Discrimination Prohibited:
Under provisions of applicable public laws enacted by Congress since 1964, no person in the United States shall, on the grounds of race, color, national origin, handicap, or age, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity (or, on the basis of sex, with respect to any education program or activity) receiving Federal financial assistance. In addition, Executive Order 11141 prohibits discrimination on the basis of age by contractors and subcontractors in the performance of Federal contracts, and Executive Order 11246 states that no federally funded contractor may discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. Therefore, the Heart, Lung, and Blood Institute must be operated in compliance with these laws and Executive Orders.

The bar graph on the front cover depicts the four leading causes of death in 2008: HEART DISEASE, cancer, COPD AND ALLIED CONDITIONS, and STROKE.
MORBIDITY & MORTALITY: 2012 CHART BOOK ON CARDIOVASCULAR, LUNG, AND BLOOD DISEASES

FEBRUARY 2012

FOR ADMINISTRATIVE USE

NATIONAL INSTITUTES OF HEALTH

National Heart, Lung, and Blood Institute
Foreword

The mission of the National Heart, Lung, and Blood Institute (NHLBI) is to provide leadership and support for research in cardiovascular, lung, and blood diseases; sleep disorders; women’s health; and blood resources. The ultimate goal is to improve the health and well-being of the American people. Although program priorities are determined primarily by research opportunities, other factors have an influence: the magnitude, distribution, and trends of cardiovascular, lung, and blood diseases in the United States, as well as the ability to improve the Nation’s health; congressional mandates; the health needs of the Nation, as perceived by Institute staff and outside advisory groups; and recommendations from the National Heart, Lung, and Blood Advisory Council.

Evaluation of the Institutes program balance and program impact is a continuous process that relies on assessments of morbidity and mortality in the United States from cardiovascular, lung, and blood diseases. Consideration is given to their distribution among the population; to their trends over time; and to related statistics on population risk factors, lifestyles, medical care, and economic impact.

This Chart Book, like its predecessors, provides information on the progress being made in the fight against cardiovascular, lung, and blood diseases. It serves as a resource for the Institute as it plans and prioritizes future activities.

I would like to express my appreciation to Dr. Michael Mussolino of the NHLBI for his time and effort in developing the material presented in this Chart Book.

Also, I would like to acknowledge Ms. Nancy Eng of the NHLBI who has for many years demonstrated extraordinary dedication to ensuring the quality of both the Chart Book and the NHLBI Fact Book.

Susan B. Shurin, M.D.
Acting Director
National Heart, Lung, and Blood Institute
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1. Introduction

During the past 40 years, major advances have been made in the prevention, diagnosis, and treatment of cardiovascular, lung, and blood diseases. Death rates from cardiovascular diseases (CVD) have declined significantly, and Americans are living longer, healthier lives. Despite the tremendous progress that has been made, morbidity and mortality from cardiovascular, lung, and blood diseases continue to impose a major burden on patients, their families, and the national health care system. The economic cost to the nation is substantial.

This Chart Book provides data that show the magnitude of the problem and time trends that highlight demographic differences in disease burden by age, sex, and racial/ethnic status. Nationally collected data are presented by race and ethnicity to the extent they are available, statistically reliable, and consistently collected.

A companion chart book, Incidence and Prevalence: 2006 Chart Book on Cardiovascular and Lung Diseases, represents a compendium of data from six cohort community studies and one surveillance study supported by the NHLBI.¹

The “Background Data” chapter provides population and life-expectancy estimates; trends in total mortality, mortality by selected causes or major diagnosis, and days of hospital care; leading causes of death and chronic conditions; prevalence of CVD risk factors; and economic cost data. The “Cardiovascular Diseases,” “Lung Diseases,” and “Blood Diseases” chapters contain detailed morbidity and mortality statistics by racial/ethnic group, sex, and geographic distribution. The first table in each chapter contains a list of diseases and their diagnostic codes from the 9th revision of the clinical modification of the International Classification (ICD-9-CM), hospitalizations and physician office visit data in 2009 for those codes, codes from the 10th revision of the International Classification of Diseases (ICD-10) of the World Health Organization (WHO), and mortality in 2008 for those codes.² ³

Sources of Data

Most of the data used in this book were obtained from the National Center for Health Statistics (NCHS). Specifically, data include the annual vital statistics of the United States; the annual National Health Interview Survey (NHIS); the National Health and Nutrition Examination Survey (NHANES), 1971–1975, 1976–1980, 1988–1994, 1999–2008; the annual National Hospital Discharge Survey (NHDS); the annual National Ambulatory Medical Care Survey; and the National Hospital Ambulatory Care Survey. International mortality data came from the WHO Mortality database.

It is beyond the scope of the Chart Book to cite all of the NCHS and Bureau of the Census publications, data tapes, and Websites that were used to prepare this document. Specific data sources for current statistics and general references to hospital and prevalence surveys and vital statistics for earlier data years may be found in Appendix E.

Population Estimates

The NCHS and the NHLBI used annual mid-year U.S. population estimates from the Bureau of the Census to express morbidity and mortality per population. Prevalence and hospital discharge statistics are based on noninstitutionalized population estimates that were included in NCHS publications. The annual live births are reported by NCHS and used for infant mortality rates.

Population counts from the 2000 Census and estimates based on it thereafter have been bridged to single race categories, combining multiple race categories found in the Census.

Economic Cost

Estimates of the direct costs of cardiovascular, lung, and blood diseases for 2008 appear in Chapter 2, along with indirect costs of mortality from the diseases. The estimates are not comparable to the direct costs included in previous NHLBI Chart Books and in
NHLBI *Fact Books* before 2010. The estimates in this *Chart Book* are the national health expenditures provided on the Website of the Medical Expenditure Panel Survey, Agency for Healthcare Research and Quality (AHRQ), for 2008.4

Indirect costs of lost productivity due to premature mortality are based on mortality data from the NCHS and the present value of lifetime earnings estimates by age and sex from the Institute for Health and Aging, University of California at San Francisco.5 The values include a 3-percent discount rate to adjust for the effect of inflation on income over a lifetime. The cost estimates were determined by multiplying the age-, sex-, and cause-specific numbers of deaths in 2008 by the estimated present value of lifetime earnings of persons by age and sex in 2007 and then inflating these values by 3 percent for 2008.

Annual estimates of indirect costs of lost productivity due to morbidity are not provided in this *Chart Book* because they would have been developed from very old data.

**Quality of Data**

Data quality issues discussed below include accuracy of diagnosis, data comparability, and ICD classification.

**Prevalence**

Estimates of disease prevalence and smoking habits are based only on self-reports from health interviews. Physical measurements, on the other hand, are used to determine the prevalence of cardiovascular risk factors, such as high serum cholesterol and overweight. Prevalence of hypertension is based on blood pressure readings and health interviews about relevant medication.

**Hospital Statistics**

Hospitalization statistics relate to rates of health care use, length of stay, and hospital case fatality. They have limitations associated with diagnostic accuracy (e.g., the diagnosis may be influenced by the billing process) and diagnostic comparability over time (e.g., ICD revisions). Time trends may not accurately reflect real changes in incidence and case-fatality because data occasionally include changes in hospital admission practices.

The term *hospitalizations*, which replaces the NHDS term *hospital discharges*, refers to all inpatients, whether discharged alive or dead. The diagnosis given at discharge is the one that is used. Because the survey is event-based rather than patient-based, annual estimates pertain to numbers of hospitalizations, not to numbers of patients hospitalized in a given year.

Charts that show hospitalization rates are based on first-listed diagnoses on the hospital record (i.e., primary diagnosis). Charts that show the numbers of hospitalizations for a particular disease include those that are classified as the primary diagnosis and those that are classified as secondary to some other disease.

Methodological problems in data collection preclude the presentation of hospital data by race.6

In 1988, the NCHS redesigned the NHDS to link it with other surveys conducted by the NCHS and to improve efficiency. Changes in the NHDS caused a shift in the trend data between 1987 and 1988 for some diseases.7 A break was inserted in the trend lines between the transitional years to draw attention to when the change occurred.

**Cause-of-Death Statistics**

Limitations of cause-of-death statistics, other than those associated with revisions in the ICD, are well-known. Inaccuracies in death certification and inconsistencies in selecting and coding the underlying cause of death create uncertainties about the true mortality from a specific cause compared with other causes. These limitations must be kept in mind when comparing the same cause of death over time or the same cause of death between demographic groups or countries.

Selecting only one cause of death as the underlying cause has the advantage of diagnostic specificity but the disadvantage of an incomplete account of the various causes that contributed to a death.

Another limitation related to cause-of-death statistics involves international comparisons of vital statistics. Comparisons of mortality data for coronary heart disease (CHD), stroke, and chronic obstructive pulmonary disease (COPD) among countries are affected by differences in diagnostic practices and physician training, interpretation of internationally recommended
rules for coding a cause of death, availability of diagnostic aids, and the use of autopsies. Information is presented in this book only for countries that are known to produce high-quality statistics.

...race identification between death certificates and data from the Bureau of the Census and undercounts of some population groups in the Census may cause over- or underestimation of death rates in racial groups.8

ICD Revisions

Revisions in the ICD codes (Appendix A) have affected the comparability of time trends, particularly those associated with mortality. In charts where more than one ICD revision has been used, breaks in trend lines have been added between revisions to alert the reader of the issue. Where differences in mortality classification between ICD-9 (1979–1998) and ICD-10 (1999–) exceed 4% (stroke and COPD in Charts 2–5, 3–5, and 3–57), NCHS-derived comparability ratios (as shown in Appendix B) have been applied to the death rates coded by ICD-9.9

Data Presentation

Mortality data (rates per population) are generally expressed by age, race/ethnicity, and sex. Age-adjusted mortality data (rates per population or percent change) are expressed by race/ethnicity and sex and in a few cases by States. Prevalence data are given as a percent of a population and are expressed by age, race/ethnicity, and sex. Hospitalization data are shown as comparisons between age groups or by primary or secondary diagnoses.

Rates per Population

Death rates are expressed per 100,000 population, using the resident population as of July 1 of the relevant year as the denominator. Hospital discharge rates are expressed per 10,000 population, and the number of discharges is the denominator for percent discharged dead. Infant mortality rates are expressed per 100,000 live births.

Age Adjustment

Age-adjusted rates are used to compare prevalence or mortality among various population groups or for one group over time. The 2000 standard population is applied in the age adjustment so that rates are not affected by differences in age composition among the populations.10–12 The European standard population is applied for age adjustment of international mortality statistics.13

Percent Change

Percent changes in death rates over time, whether between 2 specified years or on an average annual basis, are calculated from log-linear regression slopes of rates for each year of a selected period.14 The percent changes may be influenced by unusually high or low values, especially if the period is short, and do not provide information about the levels on which they are based, which might be small. Average annual percent changes should not be summed over a period because the sum will be more than the percent change from the first to the last year in the period.

An exception to the use of log-linear regression to calculate percent change is made for Chart 3–6, where the percent change and other calculations are based on the actual death rates.

Vertical Scales

Comparisons between time–trend charts are complicated because the range of the vertical scale may differ between charts. Vertical scales for less common diagnoses are magnified to focus on differences by age, race, and sex.

Arithmetic and Logarithmic Scales

In this Chart Book, time trends in death rates are plotted on an arithmetic scale to show their absolute change relative to zero. Note, however, that on an arithmetic scale, the absolute increase or decrease for a smaller death rate may appear to be modest compared with the change for a larger death rate, when in fact, the percent change over time is greater for the smaller rate. In addition, on an arithmetic scale, a decline can appear to be slowing, but if plotted on a logarithmic scale, it would not.
Truncated Age Ranges

The age range for death rates in some charts excludes individuals older than 84 years because of the difficulty associated with obtaining accurate diagnoses for patients who often have other contributing comorbidities. Selected truncated age groups are frequently used for U.S. data to highlight specific premature adult morbidity and mortality. For international comparisons, the age range 35–74 years was chosen so that differing age distributions among countries would be minimized in rate calculations. The international chart for asthma, however, includes individuals of all ages.

