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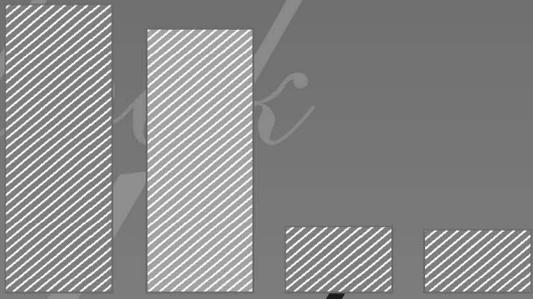*chart book*

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Morbidity &
Mortality:
2012 Chart Book
on Cardiovascular,
Lung, and Blood
Diseases

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

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 value 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.

Inconsistent 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 2–1. Prevalence of CVD, U.S.	
CVD	82,600,000
Hypertension	76,400,000
CHD	16,300,000
Acute Myocardial Infarction (AMI)	7,900,000
Angina Pectoris	9,000,000
Stroke	7,000,000
Heart Failure	5,700,000
Congenital Heart Defects	1,000,000
Atrial Fibrillation	2,200,000
Peripheral Arterial Disease	8,500,000

Table 2–2 contains estimates for the annual occurrence of CVD in the United States.[22–24]

Table 2–2. Incidence and Recurrence of CVD, U.S.	
Heart Attack	1,255,000
First Event	785,000
Recurrent Event	470,000
Stroke	795,000
First Event	610,000
Recurrent Event	185,000
Heart Failure	670,000
First Event	670,000

Lung Diseases

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

Table 2–3. Prevalence of Selected Lung Diseases, U.S.	
COPD	
Physician-diagnosed	14,800,000
Undiagnosed	12,000,000
Asthma	
Lifetime	39,900,000
Current	24,600,000
Attack	13,000,000
Cystic fibrosis	30,000
Respiratory distress syndrome	
Infants	40,000
Adults	150,000
Obstructive sleep apnea	12,000,000

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

In 2009, the mean age and percent population aged 65 years and older were lower for minorities than for whites. This was true for both males and females.[27]

	Total Population			Male			Female		
	Pop. (Mil.)	Mean Age	Percent ≥65	Pop. (Mil.)	Mean Age	Percent ≥65	Pop. (Mil.)	Mean Age	Percent ≥65
Total	309.6	37.2	13.0	152.8	36.0	11.3	156.8	38.3	14.7
White	245.9	38.3	14.2	122.1	37.1	12.3	123.8	39.4	16.0
Hispanic	(45.8)	(29.4)	(6.0)	(23.7)	(28.9)	(5.0)	(22.0)	(29.9)	(7.0)
Non-Hispanic	(200.1)	(40.3)	(16.1)	(98.4)	(39.0)	(14.0)	(101.8)	(41.5)	(18.0)
Black	40.1	33.3	8.7	19.2	31.8	7.0	20.9	34.7	10.2
Hispanic	(2.0)	(26.6)	(4.8)	(1.0)	(25.7)	(4.0)	(1.0)	(27.5)	(5.6)
Non-Hispanic	(38.0)	(33.7)	(8.9)	(18.2)	(32.1)	(7.2)	(19.9)	(35.1)	(10.4)
American Indian	3.2	31.9	7.6	1.6	31.3	6.7	1.6	32.6	8.5
Asian*	15.0	35.5	9.7	7.2	36.0	8.7	7.7	37.9	10.7
Hispanic†	49.9	29.1	5.8	25.8	28.7	4.9	24.1	29.6	6.9

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

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

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.[28]

	Total Population			Male			Female		
	Pop. (Mil.)	Mean Age	Percent ≥65	Pop. (Mil.)	Mean Age	Percent ≥65	Pop. (Mil.)	Mean Age	Percent ≥65
Total	346.7	38.2	15.9	170.8	37.2	14.3	175.9	39.2	17.4
White	269.8	39.2	17.2	133.9	38.2	15.6	135.9	40.1	18.8
Hispanic	(63.7)	(30.8)	(7.5)	(32.2)	(30.3)	(6.5)	(31.5)	(31.4)	(8.5)
Non-Hispanic	(206.1)	(41.7)	(20.2)	(101.7)	(40.6)	(18.5)	(104.4)	(42.8)	(21.9)
Black	44.9	35.3	11.3	21.5	33.7	9.3	23.3	36.7	13.2
Hispanic	(2.6)	(29.5)	(6.7)	(1.3)	(28.4)	(5.7)	(1.3)	(30.5)	(7.7)
Non-Hispanic	(42.2)	(35.6)	(11.6)	(20.2)	(34.0)	(9.6)	(22.0)	(37.1)	(13.5)
American Indian*	3.8	33.7	10.8	1.9	33.0	9.8	1.9	34.5	11.9
Asian*	20.7	37.8	12.6	9.7	36.7	11.4	11.0	38.7	13.6
Hispanic†	69.2	30.6	7.4	35.0	30.1	6.4	34.2	31.2	8.4

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

Chart 2–3
Average Remaining Lifetime Years by Age, Race, and Sex, U.S., 2008

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.[29]

Age (Years)	Total	Male	Female	Total White	White Male	White Female	Total Black	Black Male	Black Female
Birth	78.0	75.5	80.5	78.4	75.9	80.8	74.3	70.9	77.4
15	63.8	61.3	66.1	64.0	61.6	66.3	60.6	57.2	63.6
35	44.7	42.6	46.7	44.9	42.8	46.9	41.8	39.0	44.3
65	18.7	17.2	19.9	18.7	17.3	19.9	17.5	15.5	18.9
75	11.7	10.6	12.5	11.6	10.6	12.4	11.3	10.0	12.2

Background Data

Chart 2–4
Age-Adjusted Death Rates for All Causes
by Race and Sex, U.S., 1950–2008

Deaths/100,000 Population

Black* Male — · White Male —— Black* Female – – White Female
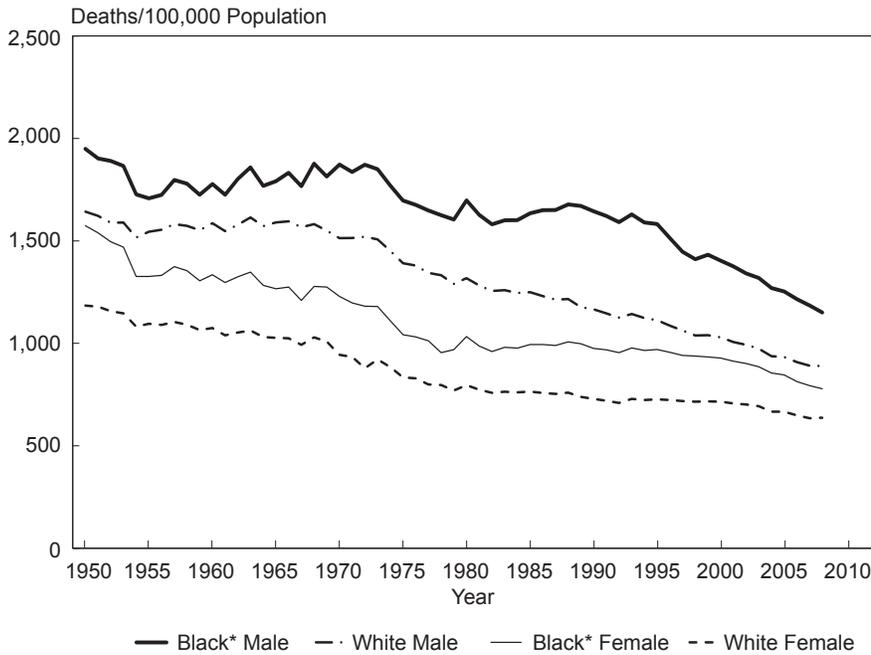
* Nonwhite from 1950 to 1967.

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
Unadjusted Death Rates for Selected Causes,
U.S., 1950–2008

Deaths/100,000 Population

ICD-6   ICD-7   ICD-8   ICD-9   ICD-10

—— CHD —— Stroke* – – – Lung Cancer – – – Other Cancer — · COPD*
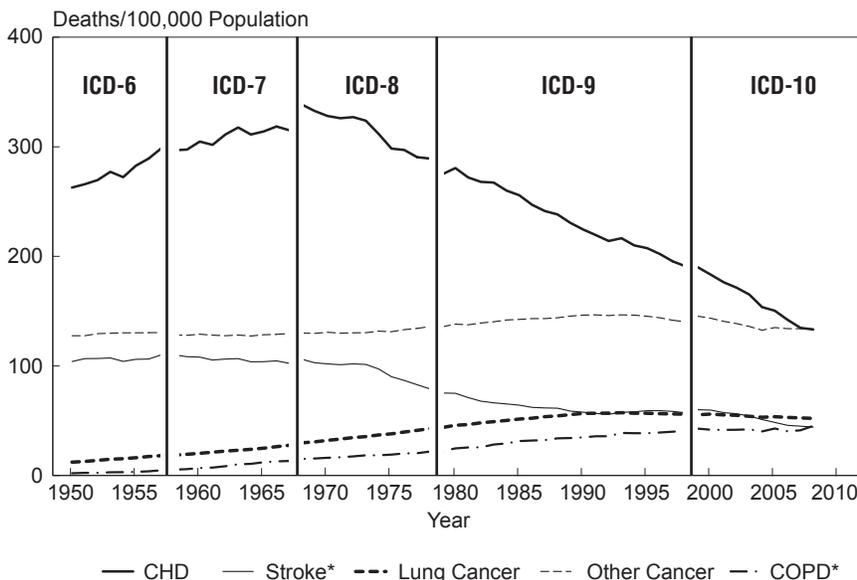
* The comparability ratio 1.0502 was applied to stroke death rates reported in vital statistics from 1979 to 1998. Similarly, the comparability ratio 1.0499 was applied to COPD death rates.

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]

Background Data

Chart 2–6
Number of Days of Inpatient Hospital Care
by Major Diagnosis, U.S., 1990–2009

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.[32]

Days of Care (Millions)

Legend: Cardiovascular, Respiratory, Mental, Digestive, Injury and Poisoning, Neoplasms, Musculoskeletal, Endocrine
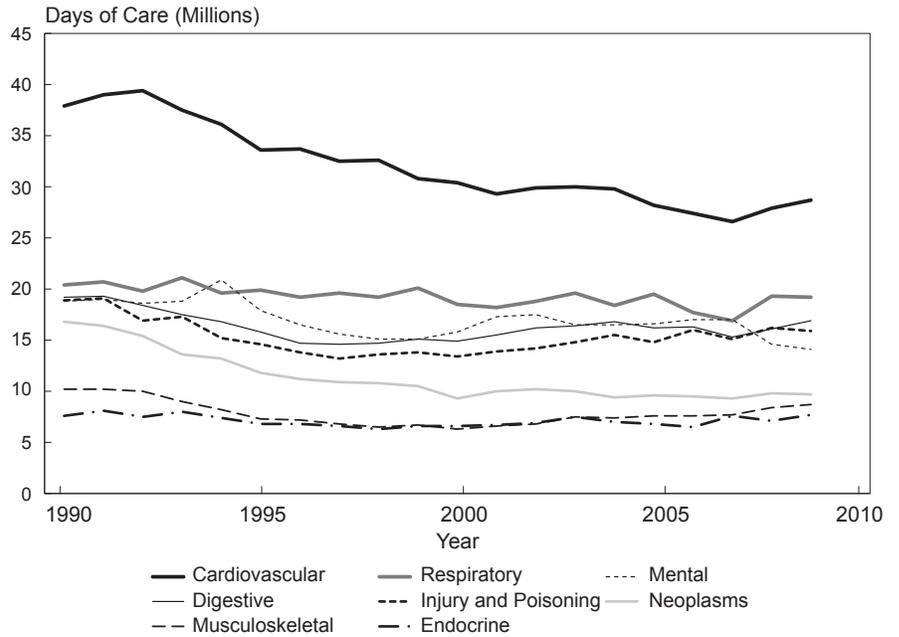
Chart 2–7
Age-Adjusted Death Rates
by Major Diagnosis, U.S., 1990–2008

From 1990 to 2008, age-adjusted death rates for cardiovascular and respiratory diseases ranked first and third, respectively.[30, 31]

Deaths/100,000 Population

Legend: Cardiovascular, Neoplasms, Respiratory, Injury and Poisoning, Endocrine, Digestive, Mental, Musculoskeletal

8
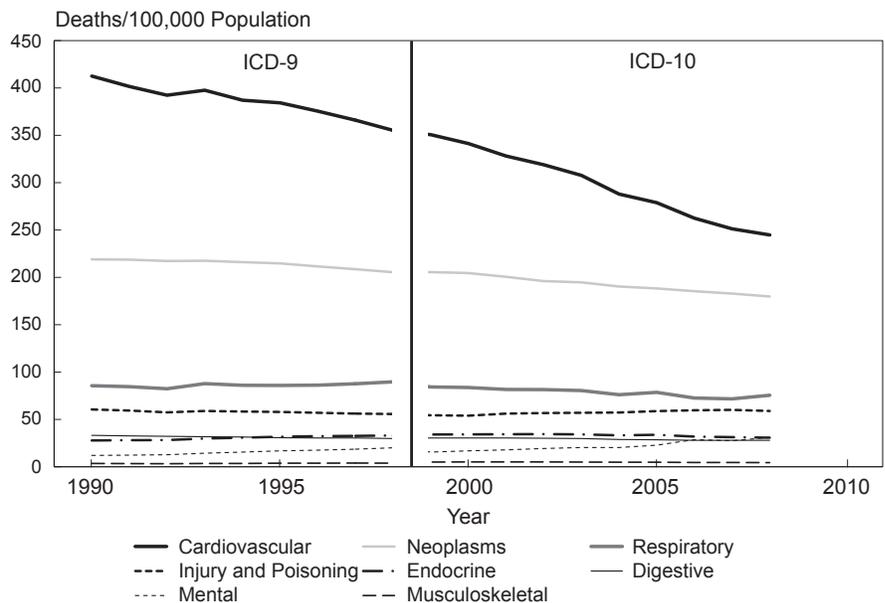
Background Data

Chart 2–8
Leading Causes of Death,
U.S., 2008

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

* Includes 405,309 deaths from CHD.

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

Chart 2–9
Leading Causes of Death
by Age and Rank, U.S., 2008

Cause of Death	Age (Years)			
	1–24	25–44	45–64	≥65
Heart disease	**5**	**3**	**2**	**1**
Cancer	4	2	1	2
Cerebrovascular diseases (stroke)	**8**	**8**	**7**	**4**
Accidents	1	1	3	9
Chronic lower respiratory diseases	**9**	**—**	**4**	**3**
Influenza and pneumonia	7	10	—	7
Diabetes mellitus	—	9	5	6
Suicide	3	4	8	—
Chronic liver disease	—	7	6	—
Nephritis and nephrosis	—	—	10	8
Homicide	2	5	—	—
Septicemia	10	—	9	10
Congenital malformations	6	—	—	—
HIV disease	—	6	—	—
Alzheimer's disease	—	—	—	5

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

Chart 2–10
Leading Causes of Death,
White Males, U.S., 2008

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

Percent of All Deaths

	Heart Disease	Cancer	Accidents	CLRD	Stroke	Diabetes
%	25.5	24.3	6.4	5.9	4.2	2.6
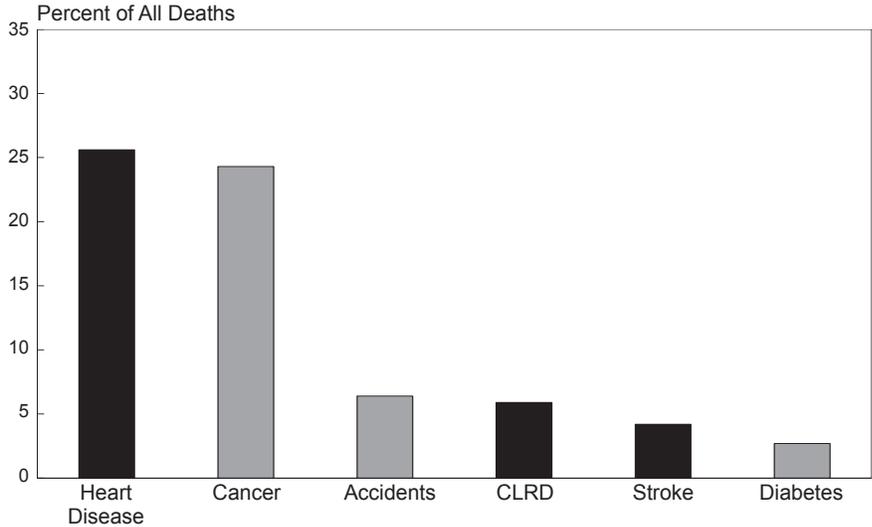
Chart 2–11
Leading Causes of Death,
White Females, U.S., 2008

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]

Percent of All Deaths

	Heart Disease	Cancer	CLRD	Stroke	Alzheimer's Disease	Accidents
%	24.5	21.5	6.5	6.5	5.0	3.5
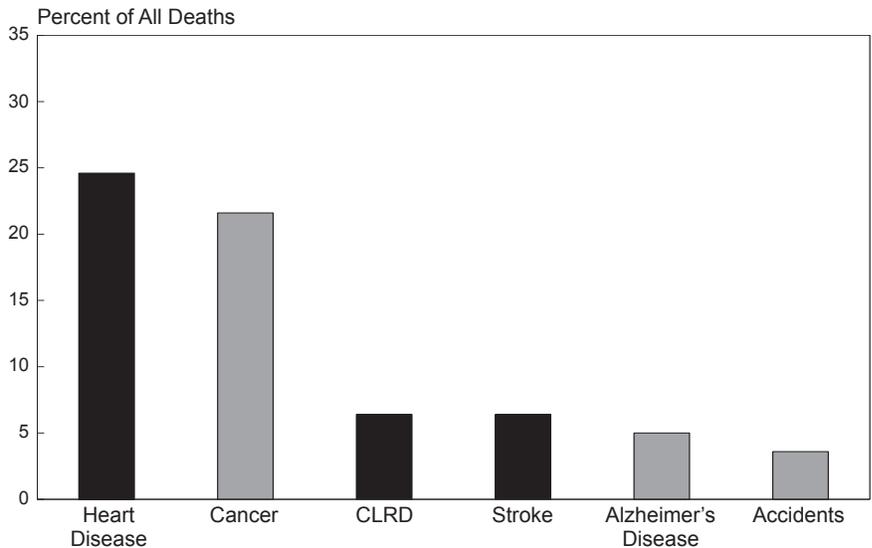
Background Data

Chart 2–12
Leading Causes of Death,
Black Males, U.S., 2008

Percent of All Deaths
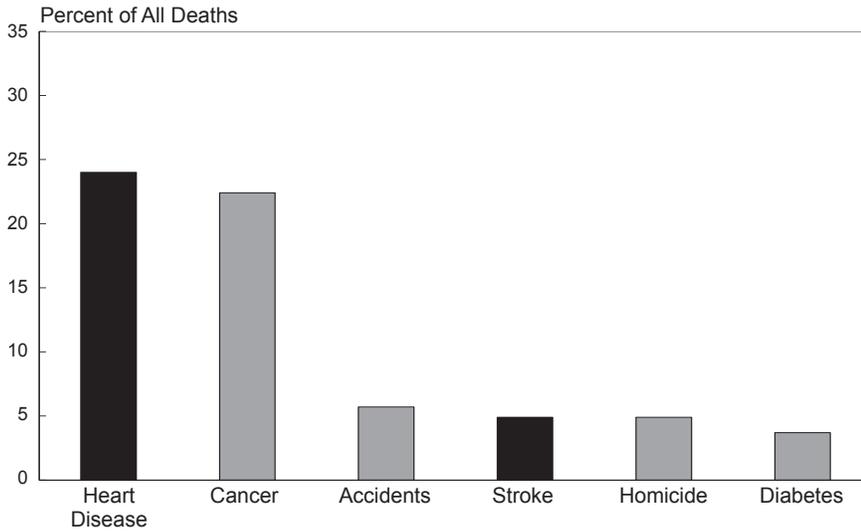
In 2008, among black males, heart disease and stroke were the first and fourth leading causes of death, respectively.[31]

Chart 2–13
Leading Causes of Death,
Black Females, U.S., 2008

Percent of All Deaths
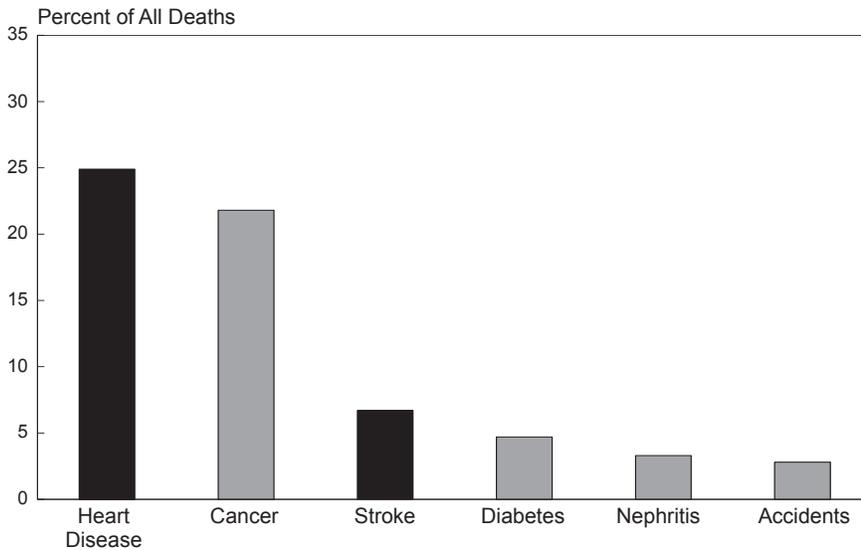
In 2008, among black females, heart disease and stroke were the first and third leading causes of death, respectively.[31]

Background Data

Chart 2–14
Leading Causes of Death,
Asian Males, U.S., 2008

In 2008, among Asian males, heart disease, stroke, and CLRD were the second, third, and sixth leading causes of death, respectively.[31]

Percent of All Deaths
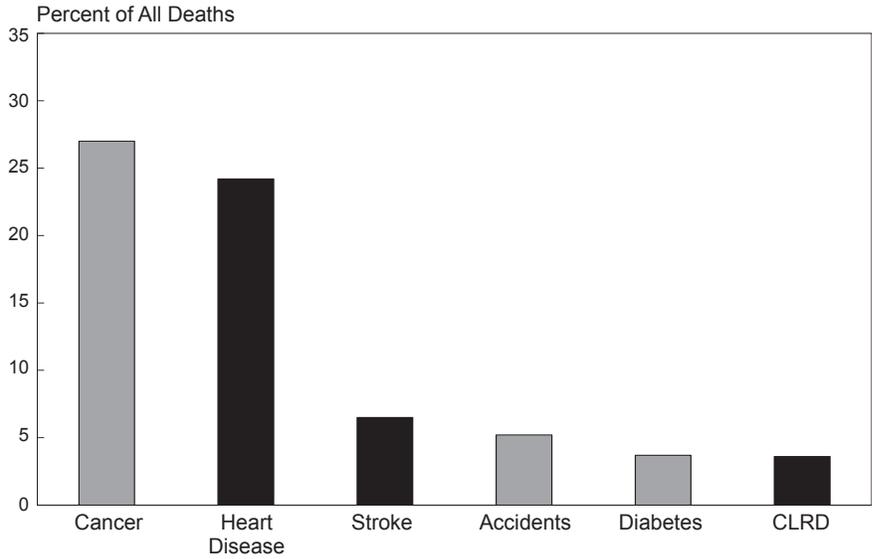
Chart 2–15
Leading Causes of Death,
Asian Females, U.S., 2008

In 2008, among Asian females, heart disease and stroke were the second and third leading causes of death, respectively.[31]

Percent of All Deaths
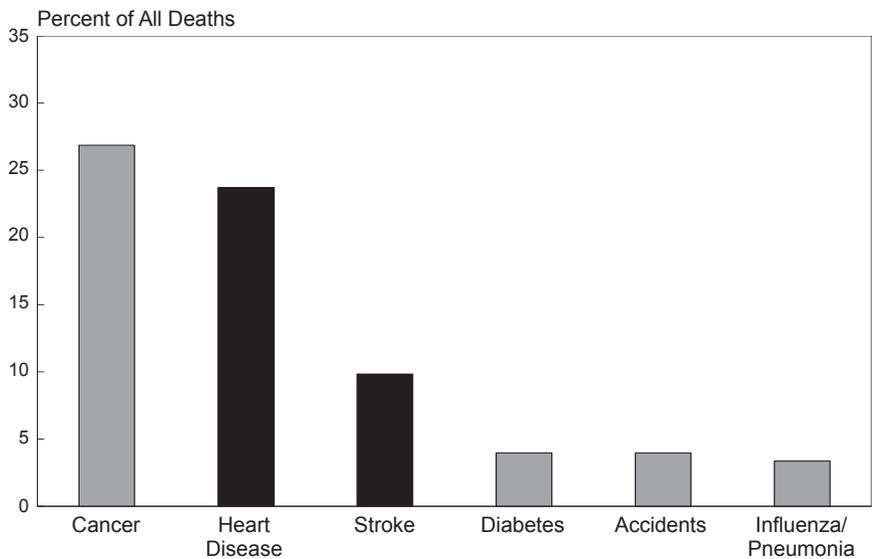
Background Data

Chart 2–16
Leading Causes of Death,
Hispanic Males, U.S., 2008

Percent of All Deaths
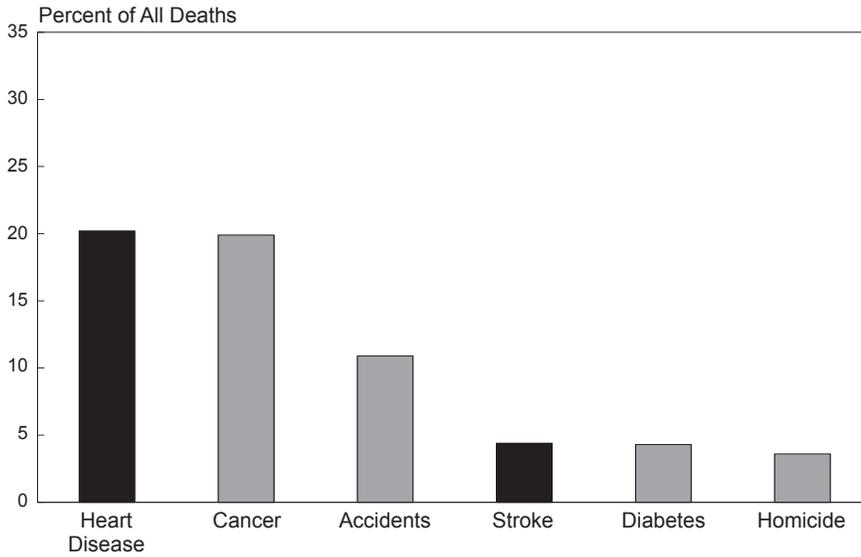
In 2008, among Hispanic males, heart disease and stroke were the first and fourth leading causes of death, respectively.[31]

Chart 2–17
Leading Causes of Death,
Hispanic Females, U.S., 2008

Percent of All Deaths
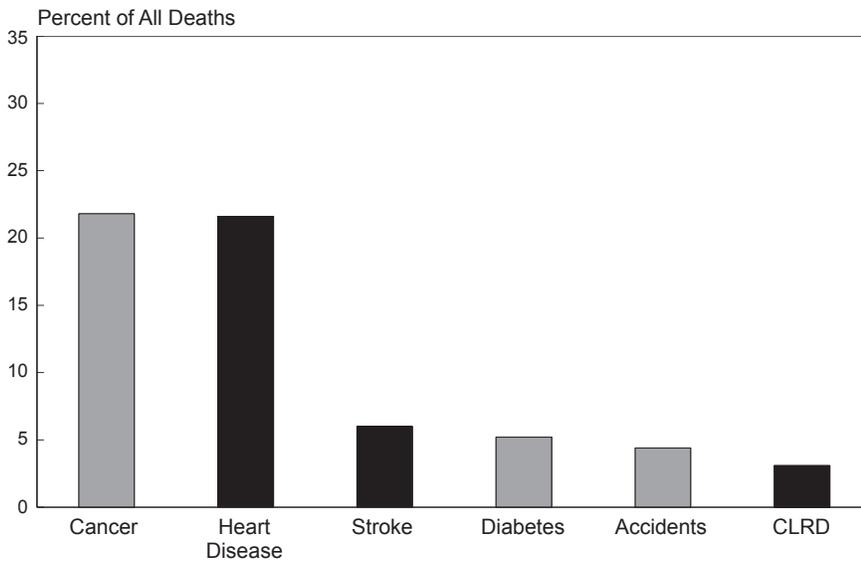
In 2008, among Hispanic females, heart disease, stroke, and CLRD were the second, third, and sixth leading causes of death, respectively.[31]

13

Background Data

Chart 2–18
Leading Causes of Death,
American Indian Males, U.S., 2008

In 2008, among American Indian males, heart disease was the leading cause of death.[31]

Percent of All Deaths

Heart Disease	
Cancer	
Accidents	
Chronic Liver Disease	
Diabetes	
Suicide	
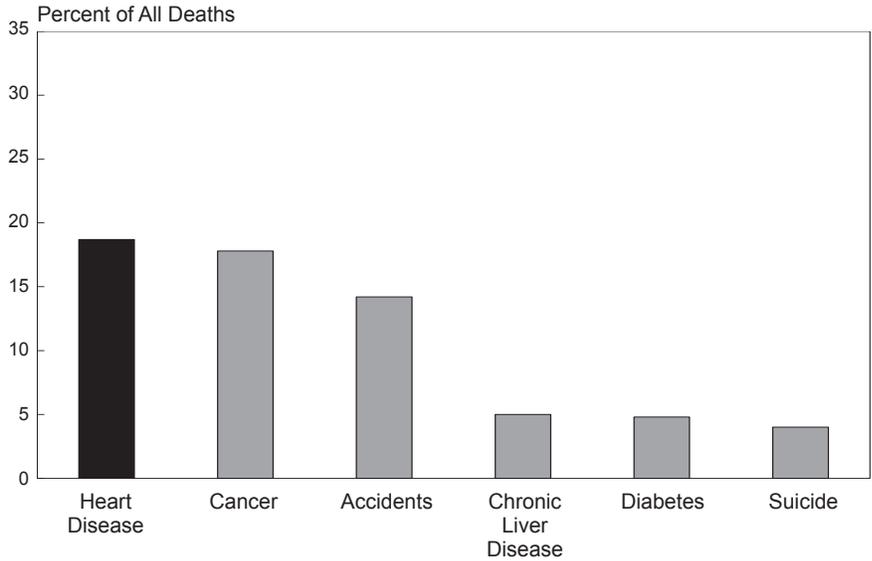
Chart 2–19
Leading Causes of Death,
American Indian Females, U.S., 2008

In 2008, among American Indian females, heart disease and CLRD were the second and sixth leading causes of death, respectively.[31]

Percent of All Deaths

Cancer	
Heart Disease	
Accidents	
Diabetes	
Chronic Liver Disease	
CLRD	
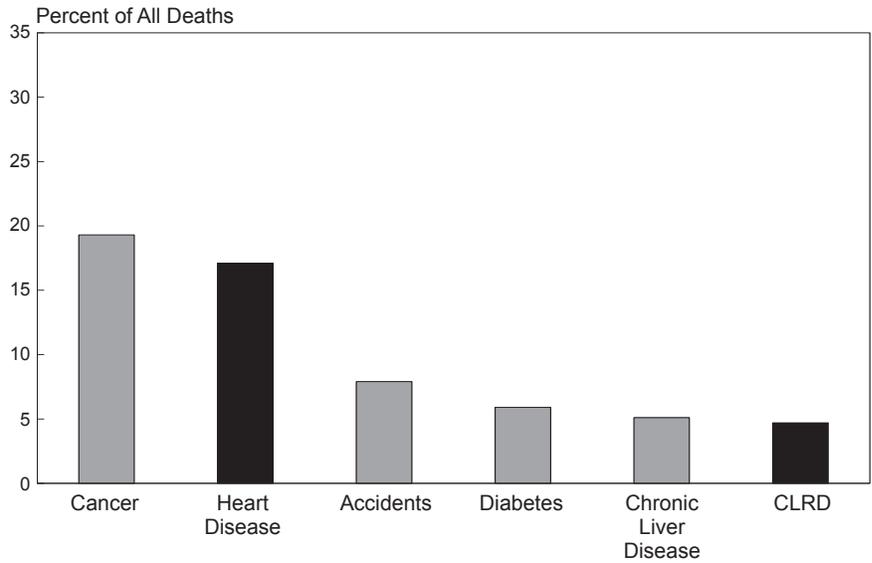
Background Data

Chart 2–20
Prevalence of Leading Chronic Conditions
Causing Limitation of Activity, U.S., 2010

Chronic Condition	Prevalence (Millions)
Back/neck conditions	7.5
Arthritis/rheumatism	6.8
Heart condition	**4.2**
Depression/anxiety	4.0
Musculoskeletal condition	3.8
Diabetes	3.6
Hypertension	**3.6**
Nervous system problem	3.3
Lung/breathing problem	**3.1**
Fracture/bone/joint injury	2.8
Vision problem	2.3
Stroke	**1.7**
Cancer	1.5

In 2010, heart disease was the third most prevalent chronic condition causing activity limitation. Hypertension, lung conditions, and stroke were also common.[25]

Chart 2–21
Age-Adjusted Percent of Population Currently Smoking
by Race and Sex, Ages 18 and Older, U.S., 1965–2010
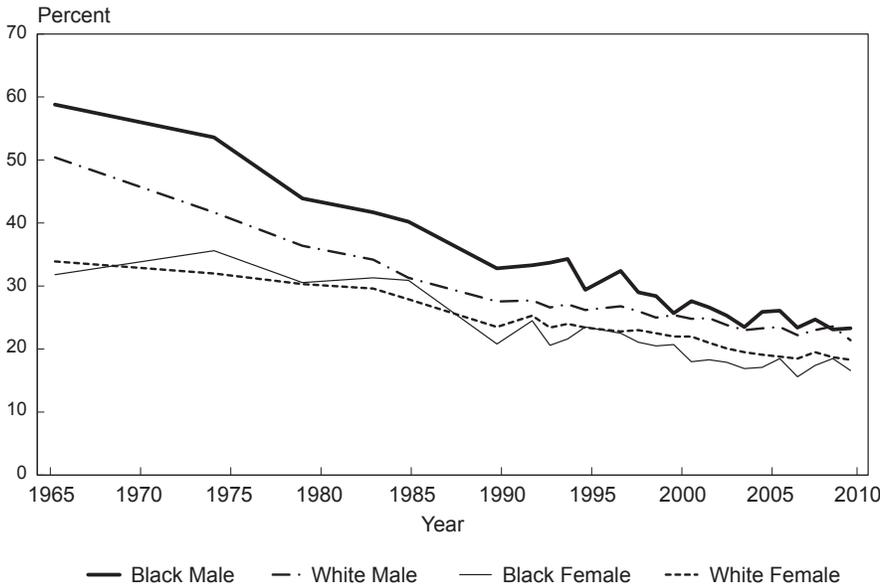
From 1965 to 1990, the percent of the population aged 18 years and older who reported that they smoke cigarettes decreased significantly.[25] From 1991 to 2010, the percent of the population who reported that they smoke declined modestly.[25, 33]

Background Data

Chart 2–22
Age-Adjusted Percent of Population With High
Serum Cholesterol* by Race and Sex, Ages
20–74, U.S., 1976–1980 to 2005–2008

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]

Percent

■ 1976–1980 □ 1988–1994 ▦ 1999–2004 ▪ 2005–2008
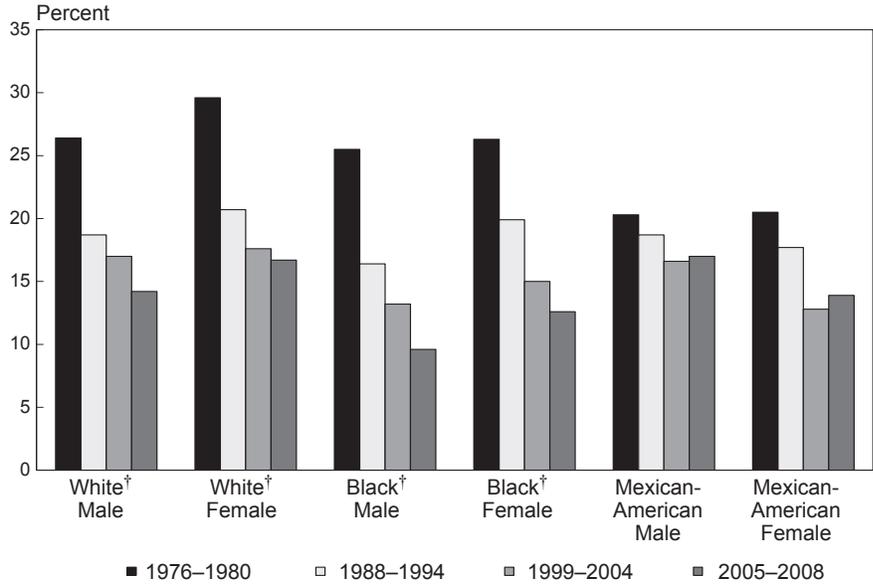
* High serum cholesterol is ≥240 mg/dL.
† Non-Hispanic.

