to age 44. An incalculable cause of human suffering, injuries are also a major source of medical costs and losses to the economy. Yet the subject is largely unknown territory, even to professionals concerned with impairments to the health of the American people and ways in which the quality of life in the United States can be improved. Only rarely do colleges or universities teach the scientific aspects of injuries—except with respect to the treatment of the injured.

This is not because of lack of knowledge. Since about 1940, what is now termed “injury control” has evolved rapidly from the prescientific folklore that still dominates much popular thinking about the causes, prevention, and amelioration of injuries to a mature scientific field with sophisticated research methods, a practical theoretical base, an extensive body of empirical knowledge, and increasing examples of the successful control of the human damage.

In these respects, injuries and their prevention are the last of the great human plagues to be the subject of scientific inquiry and understanding. But, unlike the situation in the case of infectious, cardiovascular, and neoplastic diseases, until the preparation of this book there has been no body of truly competent, comprehensive information giving, so to speak, the statistical lay of the land in the case of the many kinds of injuries.

Most of the basic analyses had never even been done before the authors meticulously performed them using a variety of governmental and other sources. Analyzed by cause, age, sex, race, socioeconomic status, urbanization, geography, time, and other variables, the results of this book, together with those the authors have drawn from other works, will constitute the indispensable statistical reference on injuries for years to come. The book will also undoubtedly be the source to which graduate students and others turn for injury research information, since the reasons for many of the trauma distributions it documents are, as yet, only poorly understood.

Since in many respects the authors have broken entirely new ground, many of the results they report will surprise, and in some cases shock, even specialists in the field. For example:

Death rates from drowning are higher at ages one and two than at any other age, and remain high throughout the preschool period.

State death rates from motor vehicle crashes correlate closely with death rates in the same states from other unintentional injuries.

The death rate per freight ton-mile varies a thousandfold, depending on the transportation mode employed. The lowest death rates are for freight moved by pipeline and marine transport, the highest for freight moved by highway.

Firearm suicide rates decrease and non-firearm suicide rates increase with increased socioeconomic status.

Per capita, Asians have by far the lowest motor vehicle death rates. Native Americans have by far the highest.

During World War II, more than 20,000 U.S. military personnel died in plane crashes in the continental United States.

With only four known exceptions, all male injury death rates greatly exceed those of females. The exceptions are deaths from falls on the same level (the rates for which are about equal), deaths from barbiturates and psychotherapeutic drugs, and deaths from strangulation, which show marked female excesses compared to males.

Although it was not the authors' intent to discuss injury theory, research, or prevention, their statistics are laced with incisive comments about the wide variations in incidence, explanations of many of the findings, and references to relevant work. In the process, they have also documented the substantial success of several injury control efforts.

An example is provided by childhood poisonings: "Since 1960, poisoning deaths among children younger than 5 years have decreased dramatically. The rate for poisoning by solids and liquids was 2.2 per 100,000 in 1960 and 0.5 in 1980 .... Between 1960 and 1980, the number of deaths from lead poisoning dropped from 78 to 2. Deaths from kerosene and other petroleum products dropped from 48 to 9, while those from aspirin dropped from 144 to 12 .... An especially steep decline in childhood poisoning death rates occurred after childproof packaging was required on all drugs and medications beginning in 1973. The 50 percent decrease in poisoning by all drugs and medications in the first three years (1973-1976) was substantially greater than the decrease in poisonings by other solids and liquids, most of which were not required to be packaged in childproof containers .... During 1968-1979, the period analyzed for most causes of death in this book, the 80 percent decline in poisoning death rates for children ages 1-4 exceeded that for any other major cause of childhood injury death."

In 1930, 348 people died in elevator failures. With improved elevator designs and government regulations and inspections, such deaths, despite huge increases in elevator use, have become so rare that they are no longer recorded separately in the nation's vital statistics.

The dramatic change in injury deaths, whether inadvertent or deliberate, that can result from correcting an environmental hazard is also illustrated

by what happened when coal gas (which had a higher carbon monoxide content) was replaced by natural gas. In 1947, domestic piped gas caused about 1,000 unintentional deaths and was the agent in some 1,200 suicides. In 1980, after the change to natural gas, the corresponding totals were only 61 and 23 deaths, a decrease of more than 90 percent.

Despite such examples, the injury picture presented in this book is generally grim. It resembles the situation in the history of infectious diseases before the sanitary revolution and subsequent preventive and therapeutic measures. In contrast, the magnitude and characteristics of the injury problem documented in this book make it clear that the country and the relevant professions have a huge amount of catching up to do to bring injury control to the level of success already achieved with the infectious diseases and the level being approached with respect to malignancies and afflictions of the cardiovascular system. The data in the book are a baseline against which that objective will long be measured. Thorough familiarity with this book will long be necessary for professional literacy in the fields with which it deals and in those to which it relates. In addition, the data and commentary this book provides will long be invaluable resources for insurers, public health workers, and, in fact, for everyone concerned with the occurrence, reduction, and cost of injuries of all kinds.