Demographic Characteristics

The Chart Book provides prevalence and mortality information for various racial and ethnic groups. Several charts show comparisons between blacks and whites. Prior to 1968, mortality data are presented for nonwhites instead of blacks.

Many charts provide a race/sex comparison. Others present data for total males and total females or for total whites and total blacks to highlight important points that otherwise would be lost if four-way combinations were used.

The term American Indian is used to refer to the population that consists of American Indians and Alaska Natives. The term Asian is used to include persons of Asian and Pacific Islander descent. Data on socioeconomic groups are not presented because they are extensively presented elsewhere.15

State Mortality

Death rates for total population by State are shown in maps for CVD, CHD, stroke, and COPD.16 Although State death rates that combine all age, race, and sex groups can be misleading, they do show a reasonably similar geographic pattern compared with maps that are either race and sex specific or confined to a specific age range (not shown). This is true even for stroke mortality in Southern States, which is not just high for blacks. Although rankings of certain States for CHD mortality differ considerably from rankings for total heart disease, their overall geographic patterns are not very different.17
2. Background Data

The charts in this chapter provide population estimates, life expectancy, morbidity and mortality, and economic cost data for cardiovascular, lung, and blood diseases. Most focus on the leading causes of death, but a few address specific CVD risk factors. Immediately below are selected prevalence and incidence estimates.

Cardiovascular Diseases

Table 2–1 contains prevalence estimates for CVD in the U.S. population.18–21 Individuals with multiple CVD are counted for each condition that applies to them, but only once in the estimate for total CVD.

<table>
<thead>
<tr>
<th>Table 2–1. Prevalence of CVD, U.S.</th>
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<tbody>
<tr>
<td>CVD</td>
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<tr>
<td>Hypertension</td>
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<tr>
<td>CHD</td>
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<tr>
<td>Acute Myocardial Infarction (AMI)</td>
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<tr>
<td>Angina Pectoris</td>
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<tr>
<td>Stroke</td>
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<tr>
<td>Heart Failure</td>
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<tr>
<td>Congenital Heart Defects</td>
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<tr>
<td>Atrial Fibrillation</td>
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<tr>
<td>Peripheral Arterial Disease</td>
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Table 2–2 contains estimates for the annual occurrence of CVD in the United States.22–24

<table>
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<tbody>
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<tr>
<td>Recurrent Event</td>
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<tr>
<td>Stroke</td>
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<tr>
<td>First Event</td>
</tr>
<tr>
<td>Recurrent Event</td>
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<tr>
<td>Heart Failure</td>
</tr>
<tr>
<td>First Event</td>
</tr>
</tbody>
</table>

Lung Diseases

Table 2–3 contains estimates for the prevalence of selected lung diseases in the United States.25–26

<table>
<thead>
<tr>
<th>Table 2–3. Prevalence of Selected Lung Diseases, U.S.</th>
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<tr>
<td>Undiagnosed</td>
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<tr>
<td>Asthma</td>
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<tr>
<td>Lifetime</td>
</tr>
<tr>
<td>Current</td>
</tr>
<tr>
<td>Attack</td>
</tr>
<tr>
<td>Cystic fibrosis</td>
</tr>
<tr>
<td>Respiratory distress syndrome</td>
</tr>
<tr>
<td>Infants</td>
</tr>
<tr>
<td>Adults</td>
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<tr>
<td>Obstructive sleep apnea</td>
</tr>
</tbody>
</table>

In this chapter, charts showing leading causes of death combine asthma and status asthmaticus with COPD and list the category as chronic lower respiratory diseases (CLRD).

Blood Diseases

An estimated 70,000–100,000 Americans, most of whom are black, have sickle cell anemia, and 1 in 500 black babies is born with the disease annually. About 500 to 1,000 persons develop aplastic anemia each year. Approximately 18,000 persons have hemophilia, and 400 babies are born with the disease each year. About 1,000 persons have thalassemia.

Population

Population estimates in Chart 2–1 are based on the 2000 U.S. Census and population surveys and projections. Estimates in Charts 2–1 and 2–2 reflect the 1997 Office of Management and Budget directive on race and ethnicity that allows survey respondents in Federal data collection programs to select more than one race. For Chart 2–3, designations of race were modified by NCHS to be consistent with the directive.
Background Data

Chart 2–1
Total Population by Mean Age, Percent Age 65 and Older, Race/Ethnicity, and Sex, U.S., 2009

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Total Population</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pop. (Mil.)</td>
<td>Mean Age</td>
<td>Percent ≥65</td>
</tr>
<tr>
<td>Total</td>
<td>309.6</td>
<td>37.2</td>
<td>13.0</td>
</tr>
<tr>
<td>White</td>
<td>245.9</td>
<td>38.3</td>
<td>14.2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>(45.8)</td>
<td>(29.4)</td>
<td>(6.0)</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>(200.1)</td>
<td>(40.3)</td>
<td>(16.1)</td>
</tr>
<tr>
<td>Black</td>
<td>40.1</td>
<td>33.3</td>
<td>8.7</td>
</tr>
<tr>
<td>Hispanic</td>
<td>(2.0)</td>
<td>(26.6)</td>
<td>(4.8)</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>(38.0)</td>
<td>(33.7)</td>
<td>(8.9)</td>
</tr>
<tr>
<td>American Indian</td>
<td>3.2</td>
<td>31.9</td>
<td>7.6</td>
</tr>
<tr>
<td>Asian*</td>
<td>15.0</td>
<td>35.5</td>
<td>9.7</td>
</tr>
<tr>
<td>Hispanic†</td>
<td>49.9</td>
<td>29.1</td>
<td>5.8</td>
</tr>
</tbody>
</table>

* Asian includes Native Hawaiian and other Pacific Islanders.
† Hispanic can be of any race.

By 2020, the U.S. population will be 20.0% Hispanic, 13.0% black, and 6.0% Asian, and 15.9% will be aged 65 and older.\textsuperscript{28}

Chart 2–2
Total Projected Population by Mean Age, Percent Age 65 and Older, Race/Ethnicity, and Sex, U.S., 2020

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Total Population</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pop. (Mil.)</td>
<td>Mean Age</td>
<td>Percent ≥65</td>
</tr>
<tr>
<td>Total</td>
<td>346.7</td>
<td>38.2</td>
<td>15.9</td>
</tr>
<tr>
<td>White</td>
<td>269.8</td>
<td>39.2</td>
<td>17.2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>(63.7)</td>
<td>(30.8)</td>
<td>(7.5)</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>(206.1)</td>
<td>(41.7)</td>
<td>(20.2)</td>
</tr>
<tr>
<td>Black</td>
<td>44.9</td>
<td>35.3</td>
<td>11.3</td>
</tr>
<tr>
<td>Hispanic</td>
<td>(2.6)</td>
<td>(29.5)</td>
<td>(6.7)</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>(42.2)</td>
<td>(35.6)</td>
<td>(11.6)</td>
</tr>
<tr>
<td>American Indian*</td>
<td>3.8</td>
<td>33.7</td>
<td>10.8</td>
</tr>
<tr>
<td>Asian*</td>
<td>20.7</td>
<td>37.8</td>
<td>12.6</td>
</tr>
<tr>
<td>Hispanic†</td>
<td>69.2</td>
<td>30.6</td>
<td>7.4</td>
</tr>
</tbody>
</table>

* Estimates for Hispanic American Indians and Hispanic Asians are not available.
† Hispanic can be of any race.

In 2008, average life expectancy at birth was 78 years—80.5 years for females compared with 75.5 for males, and 78.4 years for whites compared with 74.3 years for blacks.\textsuperscript{29}
**Background Data**

**Chart 2-4**

From 1950 to 2008, all-cause death rates declined for males, females, blacks, and whites. Males had higher mortality rates than females, and for both sexes, blacks had higher mortality rates than whites.¹⁶, ³⁰, ³¹

**Chart 2-5**

From 1950 to the mid-1960s, the unadjusted death rate for CHD increased but remained fairly stable for stroke. After 1968, death rates for CHD and stroke began to decline. CHD mortality continued to decline but stroke mortality reached a plateau in the 1990s before declining again in the 2000s. In contrast, the death rate for COPD steadily increased from 1950 until it began to plateau in the late 1990s through mid-2000s.¹⁶, ³⁰, ³¹

* The comparability ratio 1.0502 was applied to stroke death rates reported in vital statistics from 1979 to 1998. Similarly, the comparability ratio 1.0499 was applied to COPD death rates.
Background Data

From 1990 to 2009, cardiovascular disease ranked first and respiratory disease ranked second (third in 1994) in the number of days for which patients received hospital care.\textsuperscript{32}

From 1990 to 2008, age-adjusted death rates for cardiovascular and respiratory diseases ranked first and third, respectively.\textsuperscript{30, 31}
Background Data

Chart 2–8

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total deaths</td>
<td>2,471,984</td>
</tr>
<tr>
<td>Heart disease*</td>
<td>616,828</td>
</tr>
<tr>
<td>Cancer</td>
<td>565,469</td>
</tr>
<tr>
<td>Chronic lower respiratory diseases</td>
<td>141,090</td>
</tr>
<tr>
<td>Cerebrovascular diseases (stroke)</td>
<td>134,148</td>
</tr>
<tr>
<td>Accidents</td>
<td>121,902</td>
</tr>
<tr>
<td>Alzheimer's disease</td>
<td>82,435</td>
</tr>
<tr>
<td>Diabetes</td>
<td>70,553</td>
</tr>
<tr>
<td>Influenza and pneumonia</td>
<td>56,284</td>
</tr>
<tr>
<td>Nephritis</td>
<td>48,237</td>
</tr>
<tr>
<td>Septicemia</td>
<td>35,927</td>
</tr>
<tr>
<td>All other causes of death</td>
<td>599,111</td>
</tr>
</tbody>
</table>

* Includes 405,309 deaths from CHD.

Chart 2–9

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>1-24</th>
<th>25-44</th>
<th>45-64</th>
<th>&gt;65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart disease</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Cancer</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Cerebrovascular diseases (stroke)</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Accidents</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Chronic lower respiratory diseases</td>
<td>9</td>
<td>—</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Influenza and pneumonia</td>
<td>7</td>
<td>10</td>
<td>—</td>
<td>7</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>—</td>
<td>9</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Suicide</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>—</td>
</tr>
<tr>
<td>Chronic liver disease</td>
<td>—</td>
<td>7</td>
<td>6</td>
<td>—</td>
</tr>
<tr>
<td>Nephritis and nephrosis</td>
<td>—</td>
<td>—</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Homicide</td>
<td>2</td>
<td>5</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Septicemia</td>
<td>10</td>
<td>—</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Congenital malformations</td>
<td>6</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>HIV disease</td>
<td>—</td>
<td>6</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Alzheimer's disease</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>5</td>
</tr>
</tbody>
</table>

In 2008, heart disease, CLRD, and stroke were the first, third, and fourth leading causes of death, respectively.31

In 2008, heart disease was the third leading cause of death for those aged 25–44 years, second for those aged 45–64 years, and first for those aged 65 years and older. Stroke ranked seventh for those aged 45–64 years and fourth for those aged 65 years and older. CLRD ranked fourth for those aged 45–64 years and third for those aged 65 years and older.31
Background Data

In 2008, among white males, heart disease, CLRD, and stroke were the first, fourth, and fifth leading causes of death, respectively.31

In 2008, heart disease was the leading cause of death among white females. CLRD and stroke were tied for the third leading cause of death.31
In 2008, among black males, heart disease and stroke were the first and fourth leading causes of death, respectively.\textsuperscript{31}

In 2008, among black females, heart disease and stroke were the first and third leading causes of death, respectively.\textsuperscript{31}
In 2008, among Asian males, heart disease, stroke, and CLRD were the second, third, and sixth leading causes of death, respectively.31

In 2008, among Asian females, heart disease and stroke were the second and third leading causes of death, respectively.31
In 2008, among Hispanic males, heart disease and stroke were the first and fourth leading causes of death, respectively. In 2008, among Hispanic females, heart disease, stroke, and CLRD were the second, third, and sixth leading causes of death, respectively.
In 2008, among American Indian males, heart disease was the leading cause of death.31

In 2008, among American Indian females, heart disease and CLRD were the second and sixth leading causes of death, respectively.31
In 2010, heart disease was the third most prevalent chronic condition causing activity limitation. Hypertension, lung conditions, and stroke were also common.\textsuperscript{25}

From 1965 to 1990, the percent of the population aged 18 years and older who reported that they smoke cigarettes decreased significantly.\textsuperscript{25} From 1991 to 2010, the percent of the population who reported that they smoke declined modestly.\textsuperscript{25, 33}
Background Data

Chart 2–22

From 1976–1980 to 1999–2004, the prevalence of high total serum cholesterol declined for each sex and racial/ethnic group. In 2005–2008, the prevalence continued to decline for black and white males and females but increased for Mexican-American females.18

Chart 2–23

From 1976–1980 to 2005–2008, the prevalence of overweight increased for males and females of each racial/ethnic group.18

* High serum cholesterol is ≥240 mg/dL.
† Non-Hispanic.