Chart 2–23
Age-Adjusted Percent of Population That Is
Overweight* by Race and Sex, Ages 20–74,
U.S., 1976–1980 to 2005–2008

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

Percent

■ 1976–1980 □ 1988–1994 ▦ 1999–2004 ▪ 2005–2008
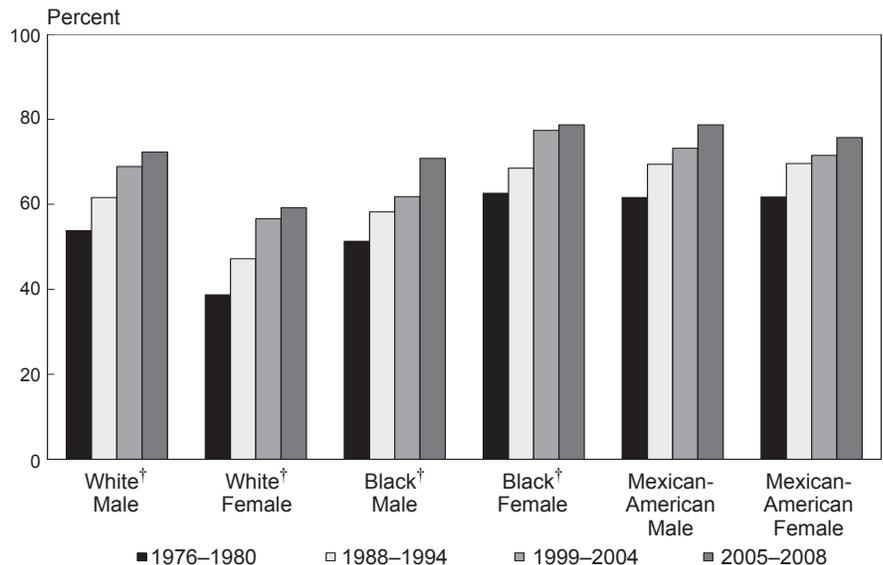
* Overweight (including obesity) is a body mass index of ≥25 kg/m^2.
† Non-Hispanic.

Background Data

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

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

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

Disease	Dollars (Billions)					
	Total	Hospital Inpatient Stays	Emergency Room Visits	Outpatient or Office-Based Providers	Prescription Medicines	Home Heath Care
Total CVD	179.3	79.7	10.8	36.4	33.0	19.5
Heart disease	95.6	54.0	7.3	16.9	9.7	7.6
Stroke	18.8	9.1	0.9	1.8	1.2	5.8
Hypertension	47.4	6.2	1.7	13.0	21.3	5.1
Other CVD	17.5	10.4	0.9	4.7	0.7	0.8
Hyperlipidemia	38.6	1.3	0.1	9.0	27.1	1.0
COPD/asthma	53.7	13.1	3.1	13.2	20.4	4.0
Pneumonia	14.0	11.9	0.6	0.8	0.3	0.5
Anemias	4.7	3.2	0.1	1.1	0.2	0.2

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.[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.[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
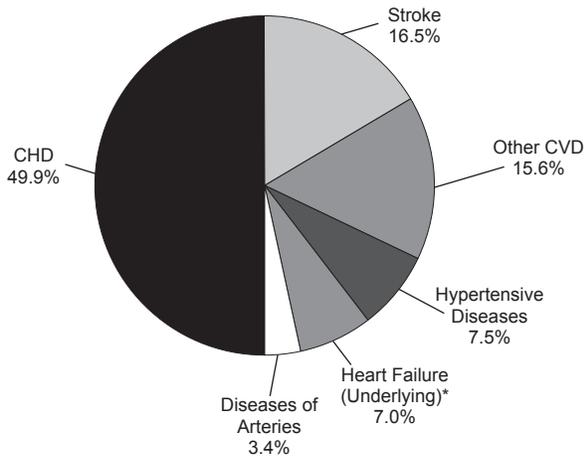
Stroke
16.5%

Other CVD
15.6%

CHD
49.9%

Hypertensive
Diseases
7.5%

Heart Failure
(Underlying)*
7.0%

Diseases of
Arteries
3.4%

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

Other
Hemorrhage
20.7%

Stroke,
Unspecified
52.7%

Other
Cerebrovascular
17.6%

Cerebral
Infarction
4.9%

Subarachnoid
Hemorrhage
4.1%
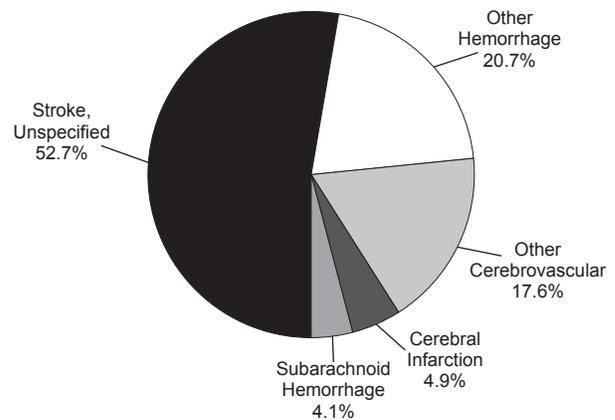
Total deaths = 134,148 (100%).
Compiled from Vital Statistics of the United States, NCHS.

Chart 3–2
Deaths From Heart Disease, Percent by Subgroup, U.S., 2008
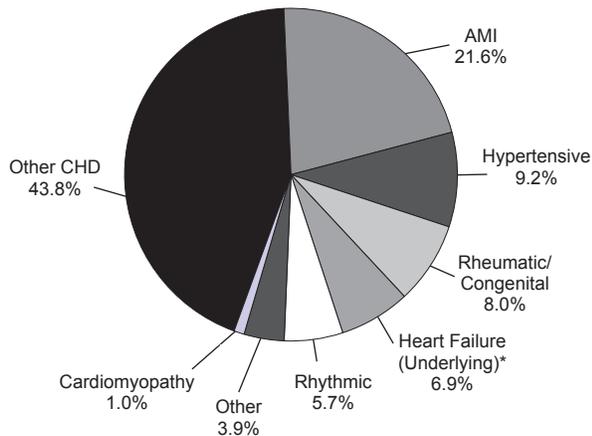
AMI
21.6%

Hypertensive
9.2%

Other CHD
43.8%

Rheumatic/
Congenital
8.0%

Heart Failure
(Underlying)*
6.9%

Cardiomyopathy
1.0%

Other
3.9%

Rhythmic
5.7%

* 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.

Cardiovascular Diseases

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

| Diagnostic Category | ICD-9-CM Codes | Hospitalizations for 2009 | | Physician Office Visits for 2009 (1,000) | ICD-10 Codes | Deaths for 2008 |
		First-Listed Discharges (1,000)	Length of Stay (Days)			
Total	390–405, 410–449, 451–459, 745–747	6,217	4.7	94,871	I00–I99, Q20–Q28	811,940
Heart disease:	390–398, 402, 404, 410–429	3,994	4.6	27,697	I00–I09, I11, I13, I20–I51	616,828
Rheumatic heart disease	390–398	38	7.5	254	I00–I09	3,141
Hypertensive heart disease	402, 404	84	5.3	334	I11, I13	35,263
Coronary heart disease:	410–414, 429.2	1,537	4.1	12,817	I20–I25	405,309
AMI	410	634	5.0	311	I21, I22	133,958
Angina pectoris, stable	413	34	4.9	931	I20.1–I20.9	126
Angina pectoris, unstable	411	49	2.2	91	I20.0	36
Atherosclerotic CVD	429.2	—	—	—	I25.0	58,625
Other CHD	412, 414	820	3.5	11,484	Other I23–I25	212,564
Diseases of pulmonary circulation:	415–417	182	5.8	590	I26–I28	12,927
Pulmonary embolism	415.1	158	5.7	487	I26	7,158
Other	415.0, 415.2–417	24	6.9	103	I27–I28	5,769
Subacute bacterial endocarditis	421	11	13.5	7	I33.0	1,143
Cardiomyopathy	425	52	4.6	841	I42	23,932
Atrial fibrillation and flutter	427.3	467	4.1	5,560	I48	15,383
Other arrythmic disorders	Other 427	323	3.5	2,276	Other I43–I49	27,299
Heart failure:	428	1,094	5.2	3,041	I50	56,830
Congestive heart failure	428.0	468	5.0	2,996	I50.0	51,693
Left heart failure and unspecified	428.1–428.9	626	5.4	46	I50.1–I50.9	5,137
Other heart disease	Other 420–429	206	5.8	1,976	Other I30–I51	35,601
Other hypertensive disease	401, 403, 405	499	3.3	53,586	I10, I12, I15	25,742
Cerebrovascular diseases (stroke)	430–438	971	5.3	3,327	I60–I69	134,148
Diseases of arteries:	440–449	331	5.9	2,948	I70–I78	27,765
Peripheral arterial disease	440.20–440.24, 440.30–440.32, 440.4, 440.9, 443.9, 445.02	166	6.0	1,155	I70.2, I70.9, I73.9, I74.3, I74.4	14,501
Aortic aneurysm	441	84	5.7	684	I71	11,079
Other diseases of arteries	Other 440–449	82	5.7	1,108	Other I70–I78	2,185
Deep vein thrombosis	451.1	3	4.3	148	I80.2	2,352
Other and unspecified CVD	Other 451–459	368	4.0	6,782	Other I80–I99	1,690
Congenital malformations of CV system:	745–747	52	7.3	383	Q20–Q28	3,415
Congenital heart disease	745, 746	35	6.5	280	Q20–Q24	2,746
Other congenital cardiovascular disease	747	17	8.8	103	Q25–Q28	669

* 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 comparability ratio 1.0502 was applied to the death rates reported in vital statistics for 1979–1998.
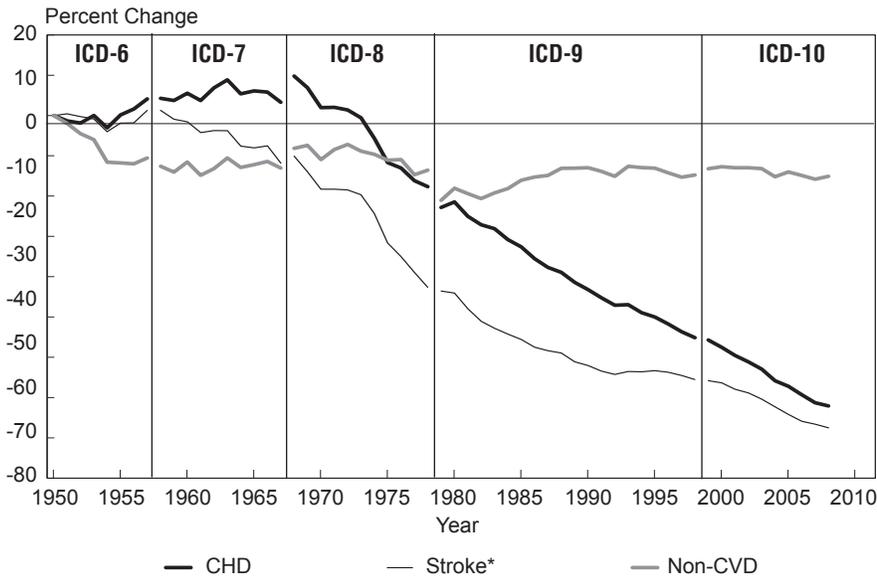
The death rate for CHD increased almost 10% from 1950 to its peak in 1968; by 2008, it was approximately 72% lower than it was in 1950. Stroke mortality, on the other hand, declined for most of those years and by 2008 was 77% lower than it was in 1950. By comparison, the death rate for non-CVD causes in 2008 decreased by only 15% since 1950.[30, 31]

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

Cause of Death	Deaths/100,000 Pop.		1968–2008 Difference	Percent Change
	1968	2008		
All causes	1,304.5	758.4	-546.1	-41.9
CVD*	759.5	244.8	-514.7	-67.8
CHD	482.6	122.7	-359.9	-74.6
Stroke	162.5	40.7	-121.8	-75.0
Other CVD	114.4	81.4	-33.0	-28.8
Non-CVD	545.0	513.6	-31.4	-5.8

* Excludes congenital malformations of the circulatory system.

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]

Cardiovascular Diseases

Chart 3–7
Average Annual Percent Change in Age-Adjusted Death Rates for All Causes and Cardiovascular Diseases, U.S., 1968–2008

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.[30, 31]

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

* 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

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.[30, 31]

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

* Excludes congenital malformations of the circulatory system.

Cardiovascular Diseases

Chart 3–9
Deaths and Age-Adjusted Death Rates for
Cardiovascular Diseases, U.S., 1979–2008
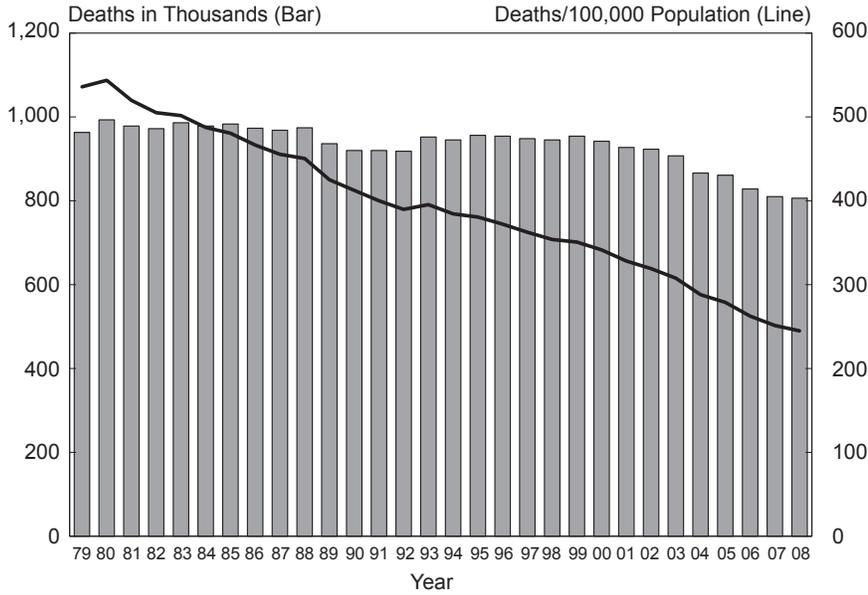
Although age-adjusted death rates for CVD declined considerably between 1979 and 2008, the total number of CVD deaths did not begin to decline until 2000.[30, 31]

Chart 3–10
Percent of All Deaths Due to Cardiovascular
Diseases* by Age, U.S., 2008
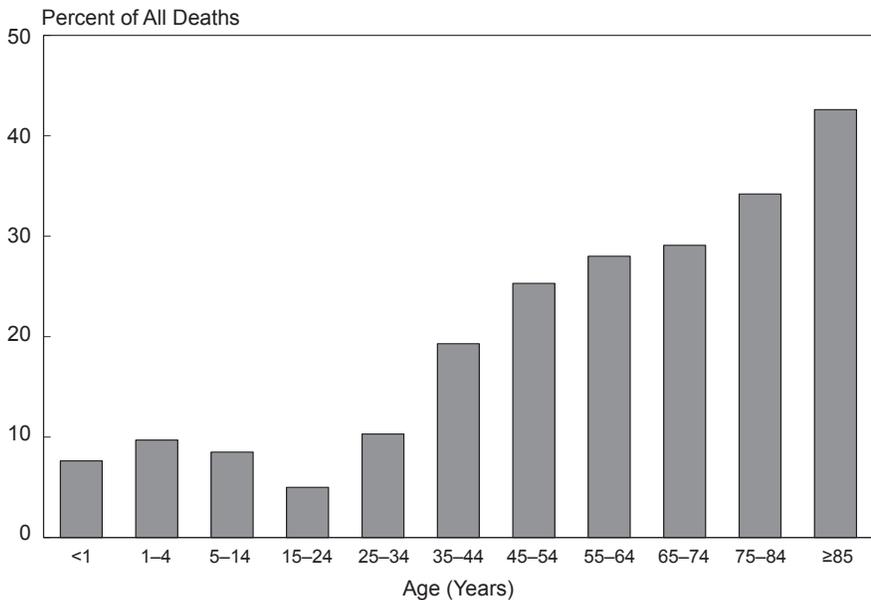
In 2008, the percent of deaths due to CVD increased with age among adults: more than 19% for those aged 35–44 years and nearly 43% for those aged 85 years and older.[31]

* Includes congenital malformations of the circulatory system.

Cardiovascular Diseases

Chart 3–11
Age-Adjusted Death Rates for Cardiovascular Diseases*
by State, U.S., 2005–2007

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

Deaths/100,000 Population
- 290–355 (10)
- 269–289 (10)
- 241–268 (10)
- 229–240 (9)
- 195–228 (11)
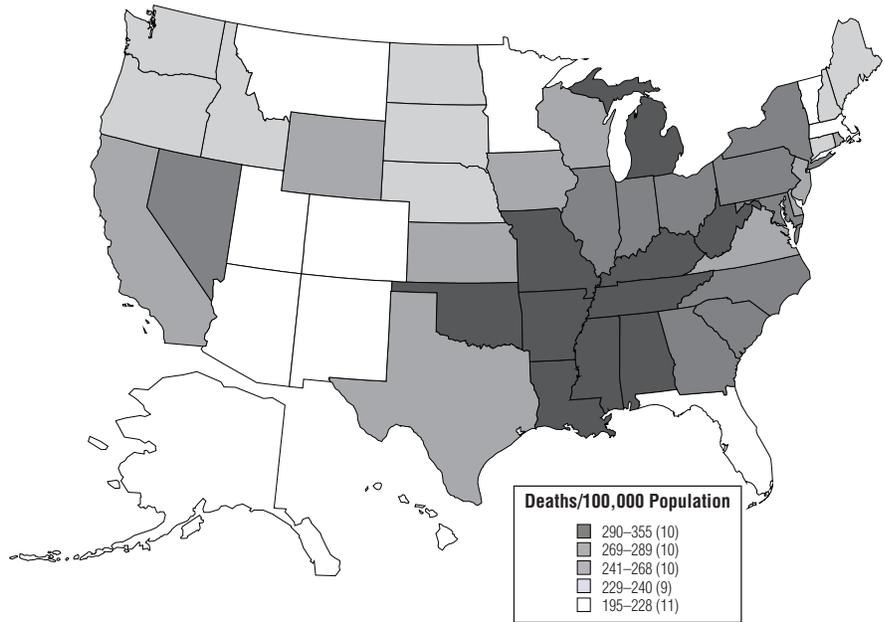
* Excludes congenital malformations of the circulatory system.

Chart 3–12
Percent Decline in Age-Adjusted Death Rates for
Cardiovascular Diseases* by State, U.S., 1996–1998 to 2005–2007

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

Percent Decline
- 31.0–35.4 (11)
- 29.7–30.9 (9)
- 27.9–29.6 (10)
- 26.1–27.8 (9)
- 19.1–26.0 (11)
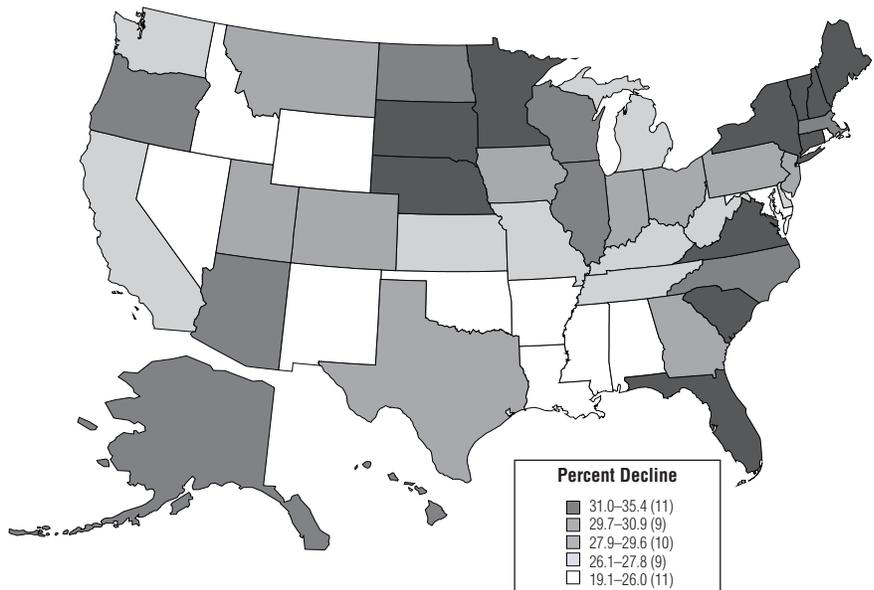
* Excludes congenital malformations of the circulatory system.

Heart Disease

Chart 3–13
Age-Adjusted Death Rates for Heart Disease
by Race/Ethnicity and Sex, U.S., 2008

Deaths/100,000 Population

■ Total　■ Black*　□ White*　■ American Indian　■ Hispanic　■ Asian
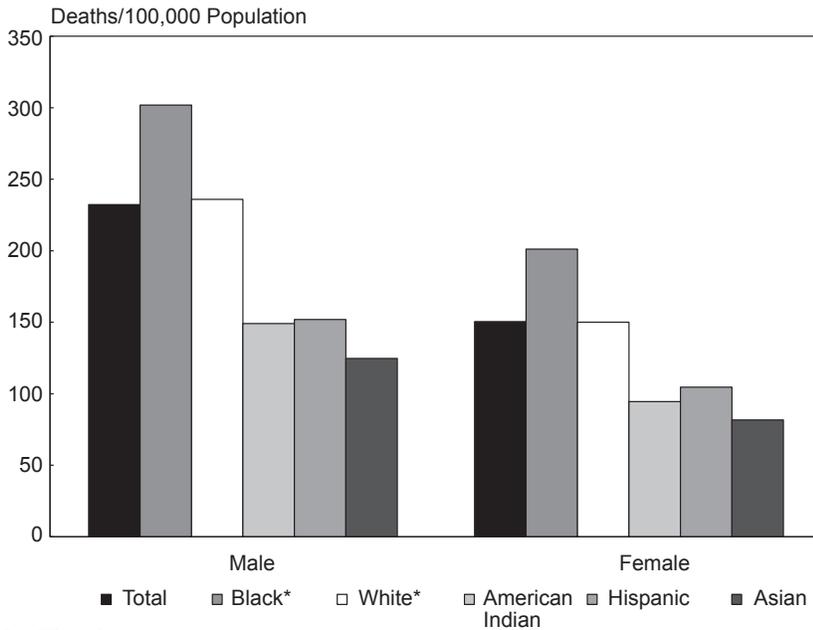
* Non-Hispanic.

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.[31]

Chart 3–14
Death Rates for Heart Disease in Males
by Age and Race/Ethnicity, U.S., 2008

Deaths/100,000 Population

Age (Years)

—— Black*　—·White*　—— American Indian　---- Hispanic　—— Asian
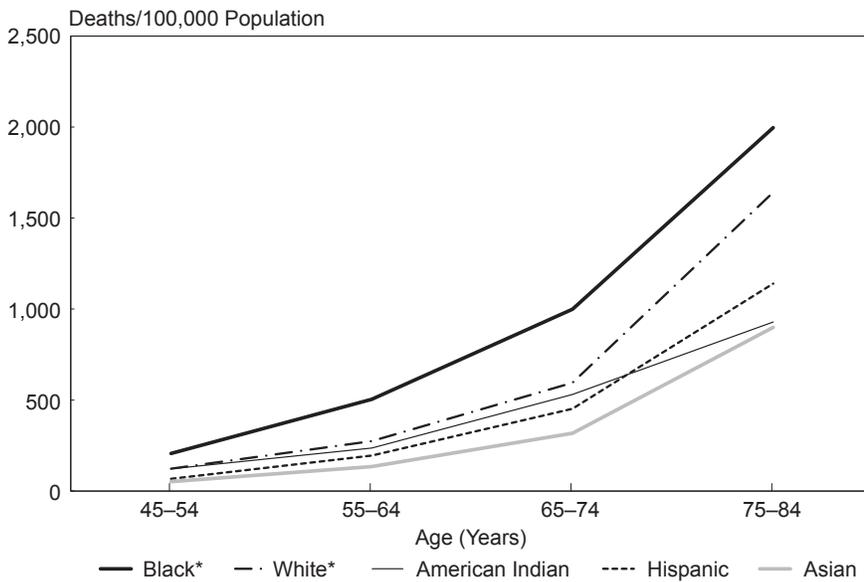
* Non-Hispanic.

In 2008, heart disease mortality in males was highest in non-Hispanic blacks across all age groups.[31]

Heart Disease/Coronary Heart Disease

Chart 3–15
Death Rates for Heart Disease in Females
by Age and Race/Ethnicity, U.S., 2008

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).[31]

Deaths/100,000 Population

Age (Years)

Black*   White*   American Indian   Hispanic   Asian
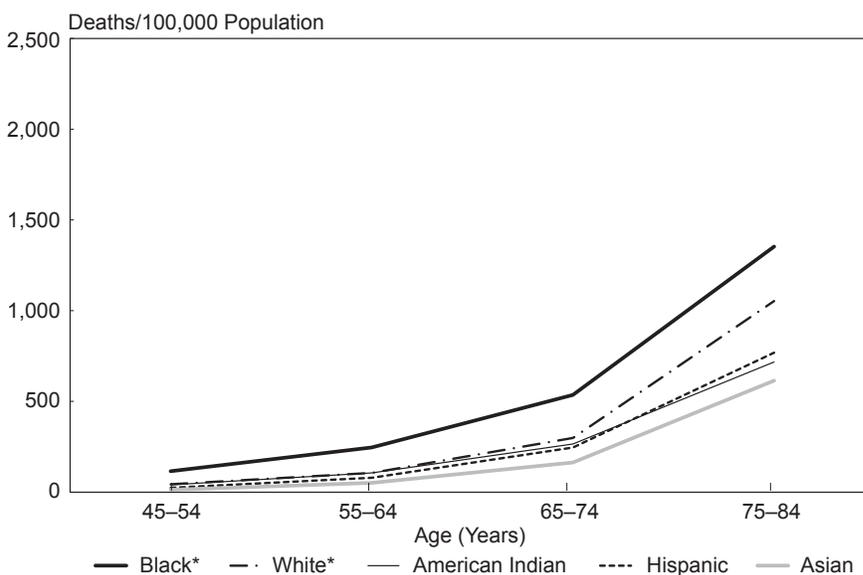
* Non-Hispanic.

