chart book

MORBIDITY & MORTALITY: 2009 CHART BOOK ON CARDIOVASCULAR, LUNG, AND BLOOD DISEASES

The bar graph on the front cover depicts
the four leading causes of death in 2006:
HEART DISEASE, cancer, STROKE, and
COPD AND ALLIED CONDITIONS.

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MORTALITY:
2009 CHART BOOK
ON CARDIOVASCULAR,
LUNG, AND BLOOD
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OCTOBER 2009

FOR ADMINISTRATIVE USE

NATIONAL INSTITUTES

OF HEALTH

National Heart, Lung,
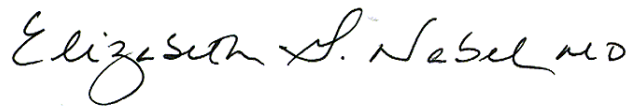
and Blood Institute

Foreword

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

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 Mr. Thomas Thom of the NHLBI for his time and effort in developing the material presented in this *Chart Book*.

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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. Diseases included in a chapter are listed in the first table of the chapter, together with appropriate diagnostic codes of the ninth revision of the clinical modification of the International Classification (ICD-9-CM) for hospitalizations and physician office visit data, and tenth revision of the *International Classification of Diseases* (ICD) of the World Health Organization (WHO) for mortality.[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, 1999–2002, and 2003–2006; the annual National Hospital Discharge Survey (NHDS); and the annual National Ambulatory Medical Care Survey. International mortality data came from the WHO Web site.

It is beyond the scope of the *Chart Book* to cite all of the NCHS and Bureau of the Census publications, data tapes, and Web sites 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.

Quality of Data

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

Prevalence

Diagnosis for most 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 measure 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.[4]

In 1988, the NCHS redesigned the NHDS to link it with other surveys conducted by NCHS and to improve efficiency. The new survey occasionally resulted in a sudden shift in the level of rates after 1987.[5] For this reason, charts display a break in the trend lines for hospitalization rates between the transitional years 1987–1988.

Cause-of-Death Statistics

Limitations of cause-of-death statistics, apart from discontinuities over time caused by 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 uncertainties 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. Almost all mortality statistics presented here are limited to the underlying cause because that provides the consistency needed for the best comparison among causes of death.

Heart failure, which is nominally classified as the underlying cause for some deaths only because the true underlying cause was not known, is an exception (see Chapter 3). Heart failure mortality is presented two ways: As the underlying cause and as "any mention" cause. "Any mention" mortality means that the condition was selected as the underlying cause or was otherwise mentioned on the death certificate.

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 presented in this book is limited to 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.[6]

Beginning in 1989, the U.S. Standard Certificate of Death was revised. One reason was to improve the medical certification of cause of death.[7] Because the revision could affect time–trend comparability, mortality trend lines between 1988 and 1989 are not connected.

ICD Revisions

Revisions in the ICD codes (Appendix A) cause discontinuity in 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 or comparability ratios have been applied. 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 3–55), NCHS-derived comparability ratios (Appendix B) have been applied to the death rates coded by ICD-9.[8]

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 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.[9–11] The European standard population is applied for age adjustment of international mortality statistics.[12]

The major disadvantage of using age-adjusted rates is loss of age-specific information. This becomes evident when the population groups being compared have mortality differences that are not in the same direction over a given age range. For example, the bar chart for mortality from total lung diseases (Chart 4–3) has a higher age-adjusted rate for white females than for black females. The age-specific line chart (Chart 4–4), however, shows that for ages 35–64 years, black females have higher rates than white females, but for ages 65–84 years, white females have higher rates than black females.

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.[13] 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. Average annual percent changes give the appearance of small differences in the comparisons being made.

An exception to the use of log-linear regression to calculate percent change is made for Chart 3–6. For this chart, it is useful to have the percent change and other calculations based on the actual death rates.

Horizontal and 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.

Demographic Characteristics

The *Chart Book* provides prevalence and mortality information for various racial and ethnic groups. Several charts show comparisons between blacks and whites.

However, for mortality prior to 1968, data for nonwhites instead of blacks are presented. 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.[14]

State Mortality

Death rates for total population by State are shown in maps for CVD, CHD, stroke, and COPD.[15] 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). For instance, stroke mortality is high in Southern States, reflecting high mortality in both blacks and whites. Although rankings of certain States for CHD mortality differ considerably from rankings for total heart disease, their geographic patterns are not very different.[16]

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.[17–21] It should be noted that individuals with multiple CVD are counted for each condition that applies to them.

Table 2–1. CVD Prevalence, U.S.	
CVD	81,100,000
Hypertension	74,500,000
CHD	17,600,000
Acute Myocardial Infarction (AMI)	8,500,000
Angina Pectoris	10,200,000
Stroke	6,400,000
Heart Failure	5,800,000
Congenital Heart Defects	1,000,000
Atrial Fibrillation	2,200,000
Peripheral Arterial Disease	8,000,000

Table 2–2 contains estimates for the annual occurrence of CVD in the United States.[21–23]

Table 2–2. CVD Incidence and Recurrence, 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

An estimated 24 million U.S. adults have COPD: 12 million physician-diagnosed and 12 undiagnosed.[24–25] An estimated 23 million individuals have asthma and 12 million of them experienced at least one asthma attack during the survey year.[26–28] Approximately 30,000 people have cystic fibrosis, and 1 in 3,000 babies are born with the disease; 40,000 infants and 150,000 adults have respiratory distress syndrome; and about 12 million persons have obstructive sleep apnea.

In this chapter, charts showing leading causes of death combine asthma with COPD and list the category as *COPD and allied conditions*. The ICD-10 term is *chronic lower respiratory diseases*.

Blood Diseases

An estimated 70,000 blacks 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 Cooley's anemia.

Population

Population estimates in Chart 2–1 are based on the 2000 U.S. Census and population surveys and projections. Estimates in Chart 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., 2007

In 2007, 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.[29]

	Total Population			Male			Female		
	Pop. (Mil.)	Mean Age	Percent ≥65	Pop. (Mil.)	Mean Age	Percent ≥65	Pop. (Mil.)	Mean Age	Percent ≥65
Total	301.6	36.8	12.6	148.6	35.6	10.8	153.0	38.0	14.3
White	241.2	38.4	13.7	119.5	37.2	11.7	121.6	39.6	15.6
Hispanic	(42.1)	(28.6)	(5.6)	(21.8)	(29.1)	(4.6)	(20.3)	(30.2)	(6.7)
Non-Hispanic	(199.1)	(40.2)	(15.4)	(97.7)	(39.0)	(13.3)	(101.3)	(41.5)	(17.4)
Black	38.8	32.2	8.1	17.9	30.8	6.5	19.6	33.6	9.6
Hispanic	(1.7)	(28.3)	(5.0)	(0.8)	(27.3)	(4.1)	(0.9)	(29.2)	(5.5)
Non-Hispanic	(37.0)	(33.0)	(8.5)	(17.6)	(31.4)	(6.8)	(19.4)	(34.4)	(10.0)
American Indian*	2.9	32.9	7.2	1.5	32.2	6.4	1.5	33.5	8.1
Asian*	13.4	36.0	9.2	6.5	35.0	8.2	6.9	37.0	10.2
Hispanic†	45.5	29.5	5.5	23.5	29.0	4.6	22.0	30.1	6.5

* Estimates for Hispanic American Indians and Hispanic Asians are not available.
† 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 19.4% Hispanic, 13.0% black, and 5.5% Asian, and 16.1% will be aged 65 and older.[30]

	Total Population			Male			Female		
	Pop. (Mil.)	Mean Age	Percent ≥65	Pop. (Mil.)	Mean Age	Percent ≥65	Pop. (Mil.)	Mean Age	Percent ≥65
Total	341.6	38.4	16.1	168.3	37.3	14.5	173.1	39.4	17.6
White	266.3	39.3	17.4	132.2	38.3	15.8	134.1	40.3	19.0
Hispanic	(61.0)	(31.1)	(7.7)	(30.9)	(30.6)	(6.7)	(30.1)	(31.6)	(8.7)
Non-Hispanic	(205.3)	(41.8)	(20.3)	(101.3)	(40.7)	(18.6)	(103.9)	(42.8)	(22.0)
Black	44.4	35.3	11.4	21.3	33.8	9.4	23.1	36.8	13.3
Hispanic	(2.5)	(29.7)	(6.9)	(1.2)	(28.6)	(5.9)	(1.3)	(30.7)	(7.8)
Non-Hispanic	(41.8)	(35.7)	(11.7)	(20.0)	(34.1)	(9.6)	(21.8)	(37.2)	(13.6)
American Indian*	3.8	33.8	10.9	1.9	33.1	9.9	1.9	34.6	12.0
Asian*	18.8	38.2	13.0	8.8	37.1	11.8	10.0	39.2	14.1
Hispanic†	66.4	30.9	7.6	33.6	30.3	6.6	32.8	31.4	8.6

* 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., 2006

In 2006, average life expectancy at birth was 77.7 years—80.4 years for females compared with 75.1 for males, and 78.2 years for whites compared with 73.2 years for blacks.[31]

Age (Years)	Total	Male	Female	Total White	White Male	White Female	Total Black	Black Male	Black Female
Birth	77.7	75.1	80.4	78.2	75.7	80.6	73.2	69.7	76.5
15	63.4	60.9	65.9	63.8	61.3	66.1	59.5	56.0	62.7
35	44.4	42.2	46.4	44.7	42.6	46.7	40.9	37.9	43.5
65	18.5	17.0	19.7	18.6	17.1	19.8	17.1	15.1	18.6
75	11.6	10.5	12.3	11.5	10.5	12.3	11.1	9.8	12.0

Background Data

Chart 2–4
Age-Adjusted Death Rates for All Causes
by Race and Sex, U.S., 1950–2006

Deaths/100,000 Population

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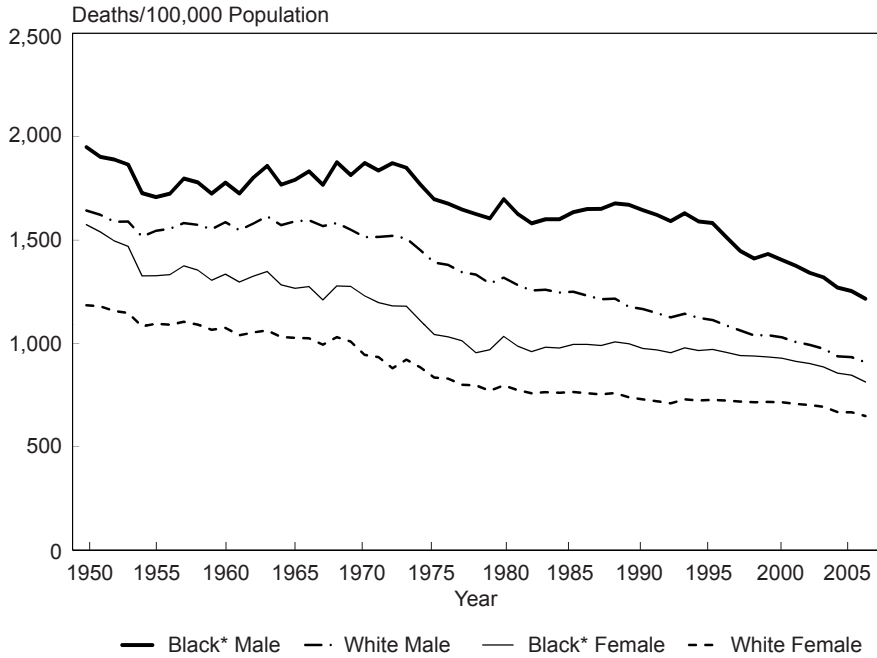
* Nonwhite from 1950 to 1967.

From 1950 to 2006, 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.[15, 32]

Chart 2–5
Unadjusted Death Rates for Selected Causes,
U.S., 1950–2006

Deaths/100,000 Population

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

— CHD   — Stroke   – – Lung Cancer   – – – Other Cancer   — · COPD
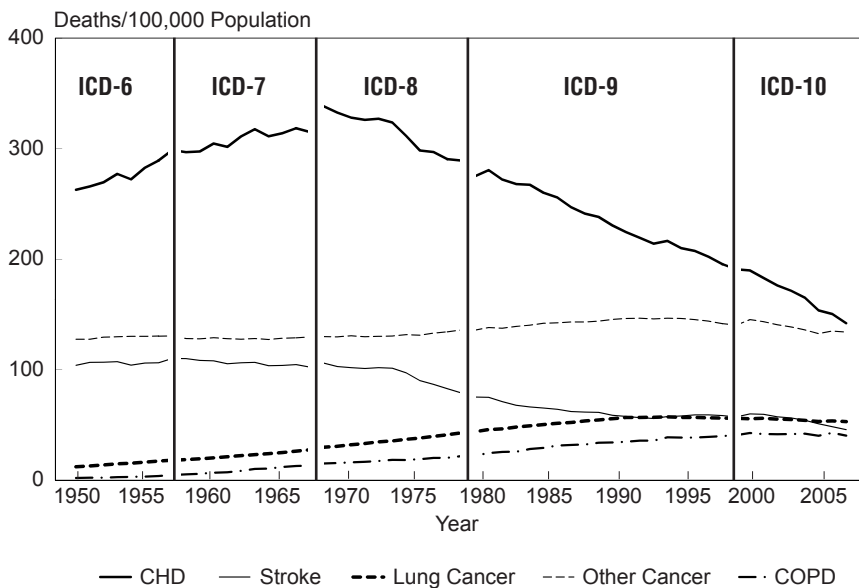
From 1950 to the mid-1960s, the unadjusted death rate for CHD increased but remained fairly stable for stroke. After 1968, death rates for CHD and stroke began to decline. CHD mortality continued to decline but stroke mortality reached a plateau in the 1990s before declining again in the 2000s. In contrast, the death rate for COPD steadily increased from 1950 until it began to plateau in the late 1990s.[15, 32]

Background Data

Chart 2–6
Number of Days of Inpatient Hospital Care
by Major Diagnosis, U.S., 1990–2006

From 1990 to 2006 (except in 1994), cardiovascular and respiratory diseases ranked first and second, respectively, in the number of days for which patients received hospital care.[33, 34]

Days of Care (Millions)

Legend: Cardiovascular, Respiratory, Mental, Digestive, Injury and Poisoning, Neoplasms, Musculoskeletal, Endocrine
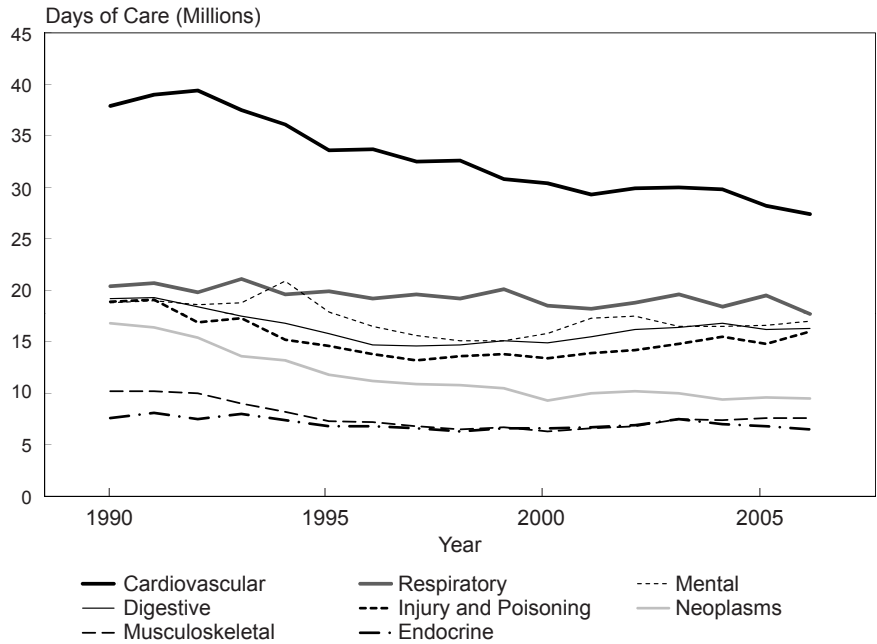
Chart 2–7
Age-Adjusted Death Rates
by Major Diagnosis, U.S., 1990–2006

From 1990 to 2006, age-adjusted death rates for cardiovascular and respiratory diseases ranked first and third, respectively.[15, 35]

Deaths/100,000 Population

ICD-9   ICD-10

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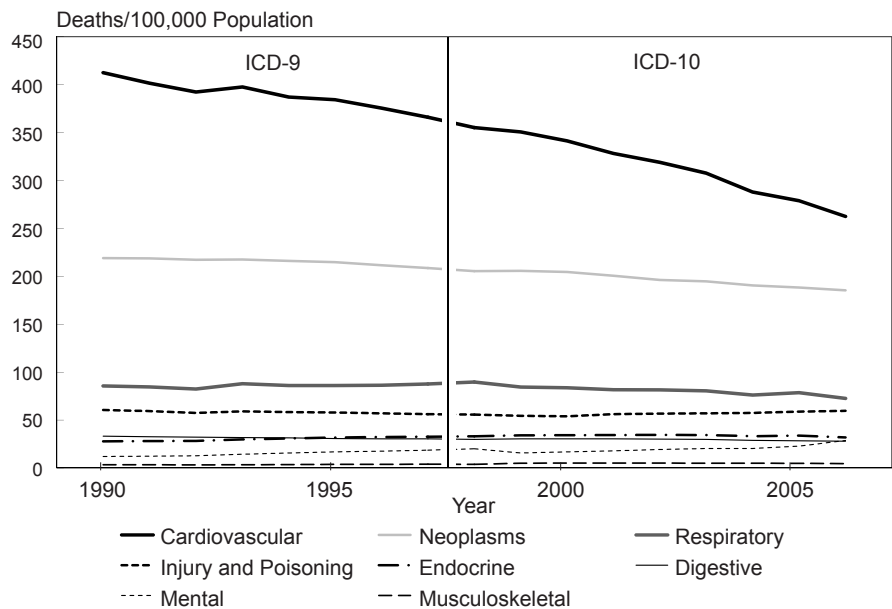
Background Data

Chart 2–8
Leading Causes of Death,
U.S., 2006

Cause of Death	Number
Total Deaths	2,426,264
Heart disease*	**631,636**
Cancer	559,888
Cerebrovascular diseases (stroke)	**137,119**
COPD and allied conditions[†]	**124,583**
Accidents	121,599
Diabetes	72,449
Alzheimer's disease	72,432
Influenza and pneumonia	56,326
Nephritis	45,344
Septicemia	34,234
All other causes of death	570,654

* Includes 425,425 deaths from CHD.
[†] Chronic lower respiratory diseases.

In 2006, heart disease, stroke, and COPD and allied conditions were the first, third, and fourth leading causes of death, respectively.[32]

Chart 2–9
Leading Causes of Death
by Age and Rank, U.S., 2006

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

* Chronic lower respiratory diseases.

In 2006, 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 fifth for those aged 45–64 years and third for those aged 65 years and older. COPD and allied conditions ranked sixth for those aged 45–64 years and fourth for those aged 65 years and older.[31]

Background Data

Chart 2–10
Leading Causes of Death,
White Males, U.S., 2006

In 2006, among white males, heart disease, COPD and allied conditions, and stroke were the first, fourth, and fifth leading causes of death, respectively.[36]

Percent of All Deaths

Heart Disease	Cancer	Accidents	COPD and Allied Conditions*	Stroke	Diabetes
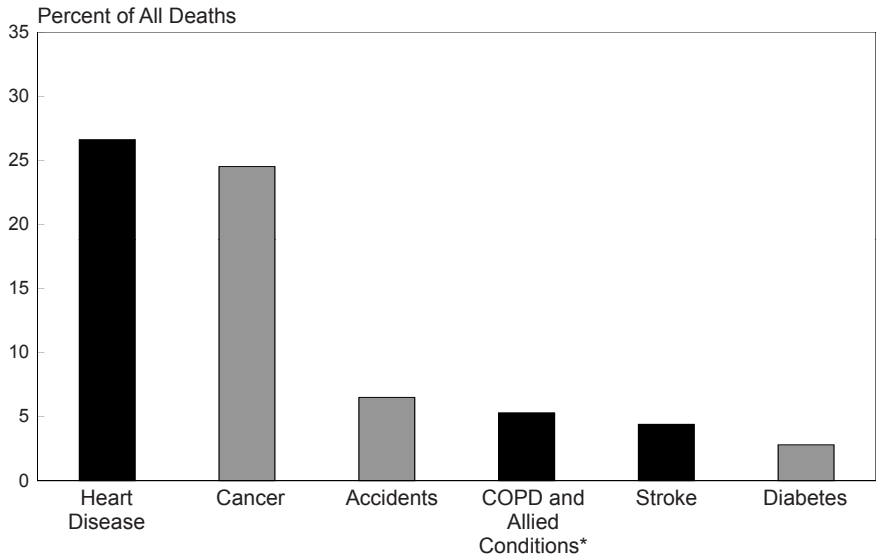
* Chronic lower respiratory diseases.

Chart 2–11
Leading Causes of Death,
White Females, U.S., 2006

In 2006, among white females, heart disease, stroke, and COPD and allied conditions were the first, third, and fourth leading causes of death, respectively.[36]

Percent of All Deaths

Heart Disease	Cancer	Stroke	COPD and Allied Conditions*	Alzheimer's Disease	Accidents

* Chronic lower respiratory diseases.

10
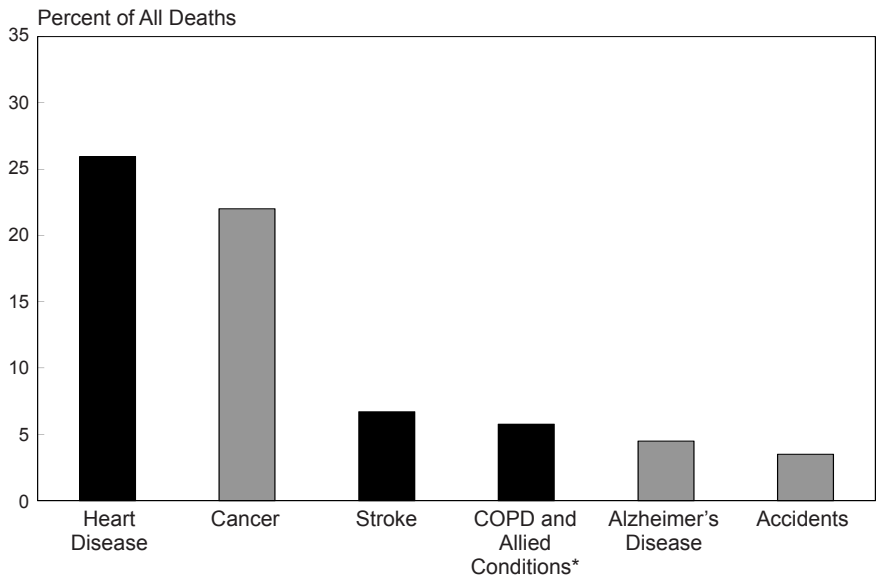
Background Data

**Chart 2–12
Leading Causes of Death,
Black Males, U.S., 2006**

Percent of All Deaths
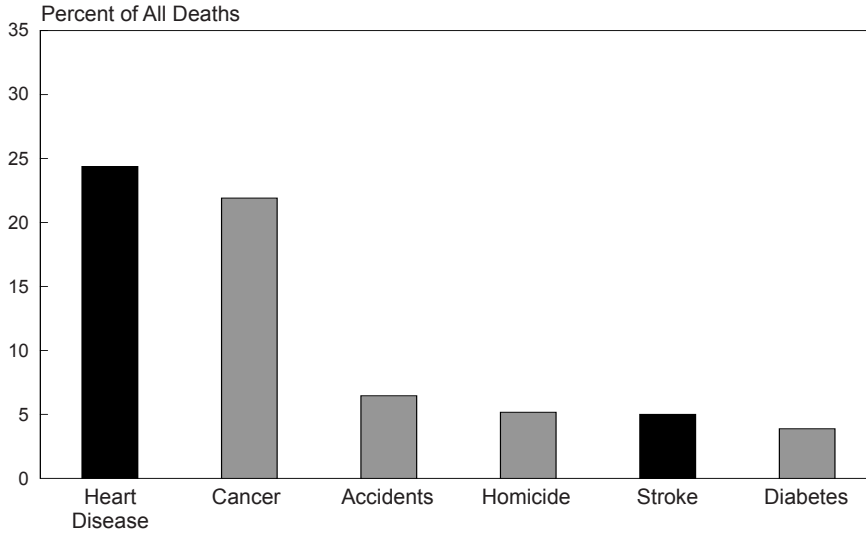
In 2006, among black males, heart disease and stroke were the first and fifth leading causes of death, respectively.[36]

**Chart 2–13
Leading Causes of Death,
Black Females, U.S., 2006**

Percent of All Deaths
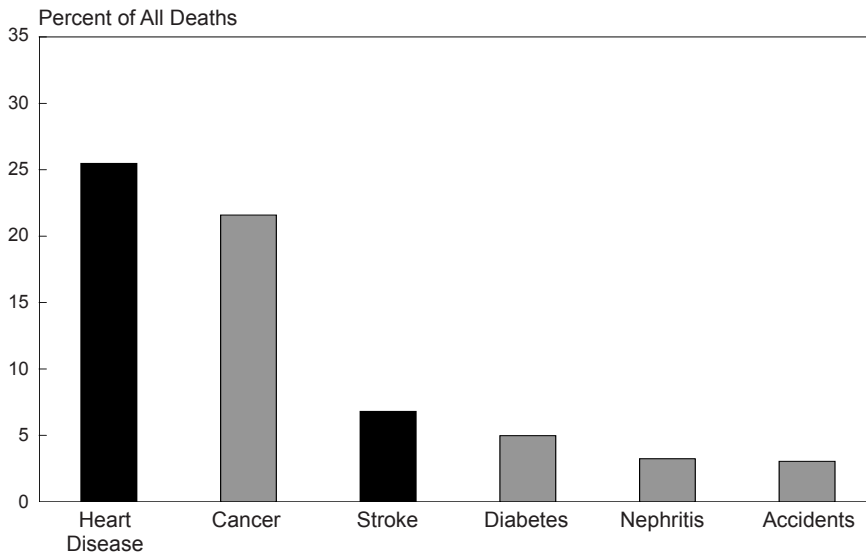
In 2006, among black females, heart disease and stroke were the first and third leading causes of death, respectively.[36]

Background Data

Chart 2–14
Leading Causes of Death,
Asian Males, U.S., 2006

In 2006, among Asian males, heart disease, stroke, and COPD and allied conditions were the second, third, and fifth leading causes of death, respectively.[36]

Percent of All Deaths
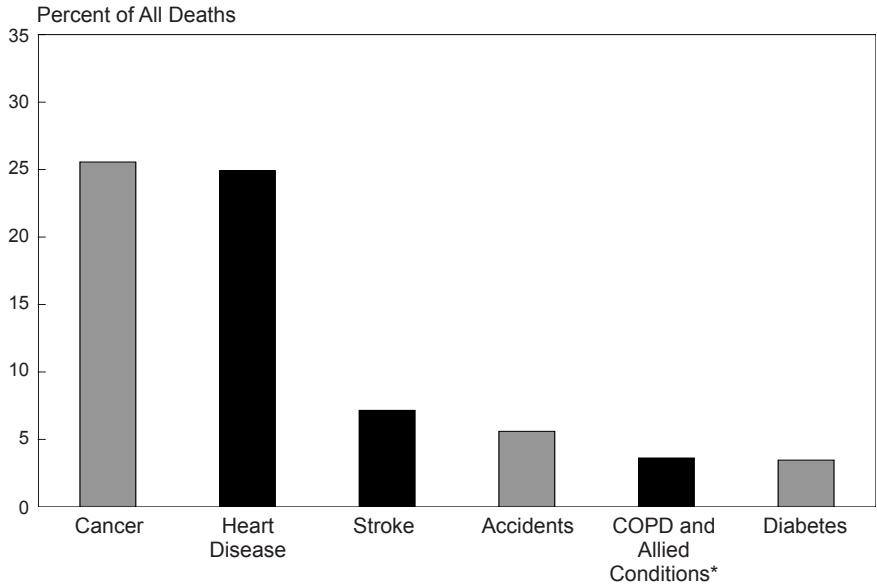
* Chronic lower respiratory diseases.

Chart 2–15
Leading Causes of Death,
Asian Females, U.S., 2006

In 2006, among Asian females, heart disease and stroke were the second and third leading causes of death, respectively.[36]

Percent of All Deaths
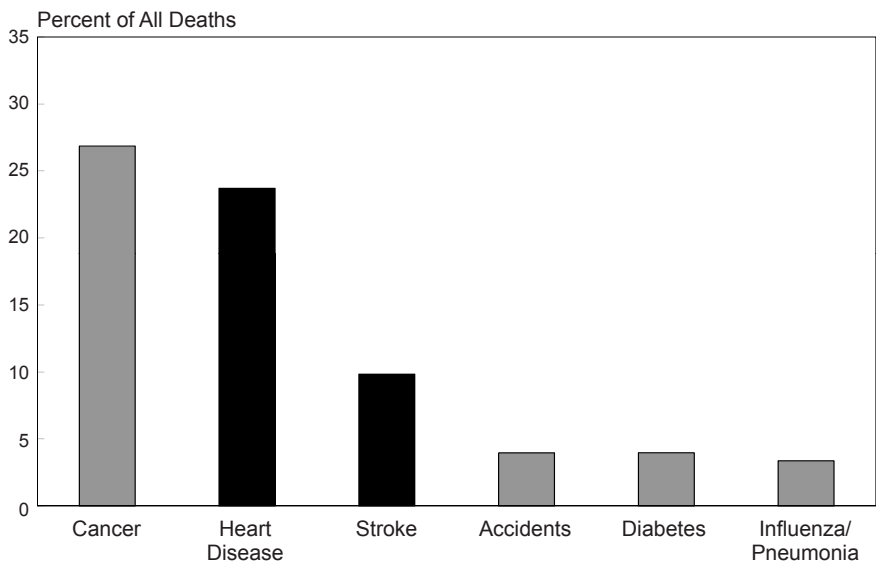
Background Data

Chart 2–16
Leading Causes of Death,
Hispanic Males, U.S., 2006

Percent of All Deaths
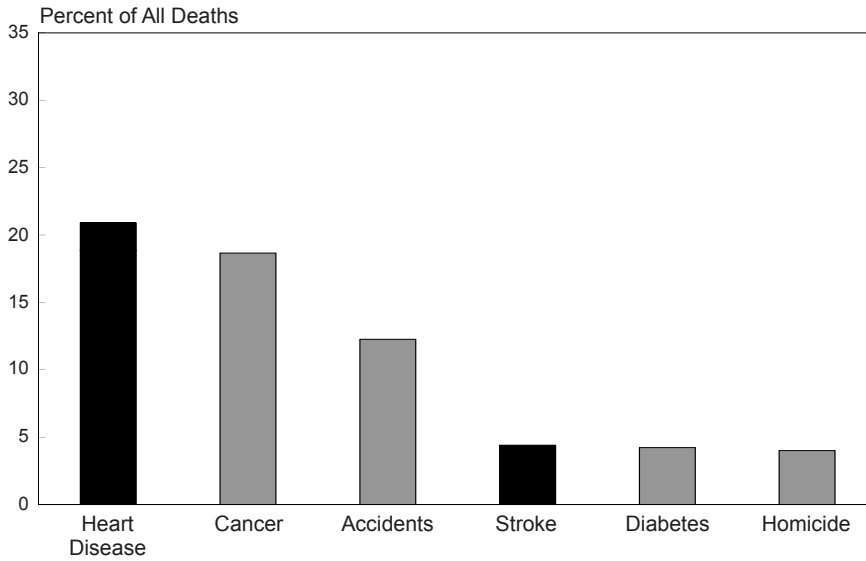
In 2006, among Hispanic males, heart disease and stroke were the first and fourth leading causes of death, respectively.[36]

Chart 2–17
Leading Causes of Death,
Hispanic Females, U.S., 2006

Percent of All Deaths
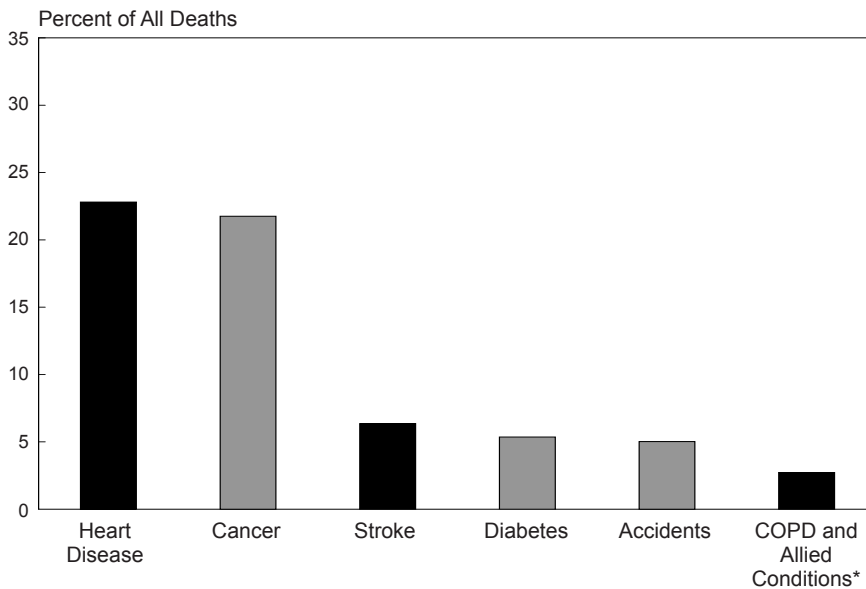
In 2006, among Hispanic females, heart disease, stroke, and COPD and allied conditions were the first, third, and sixth leading causes of death, respectively.[36]

* Chronic lower respiratory diseases.

13

Background Data

Chart 2–18
Leading Causes of Death,
American Indian Males, U.S., 2006

In 2006, among American Indian males, heart disease was the leading cause of death.[36]

Percent of All Deaths
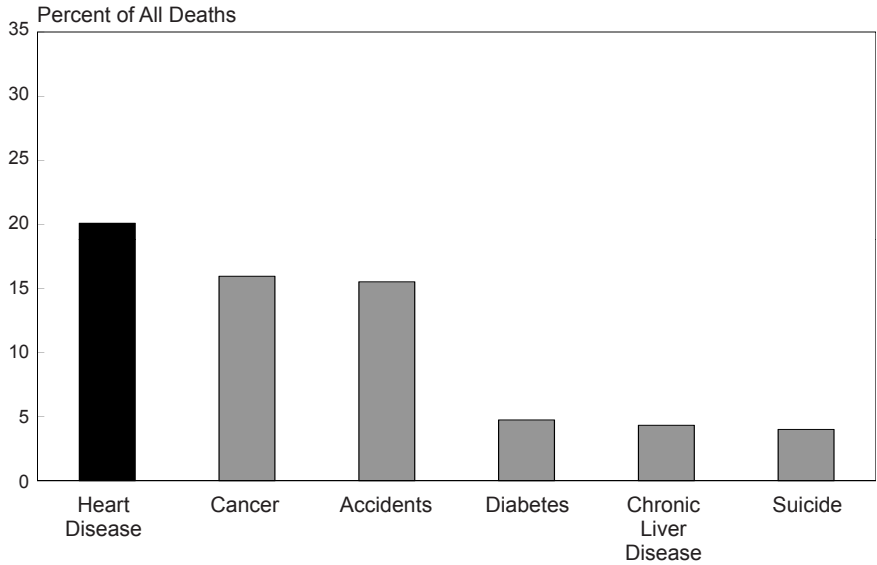
Chart 2–19
Leading Causes of Death,
American Indian Females, U.S., 2006

In 2006, among American Indian females, heart disease, stroke, and COPD and allied conditions were the second, fifth, and sixth leading causes of death, respectively.[36]

Percent of All Deaths
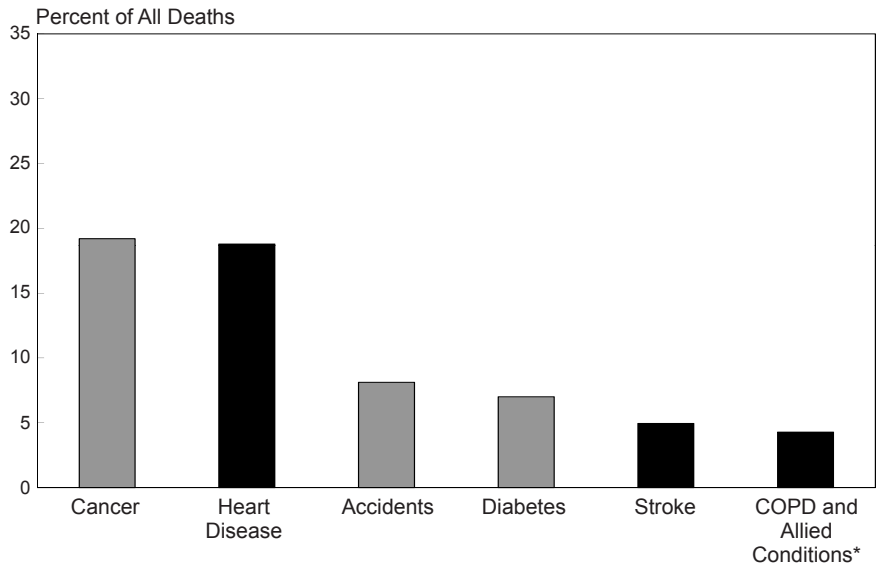
* Chronic lower respiratory diseases.