* Overweight (including obesity) is a body mass index of ≥25 kg/m².
† Non-Hispanic.
Background Data

Chart 2–24
Economic Cost of Cardiovascular, Lung, and Blood Diseases, U.S., 2008

<table>
<thead>
<tr>
<th>Disease</th>
<th>Total (Billions)</th>
<th>Direct (Billions)</th>
<th>Mortality (Billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total CVD</td>
<td>297.7</td>
<td>179.3</td>
<td>118.4</td>
</tr>
<tr>
<td>Heart disease</td>
<td>190.3</td>
<td>95.6</td>
<td>94.7</td>
</tr>
<tr>
<td>Stroke</td>
<td>34.3</td>
<td>18.8</td>
<td>15.5</td>
</tr>
<tr>
<td>Hypertension</td>
<td>50.6</td>
<td>47.4</td>
<td>3.2</td>
</tr>
<tr>
<td>Other CVD</td>
<td>22.5</td>
<td>17.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>39.8</td>
<td>38.6</td>
<td>1.2</td>
</tr>
<tr>
<td>COPD/asthma</td>
<td>68.0</td>
<td>53.7</td>
<td>14.3</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>20.4</td>
<td>14.0</td>
<td>6.4</td>
</tr>
<tr>
<td>Anemias</td>
<td>5.9</td>
<td>4.7</td>
<td>1.2</td>
</tr>
</tbody>
</table>

In 2008, the total cost of cardiovascular, lung, and blood diseases was approximately $432 billion, including $290 billion in health care expenditures and $142 billion in lost productivity.4, 5, 31

Chart 2–25
Direct Cost of Cardiovascular, Lung, and Blood Diseases, U.S., 2008

<table>
<thead>
<tr>
<th>Disease</th>
<th>Total (Billions)</th>
<th>Hospital Inpatient Stays</th>
<th>Emergency Room Visits</th>
<th>Outpatient or Office-Based Providers</th>
<th>Prescription Medicines</th>
<th>Home Health Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total CVD</td>
<td>179.3</td>
<td>79.7</td>
<td>10.8</td>
<td>26.4</td>
<td>33.0</td>
<td>19.5</td>
</tr>
<tr>
<td>Heart disease</td>
<td>95.6</td>
<td>54.0</td>
<td>7.3</td>
<td>19.1</td>
<td>8.7</td>
<td>7.6</td>
</tr>
<tr>
<td>Stroke</td>
<td>18.8</td>
<td>9.1</td>
<td>0.9</td>
<td>1.8</td>
<td>1.2</td>
<td>5.8</td>
</tr>
<tr>
<td>Hypertension</td>
<td>47.4</td>
<td>6.2</td>
<td>1.7</td>
<td>13.0</td>
<td>21.3</td>
<td>5.1</td>
</tr>
<tr>
<td>Other CVD</td>
<td>17.5</td>
<td>10.4</td>
<td>0.9</td>
<td>4.7</td>
<td>0.7</td>
<td>0.8</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>38.6</td>
<td>1.3</td>
<td>0.1</td>
<td>9.0</td>
<td>27.1</td>
<td>1.0</td>
</tr>
<tr>
<td>COPD/asthma</td>
<td>53.7</td>
<td>13.1</td>
<td>3.1</td>
<td>13.2</td>
<td>20.4</td>
<td>4.0</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>14.0</td>
<td>11.9</td>
<td>0.6</td>
<td>0.8</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>Anemias</td>
<td>4.7</td>
<td>3.2</td>
<td>0.1</td>
<td>1.1</td>
<td>0.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

In 2008, hospital inpatient care was the largest type of direct cost for health care expenditures related to cardiovascular, lung, and blood diseases. However, prescription medication accounted for the highest expenditures for hyperlipidemia, hypertension, and COPD/asthma.4
3. Cardiovascular Diseases

The diagnostic group cardiovascular diseases is used here to mean diseases and congenital malformations of the circulatory system as coded in the ICD.

Charts 3–1 through 3–3 show the distribution of deaths in 2008 specific to CVD, heart disease, and stroke deaths, respectively.\textsuperscript{31} Chart 3–4 lists CVD; ICD-9-CM codes for CVD; 2009 estimates of hospital discharges, lengths of stay, and physician office visits for those diagnostic codes; ICD-10 codes for CVD; and the number of deaths in 2008 for those codes.\textsuperscript{31,32,34} Subsequent charts display morbidity and mortality for total CVD and selected subgroups.

Coronary Heart Disease

CHD includes AMI and angina pectoris. In this chapter, charts provide information about the prevalence and hospitalization rates of AMI and angina pectoris. Mortality data are not shown for them individually because good diagnostic information is often not available at the time in which death certificates are completed.

Over the years, multiple revisions of the ICD have resulted in changes in diagnostic terms and codes included in the CHD category that compromised direct comparability of CHD deaths over time. For example, ICD-10 expanded CHD (over ICD-9) to include “Atherosclerotic CVD.” To maintain comparability over time, CHD death rates in ICD-9 (1979–1998) were retabulated to include deaths coded to the additional term.

Heart Failure

Heart failure is a sequela of various heart diseases. It is a heart “condition,” not a heart “disease,” and is more common as a contributing rather than an underlying cause of death. Thus, it is imprecise to classify heart failure as an underlying cause of death. The condition, however, is increasingly prevalent and common in the reporting of hospitalizations and mortality.

Cardiomyopathy

In 2008, 23,932 deaths were attributed to cardiomyopathy, although no consensus exists on classification and diagnostic criteria for the disease. This limitation has little effect on any mortality differences influenced by age, race, or sex.

Atrial Fibrillation

In 2008, 15,383 deaths were attributed to atrial fibrillation as the underlying cause. Normally, the disorder is not intrinsically a fatal condition, although it does predispose individuals to potentially fatal conditions such as stroke.

Cerebrovascular Diseases (Stroke)

Cerebrovascular disease (i.e., stroke) is the fourth leading cause of death. Only a small proportion of deaths from stroke can be classified as cerebral hemorrhage, occlusion, thrombosis, or embolism. Most are coded to ill-defined forms of cerebrovascular diseases (Chart 3–3). Therefore, mortality for the entire category is presented in charts related to stroke.

Hypertensive Disease

Prevalence and trend data on awareness, treatment, and control of hypertension are important statistics associated with hypertension morbidity and have therefore been included in this chapter. Mortality statistics are not presented for hypertensive disease because it is not a distinct underlying cause of death. In fact, its presence on death certificates is often arbitrary, and its selection as the underlying cause of death is often characterized by a lack of good diagnostic information at the time of death.
Peripheral Artery Disease

The ICD term *diseases of arteries* is used to refer to peripheral arterial disease and includes a variety of atherosclerotic disorders; none of them specifically involve the heart or brain. Examples are aortic aneurysm, atherosclerosis of the extremities, arterial embolism and thrombosis, and generalized atherosclerosis. Mortality data are presented, but valid prevalence estimates are not available.

Congenital Malformations of the Circulatory System

The ICD term *congenital malformations of the circulatory system* includes the specific subgroup congenital heart disease. Because most deaths in the overall category occur in infants younger than 1 year of age, the preferred mortality tabulation is the infant mortality rate.
Cardiovascular Diseases

Chart 3–1
Deaths From Cardiovascular Diseases, Percent by Subgroup, U.S., 2008

* Heart failure as an underlying cause or otherwise mentioned on the death certificate accounted for 35% (281,437) of total CVD deaths. Total deaths = 811,940 (100%), including 3,415 due to congenital CVD defects. Compiled from Vital Statistics of the United States, NCHS.

Chart 3–2
Deaths From Heart Disease, Percent by Subgroup, U.S., 2008

* Heart failure as an underlying cause or otherwise mentioned on the death certificate accounted for 45% (281,437) of total heart disease deaths. Total deaths = 619,574 (100%), including 2,746 from congenital CVD defects. Compiled from Vital Statistics of the United States, NCHS.

Chart 3–3
Deaths From Stroke, Percent by Subgroup, U.S., 2008

Total deaths = 134,148 (100%). Compiled from Vital Statistics of the United States, NCHS.
# Cardiovascular Diseases

Chart 3–4  
Number of Hospitalizations, Physician Office Visits,* and Deaths for Cardiovascular Diseases, U.S., 2008–2009