Chart 3–16
Age-Adjusted Prevalence of Acute Myocardial Infarction by
Race and Sex, Ages 25–74, U.S., 1971–1975 to 2005–2008

From 1971–1975 to 2005–2008, the prevalence of AMI declined in whites. In blacks, it rose from 1976–1980 to 1988–1994 but then declined through 2005–2008. The prevalence of AMI mostly declined from 1971–1975 to 2005–2008 in males, but only declined in 1976–1980 in females, followed by little change.[18]

Percent of Population

Black   White   Male   Female

■ 1971–1975   ■ 1976–1980   ▢ 1988–1994   ▢ 1999–2004   ■ 2005–2008
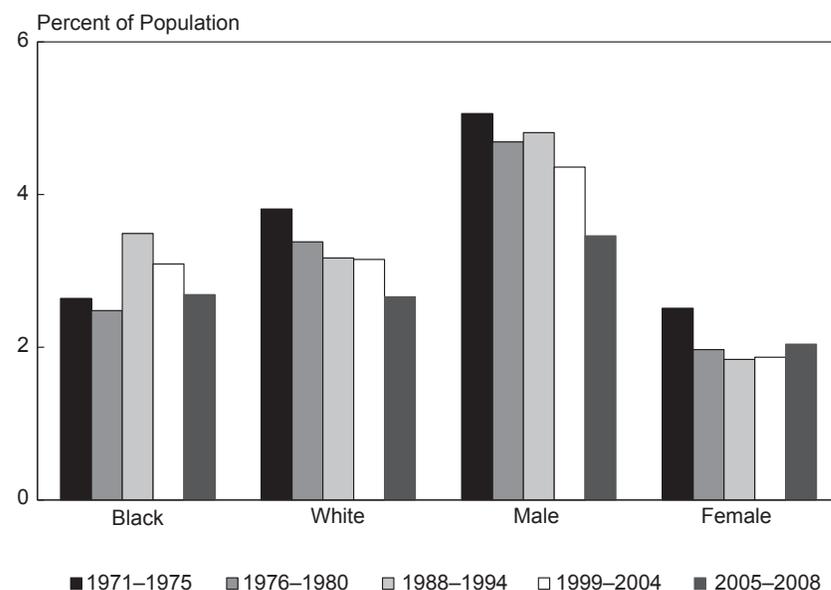
Coronary Heart Disease

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

Percent of Population
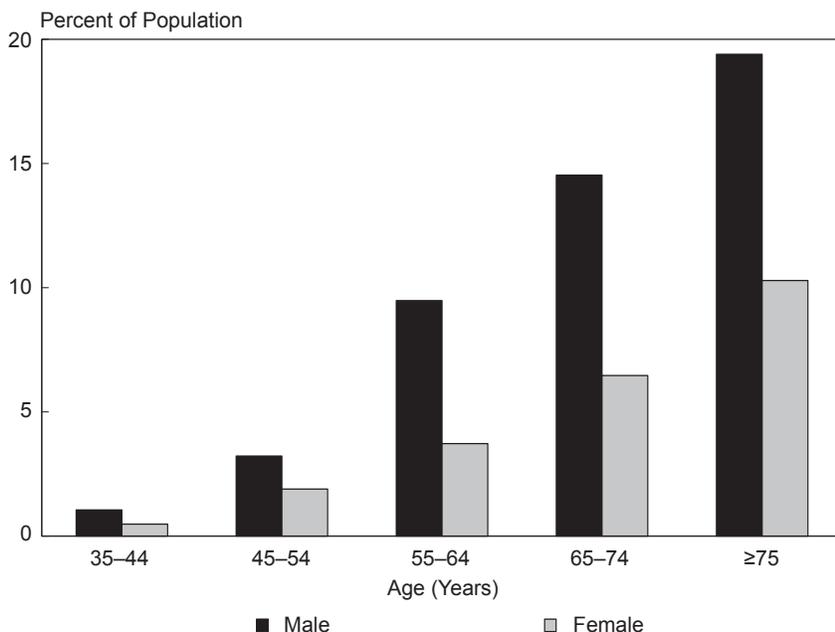
In 1999–2008, the prevalence of AMI was much higher in males than in females and increased substantially with age.[18]

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

Percent of Population
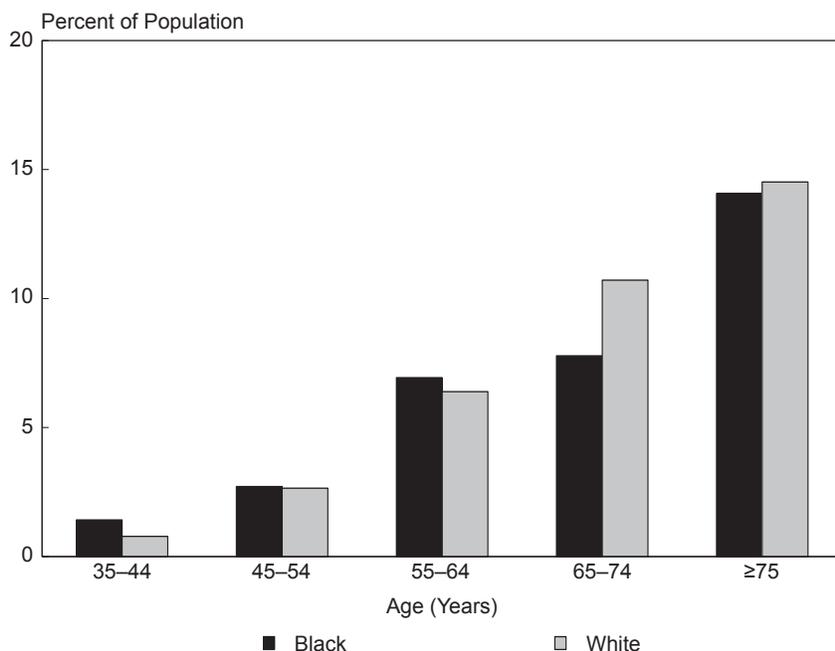
In 1999–2008, the prevalence of AMI was relatively similar between blacks and whites for three of the five age groups. For those in the 35–44 age group, the prevalence was 45% higher in blacks than in whites, but in the 65–74 age group, it was 27% higher in whites than in blacks.[18]

Coronary Heart Disease

Chart 3–19
Prevalence of Angina Pectoris by Age and Sex,
U.S., 2001–2008

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.[18]

Percent of Population

Age (Years)

■ Male   □ Female
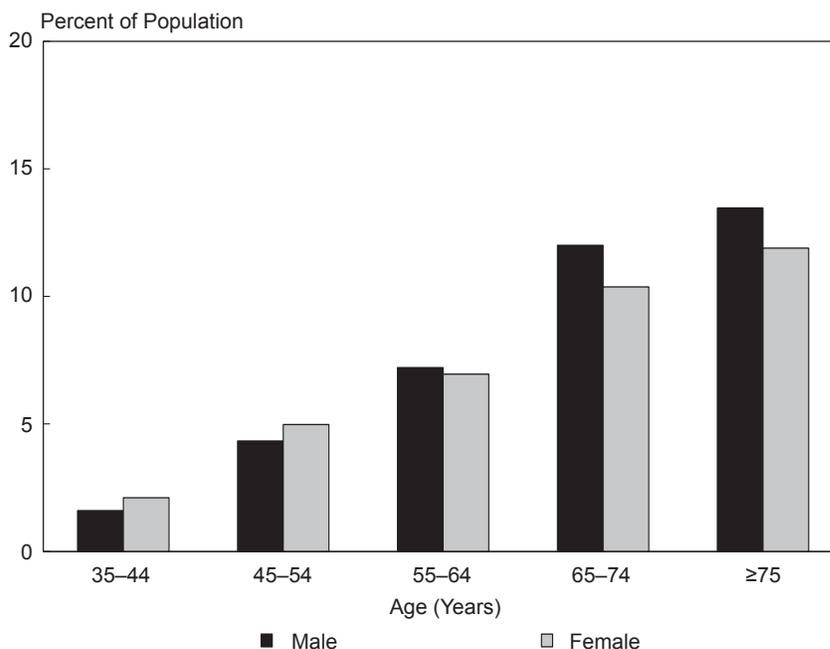
Chart 3–20
Prevalence of Angina Pectoris by Age and Race,
U.S., 2001–2008

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.[18]

Percent of Population

Age (Years)

■ Black   □ White
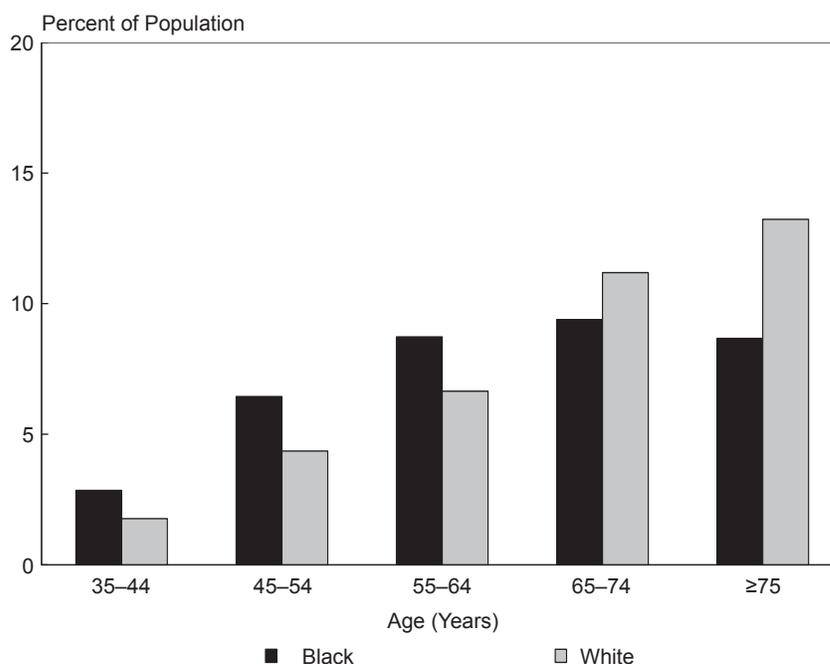
Coronary Heart Disease

Chart 3–21
Emergency Department Visit Rates for Coronary Heart Disease by Sex, U.S., 1997–1999 to 2006–2008

Visits/10,000 Population
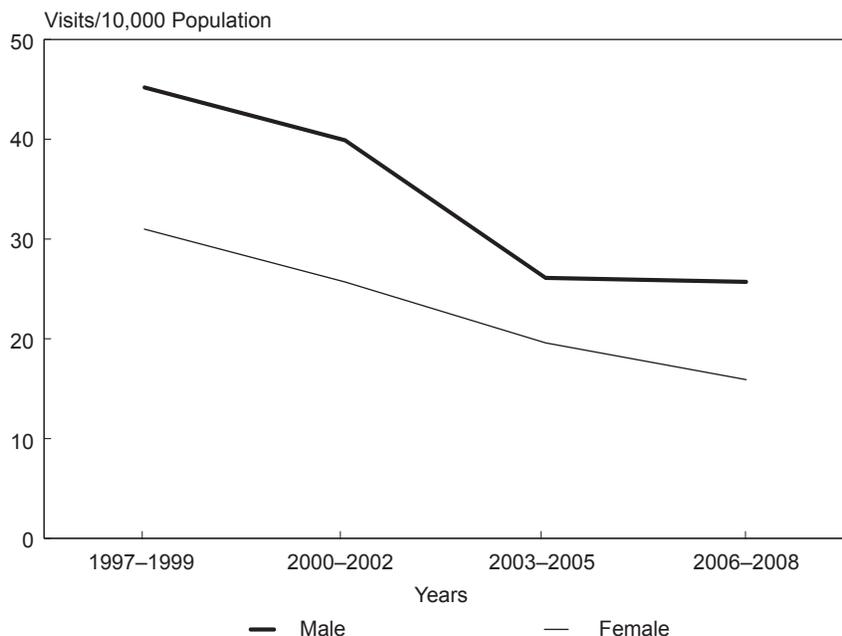
From 1997–1999 to 2006–2008, emergency department visit rates for CHD decreased more than 40% for males and about 50% for females.[35]

Chart 3–22
Hospitalization Rates for Acute Myocardial Infarction, Ages 45–64 and 65 and Older, U.S., 1965–2009

Hospitalizations/10,000 Population
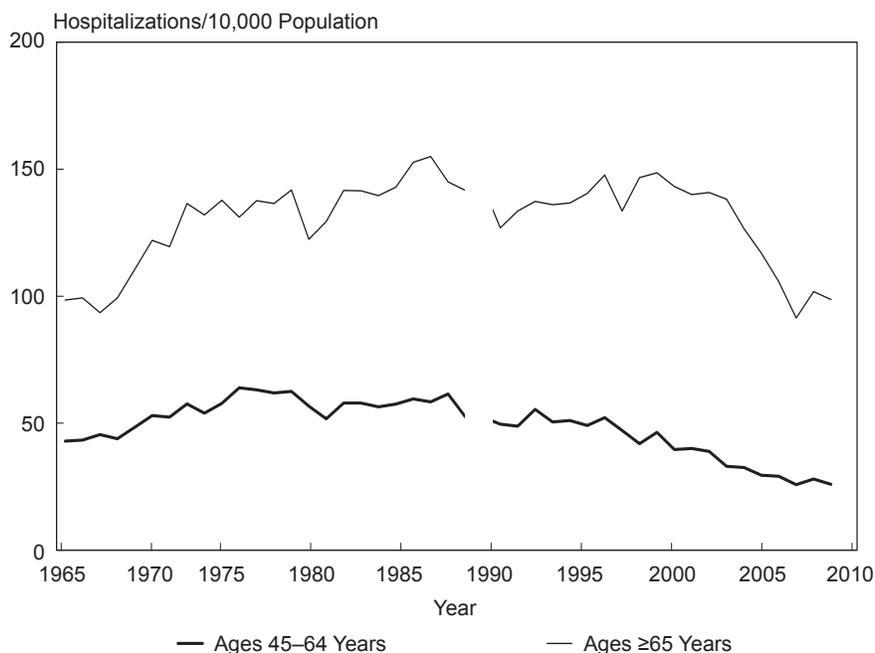
From 1965 to the mid-1970s, hospitalization rates for AMI increased for those aged 45–64 years and then remained stable before declining in the mid-1990s through 2009. For those aged 65 years and older, hospitalization rates increased from 1965 to 1986; the rates began to decline in the early 2000s and continued to decline through 2009.[32]

Coronary Heart Disease

Chart 3–23
Hospital Case-Fatality Rates for Acute Myocardial Infarction,
Ages Younger Than 65 and 65 and Older, U.S., 1970–2009

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.[32]

Percent Discharged Dead

— Ages <65 Years   — Ages ≥65 Years
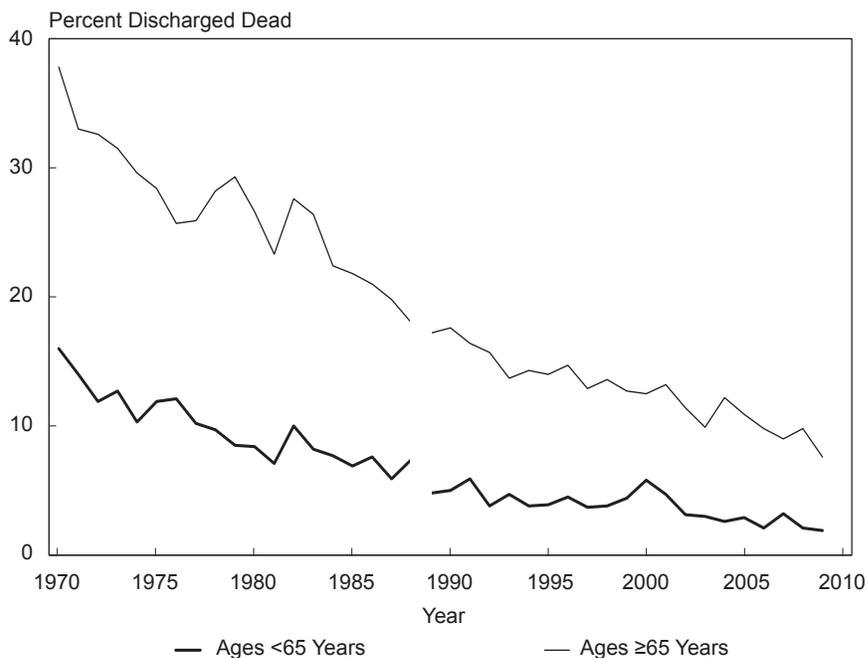
Chart 3–24
Age-Adjusted Death Rates for Coronary Heart Disease,
Actual and Expected, U.S., 1950–2008

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.[30, 31]

Deaths/100,000 Population

Peak minus actual
rates results in
1,174,000 fewer deaths
in 2008 than expected:
Actual: 405,000
Expected: 1,579,000

— Actual Rate   – – Rate if Rise Continued   — Peak Rate
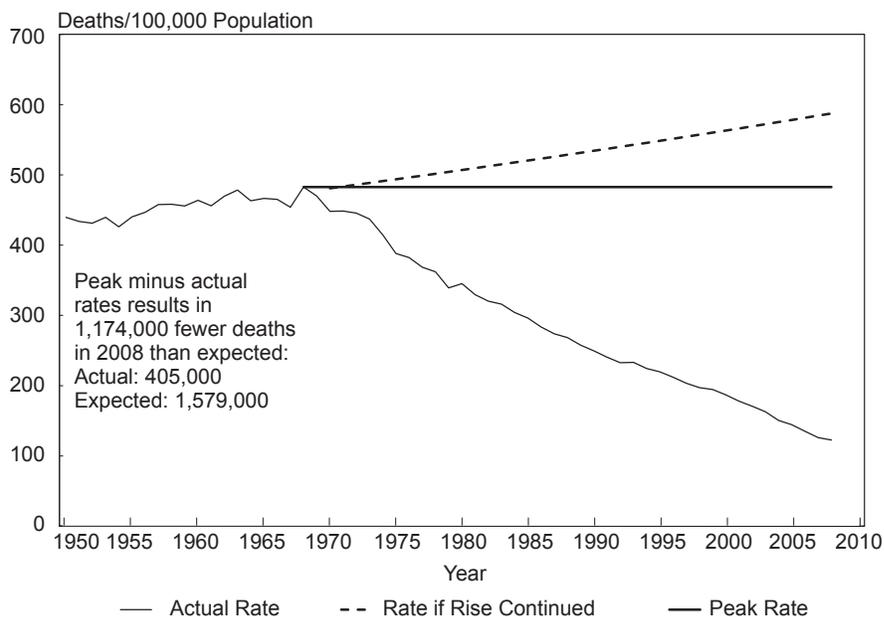
Coronary Heart Disease

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

Deaths/100,000 Population

Male   Female

Black*   White*   American Indian   Hispanic   Asian
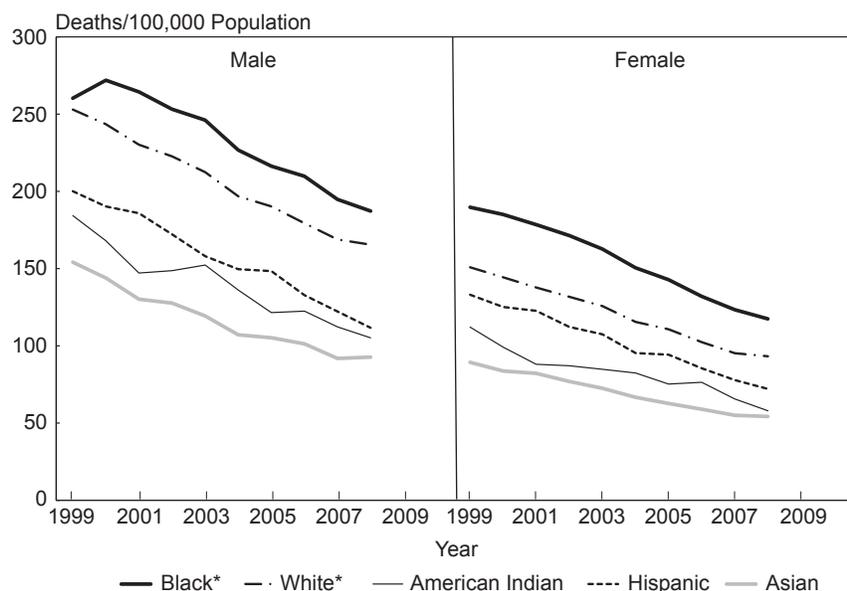
* Non-Hispanic.

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
by Race and Sex, U.S., 1950–2008

Deaths/100,000 Population

ICD-6   ICD-7   ICD-8   ICD-9   ICD-10

Black* Male   White Male   Black* Female   White Female

* Nonwhite from 1950 to 1967.
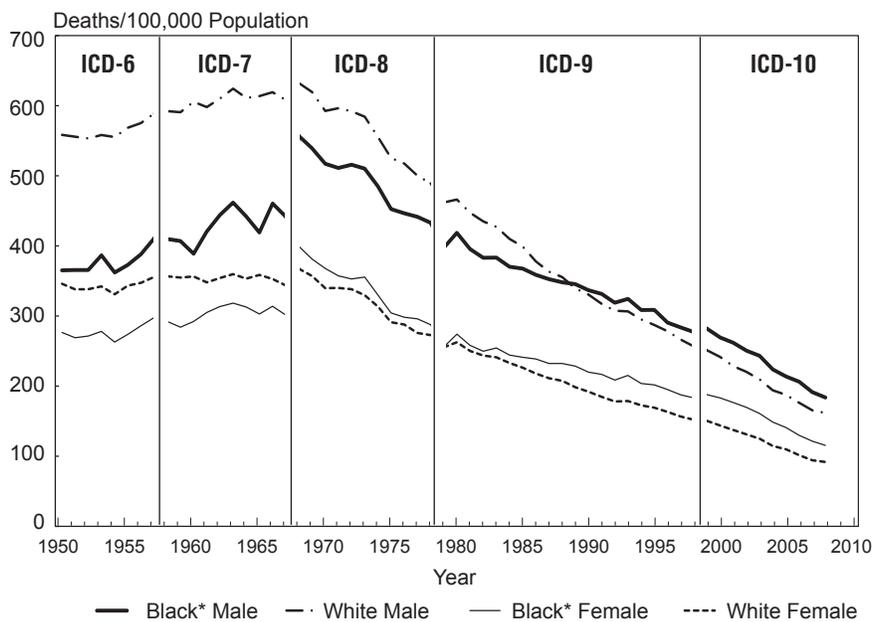
In the 1950s and 1960s, death rates for CHD increased in males, both black and white, and in black females, but were relatively stable in white females. Since then, rates for individual race and sex groups have declined appreciably.[30, 31]

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Coronary Heart Disease

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

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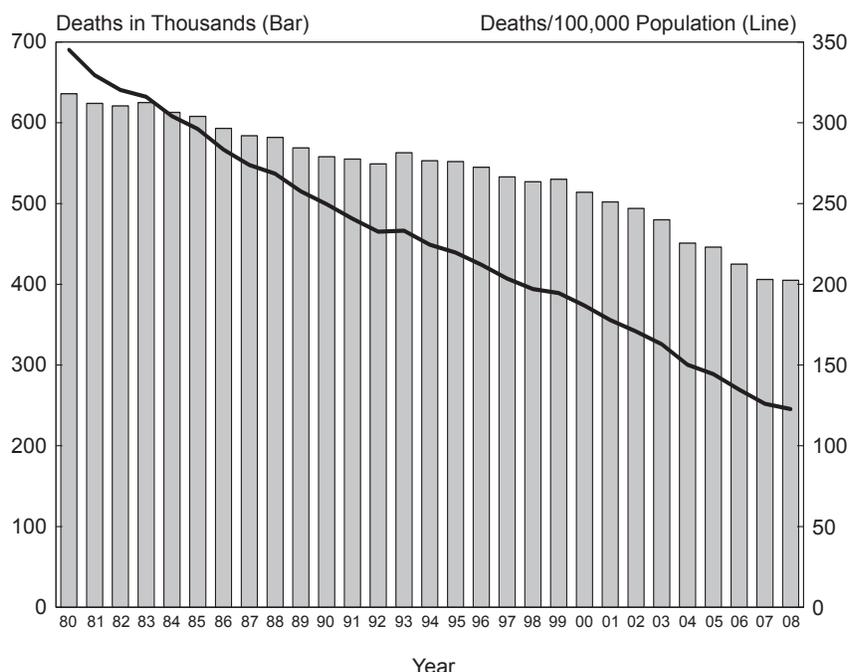
Chart 3–28
Average Annual Percent Change in Age-Adjusted Death Rates for
Coronary Heart Disease by Race and Sex, U.S., 1950–2008

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]

Years	Total Population	Black* Male	White Male	Black* Female	White Female
1950–1957	0.6	1.3	0.7	0.9	0.4
1958–1967	0.1	1.3	0.4	0.8	-0.2
1968–1978	-2.9	-2.5	-2.6	-3.3	-3.1
1979–1988	-2.8	-1.8	-3.1	-1.5	-2.6
1989–1998	-2.8	-2.4	-2.9	-2.3	-2.8
1999–2008	-5.2	-4.7	-5.0	-5.6	-5.6

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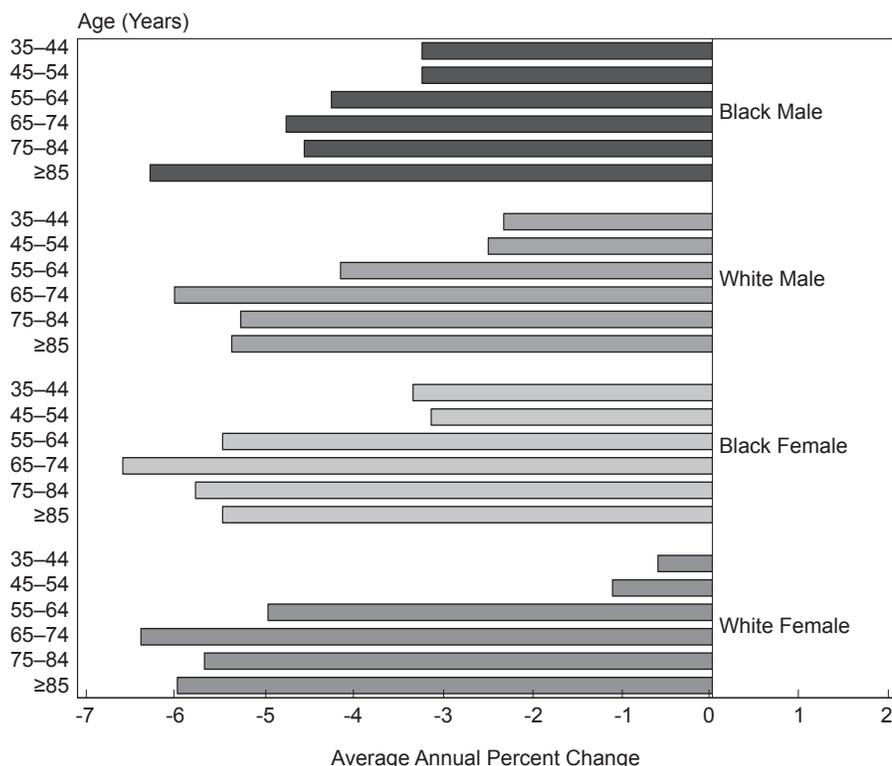
From 1999 to 2008, among blacks and whites and males and females, the average annual percent decline in CHD mortality was greater for those aged 55 years and older than for those aged 54 years and younger.[30, 31]

Chart 3–30
Age-Adjusted Death Rates for Coronary Heart Disease by Race/Ethnicity and Sex, U.S., 2008
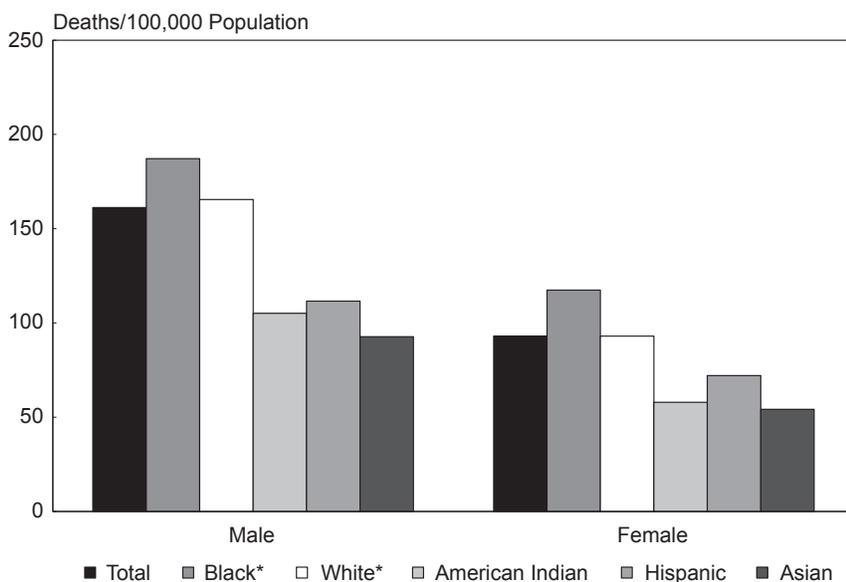
In 2008, CHD mortality was approximately 73% higher in males than in females. Within sex groups, it was highest in non-Hispanic blacks and lowest in Asians.[31]

* Non-Hispanic.

Coronary Heart Disease

Chart 3–31
Death Rates for Coronary Heart Disease in Males
by Age and Race/Ethnicity, U.S., 2008

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]

Deaths/100,000 Population

Age (Years)

—— Black* —·— White* —— American Indian ---- Hispanic —— Asian
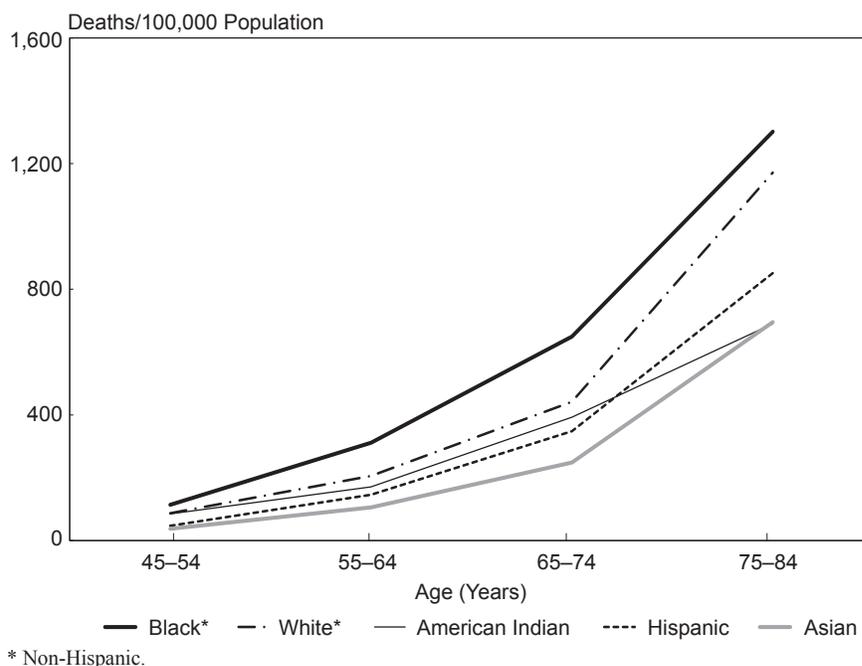
* Non-Hispanic.

Chart 3–32
Death Rates for Coronary Heart Disease in Females
by Age and Race/Ethnicity, U.S., 2008

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]

Deaths/100,000 Population

Age (Years)

—— Black* —·— White* —— American Indian ---- Hispanic —— Asian

* Non-Hispanic.
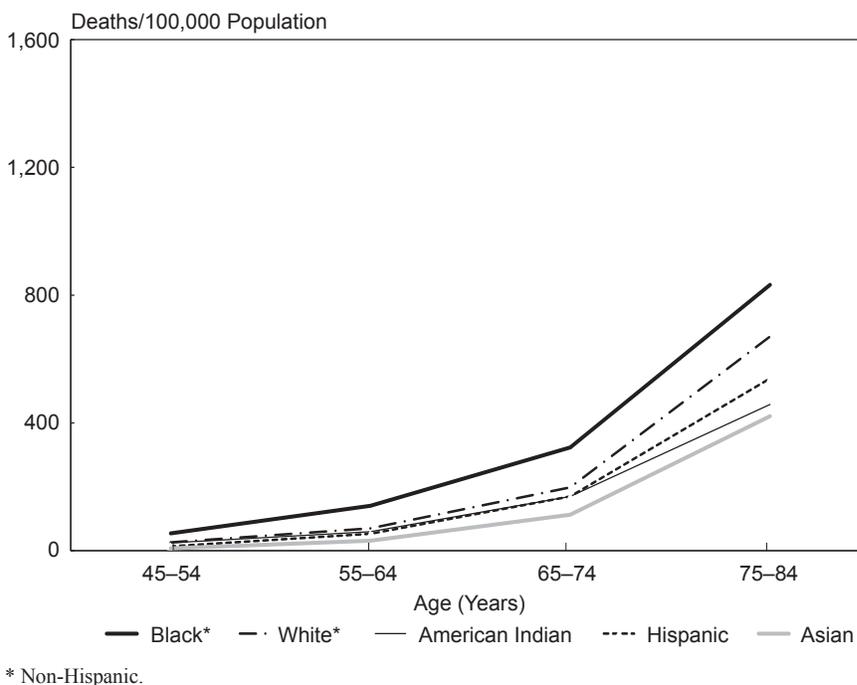
Coronary Heart Disease

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

Deaths/100,000 Population

■ 149.3–181.1 (10)
■ 134.9–149.2 (10)
■ 118.0–134.8 (10)
■ 108.4–117.9 (10)
□ 77.3–108.3 (10)
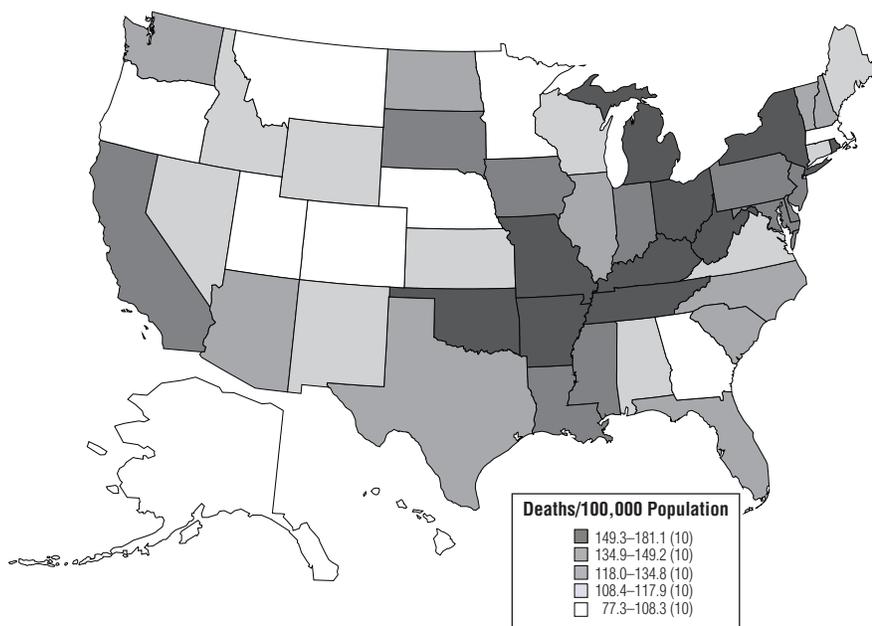
In 2005–2007, a narrow band of states from New York through Appalachia to Oklahoma had high CHD death rates. Many Western Mountain states had low CHD death rates.[16]

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

Deaths/100,000 Population
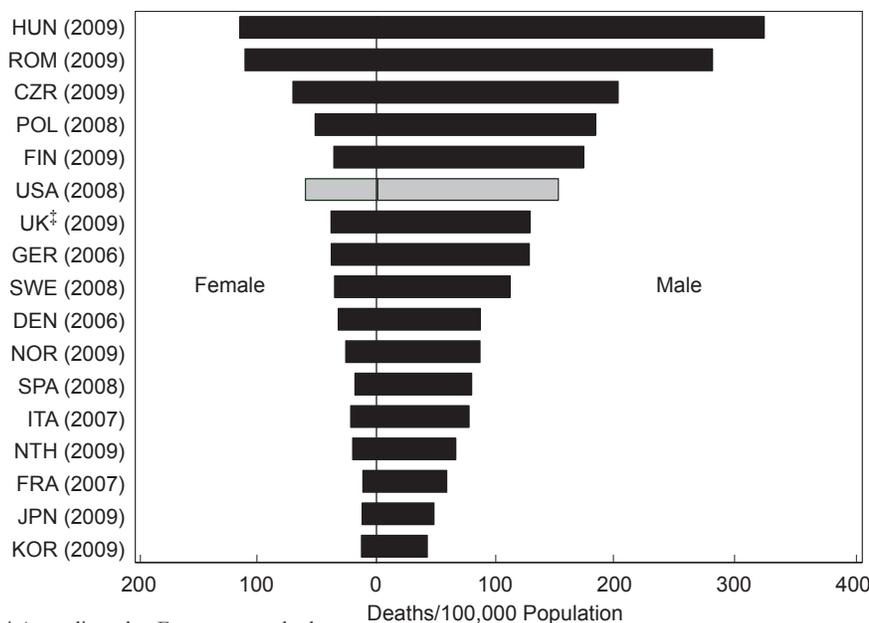
In 2006–2009, among 17 industrialized countries, the United States ranked sixth highest for CHD mortality in males and fourth highest in females.[36]

* 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

Chart 3–35
Change in Age-Adjusted Death Rates* for Coronary Heart Disease in Males by Country, Ages 35–74, 1999–2009[†]
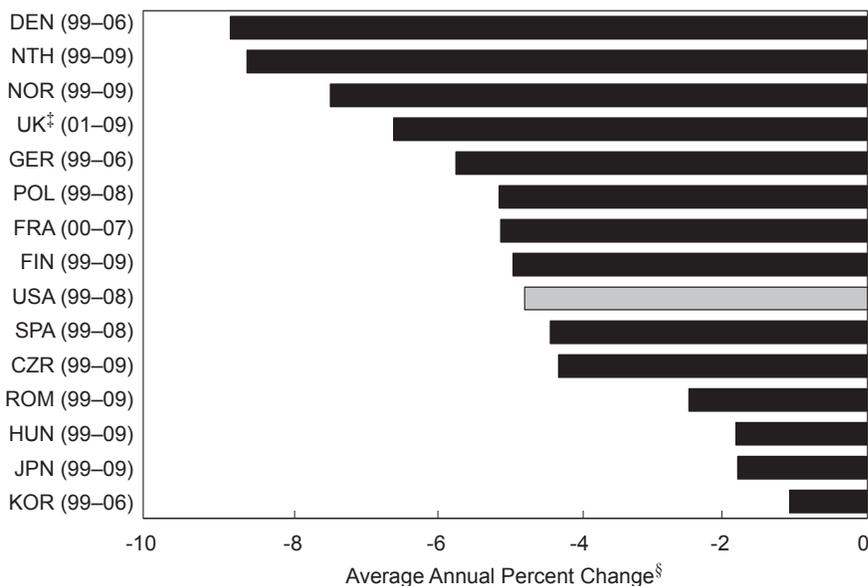
From 1999 to 2009, when compared with the United States, 8 of the 15 countries shown had a steeper average annual decline in CHD mortality in males.[36]

* 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*.
[§] Based on a log linear regression of the actual rates.