William Haddon, Jr., M.D.

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Dr. Haddon was the first head of the National Highway Traffic Safety Administration and was President of the Insurance Institute for Highway Safety from 1969 until his death in 1985.

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# Preface

Great changes have characterized the field of injury prevention since the first edition of *The Injury Fact Book* was published in 1984.

First is the sheer number of health professionals now actively engaged in the battle against injury. More than 800 came to the 1991 National Injury Control Conference, and attendance is standing-room-only at our scientific sessions of the American Public Health Association.

Second is our ability to attract doctoral students committed to specializing in injury prevention. People grounded in epidemiology, public health practice, education, nursing, medicine, law, engineering, psychology, and other disciplines are essential to our growth and advancement—but those with added training in injury prevention will have the greatest ability to effectively reduce injuries.

Third is the burgeoning literature. Dr. McLoughlin, in her foreword to this edition, describes the explosion of journal articles. Equally impressive is the number of relevant new books. Teaching is now far easier as a result of the textbooks, and more exciting with each landmark research paper.

Last, but hardly least, is the increased public demand for action. Fewer people tolerate bad designs and manmade environments that invite injury, and many understand that blaming the victim leads only to more victims. A good example of this new awareness is that in the past most automakers held the view that “safety doesn’t sell,” but virtually all automakers now promote the advantages of their cars’ safety features, such as air bags and antilock brakes. Perhaps most important, interest in injury prevention now motivates increasing numbers of legislators, members of the media, professional organizations, and others who shape the decisions that determine the public’s risk of injury.

Unchanged is our great debt to the pioneers who placed the study and control of injuries on a solid, scientific basis. In particular, William Had-don, Jr., emphasized the role of various forms of energy as the etiologic agents of injury and developed useful frameworks for conceptualizing strategies to prevent injuries. He was a passionate advocate for changes in the policies and environments that determine the burden of injury on mankind.

*The Injury Fact Book* has been written in the hope that it will be an instrument of those still-needed changes. The Insurance Institute for Highway Safety provided essential resources, both human and financial. The

National Center for Health Statistics and the National Highway Traffic Safety Administration collected and made available data for most of the analyses.

With my co-authors, Brian O'Neill, Marvin Ginsburg, and Guohua Li, I wish to thank all those whose hard work has enabled us to complete our task. In particular, Sharon Rasmussen at the Insurance Institute for Highway Safety and Diane Reintzell, my secretary, have given high priority to ensuring the excellence of our product.

Susan P. Baker, M.P.H.

# Abbreviations

AMA	American Medical Association
ATV	All-terrain vehicle
BAC	Blood Alcohol Concentration
BLS	Bureau of Labor Statistics
CDC	Centers for Disease Control
CPR	Cardiopulmonary resuscitation
CPSC	Consumer Product Safety Commission
DSR	Division of Safety Research
FARS	Fatal Accident Reporting System
FBI	Federal Bureau of Investigation
FDA	Food and Drug Administration
FHWA	Federal Highway Administration
GAO	General Accounting Office
ICD	International Classification of Diseases
IIHS	Insurance Institute for Highway Safety
IIP	Industrial Index of Production
MSA	Metropolitan Statistical Area
NASS	National Accident Sampling System
NCHS	National Center for Health Statistics
NEISS	National Electronic Injury Surveillance System
NHIS	National Health Interview Survey
NHTSA	National Highway Traffic Safety Administration
NIOSH	National Institute of Occupational Safety and Health
NRC	National Research Council
NSC	National Safety Council
NTOF	National Traumatic Occupational Fatality
NTSB	National Transportation Safety Board
OSHA	Occupational Safety and Health Administration
SIDS	Sudden Infant Death Syndrome
USCG	United States Coast Guard
USMC	United States Marine Corps
WHO	World Health Organization



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# **The Injury Fact Book**



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# 1

## Introduction

Injuries are the most serious public health problem facing developed societies. They take a heavy toll among people of all ages and cause the majority of deaths among children and young adults in the United States. Once overshadowed by more common causes of death and illness, injuries have grown in relative importance as many diseases have been controlled. Throughout the world, they are now the leading cause of death during half of the human lifespan (Barss et al. 1991).