<table>
<thead>
<tr>
<th>Diagnostic Category</th>
<th>ICD-9-CM Codes</th>
<th>First-Listed Discharges (1,000)</th>
<th>Length of Stay (Days)</th>
<th>Physician Office Visits for 2009 (1,000)</th>
<th>ICD-10 Codes</th>
<th>Deaths for 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heart disease:</strong></td>
<td>390–398, 402, 404, 410–429</td>
<td>3,994</td>
<td>4.6</td>
<td>27,697</td>
<td>I00–I11, I20–I51</td>
<td>616,828</td>
</tr>
<tr>
<td>Rheumatic heart disease</td>
<td>390–398</td>
<td>38</td>
<td>7.5</td>
<td>254</td>
<td>I00–I09</td>
<td>3,141</td>
</tr>
<tr>
<td>Hypertensive heart disease</td>
<td>402, 404</td>
<td>84</td>
<td>5.3</td>
<td>334</td>
<td>I11, I13</td>
<td>35,263</td>
</tr>
<tr>
<td>Coronary heart disease:</td>
<td>410–414, 429.2</td>
<td>1,537</td>
<td>4.1</td>
<td>12,817</td>
<td>I20–I25</td>
<td>405,309</td>
</tr>
<tr>
<td>AMI</td>
<td>410</td>
<td>634</td>
<td>5.0</td>
<td>311</td>
<td>I21, I22</td>
<td>133,958</td>
</tr>
<tr>
<td>Angina pectoris, stable</td>
<td>413</td>
<td>34</td>
<td>4.9</td>
<td>931</td>
<td>I20.1–I20.9</td>
<td>126</td>
</tr>
<tr>
<td>Angina pectoris, unstable</td>
<td>411</td>
<td>49</td>
<td>2.2</td>
<td>91</td>
<td>I20.0</td>
<td>36</td>
</tr>
<tr>
<td>Atherosclerotic CVD</td>
<td>429.2</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>I25.0</td>
<td>58,625</td>
</tr>
<tr>
<td>Other CHD</td>
<td>412, 414</td>
<td>820</td>
<td>3.5</td>
<td>11,484</td>
<td>Other I23–I25</td>
<td>212,564</td>
</tr>
<tr>
<td>Diseases of pulmonary circulation:</td>
<td>415–417</td>
<td>182</td>
<td>5.8</td>
<td>590</td>
<td>I26–I28</td>
<td>12,927</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>415.1</td>
<td>158</td>
<td>5.7</td>
<td>487</td>
<td>I26</td>
<td>7,158</td>
</tr>
<tr>
<td>Other</td>
<td>415.0, 415.2–417</td>
<td>24</td>
<td>6.9</td>
<td>103</td>
<td>I27–I28</td>
<td>5,769</td>
</tr>
<tr>
<td>Subacute bacterial endocarditis</td>
<td>421</td>
<td>11</td>
<td>13.5</td>
<td>7</td>
<td>I33.0</td>
<td>1,143</td>
</tr>
<tr>
<td>Cardiomyopathy</td>
<td>425</td>
<td>52</td>
<td>4.6</td>
<td>841</td>
<td>I42</td>
<td>23,932</td>
</tr>
<tr>
<td>Atrial fibrillation and flutter</td>
<td>427.3</td>
<td>467</td>
<td>4.1</td>
<td>5,560</td>
<td>I48</td>
<td>15,383</td>
</tr>
<tr>
<td>Other arrhythmic disorders</td>
<td>Other 427</td>
<td>323</td>
<td>3.5</td>
<td>2,276</td>
<td>Other I43–I49</td>
<td>27,299</td>
</tr>
<tr>
<td>Heart failure:</td>
<td>428</td>
<td>1,094</td>
<td>5.2</td>
<td>3,041</td>
<td>I50</td>
<td>56,830</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>428.0</td>
<td>468</td>
<td>5.0</td>
<td>2,996</td>
<td>I50.0</td>
<td>51,693</td>
</tr>
<tr>
<td>Left heart failure and unspecified</td>
<td>428.1–428.9</td>
<td>626</td>
<td>5.4</td>
<td>46</td>
<td>IS0.1–IS0.9</td>
<td>5,137</td>
</tr>
<tr>
<td>Other heart disease</td>
<td>Other 420–429</td>
<td>206</td>
<td>5.8</td>
<td>1,976</td>
<td>Other I30–I31</td>
<td>35,601</td>
</tr>
<tr>
<td>Other hypertensive disease</td>
<td>401, 403, 405</td>
<td>499</td>
<td>3.3</td>
<td>53,586</td>
<td>I10, I12, I15</td>
<td>25,742</td>
</tr>
<tr>
<td>Cerebrovascular diseases (stroke)</td>
<td>430–438</td>
<td>971</td>
<td>5.3</td>
<td>3,327</td>
<td>I60–I69</td>
<td>134,148</td>
</tr>
<tr>
<td>Diseases of arteries:</td>
<td>440–449</td>
<td>331</td>
<td>5.9</td>
<td>2,948</td>
<td>I70–I78</td>
<td>27,765</td>
</tr>
<tr>
<td>Peripheral arterial disease</td>
<td>440.20–440.24</td>
<td>166</td>
<td>6.0</td>
<td>1,155</td>
<td>I70.2, I70.9, I73.9, I74.3, I74.4</td>
<td>14,501</td>
</tr>
<tr>
<td>Aortic aneurysm</td>
<td>441</td>
<td>84</td>
<td>5.7</td>
<td>684</td>
<td>I71</td>
<td>11,079</td>
</tr>
<tr>
<td>Other diseases of arteries</td>
<td>Other 440–449</td>
<td>82</td>
<td>5.7</td>
<td>1,108</td>
<td>Other I70–I78</td>
<td>2,185</td>
</tr>
<tr>
<td>Deep vein thrombosis</td>
<td>451.1</td>
<td>3</td>
<td>4.3</td>
<td>148</td>
<td>I80.2</td>
<td>2,352</td>
</tr>
<tr>
<td>Other and unspecified CVD</td>
<td>Other 451–459</td>
<td>368</td>
<td>4.0</td>
<td>6,782</td>
<td>Other I80–I99</td>
<td>1,690</td>
</tr>
<tr>
<td>Congenital malformations of CV system:</td>
<td>745–747</td>
<td>52</td>
<td>7.3</td>
<td>383</td>
<td>Q20–Q28</td>
<td>3,415</td>
</tr>
<tr>
<td>Congenital heart disease</td>
<td>745, 746</td>
<td>35</td>
<td>6.5</td>
<td>280</td>
<td>Q20–Q24</td>
<td>2,746</td>
</tr>
<tr>
<td>Other congenital cardiovascular disease</td>
<td>747</td>
<td>17</td>
<td>8.8</td>
<td>103</td>
<td>Q25–Q28</td>
<td>669</td>
</tr>
</tbody>
</table>

* Estimates of hospitalizations and physician office visits are subject to sampling variability. Estimates of hospitalizations below 50,000 have a relative standard error of >11%. Estimates of physician office visits below 588,000 have a relative standard error of >30%.  
Compiled from references 31, 32, and 34.
Cardiovascular Diseases

Chart 3–5
Change in Age-Adjusted Death Rates for Cardiovascular and Non-Cardiovascular Diseases, U.S., 1950–2008

The death rate for CHD increased almost 10% from 1950 to its peak in 1968; by 2008, it was approximately 72% lower than it was in 1950. Stroke mortality, on the other hand, declined for most of those years and by 2008 was 77% lower than it was in 1950. By comparison, the death rate for non-CVD causes in 2008 decreased by only 15% since 1950.30, 31

* The comparability ratio 1.0502 was applied to the death rates reported in vital statistics for 1979–1998.

Chart 3–6
Age-Adjusted Death Rates and Percent Change for All Causes and Cardiovascular Diseases, U.S., 1968 and 2008

From 1968 to 2008, the death rate for CVD declined nearly 68%, compared with a nearly 6% decline in the rate for all non-CVD causes. Mortality for CHD and stroke each declined approximately 75%.30, 31

* Excludes congenital malformations of the circulatory system.
From 1968 to 2008, the death rate for total CVD, CHD, and stroke declined. The 1999–2008 average annual percent declines in the age-adjusted death rates were 4.2% for CVD, 5.3% for CHD, and 5% for stroke.\textsuperscript{30, 31} From 1999 to 2008, average annual percent declines in mortality for CVD, CHD, and stroke within sex groups were usually greater in whites than in blacks. Within racial groups, the decline in CHD mortality was greater in females than in males.\textsuperscript{30, 31}

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**Cardiovascular Diseases**

**Chart 3–7**

Average Annual Percent Change in Age-Adjusted Death Rates for All Causes and Cardiovascular Diseases, U.S., 1968–2008

<table>
<thead>
<tr>
<th>Years</th>
<th>All Causes</th>
<th>Total CVD*</th>
<th>CHD</th>
<th>Stroke</th>
<th>Other CVD</th>
<th>All Other Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1968–1978</td>
<td>-2.2</td>
<td>-3.6</td>
<td>-2.9</td>
<td>-4.2</td>
<td>-6.7</td>
<td>-0.7</td>
</tr>
<tr>
<td>1979–1988</td>
<td>-0.6</td>
<td>-2.2</td>
<td>-2.9</td>
<td>-3.7</td>
<td>0.9</td>
<td>1.0</td>
</tr>
<tr>
<td>1989–1998</td>
<td>-0.9</td>
<td>-1.8</td>
<td>-2.8</td>
<td>-0.9</td>
<td>-0.1</td>
<td>-0.1</td>
</tr>
<tr>
<td>1999–2008</td>
<td>-1.8</td>
<td>-4.2</td>
<td>-5.3</td>
<td>-5.0</td>
<td>-1.7</td>
<td>-0.4</td>
</tr>
</tbody>
</table>

* Excludes congenital malformations of the circulatory system.

**Chart 3–8**

Average Annual Percent Change in Age-Adjusted Death Rates for All Causes and Cardiovascular Diseases by Race and Sex, U.S., 1999–2008

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>All Causes</th>
<th>Black Male</th>
<th>White Male</th>
<th>Black Female</th>
<th>White Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>All causes</td>
<td>-1.8</td>
<td>-2.4</td>
<td>-2.0</td>
<td>-2.1</td>
<td>-1.6</td>
</tr>
<tr>
<td>CVD*</td>
<td>-4.2</td>
<td>-3.4</td>
<td>-4.3</td>
<td>-4.0</td>
<td>-4.3</td>
</tr>
<tr>
<td>Heart disease</td>
<td>-4.0</td>
<td>-3.5</td>
<td>-4.0</td>
<td>-4.2</td>
<td>-4.2</td>
</tr>
<tr>
<td>CHD</td>
<td>-5.2</td>
<td>-4.7</td>
<td>-5.0</td>
<td>-5.6</td>
<td>-5.6</td>
</tr>
<tr>
<td>Stroke</td>
<td>-4.9</td>
<td>-4.2</td>
<td>-5.3</td>
<td>-4.4</td>
<td>-4.9</td>
</tr>
<tr>
<td>Non-CVD</td>
<td>-0.4</td>
<td>-1.7</td>
<td>-0.7</td>
<td>-0.7</td>
<td>0.1</td>
</tr>
</tbody>
</table>

* Excludes congenital malformations of the circulatory system.
Although age-adjusted death rates for CVD declined considerably between 1979 and 2008, the total number of CVD deaths did not begin to decline until 2000.\textsuperscript{30, 31}

In 2008, the percent of deaths due to CVD increased with age among adults: more than 19\% for those aged 35–44 years and nearly 43\% for those aged 85 years and older.\textsuperscript{31}

* Includes congenital malformations of the circulatory system.
Cardiovascular Diseases

In 2005–2007, CVD mortality was generally highest in the Southern United States.16

From 1996–1998 to 2005–2007, the smallest percent declines in death rates for CVD tended to be in the Southern United States.16

* Excludes congenital malformations of the circulatory system.
Heart Disease

In 2008, heart disease mortality was 54% higher in males than in females. Within sex groups, it was highest in non-Hispanic blacks and lowest in Asians.\textsuperscript{31}

* Non-Hispanic.

In 2008, heart disease mortality in males was highest in non-Hispanic blacks across all age groups.\textsuperscript{31}

* Non-Hispanic.
Heart Disease/Coronary Heart Disease

In 2008, heart disease mortality was highest in non-Hispanic blacks across all age groups, and the disparity in mortality between non-Hispanic blacks and other racial and ethnic groups was as great or greater for females than for males (also see Chart 3–14).

Coronary Heart Disease

Chart 3–17
Prevalence of Acute Myocardial Infarction
by Age and Sex, U.S., 1999–2008

In 1999–2008, the prevalence of AMI was much higher in males than in females and increased substantially with age.\textsuperscript{18}

Chart 3–18
Prevalence of Acute Myocardial Infarction
by Age and Race, U.S., 1999–2008

In 1999–2008, the prevalence of AMI was relatively similar between blacks and whites for three of the five age groups. For those in the 35–44 age group, the prevalence was 45% higher in blacks than in whites, but in the 65–74 age group, it was 27% higher in whites than in blacks.\textsuperscript{18}
Coronary Heart Disease

In 2001–2008, the prevalence of angina pectoris, which increased substantially with age, was slightly higher in females than in males aged 35–54 years, but was higher in males than in females aged 65 years and older.\(^\text{18}\)

**Chart 3–19**

In 2001–2008, the prevalence of angina pectoris was higher in blacks than in whites aged 35–64 years, but was higher in whites than in blacks aged 65 years and older.\(^\text{18}\)

**Chart 3–20**
Coronary Heart Disease

From 1997–1999 to 2006–2008, emergency department visit rates for CHD decreased more than 40% for males and about 50% for females.\textsuperscript{35}

From 1965 to the mid-1970s, hospitalization rates for AMI increased for those aged 45–64 years and then remained stable before declining in the mid-1990s through 2009. For those aged 65 years and older, hospitalization rates increased from 1965 to 1986; the rates began to decline in the early 2000s and continued to decline through 2009.\textsuperscript{32}
Coronary Heart Disease

From 1970 to 2009, hospital case-fatality rates for AMI declined substantially for those younger than 65 years of age and for those aged 65 years and older.\textsuperscript{32}

CHD accounted for 405,000 deaths in 2008. It would have accounted for 1,579,000 deaths if CHD mortality had remained at its 1968 peak.\textsuperscript{30, 31}
Coronary Heart Disease

Chart 3–25
Age-Adjusted Death Rates for Coronary Heart Disease
by Race/Ethnicity and Sex, U.S., 1999–2008

From 1999 to 2008, CHD mortality declined in non-Hispanic blacks, non-Hispanic whites, Hispanics, Asians, and American Indians, both male and female.30, 31

Chart 3–26
Age-Adjusted Death Rates for Coronary Heart Disease

In the 1950s and 1960s, death rates for CHD increased in males, both black and white, and in black females, but were relatively stable in white females. Since then, rates for individual race and sex groups have declined appreciably.30, 31

* Nonwhite from 1950 to 1967.
Coronary Heart Disease

The number of deaths and the age-adjusted death rates for CHD have decreased almost every year since 1980. In 2008, the number of deaths and the death rates for CHD were approximately 36% and 64% lower, respectively, than they were in 1980.30, 31

The average annual decline in CHD mortality began during the 1968–1978 period for all groups (slightly earlier for white females) and was greatest—5% overall—during the 1999–2008 period.30, 31

Chart 3–27
Deaths and Age-Adjusted Death Rates for Coronary Heart Disease, U.S., 1980–2008

Chart 3–28
Average Annual Percent Change in Age-Adjusted Death Rates for Coronary Heart Disease by Race and Sex, U.S., 1950–2008

* Nonwhite from 1950 to 1967.
Coronary Heart Disease

Chart 3–29
Average Annual Percent Change in Death Rates for Coronary Heart Disease by Age, Race, and Sex, U.S., 1999–2008

From 1999 to 2008, among blacks and whites and males and females, the average annual percent decline in CHD mortality was greater for those aged 55 years and older than for those aged 54 years and younger.30, 31

Chart 3–30
Age-Adjusted Death Rates for Coronary Heart Disease by Race/Ethnicity and Sex, U.S., 2008

In 2008, CHD mortality was approximately 73% higher in males than in females. Within sex groups, it was highest in non-Hispanic blacks and lowest in Asians.31

* Non-Hispanic.
Coronary Heart Disease

In 2008, CHD mortality in males increased with age for non-Hispanic blacks, non-Hispanic whites, Hispanics, American Indians, and Asians. Mortality was highest in non-Hispanic blacks at all ages and lowest in Asians aged 45–74 years.\(^{31}\)

*Non-Hispanic.