Chart 3–36
Change in Age–Adjusted Death Rates* for Coronary Heart Disease in Females by Country, Ages 35–74, 1999–2009[†]
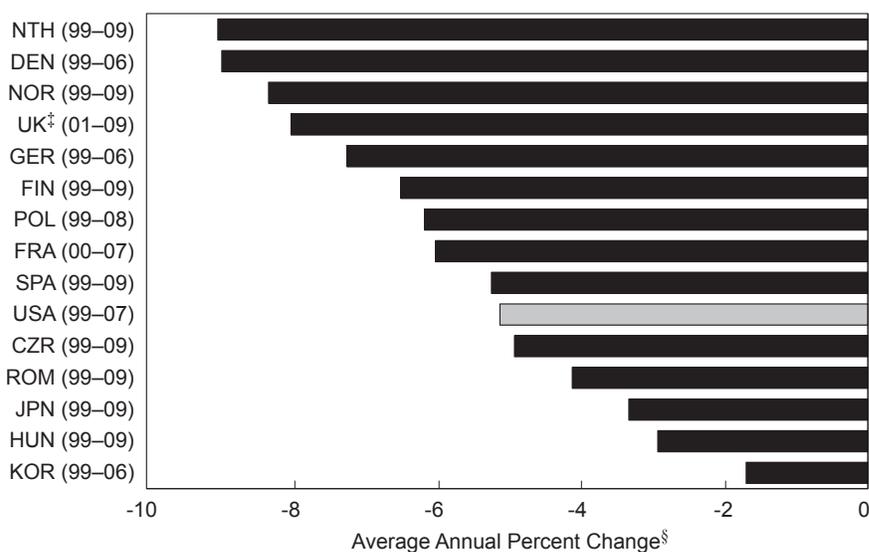
From 1999 to 2009, when compared with the United States, 9 of the 15 countries shown had a steeper average annual decline in CHD mortality in females.[36]

* 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.

Heart Failure

Chart 3–37
Age-Adjusted Prevalence of Heart Failure by Race and Sex, Ages 25–74, U.S., 1988–1994 to 2005–2008

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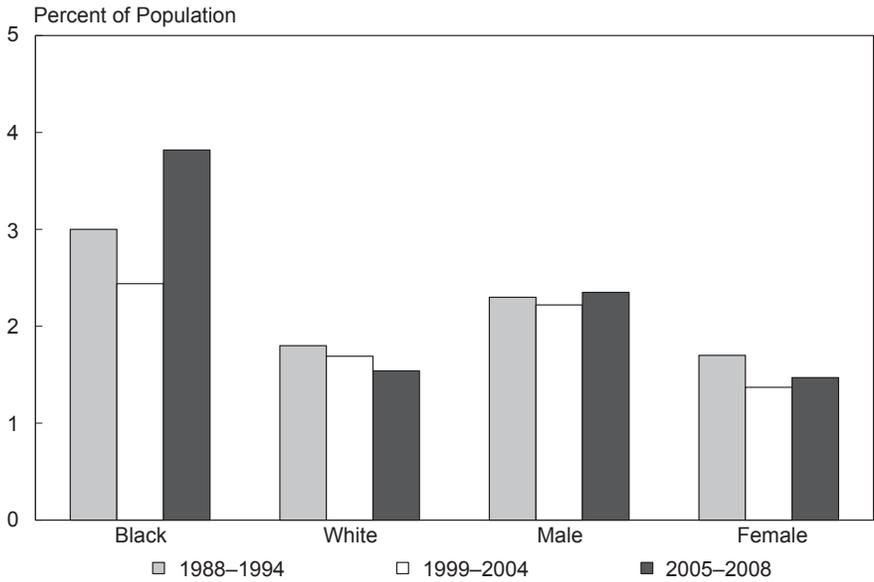
From 1988–1994 to 2005–2008, the prevalence of HF increased in blacks (except the decrease in 1999–2004) and decreased slightly in whites; it remained stable in males but decreased slightly in females.[18]

Chart 3–38
Hospitalization Rates for Heart Failure, Ages 45–64 and 65 and Older, U.S., 1971–2009

Hospitalizations/10,000 Population
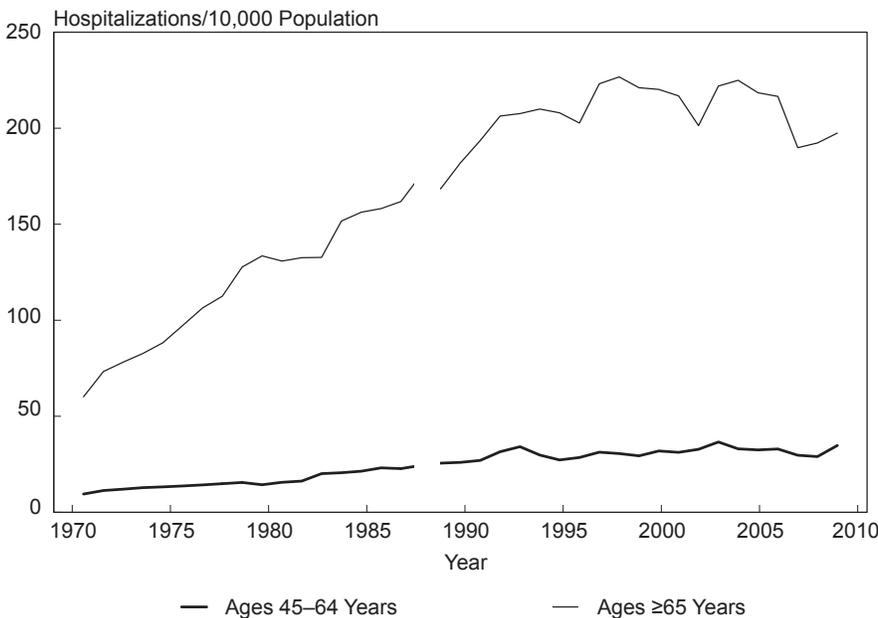
From 1971 to 1993, hospitalization rates for HF increased in those aged 45–64 years and then remained stable through 2009. For those aged 65 years and older, rates peaked in 1998 and then fluctuated through 2009.[32]

Heart Failure

Chart 3–39
Hospital Case-Fatality Rates for Heart Failure,
Ages 45–64 and 65 and Older, U.S., 1980–2009

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]

Percent Discharged Dead
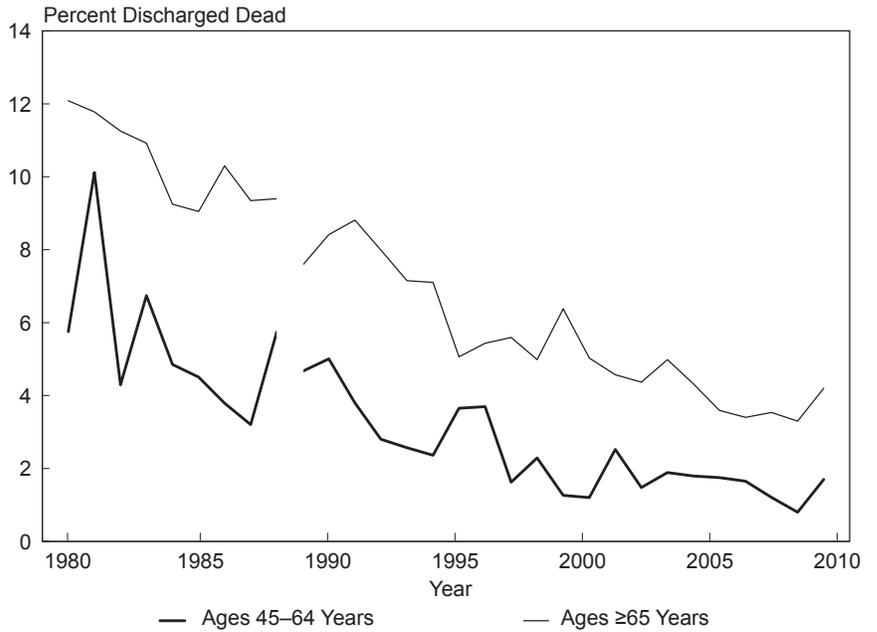
Chart 3–40
Age-Adjusted Death Rates for Heart Failure as the
Underlying Cause by Race and Sex, U.S., 1981–2008

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]

Deaths/100,000 Population

40
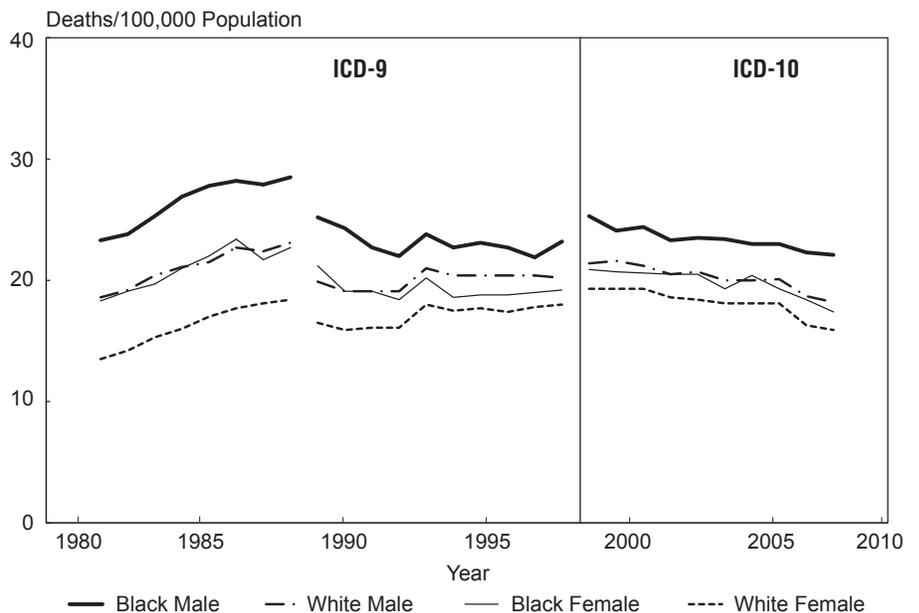
Heart Failure

Chart 3–41
Age-Adjusted Death Rates for Any Mention of Heart Failure by Race and Sex, U.S., 1981–2008

Deaths/100,000 Population

ICD-9   ICD-10

Year

Black Male — White Male — Black Female — White Female
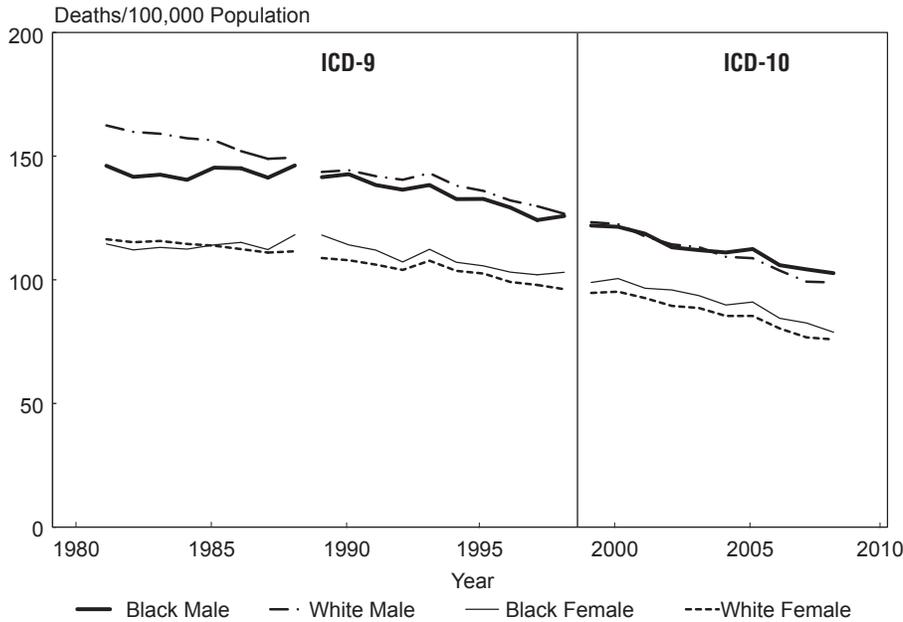
From 1989 to 2008, death rates with any mention of HF on the death certificate declined in blacks and whites, for both males and females. During this period, within sex groups, the rates were similar for blacks and whites.[30, 31] This is in contrast to HF solely as the underlying cause (see Chart 3–40).

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

Deaths/100,000 Population

Male   Female

■ Total   ■ Black*   □ White*   ■ American Indian   ■ Hispanic   ■ Asian
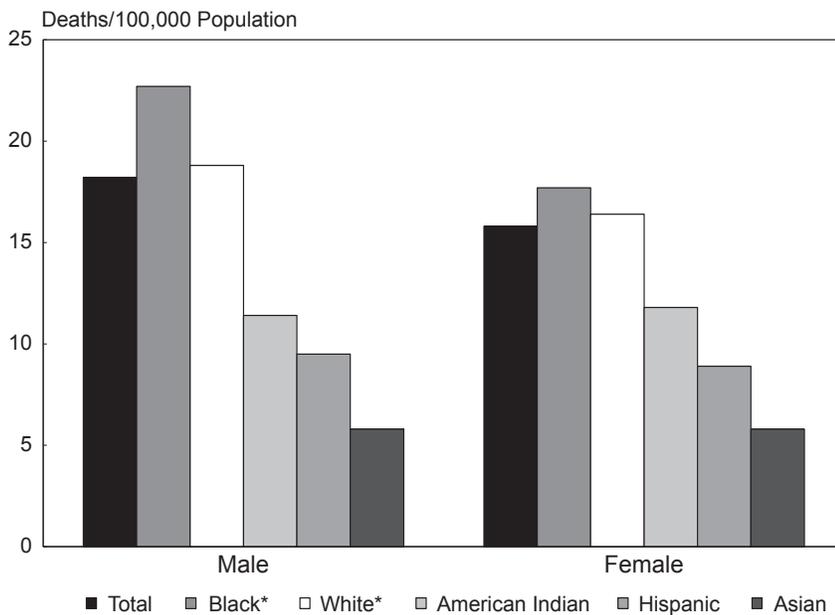
* Non-Hispanic.

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.[31]

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Heart Failure

Chart 3–43
Age-Adjusted Death Rates for Any Mention of Heart Failure
by Race/Ethnicity and Sex, U.S., 2008

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]

Deaths/100,000 Population

■ Total ■ Black* □ White* ■ American Indian ■ Hispanic ■ Asian

* Non-Hispanic.
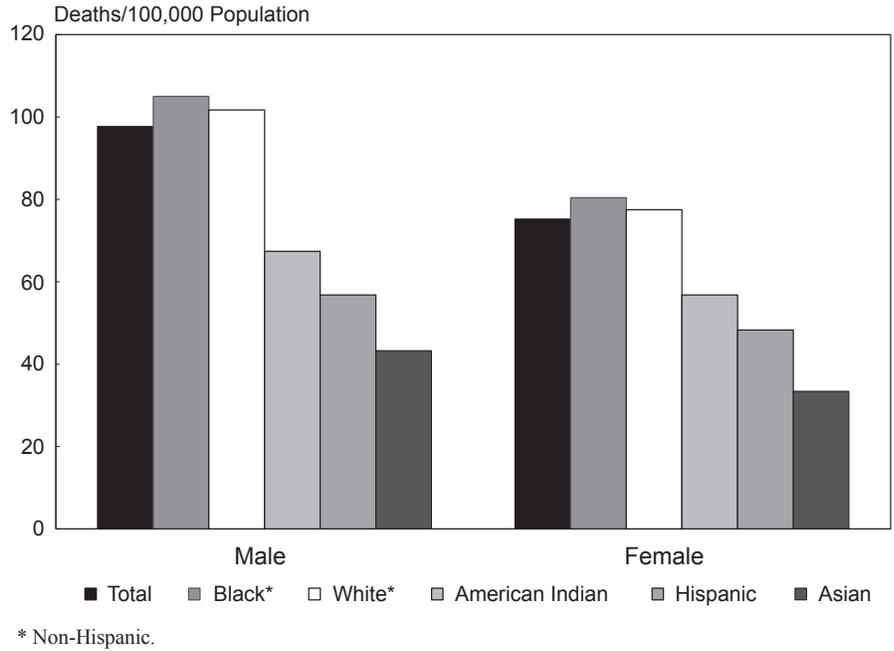
Chart 3–44
Death Rates for Heart Failure as the Underlying Cause
by Age, Race, and Sex, U.S., 2008

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]

Deaths/100,000 Population

Age (Years)

—— Black Male —·— White Male —— Black Female ---- White Female
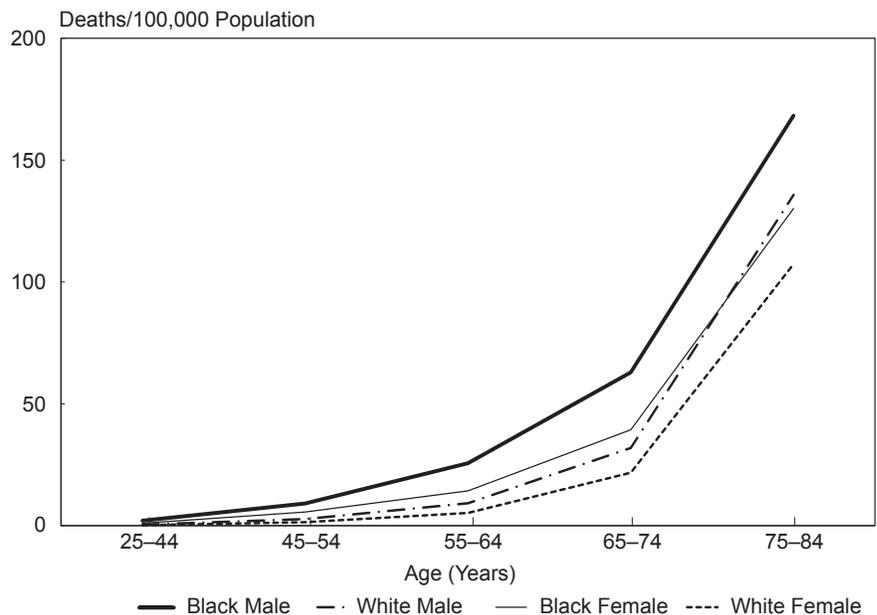
Heart Failure/Cardiomyopathy

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

Deaths/100,000 Population

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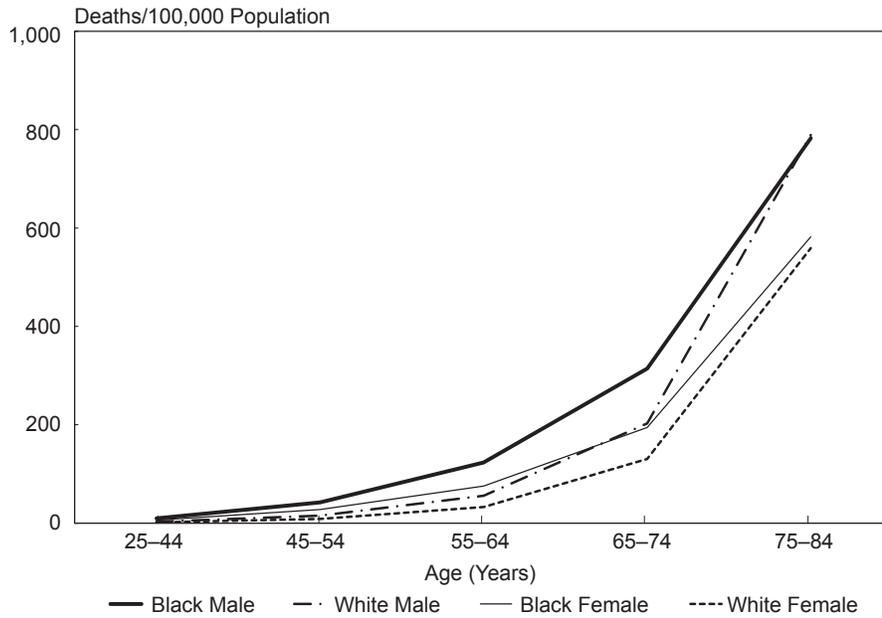
In 2008, within sex groups, mortality for any mention of HF on the death certificate was higher in blacks than in whites at all ages, with one exception: Among those aged 75–84 years, white males and black males had similar death rates. Within racial groups, death rates for HF were higher in males than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

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

Deaths/100,000 Population

Total — White — Black
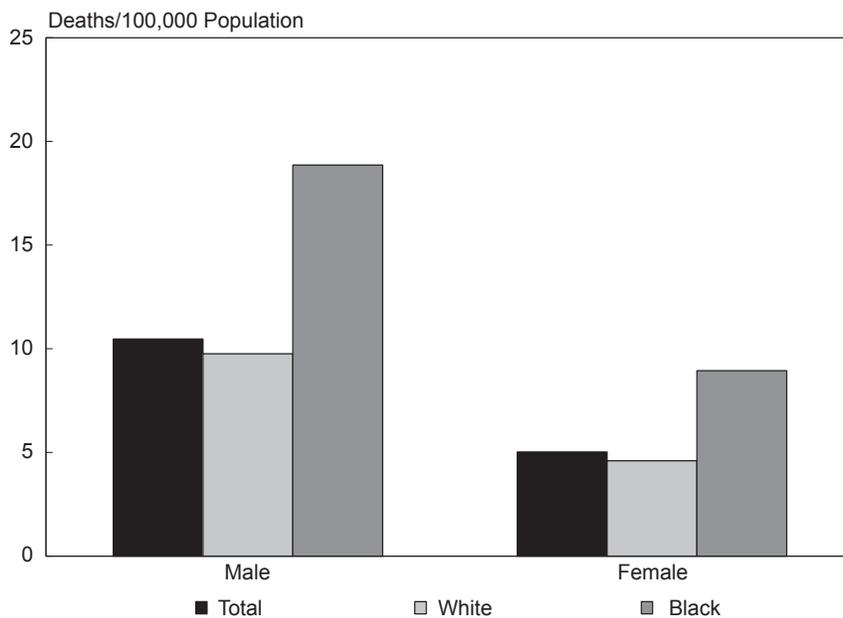
In 2008, the death rate for cardiomyopathy was approximately two times higher in males than in females and nearly two times higher in blacks than in whites.[31]

Cardiomyopathy/Atrial Fibrillation

Chart 3–47
Death Rates for Cardiomyopathy
by Age, Race, and Sex, U.S., 2008

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]

Deaths/100,000 Population

Age (Years)

— Black Male   —·— White Male   — Black Female   ---- White Female
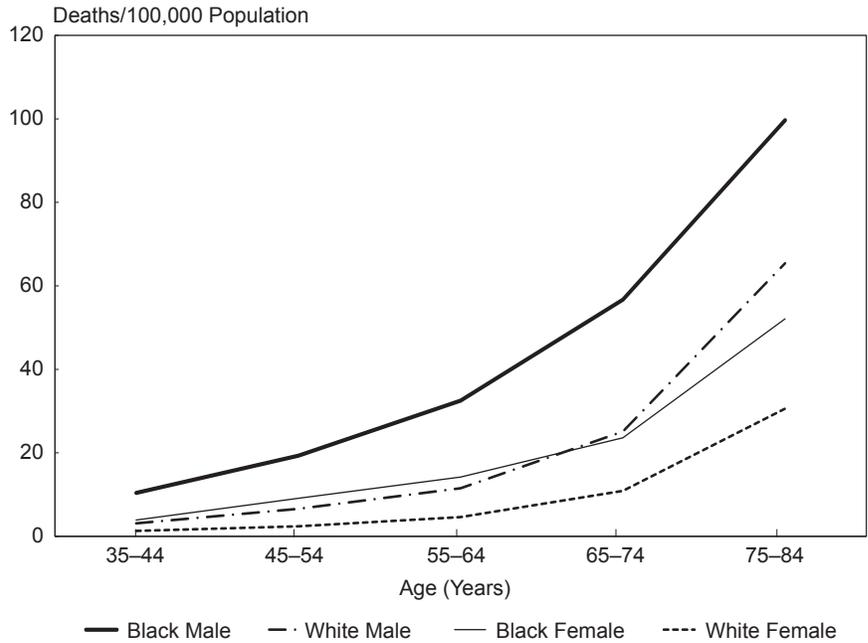
Chart 3–48
Hospitalizations for Atrial Fibrillation by Primary
and Secondary Diagnosis, U.S., 1982–2009

From 1988 to 2009, the number of hospitalizations for atrial fibrillation, as either a primary or secondary diagnosis, more than doubled.[32]

Hospitalizations (Thousands)

Year

— Primary Diagnosis   — Secondary Diagnosis
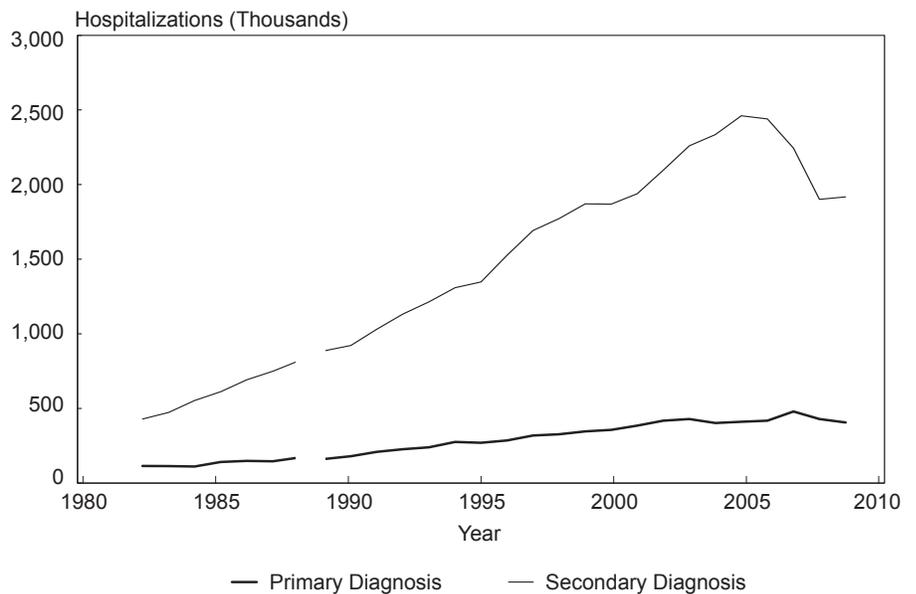
Atrial Fibrillation/Cerebrovascular Diseases (Stroke)

Chart 3–49
Hospitalization Rates for Atrial Fibrillation
by Age, U.S., 1982–2009

Hospitalizations/10,000 Population

— Ages 45–64 Years   — Ages ≥65 Years
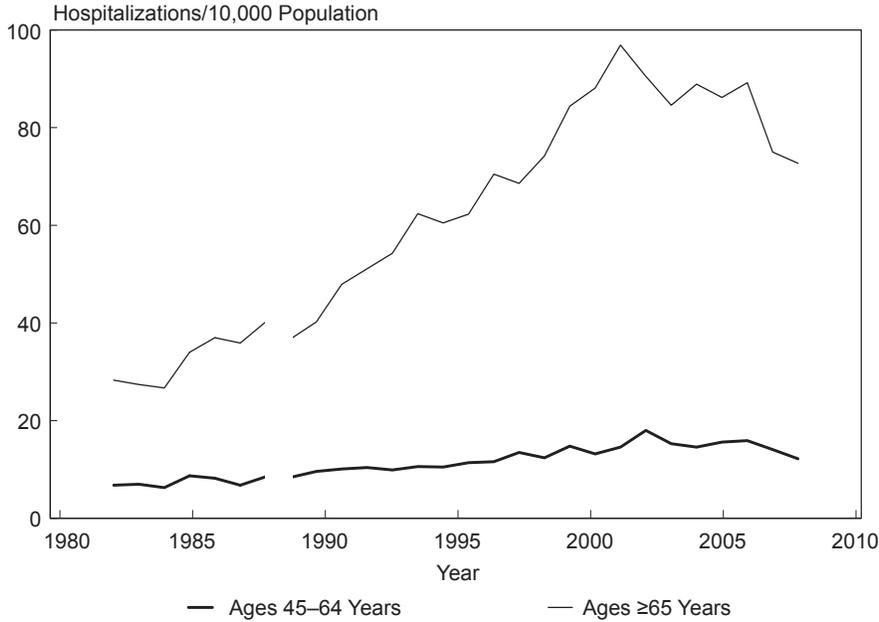
From 1988 to 2003, hospitalization rates for atrial fibrillation more than doubled for both age groups and did not begin to decline until 2008.[32]

Chart 3–50
Age-Adjusted Prevalence of Stroke by Race and Sex,
Ages 25–74, U.S., 1971–1975 to 2005–2008

Percent of Population

■ 1971–1975   ■ 1976–1980   ▨ 1988–1994   ☐ 1999–2004   ■ 2005–2008
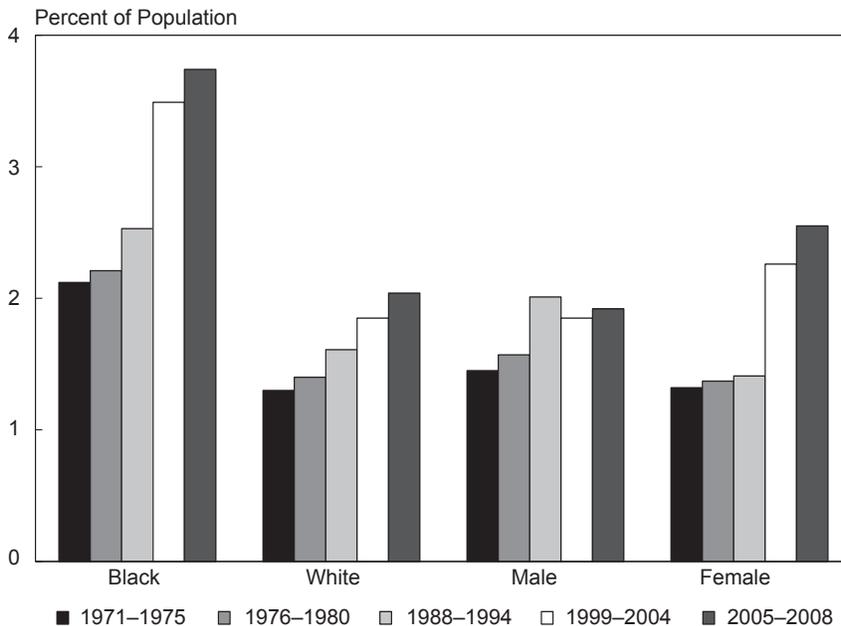
From 1971–1975 to 2005–2008, the prevalence of stroke increased in blacks and whites. It increased in males until 1999–2004; in females it was stable from 1971–1975 to 1988–1994 and then increased through 2005–2008.[18]

Cerebrovascular Diseases (Stroke)

Chart 3–51
Prevalence of Stroke by Age and Sex,
U.S., 1999–2008

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.[18]

Percent of Population

Age (Years)

■ Male   □ Female
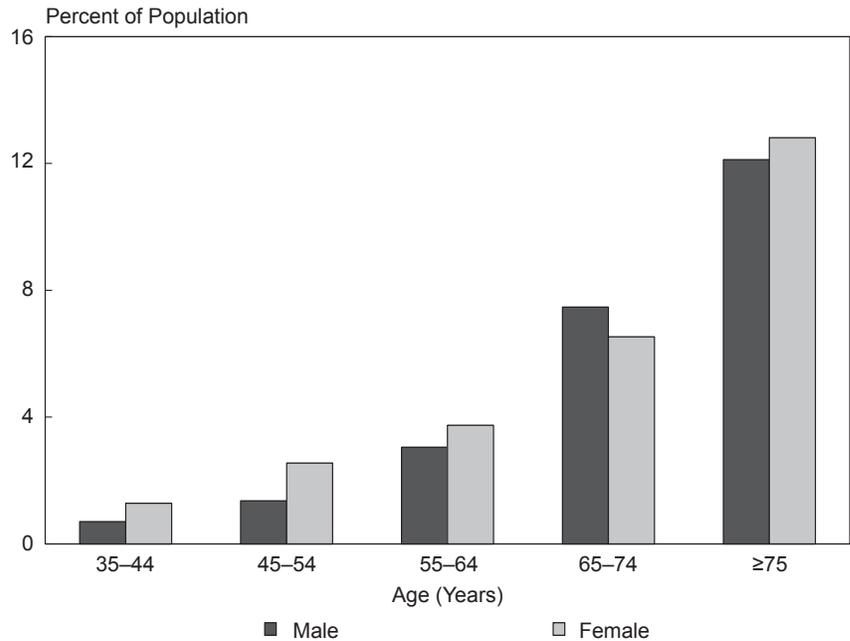
Chart 3–52
Prevalence of Stroke by Age and Race,
U.S., 1999–2008