Background Data

Chart 2–20
Prevalence of Leading Chronic Conditions
Causing Limitation of Activity, U.S., 2007

Chronic Condition	Prevalence (Millions)
Arthritis	6.6
Back/neck conditions	6.6
Heart condition	**4.3**
Mental conditions	3.6
Diabetes	3.5
Hypertension	**3.3**
Musculoskeletal condition	3.2
Nervous condition	2.9
Lung condition	**2.9**
Fractures	2.7
Vision condition	2.0
Stroke	**1.6**
Cancer	1.5

In 2007, heart disease was the third leading chronic condition causing activity limitation. Hypertension, lung condition, and stroke were also very common.[24]

Chart 2–21
Age-Adjusted Percent of Population Currently Smoking
by Race and Sex, Ages 18 and Older, U.S., 1965–2007
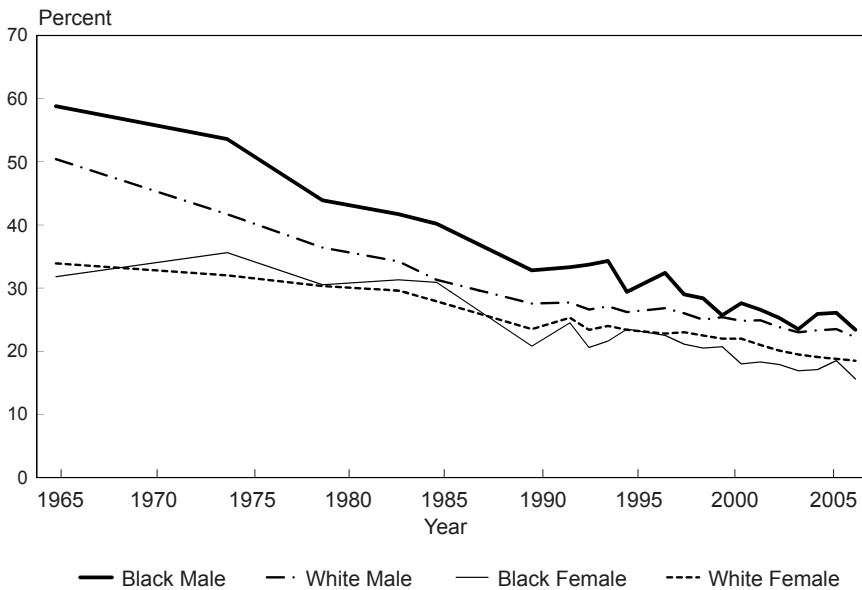
From 1965 to 1990, the percent of the population aged 18 years and older who reported that they smoke cigarettes decreased significantly. Since then, the percent of the population who reported that they currently smoke declined modestly.[37]

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 2003–2006

From 1976–1980 to 1999–2002, the prevalence of high serum cholesterol declined for each sex and racial/ethnic group, continuing to 2003–2006 for black and white males and black females. This trend was reversed in white and Mexican-American females.[17, 37]

Percent

■ 1976–1980　□ 1988–1994　▨ 1999–2002　▨ 2003–2006
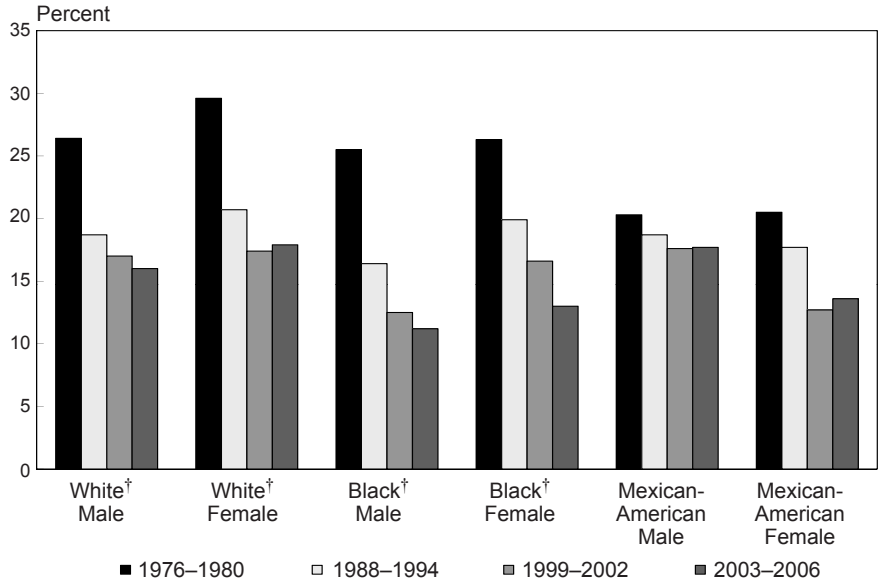
* High serum cholesterol is ≥240 mg/dL.
† Non-Hispanic.

Chart 2–23
Age-Adjusted Percent of Population That Is Overweight* by Race and Sex, Ages 20–74, U.S., 1976–1980 to 2003–2006

From 1976–1980 to 2003–2006, the prevalence of overweight males and females increased for each racial/ethnic group.[17, 37]

Percent

■ 1976–1980　□ 1988–1994　▨ 1999–2002　▨ 2003–2006
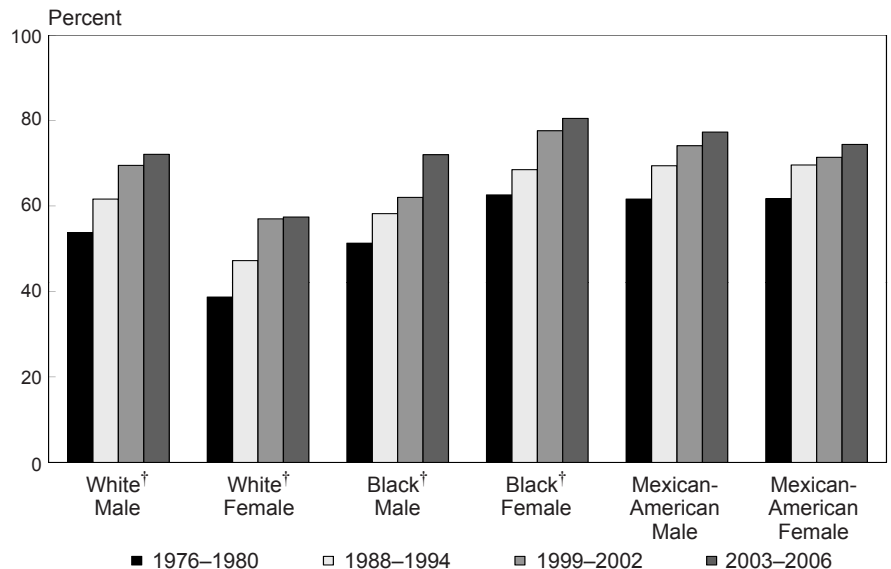
* Overweight (including obesity) is a body mass index of ≥25 kg/m^2.
† Non-Hispanic.

Background Data

Chart 2–24
Projected Economic Cost of Cardiovascular, Lung, and Blood Diseases, U.S., 2010

Disease	Dollars (Billions)			
	Total	Direct	Morbidity	Mortality
Total CVD	485.6	324.1	39.1	122.4
Heart disease	311.1	189.5	24.0	97.6
Coronary	168.6	96.0	10.6	62.0
Heart failure	38.6	35.1	—*	3.5
Stroke	71.2	48.2	7.0	16.0
Hypertensive disease	73.9	54.7	8.4	10.8
Lung diseases	173.4	108.9	27.9	36.6
COPD	49.9	29.5	8.0	12.4
Asthma	20.7	15.6	3.1	2.0
Blood diseases	15.9	11.8	0.7	3.4
Anemias	9.6	8.0	0.6	1.0

* No estimate is available.

In 2010, cardiovascular, lung, and blood diseases are projected to cost $445 billion in health care expenditures and $230 billion in lost productivity. Costs attributed to them as secondary causes of morbidity and mortality are not included.[35, 38–44]

Chart 2–25
Projected Direct Cost of Cardiovascular, Lung, and Blood Diseases, U.S., 2010

Disease	Dollars (Billions)					
	Total	Hospital Care	Physicians Services*	Prescription Drugs	Home Heath Care	Nursing Home Care
Total CVD	324.1	150.1	46.4	52.3	16.8	48.2
Heart disease	189.5	106.3	23.8	22.1	7.4	23.4
Coronary	96.0	54.6	13.4	10.3	2.2	12.3
Heart failure	35.1	20.1	2.4	3.3	3.4	4.5
Stroke	48.2	21.0	3.8	1.3	5.0	17.1
Hypertensive disease	54.7	8.5	13.9	24.7	2.7	5.1
Lung diseases	108.9	68.2	15.9	16.1	3.6	5.2
COPD	29.5	13.2	5.5	5.8	1.3	3.7
Asthma	15.6	5.5	4.2	5.9	—†	—†
Blood diseases	11.8	6.1	2.5	0.8	1.2	1.1
Anemias	8.0	3.9	1.7	0.6	0.8	1.0

* Physicians, clinics, and other professional services.
† No estimate is available.

In 2010, hospital care is projected to be the largest type of direct cost for health care expenditures related to cardiovascular, lung, and blood diseases.[38–44]

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 2006 due to specific CVD, heart disease, and stroke deaths, respectively.[35] For CVD, Chart 3–4 shows, according to ICD-9-CM codes, the number of physician office visits, the number of hospitalizations, and length of hospital stay in 2006 and according to ICD-10 codes, the number of deaths in 2006.[34, 35, 44] Subsequent charts display morbidity and mortality for total CVD and selected subgroups.

Coronary Heart Disease

CHD includes acute myocardial infarction (AMI) and angina pectoris. In the *Chart Book,* charts provide information on 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 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. As a result, CHD death rates from 1979 to 1998 included in this *Chart Book* are higher than those found in issues of the *Chart Book* prior to 2004.

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.

In fact, hospitalizations and mortality for heart failure have increased (until very recently), while mortality for total heart diseases has declined substantially. Charts are presented for any mention of heart failure on death certificates and for heart failure nominally classified as the underlying cause.

Cardiomyopathy

In 2006, 24,703 deaths were attributed to cardiomyopathy, although no consensus exists on classification and diagnostic criteria for the disease. This limitation presumably has little effect on any mortality differences influenced by age, race, or sex.

Atrial Fibrillation and Other Heart Diseases

The number of hospitalizations for atrial fibrillation has been steadily increasing over the past several years. Charts 3–47 and 3–48 show the number and rates of hospitalizations for atrial fibrillation. Mortality due to atrial fibrillation is not shown because atrial fibrillation is not intrinsically a fatal condition, although it does predispose individuals to potentially fatal conditions such as stroke. Moreover, the inconsistency in which atrial fibrillation is mentioned on death certificates and the difficulty of determining whether it is truly the cause of death make it impossible to gather reliable data.

Diseases of pulmonary circulation, acute and subacute endocarditis, and cardiac dysrhythmias are additional heart diseases of interest. Because measures of their morbidity, and especially their mortality, are of uncertain quality, charts pertaining to them have not been included.

Cerebrovascular Diseases (Stroke)

Cerebrovascular disease (i.e., stroke) is the third 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.

Diseases of Arteries

The ICD term *diseases of arteries* is used to refer to peripheral vascular 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
Cardiovascular Disease Deaths,
Percent by Subgroup, U.S., 2006
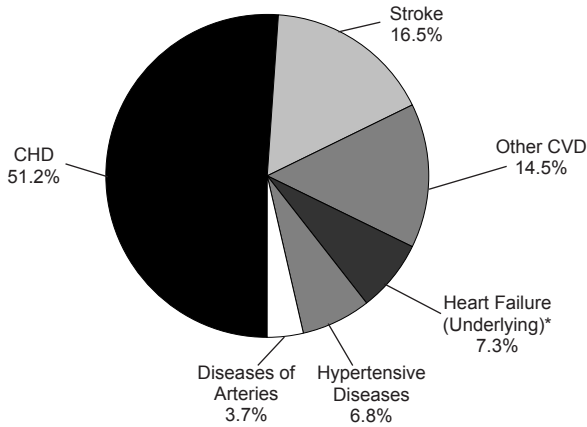
Stroke
16.5%

Other CVD
14.5%

CHD
51.2%

Heart Failure
(Underlying)*
7.3%

Diseases of
Arteries
3.7%

Hypertensive
Diseases
6.8%

* Heart failure as an underlying cause or otherwise mentioned on the death
   certificate accounted for 23% (192,002) of total CVD deaths.

Total deaths = 831,272 (100%), including 3,531 due to congenital CVD
   defects.

Chart 3–3
Stroke Deaths,
Percent by Subgroup, U.S., 2006

Other
Hemorrhage
19.8%

Stroke,
Unspecified
52.9%

Other
Cerebrovascular
17.9%

Cerebral
Infarction
5.1%

Subarachnoid
Hemorrhage
4.3%
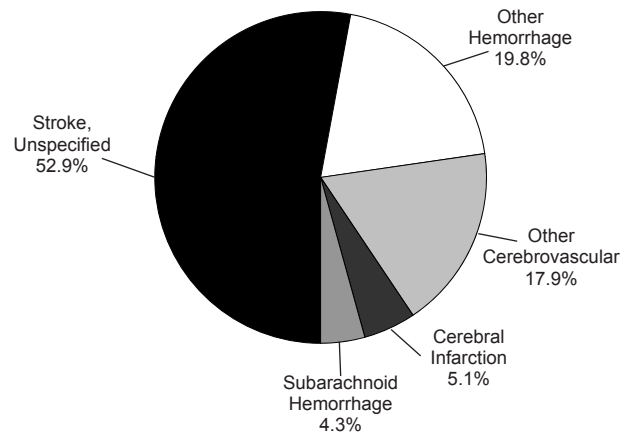
Total deaths = 137,119 (100%).

Chart 3–2
Heart Disease Deaths,
Percent by Subgroup, U.S., 2006
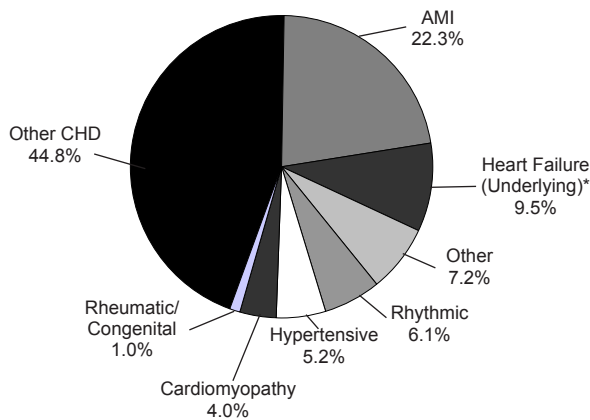
AMI
22.3%

Other CHD
44.8%

Heart Failure
(Underlying)*
9.5%

Other
7.2%

Rhythmic
6.1%

Rheumatic/
Congenital
1.0%

Hypertensive
5.2%

Cardiomyopathy
4.0%

* Heart failure as an underlying cause or otherwise mentioned on the death
   certificate accounted for almost 29% (182,337) of total heart disease deaths.

Total deaths = 634,490 (100%), including 2,854 from congenital heart defects.

Cardiovascular Diseases

Chart 3–4
Number of Hospitalizations, Physician Office Visits,* and
Deaths for Cardiovascular Diseases, U.S., 2006

| Diagnostic Category | ICD-9-CM Codes | Hospitalizations | | Physician Office Visits (1,000) | ICD-10 Codes | Deaths |
		First-Listed Discharges (1,000)	Length of Stay (Days)			
Total	390–404, 410–448, 451–459, 745–747	6,211	4.5	72,559	I00–I99, Q20–Q28	831,272
Heart disease:	390–398, 402, 404, 410–429	4,195	4.4	24,182	I00–I09, I11, I13, I20–I51	631,636
Rheumatic heart disease	390–398	54	7.7	270	I00–I09	3,257
Hypertensive heart disease	402, 404	87	6.0	453	I11, I13	32,706
Coronary heart disease:	410–414, 429.2	1,760	4.0	10,956	I20–I25	425,425
AMI	410	647	5.4	206	I21, I22	141,462
Angina pectoris, stable	413	41	2.1	757	I20.1–I20.9	179
Angina pectoris, unstable	411	86	2.5	201	I20.0	30
Atherosclerotic CVD	429.2	—	—	98	I25.0	61,030
Other CHD	412, 414	986	3.2	9,695	Other I23–I25	222,724
Diseases of pulmonary circulation:	415–417	160	5.7	264	I26–I28	12,387
Pulmonary embolism	415.1	145	5.6	128	I26	6,924
Other	415.0, 415.2–417	15	6.7	136	I27–I28	5,463
Subacute bacterial endocarditis	421	13	11.7	—	I33.0	1,175
Cardiomyopathy	425	43	3.8	691	I42	24,703
Atrial fibrillation and flutter	427.3	461	3.5	4,065	I48	11,438
Other arrythmic disorders	Other 427	311	3.2	1,966	Other I43–I49	26,301
Heart failure:	428	1,106	5.1	2,681	I50	60,337
Congestive heart failure	428.0	1,002	5.1	2,605	I50.0	55,923
Left heart failure and unspecified	428.1–428.9	104	5.5	76	I50–I50.9	4,414
Other heart disease	Other 420–429	200	5.6	2,836	Other I30–I51	33,907
Other hypertensive disease	401, 403	426	3.1	37,885	I10, I12	23,855
Cerebrovascular diseases (stroke)	430–438	885	4.9	2,005	I60–I69	137,119
Diseases of arteries:	440–448	282	5.6	1,477	I70–I78	31,136
Atherosclerosis	440	129	5.7	251	I70	8,652
Aortic aneurysm	441	57	6.5	253	I71	13,238
Other diseases of arteries	442–448	96	5.0	973	I72–I78	9,246
Deep vein thrombosis	451.1	10	4.5	—	I80.2	2,328
Other and unspecified CVD	Other 451–459	343	4.4	6,591	Other I80–I99	1,667
Congenital malformations of CV system:	745–747	70	9.6	419	Q20–Q28	3,531
Congenital heart disease	745, 746	41	8.4	356	Q20–Q24	2,854
Other congenital cardiovascular disease	747	29	11.5	63	Q25–Q28	677

* 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%.

Cardiovascular Diseases

Chart 3–5
Change in Age-Adjusted Death Rates,
U.S., 1950–2006
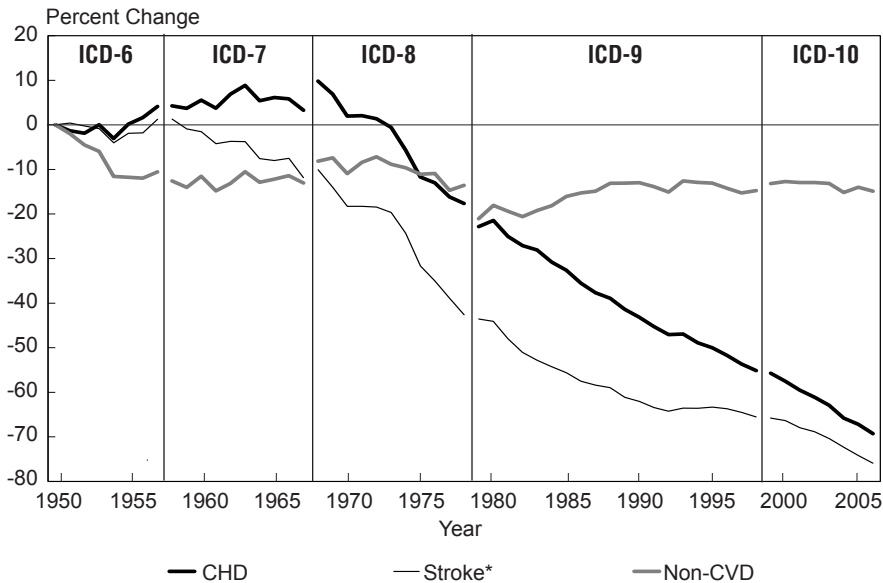
The death rates for CHD increased almost 10% from 1950 to its peak in 1968; by 2006, it was 69% lower than it was in 1950. Stroke mortality, on the other hand, declined for most of those years and by 2006 was 76% lower than it was in 1950. By comparison, the death rate for non-CVD causes decreased only 15% since 1950.[31, 32]

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

Chart 3–6
Age-Adjusted Death Rates and Percent Change for All Causes
and Cardiovascular Diseases, U.S., 1968 and 2006

Cause of Death	Deaths/100,000 Pop.		1968–2006 Difference	Percent Change
	1968	2006		
All causes	1,304.5	776.5	-528.0	-40.5
CVD*	759.5	262.5	-497.0	-65.4
CHD	482.6	134.9	-347.7	-72.0
Stroke	162.5	43.6	-118.9	-73.2
Other CVD	114.4	84.0	-30.4	-26.6
Non-CVD	545.0	514.0	-31.0	-5.7

* Excludes congenital malformations of the circulatory system.

From 1968 to 2006, the death rate for CVD declined 65%, compared with a 5.7% decline in the rate for all non-CVD causes. Mortality for CHD and stroke declined 72% and 73%, respectively.[31, 32]

Cardiovascular Diseases

Chart 3–7
Average Annual Percent Change in Age-Adjusted Death Rates
for All Causes and Cardiovascular Diseases, U.S., 1968–2006

From 1968 to 2006, the death rate for total CVD had declined. The 1999–2006 average annual percent declines in the age-adjusted death rates were 4.0% for CVD, 5.1% for CHD, and 4.9% for stroke.[31, 32]

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
1979–1989	-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
1999–2006	-1.7	-4.0	-5.1	-4.9	-1.6	-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., 1999–2006

From 1999 to 2006, average annual percent declines in mortality for CVD, CHD, and stroke within sex groups were greater in whites than in blacks. Within racial groups, the decline in CHD mortality was greater in females than in males. The decline in stroke mortality in whites was greater in males than in females.[36]

Cause of Death	All Causes	Black Male	White Male	Black Female	White Female
All causes	-1.7	-2.3	-2.0	-1.9	-1.5
CVD*	-4.0	-3.4	-4.2	-3.8	-4.1
Heart disease	-4.0	-3.4	-4.0	-4.0	-4.1
CHD	-5.1	-4.4	-5.0	-5.2	-5.4
Stroke	-4.9	-4.2	-5.4	-4.2	-4.9
Non-CVD	-0.4	-1.7	-0.6	-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., 1979–2006
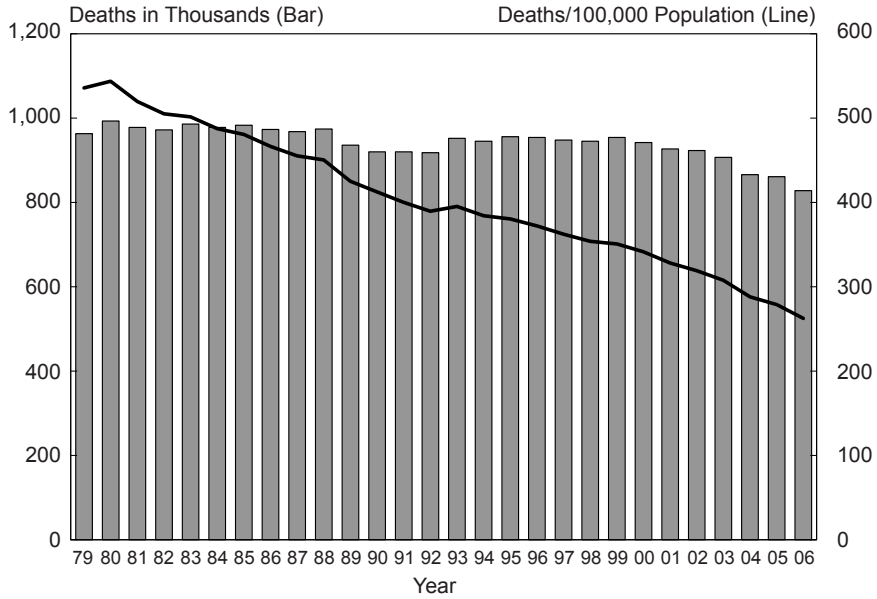
Although age-adjusted death rates for CVD declined considerably between 1979 and 2006, the total number of CVD deaths declined only modestly because of a growing and aging population.[31, 32]

Chart 3–10
Percent of All Deaths Due to Cardiovascular
Diseases* by Age, U.S., 2006
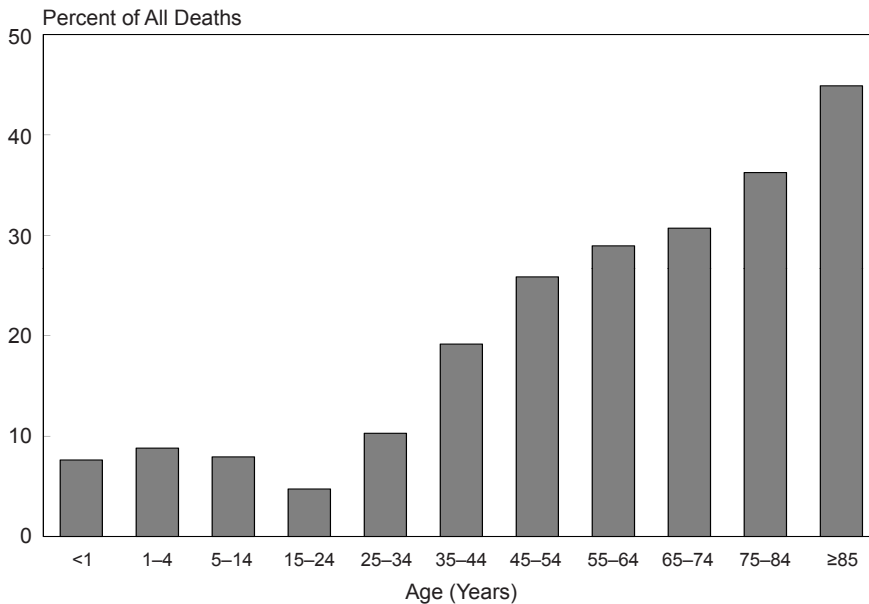
In 2006, the percent of deaths due to CVD increased with age among adults: 19% for those aged 35-44 years and 45% for those aged 85 years and older.[31]

* Includes congenital malformations of the circulatory system.

Cardiovascular Diseases

Chart 3–11
Age-Adjusted Death Rates for Cardiovascular Diseases*
by State, U.S., 2003–2005

In 2003–2005, CVD mortality was generally highest in the Southeastern United States.[15]

Deaths/100,000 Population
- 321–380 (9)
- 300–320 (9)
- 261–299 (11)
- 251–260 (11)
- 214–250 (10)
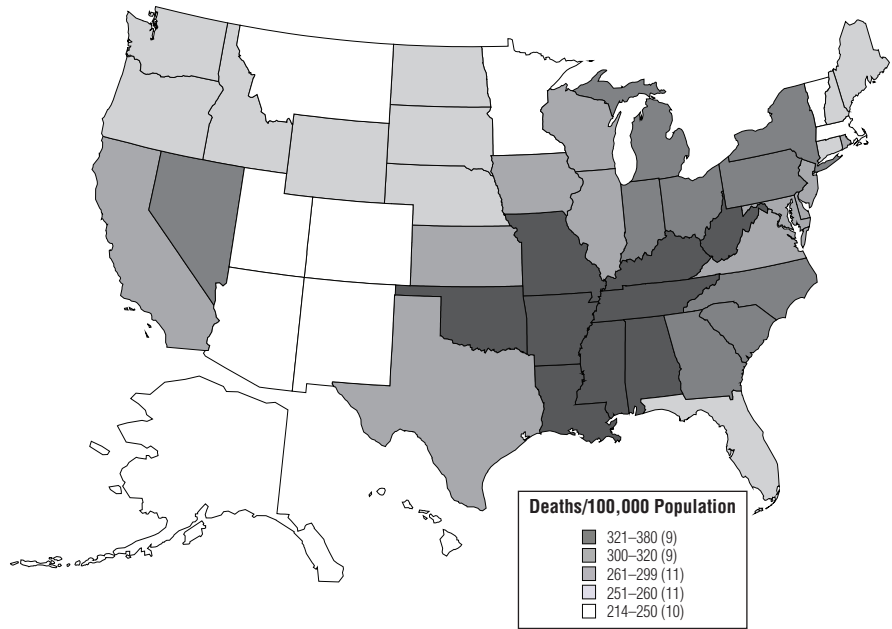
* Excludes congenital malformations of the circulatory system.

Chart 3–12
Percent Decline in Age-Adjusted Death Rates for
Cardiovascular Diseases* by State, U.S., 1993–1995 to 2003–2005

From 1993–1995 to 2003–2005, the smallest percent declines in death rates for CVD tended to be in the Southeastern United States.[15]

Percent Decline
- 27.1–33.0 (11)
- 25.0–27.0 (9)
- 23.5–24.9 (9)
- 21.8–23.4 (10)
- 14.3–21.7 (11)
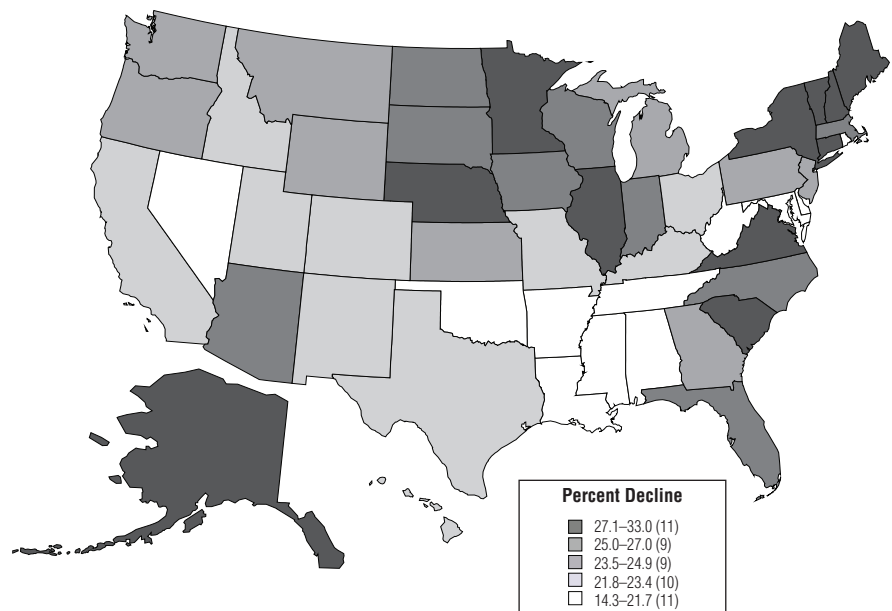
* Excludes congenital malformations of the circulatory system.

Total Heart Disease

Chart 3–13
Age-Adjusted Death Rates for Heart Disease
by Race/Ethnicity and Sex, U.S., 2006

Deaths/100,000 Population

Male   Female

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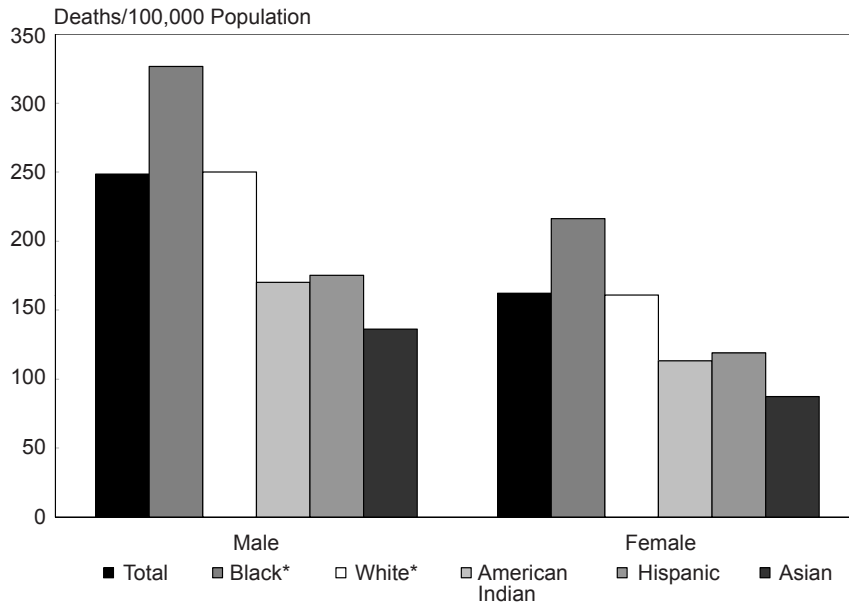
* Non-Hispanic.

In 2006, heart disease mortality was 53% higher in males than in females. Within sex groups, it was highest in non-Hispanic blacks and lowest in Asians.[36]

Chart 3–14
Death Rates for Heart Disease in Males
by Age and Race/Ethnicity, U.S., 2006

Deaths/100,000 Population

Age (Years)

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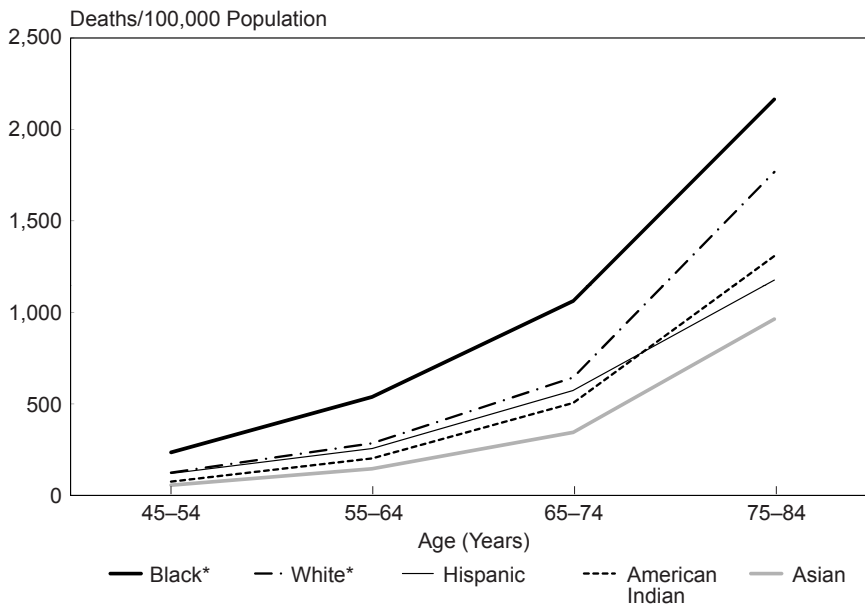
* Non-Hispanic.