In 2008, CHD mortality in females increased with age for non-Hispanic blacks, non-Hispanic whites, Hispanics, American Indians, and Asians. At all ages, mortality was highest in non-Hispanic blacks and lowest in Asians.\(^{31}\)

*Non-Hispanic.*
Coronary Heart Disease

Chart 3–33
Age-Adjusted Death Rates for Coronary Heart Disease by State, U.S., 2005–2007

In 2005–2007, a narrow band of states from New York through Appalachia to Oklahoma had high CHD death rates. Many Western Mountain states had low CHD death rates.16

Chart 3–34
Age-Adjusted Death Rates* for Coronary Heart Disease by Country and Sex, Ages 35–74, 2006–2009†

In 2006–2009, among 17 industrialized countries, the United States ranked sixth highest for CHD mortality in males and fourth highest in females.36

* Age-adjusted to European standard.
† Data for years indicated in parentheses.
‡ Death rate is for the United Kingdom, not just England and Wales as in previous editions of the Chart Book.
Coronary Heart Disease

From 1999 to 2009, when compared with the United States, 8 of the 15 countries shown had a steeper average annual decline in CHD mortality in males.36

Chart 3–36
Change in Age-Adjusted Death Rates* for Coronary Heart Disease in Males by Country, Ages 35–74, 1999–2009†

From 1999 to 2009, when compared with the United States, 9 of the 15 countries shown had a steeper average annual decline in CHD mortality in females.36

Chart 3–36
Change in Age-Adjusted Death Rates* for Coronary Heart Disease in Females by Country, Ages 35–74, 1999–2009†
Heart Failure

From 1988–1994 to 2005–2008, the prevalence of HF increased in blacks (except the decrease in 1999–2004) and decreased slightly in whites; it remained stable in males but decreased slightly in females.18

From 1971 to 1993, hospitalization rates for HF increased in those aged 45–64 years and then remained stable through 2009. For those aged 65 years and older, rates peaked in 1998 and then fluctuated through 2009.32
Heart Failure

From 1980 to 2009, hospital case-fatality rates for HF were rather erratic for those aged 45–64 years and those aged 65 years and older; overall however, the rates declined appreciably for both groups during the period.32

From 1981 to 1988, death rates with HF as the underlying cause increased in blacks and whites, for both males and females. Rates stabilized in the early 1990s and slightly decreased in the 2000s. Mortality was highest in black males and lowest in white females.30, 31
Heart Failure

Chart 3–41

From 1989 to 2008, death rates with any mention of HF on the death certificate declined in blacks and whites, for both males and females. During this period, within sex groups, the rates were similar for blacks and whites. This is in contrast to HF solely as the underlying cause (see Chart 3–40).

Chart 3–42
Age-Adjusted Death Rates for Heart Failure as the Underlying Cause by Race/Ethnicity and Sex, U.S., 2008

In 2008, death rates for HF as the underlying cause were slightly higher in males than in females. Within sex groups, death rates were highest in non-Hispanic blacks and non-Hispanic whites and lowest in Asians.

* Non-Hispanic.
In 2008, death rates for any mention of HF on the death certificate were higher in males than in females. Within sex groups, death rates were highest in non-Hispanic blacks and non-Hispanic whites and lowest in Asians.31

In 2008, HF mortality as the underlying cause increased with age. Within sex groups, rates were higher in blacks than in whites; and within racial groups, rates were higher in males than in females.31
Heart Failure/Cardiomyopathy

Chart 3–45
Death Rates for Any Mention of Heart Failure by Age, Race, and Sex, U.S., 2008

In 2008, within sex groups, mortality for any mention of HF on the death certificate was higher in blacks than in whites at all ages, with one exception: Among those aged 75–84 years, white males and black males had similar death rates. Within racial groups, death rates for HF were higher in males than in females.31

Chart 3–46
Age-Adjusted Death Rates for Cardiomyopathy by Race and Sex, U.S., 2008

In 2008, the death rate for cardiomyopathy was approximately two times higher in males than in females and nearly two times higher in blacks than in whites.31
Cardiomyopathy/Atrial Fibrillation

In 2008, within sex groups, cardiomyopathy mortality was much higher in blacks than in whites at all ages. Within racial groups, cardiomyopathy mortality was higher in males than in females.31

From 1988 to 2009, the number of hospitalizations for atrial fibrillation, as either a primary or secondary diagnosis, more than doubled.32
From 1988 to 2003, hospitalization rates for atrial fibrillation more than doubled for both age groups and did not begin to decline until 2008.32

Cerebrovascular Diseases (Stroke)

In 1999–2008, the prevalence of stroke, which increased markedly with age, was higher in females than in males for all age groups except one. In the 65–74 age group, the prevalence was slightly higher in males than in females.\textsuperscript{18}

Chart 3–51
Prevalence of Stroke by Age and Sex,

Chart 3–52
Prevalence of Stroke by Age and Race,

In 1999–2008, the prevalence of stroke, which increased significantly with age, was higher in blacks than in whites at all ages.\textsuperscript{18}
Cerebrovascular Diseases (Stroke)

Chart 3–53

From 1997–1999 to 2006–2008, emergency department visit rates for stroke decreased for all age groups. The greatest decrease occurred among those aged 75 years and older.35

Chart 3–54

Hospitalization rates for stroke in those aged 45–64 years increased from 1971 to the mid-1980s and then remained relatively stable through 2009. For those aged 65 years and older, the rates generally rose from 1971 to 1997 and subsequently declined through 2007.32
Cerebrovascular Diseases (Stroke)

Hospital case-fatality rates for stroke in patients younger than 65 years declined appreciably from 1971 to 1983 and then fluctuated through 2009. For those aged 65 years and older, the rates continued to decline through 1997 and then fluctuated before declining from 2005 to 2009.\(^\text{32}\)

For all groups, the steep decline in stroke mortality that occurred in the 1970s and mid-1980s slowed through the 1990s and 2000s.\(^\text{30, 31}\)
From 1980 to the early 1990s, the number of deaths and the age-adjusted death rates for stroke declined. The number of deaths remained relatively stable after the mid-1990s but began to decline again after 2000. The age-adjusted death rates were stable for most of the 1990s but began to decline in 1997 through 2008.30, 31

From 1999 to 2008, stroke mortality declined for non-Hispanic blacks, non-Hispanic whites, American Indians, Hispanics, and Asians, both males and females. Blacks continue to have the highest mortality rates.30, 31
The steep average annual declines in stroke mortality that occurred in black and white males and females from 1968 to 1988 were followed by modest reductions for several years. Appreciable annual declines resumed in 1999 through 2008.\textsuperscript{30, 31}

In 2008, stroke mortality was about the same in males as in females. By race/ethnicity, death rates were highest in non-Hispanic blacks and lowest in American Indians.\textsuperscript{31}
Cerebrovascular Diseases (Stroke)

Chart 3–61
Death Rates for Stroke in Males
by Age and Race/Ethnicity, U.S., 2008

In 2008, death rates for stroke in males increased with age for each racial/ethnic group. Stroke mortality was much higher in non-Hispanic blacks than in other groups.31

Chart 3–62
Death Rates for Stroke in Females
by Age and Race/Ethnicity, U.S., 2008

In 2008, death rates for stroke in females increased with age for each racial/ethnic group. Stroke mortality was much higher in non-Hispanic blacks than in other groups.31

* Non-Hispanic.
† Data unreliable for American Indian females aged 45–54 years.
Cerebrovascular Diseases (Stroke)

In 2005–2007, stroke mortality was highest in many of the Southeastern states, most of which comprise “the stroke belt.”

In 2006–2009, among 17 industrialized countries, the United States ranked 12th highest in stroke mortality in males and 7th highest in females. Eastern European countries had markedly higher death rates for stroke compared with other countries.

* Age adjusted to European standard.
† Data for years indicated in parentheses.
‡ Death rate is for the United Kingdom, not just England and Wales as in previous editions of the Chart Book.
Cerebrovascular Diseases (Stroke)

Chart 3–65
Change in Age-Adjusted Death Rates* for Stroke in Males by Country, Ages 35–74, 1999–2009†

-10 -8 -6 -4 -2 0
Average Annual Percent Change‡

KOR (99–06)
UK† (01–09)
CZR (99–09)
NTH (99–09)
GER (99–06)
HUN (99–09)
NOR (99–09)
FRA (00–07)
FIN (99–09)
DEN (99–06)
SPA (99–08)
JPN (99–09)
POL (99–08)
ROM (99–09)
USA (99–08)

* Age adjusted to European standard.
† Data for years indicated in parentheses.
‡ Death rate is for the United Kingdom, not just England and Wales as in previous editions of the Chart Book.
§ Based on a log linear regression of the actual rates.

From 1999–2001 to 2006–2009, the United States ranked last among 15 industrialized countries in the average annual decline in stroke mortality in males.36

Chart 3–66
Change in Age-Adjusted Death Rates* for Stroke in Females by Country, Ages 35–74, 1999–2009†

-10 -8 -6 -4 -2 0
Average Annual Percent Change§

KOR (99–06)
CZR (99–09)
HUN (99–09)
UK† (01–09)
GER (99–06)
NTH (99–09)
POL (99–08)
FIN (99–09)
NOR (99–09)
FRA (00–07)
JPN (99–09)
SPA (99–08)
ROM (99–09)
USA (99–08)
DEN (99–06)

* Age adjusted to European standard.
† Data for years indicated in parentheses.
‡ Death rate is for the United Kingdom, not just England and Wales as in previous editions of the Chart Book.
§ Based on a log linear regression of the actual rates.

From 1999–2001 to 2006–2009, the United States ranked next to last among 15 industrialized countries in the average annual decline in stroke mortality in females.36
In 1999–2008, the prevalence of hypertension was appreciably higher in non-Hispanic blacks than in non-Hispanic whites or Mexican-Americans. Within racial groups, the prevalence of hypertension was fairly similar in males and females.18

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Hypertension

Chart 3–67

- Hypertension is defined as systolic BP $\geq 140$ mmHg, or diastolic BP $\geq 90$, or on medication.
- Prehypertension is defined as systolic BP $120–139$ mmHg or diastolic BP $80–89$.