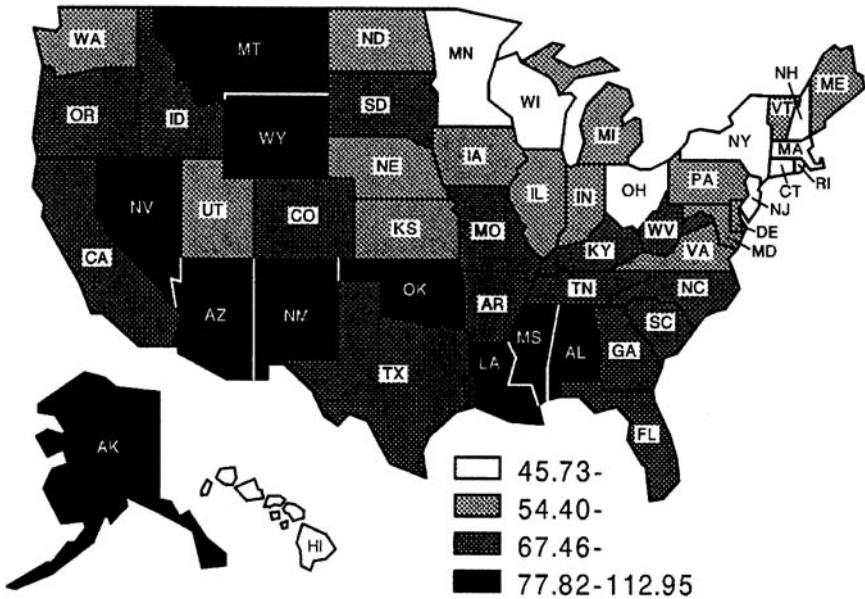
Injury is important not only in relation to other health conditions but also in the absolute magnitude of the problem. More than six million people alive today in the United States can be expected to die from injuries (Whitfield et al. 1983). The risk of injury while traveling, working, playing, or even sleeping is so great that most people sustain a significant injury at some time during their lives. Few escape the tragedy of a fatal or permanently disabling injury to a relative or friend. Nevertheless, this widespread human damage too often is taken for granted, in the erroneous belief that injuries occur by chance and are the result of unpreventable “accidents.”

Comparatively little public attention is given to injuries and their prevention except during the aftermath of a disaster, even though on an average day the number of injury deaths in the United States is several times the toll of a major airliner crash. The amount of scientific attention directed to the injury problem is small in relation to the attention and resources accorded many other health problems (National Academy of Sciences 1985).

## EPIDEMIOLOGY AND PREVENTION

The occurrence of injuries is largely determined by characteristics of the environment and the many products we use in work, recreation, and travel. Modifying man-made systems and products is often more feasible than altering the behavior of each individual. Failure to recognize the difficulty of “improving” behavior has often led to failure to apply more effective alternative countermeasures to the injury problem.

Specific injuries differ greatly in their distribution in space, time, and populations. The incidence and severity of injury are influenced by demographic factors such as age, sex, race, and occupation as well as by economic, temporal, and geographic effects (Figure 1-1). The influence of these

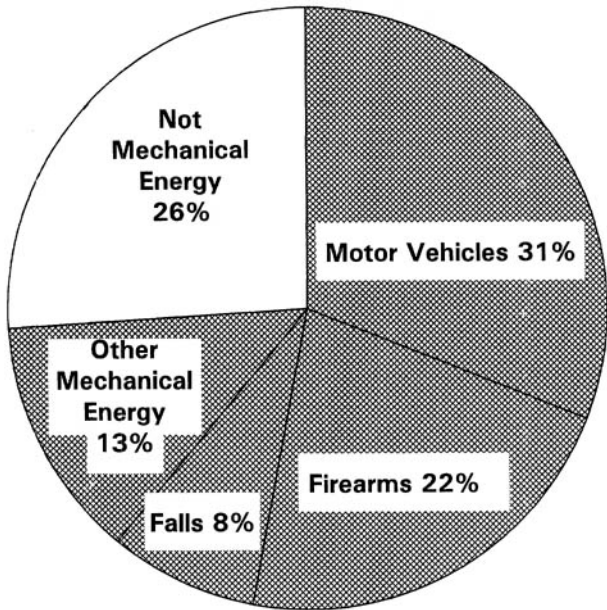


**Figure 1-1. Death Rates from All Injuries by State, per 100,000 Population, 1980–1986**

factors is so great that death rates from many injuries differ enormously among various groups of people. For example, the homicide rate in the United States is 24 times as high for black men aged 25–29 as for Asian women of the same age; the risk of dying in an airplane crash is 45 times as great for residents of Alaska as for residents of Massachusetts; and the death rate from occupational injury among truck drivers is 48 times the rate for laundry operators (Leigh 1987).

Injuries are caused by acute exposure to physical agents such as mechanical energy, heat, electricity, chemicals, and ionizing radiation interacting with the body in amounts or at rates that exceed the threshold of human tolerance (Gibson 1961; Haddon 1963). In some cases (for example, drowning and frostbite), injuries result from the sudden lack of essential agents such as oxygen or heat. About three-fourths of all injuries, including most from vehicle crashes, falls, sports, and shootings, are caused by mechanical energy (Figure 1-2).