In 1999–2008, the prevalence of stroke, which increased significantly with age, was higher in blacks than in whites at all ages.[18]

Percent of Population

Age (Years)

■ Black   □ White
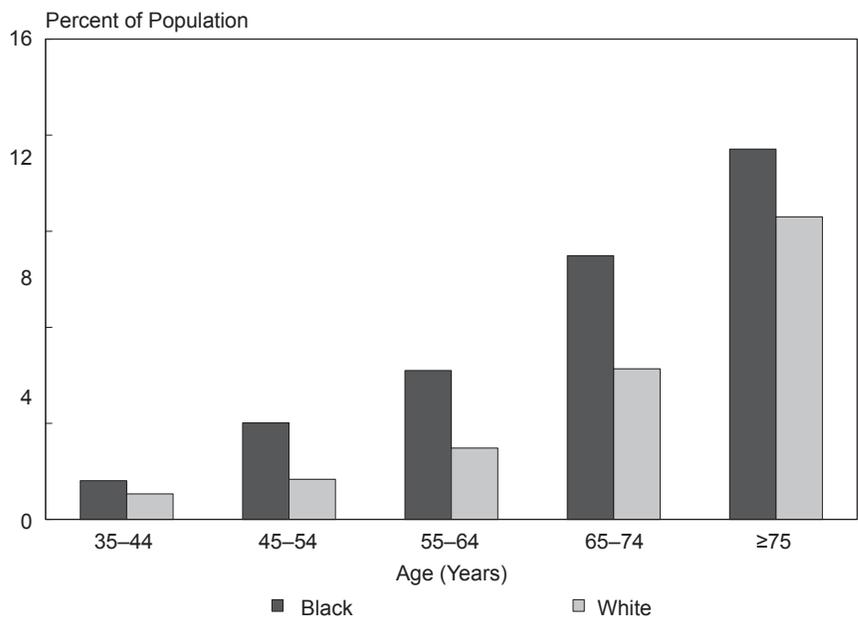
Cerebrovascular Diseases (Stroke)

Chart 3–53
Emergency Department Visit Rates for Stroke
by Age, U.S., 1997–1999 to 2006–2008

Visits/10,000 Population
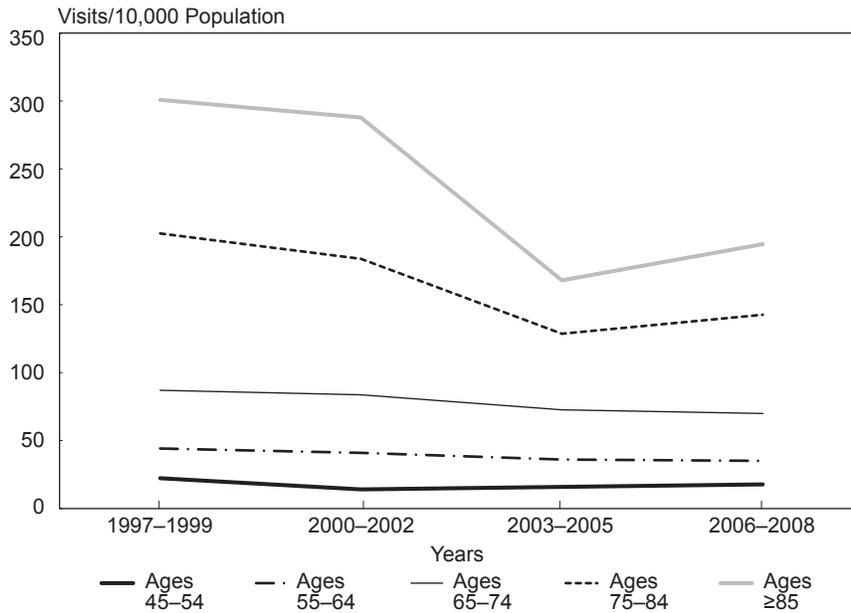
From 1997–1999 to 2006–2008, emergency department visit rates for stroke decreased for all age groups. The greatest decrease occurred among those aged 75 years and older.[35]

Chart 3–54
Hospitalization Rates for Stroke,
Ages 45–64 and 65 and Older, U.S., 1971–2009

Hospitalizations/10,000 Population
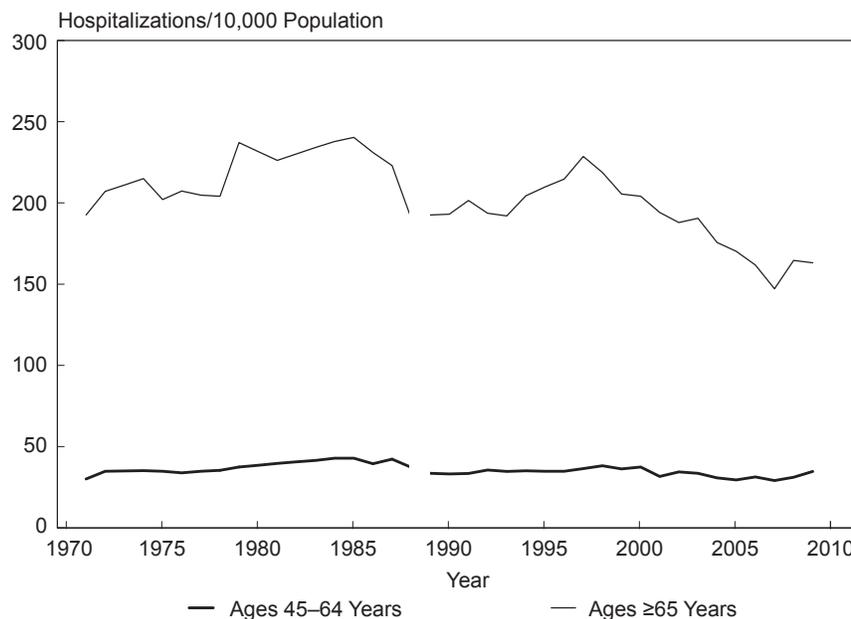
Hospitalization rates for stroke in those aged 45–64 years increased from 1971 to the mid-1980s and then remained relatively stable through 2009. For those aged 65 years and older, the rates generally rose from 1971 to 1997 and subsequently declined through 2007.[32]

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Cerebrovascular Diseases (Stroke)

Chart 3–55
Hospital Case-Fatality Rate for Stroke,
Ages Younger Than 65 and 65 and Older, U.S., 1971–2009*

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.[32]

Percent Discharged Dead

Ages <65 Years   Ages ≥65 Years
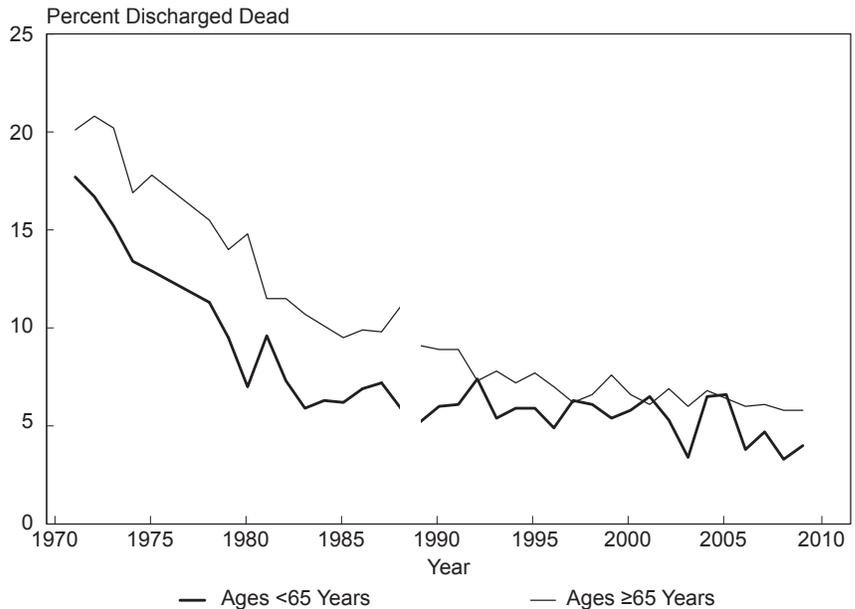
* Estimates are not available for 1976 and 1977.

Chart 3–56
Age-Adjusted Death Rates for Stroke
by Race and Sex, U.S., 1950–2008

For all groups, the steep decline in stroke mortality that occurred in the 1970s and mid-1980s slowed through the 1990s and 2000s.[30, 31]

Deaths/100,000 Population

ICD-6   ICD-7   ICD-8   ICD-9   ICD-10

Black* Male   White Male   Black* Female   White Female
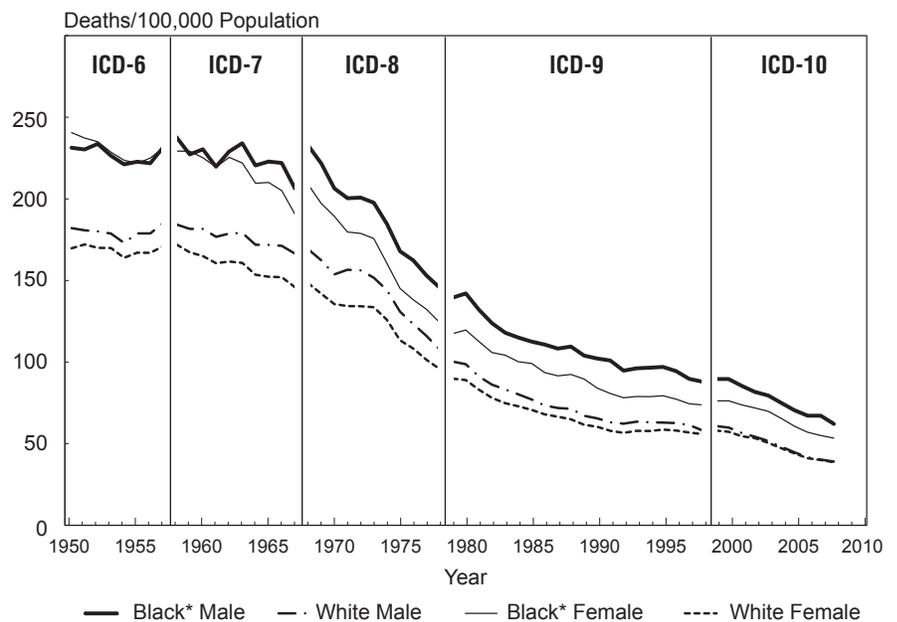
* Nonwhite from 1950 to 1967.

Cerebrovascular Diseases (Stroke)

Chart 3–57
Deaths and Age-Adjusted Death Rates for Stroke,
U.S., 1979–2008*

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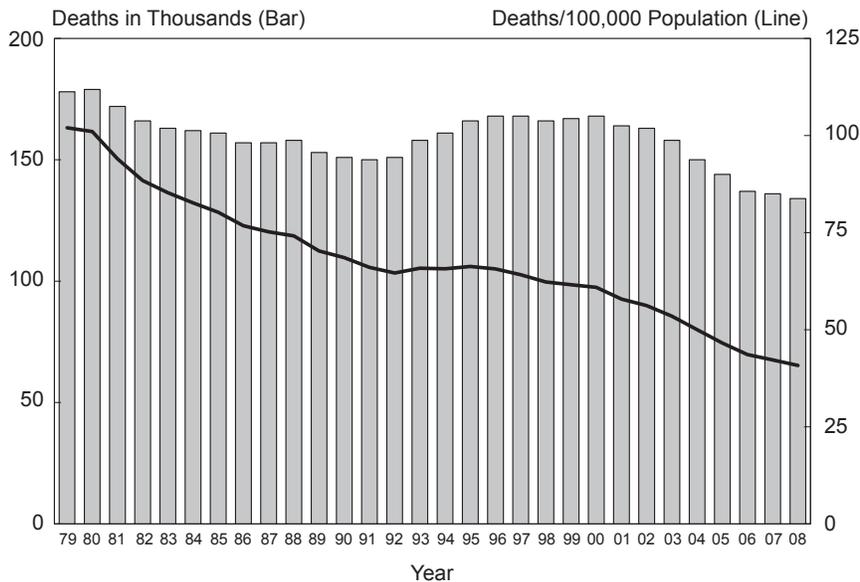
* The comparability ratio 1.0502 was applied to the deaths and rates reported in vital statistics for 1979–1998.

Chart 3–58
Age-Adjusted Death Rates for Stroke
by Race/Ethnicity and Sex, U.S., 1999–2008
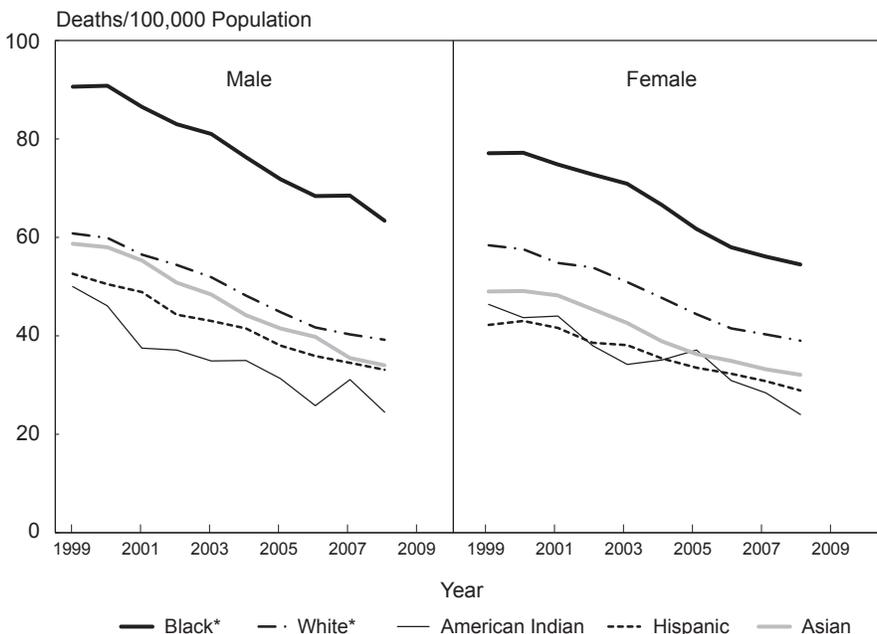
From 1999 to 2008, stroke mortality declined for non-Hispanic blacks, non-Hispanic whites, American Indians, Hispanics, and Asians, both males and females. Blacks continue to have the highest mortality rates.[30, 31]

* Non-Hispanic.

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Cerebrovascular Diseases (Stroke)

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.[30, 31]

Chart 3–59
Average Annual Percent Change in Age-Adjusted Death Rates for Stroke by Race and Sex, U.S., 1960–2008

Years	Total Population	Black* Male	White Male	Black* Female	White Female
1960–1967	-1.4	-1.0	-1.1	-2.1	-1.6
1968–1978	-4.2	-4.4	-4.2	-5.0	-4.1
1979–1988	-3.7	-3.0	-3.9	-3.0	-3.7
1989–1998	-0.9	-1.6	-1.1	-1.7	-0.7
1999–2008	-4.7	-4.1	-5.3	-4.2	-4.8

* Nonwhite from 1960 to 1967.

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.[31]

Chart 3–60
Age-Adjusted Death Rates for Stroke by Race/Ethnicity and Sex, U.S., 2008

Deaths/100,000 Population

Legend: ■ Total ■ Black* □ White* ■ American Indian ■ Hispanic ■ Asian
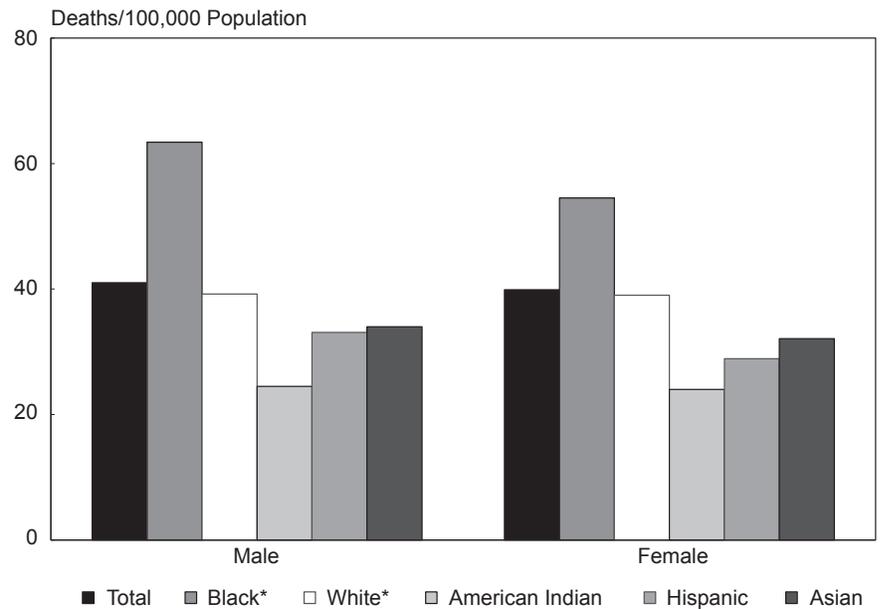
* Non-Hispanic.

Cerebrovascular Diseases (Stroke)

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

Deaths/100,000 Population

Black* —· White* — American Indian ---- Hispanic — Asian
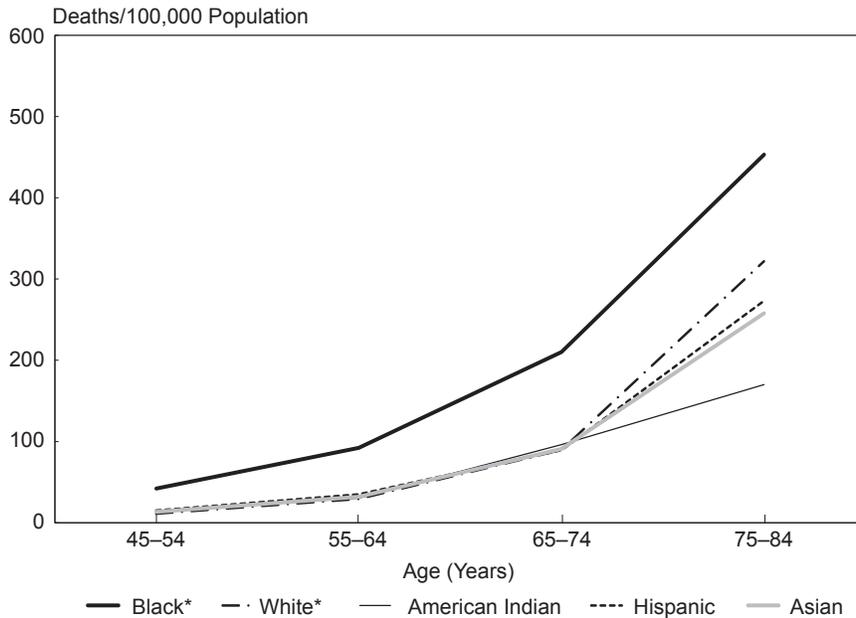
In 2008, death rates for stroke in males increased with age for each racial/ethnic group. Stroke mortality was much higher in non-Hispanic blacks than in other groups.[31]

* Non-Hispanic.

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

Deaths/100,000 Population

Black* —· White* — American Indian[†] ---- Hispanic — Asian

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]
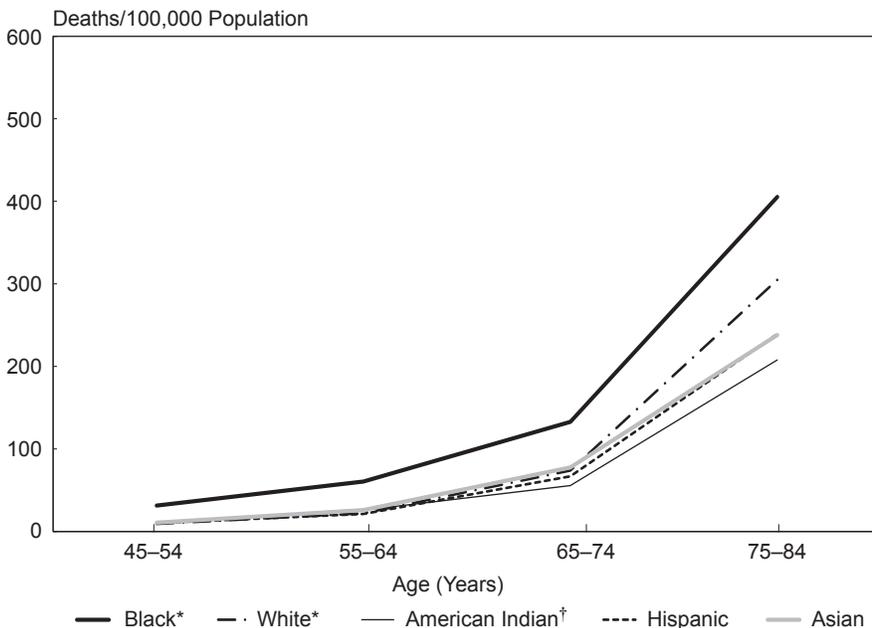
* Non-Hispanic.
[†] Data unreliable for American Indian females aged 45–54 years.

Cerebrovascular Diseases (Stroke)

Chart 3–63
Age-Adjusted Death Rates for Stroke
by State, U.S., 2005–2007

In 2005–2007, stroke mortality was highest in many of the Southeastern states, most of which comprise "the stroke belt."[16]

Deaths/100,000 Population

49.8–58.3 (10)
46.7–49.7 (10)
43.9–46.6 (10)
38.5–43.8 (10)
29.5–38.4 (10)
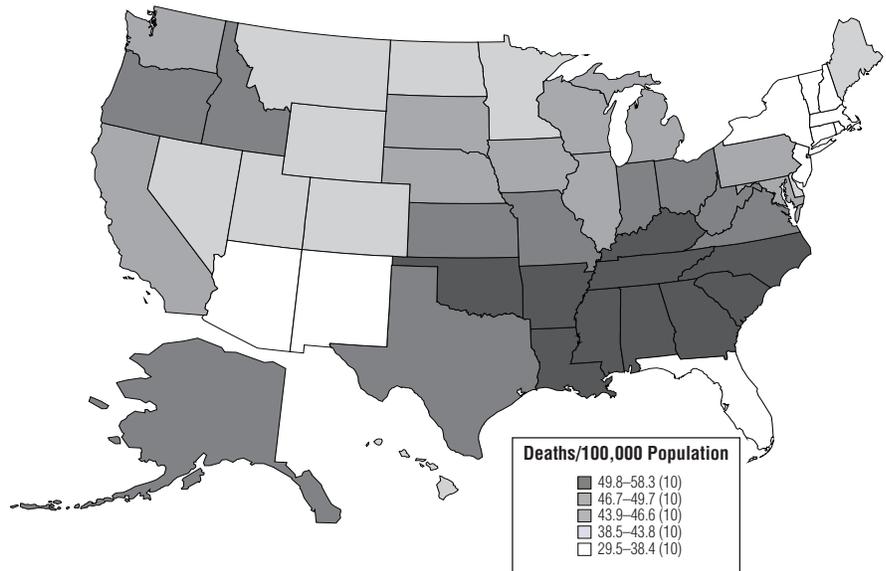
Chart 3–64
Age-Adjusted Death Rates* for Stroke by
Country and Sex, Ages 35–74, 2006–2009[†]

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.[35]
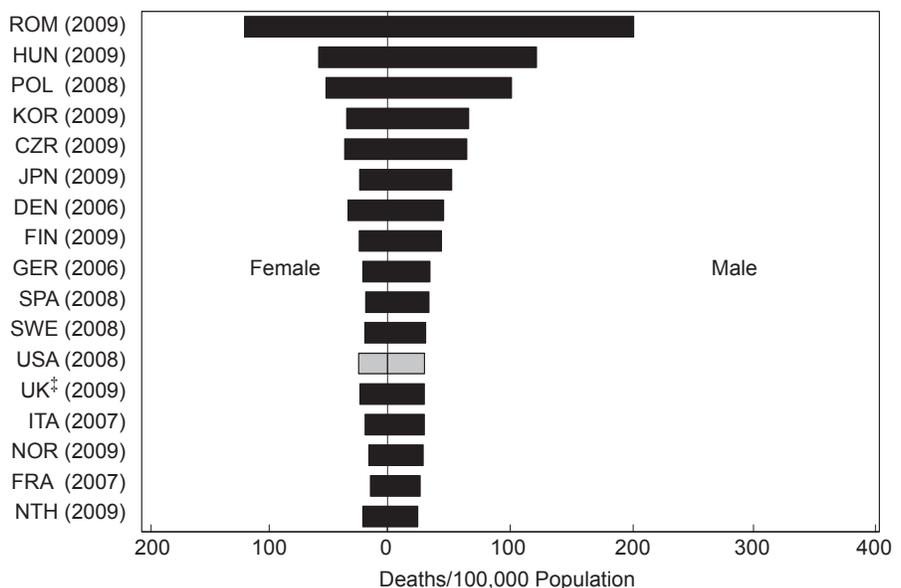
* Age adjusted to European standard.
[†] Data for years indicated in parentheses.
[‡] Death rate is for the United Kingdom, not just England and Wales as in previous editions of the *Chart Book.*

Cerebrovascular Diseases (Stroke)

Chart 3–65
Change in Age-Adjusted Death Rates* for Stroke
in Males by Country, Ages 35–74, 1999–2009[†]
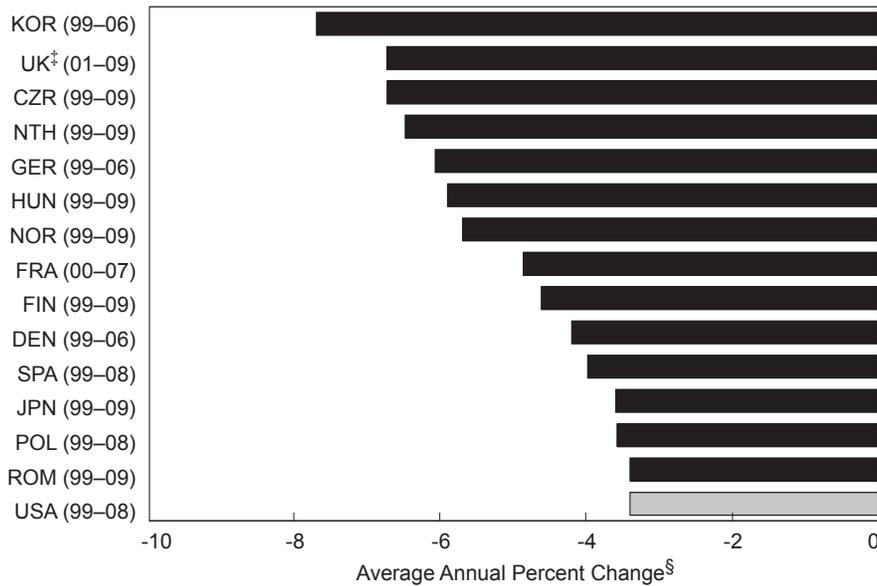
From 1999–2001 to 2006–2009, the United States ranked last among 15 industrialized countries in the average annual decline in stroke mortality in males.[36]

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

Chart 3–66
Change in Age-Adjusted Death Rates* for Stroke
in Females by Country, Ages 35–74, 1999–2009[†]
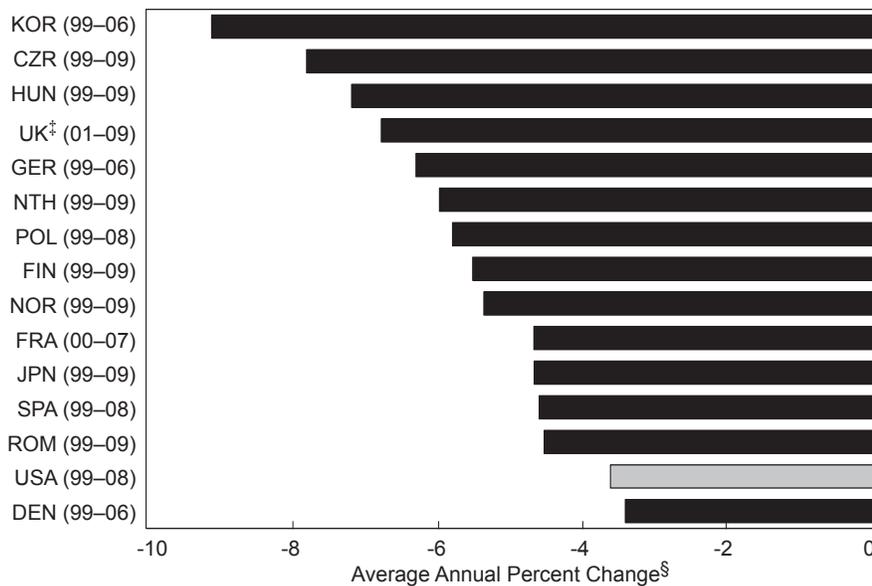
From 1999–2001 to 2006–2009, the United States ranked next to last among 15 industrialized countries in the average annual decline in stroke mortality in females.[36]

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

Hypertension

Chart 3–67
Prevalence of Hypertension* and Prehypertension[†]
by Age, U.S., 1999–2008

In 1999–2008, the prevalence of hypertension was 40% among those aged 50–59 years and 73% among those aged 80 years and older. These percentages are considerably higher when prehypertension is included.[18]

Percent of Population
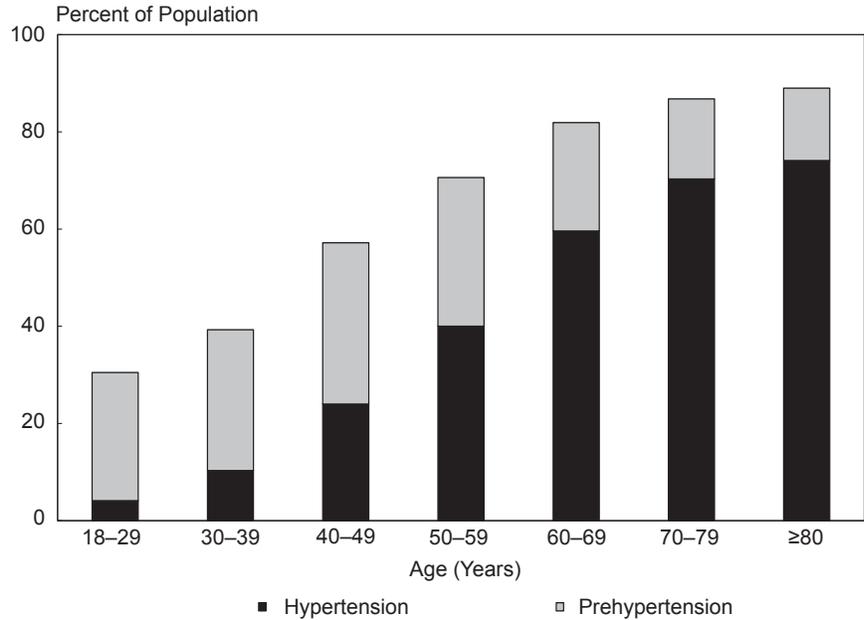
* Hypertension is defined as systolic BP ≥140 mmHg, or diastolic BP ≥90, or on medication.
[†] Prehypertension is defined as systolic BP 120–139 mmHg or diastolic BP 80–89.

Chart 3–68
Age-Adjusted Prevalence of Hypertension* by Race/Ethnicity
and Sex, Ages 20–74, U.S., 1999–2008

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]
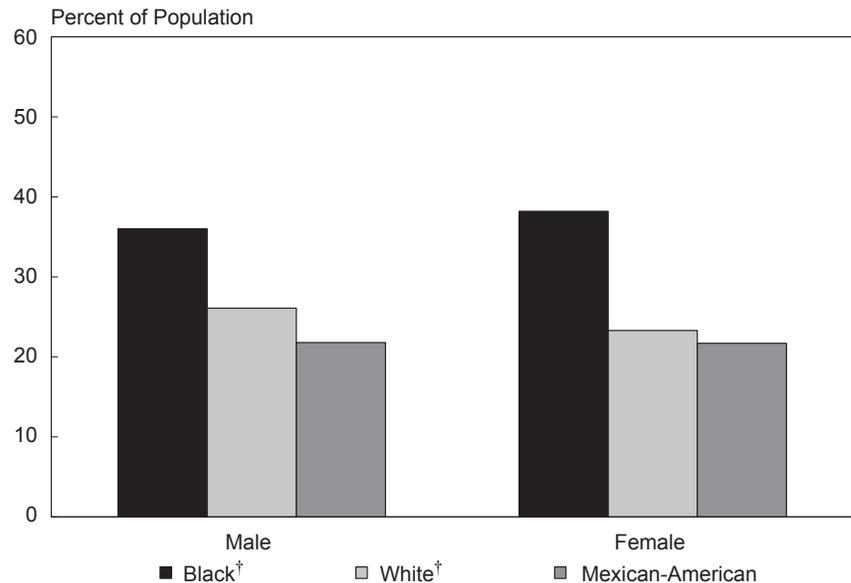
Percent of Population

* Hypertension is defined as systolic BP ≥140 mmHg, or diastolic BP ≥90, or on medication.
[†] Non-Hispanic.