Chart 3–68

- Hypertension is defined as systolic BP $\geq 140$ mmHg, or diastolic BP $\geq 90$, or on medication.
- Non-Hispanic.
Hypertension


In 2005–2008, 93% of persons with a high level of hypertension (≥160/≥95 mmHg) were aware of their condition compared with 54% in 1971–1974. The percent of persons on medication with their condition controlled increased from 16% in 1971–1974 to 81% in 2005–2008.18
In 2005–2008, among individuals with hypertension (≥140/≥90 mmHg), 79% were aware of their condition; 70% were on treatment for it; and 49% had it controlled. These percentages are appreciably greater than the comparable figures (51%, 31%, and 10%, respectively) for 1976–1980.18

From 1997–1999 to 2006–2008, the rate of emergency department visits for hypertension increased 45% for those aged 25–44 years. Those aged 65 years and older had the highest rates.35
In 2008, death rates for diseases of the arteries within sex groups were slightly higher in blacks than in whites. Overall, death rates were nearly 44% higher in males than in females.31

In 2008, death rates for diseases of the arteries within racial groups were higher in males than in females at all ages. Within sex groups, blacks had slightly higher rates than whites.31
The percentage of deaths from congenital malformations of the circulatory system for infants aged less than 1 year declined from 82% in 1940 to 45% in 2008.29–31

In blacks and whites, infant congenital heart disease mortality declined from 1970 to 2008. Mortality from other congenital malformations of the circulatory system began to decline in the mid-1980s and remained relatively stable during the 2000s.29–31
4. Lung Diseases

The term *lung diseases* is used here to mean:

- Acute lower respiratory infections
- Chronic lower respiratory diseases
- Lung diseases due to external agents
- Adult respiratory distress syndrome
- Pulmonary edema
- Interstitial lung diseases
- Cardiopulmonary diseases
- Selected HIV-related and other pulmonary infections
- Neonatal pulmonary diseases

Chart 4–1 shows the distribution of deaths in 2008 by major lung subgroups. Chart 4–2 lists selected lung diseases; ICD-9-CM codes for the lung diseases; 2009 estimates of hospital discharges, lengths of stay, and physician office visits for those diagnostic codes; ICD-10 codes for the lung diseases; and number of deaths in 2008 for those codes. Subsequent charts display morbidity and mortality for total lung diseases and specific subgroups: COPD, asthma, respiratory distress syndrome (RDS), and sudden infant death syndrome (SIDS).

**Chronic Obstructive Pulmonary Disease**

The term *COPD* is used here to include chronic bronchitis and emphysema. It has been defined as “the physiologic finding of nonreversible pulmonary function impairment.”

Data used for the COPD prevalence charts in this *Chart Book* were obtained from the NHIS and are based on self-reports of lifetime prevalence of COPD as determined by a physician. In 2010, an estimated 14.8 million individuals were identified with COPD. Additionally, based on spirometry readings of lung function in the 1988–1994 NHANES, COPD was estimated to go undiagnosed in 12 million people.

**Asthma**

Three different prevalence estimates derived from NHIS data are presented in this chapter. Since 1997, NHIS has gathered information about lifetime asthma and asthma attacks or episodes from the Sample Adult Core and Sample Child Core questionnaires. A “yes” response to the question, “Has a doctor or other health professional ever told you that you had asthma?” determined lifetime prevalence. Those who responded “yes” to the lifetime asthma question were then asked, “During the past 12 months, have you had an episode of asthma or an asthma attack?” A “yes” response to the 12-month question determined asthma attack prevalence. Since 2001, current asthma status has also been collected. To determine current asthma, persons answering “yes” to the lifetime asthma question must also have answered “yes” to the question, “Do you still have asthma?”

![Chart 4–1](chart41.png)

**Deaths From Lung Diseases, Percent by Subgroup, U.S., 2008**

Total Deaths = 242,350 (100%)
Compiled from Vital Statistics of the United States, NCHS.
### Lung Diseases

#### Chart 4–2
**Number of Hospitalizations, Physician Office Visits, and Deaths for Lung Diseases, U.S., 2008–2009**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First-Listed Discharges (1,000)</td>
<td>Length of Stay (Days)</td>
<td>(1,000)</td>
<td>ICD-10 Codes</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,468</td>
<td>5.6</td>
<td>38,270</td>
<td>242,350</td>
</tr>
<tr>
<td>Acute lower respiratory infections:</td>
<td>466, 480–487</td>
<td>1,385</td>
<td>4.9</td>
<td>10,678</td>
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<tr>
<td>Influenza and pneumonia</td>
<td>480–487</td>
<td>1,226</td>
<td>5.1</td>
<td>6,319</td>
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<tr>
<td>Acute bronchitis</td>
<td>466</td>
<td>159</td>
<td>3.4</td>
<td>4,359</td>
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<tr>
<td>Acute bronchiolitis</td>
<td>included in 466</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Chronic lower respiratory diseases:</td>
<td>490–496</td>
<td>1,218</td>
<td>4.7</td>
<td>25,956</td>
</tr>
<tr>
<td>COPD:</td>
<td>490–492, 494–496</td>
<td>739</td>
<td>4.9</td>
<td>15,392</td>
</tr>
<tr>
<td>Chronic bronchitis</td>
<td>490, 491</td>
<td>648</td>
<td>4.7</td>
<td>9,280</td>
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<tr>
<td>Emphysema</td>
<td>492</td>
<td>15</td>
<td>4.3</td>
<td>747</td>
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<tr>
<td>Other COPD</td>
<td>495, 496</td>
<td>67</td>
<td>7.5</td>
<td>5,153</td>
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<tr>
<td>Bronchiectasis</td>
<td>494</td>
<td>9</td>
<td>5.1</td>
<td>212</td>
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<tr>
<td>Asthma</td>
<td>493</td>
<td>479</td>
<td>10.5</td>
<td>10,564</td>
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<tr>
<td>Status asthmatic</td>
<td>included in 493</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Cystic fibrosis</td>
<td>277.0</td>
<td>14</td>
<td>8.8</td>
<td>110</td>
</tr>
<tr>
<td>Lung disease due to external agents</td>
<td>500–508</td>
<td>182</td>
<td>7.5</td>
<td>110</td>
</tr>
<tr>
<td>Adult respiratory distress syndrome</td>
<td>518.5</td>
<td>11</td>
<td>10.3</td>
<td>—</td>
</tr>
<tr>
<td>Pulmonary edema</td>
<td>518.4</td>
<td>7</td>
<td>6.0</td>
<td>—</td>
</tr>
<tr>
<td>Interstitial lung diseases:</td>
<td>011, 012, 135, 446.2, 446.4, 518.8</td>
<td>411</td>
<td>8.1</td>
<td>811</td>
</tr>
<tr>
<td>Sarcoidosis</td>
<td>135</td>
<td>7</td>
<td>7.0</td>
<td>96</td>
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<tr>
<td>Respiratory tuberculosis</td>
<td>011, 012</td>
<td>6</td>
<td>11.0</td>
<td>120</td>
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<tr>
<td>Respiratory failure</td>
<td>518.8</td>
<td>394</td>
<td>8.1</td>
<td>525</td>
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<tr>
<td>Pulmonary manifestations of connective tissue disorders</td>
<td>446.2, 446.4</td>
<td>4</td>
<td>5.8</td>
<td>70</td>
</tr>
<tr>
<td>Cardiopulmonary diseases:</td>
<td>415.1–417</td>
<td>181</td>
<td>5.8</td>
<td>590</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>415.1</td>
<td>158</td>
<td>5.7</td>
<td>487</td>
</tr>
<tr>
<td>Other pulmonary heart disease</td>
<td>415.2–417</td>
<td>23</td>
<td>6.5</td>
<td>103</td>
</tr>
<tr>
<td>Selected HIV-related and other pulmonary infections</td>
<td>114–116, 117.3, 117.5, 117.7, 136.3</td>
<td>7</td>
<td>7.4</td>
<td>86</td>
</tr>
<tr>
<td>Neonatal pulmonary disorders:</td>
<td>748.4–748.6, 769, 770, 798.0</td>
<td>52</td>
<td>14.5</td>
<td>39</td>
</tr>
<tr>
<td>Respiratory distress syndrome</td>
<td>769</td>
<td>14</td>
<td>22.8</td>
<td>—</td>
</tr>
<tr>
<td>Sudden infant death syndrome</td>
<td>798.0</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Congenital malformation of the lung</td>
<td>748.4–748.6</td>
<td>2</td>
<td>27.5</td>
<td>—</td>
</tr>
<tr>
<td>Bronchopulmonary dysplasia</td>
<td>770.7</td>
<td>5</td>
<td>3.4</td>
<td>—</td>
</tr>
<tr>
<td>Atelectasis of newborn</td>
<td>770.4, 770.5</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Other perinatal respiratory diseases</td>
<td>770.1–770.3, 770.6, 770.8, 770.9</td>
<td>31</td>
<td>11.7</td>
<td>39</td>
</tr>
</tbody>
</table>

* Estimates of hospitalizations and physician office visits are subject to sampling variability. Estimates of hospitalizations at 10,000 or below have a relative standard error of more than 18%. Estimates of physician office visits below 1 million have a relative standard error of more than 30%.

† Does not include lung cancer.

Compiled from references 31, 32, and 34.
Lung Diseases

In 2008, lung disease mortality was higher in males than in females. Within sex groups, it was similar between black males and white males and slightly higher in white females than in black females.\textsuperscript{31}

In 2008, the male–female gap in mortality from lung diseases generally increased with age. Within racial groups, the rate was higher in black males than in white males aged 74 years and younger; it was higher in black females than in white females aged 64 years and younger.\textsuperscript{31}
Chronic Obstructive Pulmonary Disease

From 1997 to 2010, the prevalence of physician-diagnosed COPD fluctuated for all age groups.25

In 2010, within racial groups, the prevalence of COPD was higher in females than in males, except in blacks aged 65 years and older. Differences were observed between races: In males and females aged 45–64 years and in females aged 65 years and older, the prevalence of COPD was higher in whites than in blacks.25

* Physician-diagnosed COPD only.

* Physician-diagnosed COPD only.
Chronic Obstructive Pulmonary Disease

Chart 4–7

From 1995 to 2009 hospitalization rates for COPD were stable for those aged 45–64 years; for those aged 65 years and older, however, rates have fluctuated since 2001.\textsuperscript{32}

![Hospitalization Rates Chart]

Chart 4–8

From 1960 to 1990, COPD mortality increased in black males, followed by a gradual turnaround and decline in the 2000s. In white males, COPD mortality peaked in 1985, remained stable throughout the 1990s, and declined during the 2000s. In white and black females, the rates increased until 1999 and then stabilized.\textsuperscript{16, 30, 31, 37}

![Death Rates Chart]
Chronic Obstructive Pulmonary Disease

From 1999 to 2008, COPD mortality in males generally declined slightly in all racial/ethnic groups. In females, it declined slightly in Asians and Hispanics but was stable in non-Hispanic whites and non-Hispanic blacks. Within sex groups, COPD mortality was highest in whites.16, 30, 31

In white males, the 1960–2006 death rates for COPD changed from an increasing to a declining trend. In successive age groups, the change occurred later but was increasingly prominent. Beginning in 2007, the rates began to increase again.16, 30, 31, 37
Chronic Obstructive Pulmonary Disease

Chart 4–11

In black males, the 1960–2008 death rates for COPD changed from an increasing to a declining trend. In successive age groups, the change occurred later but was increasingly prominent.16, 30, 31, 37

* Nonwhite from 1960 to 1967.

Chart 4–12

From 1960 to 1990, death rates for COPD increased in all age groups of white females. Rates stabilized among those aged 55–64 years in the 1990s and among those aged 65 years and older in the 2000s.16, 30, 31, 37
Chronic Obstructive Pulmonary Disease

From the early 1980s to 2008, death rates for COPD increased in the black females aged 75 years and older. During the same period, the trend of increasing death rates changed to a stable one for those younger than 75 years of age.16, 30, 31, 37

In 2005–2007, death rates for COPD tended to be highest in the Mountain States and Appalachia.16

* Nonwhite from 1960 to 1967.
Chronic Obstructive Pulmonary Disease

In 2006–2009, among 16 industrialized countries, the United States ranked highest in COPD mortality for males and second highest for females.\(^{36}\)

In 2008, COPD mortality was approximately one-third higher in males than in females. Within sex groups, it was highest among non-Hispanic whites and lowest among Asians.\(^{31}\)

---

* Chart 4–15
Age-Adjusted Death Rates* for Chronic Obstructive Pulmonary Disease by Country and Sex, Ages 35–74, 2006–2009†

* Age-adjusted to European standard.
† Data for years indicated in parentheses.
‡ Death rate is for the United Kingdom, not just England and Wales as in previous editions of the Chart Book.