Although there are no sharp scientific distinctions between injury and disease, injuries usually are perceived almost immediately after contact with the causal agent (Haddon 1980). Because injuries and the events leading to them are generally more obvious and closer together in time than are diseases and the events that precede them, the role of human behavior is often erroneously assumed to be more important to injury causation than to disease causation. In fact, human behavior is important to both. For example, wearing shoes and cooking food are behaviors that can influence susceptibility to disease—but the behavioral element often goes unnoticed



**Figure 1-2. Percentage of All Injury Deaths Caused by Mechanical Energy, 1986**

because symptoms of hookworm or amebic dysentery may not be apparent until months after a person walked barefoot in dirt infested with hookworm larvae or ate uncooked vegetables containing amebic cysts. There is no basis for the widespread assumption that modifying human behavior is any more important in preventing injuries than diseases (Haddon and Baker 1981).

**ORGANIZATION OF THE BOOK**

This book includes detailed information on many of the factors surrounding injuries—the man-made systems and products involved, the groups of people at greatest risk, and effective ways to protect people from injuries. The circumstances under which injuries occur, the etiologic agents, and the characteristics of the people involved are examined. Chapter 2 summarizes the importance of injuries in relation to other prominent health problems. Subsequent chapters describe injury mortality and, in cases where good population-based studies are available, nonfatal injuries.

The organization of the book is influenced by the International Classification of Diseases (ICD) codes, which determine the availability of most national mortality data on injuries. Since these codes are subdivided according to apparent “intent” of injury (i.e., unintentional, suicidal, or homicidal), Chapters 3–6 are organized on the basis of intent. Chapters 7–21 are organized on the basis of injury etiology; the chapter on poisoning,

for example, includes details on suicidal as well as unintentional poisonings. To minimize repetition, the reader is sometimes referred to other chapters.

The analyses in Chapters 3–15 are primarily of injury deaths during 1980–1986, the most recent years for which detailed mortality data were available in mid-1989 for deaths other than those related to motor vehicles. In many instances the text and tables have been further updated with 1988 mortality data. Most of these data were collected by the U.S. Department of Health and Human Services, National Center for Health Statistics (NCHS).

Chapters 16–21 present data on deaths from motor vehicle-related injuries, based primarily on the Fatal Accident Reporting System (FARS) of the U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA). The U.S. Bureau of the Census population estimates for 1980–1986 provided denominators for rates throughout the book. Further details on data sources may be found in the Appendix, which also provides a wealth of statistics on 69 categories of injury.

The scientific foundation for injury research was laid almost three decades ago by William Haddon and his colleagues in their comprehensive review and analysis of the injury studies available at that time (Haddon et al. 1964). The literature on injury research and prevention has grown rapidly in recent years and is comprehensively described elsewhere (Baker 1989; Barss et al. 1991; Haddon 1980; Haddon and Baker 1981; National Academy of Sciences 1985; National Committee for Injury Prevention and Control 1989; Rice et al. 1989; Robertson 1983, in press; Waller 1985; Wilson et al. 1991).

The purpose of this second edition of *The Injury Fact Book* is not only to present more recent data but also to further improve understanding of the nature and magnitude of the injury problem in the United States. Most of the analyses presented here were conducted for this book and are not presented elsewhere. To highlight changes since the first edition was published, where appropriate, comparisons are drawn for the periods 1977–1979 and 1984–1986.

This book provides a detailed documentation of the injury problem in the United States. The facts are presented to improve understanding of which groups of people are likely to be injured and how, and to encourage work on solutions to the injury problem.

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# 2

## Injuries in Relation to Other Health Problems

This chapter documents the importance of injuries in relation to other health problems. Health expenditures in the United States in recent years have been rising much faster than the gross national product. Increasingly, policymakers and health professionals recognize that the resources needed for health care are limited and that available resources must be used more efficiently. Allocations of resources for research and for prevention and treatment of disease and injury should be made on the basis of the relative importance of various causes of morbidity and mortality in the population and the potential for effective intervention.

### INJURIES AS A CAUSE OF DEATH

Mortality data are commonly used to describe and compare public health problems, in part because deaths are well defined and detailed data are available. Most of the analyses presented in this book focus on mortality. In keeping with standard public health practice, results are generally summarized by death rates, defined as the number of deaths per 100,000 population each year.

One death out of every 14 in the United States results from injury. Injuries are the third leading cause of death, claiming 150,000 lives each year. In 1988, the death rate for injuries (62 per 100,000 people) was surpassed only by the rates for heart disease and cancer (NCHS 1990a).

For more than four decades of life—specifically, ages 1–44—injuries are the leading cause of death (Figure 2-1; NCHS 1990a). As is true of cancer and other disease groups, injuries include a number of subgroups. One subgroup of injuries, those related to motor vehicles, is the most common cause of death for ages 1–34. Fatal motor vehicle injuries outnumber by 125 to 1 deaths from cystic fibrosis, a disease that is the object of considerable public concern.