Hypertension

Chart 3–69
Age-Adjusted Prevalence of Hypertension* by Race/Ethnicity and Sex, Ages 20–74, U.S., 1976–1980 to 2005–2008

Percent of Population

Legend: ■ 1976–1980 ▨ 1988–1994 □ 1999–2004 ▨ 2005–2008

* Hypertension is defined as systolic BP ≥140 mmHg, or diastolic BP ≥90, or on medication.
† Non-Hispanic.
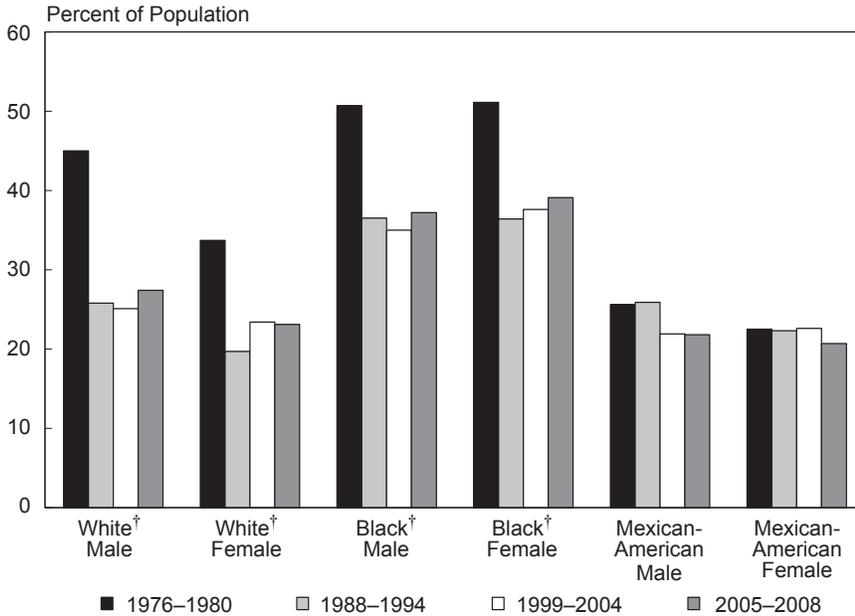
From 1976–1980 to 1988–1994, the prevalence of hypertension decreased substantially in both non-Hispanic black and white males and females and then remained relatively stable through 2005–2008. In Mexican-American males, the prevalence decreased in 1999–2004 and remained stable through 2005–2008. The prevalence in Mexican-American females was stable throughout the entire period.[18]

Chart 3–70
Hypertensive* Population Aware, Treated, and Controlled, Ages 18–74, U.S., 1971–1974 to 2005–2008

Percent of Hypertensive Population

Years

Legend: ■ Unaware ▨ On Medication Controlled □ On Medication Uncontrolled ▨ No Medication Uncontrolled
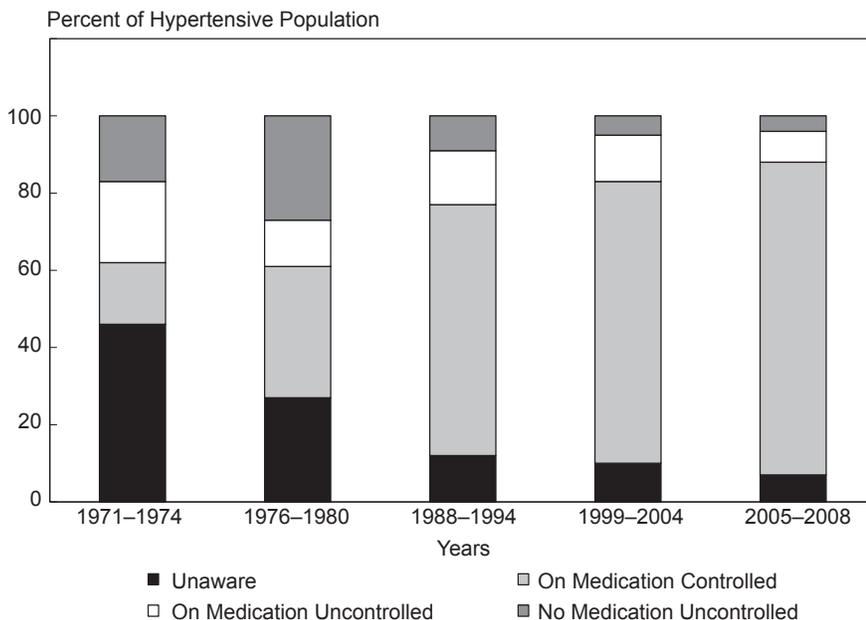
In 2005–2008, 93% of persons with a high level of hypertension (≥160/≥95 mmHg) were aware of their condition compared with 54% in 1971–1974. The percent of persons on medication with their condition controlled increased from 16% in 1971–1974 to 81% in 2005–2008.[18]

* Hypertension is defined as systolic BP ≥160 mmHg, or diastolic BP ≥95 mmHg, or on medication.

Hypertension

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]

Chart 3–71
Hypertensive* Population Aware, Treated, and Controlled,
Ages 18–74, U.S., 1976–1980 to 2005–2008

Percent of Hypertensive Population

- ■ Unaware
- □ On Medication Uncontrolled
- ▢ On Medication Controlled
- ▨ No Medication Uncontrolled
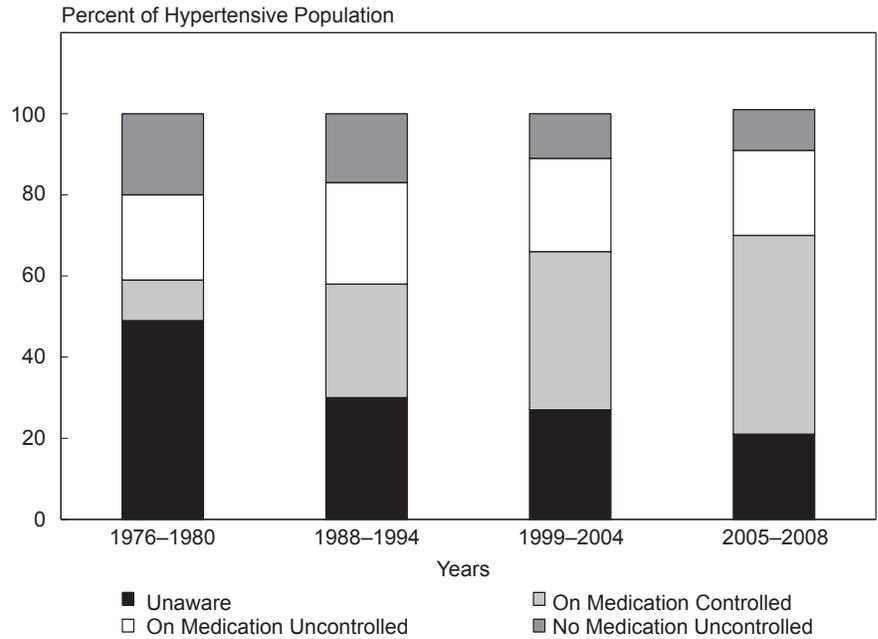
* Hypertension is defined as systolic BP ≥140 mmHg, or diastolic BP ≥90 mmHg, or on medication.

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]

Chart 3–72
Emergency Department Visit Rates for Hypertension
by Age, U.S., 1997–1999 to 2006–2008

Visits/10,000 Population

—— Ages 25–44 Years   — · Ages 45–64 Years   —— Ages ≥65 Years
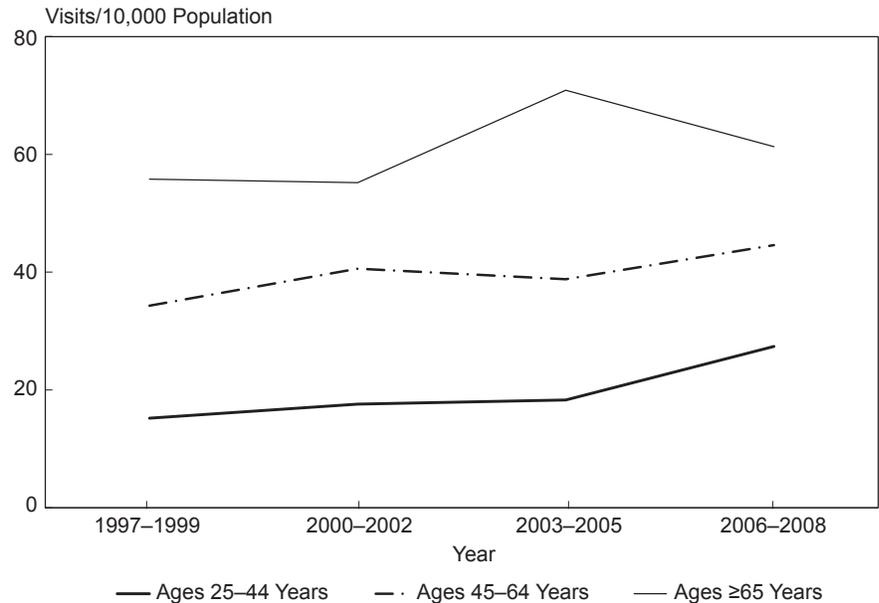
Diseases of the Arteries

Chart 3–73
Age-Adjusted Death Rates for Diseases of the Arteries
by Race and Sex, U.S., 2008

Deaths/100,000 Population

Legend: ■ Total   ▢ White   ▪ Black
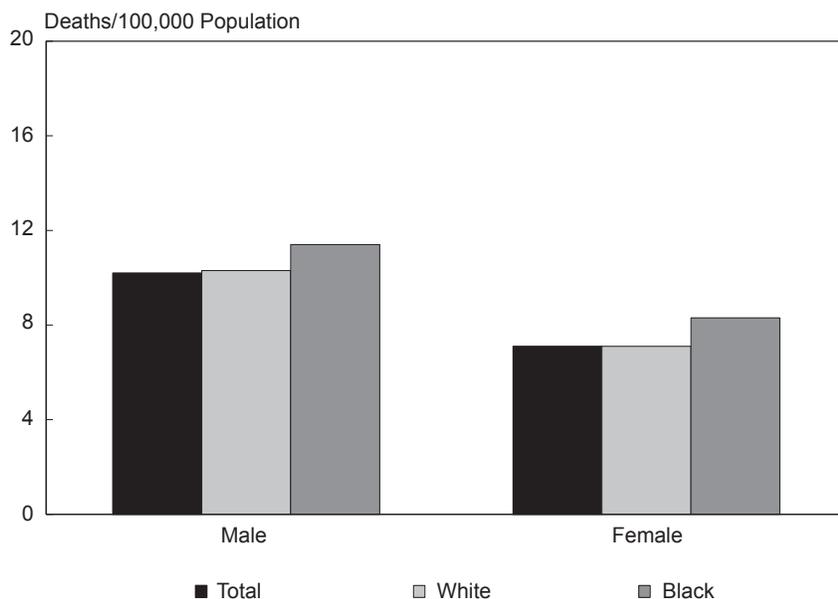
In 2008, death rates for diseases of the arteries within sex groups were slightly higher in blacks than in whites. Overall, death rates were nearly 44% higher in males than in females.[31]

Chart 3–74
Death Rates for Diseases of the Arteries
by Age, Race, and Sex, U.S., 2008

Deaths/100,000 Population

Age (Years)

Legend: —— Black Male   — · White Male   —— Black Female   ---- White Female
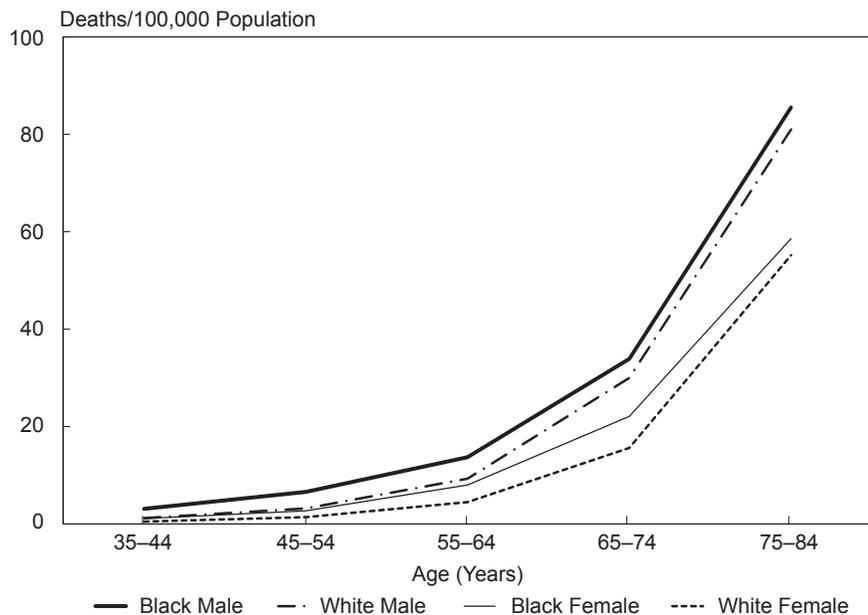
In 2008, death rates for diseases of the arteries within racial groups were higher in males than in females at all ages. Within sex groups, blacks had slightly higher rates than whites.[31]

Congenital Malformations of the Circulatory System

Chart 3–75
Percent of Deaths From Congenital Malformations of the Circulatory System, Age Under 1, U.S., 1940–2008

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]

Percent of Deaths
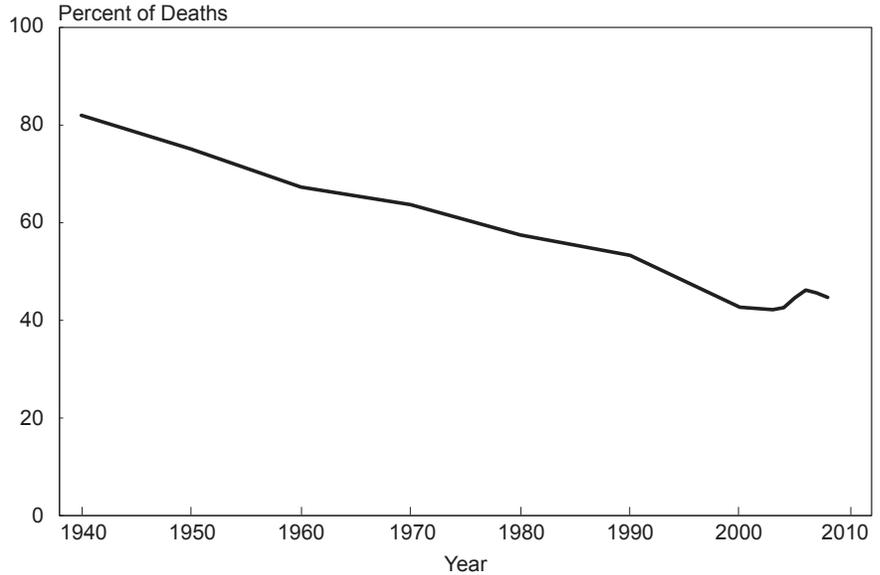
Chart 3–76
Infant Mortality From Congenital Malformations of the Circulatory System by Race, U.S., 1970–2008

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]

Deaths/100,000 Live Births

ICD-8   ICD-9   ICD-10

— Heart Black   —·— Heart White   —— Other CVD Black   ---- Other CVD White
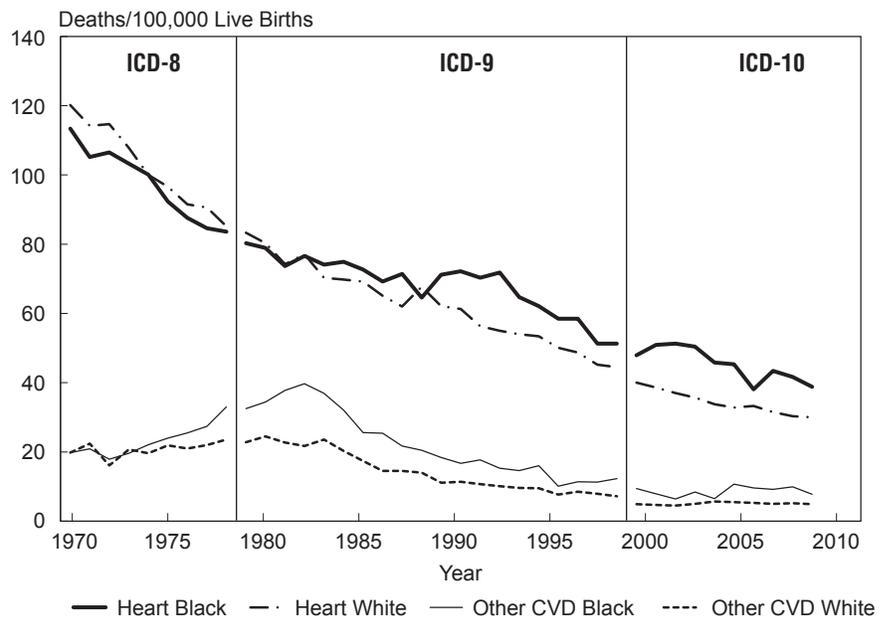
4. Lung Diseases

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.[31] 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.[31, 32, 34] 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."[26]

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.[25] Additionally, based on spirometry readings of lung function in the 1988–1994 NHANES, COPD was estimated to go undiagnosed in 12 million people.[26]

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
Deaths From Lung Diseases, Percent by Subgroup, U.S., 2008
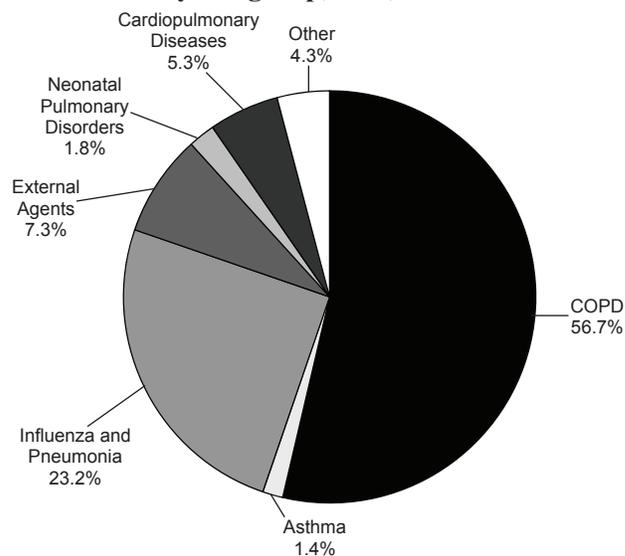
Total Deaths = 242,350 (100%)

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

| Diagnostic Category | ICD-9-CM Codes | Hospitalizations for 2009 | | Physician Office Visits for 2009 (1,000) | ICD-10 Codes | Deaths for 2008 |
		First-Listed Discharges (1,000)	Length of Stay (Days)			
Total		3,468	5.6	38,270		242,350
Acute lower respiratory infections:	466, 480–487	1,385	4.9	10,678	J09–J18, J20, J21	56,519
Influenza and pneumonia	480–487	1,226	5.1	6,319	J09–J18	56,284
Acute bronchitis	466	159	3.4	4,359	J20	160
Acute bronchiolitis	included in 466	—	—	—	J21	75
Chronic lower respiratory diseases:	490–496	1,218	4.7	25,956	J40–J47	141,090
COPD:	490–492, 494–496	739	4.9	15,392	J40–J44, J47	137,693
Chronic bronchitis	490, 491	648	4.7	9,280	J40–J42	731
Emphysema	492	15	4.3	747	J43	12,448
Other COPD	495, 496	67	7.5	5,153	J44	123,527
Bronchiectasis	494	9	5.1	212	J47	987
Asthma	493	479	4.3	10,564	J45	3,131
Status asthmaticus	included in 493	—	—	—	J46	266
Cystic fibrosis	277.0	14	8.8	—	E84	491
Lung disease due to external agents	500–508	182	7.5	110	J60–J70	17,613
Adult respiratory distress syndrome	518.5	11	10.3	—	J80	1,608
Pulmonary edema	518.4	7	6.0	—	J81	561
Interstitial lung diseases:	011, 012, 135, 446.2, 446.4, 518.8	411	8.1	811	A15, A16, A19, A31.0, D86, J96, J99, M31.0, M31.3	6,650
Sarcoidosis	135	7	7.0	96	D86	890
Respiratory tuberculosis	011, 012	6	11.0	120	A15, A16, A19, A31.0	734
Respiratory failure	518.8	394	8.1	525	J96	4,668
Pulmonary manifestations of connective tissue disorders	446.2, 446.4	4	5.8	70	J99, M31.0, M31.3	358
Cardiopulmonary diseases:	415.1–417	181	5.8	590	I26, I27	12,854
Pulmonary embolism	415.1	158	5.7	487	I26	7,158
Other pulmonary heart disease	415.2–417	23	6.5	103	I27	5,696
Selected HIV-related and other pulmonary infections	114–116, 117.3, 117.5, 117.7, 136.3	7	7.4	86	B38–B40, B44–B46, B59	560
Neonatal pulmonary disorders:	748.4–748.6, 769, 770, 798.0	52	14.5	39	P22, P23, P25–P28, Q33, R95	4,404
Respiratory distress syndrome	769	14	22.8	—	P22	630
Sudden infant death syndrome	798.0	—	—	—	R95	2,353
Congenital malformation of the lung	748.4–748.6	2	27.5	—	Q33	345
Bronchopulmonary dysplasia	770.7	5	3.4	—	P27.1	217
Atelectasis of newborn	770.4, 770.5	—	—	—	P28.0, P28.1	335
Other perinatal respiratory diseases	770.1–770.3, 770.6, 770.8, 770.9	31	11.7	39	P23, P25, P26, P27.0, P27.8, P27.9, P28.2–P28.9	524

* 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

Chart 4–3
Age-Adjusted Death Rates for Lung Diseases
by Race and Sex, U.S., 2008

Deaths/100,000 Population
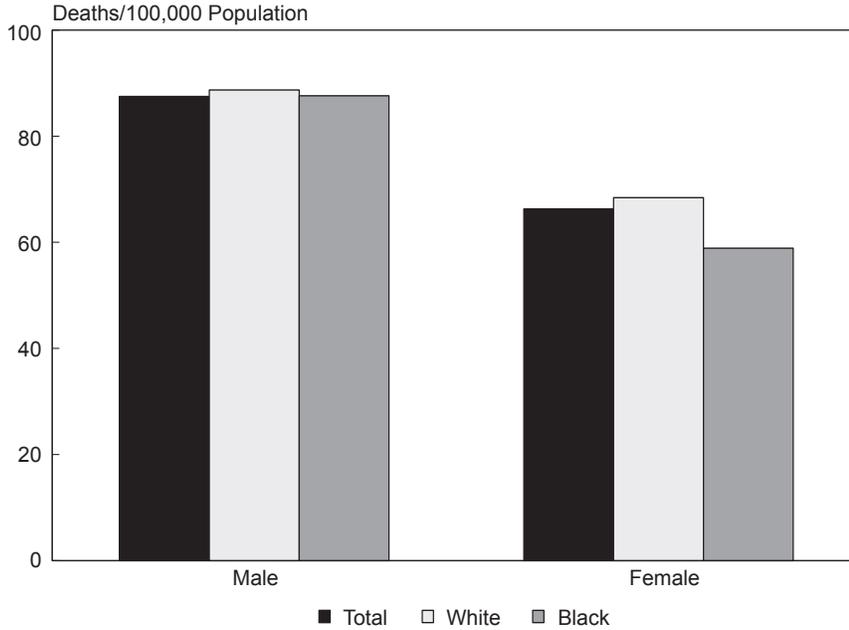
In 2008, lung disease mortality was higher in males than in females. Within sex groups, it was similar between black males and white males and slightly higher in white females than in black females.[31]

Chart 4–4
Death Rates for Lung Diseases
by Age, Race, and Sex, U.S., 2008

Deaths/100,000 Population
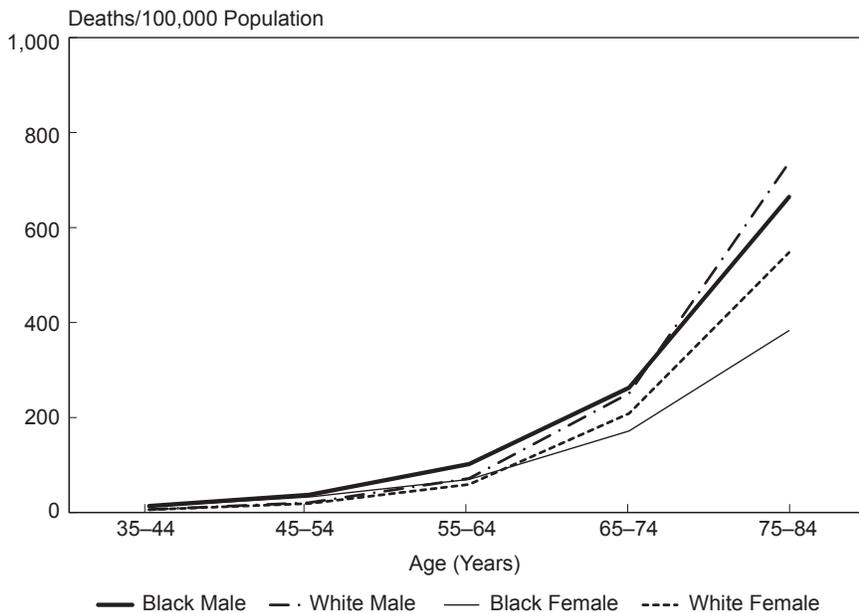
In 2008, the male–female gap in mortality from lung diseases generally increased with age. Within racial groups, the rate was higher in black males than in white males aged 74 years and younger; it was higher in black females than in white females aged 64 years and younger.[31]

Chronic Obstructive Pulmonary Disease

Chart 4–5
Prevalence of Chronic Obstructive Pulmonary Disease*
by Age, U.S., 1997–2010

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

Percent of Population
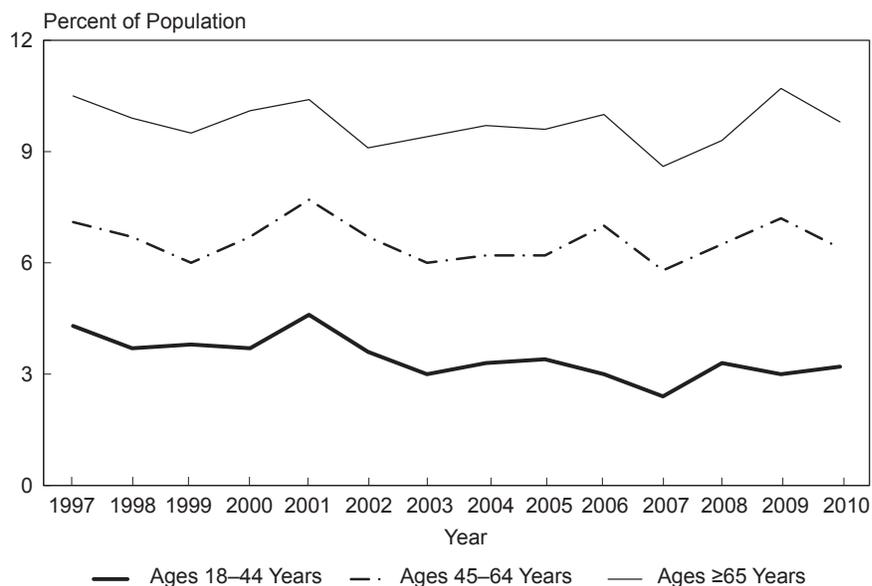
* Physician-diagnosed COPD only.

Chart 4–6
Prevalence of Chronic Obstructive Pulmonary Disease*
by Age, Race, and Sex, U.S., 2010

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]

Percent of Population
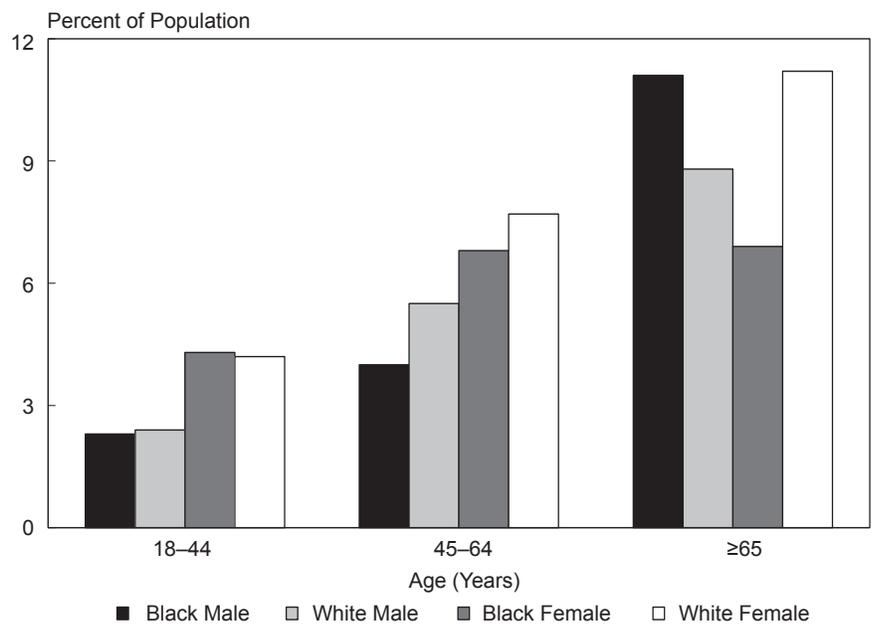
* Physician-diagnosed COPD only.

Chronic Obstructive Pulmonary Disease

Chart 4–7
Hospitalization Rates for Chronic Obstructive Pulmonary Disease,
Ages 45–64 and 65 and Older, U.S., 1995–2009

Hospitalizations/10,000 Population

Ages 45–64 Years   Ages ≥65 Years
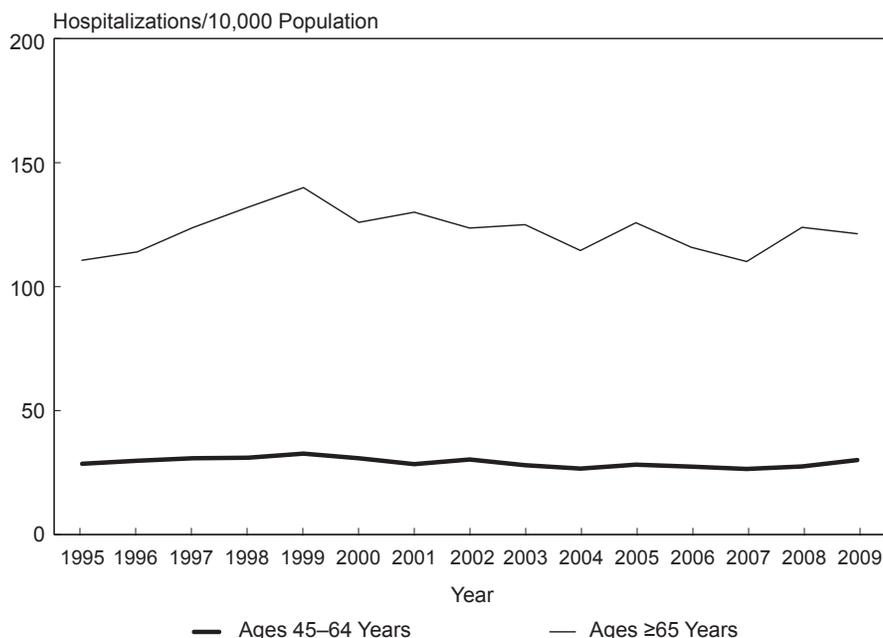
From 1995 to 2009 hospitalization rates for COPD were stable for those aged 45–64 years; for those aged 65 years and older, however, rates have fluctuated since 2001.[32]

Chart 4–8
Age-Adjusted Death Rates for Chronic Obstructive Pulmonary
Disease by Race and Sex, U.S., 1960–2008

Deaths/100,000 Population

Black* Male   White Male   Black* Female   White Female

* Nonwhite from 1960 to 1967.
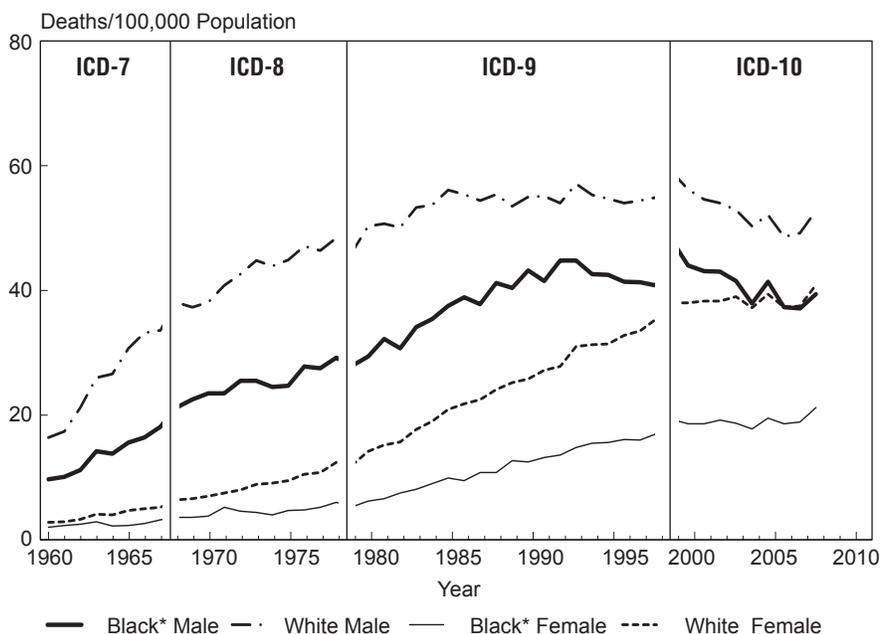
From 1960 to 1990, COPD mortality increased in black males, followed by a gradual turnaround and decline in the 2000s. In white males, COPD mortality peaked in 1985, remained stable throughout the 1990s, and declined during the 2000s. In white and black females, the rates increased until 1999 and then stabilized.[16, 30, 31, 37]

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]

Chart 4–9
Age-Adjusted Death Rates for Chronic Obstructive Pulmonary Disease by Race/Ethnicity and Sex, U.S., 1999–2008

Deaths/100,000 Population

* Non-Hispanic.