In 2006, heart disease mortality in males was highest in non-Hispanic blacks across all age groups. This disparity was proportionately greater in younger age groups than in older age groups.[36]

27

Total Heart Disease/Coronary Heart Disease

Chart 3–15
Death Rates for Heart Disease in Females
by Age and Race/Ethnicity, U.S., 2006

In 2006, the disparity in heart disease mortality between blacks and other racial and ethnic groups was as great or greater for females than for males (also see Chart 3–14).[36]

Deaths/100,000 Population

	45–54	55–64	65–74	75–84

Age (Years)

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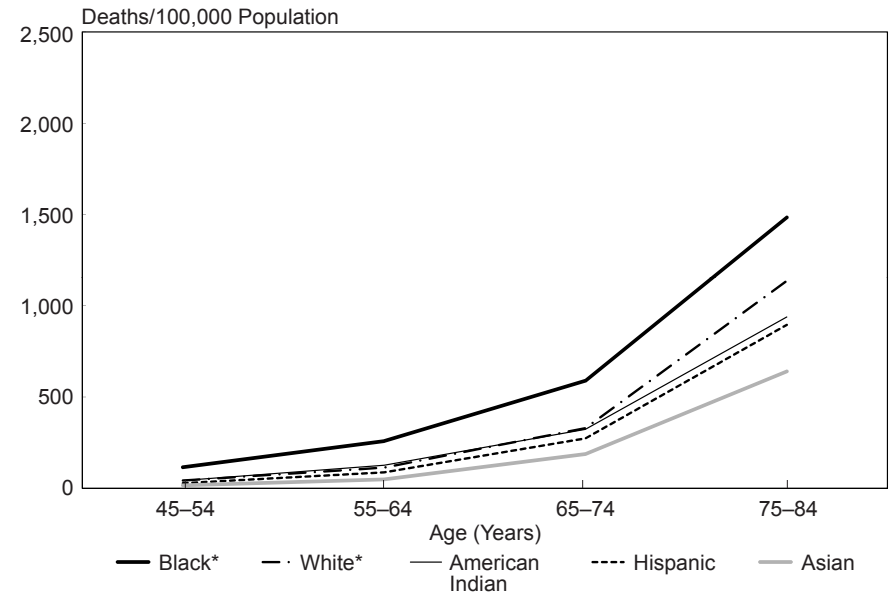
* Non-Hispanic.

Chart 3–16
Age-Adjusted Prevalence of Acute Myocardial Infarction by
Race and Sex, Ages 25–74, U.S., 1971–1975 to 2003–2006

From 1971–1975 to 1999–2002, the prevalence of AMI mostly declined in whites, males, and females. In 2003–2006, the downward trend continued in males, but was reversed in whites and females. The prevalence of AMI rose in blacks from 1976–1980 to 1988–1994 but then declined through 2003–2006.[17]

Percent of Population

Black   White   Male   Female

■1971–1975   ■1976–1980   ■1988–1994   □1999–2002   ■2003–2006
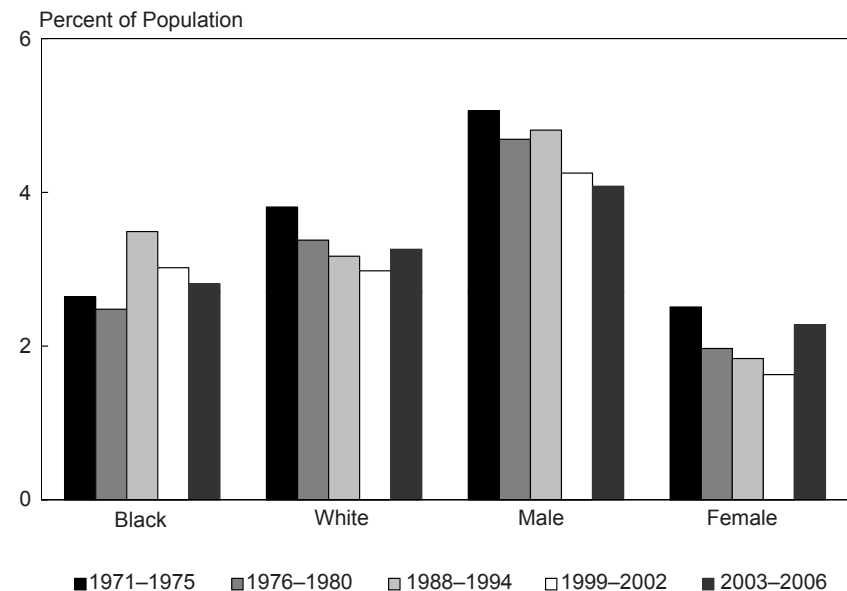
Coronary Heart Disease

Chart 3–17
Prevalence of Acute Myocardial Infarction
by Age and Sex, U.S., 1999–2006

Percent of Population
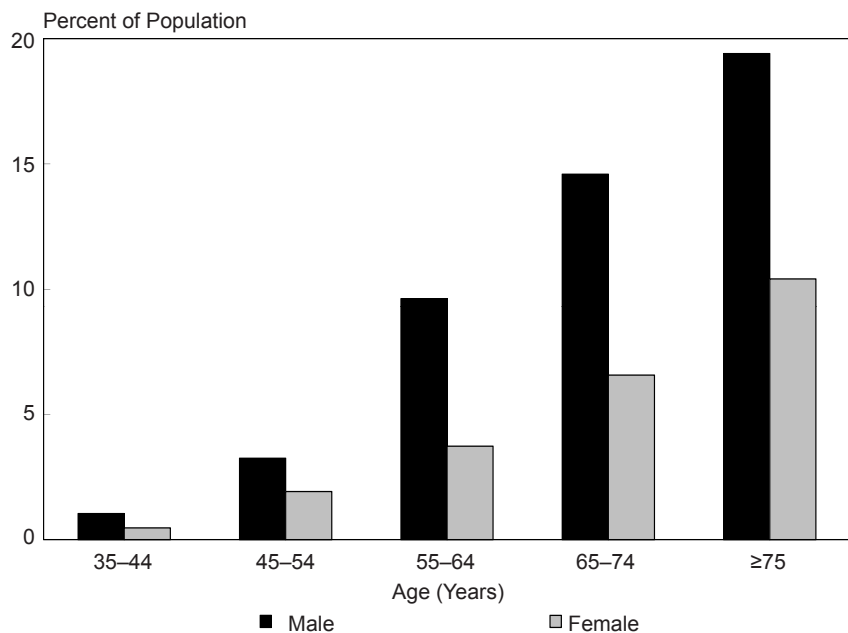
In 1999–2006, the prevalence of AMI was higher in males than in females and increased substantially with age.[17]

Age (Years)

■ Male   □ Female

Chart 3–18
Prevalence of Acute Myocardial Infarction
by Age and Race, U.S., 1999–2006

Percent of Population
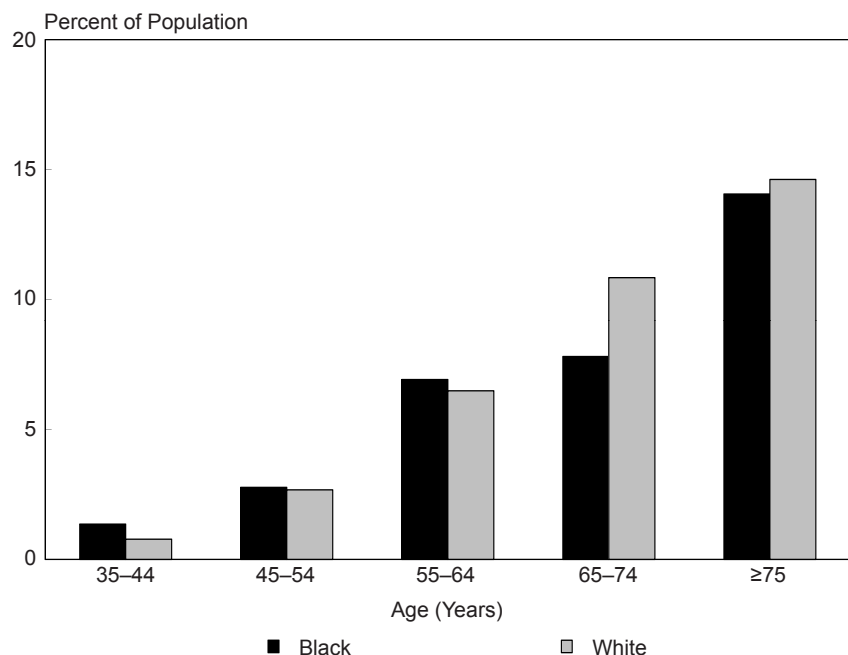
In 1999–2006, the prevalence of AMI was higher in blacks than in whites aged 35 to 64 years, but was higher in whites than in blacks among those aged 65 years and older.[17]

Age (Years)

■ Black   □ White

Coronary Heart Disease

**Chart 3–19
Prevalence of Angina Pectoris by Age and Sex,
U.S., 1999–2006**

In 1999–2006, the prevalence of angina pectoris, which increased substantially with age, was slightly higher in females than in males aged 35 to 64 years, but was higher in males than in females among those aged 65 years and older.[17]

Percent of Population
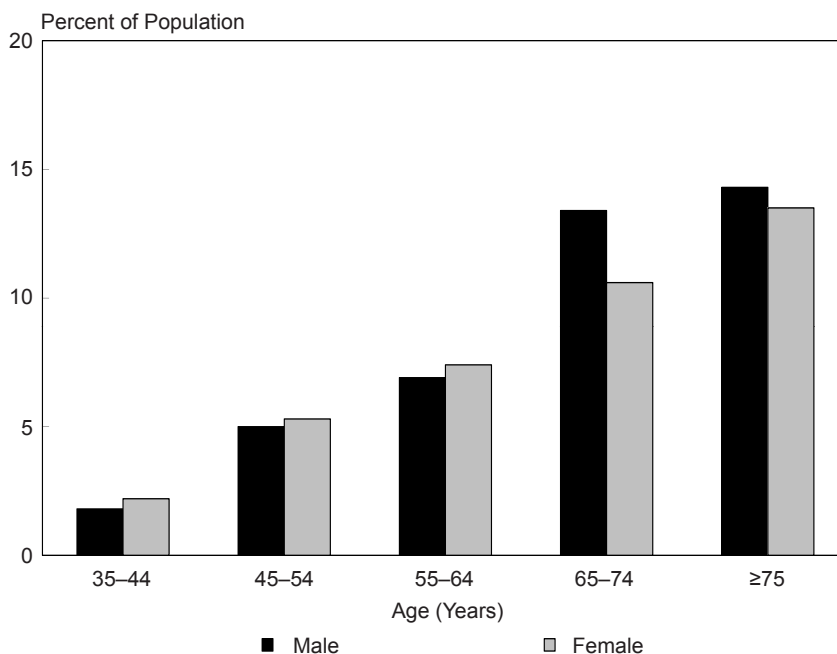
**Chart 3–20
Prevalence of Angina Pectoris by Age and Race,
U.S., 1999–2006**

In 1999–2006, the prevalence of angina pectoris increased with age for blacks and whites. The increase, however, did not continue in blacks past age 74 years. Prevalence was higher in blacks than in whites prior to age 65 years but was higher in whites than in blacks for those aged 65 years and older.[17]

Percent of Population
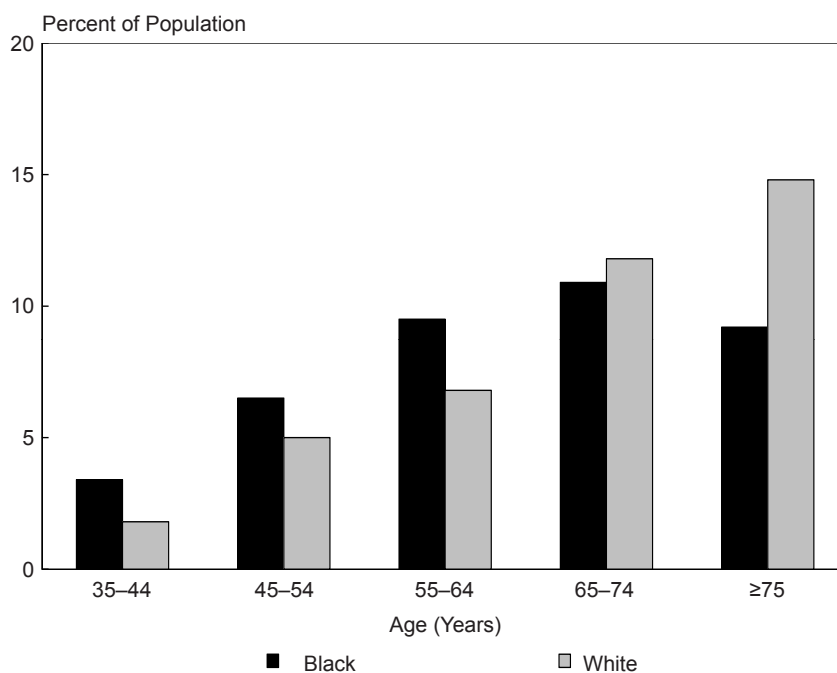
Coronary Heart Disease

Chart 3–21
Hospitalization Rates for Acute Myocardial Infarction,
Ages 45–64 and 65 and Older, U.S., 1965–2006

Hospitalizations/10,000 Population
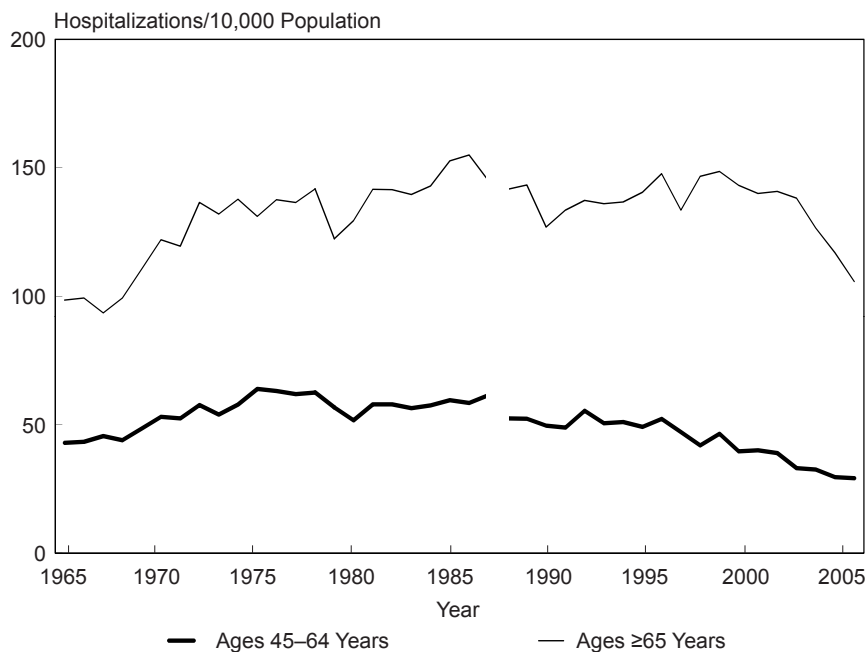
For those aged 45–64 years, hospitalization rates for AMI increased from 1965 to the mid-1970s and then remained stable before declining in the mid-1990s. For those aged 65 years and older, hospitalization rates for AMI increased from 1965 to 1986; the rates began to decline in the early 2000s through 2006.[33, 34]

Ages 45–64 Years   Ages ≥65 Years

Chart 3–22
Hospital Case-Fatality Rates for Acute Myocardial Infarction,
Ages Younger Than 65 and 65 and Older, U.S., 1970–2006

Percent Discharged Dead
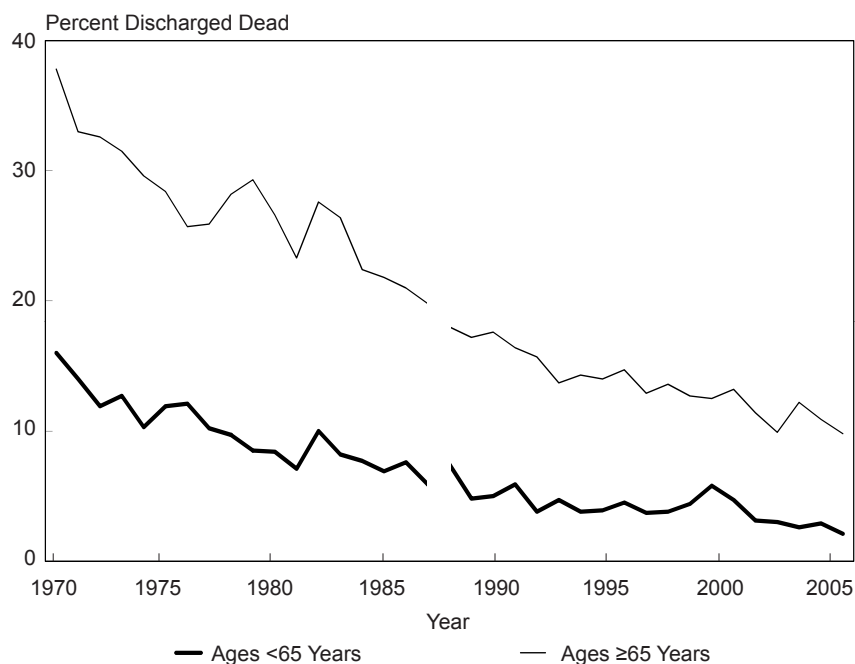
From 1970 to 2006, hospital case-fatality rates for AMI declined substantially for those younger than 65 years and for those aged 65 years and older.[33, 34]

Ages <65 Years   Ages ≥65 Years

Coronary Heart Disease

Chart 3–23
Age-Adjusted Death Rates for Coronary Heart Disease,
Actual and Expected, U.S., 1950–2006

CHD accounted for 425,000 deaths in 2006. It would have accounted for 1,511,000 deaths if CHD mortality had remained at its 1968 peak.[31, 32]

Deaths/100,000 Population

Peak minus actual
rates results in
1,086,000 fewer deaths
in 2006 than expected:
Actual: 425,000
Expected: 1,511,000

Year

—— Actual Rate   – – Rate if Rise Continued   —— Peak Rate
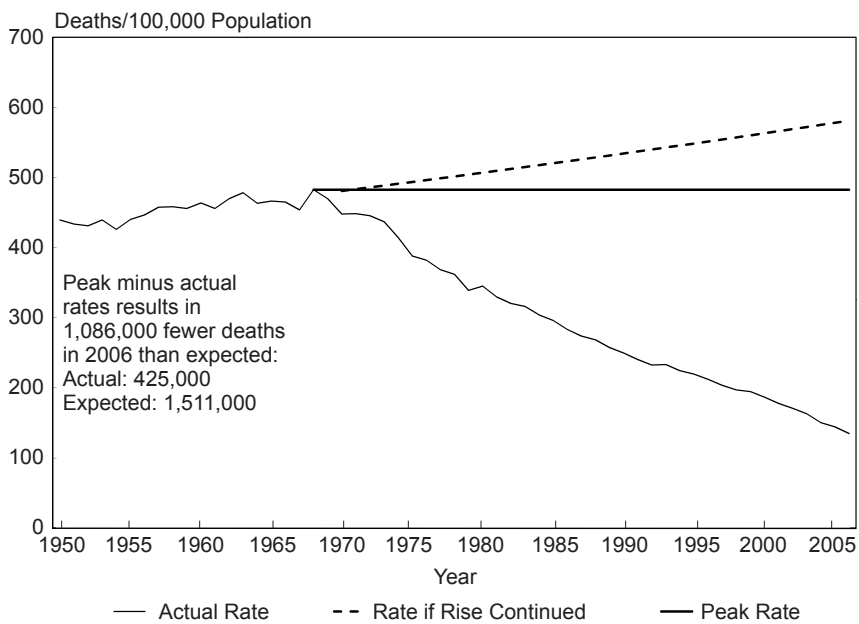
Chart 3–24
Age-Adjusted Death Rates for Coronary Heart Disease
by Race/Ethnicity and Sex, U.S., 1999–2006

From 1999 to 2006, CHD mortality declined in non-Hispanic whites, non-Hispanic blacks, Hispanics, Asians, and American Indians, both male and female.[36]

Deaths/100,000 Population

Male   Female

Year

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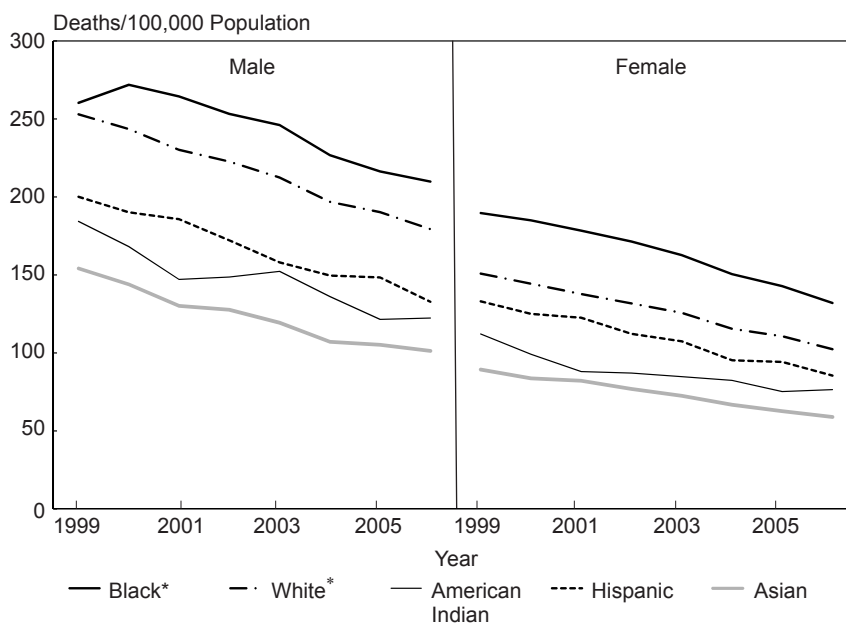
* Non-Hispanic.

Coronary Heart Disease

Chart 3–25
Age-Adjusted Death Rates for Coronary Heart Disease
by Race and Sex, U.S., 1950–2006

Deaths/100,000 Population

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

Year

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

* Nonwhite from 1950 to 1967.
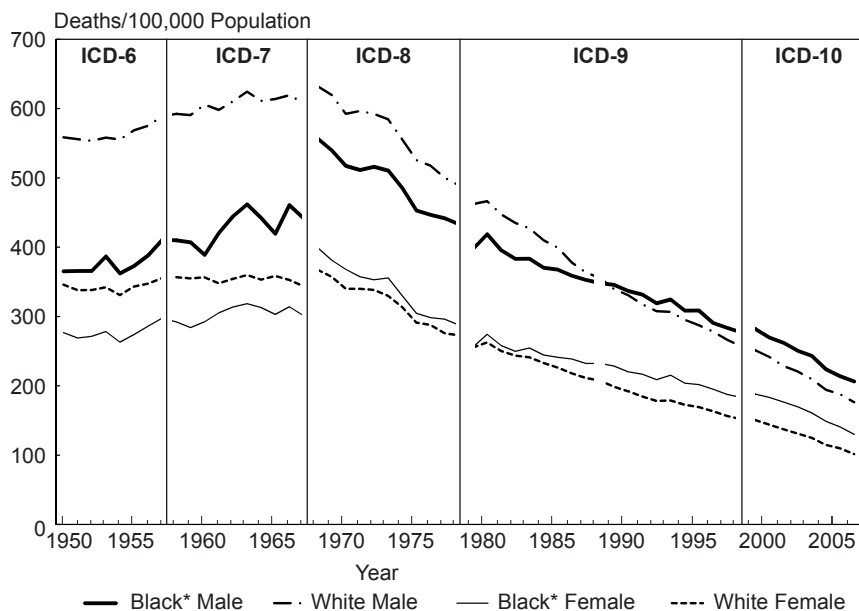
In the 1950s and 1960s, death rates for CHD increased in white males and in blacks, both male and female, but were relatively stable in white females. Since then, all rates have declined appreciably.[31, 32]

Chart 3–26
Deaths and Age-Adjusted Death Rates for
Coronary Heart Disease, U.S., 1980–2006

Deaths in Thousands (Bar)   Deaths/100,000 Population (Line)
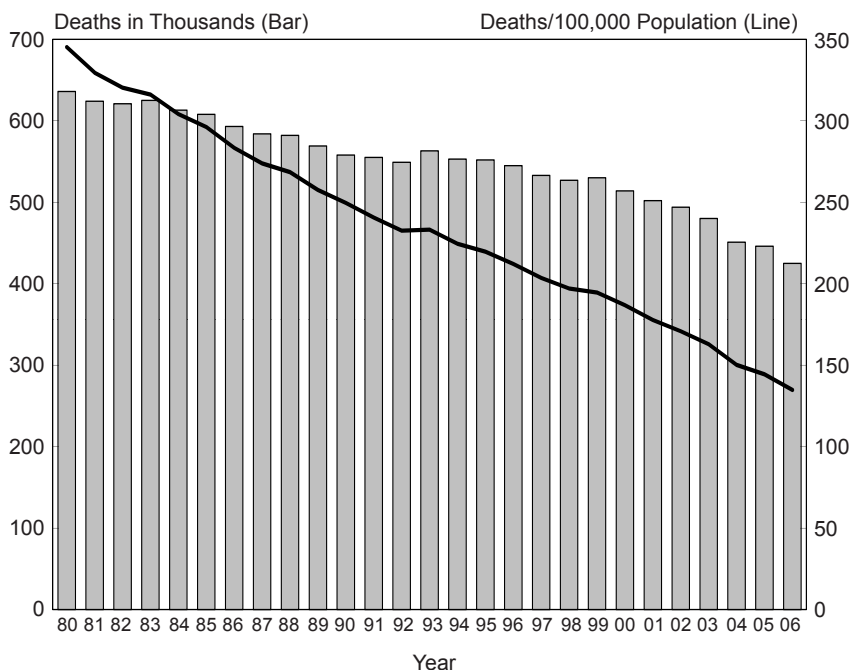
Year

Since 1980, the number of deaths and the age-adjusted death rates for CHD decreased almost every year.[31, 32]

Coronary Heart Disease

Chart 3–27
Average Annual Percent Change in Age-Adjusted Death Rates for Coronary Heart Disease by Race and Sex, U.S., 1950–2006

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 1999–2006 period. Since 1979, within sex groups, CHD mortality declined more for whites than blacks.[31, 32]

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
1979–1989	-2.9	-1.8	-3.2	-1.5	-2.7
1989–1998	-2.8	-2.4	-3.0	-2.3	-2.7
1999–2006	-5.1	-4.4	-5.0	-5.2	-5.4

* Nonwhite from 1950 to 1967.

Chart 3–28
Average Annual Percent Change in Death Rates for Coronary Heart Disease by Age, Race, and Sex, U.S., 1999–2006
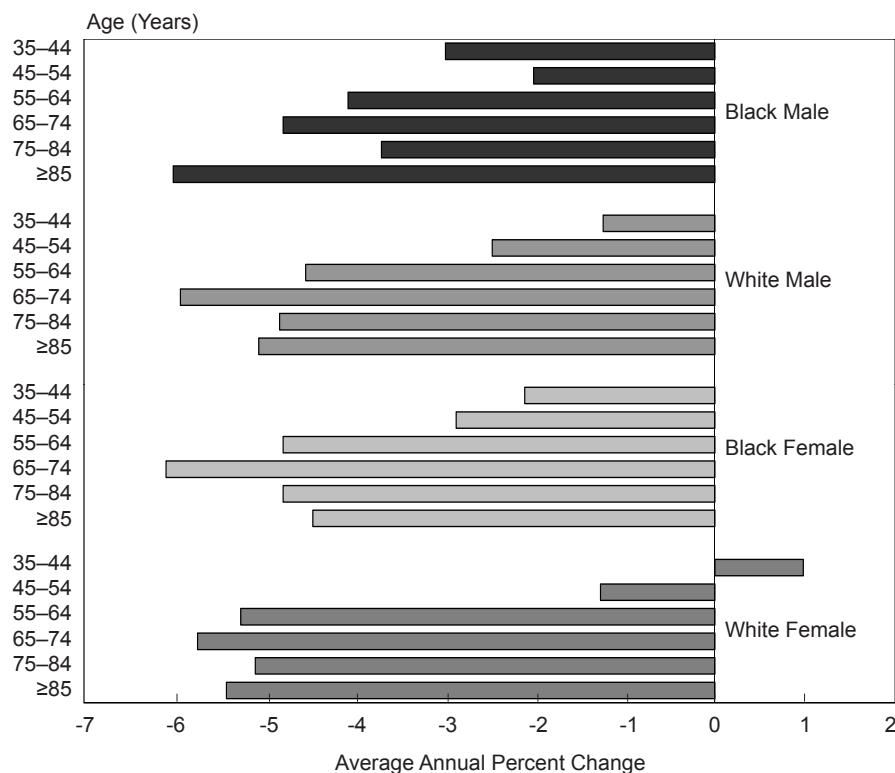
From 1999 to 2006, the average annual percent decline in CHD mortality was greater for those aged 55 years and older than for those aged 54 years and younger. White females aged 35–44 years experienced an increase in CHD mortality during this period.[36]

Coronary Heart Disease

Chart 3–29
Age-Adjusted Death Rates for Coronary Heart Disease
by Race/Ethnicity and Sex, U.S., 2006

Deaths/100,000 Population
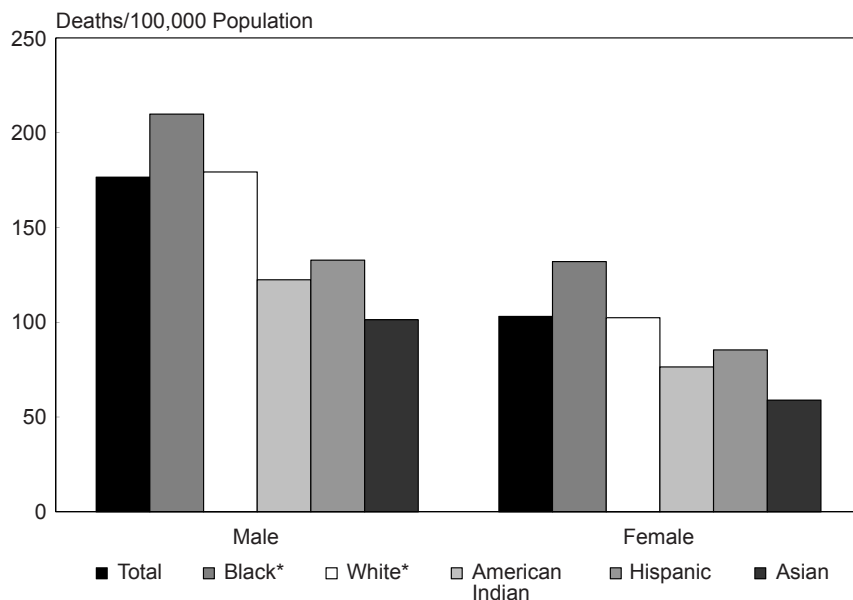
* Non-Hispanic.

In 2006, CHD mortality was 70% higher in males than in females. Within sex groups, it was highest in non-Hispanic blacks and lowest in Asians.[36]

Chart 3–30
Death Rates for Coronary Heart Disease in Males
by Age and Race/Ethnicity, U.S., 2006

Deaths/100,000 Population
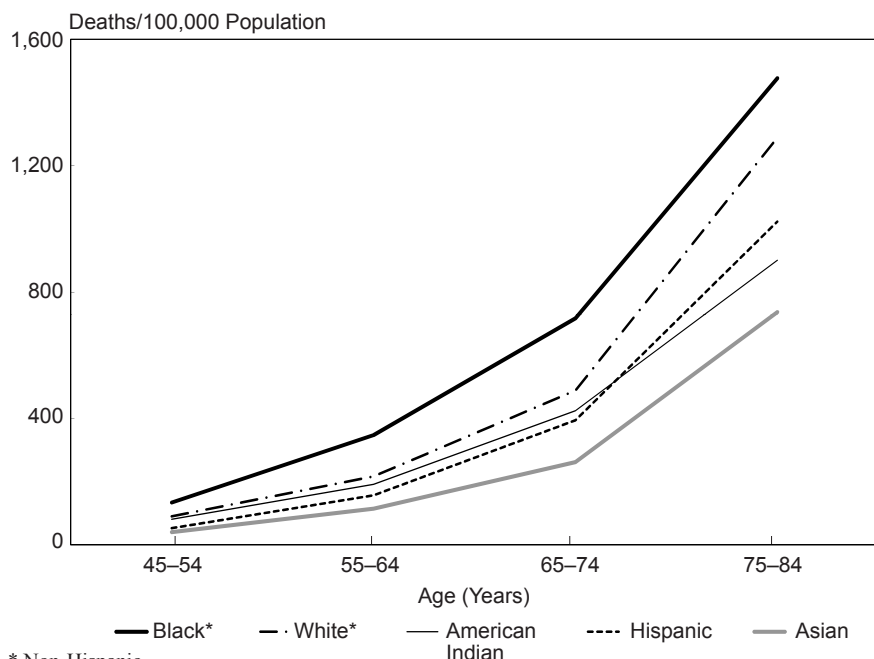
* Non-Hispanic.