The age-specific death rates for injuries far surpass those for cancer and heart disease for ages 1–44 (Figure 2-2; NCHS 1990). From age 1 through 4, injuries cause almost half of all deaths and result in more than three times

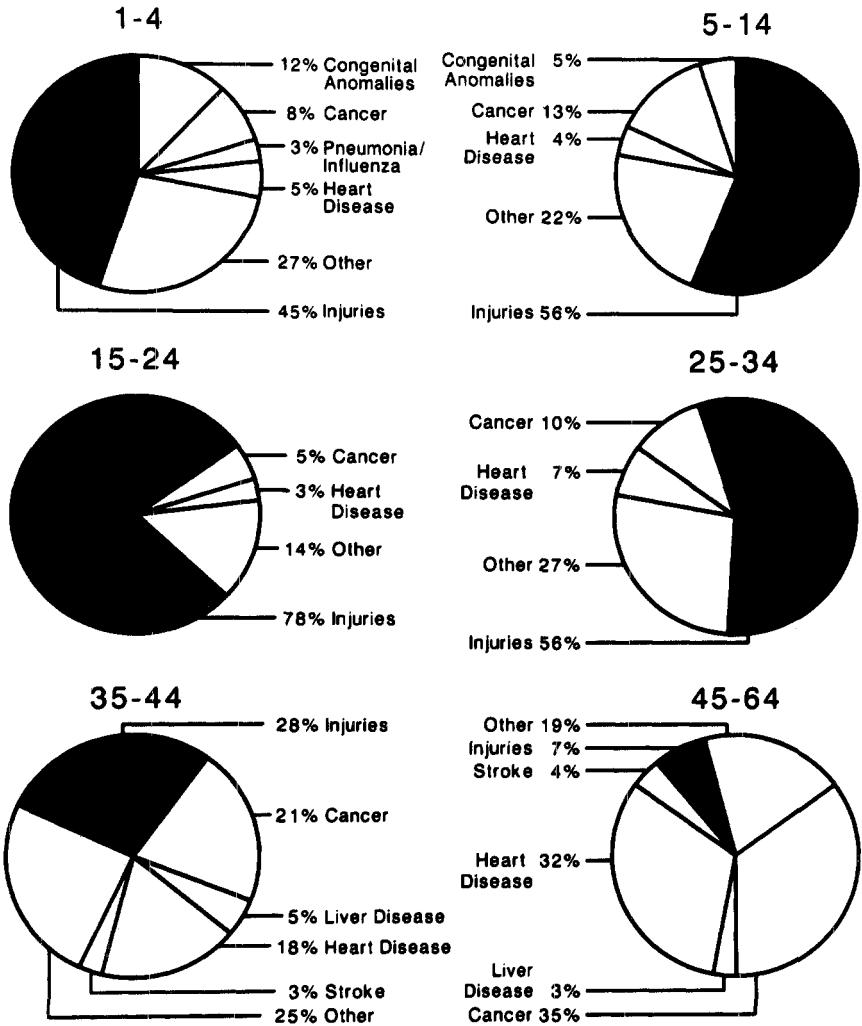


Figure 2-1. Percentage of All Deaths by Cause and Age, 1987

the number of deaths from congenital anomalies, the second leading cause. Injury deaths exceed deaths from all other causes combined from age 5 through 34 and are most prominent at ages 15-24, when they cause 78 percent of all deaths. From age 35 through 44, they continue to outnumber deaths from any other single cause (NCHS 1990a).

After age 45, injuries account for fewer deaths than several other health problems, such as heart disease, cancer, and stroke. Despite the decrease in the proportion of deaths due to injury, the death rate from injuries is actually higher among the elderly than among younger people. In absolute numbers, injuries remain important throughout life. For example, each year some 30,000 people aged 65 or older die from injuries (NCHS 1990a).