* Chart 4–16
Age-Adjusted Death Rates for Chronic Obstructive Pulmonary Disease by Race/Ethnicity and Sex, U.S., 2008

* Non-Hispanic.
In 2008, COPD mortality increased with age for all racial and sex groups. Within age groups, it was highest in white males aged 65 years and older and lowest in black females aged 45 years and older.31

Lifetime (1997–2010) and current prevalence (2001–2010) of asthma rose in both age groups, but the trends in 12-month asthma attack prevalence (1997–2010) were relatively stable. All prevalence measures were higher in the younger age group than in the older group.25
Asthma

Chart 4–19
Prevalence of Asthma by Race, Ages Younger Than 18, U.S., 1997–2010

Lifetime (1997–2010), current (2001–2010), and attack prevalence (1997–2010) of asthma rose in non-Hispanic blacks younger than 18 years of age but remained relatively stable in non-Hispanic whites in the same age group. All three measures of asthma prevalence showed higher rates in non-Hispanic blacks than in non-Hispanic whites younger than 18 years of age.25

Chart 4–20
Prevalence of Asthma by Race, Ages 18 and Older, U.S., 1997–2010

Asthma

In 2010, among children younger than 18 years of age, current asthma prevalence was 22% higher in males than in females. Within sex groups, the prevalence of current asthma was highest in non-Hispanic blacks.25

Chart 4–21
Prevalence of Current Asthma by Race/Ethnicity and Sex, Ages Younger Than 18, U.S., 2010

Chart 4–22
Prevalence of Current Asthma by Race/Ethnicity and Sex, Ages 18 and Older, U.S., 2010

In 2010, among adults aged 18 years and older, current asthma prevalence was nearly 45% higher in females than in males. Within sex groups, it was highest in non-Hispanic blacks and lowest in Hispanics.25

* Non-Hispanic.
From 1990 to 2009, the number of physician office visits for asthma was erratic with no obvious trend.\textsuperscript{34}

From 1997–1999 to 2006–2008, within age groups, emergency department visit rates for asthma were higher for males than females younger than 18 years of age but higher for females than males ages 18 years and older.\textsuperscript{35}
Asthma

In 2006–2008, emergency department visit rates for asthma declined in males with age.\textsuperscript{35}

From 1980 to 2009, the number of hospitalizations with asthma as the primary diagnosis remained relatively stable, but it increased significantly as a secondary diagnosis.\textsuperscript{32}
Asthma

Chart 4–27
Hospitalization Rates for Asthma by Age,

From 1980 to 2009, hospitalization rates for asthma were lowest among those aged 15–44 years.32

Chart 4–28
Age-Adjusted Death Rates for Asthma by Race/Ethnicity and Sex, U.S., 2008

In 2008, asthma mortality for males was at least 2.5 times higher in non-Hispanic blacks than in the other racial/ethnic groups. In females, asthma mortality was more than 2 times higher in non-Hispanic blacks than in the other racial/ethnic groups. Overall, asthma mortality was 48% higher in females than in males.31

* Non-Hispanic.
From 1980 to the mid-1990s, death rates for asthma, although erratic, tended to rise in all groups aged 1–24 years and subsequently began to decline in the 2000s.\textsuperscript{16, 30, 31}

From 1980 to the mid-1990s, death rates for asthma rose in blacks and whites, both male and female, but then declined through 2008. Within sex groups, blacks had higher asthma mortality rates than whites.\textsuperscript{16, 30, 31}
Asthma

In 2006–2009, among 15 countries, the United States ranked 11th in asthma mortality for males and 7th for females.\(^3\)

In 1999–2008, among blacks, asthma mortality was higher in males than in females aged 1–34 years, but was higher in females than in males aged 35–84 years. Among whites, asthma mortality was slightly higher in males than in females aged 1–24 years, but was higher in females than in males aged 25–84 years.\(^{16, 30, 31}\)

In 2006–2009, among 15 countries, the United States ranked 11th in asthma mortality for males and 7th for females.\(^3\)

* Age-adjusted to European standard.
† Data for years indicated in parentheses.
‡ Death rate is for the United Kingdom, not just England and Wales as in previous editions of the Chart Book.
Respiratory Distress Syndrome

Infant mortality for RDS declined steeply from 1974 to the mid-1990s, followed by a slow but appreciable decline through 2007.\textsuperscript{38, 39}

From 1980 to 2007, infant mortality for RDS decreased appreciably in blacks and whites, with rates remaining higher in blacks.\textsuperscript{38, 39}
Respiratory Distress Syndrome/Sudden Infant Death Syndrome

Chart 4–35

In 2007, infant mortality for RDS was highest in blacks and lowest in Asians, among the racial/ethnic groups shown.39

* Data are not available for American Indians, Central and South Americans, and Puerto Ricans.
† Non-Hispanic.

Chart 4–36
Infant Mortality Rate for Sudden Infant Death Syndrome by Race/Ethnicity, U.S., 2007

In 2007, mortality for SIDS was highest in American Indians and lowest in Central and South Americans.38

* Non-Hispanic.
5. Blood Diseases

The term *blood diseases* is used here to mean diseases within the diagnostic categories listed in *Diseases of the Blood and Blood-Forming Organs and Certain Disorders Involving the Immune Mechanism* of ICD-10; hemochromatosis is also included in this chapter. Blood-clotting diseases, most of which are subsumed under CVD, have been excluded, as have other blood diseases, such as bleeding and red blood disorders of the newborn and serum hepatitis.

Chart 5–1 shows the distribution of deaths in 2008 by blood disease subgroups. Chart 5–2 lists specific blood diseases; the ICD-9-CM codes of the blood diseases; 2009 estimates of hospital discharges, lengths of stay, and physician office visits for those diagnostic codes; ICD-10 codes for the blood diseases; and the number of deaths in 2008 for those codes.

Subsequent charts display morbidity and mortality for aplastic anemia and sickle cell anemia. The annual death rates for these diseases are small and may vary considerably from year to year. To increase data reliability for race and sex comparisons, average annual death rates over a 4- to 5-year period were used instead of rates from a single year.

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**Chart 5–1**

**Deaths From Blood Diseases, Percent by Subgroup, U.S., 2008**

- Aplastic Anemia: 9.5%
- Sickle Cell Anemia: 5.0%
- Other Diseases of Blood and Blood-Forming Organs: 17.5%
- Hemochromatosis: 1.9%
- Diseases of White Blood Cells: 4.5%
- Purpura and Other Hemorrhagic Conditions: 8.3%
- Coagulation Defects: 17.0%
- Other Anemias: 35.3%

Total Deaths = 10,066 (100%)
Compiled from Vital Statistics of the United States, NCHS
## Blood Diseases

### Chart 5–2

**Number of Hospitalizations, Physician Office Visits,* and Deaths for Blood Diseases, U.S., 2008–2009†**

<table>
<thead>
<tr>
<th>Diagnostic Category</th>
<th>ICD-9 Codes</th>
<th>First-Listed Discharges (1,000)</th>
<th>Length of Stay (Days)</th>
<th>Physician Office Visits for 2009 (1,000)</th>
<th>ICD-10 Codes</th>
<th>Deaths for 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>280–289, 275</td>
<td>609</td>
<td>4.3</td>
<td>6,812</td>
<td>D50–D89, E83.1</td>
<td>10,066</td>
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<td><strong>Anemias</strong></td>
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<tr>
<td>Iron deficiency anemia</td>
<td>280–285</td>
<td>429</td>
<td>4.3</td>
<td>4,997</td>
<td>D50–D64</td>
<td>5,018</td>
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<tr>
<td>Other deficiency anemia</td>
<td>281</td>
<td>9</td>
<td>2.7</td>
<td>238</td>
<td>D51, D52</td>
<td>54</td>
</tr>
<tr>
<td>Thalassemia‡</td>
<td>282.4</td>
<td>14</td>
<td>3.1</td>
<td>68</td>
<td>D56</td>
<td>19</td>
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<tr>
<td>Sickle cell anemia</td>
<td>282.6</td>
<td>69</td>
<td>5.0</td>
<td>24</td>
<td>D57.0, D57.1</td>
<td>501</td>
</tr>
<tr>
<td>Aplastic anemia</td>
<td>284</td>
<td>40</td>
<td>4.9</td>
<td>20</td>
<td>D60, D61</td>
<td>960</td>
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<tr>
<td>Other and unspecified anemias</td>
<td>Other 282, 283, 285</td>
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<td>4.6</td>
<td>3,731</td>
<td>Residual</td>
<td>3,295</td>
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<tr>
<td><strong>Coagulation defects</strong></td>
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<td></td>
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<tr>
<td>Hemophilia. Factor VIII</td>
<td>286.0</td>
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<td>10.5</td>
<td>52</td>
<td>D66</td>
<td>71</td>
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<td>Hemophilia. Factor IX</td>
<td>286.1</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>D67</td>
<td>2</td>
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<tr>
<td>Other</td>
<td>286.2–286.9</td>
<td>8</td>
<td>4.1</td>
<td>151</td>
<td>Residual</td>
<td>1,727</td>
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<tr>
<td><strong>Purpura and other hemorrhagic conditions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary thrombocytopenia</td>
<td>287.3</td>
<td>17</td>
<td>3.4</td>
<td>267</td>
<td>D69.3, D69.4</td>
<td>363</td>
</tr>
<tr>
<td>Unspecified thrombocytopenia</td>
<td>287.4</td>
<td>3</td>
<td>6.0</td>
<td>—</td>
<td>D69.5, D69.6</td>
<td>436</td>
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<tr>
<td>Other</td>
<td>287.0–287.2, 287.5–287.9</td>
<td>23</td>
<td>3.2</td>
<td>196</td>
<td>Residual</td>
<td>32</td>
</tr>
<tr>
<td>Diseases of white blood cells</td>
<td>288</td>
<td>74</td>
<td>4.1</td>
<td>619</td>
<td>D70–D72</td>
<td>458</td>
</tr>
<tr>
<td>Other diseases of blood and blood-forming organs</td>
<td>289</td>
<td>20</td>
<td>3.2</td>
<td>163</td>
<td>D73–D89</td>
<td>1,766</td>
</tr>
<tr>
<td>Hemochromatosis</td>
<td>275</td>
<td>33</td>
<td>6.5</td>
<td>367</td>
<td>E83.1</td>
<td>193</td>
</tr>
</tbody>
</table>

* Estimates of hospitalizations and physician office visits are subject to sampling variability. Estimates of hospitalizations below 15,000 have a relative standard error of more than 16%. Estimates of physician office visits below 1 million have a relative standard error of more than 30%.

† Compiled from references 31, 32, and 34: NHLBI tabulation of NHDS, NAMCS, and NCHS mortality.

‡ Cooley’s anemia has been changed to thalassemia, which is the correct disease for the ICD-9 and ICD-10 codes in the table.