In 2006, CHD mortality in males increased with age from 45–54 to 75–84 years for non-Hispanic blacks, non-Hispanic whites, Hispanics, American Indians, and Asians. The relatively high rates in non-Hispanic blacks and low rates in Asians occurs in all age groups.[36]

Coronary Heart Disease

Chart 3–31
Death Rates for Coronary Heart Disease in Females
by Age and Race/Ethnicity, U.S., 2006

In 2006, CHD mortality in females increased with age from 45–54 to 75–84 years for non-Hispanic blacks, non-Hispanic whites, Hispanics, American Indians, and Asians. The relatively high rates in non-Hispanic blacks and low rates in Asians occurs in all age groups.[36]

Deaths/100,000 Population

Age (Years)

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

* Non-Hispanic.
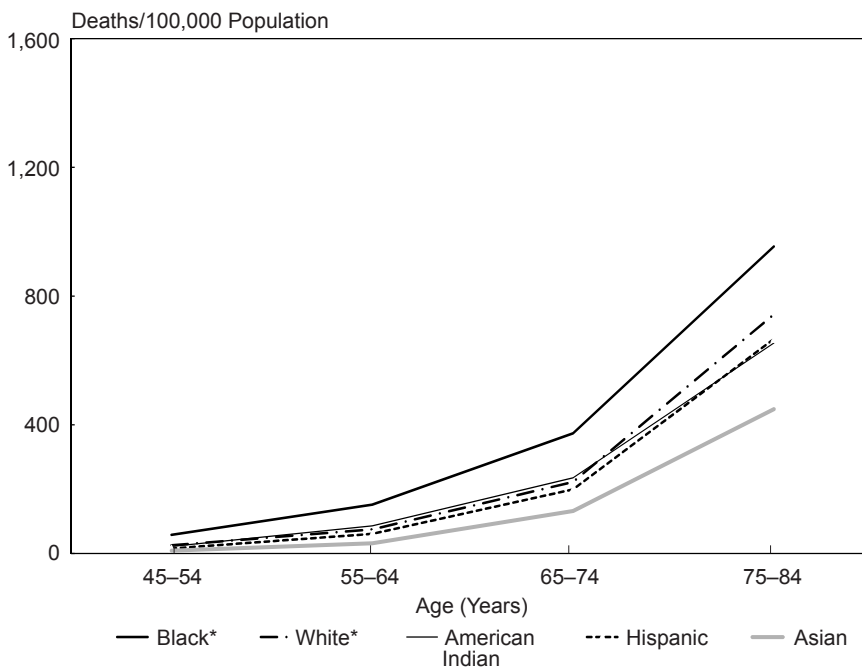
Chart 3–32
Age-Adjusted Death Rates for Coronary Heart Disease
by State, U.S., 2003–2005

In 2003–2005, 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.[15]

Deaths/100,000 Population
- 166–205 (11)
- 151–165 (10)
- 131–151 (10)
- 123–130 (9)
- 90–122 (10)
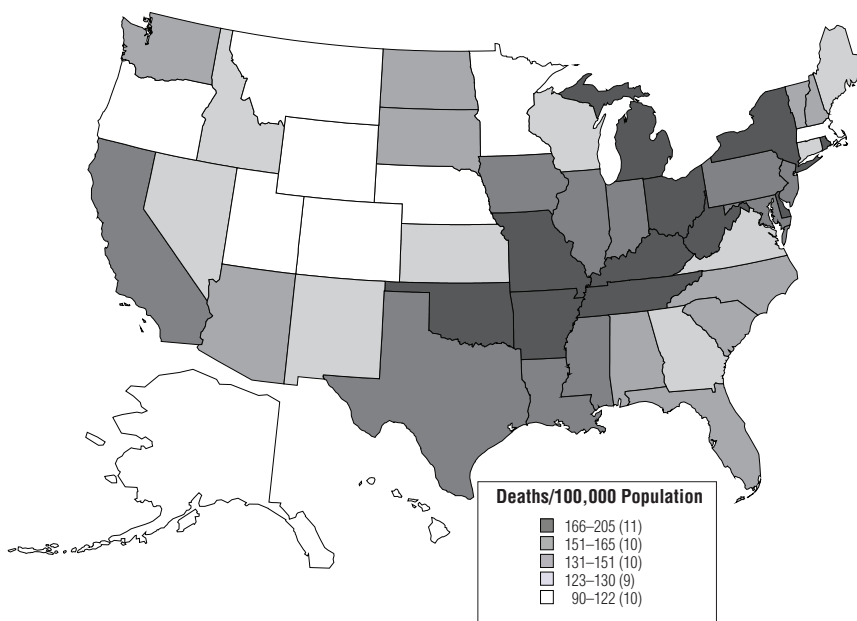
Coronary Heart Disease

Chart 3–33
Age-Adjusted Death Rates* for Coronary Heart Disease by Country and Sex, Ages 35–74, 2007
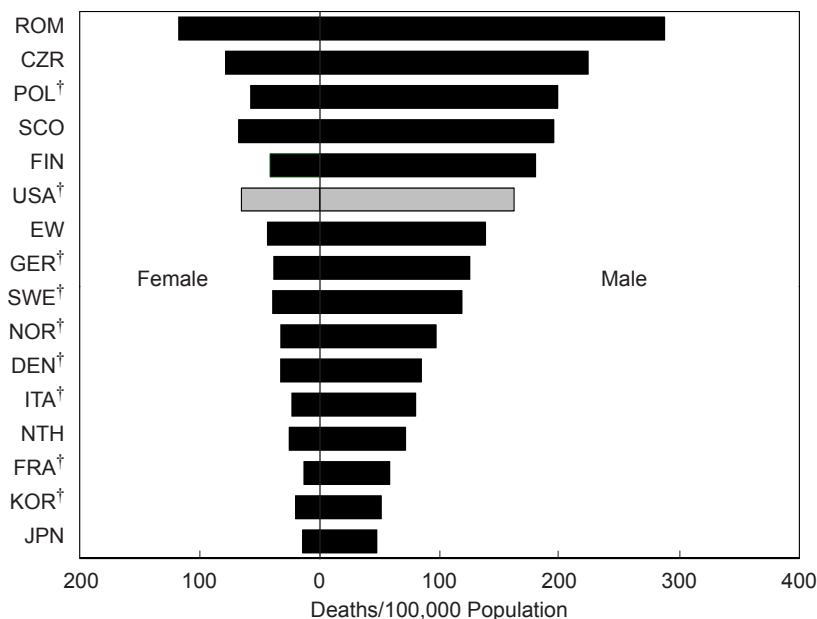
In 2006–2007, among 16 industrialized countries, the United States ranked sixth highest for CHD mortality in males and fourth highest in females.[45]

* Age adjusted to European standard.
† Data for 2006.

Chart 3–34
Change in Age-Adjusted Death Rates* for Coronary Heart Disease in Males by Country, Ages 35–74, 1999–2007†
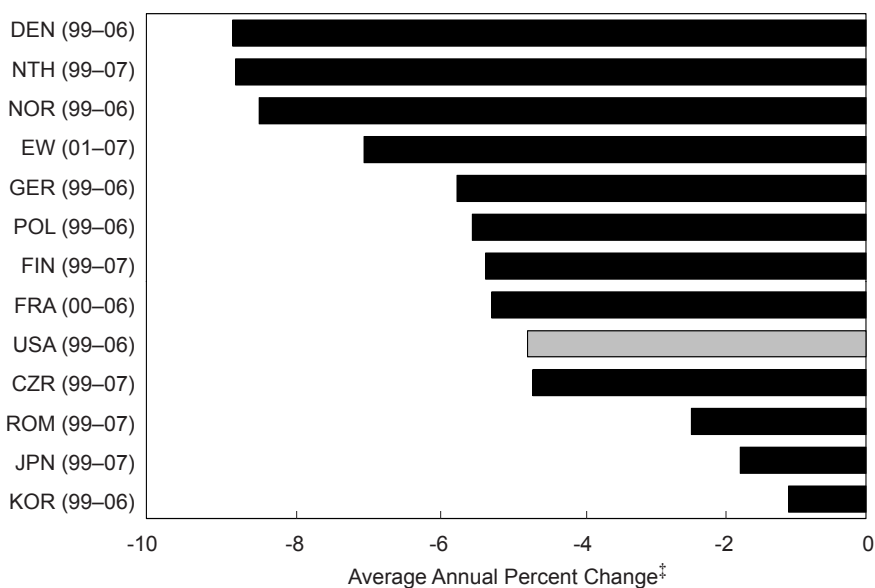
From 1999 to 2007, when compared with the United States, 8 of the 13 countries shown had a steeper average annual decline in CHD mortality in males.[45]

* Age adjusted to European standard.
† Data for years indicated in parentheses.
‡ Based on a log linear regression of the actual rates.

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Coronary Heart Disease/Heart Failure

Chart 3–35
Change in Age–Adjusted Death Rates* for Coronary Heart Disease in Females by Country, Ages 35–74, 1999–2007[†]
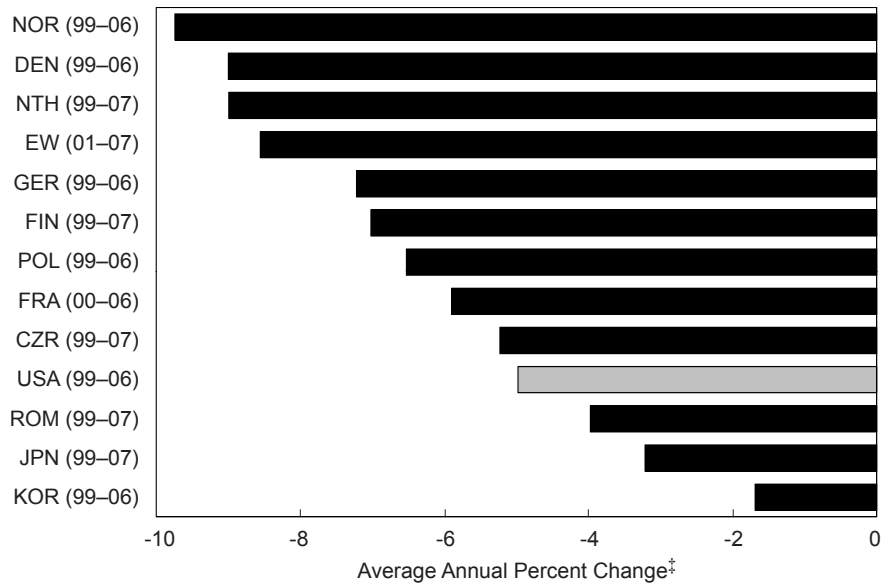
From 1999 to 2007, when compared with the United States, 9 of the 13 countries shown had a steeper average annual decline in CHD mortality in females.[45]

* Age adjusted to European standard.
[†] Data for years indicated in parentheses.
[‡] Based on a log linear regression of the actual rates.

Chart 3–36
Age-Adjusted Prevalence of Heart Failure by Race and Sex, Ages 25–74, U.S., 1971–1975 to 2003–2006

From 1976–1980 to 1988–1994, the prevalence of HF increased markedly in males, females, whites, and blacks and remained relatively high thereafter. The extent to which the increase is attributed to the change in terminology, from *HF* to *congestive HF,* beginning with the 1988–1994 survey is unknown.[17]
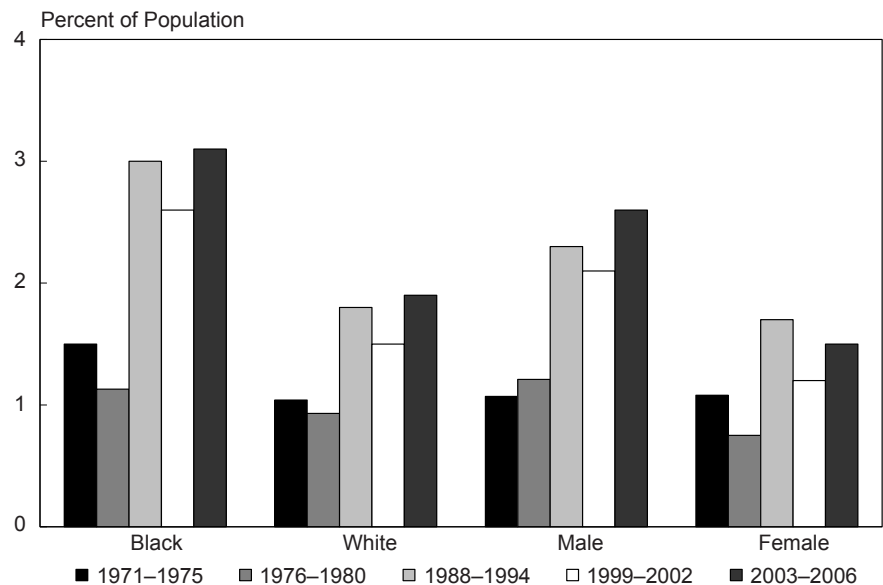
Congestive Heart Failure

Chart 3–37
Hospitalization Rates for Congestive Heart Failure, Ages Younger Than 65 and 65 and Older, U.S., 1971–2006

Hospitalizations/10,000 Population

Ages <65 Years   Ages ≥65 Years
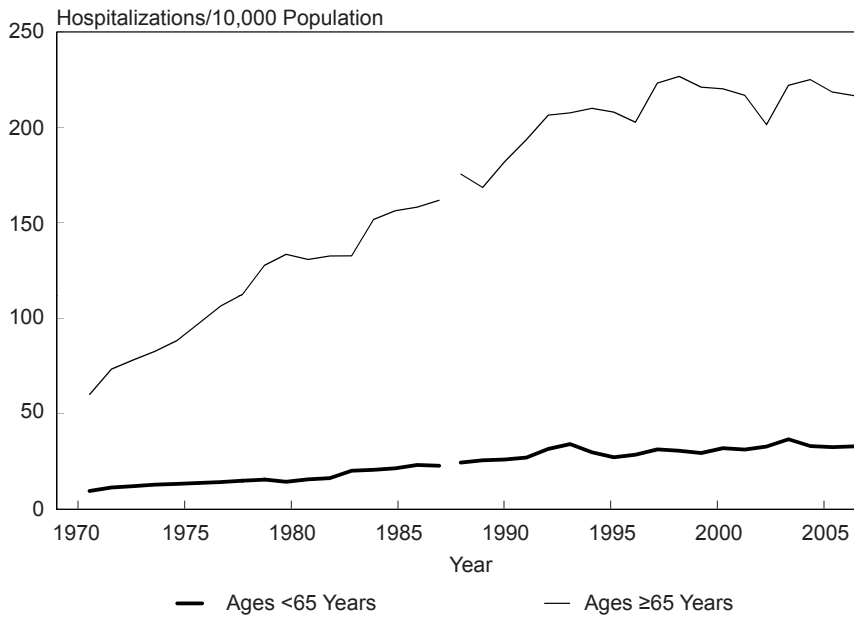
Hospitalization rates for conges-
tive HF in those younger than
65 years increased from 1971
to 1993 and remained stable
through 2006. Rates for those
65 years and older increased
from 1970 to 1998 and re-
mained somewhat stable until
2006.[33, 34]

Chart 3–38
Hospital Case-Fatality Rates for Congestive Heart Failure, Ages Younger Than 65 and 65 and Older, U.S., 1982–2006

Percent Discharged Dead

Ages <65 Years   Ages ≥65 Years
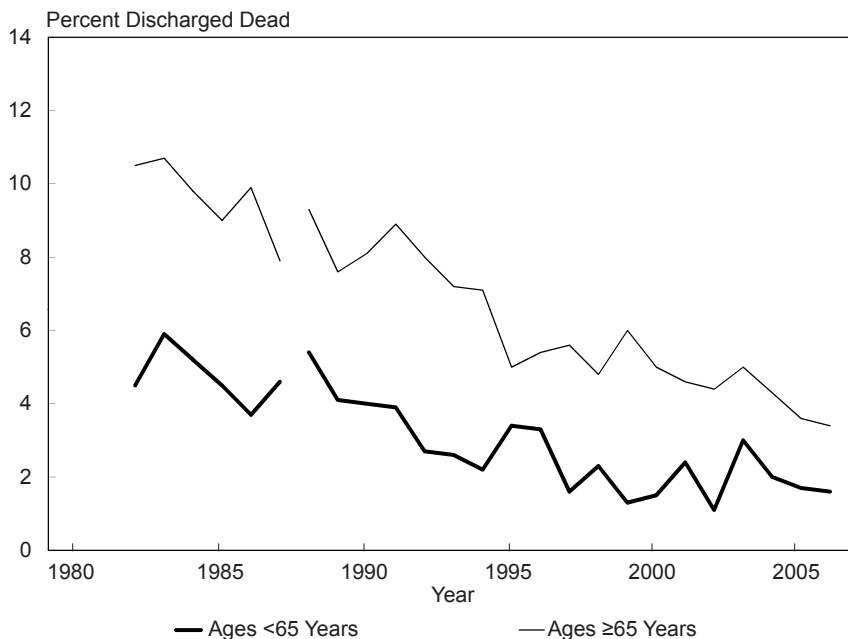
Hospital case-fatality rates for
congestive HF declined appre-
ciably from 1982 to 2006 for
those younger than 65 years and
65 years and older.[33, 34]

39

Heart Failure

Chart 3–39
Age-Adjusted Death Rates for Heart Failure as the Underlying Cause by Race and Sex, U.S., 1981–2006

From 1981 to 1988, death rates with HF as the underlying cause increased in blacks and whites, both male and female. Rates stabilized in the early 1990s and remained so through 2006. Mortality was highest in black males and lowest in white females.[36]

Deaths/100,000 Population

ICD-9   ICD-10

— Black Male   —· White Male   — Black Female   ---- White Female
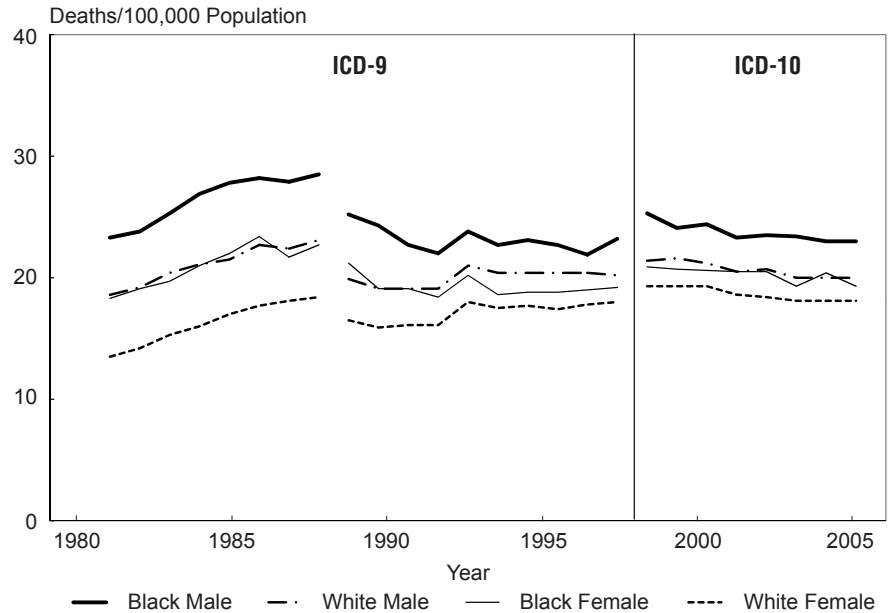
Chart 3–40
Age-Adjusted Death Rates for Any Mention of Heart Failure by Race and Sex, U.S., 1981–2006

From 1989 to 2006, death rates for any mention of HF on the death certificate declined for blacks and whites, both male and female. From 1981 to 2000, mortality in males was higher in whites than in blacks and then was similar through 2006. This is in contrast to HF solely as the underlying cause (also see Chart 3–39).[36]

Deaths/100,000 Population

ICD-9   ICD-10

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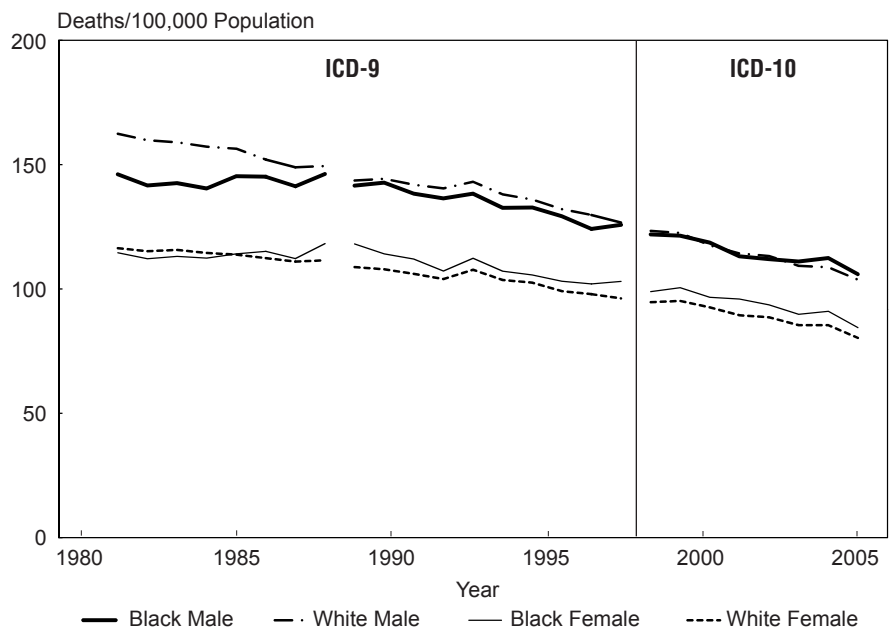
Heart Failure

Chart 3–41
Age-Adjusted Death Rates for Heart Failure as the Underlying Cause
of Death by Race/Ethnicity and Sex, U.S., 2006

Deaths/100,000 Population

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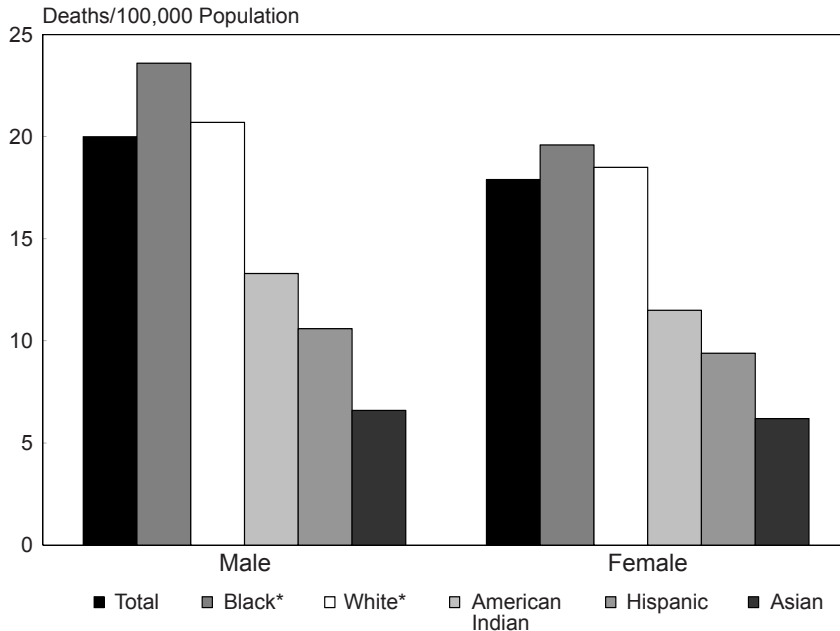
* Non-Hispanic.

In 2006, 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.[36]

Chart 3–42
Age-Adjusted Death Rates for Any Mention of Heart Failure
by Race/Ethnicity and Sex, U.S., 2006

Deaths/100,000 Population

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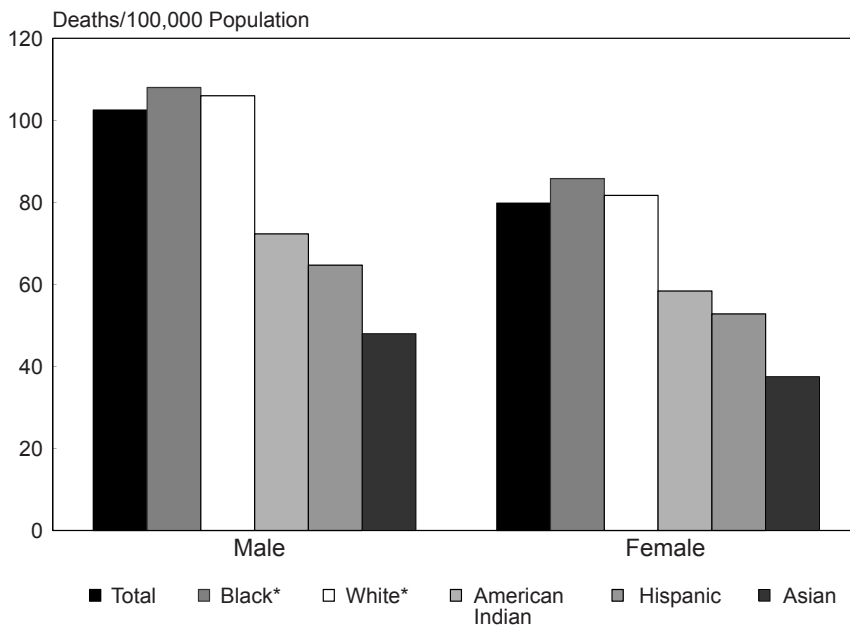
* Non-Hispanic.

In 2006, 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.[36]

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Heart Failure

Chart 3–43
Death Rates for Heart Failure as the Underlying Cause
by Age, Race, and Sex, U.S., 2006

In 2006, 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.[36]

Deaths/100,000 Population

Black Male — White Male — Black Female ---- White Female
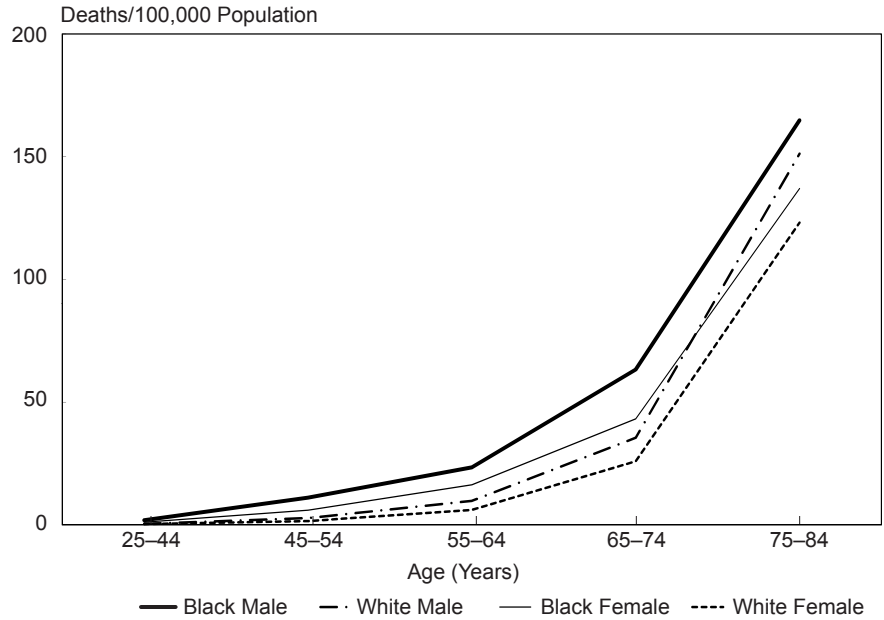
Chart 3–44
Death Rates for Any Mention of Heart Failure
by Age, Race, and Sex, U.S., 2006

In 2006, mortality for any mention of HF on the death certificate was higher in blacks than in whites within sex groups and at all ages, with one exception: For those aged 75–84 years, the death rate in white males surpassed the rate in black males. Within racial groups, death rates for HF were higher in males than in females.[36]

Deaths/100,000 Population

Black Male — White Male — Black Female ---- White Female
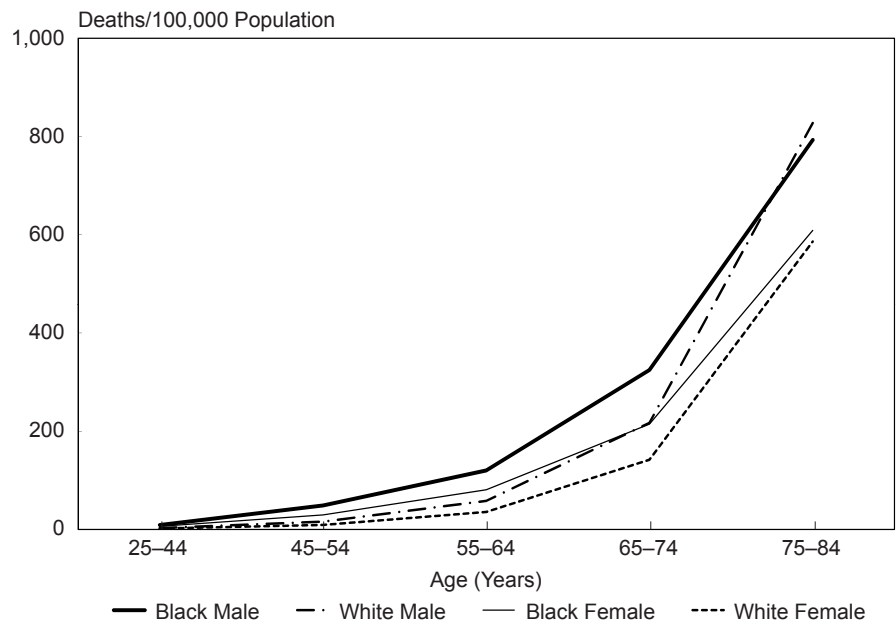
Cardiomyopathy

Chart 3–45
Age-Adjusted Death Rates for Cardiomyopathy
by Race and Sex, U.S., 2006

Deaths/100,000 Population
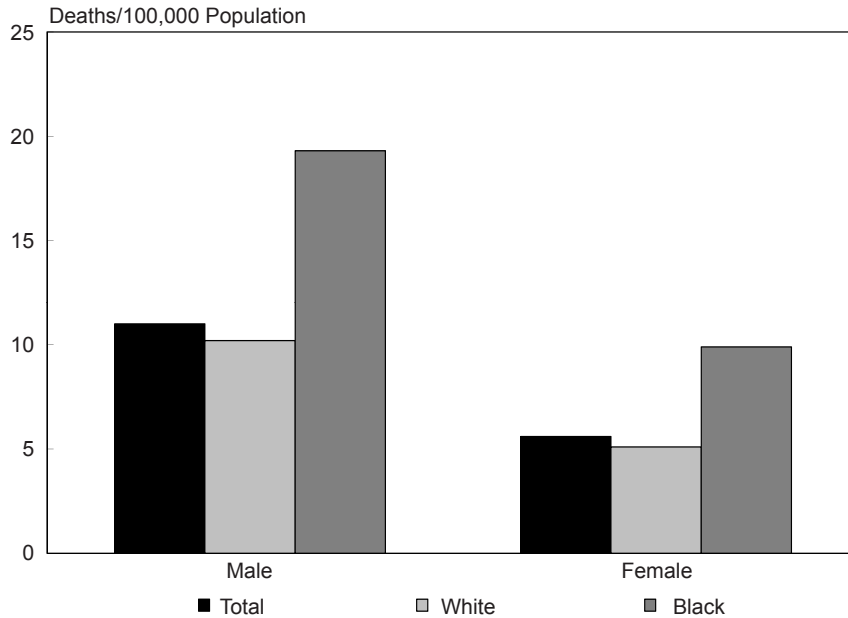
In 2006, the death rate for cardiomyopathy was about twice as high in males than in females and nearly twice as high in blacks than in whites.[35]

Chart 3–46
Death Rates for Cardiomyopathy
by Age, Race, and Sex, U.S., 2006

Deaths/100,000 Population
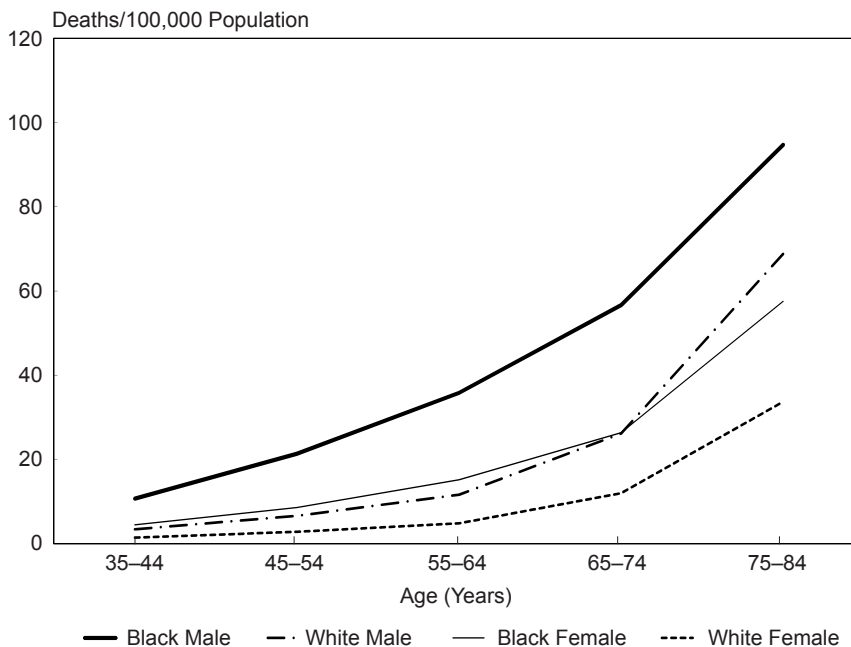
In 2006, within sex groups, cardiomyopathy mortality was much higher in blacks than in whites at all ages from 35–44 to 75–84 years. Within racial groups, cardiomyopathy mortality was higher in males than in females.[35]

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Atrial Fibrillation

Chart 3–47
Hospitalizations for Atrial Fibrillation by Primary
and Secondary Diagnosis, U.S., 1982–2006

The number of hospitalizations for atrial fibrillation as a primary diagnosis was more than 2.5 times higher in 2006 than in 1988. As a secondary diagnosis, the number of hospitalizations was 3 times higher in 2006 than in 1988.[33, 34]

Hospitalizations (Thousands)

Primary Diagnosis — *Secondary Diagnosis*
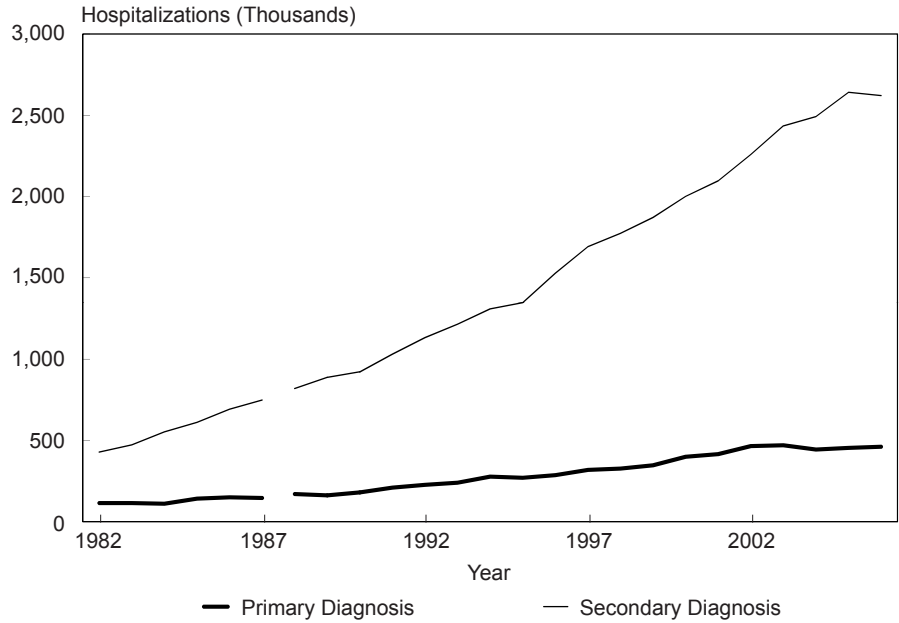
Chart 3–48
Hospitalization Rates for Atrial Fibrillation
by Age, U.S., 1982–2006

From 1988 to 2006, hospitalization rates for atrial fibrillation nearly doubled for those aged 45–64 years and slightly more than doubled for those aged 65 years and older.[33, 34]

Hospitalizations/10,000 Population

Ages 45–64 Years — *Ages ≥65 Years*
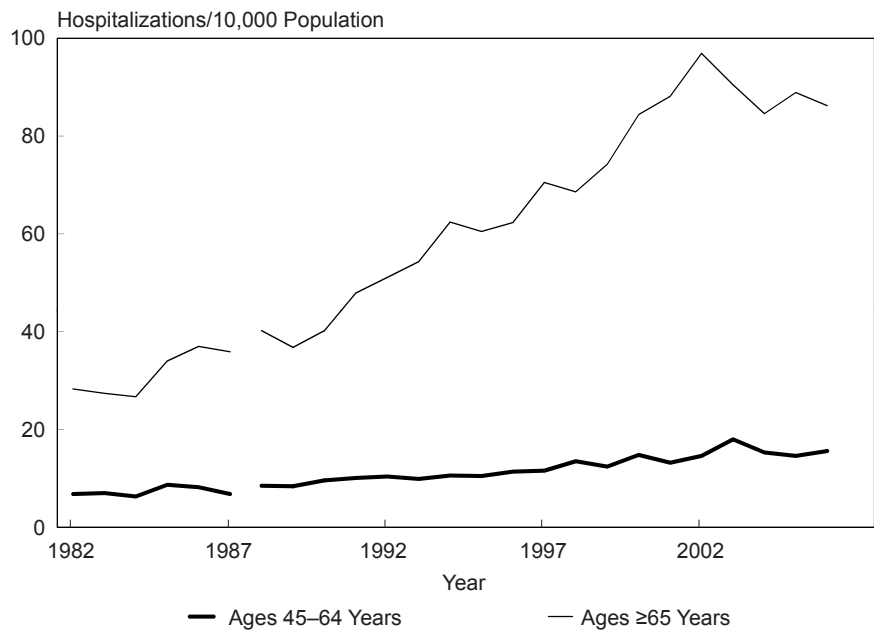
Cerebrovascular Diseases (Stroke)

Chart 3–49
Age-Adjusted Prevalence of Stroke by Race and Sex,
Ages 25–74, U.S., 1971–1975 to 2003–2006