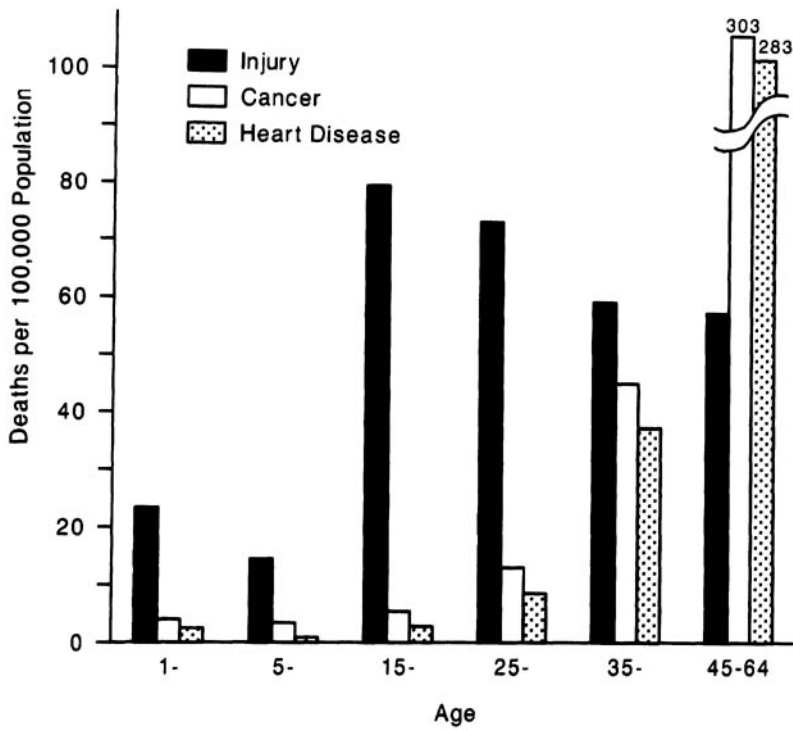


Figure 2-2. Death Rates by Cause and Age, 1986

Children less than 1 year old are often omitted from published injury statistics, even though injury deaths during the first year of life now are twice the number of deaths from pneumonia and are outranked only by congenital anomalies and perinatal conditions.

TRENDS IN MORTALITY FROM INJURIES AND OTHER CAUSES

Injuries have always been a serious problem, but until the 1940s their importance was overshadowed by the prominence of many infectious diseases. In 1910, the death rates from three major disease groups—tuberculosis, influenza/pneumonia, and gastroenteritis—were higher than the death rate from injuries (Figure 2-3). By 1980, however, death rates from tuberculosis and gastrointestinal disorders had declined by 99 percent and deaths from influenza/pneumonia by 85 percent, whereas the injury death rate had declined by only about 30 percent during these seven decades. Injuries presently are responsible for more than twice as many deaths as are influenza and pneumonia.

Trends in childhood deaths during this century vividly illustrate the success of disease prevention and amelioration, which have long been based on scientific approaches, in contrast with injury prevention, which only

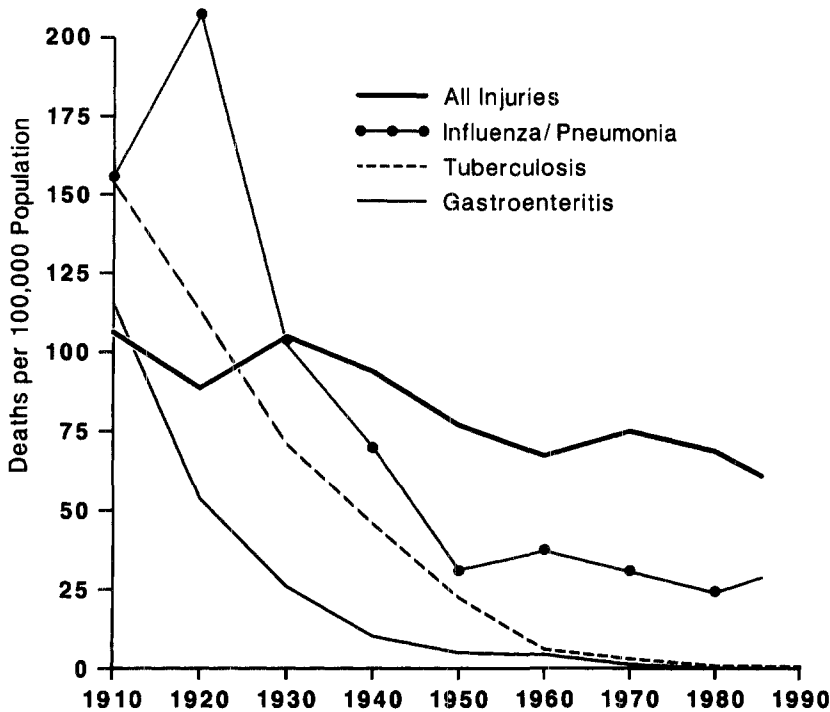


Figure 2-3. Death Rates from Injuries and Infectious Diseases by Year, 1910–1986

recently has been treated scientifically. In 1930, deaths from diseases among children aged 1–4 were eight times as common as injury deaths, but by 1980 the death rate from diseases had decreased almost to the level of the injury rate, which had declined by less than half (Figure 2-4). For ages 15–24, the injury death rate by 1986 was three and a half times the death rate from diseases, whereas the opposite was true in 1930.