Compiled from references 31, 32, and 34.
In 2009, the number of hospitalizations for aplastic anemia as a primary diagnosis was more than twice as high as it was in 1990; as a secondary diagnosis, it was 2.5 times higher in 2009 than in 1990.16, 32

In 2004–2007, mortality from aplastic anemia was similar in blacks and whites. Overall, it was 20% higher in males than in females.16
Aplastic Anemia/Sickle Cell Anemia

In 2004–2007, mortality from aplastic anemia was higher in black males than in white males. Within racial groups, it was higher in black males than in black females aged 45 years and older and in white males than in white females aged 65 years and older.\textsuperscript{16, 32}

Hospitalization rates for sickle cell anemia in blacks varied considerably between 1988 and 2009. Except in 1989 and 1990, rates in the 15–44 age group were higher than those in the younger than 15 age group; overall rates increased for the older group but not for the younger group.\textsuperscript{32}
Sickle Cell Anemia

Chart 5–7
Age-Adjusted Death Rates* for Sickle Cell Anemia


Chart 5–8
Death Rates* for Sickle Cell Anemia
in Blacks by Age and Sex, U.S., 2004–2007†

In 2004–2007, sickle cell anemia mortality was somewhat similar in males and females. Death rates were relatively high for individuals aged 25–64 years; few individuals live long enough to die of old age.16

* Average annual rates.
† Rates are unreliable for black males aged 5–14 and 65–74 years and black females aged 5–14 and 75–84 years.
Appendices

A. International Classification of Diseases
B. Comparability Ratios
C. Definition of Terms
D. Abbreviations
E. References
### Appendix A

**International Classification of Diseases:**
**Codes for Selected Diagnostic Categories**
*(6th, 7th, 8th, 9th, and 10th Revisions)*

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Coronary heart disease</td>
<td>420, 422</td>
<td>420, 422</td>
<td>410–413</td>
<td>410–414, 429.2</td>
<td>I20–I25</td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td>*</td>
<td>*</td>
<td>410</td>
<td>410</td>
<td>I21, I22</td>
</tr>
<tr>
<td>Heart failure</td>
<td>†</td>
<td>†</td>
<td>427.0, 427.1</td>
<td>428</td>
<td>I50</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>†</td>
<td>†</td>
<td>427.0</td>
<td>428</td>
<td>I50.1</td>
</tr>
<tr>
<td>Cardiomyopathy</td>
<td>†</td>
<td>†</td>
<td>425</td>
<td>425</td>
<td>I42</td>
</tr>
<tr>
<td>Congenital malformations of the circulatory system</td>
<td>†</td>
<td>†</td>
<td>746–747</td>
<td>745–747</td>
<td>Q20–Q28</td>
</tr>
<tr>
<td>Chronic lower respiratory diseases</td>
<td>†</td>
<td>†</td>
<td>†</td>
<td>490–496</td>
<td>J40–J47</td>
</tr>
<tr>
<td>Asthma</td>
<td>241</td>
<td>241</td>
<td>493</td>
<td>493</td>
<td>J45, J46</td>
</tr>
<tr>
<td>Respiratory distress syndrome</td>
<td>†</td>
<td>†</td>
<td>776.1, 776.2</td>
<td>769</td>
<td>P22</td>
</tr>
<tr>
<td>Sudden infant death syndrome</td>
<td>†</td>
<td>†</td>
<td>†</td>
<td>†</td>
<td>R95</td>
</tr>
</tbody>
</table>

---

* The ICD term is diseases of the circulatory system.
* The ICD-6 and ICD-7 term is arteriosclerotic heart disease; the ICDA-8, ICD-9, and ICD-10 term is ischemic heart disease.
* The ICDA-8 terms are congestive heart failure and left ventricular failure. The ICD-9 and ICD-10 term is heart failure.
* The ICD-6 and ICD-7 term is vascular diseases affecting the central nervous system; the ICDA-8, ICD-9, and ICD-10 term is cerebrovascular disease.
* The ICDA-8 terms are congenital anomalies of heart and other congenital anomalies of circulatory system. The ICD-9 terms are bulbus cordis anomalies and anomalies of cardiac septal closure, other congenital anomalies of heart, and other congenital anomalies of circulatory system. The ICD-10 term is congenital malformations of the cardiovascular system.
* The ICD-9 term is chronic obstructive pulmonary disease and allied conditions.
* The ICD-6 and ICD-7 terms are chronic bronchitis, unqualified bronchitis, and emphysema without mention of bronchitis; the ICDA-8 terms are chronic bronchitis, unqualified bronchitis, emphysema, and chronic obstructive lung disease; the ICD-9 and ICD-10 terms are chronic bronchitis, bronchitis not specified as acute or chronic, emphysema, bronchiectasis, extrinsic allergic alveolitis, and chronic airways obstruction not elsewhere classified.
* The ICD-6 through ICD-9 term is asthma; the ICD-10 terms are asthma and status asthmaticus.
* The ICDA-8 terms are hyaline membrane disease and respiratory distress syndrome. The ICD-9 term is respiratory distress syndrome. The ICD-10 term is respiratory distress of newborns.
* No code for this category exists in this ICD revision.
* No data for this category are presented in the Chart Book in this period.
## Appendix B

### Estimated Comparability Ratios for Selected Causes of Death, U.S.

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Codes of the Classification of International Diseases</th>
<th>Number of Deaths*</th>
<th>Comparability Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ICD-10</td>
<td>ICD-9</td>
<td>ICD-10</td>
</tr>
<tr>
<td>Major cardiovascular diseases</td>
<td>I00–I78</td>
<td>390–434, 436–448</td>
<td>942,439</td>
</tr>
<tr>
<td>Diseases of the heart</td>
<td>I00–I09, I11, I13, 120–151</td>
<td>390–398, 402, 404, 410–429</td>
<td>719,631</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td>I20–I25</td>
<td>410-414, 429.2</td>
<td>543,063</td>
</tr>
<tr>
<td>Heart failure</td>
<td>I50</td>
<td>428</td>
<td>48,876</td>
</tr>
<tr>
<td>Cerebrovascular disease (stroke)</td>
<td>I60–I69</td>
<td>430–434, 436–438</td>
<td>166,837</td>
</tr>
<tr>
<td>COPD</td>
<td>J40–J44</td>
<td>490–492, 494, 496</td>
<td>104,775</td>
</tr>
<tr>
<td>Asthma</td>
<td>J45–J46</td>
<td>493</td>
<td>4,971</td>
</tr>
<tr>
<td>RDS†</td>
<td>P22</td>
<td>769</td>
<td>2,904</td>
</tr>
</tbody>
</table>

* From a sample of deaths in 1996. 
† Infant deaths.
## Appendix C

### Definition of Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age-adjusted death rate:</strong></td>
<td>An age-adjusted rate is a summary rate for a given age range and is computed by multiplying the age-specific rates for a given diagnosis (or cause of death) by the standard population for the age range and summing those products. The standard population is the U.S. population in 2000 as it is distributed proportionately in 10-year age groups.</td>
</tr>
<tr>
<td><strong>Any mention mortality:</strong></td>
<td>A count of death certificates for a given cause of death that was selected as either the underlying cause or otherwise mentioned on the death certificate.</td>
</tr>
<tr>
<td><strong>Chronic condition:</strong></td>
<td>A condition is considered chronic if (1) the respondent (in a health interview) indicates the condition was first noticed more than 3 months before the initial date of the interview or (2) the type of condition ordinarily has a duration of more than 3 months.</td>
</tr>
<tr>
<td><strong>Comparability ratio:</strong></td>
<td>A comparability ratio is the number of deaths from a cause as coded by an ICD revision divided by the number of deaths from the closest similar cause as coded by the preceding ICD revision. A sample of death certificates from a chosen year is used for the calculation. The ratios measure discontinuities in mortality trends that result from the introduction of a new ICD revision.</td>
</tr>
<tr>
<td><strong>Emergency department:</strong></td>
<td>An emergency department is a hospital facility that is staffed 24 hours a day and provides unscheduled outpatient services to patients whose conditions require immediate care.</td>
</tr>
<tr>
<td><strong>Hospitalization:</strong></td>
<td>Hospitalization refers to hospital discharge—that is, the formal release of a hospital inpatient. Hospital discharge may be the result of death or transfer to a place of residence, nursing home, or another hospital. First-listed diagnosis is the coded diagnosis identified as the primary diagnosis or the diagnosis first listed on the face sheet of the hospital medical record. Hospital refers to non-Federal, short-stay (average length of patient’s stay is less than 30 days), general (e.g., medical or surgical), or children’s general hospitals, with six or more beds for inpatient use.</td>
</tr>
<tr>
<td><strong>Incidence:</strong></td>
<td>Incidence is the number of cases with onset during a specified period of time, usually a year.</td>
</tr>
<tr>
<td><strong>Infant mortality rate:</strong></td>
<td>Infant mortality is the number of deaths occurring in infants younger than 1 year of age from a cause (or all causes) divided by the number of live births occurring the same year, and then expressed as the rate per 100,000 live births for that year.</td>
</tr>
<tr>
<td><strong>Limited in activity:</strong></td>
<td>Also called chronic activity limitation, it refers to the limitation of a person’s usual activity due to a chronic condition.</td>
</tr>
</tbody>
</table>
Appendix C

Definition of Terms (continued)

Morbidity: Morbidity refers to incidence, prevalence, hospitalizations, and physician office visits.

Prevalence: The prevalence of a condition is the number of persons who have the condition at a given time.40

Relative standard error: The standard error is primarily a measure of sampling error—not measurement error—that is, the variation that might occur by chance because only a sample of the population is surveyed. The relative standard error of an estimate is obtained by dividing the standard error of the estimate by the actual estimate.40

Underlying cause of death: The underlying cause of death is the disease or injury that initiated the events leading directly to death. Underlying cause of death is selected from the cause(s) or condition(s) entered in the cause-of-death section of the death certificate. When more than one cause or condition is entered by the physician, the underlying cause is determined by the sequence of conditions on the certificate, provisions of the ICD, and rules of associated classifications.40
Appendix D

Abbreviations*

AMI  acute myocardial infarction
BP   blood pressure
CHD  coronary heart disease
CLRD chronic lower respiratory diseases
CM   clinical modification
CMS  Centers for Medicare & Medicaid Services
COPD chronic obstructive pulmonary disease
CVD  cardiovascular diseases
HF   heart failure
ICD  International Classification of Diseases
NAMCS National Ambulatory Medical Care Survey
NCHS National Center for Health Services
NHAMCS National Hospital Ambulatory Medical Care Survey
NHANES National Health and Nutrition Examination Survey
NHDS National Hospital Discharge Survey
NHIS National Health Interview Survey
NHLBI National Heart, Lung, and Blood Institute
RDS  respiratory distress syndrome
SIDS sudden infant death syndrome
WHO  World Health Organization

* Country abbreviations are listed on the next page.
## Appendix D

### Abbreviations (continued)

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
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<tbody>
<tr>
<td>CZR</td>
<td>Czech Republic</td>
</tr>
<tr>
<td>DEN</td>
<td>Denmark</td>
</tr>
<tr>
<td>FIN</td>
<td>Finland</td>
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<tr>
<td>FRA</td>
<td>France</td>
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<tr>
<td>GER</td>
<td>Germany</td>
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<tr>
<td>HUN</td>
<td>Hungary</td>
</tr>
<tr>
<td>ITA</td>
<td>Italy</td>
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<tr>
<td>JPN</td>
<td>Japan</td>
</tr>
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<td>KOR</td>
<td>Republic of Korea</td>
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<tr>
<td>NOR</td>
<td>Norway</td>
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<td>NTH</td>
<td>Netherlands</td>
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<td>POL</td>
<td>Poland</td>
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<td>Spain</td>
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<td>SWE</td>
<td>Sweden</td>
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<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
</tbody>
</table>
Appendix E

References


9. Minino AM, Anderson RN. *Documentation for the Public Use Multiple Cause of Death File on Comparability Between ICD-9 and ICD-10: A Double-Coded File Based on the 1996 Data Year Multiple Cause of Death File*. National Center for Health Statistics. May 2004. This file was provided to NHLBI in May 2004.

Appendix E

References (continued)


Appendix E

References (continued)

23. National Heart, Lung, and Blood Institute. Extrapolation to the U.S. Population From Unpublished Data Received in 2007 From the Atherosclerosis Risk in Communities Study (Surveillance) and the Cardiovascular Health Survey.


Appendix E

References (continued)


Discrimination Prohibited: Under provisions of applicable public laws enacted by Congress since 1964, no person in the United States shall, on the grounds of race, color, national origin, handicap, or age, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity (or, on the basis of sex, with respect to any education program or activity) receiving Federal financial assistance. In addition, Executive Order 11141 prohibits discrimination on the basis of age by contractors and subcontractors in the performance of Federal contracts, and Executive Order 11246 states that no federally funded contractor may discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. Therefore, the Heart, Lung, and Blood Institute must be operated in compliance with these laws and Executive Orders.
Morbidity & Mortality Chart Book: 2012 Chart Book on Cardiovascular, Lung, and Blood Diseases

National Institutes of Health
National Heart, Lung, and Blood Institute

Morbidity & Mortality Chart Book

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