Percent of Population

■ 1971–1975   ■ 1976–1980   ■ 1988–1994   □ 1999–2002   ■ 2003–2006
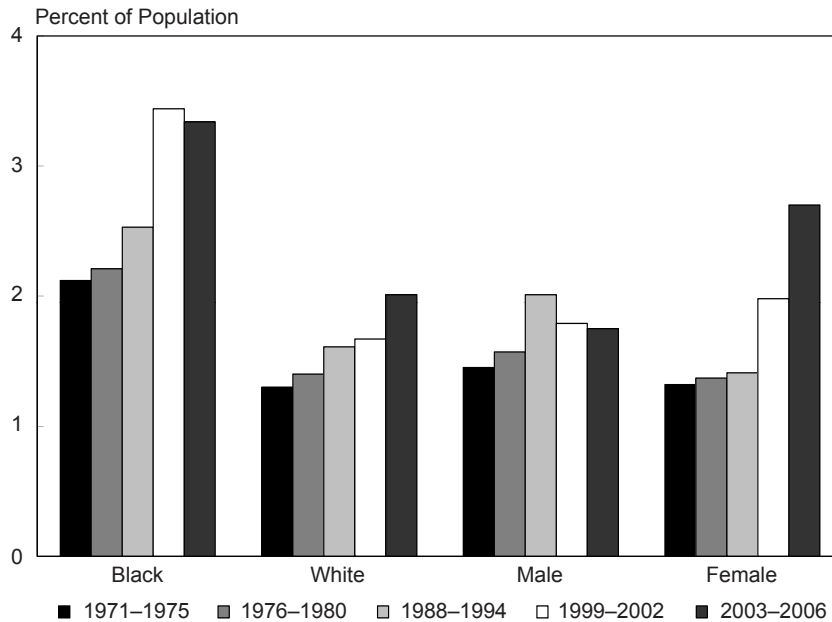
From 1971–1975 to 2003–2006, the prevalence of stroke mostly increased in blacks, whites, and females. In males, the prevalence increased from 1971–1975 to 1988–1994 and then decreased in 1999–2002.[17]

Chart 3–50
Prevalence of Stroke by Age and Sex,
U.S., 1999–2006

Percent of Population

Age (Years)

■ Male   □ Female
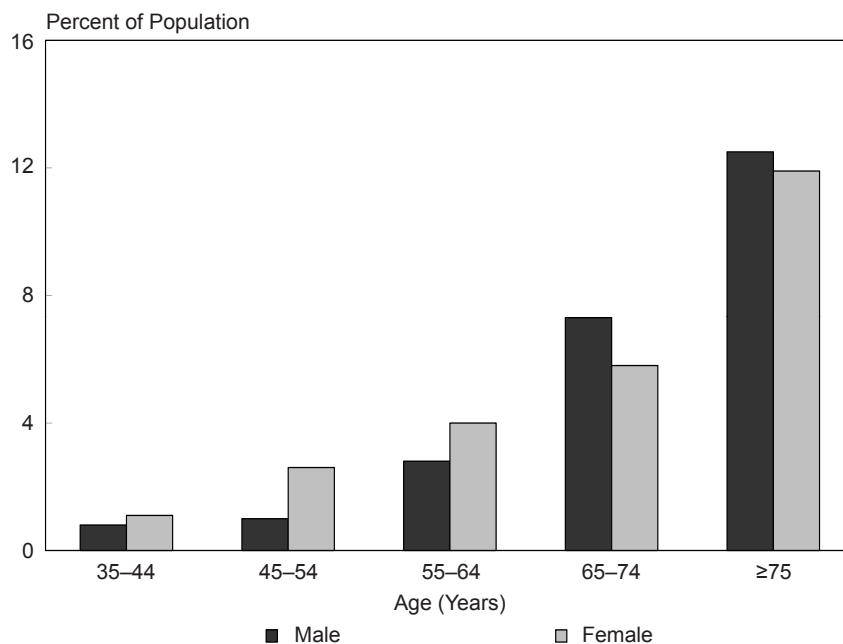
In 1999–2006, the prevalence of stroke, which increased with age, was higher in females than in males through age 55–64 years; it was higher in males than in females aged 65 years and older.[17]

Cerebrovascular Diseases (Stroke)

Chart 3–51
Prevalence of Stroke by Age and Race,
U.S., 1999–2006

In 1999–2006, the prevalence of stroke increased with age and was higher in blacks than in whites at all ages.[17]

Percent of Population
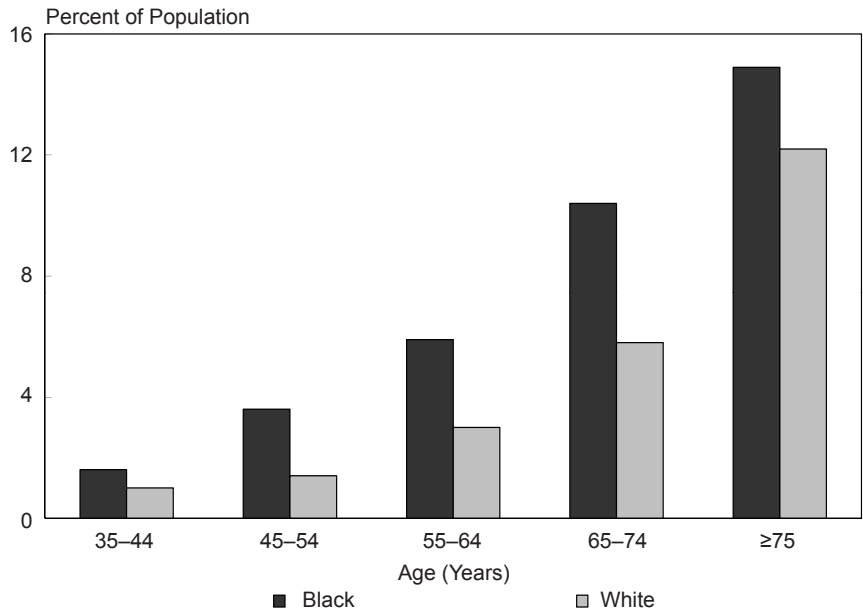
Chart 3–52
Hospitalization Rates for Stroke,
Ages 45–64 and 65 and Over, U.S., 1971–2006

Hospitalization rates for stroke in those aged 45–64 years increased from 1971 to the mid-1980s, then remained relatively stable through 2006. For those aged 65 years and older, the rates generally rose from 1971 to 1997, and subsequently declined through 2006.[33, 34]

Hospitalizations/10,000 Population
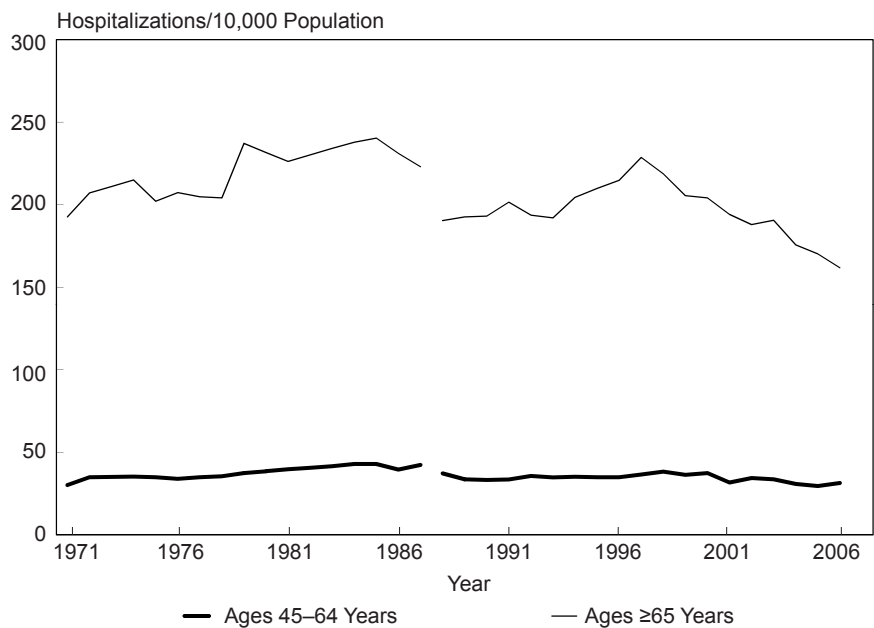
Cerebrovascular Diseases (Stroke)

Chart 3–53
Hospital Case-Fatality Rate for Stroke,
Ages Younger Than 65 and 65 and Over, U.S., 1971–2006*

Percent Discharged Dead

Ages <65 Years —— Ages ≥65 Years

* Estimates are not available for 1976 and 1977.
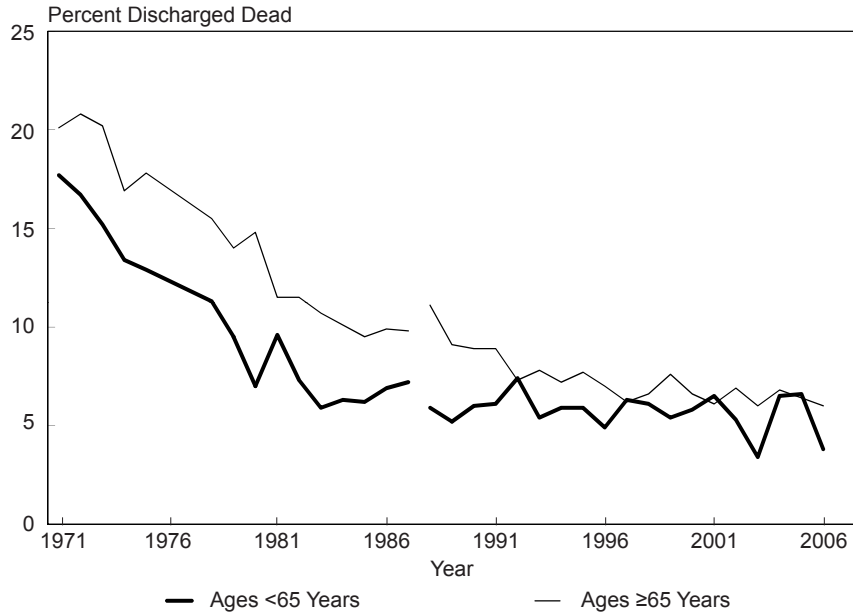
Hospital case-fatality rates for stroke in patients younger than 65 years declined appreciably from 1971 to 1983 and then fluctuated through 2006. For those aged 65 years and older, the rates continued to decline until 1997 and then stabilized.[33, 34]

Chart 3–54
Age-Adjusted Death Rates for Stroke
by Race and Sex, U.S., 1950–2006

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.
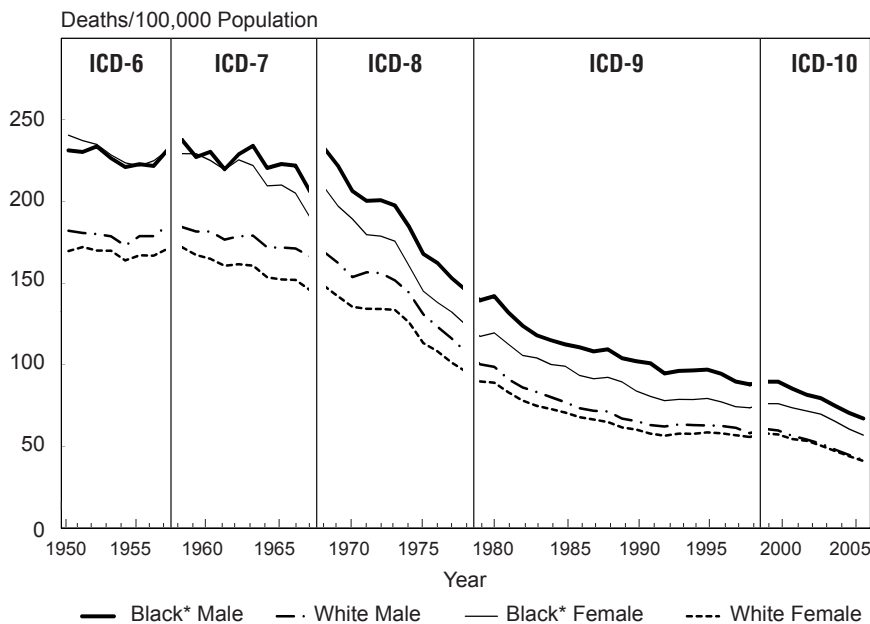
The steep decline in stroke mortality that occurred for black and for white males and females in the 1970s and mid-1980s slowed through the 1990s before resuming in 2001.[31, 32]

Cerebrovascular Diseases (Stroke)

Chart 3–55
Deaths and Age-Adjusted Death Rates for Stroke, U.S., 1979–2006*

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 1998 through 2006.[31, 32]

Deaths in Thousands (Bar)   Deaths/100,000 Population (Line)
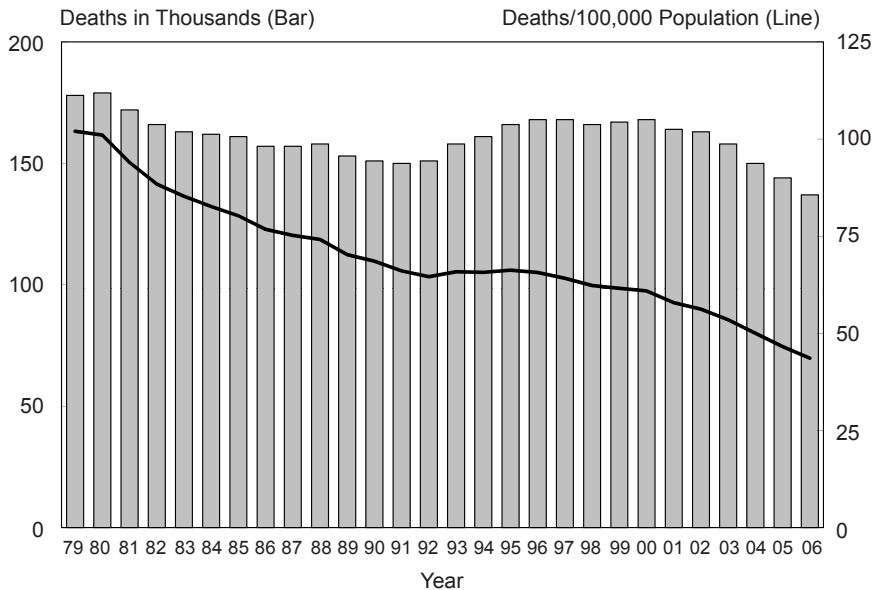
* The comparability ratio 1.0502 was applied to the deaths and rates reported in vital statistics for 1979–1998.

Chart 3–56
Age-Adjusted Death Rates for Stroke by Race/Ethnicity and Sex, U.S., 1999–2006

From 1999 to 2006, stroke mortality declined for non-Hispanic blacks, non-Hispanic whites, Asians, Hispanics, and American Indians, both male and female.[36]

Deaths/100,000 Population

Male   Female

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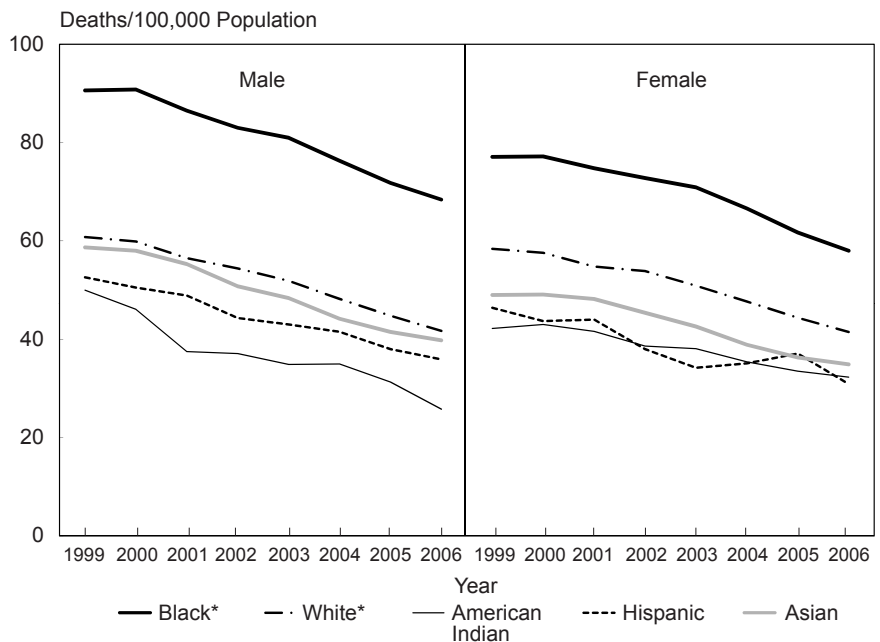
* Non-Hispanic.

Cerebrovascular Diseases (Stroke)

Chart 3–57
Average Annual Percent Change in Age-Adjusted Death Rates for Stroke by Race and Sex, U.S., 1960–2006

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
1979–1989	-3.7	-3.0	-3.9	-3.0	-3.7
1989–1998	-0.9	-1.6	-1.1	-1.7	-0.7
1999–2006	-4.9	-4.2	-5.4	-4.1	-4.9

* Nonwhite from 1960 to 1967.

The steep average annual declines in stroke mortality that occurred in males and females, and in blacks and whites, from 1968 to 1989 were followed by modest reductions for several years. Appreciable annual declines—almost 5% overall—resumed in 1999 through 2006.[31, 32]

Chart 3–58
Age-Adjusted Death Rates for Stroke by Race/Ethnicity and Sex, U.S., 2006

Deaths/100,000 Population

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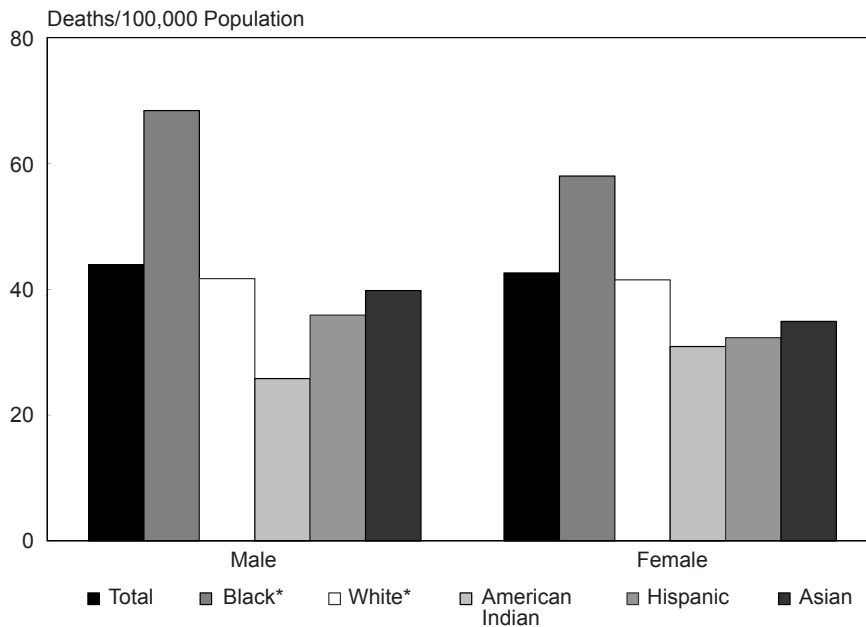
* Non-Hispanic.

In 2006, stroke mortality was about the same in males and females. By race/ethnicity, death rates were highest in non-Hispanic blacks and lowest in American Indians.[36]

Cerebrovascular Diseases (Stroke)

Chart 3–59
Death Rates for Stroke in Males
by Age and Race/Ethnicity, U.S., 2006

In 2006, stroke mortality in males increased with age from 45–54 to 75–84 years for non-Hispanic blacks, non-Hispanic whites, Hispanics, American Indians, and Asians.[36]

Deaths/100,000 Population

Age (Years)

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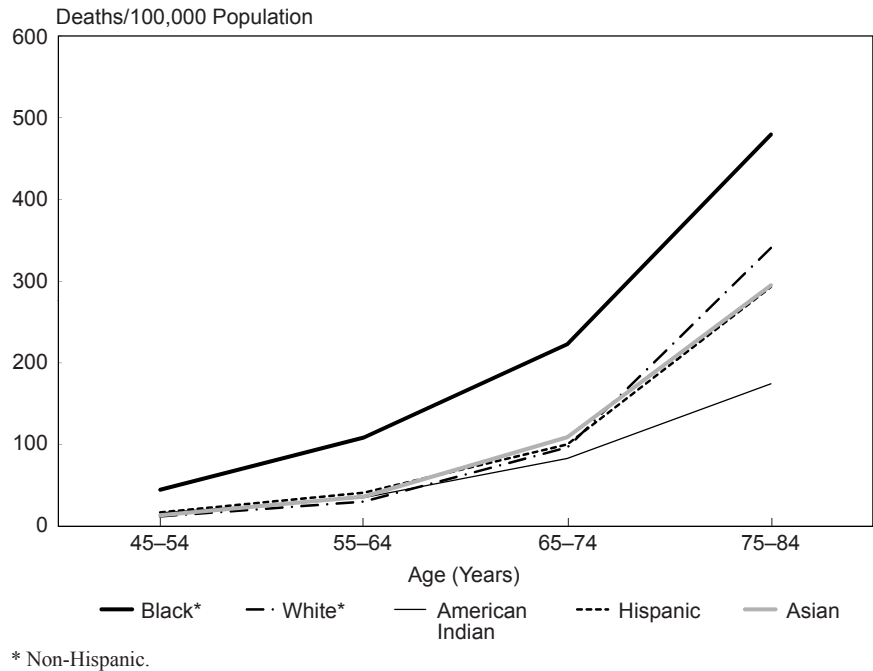
* Non-Hispanic.

Chart 3–60
Death Rates for Stroke in Females
by Age and Race/Ethnicity, U.S., 2006

In 2006, stroke mortality in females increased with age from 45–54 to 75–84 years for non-Hispanic blacks, non-Hispanic whites, Hispanics, American Indians, and Asians.[36]

Deaths/100,000 Population

Age (Years)

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

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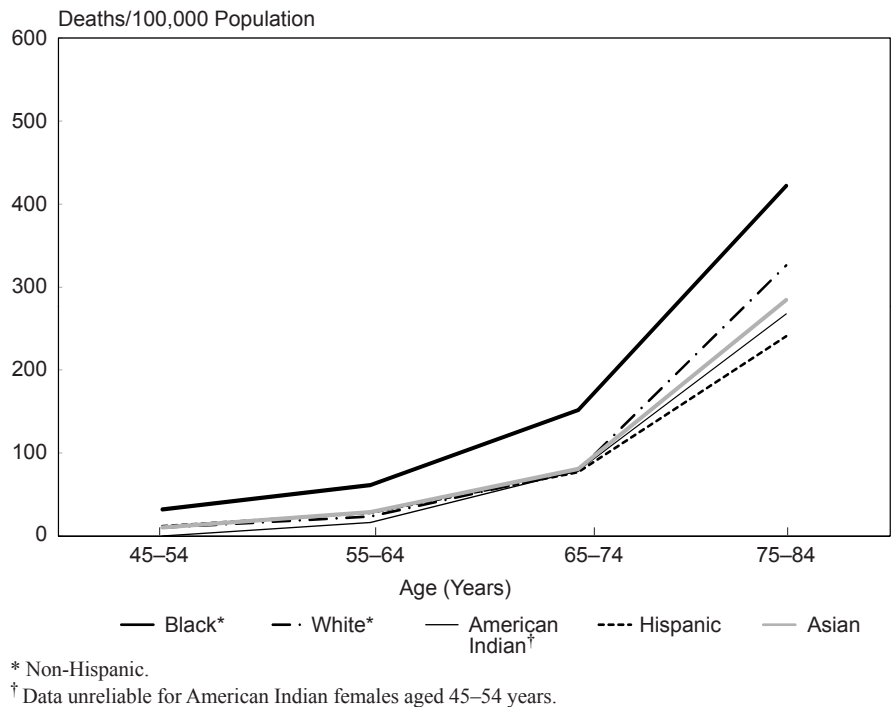
Cerebrovascular Diseases (Stroke)

Chart 3–61
Age-Adjusted Death Rates for Stroke
by State, U.S., 2003–2005

Deaths/100,000 Population
- 58.0–64.0 (10)
- 54.0–57.9 (9)
- 50.0–53.9 (10)
- 45.0–49.9 (10)
- 30.0–44.9 (11)
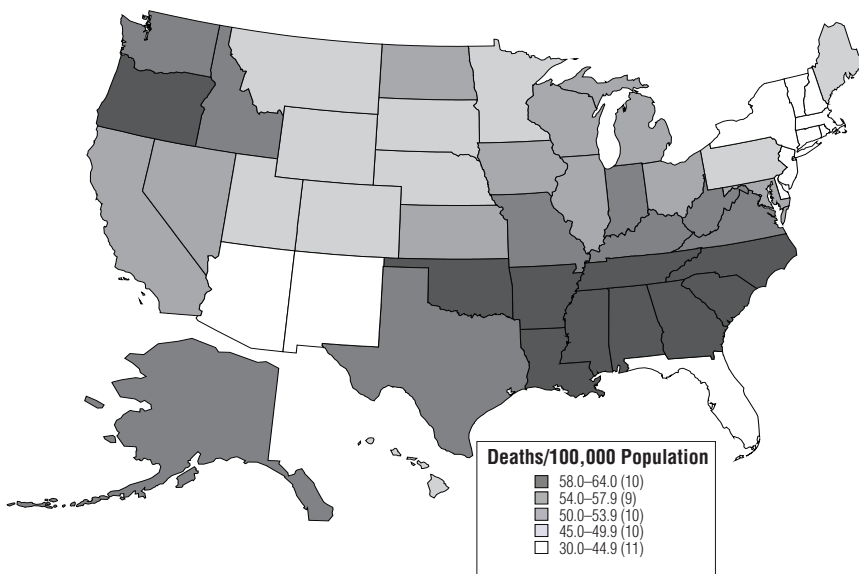
In 2003–2005, stroke mortality was highest in many of the Southeastern states, most of which comprise "the stroke belt."[15]

Chart 3–62
Age-Adjusted Death Rates* for Stroke by
Country and Sex, Ages 35–74, 2007
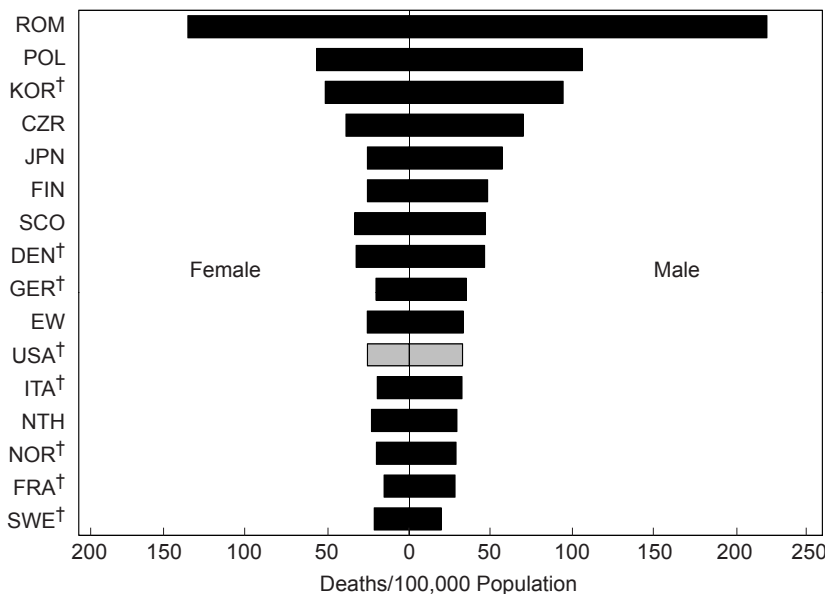
In 2006–2007, among 16 industrialized countries, the United States ranked 11th highest in stroke mortality in males and 10th in females. Eastern European countries had markedly higher death rates for stroke compared with other countries.[45]

* Age adjusted to European standard.
[†] Data for 2006.

Cerebrovascular Diseases (Stroke)

From 1999 to 2005–2007, among 13 industrialized countries, 11 had a steeper average annual decline in stroke mortality in males than the United States.[45]
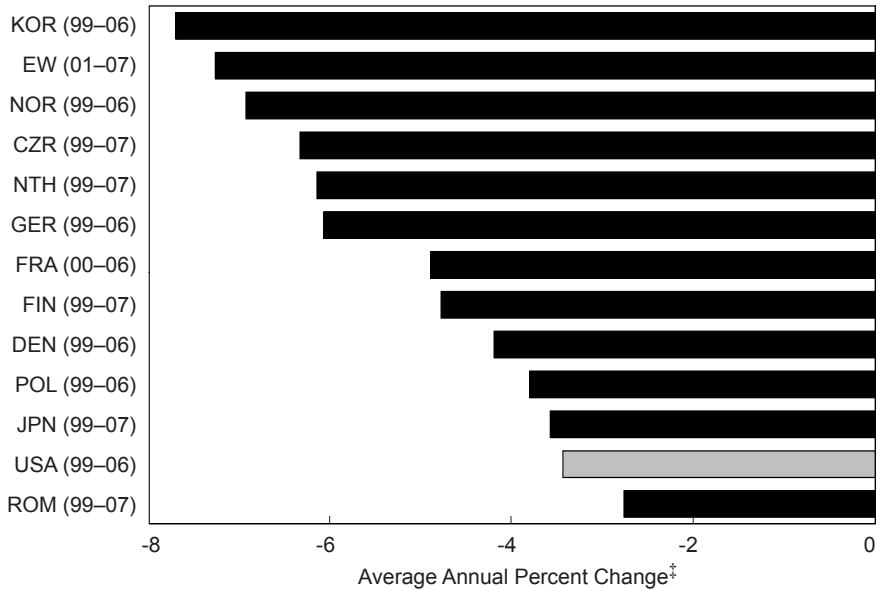
Chart 3–63
Change in Age-Adjusted Death Rates* for Stroke in Males by Country, Ages 35–74, 1999–2007[†]

* Age adjusted to European standard.
[†] Data for years indicated in parentheses.
[‡] Based on a log linear regression of the actual rates.

From 1999 to 2007, when compared with the United States, 9 of the 13 countries shown had steeper average annual declines in stroke mortality in females.[45]
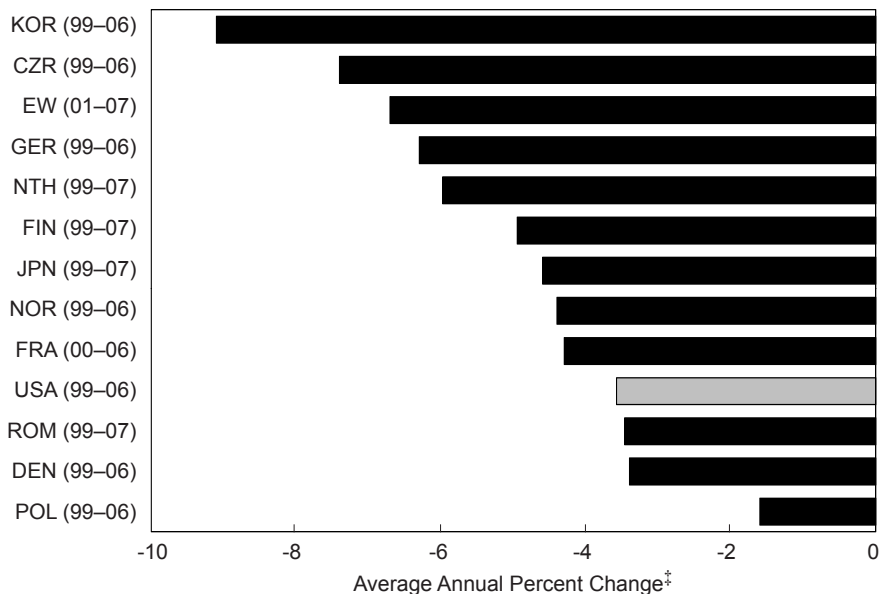
Chart 3–64
Change in Age-Adjusted Death Rates* for Stroke in Females by Country, Ages 35–74, 1999–2007[†]

* Age adjusted to European standard.
[†] Data for years indicated in parentheses.
[‡] Based on a log linear regression of the actual rates.