**SOCIETAL COSTS**

Mortality comparisons, useful as they are for policymakers, illustrate only one part of the nation’s health burden. Nonfatal health problems are also significant because of the large number of people involved and the demands they place on the health care system. In addition, as in the case of deaths, nonfatal injuries cause suffering and inconvenience to involved individuals and their families and associates. Comparing the relative impact of health problems is a complex matter because of the difficulty of assessing the seriousness of quite different health problems, for example, a serious brain injury versus breast cancer, as well as the substantially different outcomes that can result. One comparative approach involves computing the societal costs associated with health problems and thus using dollars as a basis for

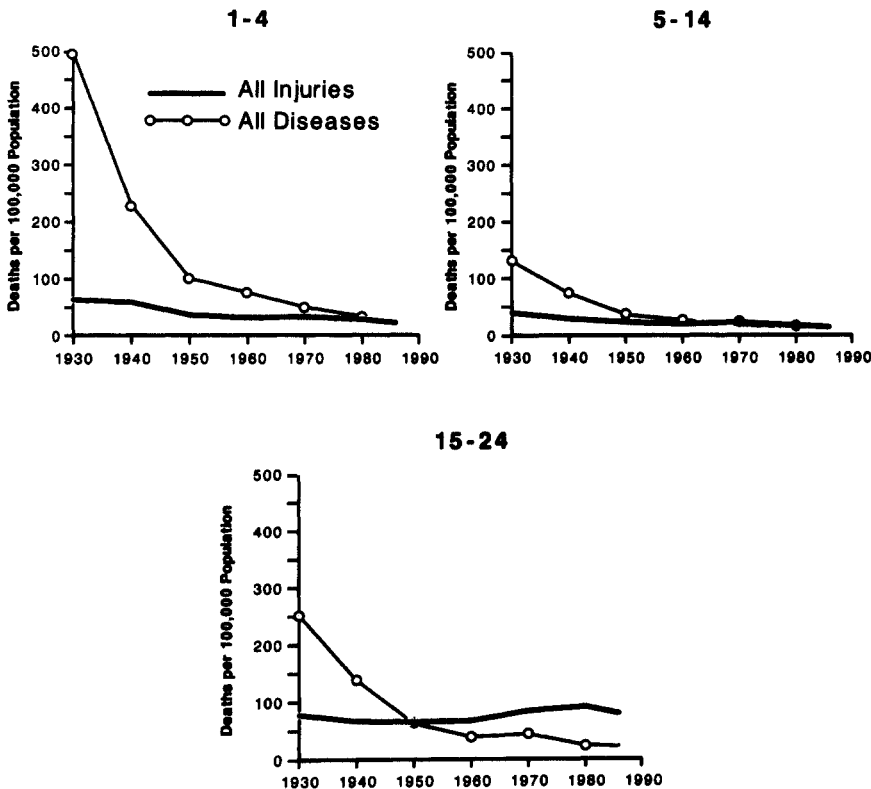


Figure 2-4. Death Rates from All Diseases and Injuries by Year and Age Group, 1930–1986

comparison. Comparisons of the impact of health problems in economic terms must always be treated with caution because effects such as pain, grief, and family or social disruption cannot be measured in these terms. However, key effects such as loss of productivity (indirect costs to society) and the use of medical and other resources (direct costs) can be measured and compared in dollars for various health problems.

A study of motor vehicle crash injuries occurring in 1975 found their total societal cost to be second only to the cost of cancer (Figure 2-5; Hartunian et al. 1980, 1981). The direct costs (expenditures for goods and services) resulting from motor vehicle crash injuries were approximately twice the direct costs of coronary heart disease. Indirect costs (loss of potential earnings) are especially high for injuries because the average age at which fatal or disabling injury occurs is much lower than the corresponding ages for most major diseases.

A major component of indirect costs is the loss of productivity associated with premature death. For convenience, deaths prior to age 70 are sometimes called premature, and the number of years of life that would