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]

Chart 4–10
Death Rates for Chronic Obstructive Pulmonary Disease in White Males by Age, U.S., 1960–2008

Deaths/100,000 Population
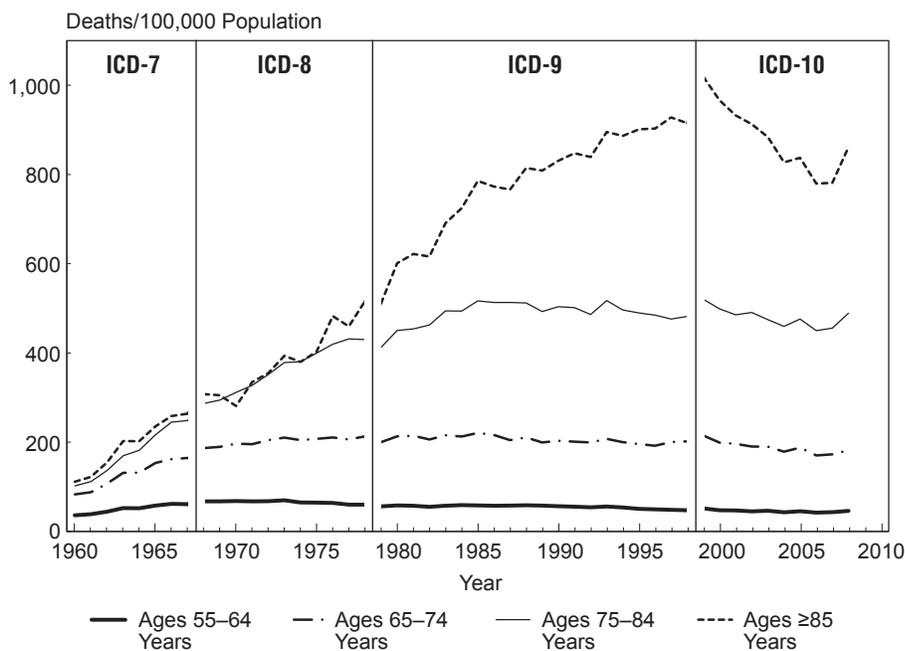
Chronic Obstructive Pulmonary Disease

Chart 4–11
Death Rates for Chronic Obstructive Pulmonary Disease
in Black* Males by Age, U.S., 1960–2008

Deaths/100,000 Population
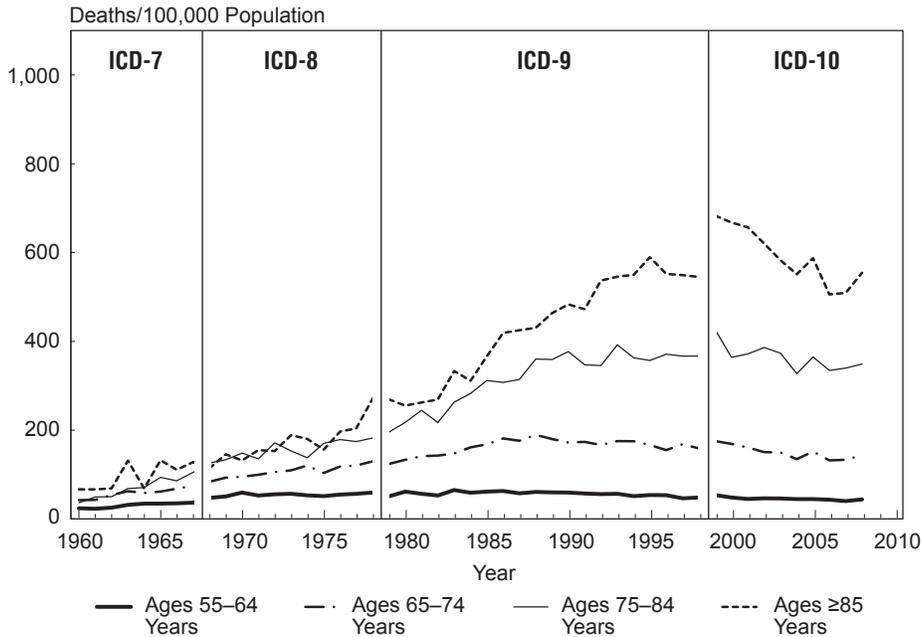
In black males, the 1960–2008 death rates for COPD changed from an increasing to a declining trend. In successive age groups, the change occurred later but was increasingly prominent.[16, 30, 31, 37]

Legend: Ages 55–64 Years; Ages 65–74 Years; Ages 75–84 Years; Ages ≥85 Years

* Nonwhite from 1960 to 1967.

Chart 4–12
Death Rates for Chronic Obstructive Pulmonary Disease
in White Females by Age, U.S., 1960–2008

Deaths/100,000 Population
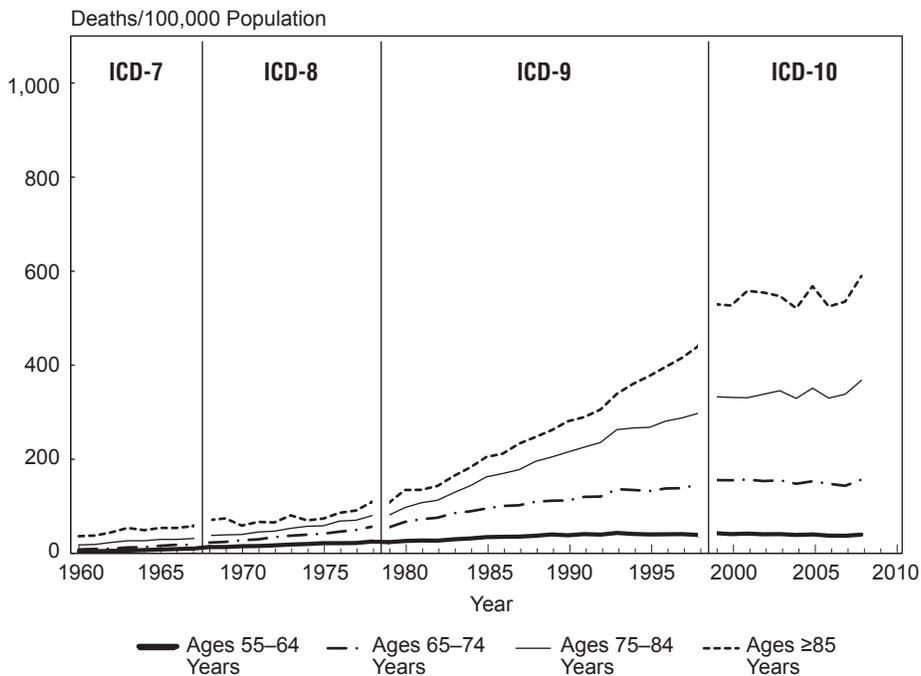
From 1960 to 1990, death rates for COPD increased in all age groups of white females. Rates stabilized among those aged 55–64 years in the 1990s and among those aged 65 years and older in the 2000s.[16, 30, 31, 37]

Legend: Ages 55–64 Years; Ages 65–74 Years; Ages 75–84 Years; Ages ≥85 Years

Chronic Obstructive Pulmonary Disease

Chart 4–13
Death Rates for Chronic Obstructive Pulmonary Disease
in Black* Females by Age, U.S., 1960–2008

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]
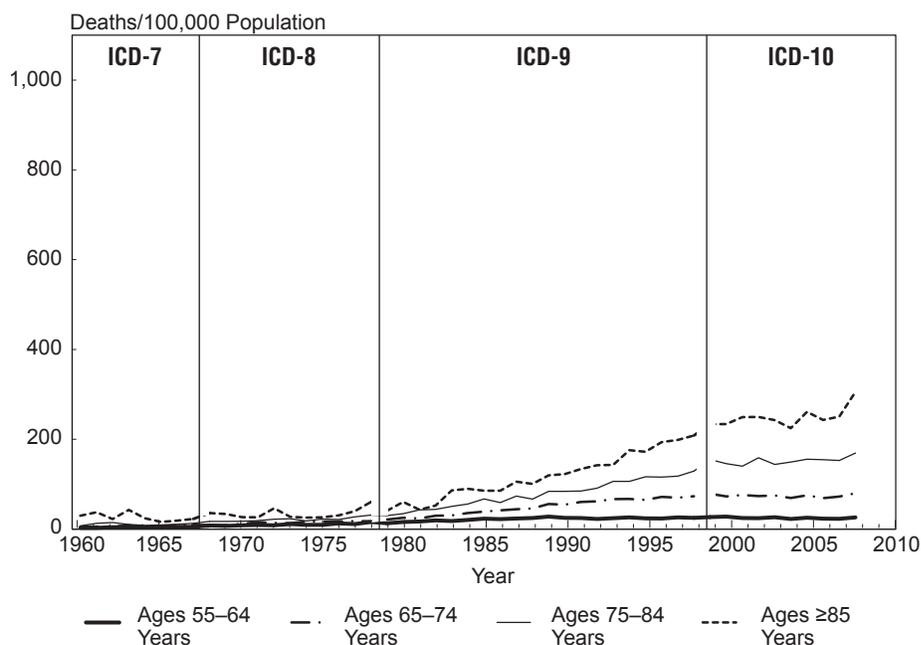
* Nonwhite from 1960 to 1967.

Chart 4–14
Age-Adjusted Death Rates for Chronic Obstructive Pulmonary
Disease by State, U.S., 2005–2007

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

Deaths/100,000 Population
- 48.3–59.1 (12)
- 44.0–48.2 (12)
- 37.0–43.9 (13)
- 17.7–36.9 (13)
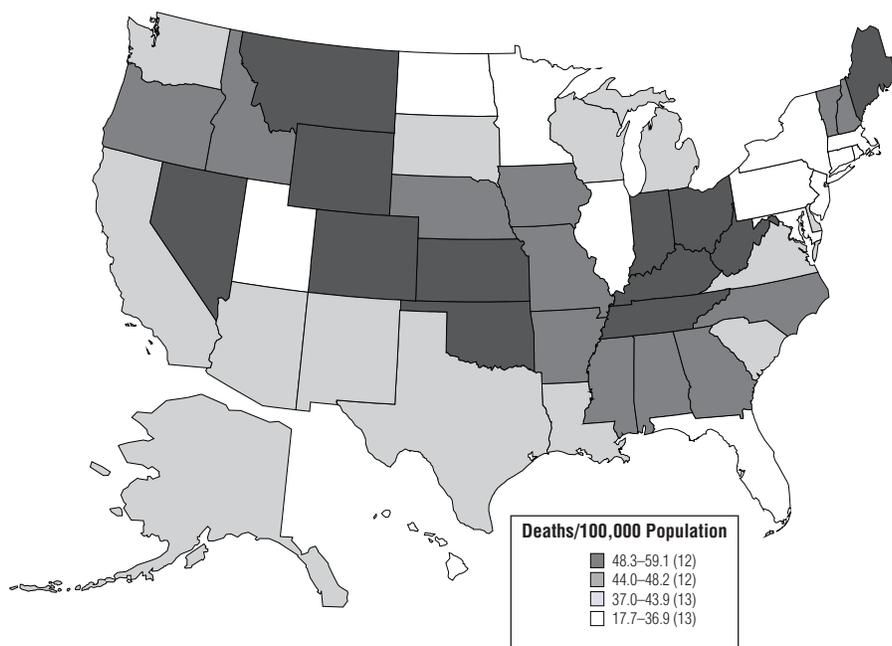
Chronic Obstructive Pulmonary Disease

Chart 4–15
Age-Adjusted Death Rates* for Chronic Obstructive
Pulmonary Disease by Country and Sex, Ages 35–74, 2006–2009[†]
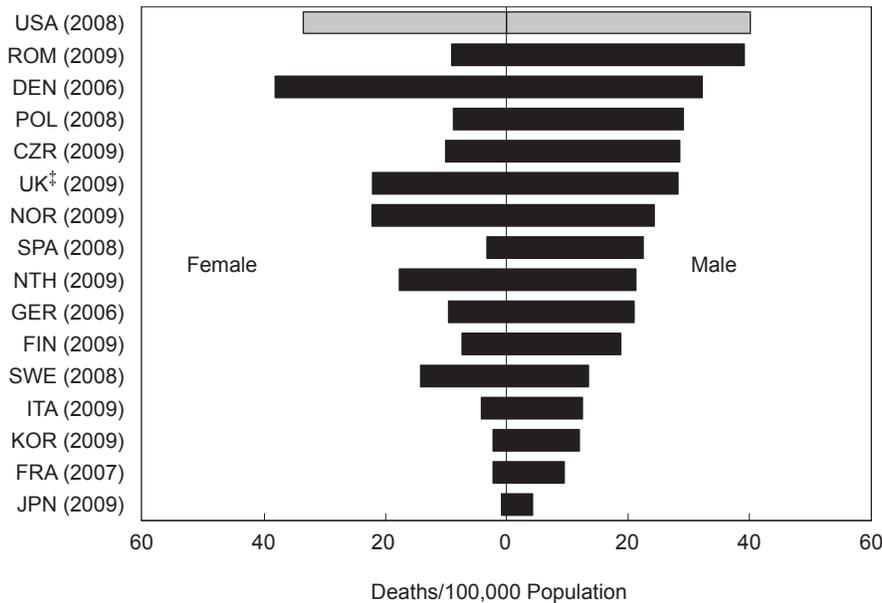
In 2006–2009, among 16 industrialized countries, the United States ranked highest in COPD mortality for males and second highest for females.[36]

* 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*.

Chart 4–16
Age-Adjusted Death Rates for Chronic Obstructive
**Pulmonary Disease by Race/Ethnicity and Sex, U.S., 2008**
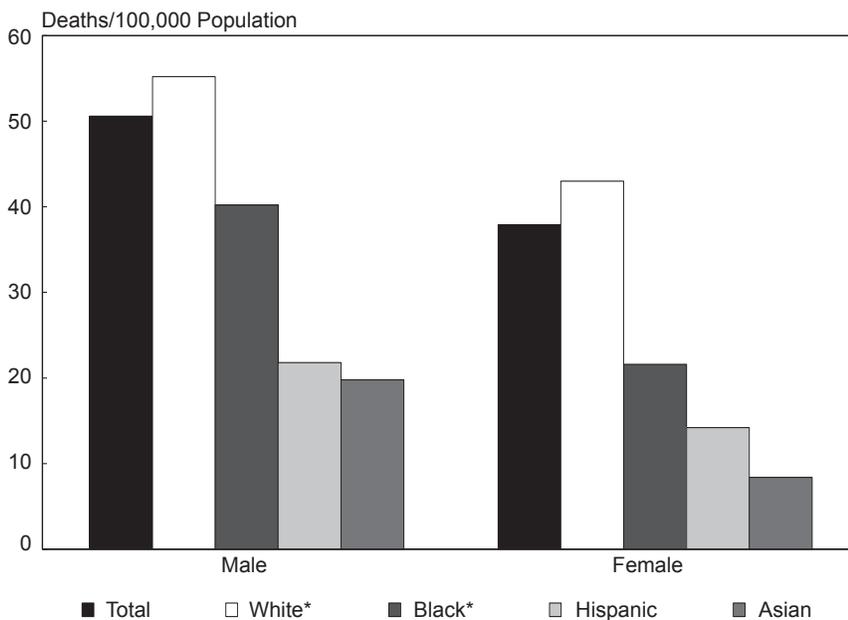
In 2008, COPD mortality was approximately one-third higher in males than in females. Within sex groups, it was highest among non-Hispanic whites and lowest among Asians.[31]

* Non-Hispanic.

Chronic Obstructive Pulmonary Disease/Asthma

Chart 4–17
Death Rates for Chronic Obstructive Pulmonary
Disease by Age, Race, and Sex, U.S., 2008

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]

Deaths/100,000 Population

Age (Years)

Black Male — · White Male — Black Female ---- White Female
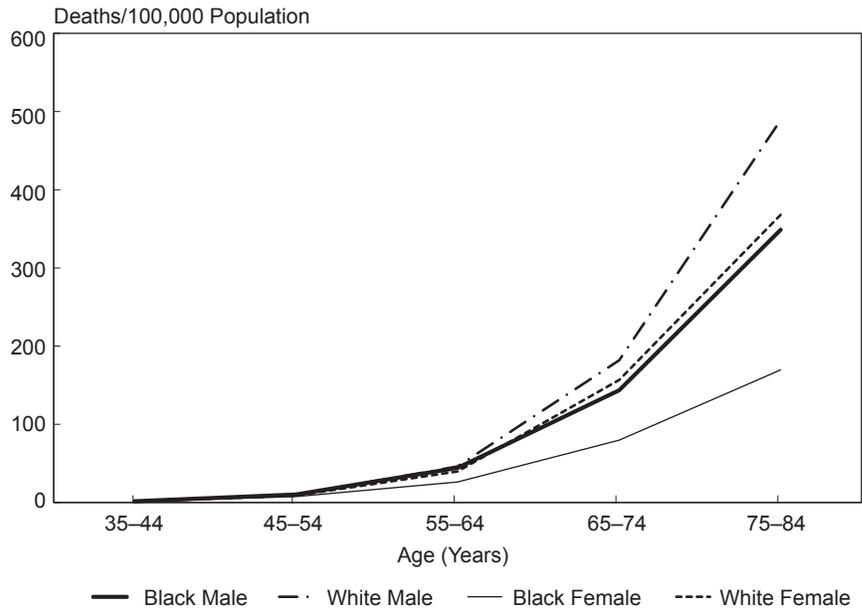
Chart 4–18
Prevalence of Asthma by Age,
U.S., 1997–2010

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]

Percent of Population

Lifetime prevalence

Current prevalence →

12-month attack prevalence

Year

— Ages <18 Years — Ages ≥18 Years
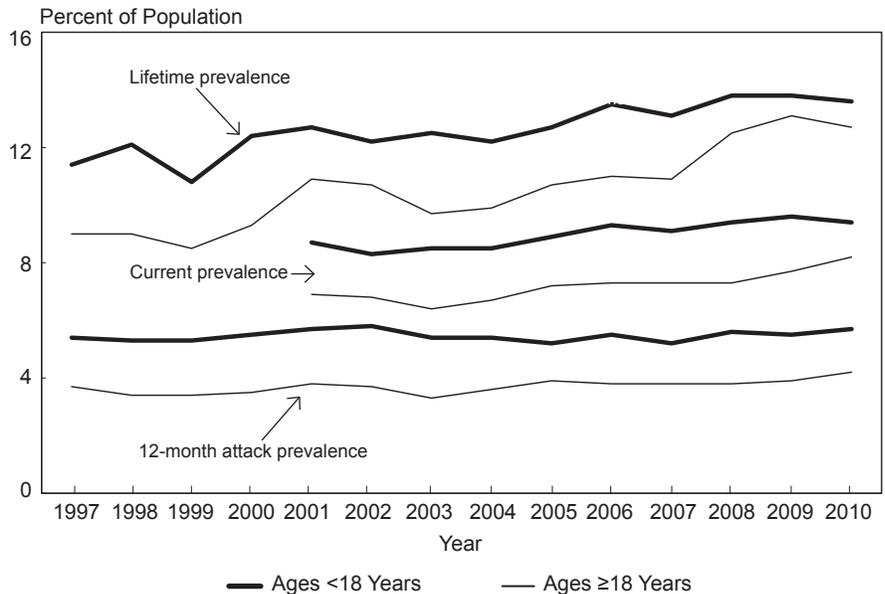
Asthma

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

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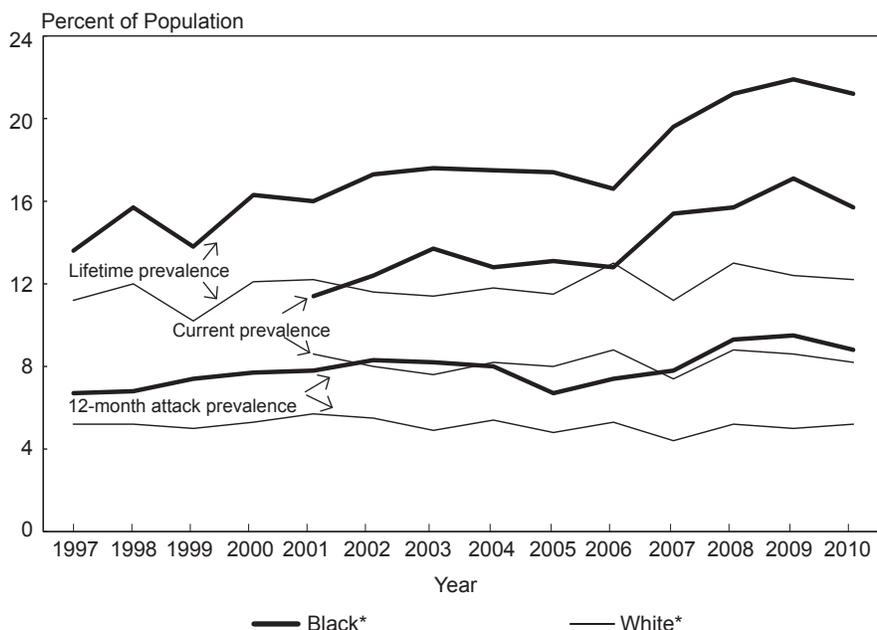
Lifetime (1997–2010), current (2001–2010), and attack prevalence (1997–2010) of asthma rose in non-Hispanic blacks younger than 18 years of age but remained relatively stable in non-Hispanic whites in the same age group. All three measures of asthma prevalence showed higher rates in non-Hispanic blacks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

* Non-Hispanic.

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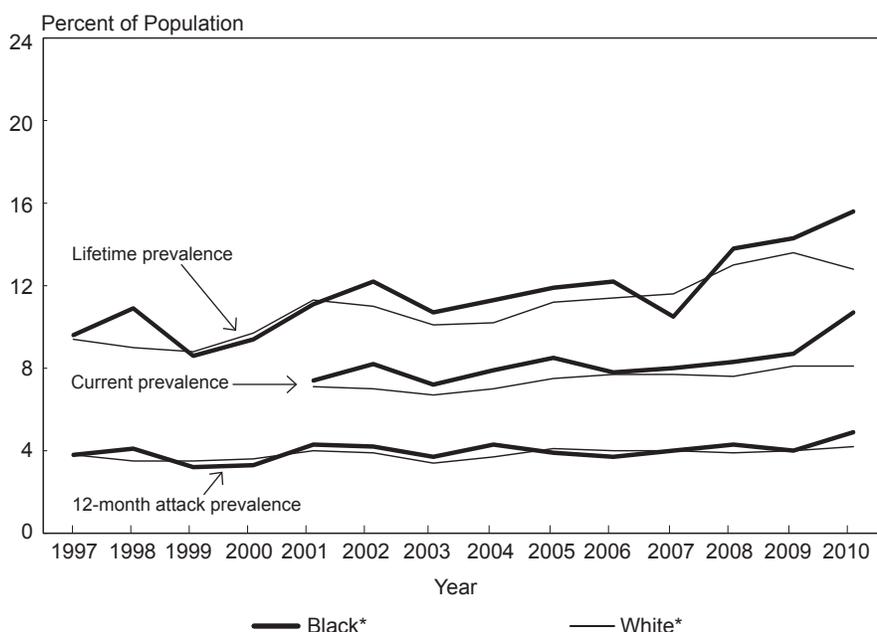
Percent of Population

Lifetime (1997–2010) and current prevalence (2001–2010) of asthma rose in non-Hispanic blacks and non-Hispanic whites aged 18 years and older. Attack prevalence (1997–2010) was stable in both groups.[25]

* Non-Hispanic.

Asthma

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

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]

Percent of Population

■ Total   □ Black*   ▩ White*   ▩ Hispanic

* Non-Hispanic.

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]

Percent of Population

■ Total   □ Black*   ▩ White*   ▩ Hispanic

* Non-Hispanic.

70

Asthma

Chart 4–23
Physician Office Visits for Asthma,
U.S., 1990–2009

Physician Office Visits (Millions)
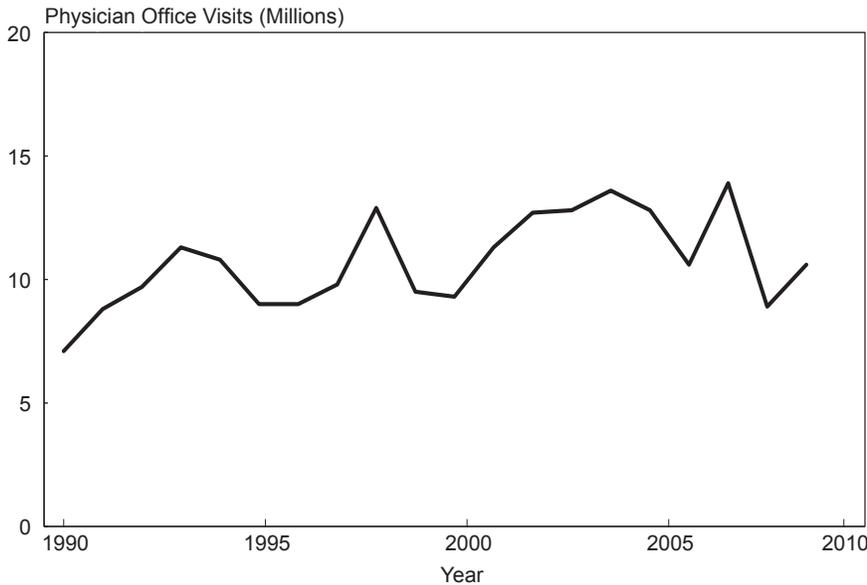
From 1990 to 2009, the number of physician office visits for asthma was erratic with no obvious trend.[34]

Chart 4–24
Emergency Department Visit Rates for Asthma
by Age and Sex, U.S., 1997–1999 to 2006–2008

Visits/10,000 Population
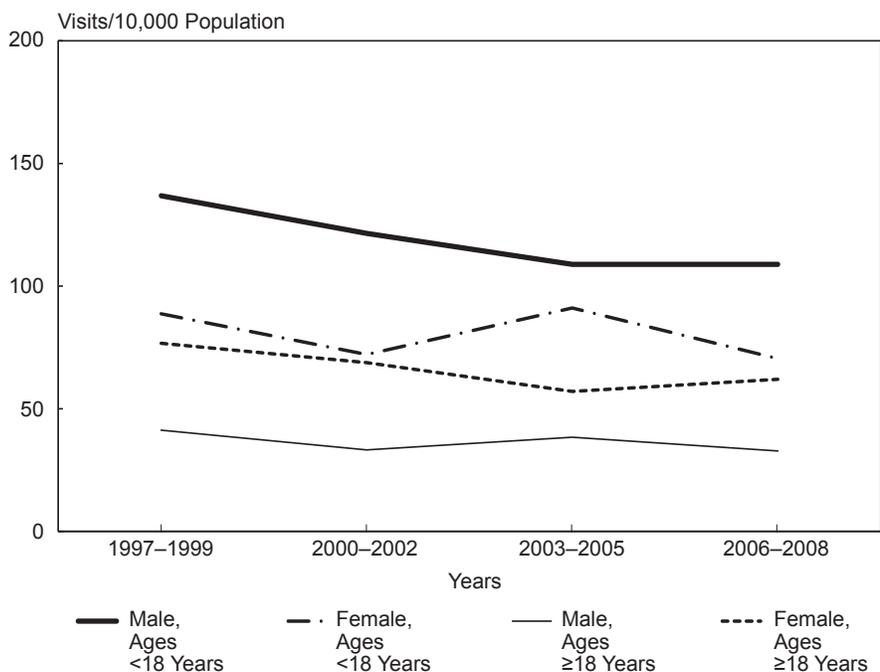
From 1997–1999 to 2006–2008, within age groups, emergency department visit rates for asthma were higher for males than females younger than 18 years of age but higher for females than males ages 18 years and older.[35]

Male, Ages <18 Years   Female, Ages <18 Years   Male, Ages ≥18 Years   Female, Ages ≥18 Years

71

Asthma

Chart 4–25
Emergency Department Visit Rates for Asthma
by Age and Sex, U.S., 2006–2008

In 2006–2008, emergency department visit rates for asthma declined in males with age.[35]

Visits/10,000 Population

[Bar chart showing visit rates by age group for Male and Female]

Age (Years)	Male	Female
0–4	165	86
5–9	125	79
10–17	62	55
18–24	58	82
25–44	37	74
45–64	23	56

Age (Years)

■ Male   □ Female
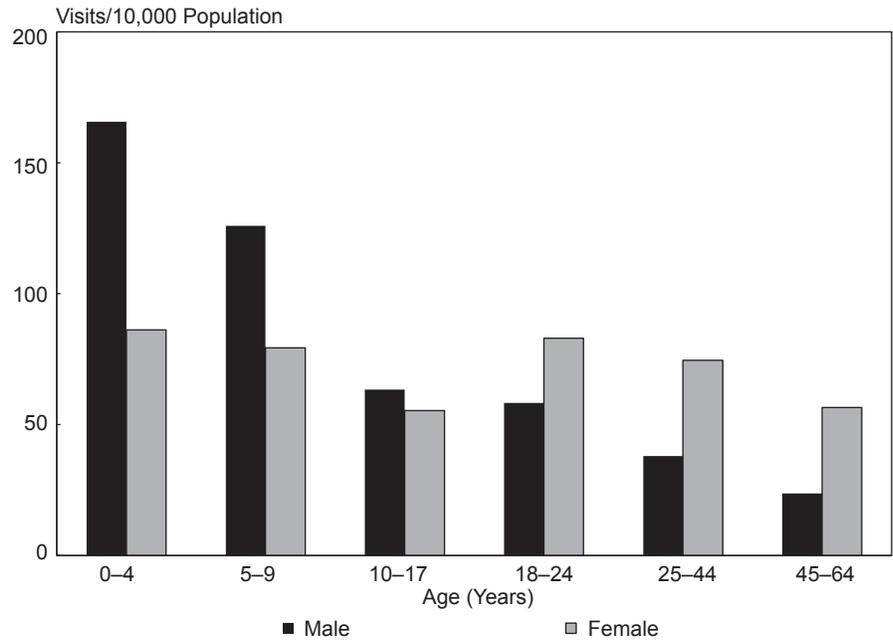
Chart 4–26
Hospitalizations for Asthma by Primary and Secondary
Diagnosis, U.S., 1980–2009

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.[32]

Hospitalizations (Thousands)

[Line chart showing Primary Diagnosis relatively flat around 400–600 from 1980–2009, and Secondary Diagnosis rising from about 200 in 1980 to about 1,550 in 2009]

Year

— Primary Diagnosis   — Secondary Diagnosis

Asthma

Chart 4–27
Hospitalization Rates for Asthma by Age, U.S., 1980–2009

Hospitalizations/10,000 Population

Ages <15 Years

Ages 15–44 Years

Ages 45–64 Years

Ages ≥65 Years

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

Deaths/100,000 Population

Male   Female

■ Total   □ Black*   ■ White*   ▨ Hispanic   ▨ Asian

* Non-Hispanic.