Hypertension

Chart 3–65
Prevalence of Hypertension* and Prehypertension[†] by Age, U.S., 1999–2006

Percent of Population

Age (Years)

■ Hypertension   □ Prehypertension

* 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.
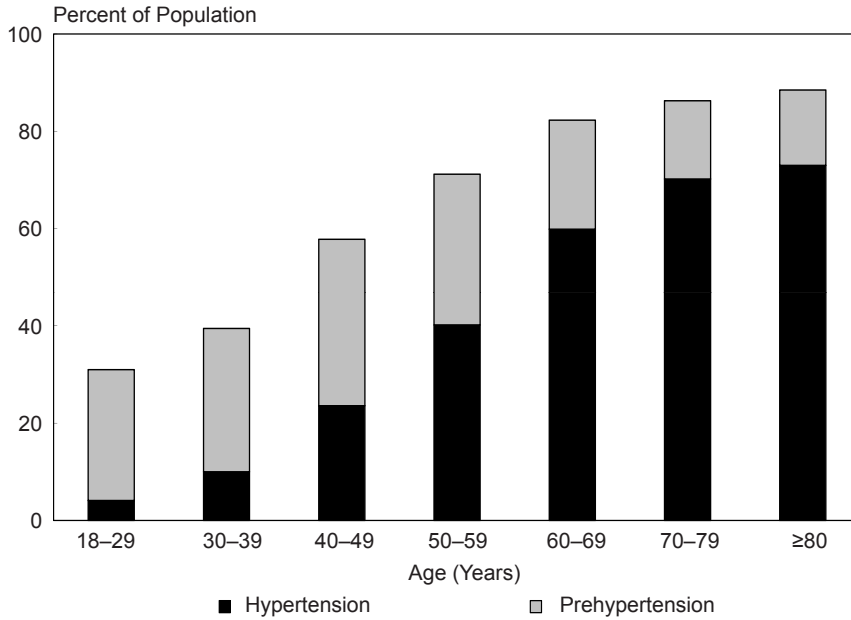
In 1999–2006, the prevalence of hypertension was 40% among those aged 50–59 years and 73% among those aged 80 years and older. These percentages are considerably higher when prehypertension is included.[17]

Chart 3–66
Age-Adjusted Prevalence of Hypertension* by Race/Ethnicity and Sex, Ages 20–74, U.S., 1999–2006

Percent of Population

■ Black[†]   □ White[†]   ■ Mexican-American

* Hypertension is defined as systolic BP ≥140 mmHg, or diastolic BP ≥90, or on medication.
[†] Non-Hispanic.
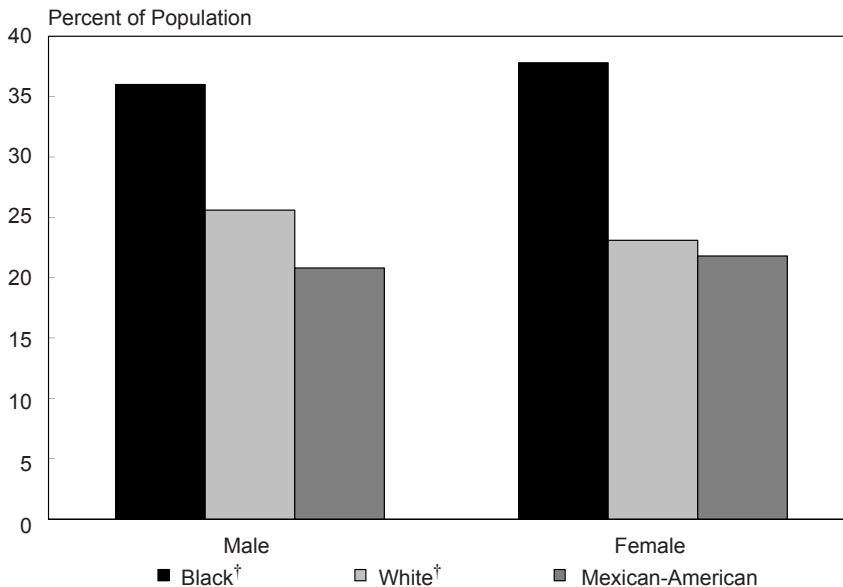
In 1999–2006, the prevalence of hypertension was appreciably higher in non-Hispanic blacks than in non-Hispanic whites or Mexican-Americans aged 20–74 years. Within racial groups, the prevalence of hypertension was similar in males and females.[17]

Hypertension

From 1976–1980 to 1988–1994, the prevalence of hypertension decreased substantially in both non-Hispanic whites and blacks and in males and females and remained relatively stable through 2003–2006. In Mexican-American males, it was stable from 1976–1980 through 1988–1994 before decreasing slightly in 1999–2002 and remaining unchanged in 2003–2006. The prevalence of hypertension was stable for the entire time in Mexican-American females.[17]
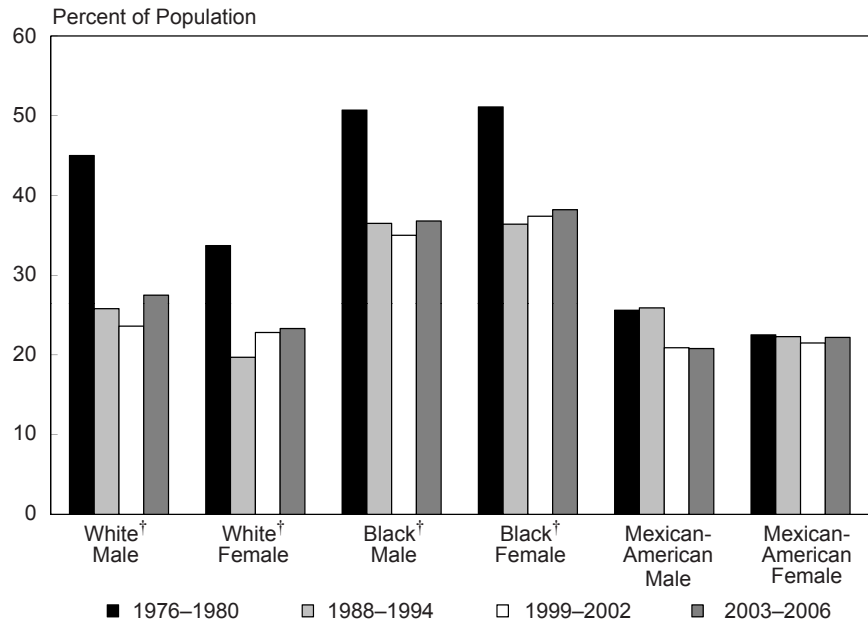
Chart 3–67

Age-Adjusted Prevalence of Hypertension* by Race/Ethnicity and Sex, Ages 20–74, U.S., 1976–1980 to 2003–2006

Percent of Population

■ 1976–1980   ▨ 1988–1994   □ 1999–2002   ▧ 2003–2006

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

In 2003–2006, 93% of persons with a high level of hypertension (160/95+ mmHg) were aware of their condition, compared with 51% in 1971–1972. The percent of hypertensive persons treated and controlled increased from 16% in 1971–1972 to 79% in 2003–2006.[17]

Chart 3–68

Hypertensive* Population Aware, Treated, and Controlled, Ages 18–74, U.S., 1971–1972 to 2003–2006

Percent of Hypertensive Population

Years

■ Unaware   ▨ On Medication Controlled
□ On Medication Uncontrolled   ▧ No Medication Uncontrolled
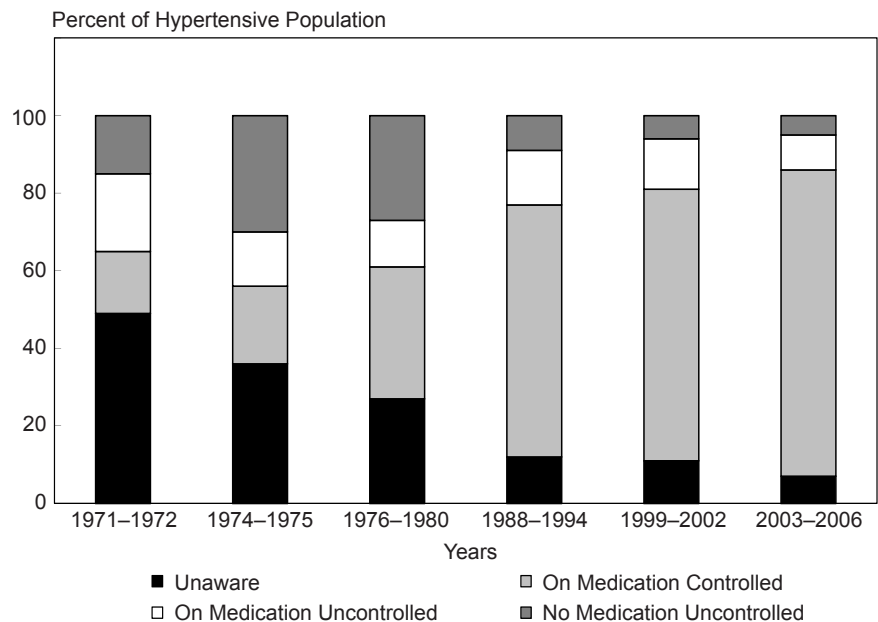
* Hypertension is defined as systolic BP ≥160 mmHg, or diastolic BP ≥95 mmHg, or on medication.

Hypertension/Diseases of the Arteries

Chart 3–69
Hypertensive* Population Aware, Treated, and Controlled,
Ages 18–74, U.S., 1976–1980 to 2003–2006

Percent of Hypertensive Population

Legend:
■ 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.
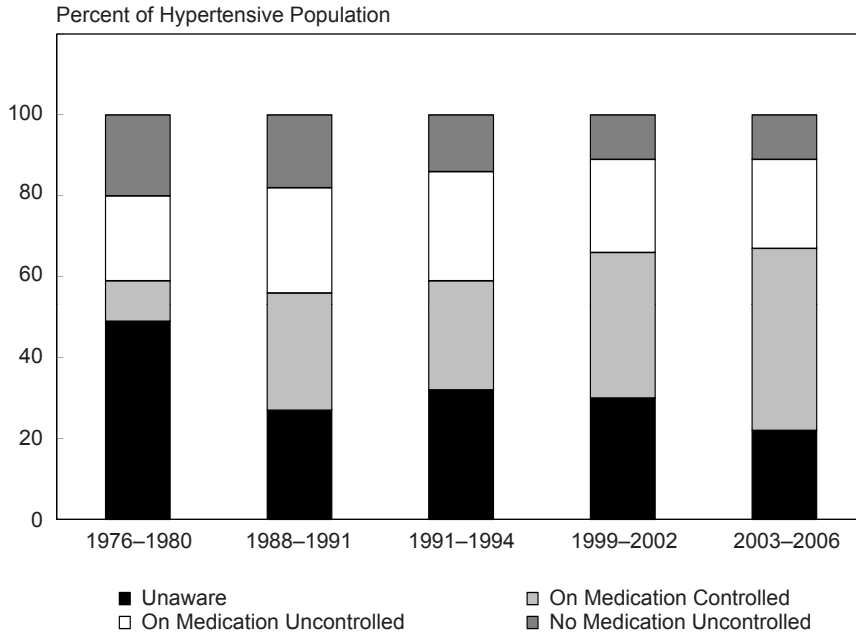
In 2003–2006, for hypertension of 140/90+ mmHg, 78% of hypertensive persons were aware of their condition; 67% were on treatment for it; and 45% had it controlled. These percentages are appreciably greater than the comparable figures (51%, 31%, and 10%, respectively) for 1976–1980.[17]

Chart 3–70
Age-Adjusted Death Rates for Diseases of the Arteries
by Race and Sex, U.S., 2006

Deaths/100,000 Population

Legend:
■ Total
▨ White
▨ Black
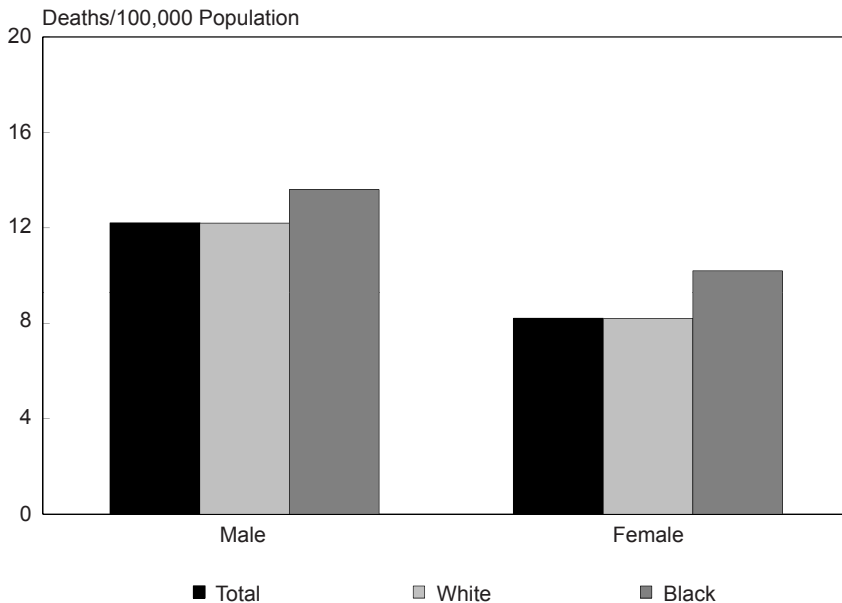
In 2006, death rates for diseases of the arteries within sex groups were higher in blacks than in whites. Overall, death rates were higher in males than in females.[31]

Diseases of the Arteries/Congenital Malformations
of the Circulatory System

Chart 3–71
Death Rates for Diseases of the Arteries
by Age, Race, and Sex, U.S., 2006

In 2006, death rates for diseases of the arteries within racial groups were higher in males than in females at all ages. Rates were higher in black males and females than in white males and females, respectively, except for those aged 75–84 years, where white males had a higher rate than black males.[35]

Deaths/100,000 Population

| | Black Male | White Male | Black Female | White Female |

Age (Years)
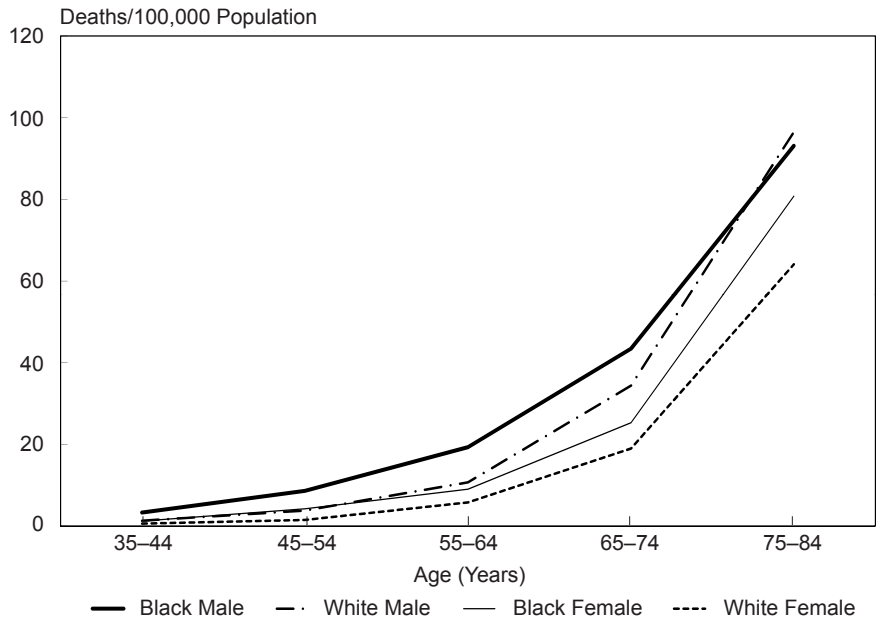
Chart 3–72
Percent of Deaths From Congenital Malformations
of the Circulatory System, Age Under 1, U.S., 1940–2006

The percentage of deaths from congenital malformations of the circulatory system for infants aged less than 1 year declined from 82% in 1940 to 46% in 2006.[31, 32]

Percent of Deaths

Year
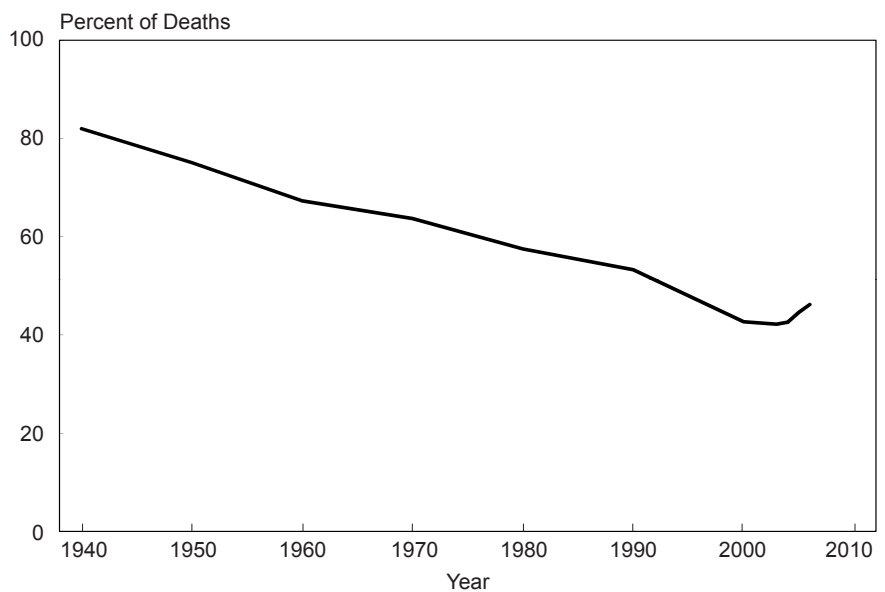
Congenital Malformations of the Circulatory System

Chart 3–73
Infant Mortality From Congenital Malformations
of the Circulatory System by Race, U.S., 1970–2006

Deaths/100,000 Live Births
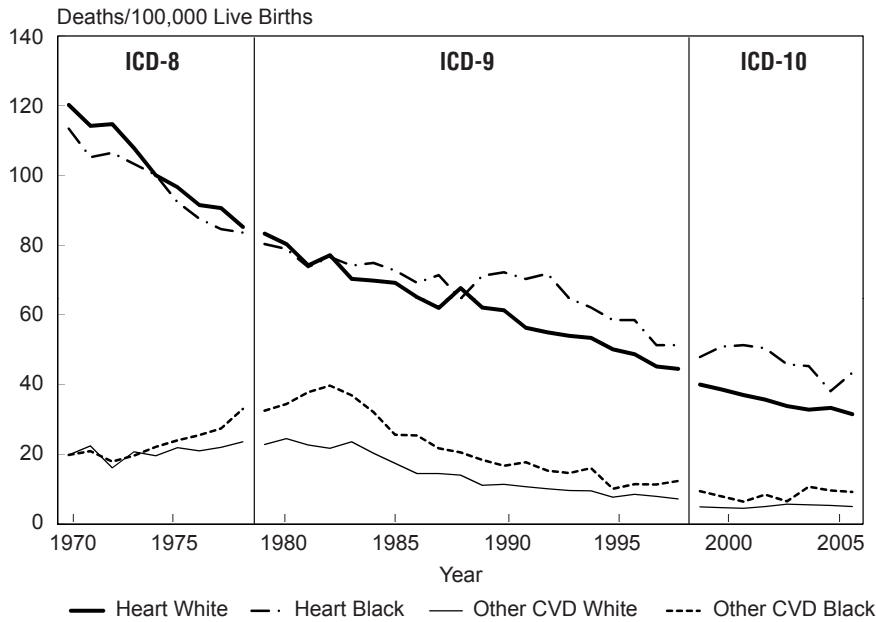
Infant congenital heart disease mortality declined from 1970 to 2006 in blacks and in whites. Mortality from other congenital malformations of the circulatory system did not decline until the mid-1980s in blacks and whites and continued through 2003 in blacks. In whites, the rates were stable during the 2000s.[31, 32]

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 2006 by major lung subgroups.[35] For lung diseases (excluding lung cancer), Chart 4–2 shows, according to ICD-9-CM codes, the estimated number of physician office visits, the estimated number of hospitalizations, and the average length of hospital stay in 2006 and according to ICD-10 codes, the estimated number of deaths in 2006.[34, 35, 44] Subsequent charts display morbidity and mortality for total lung diseases and specific subgroups: COPD, asthma, neonatal 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 recently as "the physiologic finding of nonreversible pulmonary function impairment."[25]

COPD prevalence charts in this *Chart Book* are based on physician-diagnosed COPD. Prevalence is determined from annual COPD data, which are obtained from NHIS, of self-reports of lifetime prevalence. In 2007, an estimated 12 million individuals were identified with COPD.[24] Additionally, based on spirometry readings of lung function in the 1988–1994 NHANES, COPD was estimated to go undiagnosed in 12 million people.[25]

Asthma

Three different prevalence estimates derived from NHIS data are found in this chapter. Before 1997, prevalence was based on NHIS estimates of individuals who had or knew someone in the family who had asthma during the past 12 months. Beginning in 1997, "attack prevalence" was introduced to limit the count to individuals who responded *yes* to the following questions:

- Have you ever been told by a doctor or other health professional that you have asthma?
- During the past 12 months, have you had an episode of asthma or asthma attack?

As a result, the estimates from 1997 to 2007 are not comparable to those based on NHIS data prior to 1997. Charts 4–18 and 4–19 indicate this change by breaking the asthma prevalence trend line between 1996 and 1997.

In 2001, a question was added to the survey to determine "current prevalence" or simply, prevalence. "Do you still have it?" is the question asked of those who have been told by a doctor or other health professional that they have asthma. Current prevalence is based on individuals who respond yes to that question. (See Charts 4–18 to 4–21.)

Chart 4–1
Deaths From Lung Diseases, Percent by Subgroup, U.S., 2006

Cardiopulmonary Diseases 5.5%
Other 4.1%
Neonatal Pulmonary Disorders 2.1%
External Agents 8.0%
Influenza and Pneumonia 25.0%
COPD 53.6%
Asthma 1.6%

Total Deaths = 225,028 (100%)
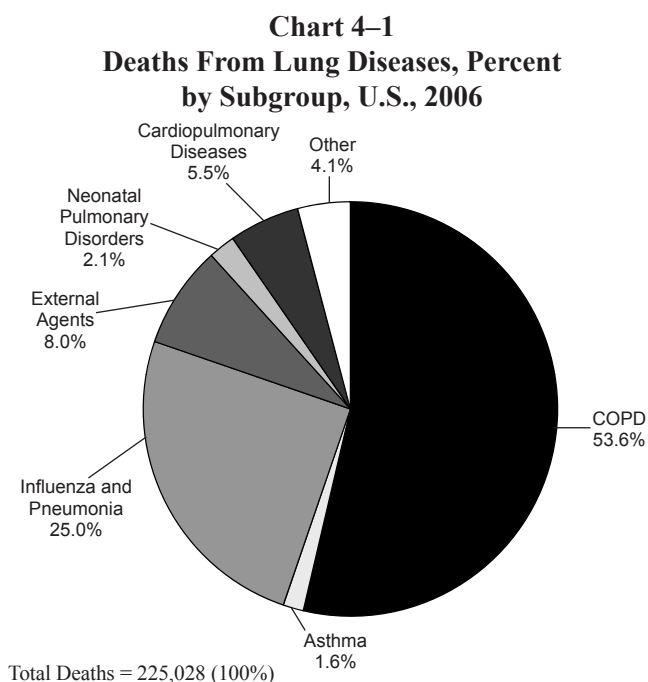
Lung Diseases

Chart 4–2
Number of Hospitalizations, Physician Office Visits,*
and Deaths for Lung Diseases,† U.S., 2006

Diagnostic Category	ICD-9-CM Codes	Hospitalizations		Physician Office Visits (1,000)	ICD-10 Codes	Deaths
		First-Listed Discharges (1,000)	Length of Stay (Days)			
Total		3,376	5.3	35,323		225,028
Acute lower respiratory infections:	466, 480–487	1,487	4.8	6,988	J10–J18, J20, J21	56,540
Influenza and pneumonia	480–487	1,270	5.0	4,030	J10–J18	56,326
Acute bronchitis	466	217	3.2	2,959	J20	137
Acute bronchiolitis	included in 466	—	—	—	J21	77
Chronic lower respiratory disease:	277.0, 490–496	1,125	4.0	26,939	J40–J47, E84	125,021
COPD:	490–492, 494–496	670	4.4	16,343	J40–J44, J47	120,970
Chronic bronchitis	490, 491	537	4.6	9,856	J40–J42	740
Emphysema	492	19	4.4	324	J43	12,551
Other COPD	495, 496	105	3.1	6,081	J44	106,706
Bronchiectasis	494	9	6.2	82	J47	973
Asthma	493	444	3.2	10,590	J45	3,365
Status asthmaticus	included in 493	—	—	—	J46	248
Cystic fibrosis	277.0	11	9.5	6	E84	438
Lung disease due to external agents	500–508	180	7.5	47	J60–J70	17,899
Adult respiratory distress syndrome	518.5	7	10.3	—	J80	1,609
Pulmonary edema	518.4	—	—	—	J81	572
Interstitial lung diseases:	011, 012, 135, 446.2, 446.4, 518.8	356	8.8	1,309	A15, A16, A19, A31.0, D86, J96, J99, M31.0, M31.3	5,849
Sarcoidosis	135	8	6.4	435	D86	931
Respiratory tuberculosis	011, 012	8	7.0	49	A15, A16, A19, A31.0	731
Respiratory failure	518.8	340	8.9	663	J96	3,769
Pulmonary manifestations of connective tissue disorders	446.2, 446.4	—	—	163	J99, M31.0, M31.3	418
Cardiopulmonary diseases:	415.1–417	160	5.7	264	I26, I27	12,317
Pulmonary embolism	415.1	145	5.6	128	I26	6,924
Other pulmonary heart disease	415.2–417	15	6.5	136	I27	5,393
Selected HIV-related and other pulmonary infections	114–116, 117.3, 117.5, 117.7, 136.3	—	—	76	B38–40, B44–46, B59	576
Neonatal pulmonary disorders:	748.4–748.6, 769, 770, 798.0	61	15.5	—	P22, P25–P28, Q33, R95	4,645
Respiratory distress syndrome	769	19	29.1	—	P22	825
Sudden infant death syndrome	798.0	—	—	—	R95	2,323
Congenital malformation of the lung	748.4–748.6	1	4.1	—	Q33	408
Bronchopulmonary dysplasia	770.7	—	—	—	P27.1	260
Atelectasis of newborn	770.4, 770.5	—	—	—	P28.0, P28.1	399
Other perinatal respiratory diseases	770.1–770.3, 770.6, 770.8, 770.9	27	7.6	—	P25, P26, P27.0, P27.8, P27.9, P28.2–P28.9	398

* 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.

Lung Diseases

**Chart 4–3
Age-Adjusted Death Rates for Total Lung Diseases
by Race and Sex, U.S., 2006**

Deaths/100,000 Population
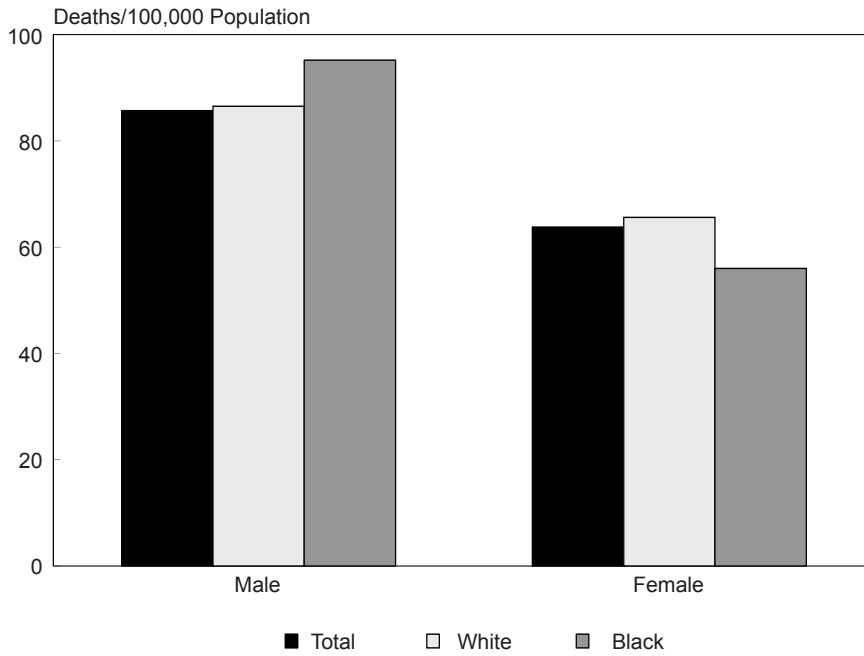
In 2006, total lung disease mortality was one-third higher in males than in females. Within sex groups, it was slightly higher in black males than in white males but was lower in black females than in white females.[35]

**Chart 4–4
Death Rates for Total Lung Diseases
by Age, Race, and Sex, U.S., 2006**

Deaths/100,000 Population
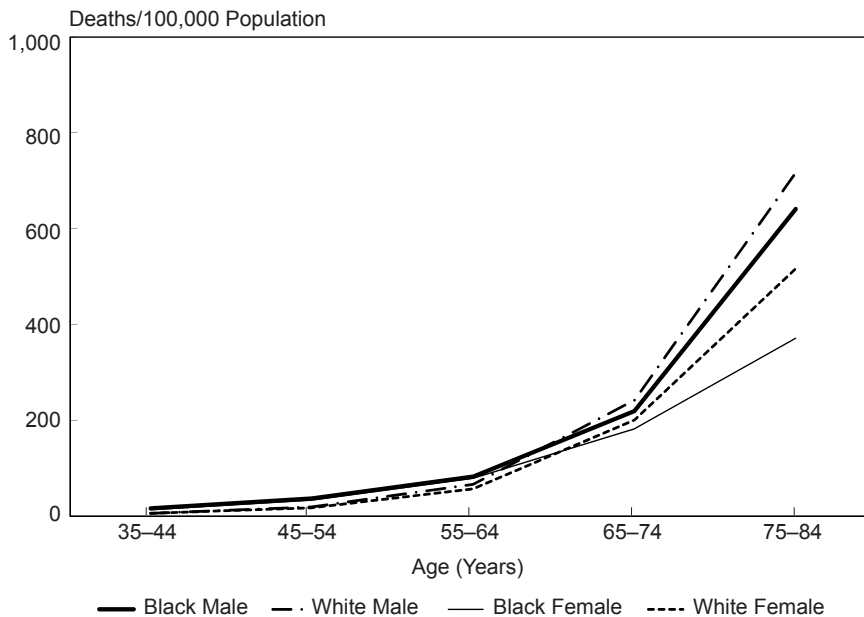
In 2006, the male–female gap in mortality from total lung diseases mostly increased with increasing age for both blacks and whites.[35]

Chronic Obstructive Pulmonary Disease

Chart 4–5
Prevalence of Chronic Obstructive Pulmonary Disease*
by Age, U.S., 1997–2007

From 1997 through 2007, the prevalence of physician-diagnosed COPD decreased slightly for all age groups.[24]

Percent of Population
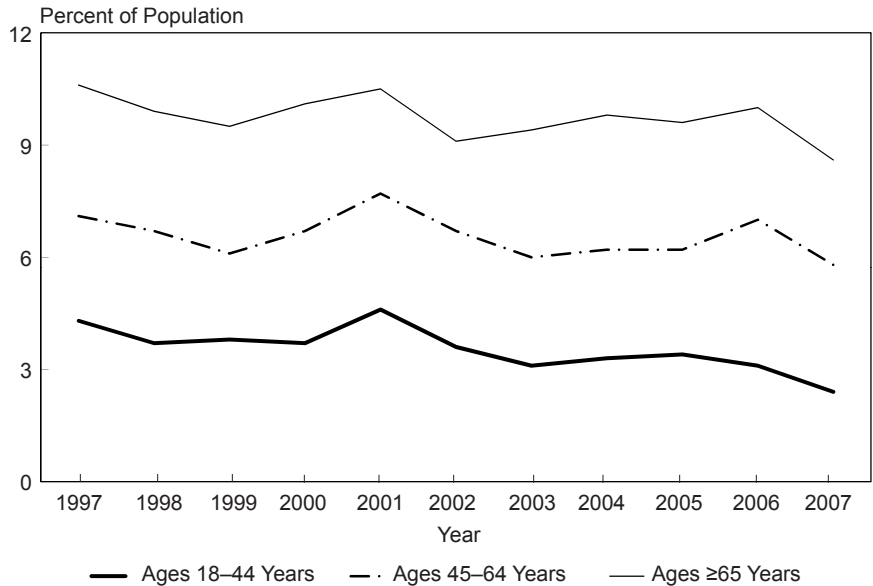
* Physician-diagnosed COPD only.

Chart 4–6
Prevalence of Chronic Obstructive Pulmonary Disease*
by Age, Race, and Sex, U.S., 2007

In 2007, within racial groups, the prevalence of COPD was higher in females than in males, with one exception: In those aged 65 years and older, the prevalence was similar in males and females. Differences were observed between races: In males aged 45–64 years and in both males and females aged 65 years and older, the prevalence of COPD was higher in whites than in blacks.[24]

Percent of Population
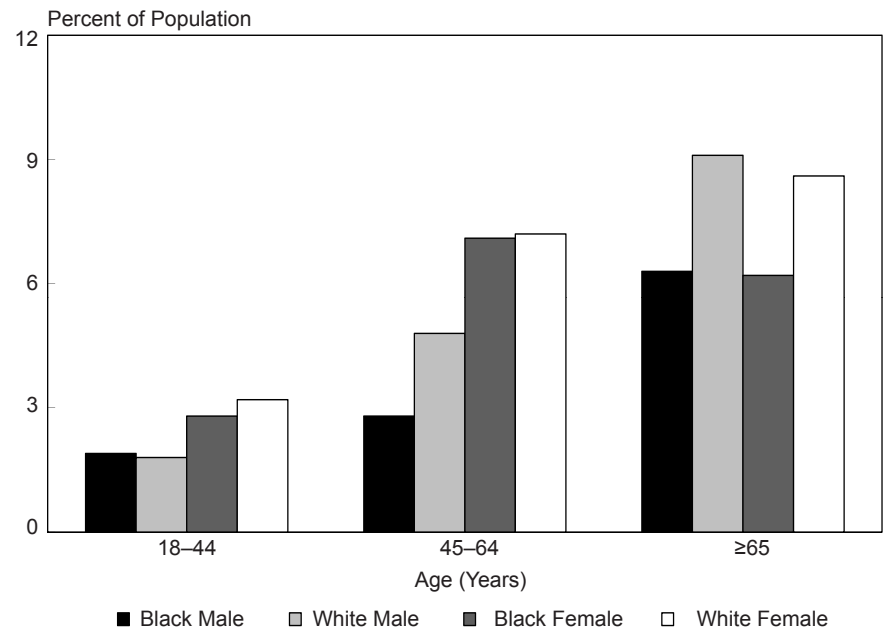
* Physician-diagnosed COPD only.