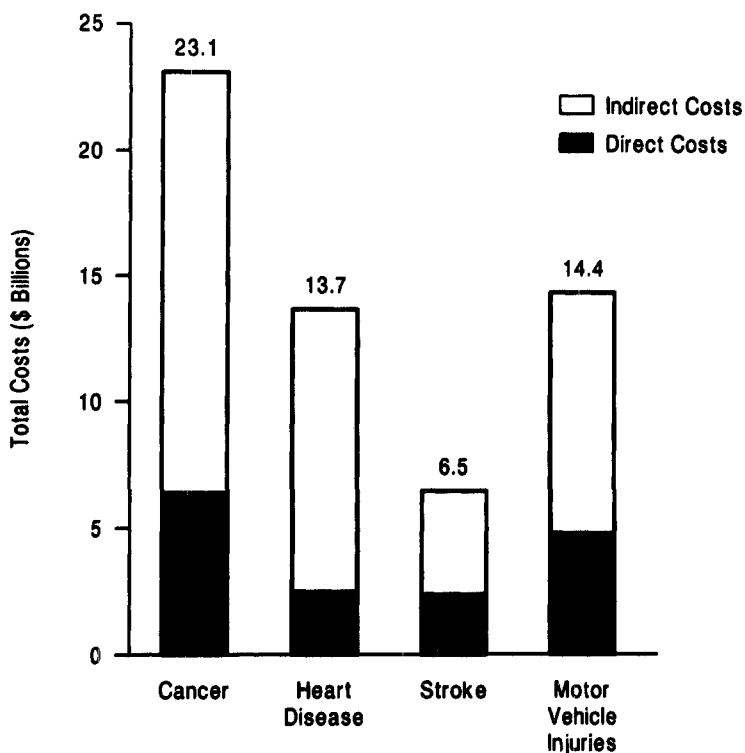


Figure 2-5. Societal Costs Associated with the Annual Incidence of Cancer, Coronary Heart Disease, Stroke, and Motor Vehicle Injuries, 1975 (Source: N.S. Hartunian, C.N. Smart, and M.S. Thompson, The incidence and economic costs of cancer, motor vehicle injuries, coronary heart disease and stroke: A Comparative analysis. *American Journal of Public Health* 70 (1980): 1258. Reprinted with the permission of the publisher.)

have remained are considered years of life lost prematurely. For each cause, the difference between age 70 and the age at death can be used to calculate the total number of years of life lost because of death prior to age 70. There are 4.3 million potential years of life lost prematurely each year because of injuries, compared with less than 3 million each for cancer and heart disease and about 0.4 million each for AIDS and cerebrovascular disease (stroke) (Figure 2-6). Even when injury deaths from homicide and suicide are not included, the remaining unintentional injury deaths result in a greater loss than for any single disease.

A recent report to Congress carefully documented the cost to society of injury (Rice, MacKenzie, and associates 1989). In this analysis, years of life lost per death were based on average life expectancy at the time of death. Discounting lifetime earnings at 6 percent, the total lifetime costs of all injuries that occurred during 1985 were estimated at \$158 billion. Lifetime costs per death were almost four times the losses for cancer and more than

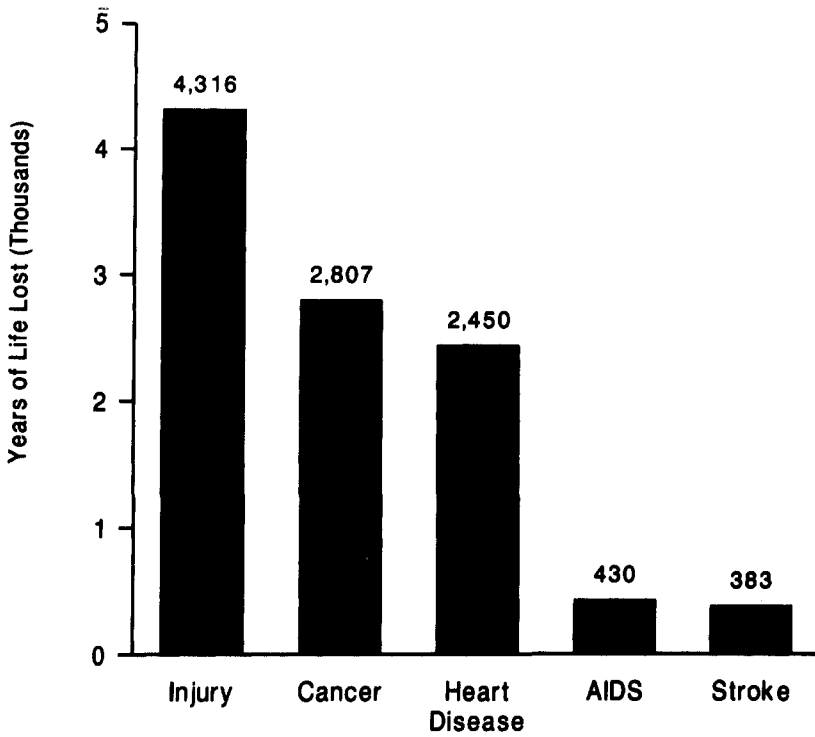


Figure 2-6. Potential Years of Life Lost Prior to Age 70, 1987

six times the losses for cardiovascular disease (heart disease and stroke) (Figure 2-7). The rationale for government research and programs to reduce injuries is further strengthened by the fact that more than one-fourth (28 percent) of the direct cost of injuries is borne by federal, state, and local governments. In marked contrast to societal burdens, total federal research expenditures for injury were estimated at \$160 million, compared with National Cancer Institute obligations of \$1,400 million and National Heart, Lung, and Blood Institute obligations of \$930 million.

## PHYSICIAN CONTACTS

Another measure of the burden that nonfatal injuries place on society is the utilization of physicians for treatment. Injuries result in 114 million physician contacts annually, almost as many as for respiratory conditions (118 million), the leading cause of such visits (NCHS 1987).

Hospital emergency department visits are an important component of medical care. More than 25 percent of *all* emergency room or hospital clinic visits are for the treatment of injuries (NCHS 1983). The annual cost of emergency room care of the injured is \$2.6 billion (Rice, MacKenzie, and