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]

73

Asthma

Chart 4–29
Age-Adjusted Death Rates for Asthma by Race
and Sex, Ages 1–24, U.S., 1980–2008

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.[16, 30, 31]

Deaths/100,000 Population

ICD-9   ICD-10

Year

— Black Male   — · White Male   — Black Female   ---- White Female
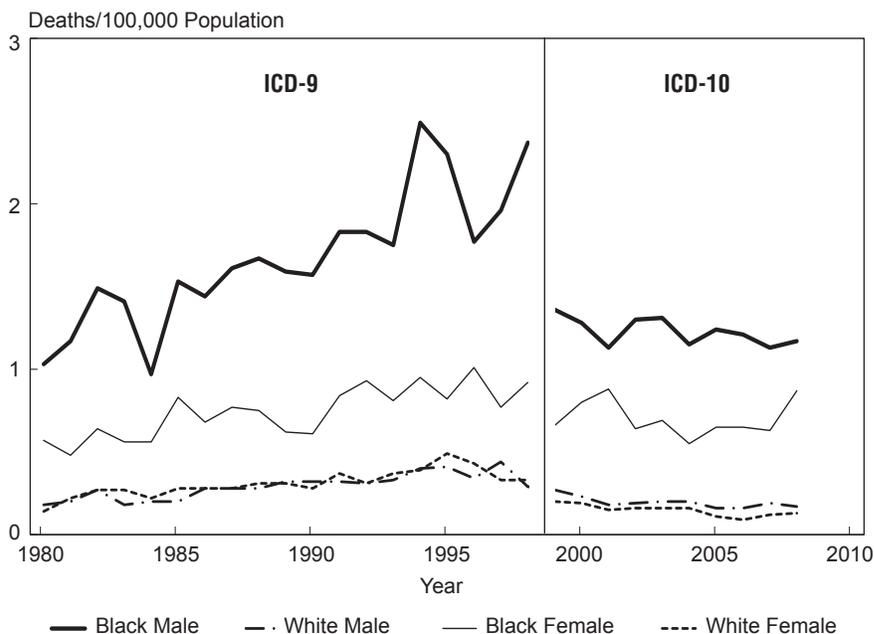
Chart 4–30
Age-Adjusted Death Rates for Asthma
by Race and Sex, U.S., 1980–2008

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.[16, 30, 31]

Deaths/100,000 Population

ICD-9   ICD-10

Year

— Black Male   — · White Male   — Black Female   ---- White Female

74
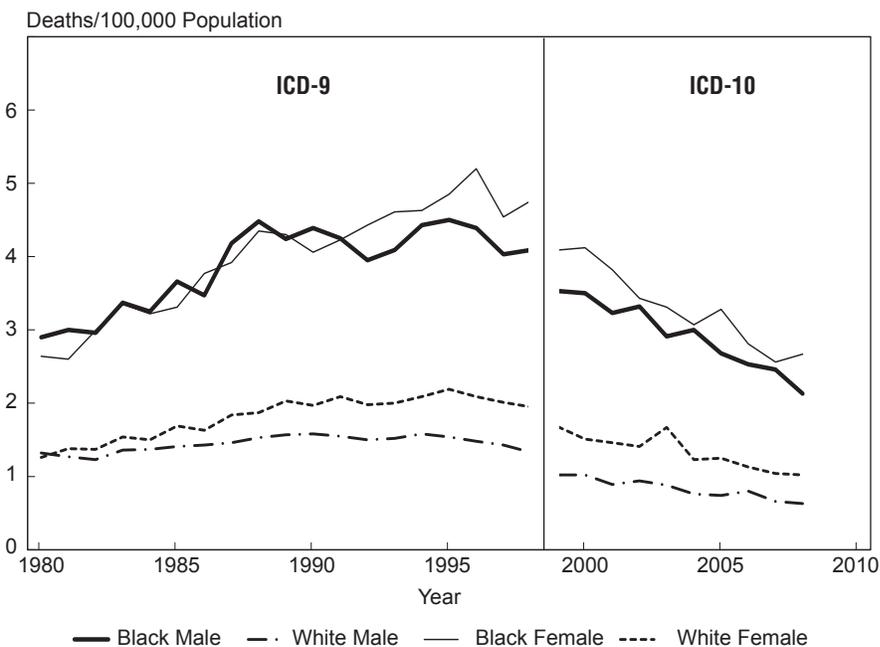
Asthma

Chart 4–31
Death Rates for Asthma by
Age, Race, and Sex, U.S., 1999–2008

Deaths/100,000 Population
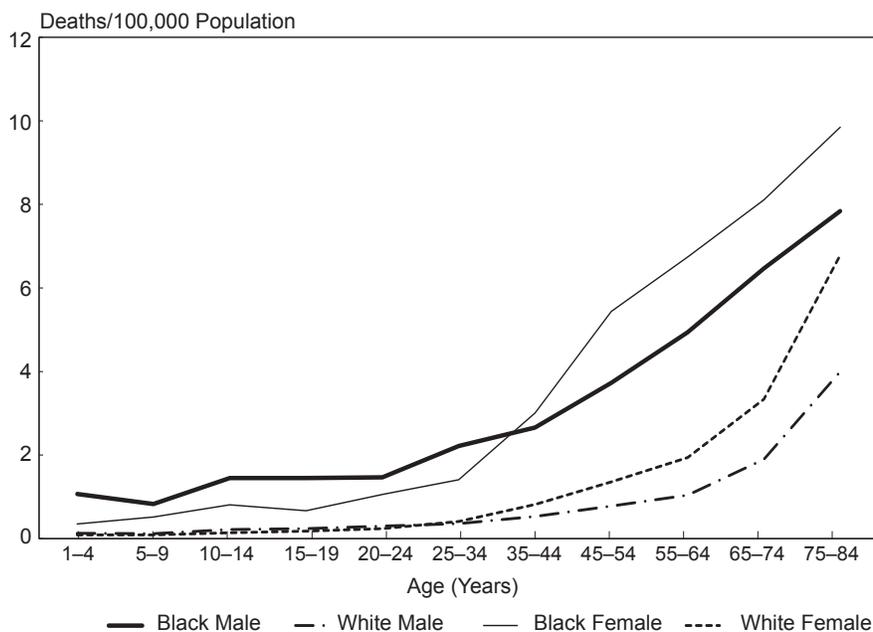
In 1999–2008, among blacks, asthma mortality was higher in males than in females aged 1–34 years, but was higher in females than in males aged 35–84 years. Among whites, asthma mortality was slightly higher in males than in females aged 1–24 years, but was higher in females than in males aged 25–84 years.[16, 30, 31]

Age (Years)

— Black Male   — · White Male   —— Black Female   ---- White Female

Chart 4–32
Age-Adjusted Death Rates* for Asthma
by Country and Sex, 2006–2009[†]
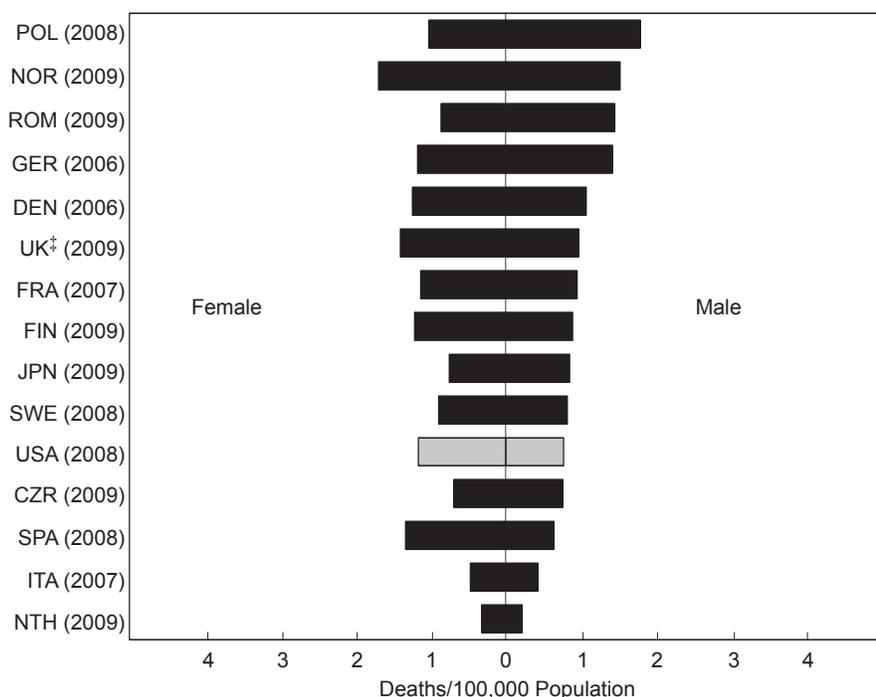
In 2006–2009, among 15 countries, the United States ranked 11th in asthma mortality for males and 7th for females.[36]

Deaths/100,000 Population

* 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

Chart 4–33
Infant Mortality Rate for Respiratory Distress
Syndrome, U.S., 1968–2007

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

Deaths/100,000 Live Births

Year
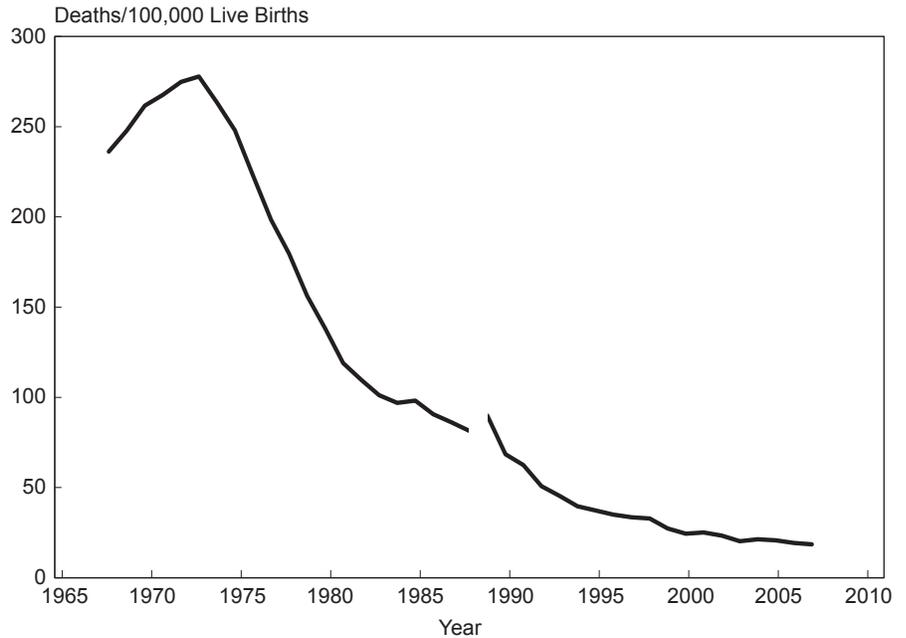
Chart 4–34
Infant Mortality Rate for Respiratory Distress
Syndrome by Race, U.S., 1980–2007

From 1980 to 2007, infant mortality for RDS decreased appreciably in blacks and whites, with rates remaining higher in blacks.[38, 39]

Deaths/100,000 Live Births

Year

— Black   — White

76
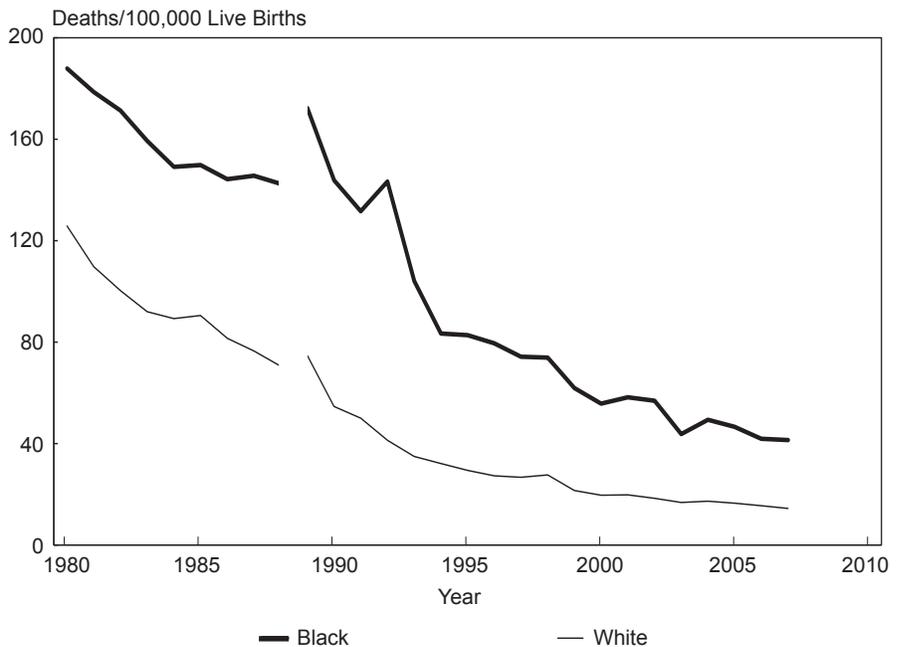
Respiratory Distress Syndrome/Sudden Infant Death Syndrome

Chart 4–35
Infant Mortality Rate for Respiratory Distress
Syndrome by Race/Ethnicity,* U.S., 2007

Deaths/100,000 Live Births
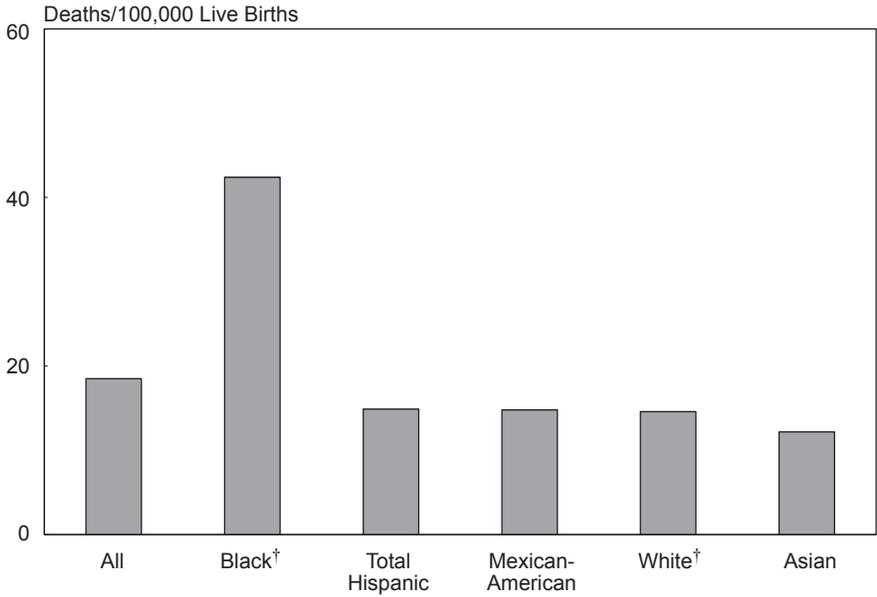
In 2007, infant mortality for RDS was highest in blacks and lowest in Asians, among the racial/ethnic groups shown.[39]

* 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

Deaths/100,000 Live Births
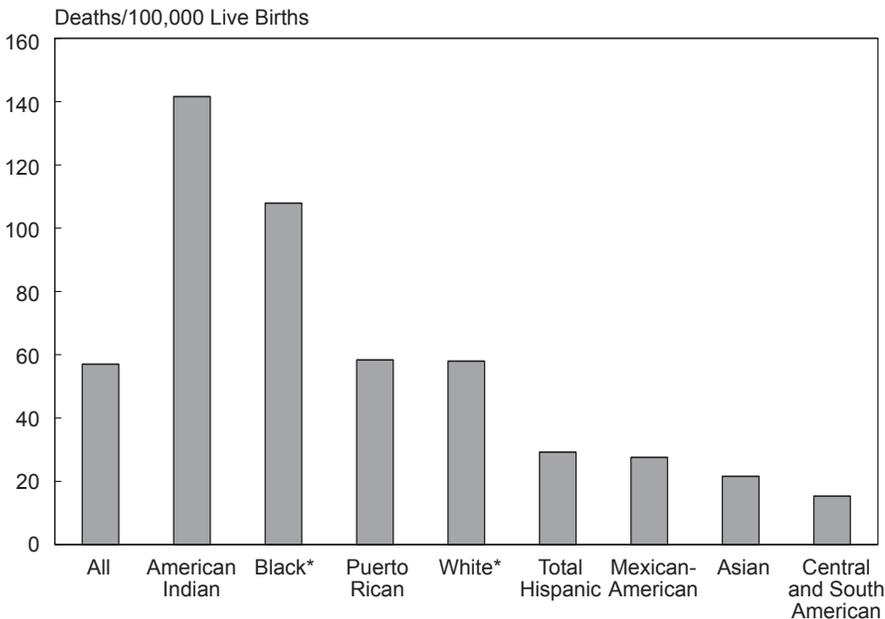
In 2007, mortality for SIDS was highest in American Indians and lowest in Central and South Americans.[38]

* 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.

Chart 5–1
Deaths From Blood Diseases,
Percent by Subgroup, U.S., 2008
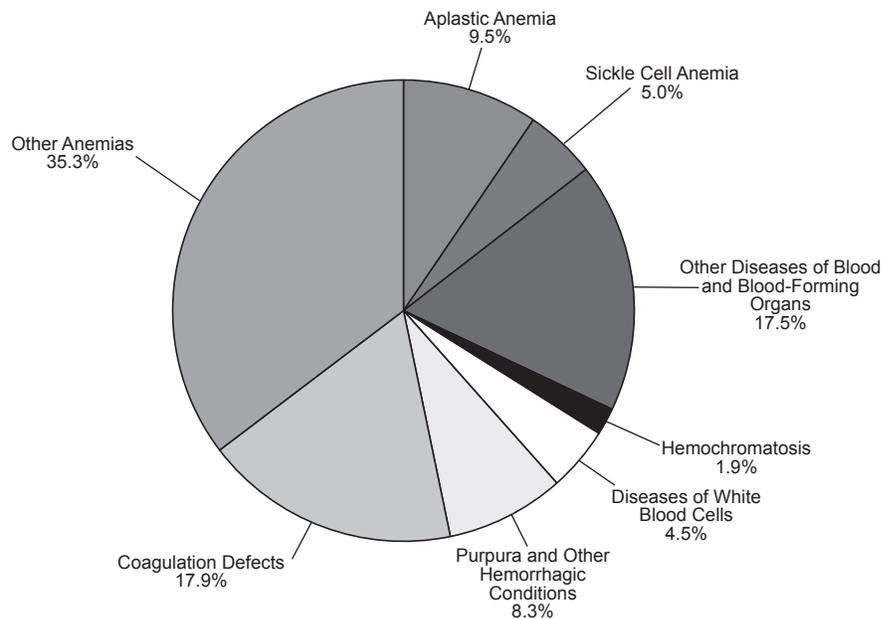
Total Deaths = 10,066 (100%)
Compiled from Vital Statistics of the United States, NCHS

Blood Diseases

Chart 5–2
Number of Hospitalizations, Physician Office Visits,*
and Deaths for Blood Diseases, U.S., 2008–2009[†]

Diagnostic Category	ICD-9 Codes	Hospitalizations for 2009		Physician Office Visits for 2009 (1,000)	ICD-10 Codes	Deaths for 2008
		First-Listed Discharges (1,000)	Length of Stay (Days)			
Total	280–289, 275	609	4.3	6,812	D50–D89, E83.1	10,066
Anemias	280–285	429	4.3	4,997	D50–D64	5,018
Iron deficiency anemia	280	88	3.3	916	D50	189
Other deficiency anemia	281	9	2.7	238	D51, D52	54
Thalassemia[‡]	282.4	14	3.1	68	D56	19
Sickle cell anemia	282.6	69	5.0	24	D57.0, D57.1	501
Aplastic anemia	284	40	4.9	20	D60, D61	960
Other and unspecified anemias	Other 282, 283, 285	209	4.6	3,731	Residual	3,295
Coagulation defects	286	10	5.5	203	D65–D68	1,800
Hemophilia: Factor VIII	286.0	2	10.5	52	D66	71
Hemophilia: Factor IX	286.1	—	—	—	D67	2
Other	286.2–286.9	8	4.1	151	Residual	1,727
Purpura and other hemorrhagic conditions	287	43	3.4	463	D69	831
Primary thrombocytopenia	287.3	17	3.4	267	D69.3, D69.4	363
Unspecified thrombocytopenia	287.4	3	6.0	—	D69.5, D69.6	436
Other	287.0–287.2; 287.5–287.9	23	3.2	196	Residual	32
Diseases of white blood cells	288	74	4.1	619	D70–D72	458
Other diseases of blood and blood-forming organs	289	20	3.2	163	D73–D89	1,766
Hemochromatosis	275	33	6.5	367	E83.1	193

* 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.

Aplastic Anemia

Chart 5–3
Hospitalizations for Aplastic Anemia by Primary
and Secondary Diagnosis, U.S., 1988–2009

Hospitalizations (Thousands)
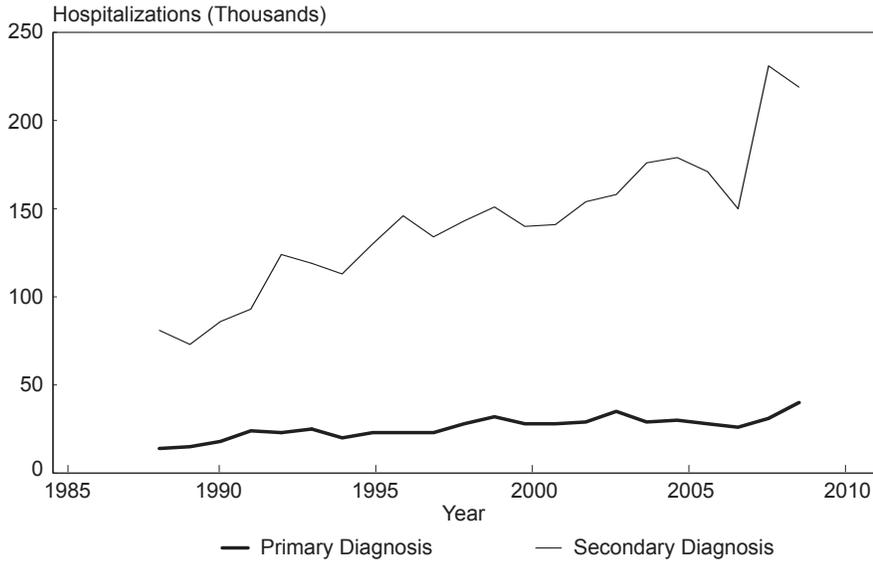
In 2009, the number of hospitalizations for aplastic anemia as a primary diagnosis was more than twice as high as it was in 1990; as a secondary diagnosis, it was 2.5 times higher in 2009 than in 1990.[16, 32]

Chart 5–4
Age-Adjusted Death Rates* for Aplastic Anemia
by Race and Sex, U.S., 2004–2007

Deaths/100,000 Population
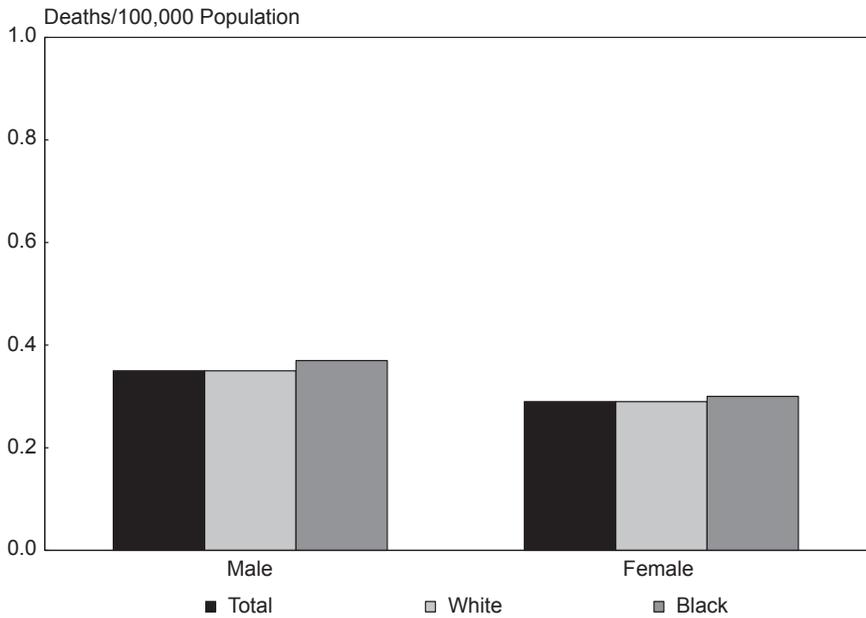
In 2004–2007, mortality from aplastic anemia was similar in blacks and whites. Overall, it was 20% higher in males than in females.[16]

* Average annual rates.

Aplastic Anemia/Sickle Cell Anemia

Chart 5–5
Death Rates* for Aplastic Anemia
by Age, Race, and Sex, U.S., 2004–2007[†]

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.[16, 32]

Deaths/100,000 Population
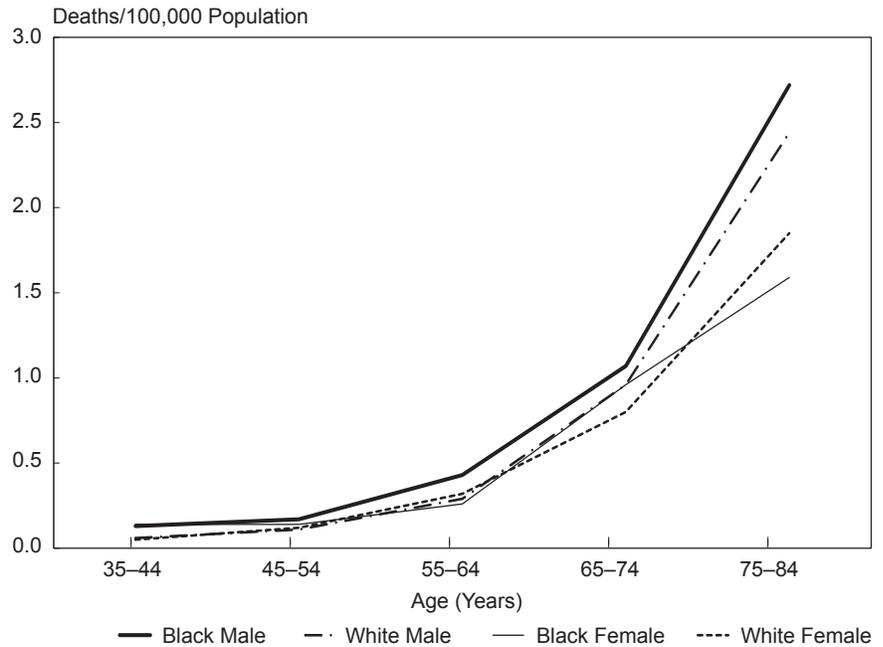
* Average annual rates.
[†] Rates are unreliable for black males aged 35–54 years and black females aged 35–64 years.

Chart 5–6
Hospitalization Rates for Sickle Cell Anemia in Blacks,
Ages Younger Than 15 and 15–44, U.S., 1988–2009

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.[32]

Hospitalizations/10,000 Population
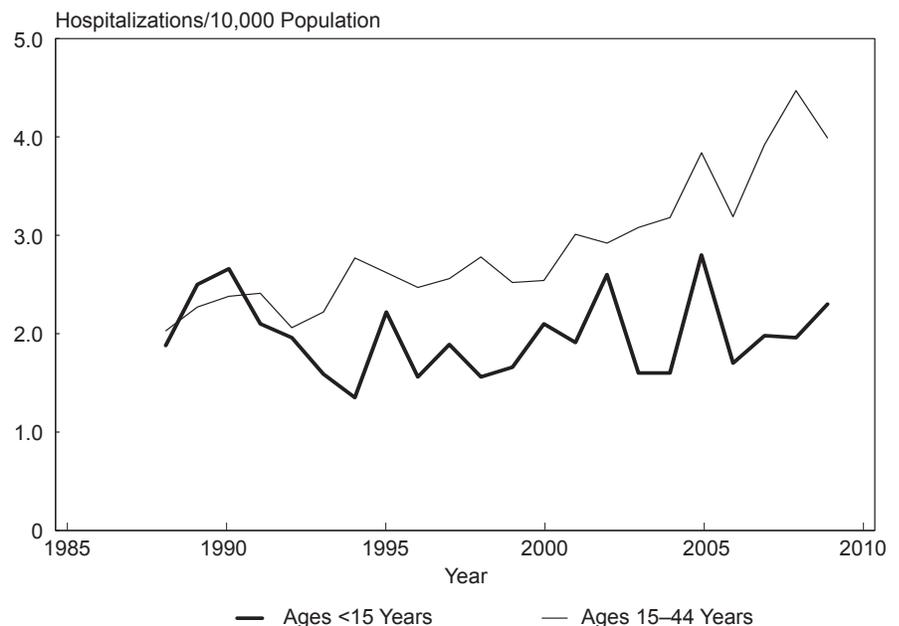
Sickle Cell Anemia

Chart 5–7
Age-Adjusted Death Rates* for Sickle Cell Anemia in Blacks by Sex, U.S., 1980–1984 to 2003–2007

Deaths/100,000 Population
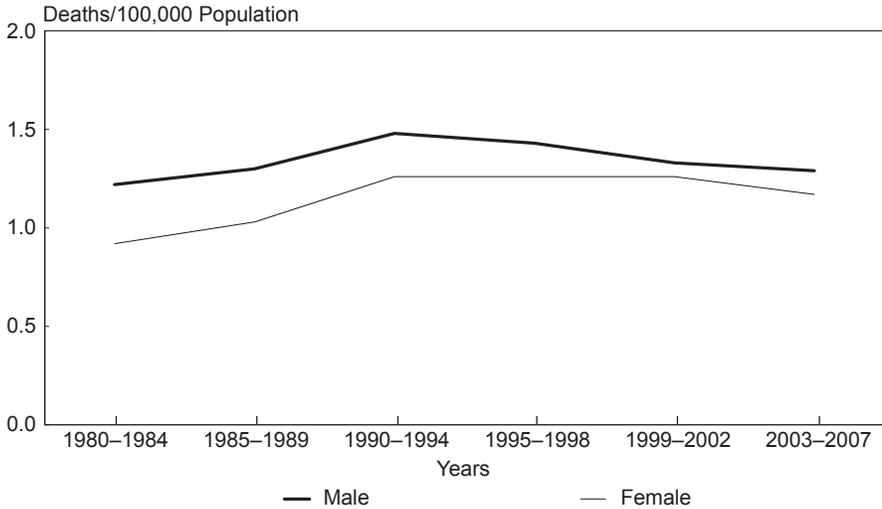
From 1980–1984 to 1990–1994, death rates for sickle cell anemia rose for black males and females. Since then, death rates slowly declined for black males through 2003–2007; in black females, rates remained unchanged before declining in 2003–2007.[16]

* Average annual rates.

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

Deaths/100,000 Population

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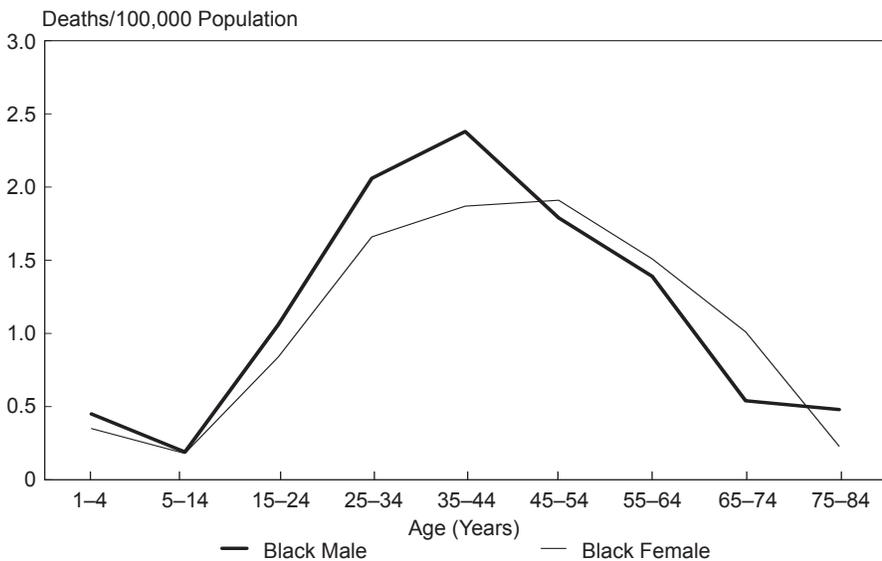
* Average annual rates.
[†] Rates are unreliable for black males aged 5–14 and 65–74 years and black females aged 5–14 and 75–84 years.

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)

Diagnostic Term in *Chart Book*	ICD-6 1949–1957	ICD-7 1958–1967	ICDA-8 1968–1978	ICD-9 1979–1998	ICD-10 1999–
Cardiovascular diseases[a]	330–334, 400–468	330–334, 400–468	390–458	390–459	I00–I99
Heart disease	400–402, 410–443	400–402, 410–443	390–398	390–398, 402, 404–429	I00–I09, I11, I13, I20–I51
Coronary heart disease[b]	420, 422	420, 422	410–413	410–414, 429.2	I20–I25
Acute myocardial infarction	*	*	410	410	I21, I22
Heart failure[c]	†	†	427.0, 427.1	428	I50
Congestive heart failure	†	†	427.0	428	I50.1
Cardiomyopathy	†	†	†	425	I42
Cerebrovascular disease (stroke)[d]	330–334	330–334	430–438	430–438	I60–I69
Diseases of arteries	450–456	450–456	440–448	440–448	I70–I78
Congenital malformations of the circulatory system[e]	†	†	746–747	745–747	Q20–Q28
Chronic lower respiratory diseases[f]	†	†	†	490–496	J40–J47
Chronic obstructive pulmonary disease[g]	500–502, 527.1	500–502, 527.1	490–492, 519.3	490–492, 494–496	J40–J44, J47
Asthma[h]	241	241	493	493	J45, J46
Respiratory distress syndrome[i]	†	†	776.1, 776.2	769	P22
Sudden infant death syndrome	†	†	†	†	R95

[a] The ICD term is diseases of the circulatory system.

[b] The ICD-6 and ICD-7 term is arteriosclerotic heart disease; the ICDA-8, ICD-9, and ICD-10 term is ischemic heart disease.

[c] The ICDA-8 terms are congestive heart failure and left ventricular failure. The ICD-9 and ICD-10 term is heart failure.

[d] 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.

[e] 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.

[f] The ICD-9 term is chronic obstructive pulmonary disease and allied conditions.

[g] 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.

[h] The ICD-6 through ICD-9 term is asthma; the ICD-10 terms are asthma and status asthmaticus.

[i] 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.

Cause of Death	Codes of the Classification of International Diseases		Number of Deaths*		Comparability Ratio
	ICD-10	ICD-9	ICD-10	ICD-9	
Major cardiovascular diseases	I00–I78	390–434, 436–448	942,439	945,945	0.9963
Diseases of the heart	I00–I09, I11, I13, I20–I51	390–398, 402, 404, 410–429	719, 631	730,444	0.9852
Coronary heart disease	I20–I25	410-414, 429.2	543, 063	542,728	1.0006
Heart failure	I50	428	48,876	47,052	1.0388
Cerebrovascular disease (stroke)	I60–I69	430–434, 436–438	166,837	158,855	1.0502
COPD	J40–J44	490–492, 494, 496	104,775	99,797	1.0499
Asthma	J45–J46	493	4,971	5,614	0.8855
RDS[†]	P22	769	2,904	3,144	0.9237

* From a sample of deaths in 1996.[9]

[†] Infant deaths.

Appendix C

Definition of Terms

Age-adjusted death rate: 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.[11]

Any mention mortality: 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.[31]

Chronic condition: 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.[40]

Comparability ratio: 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 proceeding 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.[9]

Emergency department: 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.[40]

Hospitalization: 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.[40]

Incidence: Incidence is the number of cases with onset during a specified period of time, usually a year.[40]

Infant mortality rate: 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.[40]

Limited in activity: Also called chronic activity limitation, it refers to the limitation of a person's usual activity due to a chronic condition.[40]

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)

CZR	Czech Republic
DEN	Denmark
FIN	Finland
FRA	France
GER	Germany
HUN	Hungary
ITA	Italy
JPN	Japan
KOR	Republic of Korea
NOR	Norway
NTH	Netherlands
POL	Poland
ROM	Romania
SPA	Spain
SWE	Sweden
UK	United Kingdom
USA	United States of America

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