Chronic Obstructive Pulmonary Disease

Chart 4–7
**Hospitalization Rates for Chronic Obstructive Pulmonary Disease,
Ages 45–64 and 65 and Older, U.S., 1995–2006**

Hospitalizations/10,000 Population

Ages 45–64 Years   Ages ≥65 Years
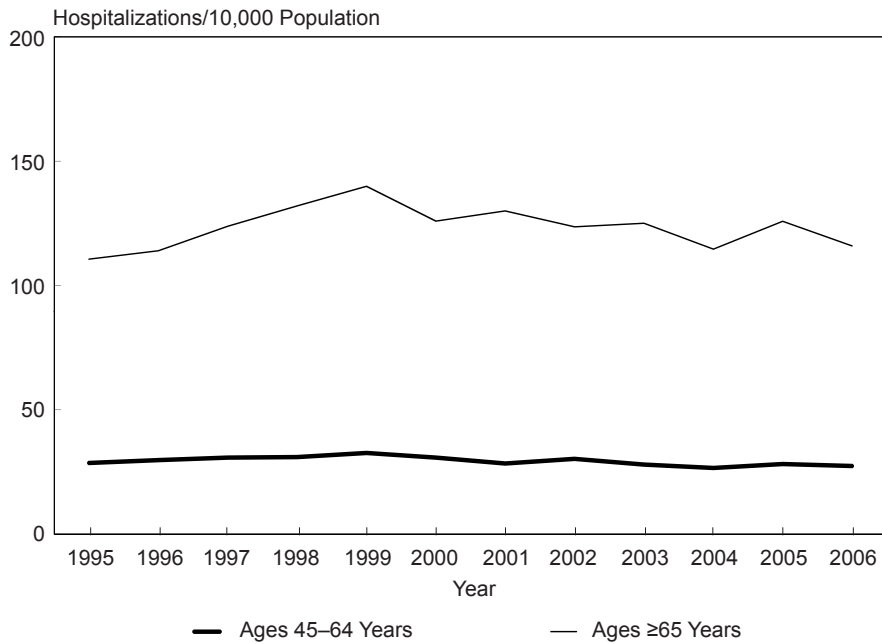
Hospitalization rates for COPD
were stable for those aged
45–64 years from 1995 to 2006
and for those aged 65 years
and older from 2000 through
2006.[33, 34]

Chart 4–8
**Age-Adjusted Death Rates for Chronic Obstructive Pulmonary
Disease by Race and Sex, U.S., 1960–2006**

Deaths/100,000 Population

Black* Male   · White Male   Black* Female   White Female

* Nonwhite from 1960 to 1967.
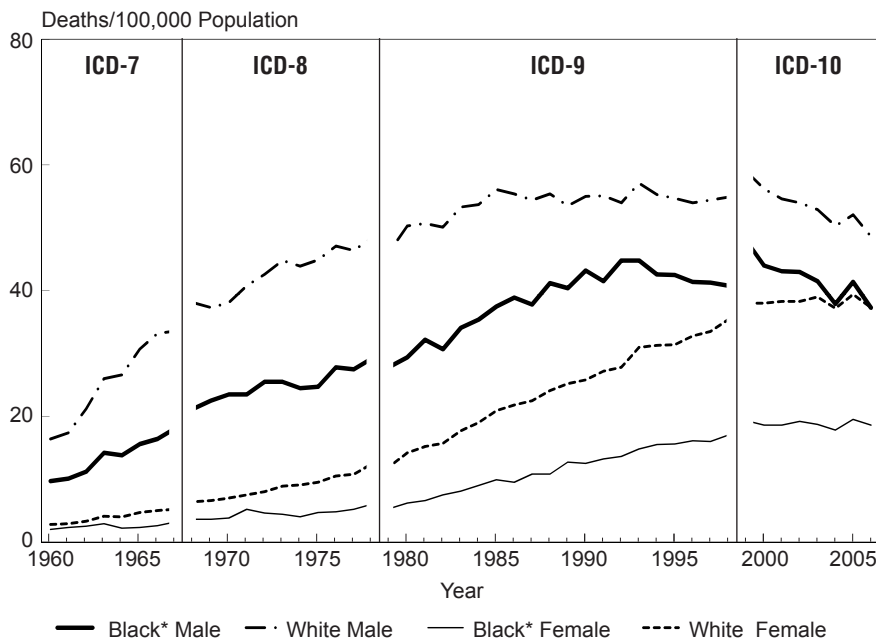
From 1960 to 1990, COPD
mortality increased in white
and black males, followed by a
gradual turnaround and then a
steep decline beginning in 1999.
COPD mortality increased in
white and black females until
1999 and then stabilized through
2006. The gaps between whites
and blacks within sex groups
continued throughout the
period.[15, 32, 36, 46]

Chronic Obstructive Pulmonary Disease

Chart 4–9
Age-Adjusted Death Rates for Chronic Obstructive Pulmonary
Disease by Race/Ethnicity and Sex, U.S., 1999–2006

From 1999 to 2006, COPD mortality in males 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.[36]

Deaths/100,000 Population

Male

Female

Year

Black*   White*   Hispanic   Asian

* Non-Hispanic.
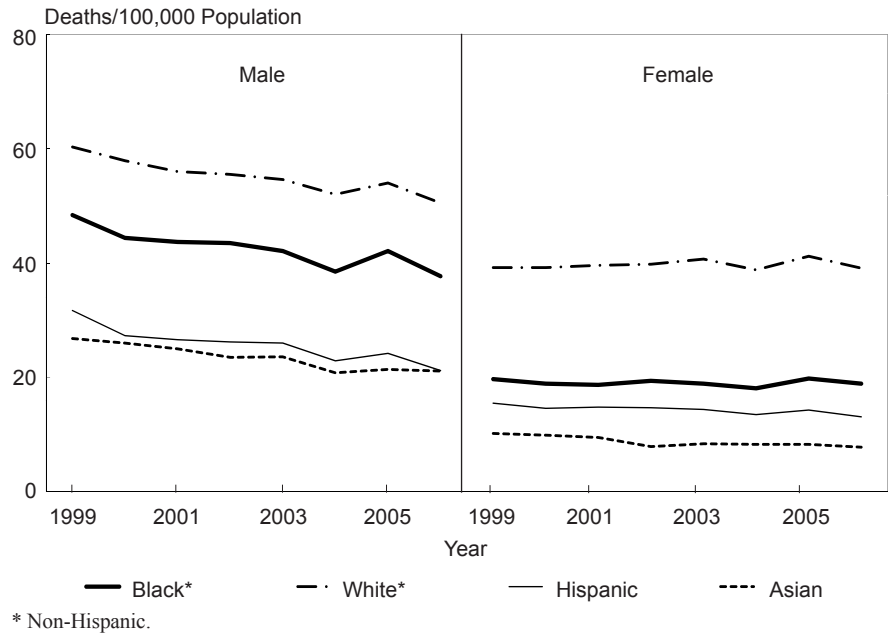
Chart 4–10
Death Rates for Chronic Obstructive Pulmonary Disease
in White Males by Age, U.S., 1960–2006

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.[15, 32, 36, 46]

Deaths/100,000 Population

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

Year

Ages 55–64   Ages 65–74   Ages 75–84   Ages ≥85
Years   Years   Years   Years
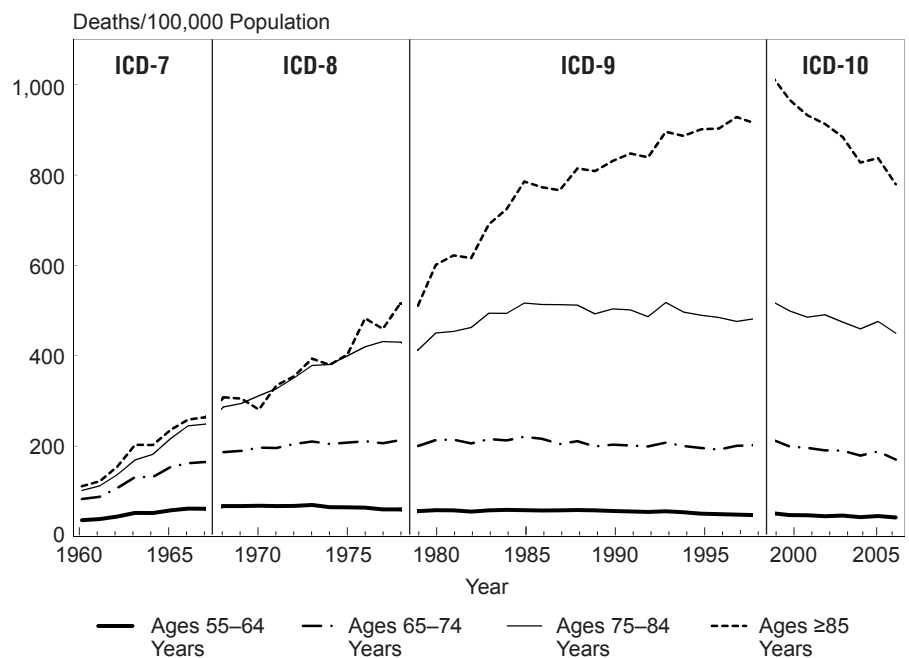
Chronic Obstructive Pulmonary Disease

Chart 4–11
Death Rates for Chronic Obstructive Pulmonary Disease
in Black* Males by Age, U.S., 1960–2006

Deaths/100,000 Population
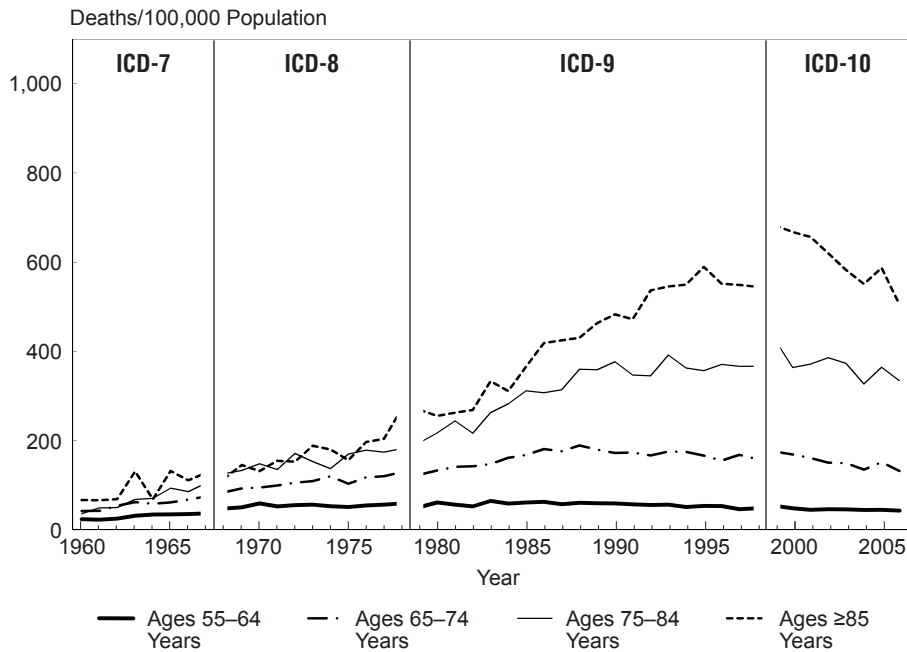
In black males, the 1960–2006 death rates for COPD changed from an increasing to a declining trend. In successive age groups, the change occurred later but was increasingly prominent.[15, 32, 36, 46]

* Nonwhite from 1960 to 1967.

Chart 4–12
Death Rates for Chronic Obstructive Pulmonary Disease
in White Females by Age, U.S., 1960–2006

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.[15, 32, 36, 46]

Chronic Obstructive Pulmonary Disease

Chart 4–13
Death Rates for Chronic Obstructive Pulmonary Disease
in Black* Females by Age, U.S., 1960–2006

From 1960 to 1990, death rates for COPD increased in black females of all age groups; however, rates before 1980 for those aged 85 years and older were too erratic to discern a trend. Rates stabilized among those aged 55–64 years in the 1990s and among those aged 65 years and older in the 2000s.[15, 32, 36, 46]

Deaths/100,000 Population

| ICD-7 | ICD-8 | ICD-9 | ICD-10 |

— Ages 55–64 Years   — · Ages 65–74 Years   — Ages 75–84 Years   ---- Ages ≥85 Years
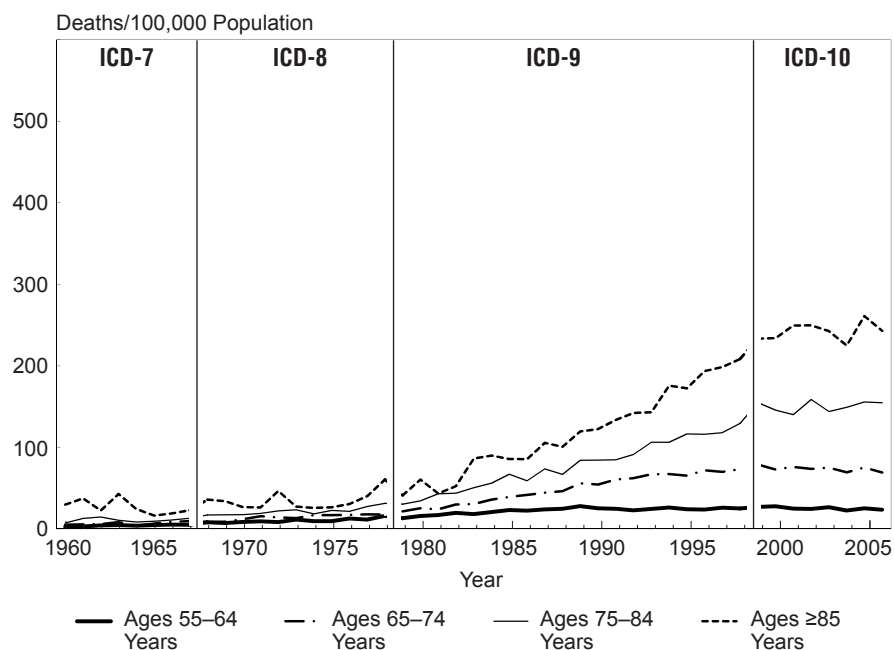
* Nonwhite from 1960 to 1967.

Chart 4–14
Age-Adjusted Death Rates for Chronic Obstructive Pulmonary
Disease by State, U.S., 2003–2005

In 2003–2005, death rates for COPD tended to be highest in the Mountain States.[15]

Deaths/100,000 Population
- 49.1–59.0 (13)
- 45.1–49.0 (12)
- 39.1–45.0 (12)
- 20.0–39.0 (13)
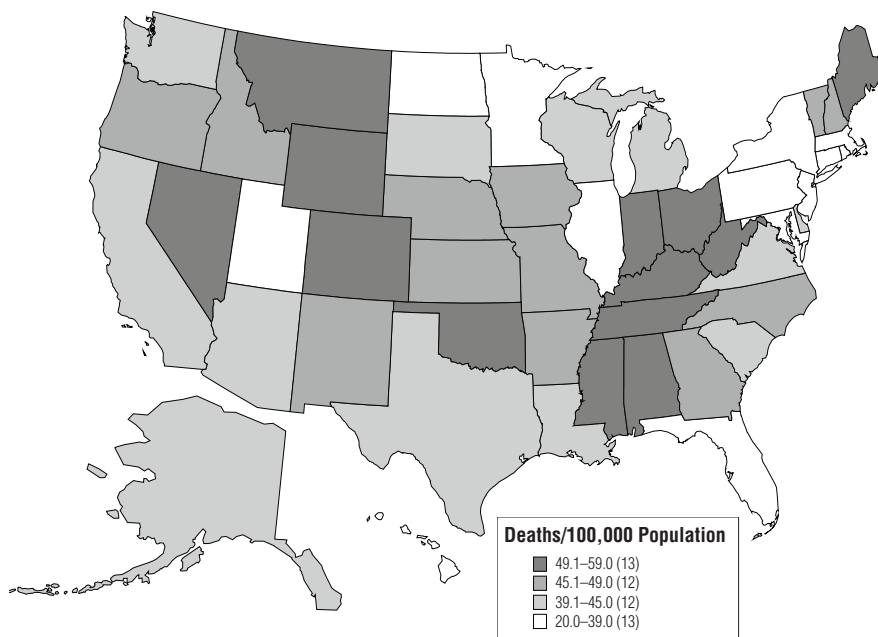
Chronic Obstructive Pulmonary Disease

Chart 4–15
Age-Adjusted Death Rates* for Chronic Obstructive
Pulmonary Disease by Country and Sex, Ages 35–74, 2007

Deaths/100,000 Population

* Age-adjusted to European standard.
† Data for 2006.
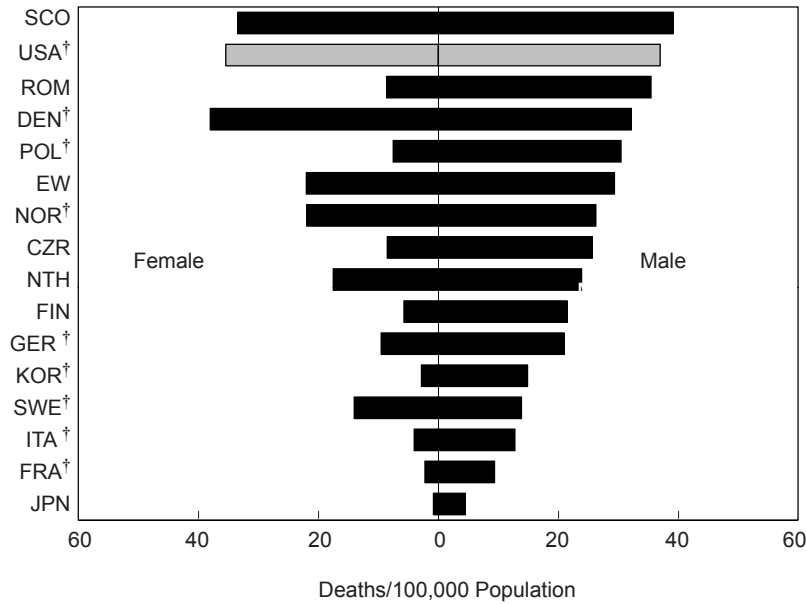
In 2006–2007, among 16 industrialized countries, the United States ranked second highest in COPD mortality for both males and females.[45]

Chart 4–16
Age-Adjusted Death Rates for Chronic Obstructive
Pulmonary Disease by Race/Ethnicity and Sex, U.S., 2006

Deaths/100,000 Population

Total   White*   Black*   Hispanic   Asian
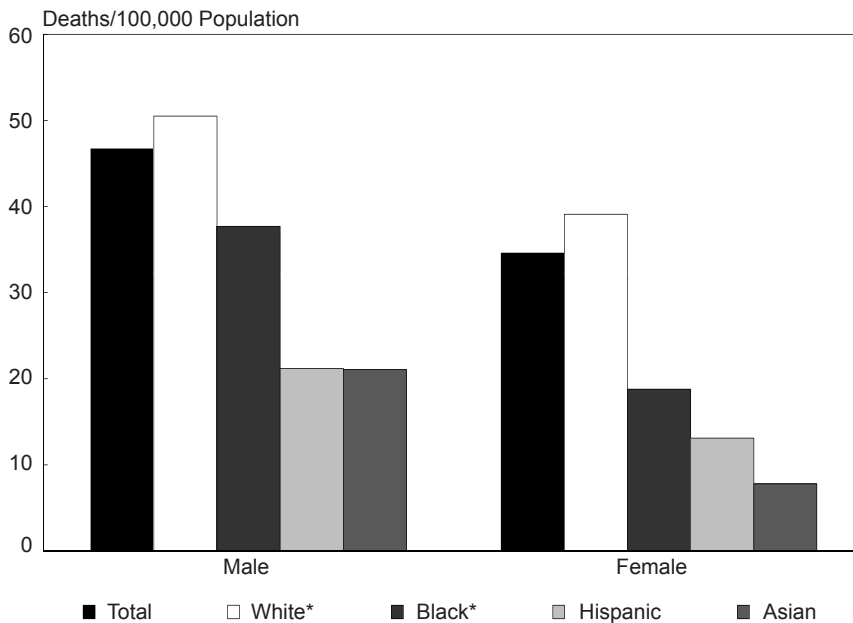
* Non-Hispanic.

In 2006, COPD mortality was 35% higher in males than in females. Within sex groups, it was highest among non-Hispanic whites and lowest among Asians. COPD mortality in Hispanic males was similar to that of Asian males.[35]

Chronic Obstructive Pulmonary Disease/Asthma

Chart 4–17
Death Rates for Chronic Obstructive Pulmonary
Disease by Age, Race, and Sex, U.S., 2006

In 2006, COPD mortality increased with age for all racial and sex groups. Within age groups was highest in white males aged 65 years and older and lowest in black females aged 45 years and older.[35]

Deaths/100,000 Population

Age (Years)

Black Male — White Male — Black Female ---- White Female
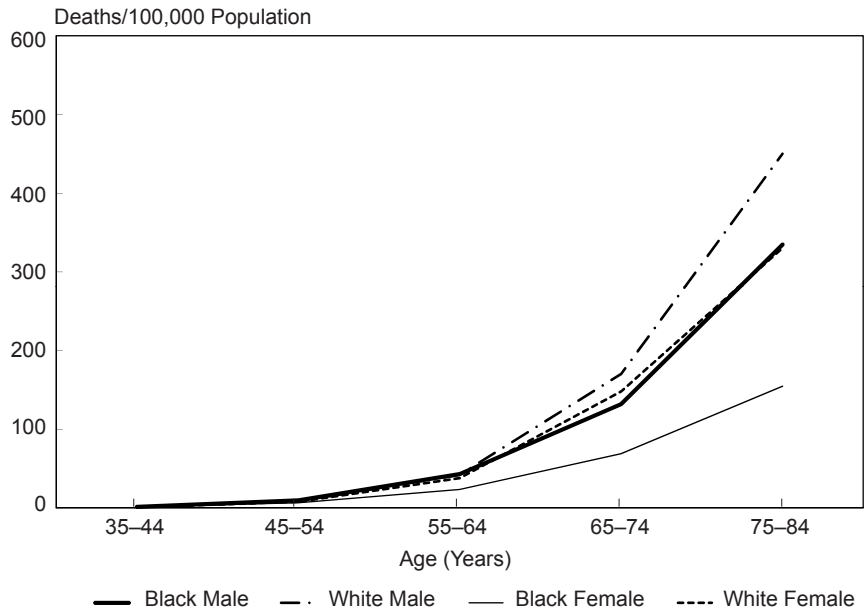
Chart 4–18
Prevalence of Asthma Ages Younger Than 18 and
18 and Older, U.S., 1980–2007

The prevalence of asthma during a given 12-month period (for 1980–1996) and the lifetime prevalence of asthma (for 1997–2007) rose in both age groups, while trends in asthma attack prevalence (for 1997–2006) and current prevalence (for 2001–2007) were relatively stable. All prevalence measures were higher in the younger group than in the older group.[26–28]

Percent of Population

Year

Ages <18 Years — Ages ≥18 Years
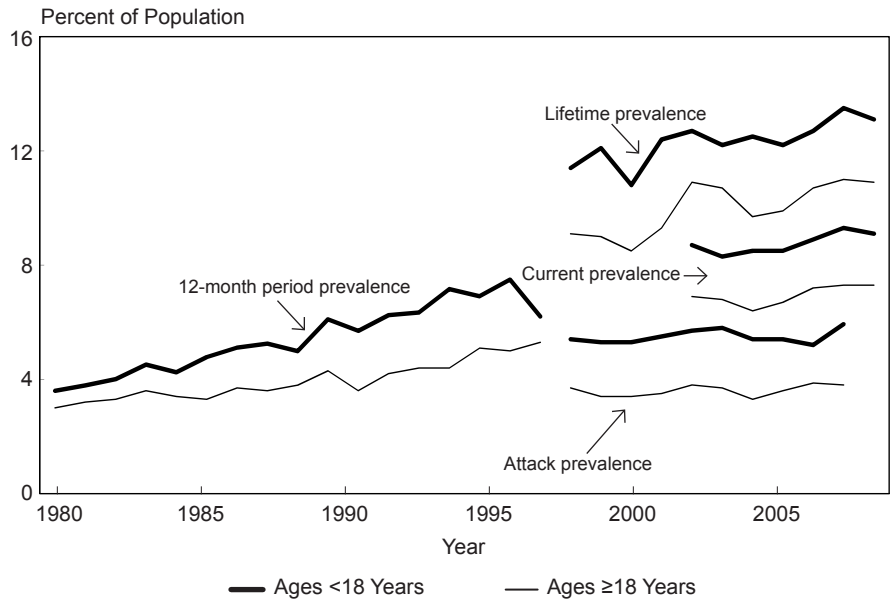
Asthma

Chart 4–19
Prevalence of Asthma by Race,
U.S., 1980–2007

Percent of Population
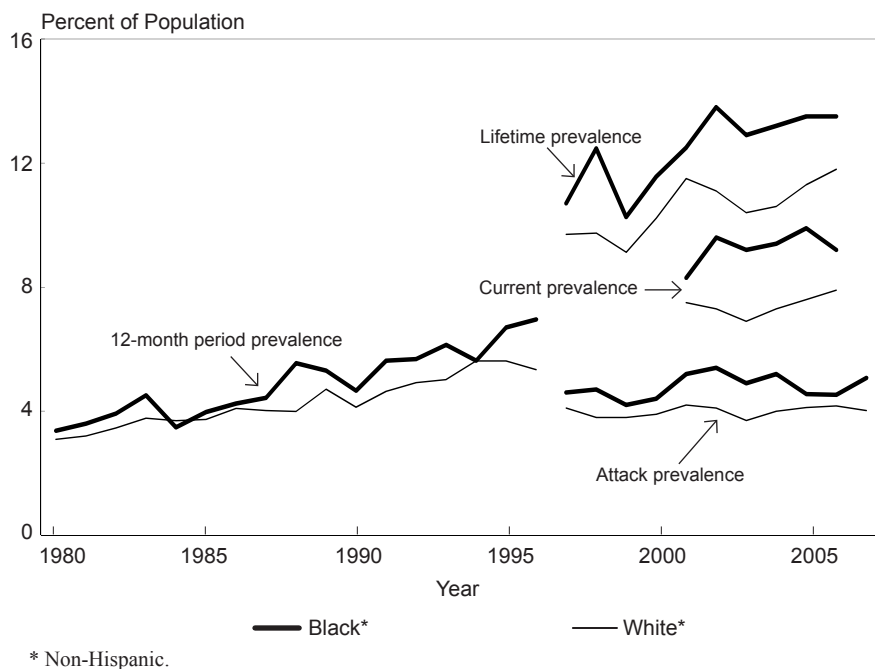
The prevalence of asthma during a given 12-month period (for 1980–1996) and lifetime prevalence of asthma (for 1997–2007) rose in black and whites, but asthma attack prevalence (for 1997–2006) and current prevalence (for 2001–2007) were more stable. Measures of prevalence were generally higher in blacks than in whites.[26–28]

* Non-Hispanic.

Chart 4–20
Prevalence of Current Asthma by Race/Ethnicity and
Sex, Ages Younger Than 18, U.S., 2006

Percent of Population
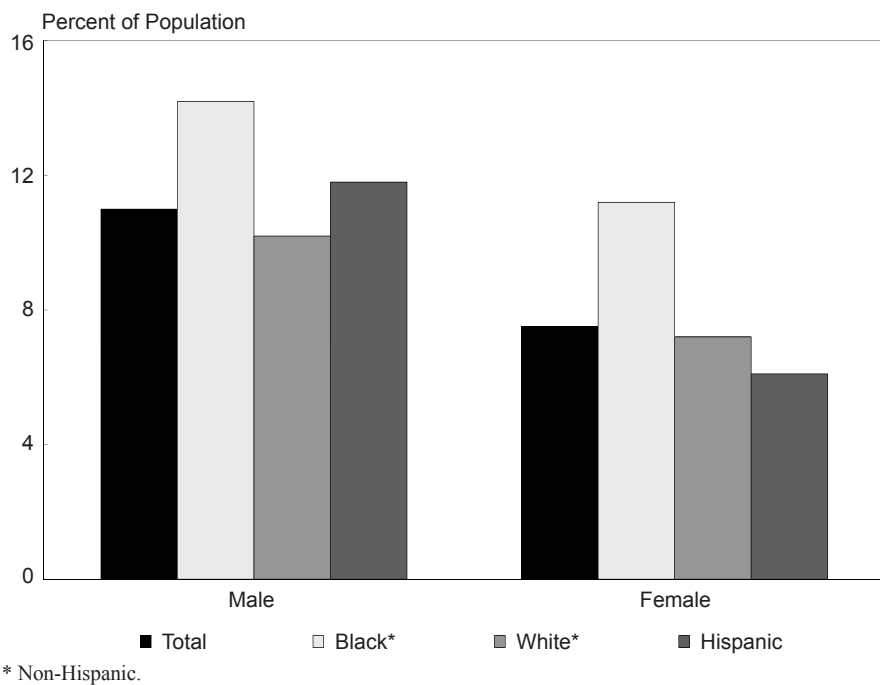
In 2006, among children younger than 18 years of age, the prevalence of current asthma was higher in males than in females. Within sex groups, the prevalence of current asthma was higher in non-Hispanic blacks than in non-Hispanic whites and Hispanics.[26–28]

* Non-Hispanic.

Asthma

Chart 4–21
Prevalence of Current Asthma by Race/Ethnicity and Sex, Ages 18 and Older, U.S., 2006

In 2006, among adults aged 18 years and older, the prevalence of current asthma was higher in females than in males. Within sex groups, the prevalence of current asthma was higher in non-Hispanic blacks and non-Hispanic whites than in Hispanics.[26–28]

Percent of Population

	Total	Black*	White*	Hispanic
Male	5.5	5.3	6.1	2.8
Female	8.9	9.5	9.2	7.3
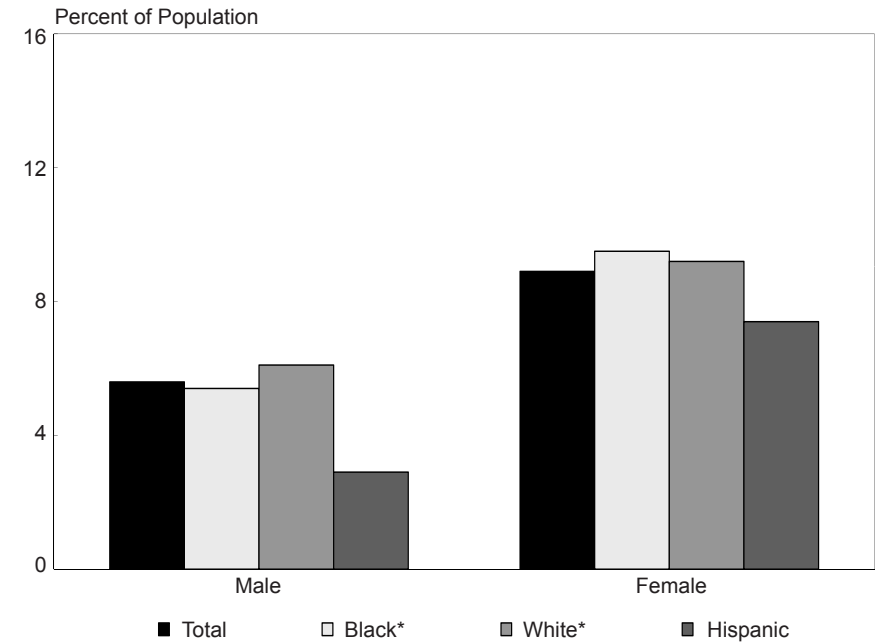
* Non-Hispanic.

Chart 4–22
Physician Office Visits for Asthma, U.S., 1990–2006

From 1990 to 2006, the number of physician office visits for asthma was erratic with no obvious trend.[44]

Physician Office Visits (Millions)

Year
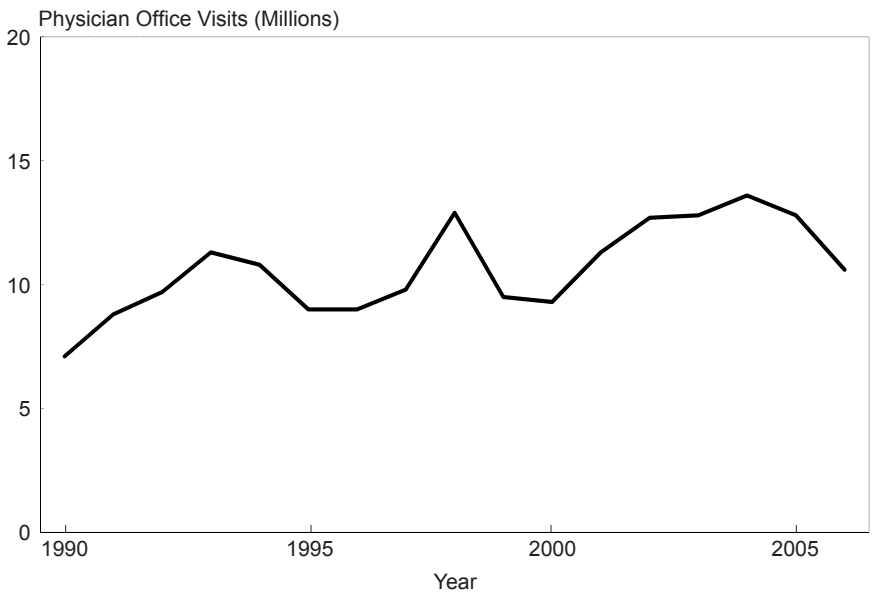
Asthma

Chart 4–23
Hospitalizations for Asthma by Primary and Secondary
Diagnosis, U.S., 1980–2006

Hospitalizations (Thousands)

Primary Diagnosis   Secondary Diagnosis
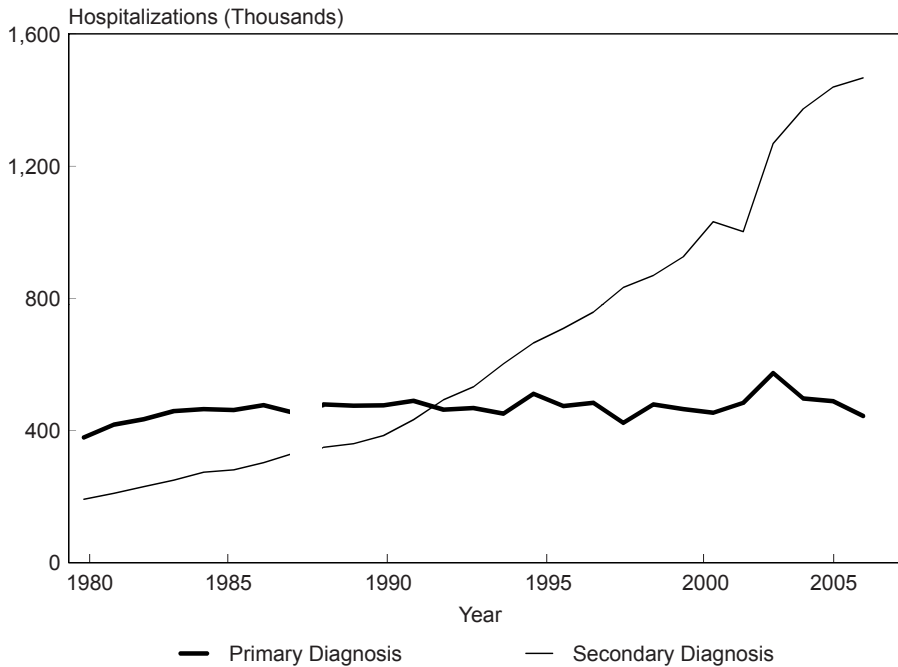
From 1980 to 2006, the number of hospitalizations with asthma as the primary diagnosis remained relatively stable. However, the number of hospitalizations with asthma as a secondary diagnosis increased significantly.[33, 34]

Chart 4–24
Hospitalizations for Asthma by Age,
U.S., 1980–2006

Hospitalizations/10,000 Population

Ages <15 Years   Ages 15–44 Years   Ages 45–64 Years   Ages ≥65 Years
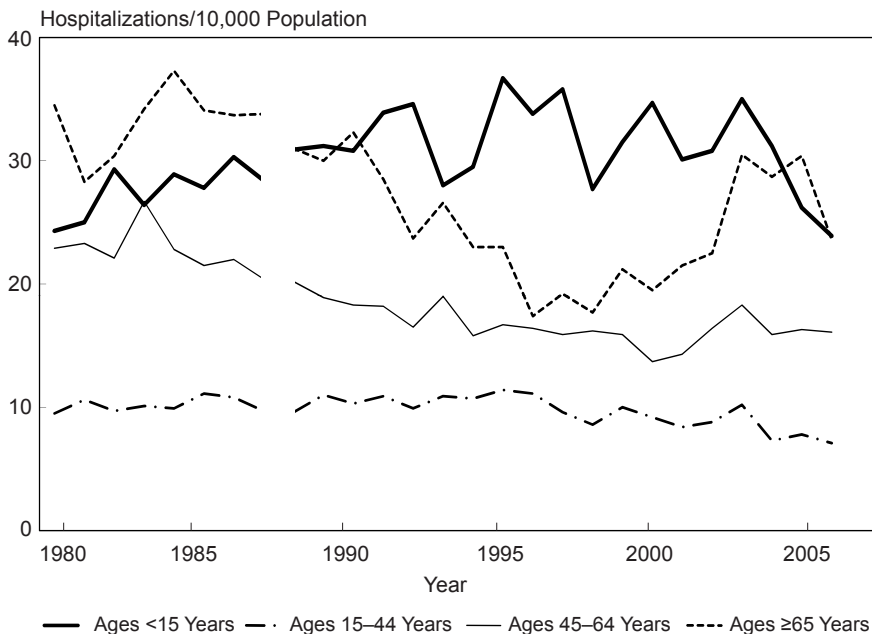
From 1980 to 2006, hospitalization rates for asthma were lowest among those aged 15–44 years. From 1991 to 2004, hospitalization rates for asthma were highest among those aged younger than 15 years.[33, 34]

Asthma

Chart 4–25
Age-Adjusted Death Rates for Asthma
by Race and Sex, U.S., 2006

In 2006, asthma mortality in males was 2–3.5 times higher in non-Hispanic blacks than in all other racial/ethnic groups. In females, asthma mortality was more than 2 times higher in non-Hispanic blacks than in all other racial/ethnic groups. Overall, asthma mortality was 44% higher in females than in males.[31]

Deaths/100,000 Population

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

* Non-Hispanic.
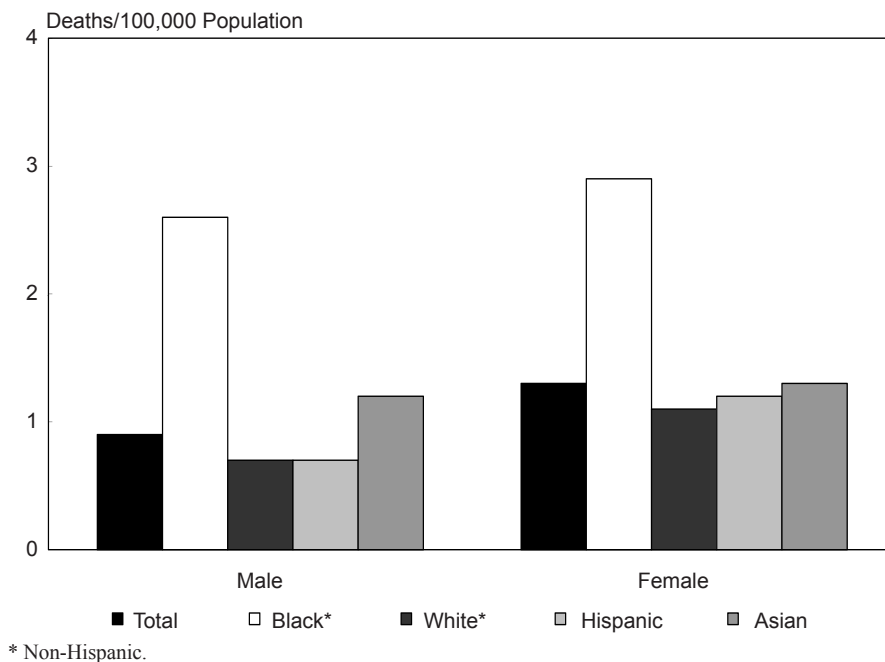
Chart 4–26
Age-Adjusted Death Rates for Asthma by Race
and Sex, Ages 1–24, U.S., 1980–2006

From 1980 through 1998, death rates for asthma, although erratic, tended to rise in black and white males and females aged 1–24 years. From 2001 to 2006, asthma mortality continued to fluctuate in black males and females but was stable in white males and females.[15, 35]

Deaths/100,000 Population

ICD-9   ICD-10

Year

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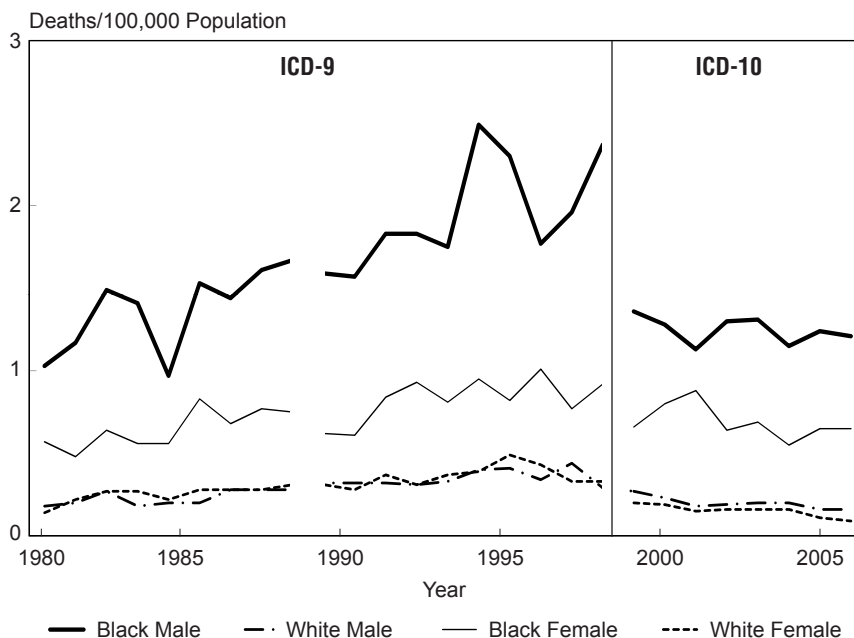
Asthma

Chart 4–27
Age-Adjusted Death Rates for Asthma
by Race and Sex, U.S., 1980–2006

Deaths/100,000 Population
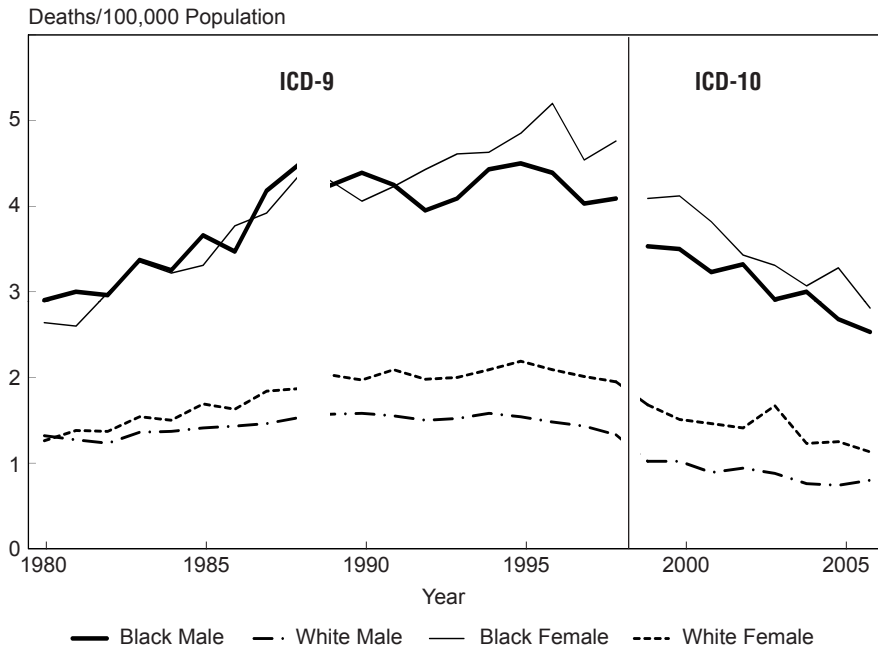
From 1980 to the mid-1990s, death rates for asthma rose in blacks and whites, both male and female, but then declined through 2006. Within sex groups, blacks had higher asthma mortality rates than whites.[15, 35]

Chart 4–28
Death Rates for Asthma by
Age, Race, and Sex, U.S., 1999–2006

Deaths/100,000 Population
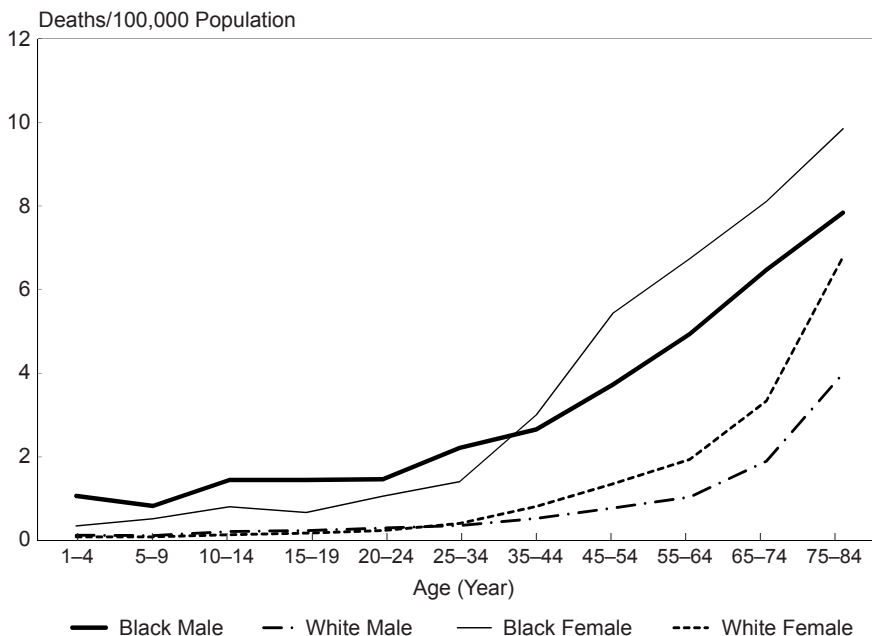
In 1999–2006, among blacks, asthma mortality was higher in males than in females aged 1–34 years, but was higher in females than in males aged 35–84 years. Among whites, asthma mortality was slightly higher in males than in females aged 1–24 years, but was higher in females than in males aged 25–84 years.[15]

Asthma/ Neonatal Respiratory Distress Syndrome

In 2006–2007, among 15 countries, the United States ranked ninth for males and fourth for females for asthma mortality.[45]

Chart 4–29
Age-Adjusted Death Rates* for Asthma
by Country and Sex, 2007

	Female		Male
POL[†]			
GER[†]			
ROM			
SCO			
DEN[†]			
NOR[†]			
EW			
FRA[†]			
USA[†]			
FIN			
CZR			
SWE[†]			
JPN			
ITA[†]			
NTH			

Deaths/100,000 Population
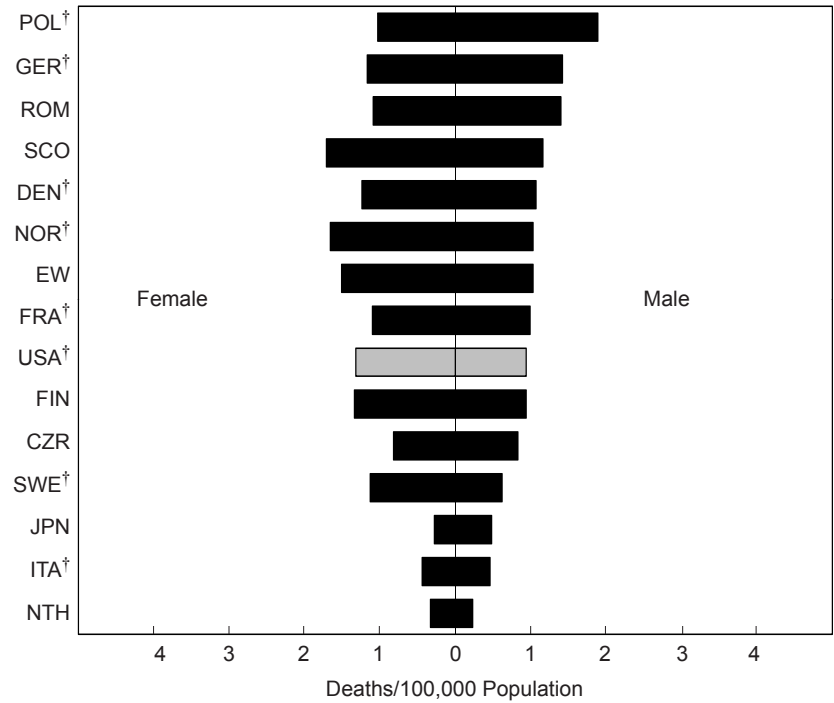
* Age-adjusted to European standard.
† Data for 2006.

Chart 4–30
Infant Mortality Rate for Respiratory Distress
Syndrome, U.S., 1968–2006

Infant mortality for RDS declined steeply from 1974 to 1981, followed by a slow but appreciable decline through 2006.[31, 32]

Deaths/100,000 Live Births

Year
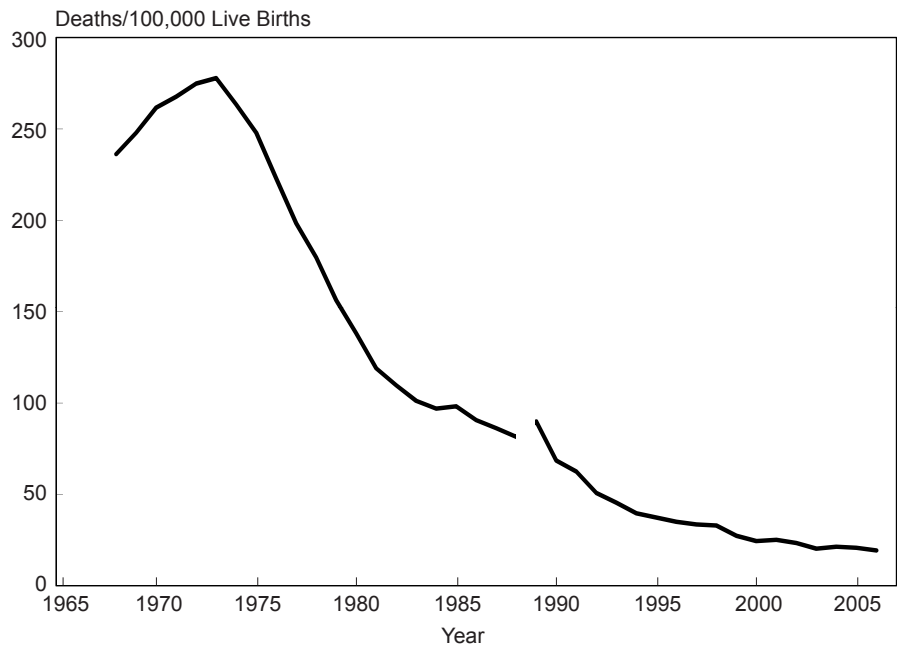
Neonatal Respiratory Distress Syndrome

Chart 4–31
Infant Mortality Rate for Respiratory Distress
Syndrome by Race, U.S., 1980–2006

Deaths/100,000 Live Births
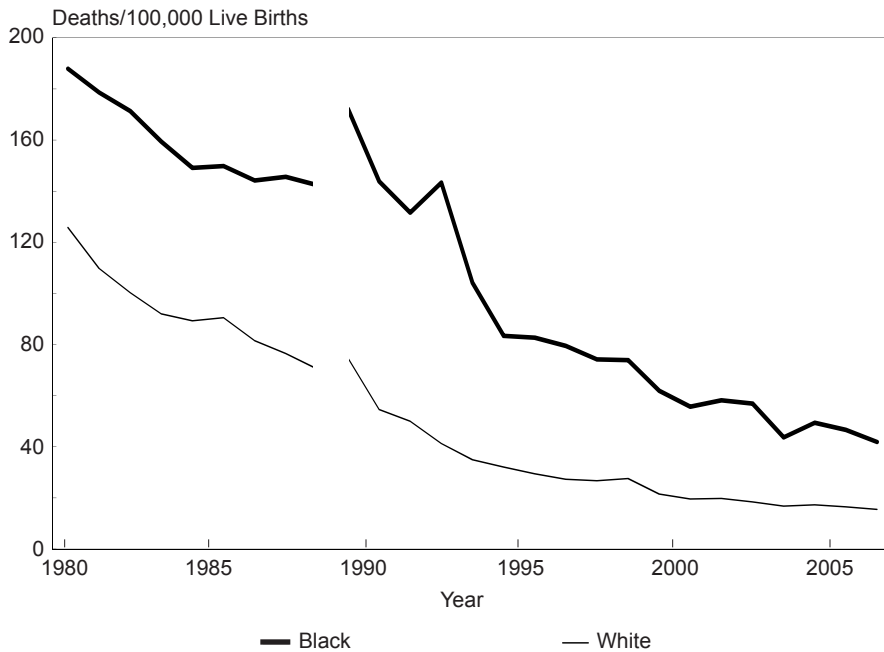
From 1980 to 2006, infant mortality for RDS decreased appreciably in blacks and whites, with rates remaining higher in blacks.[31, 32]

Chart 4–32
Infant Mortality Rate for Respiratory Distress
Syndrome by Race/Ethnicity,* U.S., 2005

Deaths/100,000 Live Births
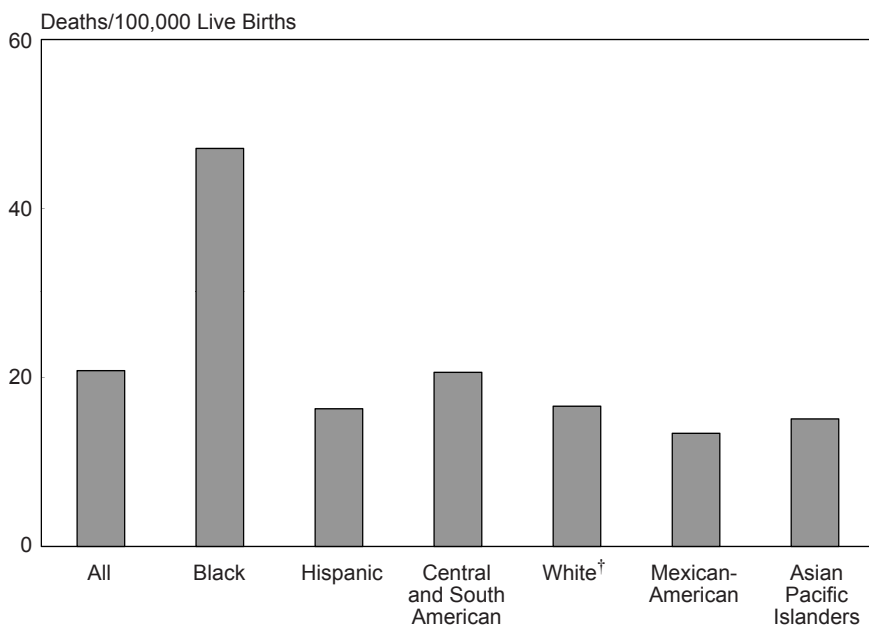
In 2005, infant mortality for neonatal RDS was much higher in blacks than in any other racial/ethnic group. Mortality for neonatal RDS in Mexican Americans was the lowest among all racial/ethnic groups.[47]

* No data for American Indians and Puerto Ricans.
† Non-Hispanic.

Sudden Infant Death Syndrome

Chart 4–33
Infant Mortality Rate for Sudden Infant Death
Syndrome by Race/Ethnicity, U.S., 2005

In 2005, mortality for SIDS was highest in American Indians and lowest in Asian Pacific Islanders.[48]

Deaths/100,000 Live Births

All	
American Indian	
Black	
White†	
Puerto Rican	
Mexican-American	
Hispanic	
Asian Pacific Islanders	
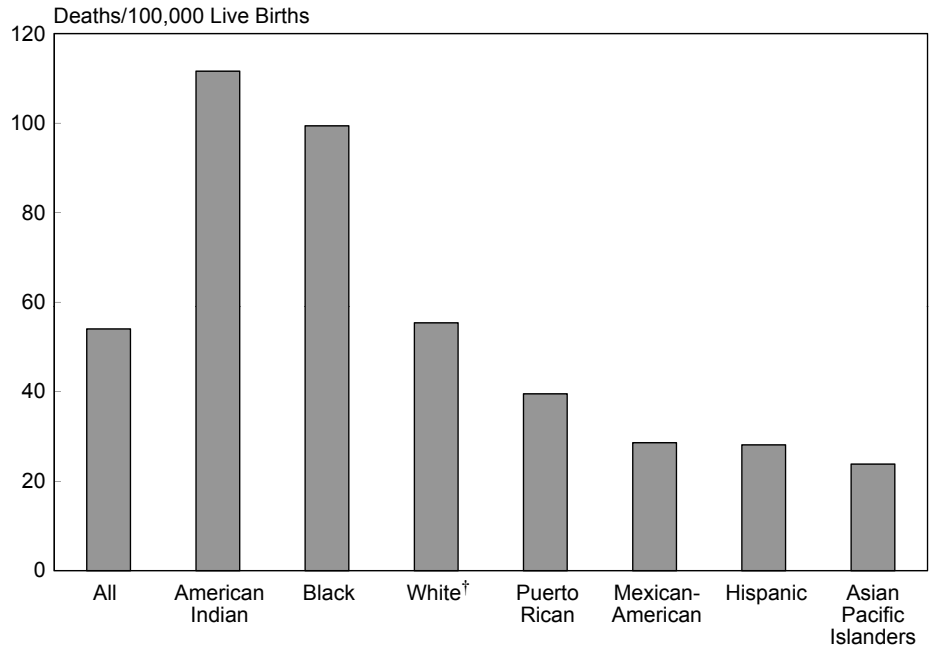
* No data for Central and South Americans.
† Non-Hispanic.

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 the 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 2006 by blood disease subgroups.[35] For blood diseases, Chart 5–2 shows according to ICD-9-CM codes, the number of physician office visits, the number of hospitalizations, and length of hospital stay in 2006, and according to ICD-10 codes, the number of deaths in 2006.[34, 35, 44]

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. By using combined mortality over 4 to 5 years to obtain average annual death rates rather than statistics for a single year, it is possible to improve data reliability for race and sex comparisons.

Chart 5–1
Blood Disease Deaths,
Percent by Subgroup, U.S., 2006

Aplastic Anemia
10.0%

Sickle Cell Anemia
5.2%

Other Anemias
29.0%

Other Diseases of Blood
and Blood-Forming
Organs
20.4%

Hemochromatosis
2.4%

Diseases of White
Blood Cells
4.9%

Coagulation Defects
19.1%

Purpura and Other
Hemorrhagic
Conditions
9.1%
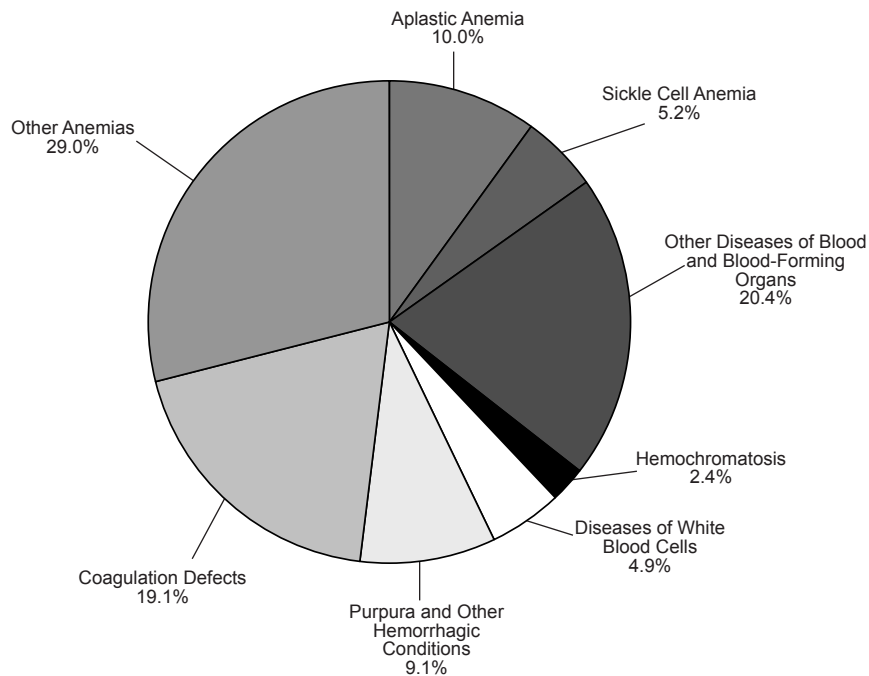
Total Deaths = 9,050 (100%)

Blood Diseases

Chart 5–2
Number of Hospitalizations, Physician Office Visits,*
and Deaths for Blood Diseases, U.S., 2006

| Diagnostic Category | ICD-9-CM Codes | Hospitalizations | | Physician Office Visits (1,000) | ICD-10 Codes | Deaths |
		First-Listed Discharges (1,000)	Length of Stay (Days)			
Total	280–289, 275	465	4.3	5,503	D50–D89, E83.1	9,050
Anemias	280–285	312	4.0	3,855	D50–D64	3,996
Iron deficiency anemia	280	94	3.5	451	D50	161
Other deficiency anemia	281	—	—	382	D51, D52	53
Cooley's anemia	282.4	9	3.9	7	D56	21
Sickle cell anemia	282.6	57	4.9	104	D57.0, D57.1	473
Aplastic anemia	284	28	5.9	247	D60, D61	901
Other and unspecified anemias	Residual	124	3.6	2,663	Residual	2,387
Coagulation defects	286	13	5.2	113	D65–D68	1,725
Hemophilia: Factor VIII	286.0	—	—	—	D66	59
Hemophilia: Factor IX	286.1	—	—	13	D67	3
Other	Residual	13	5.2	100	Residual	1,706
Purpura and other hemorrhagic conditions	287	35	5.0	490	D69	822
Primary thrombocytopenia	287.3	15	4.7	133	D69.3, D69.4	326
Unspecified thrombocytopenia	287.4	—	—	—	D69.5, D69.6	457
Other	Residual	20	5.3	357	Residual	39
Diseases of white blood cells	288	66	5.0	253	D70–D72	447
Other diseases of blood and blood-forming organs	289	22	4.0	378	D73–D89	1,844
Hemochromatosis	275	17	4.6	414	E83.1	216

* 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%.

Aplastic Anemia

Chart 5–3
Hospitalizations for Aplastic Anemia by Primary
and Secondary Diagnosis, U.S., 1982–2006

Number (Thousands)

Primary Diagnosis — Secondary Diagnosis
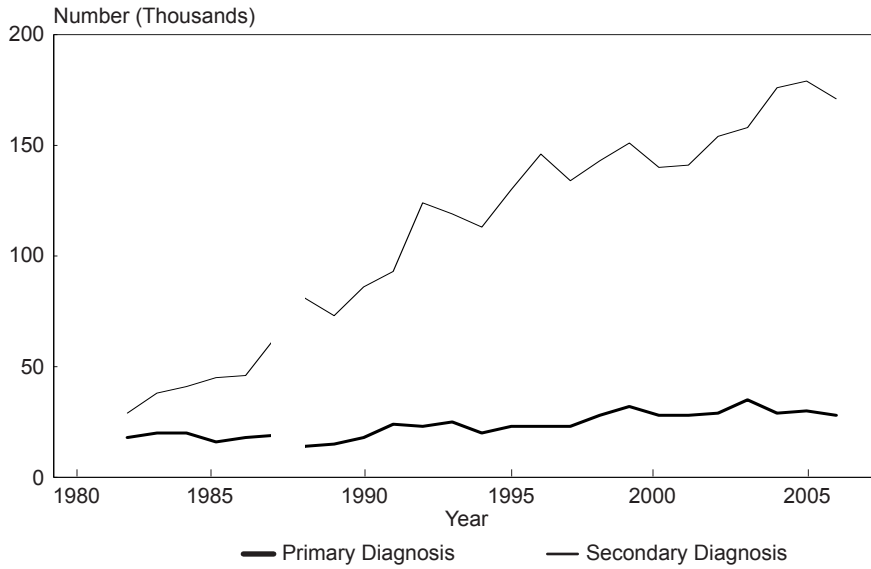
In 2006, the number of hospitalizations for aplastic anemia as a primary diagnosis was 56% higher than it was in 1990; as a secondary diagnosis it was 100% higher in 2006 than in 1990.[33, 34]

Chart 5–4
Age-Adjusted Death Rates* for Aplastic Anemia
by Race and Sex, U.S., 2003–2006
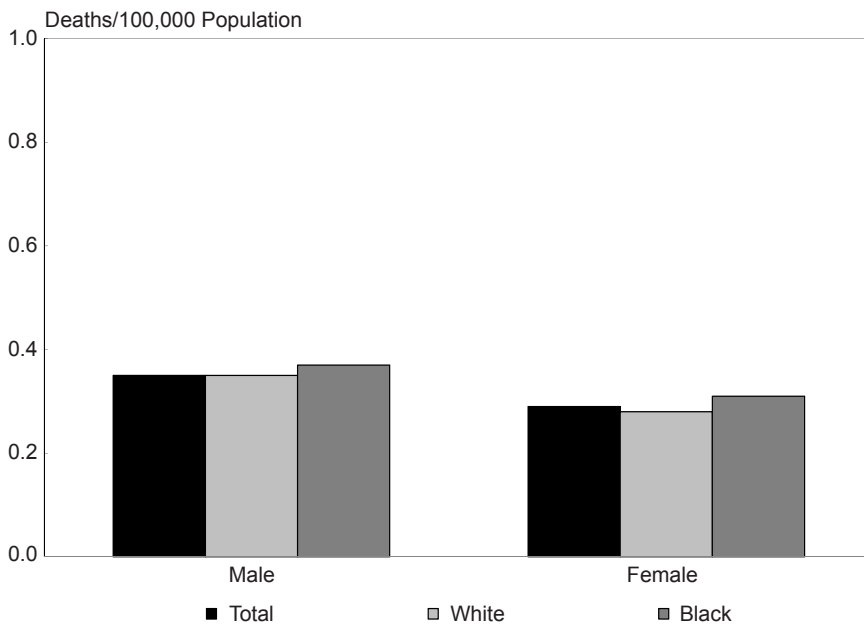
Deaths/100,000 Population

■ Total   □ White   ■ Black

In 2003–2006, mortality from aplastic anemia within sex groups was slightly higher in blacks than in whites. Overall, it was approximately 20% higher in males than in females.[15]

* Average annual rates.

Aplastic Anemia/Sickle Cell Anemia

Chart 5–5
Death Rates* for Aplastic Anemia
by Age, Race, and Sex, U.S., 2003–2006

In 2003–2006, mortality from aplastic anemia within sex groups was slightly higher in blacks than in whites, except those in the 75–84 age group. Within racial groups, it was higher in males than in females for blacks at all ages and for white males aged 65 years and older.[15]

Deaths/100,000 Population

Age (Years)

— Black Male   —·White Male   — Black Female   – – White Female
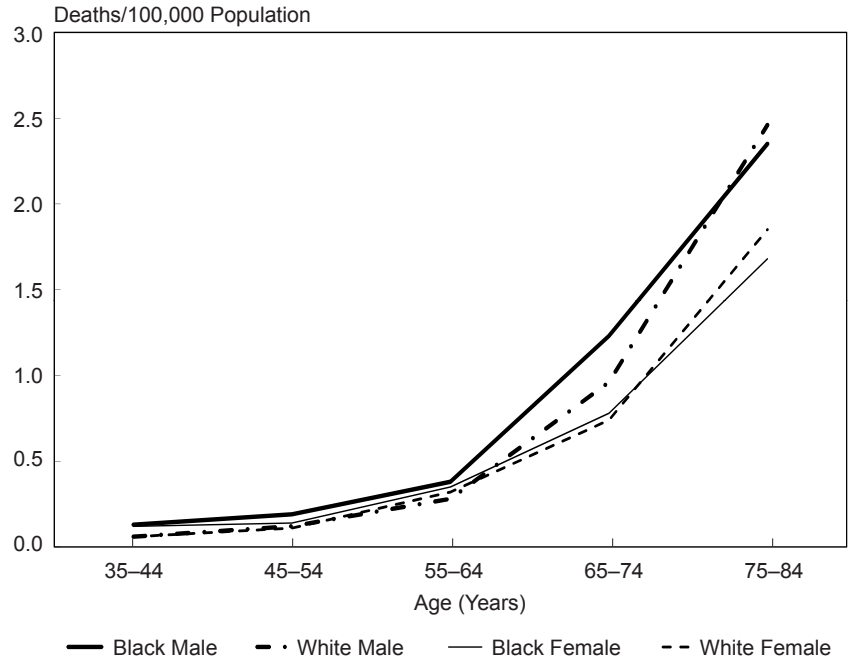
* Average annual rates.

Chart 5–6
Hospitalization Rates for Sickle Cell Anemia in Blacks,
Ages Younger Than 15 and 15–44, U.S., 1982–2006

Hospitalization rates for sickle cell anemia in blacks varied considerably between 1982 and 2006. Overall, however, hospitalization rates increased for both age groups, with rates in the 15–44 age group remaining higher than those in the younger than 15 age group.[33, 34]

Hospitalizations/10,000 Population

Year

— Ages <15 Years   — Ages 15–44 Years
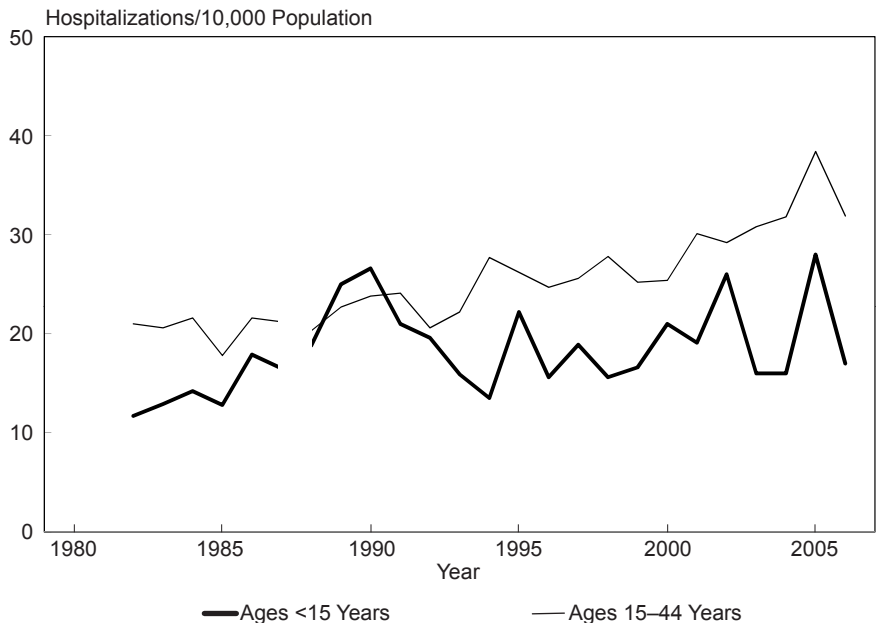
Sickle Cell Anemia

Chart 5–7
Age-Adjusted Death Rates* for Sickle Cell Anemia
in Blacks by Sex, U.S., 1980–1984 to 2003–2006

Deaths/100,000 Population

Male   Female
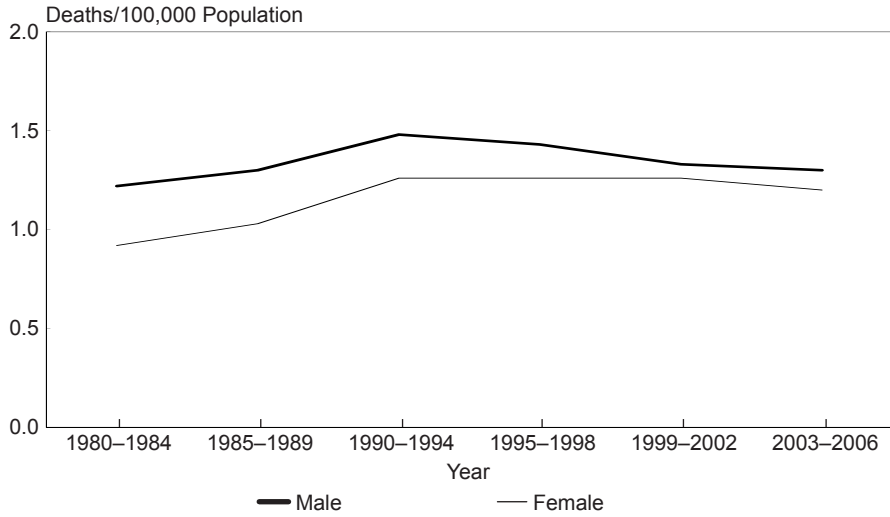
* Average annual rates.

From 1980–1984 to 1990–1994, sickle cell anemia mortality rose for black males and females. Since then, death rates have stabilized for black women, but declined for black males through 1999–2002 before stabilizing through 2003–2006.[15]

Chart 5–8
Death Rates* for Sickle Cell Anemia
in Blacks by Age and Sex, U.S., 2003–2006

Deaths/100,000 Population

Black Male   Black Female
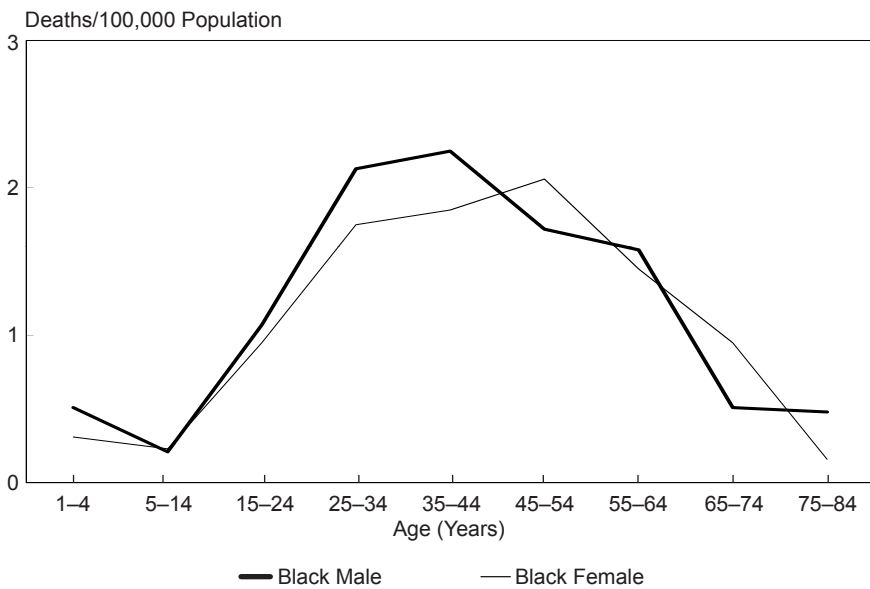
* Average annual rates.

In 2003–2006, sickle cell anemia mortality was somewhat similar in males and females at all ages. Death rates were relatively high for individuals aged 25–64 years.[15]

Appendixes

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 anomalies of the circulatory system[e]	†	†	746–747	745–747	Q20–Q28
Chronic obstructive pulmonary disease[f]	500–502, 527.1	500–502, 527.1	490–492, 519.3	490–492, 494–496	J40–J44, J47
Asthma[g]	241	241	493	493	J45, J46
Neonatal respiratory distress syndrome[h]	†	†	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-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.

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

[h] The ICDA-8 terms are hyaline membrane disease and respiratory distress syndrome. The ICD-9 term is respiratory distress syndrome. The ICD-10 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
Neonatal RDS[‡]	P22	769	2,904	3,144	0.9237

* From a sample of deaths in 1996.[8]

[†] Deaths coded to ICD-10 divided by deaths coded to ICD-9.

[‡] Infant deaths.

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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.[10]

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.[36]

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.[37]

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.[8]

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.[37]

Incidence: Incidence is the number of cases with onset during a specified period of time, usually a year.[37]

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.[37]

Limited in activity: Also called chronic activity limitation, it refers to the limitation of a person's usual activity due to a chronic condition.[37]

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

Appendix C

Definition of Terms (continued)

Prevalence: The prevalence of a condition is the number of persons who have the condition at a given time.[37]

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.[37]

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.[37]

Appendix D

Abbreviations*

AMI	acute myocardial infarction
BP	blood pressure
CHD	coronary heart disease
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
NCHS	National Center for Health Services
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
EW	England/Wales
FIN	Finland
FRA	France
GER	Germany
ITA	Italy
JPN	Japan
KOR	Republic of Korea
NOR	Norway
NTH	Netherlands
POL	Poland
ROM	Romania
SCO	Scotland
SWE	Sweden
USA	United States of America

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