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Heart Disease and Stroke Statistics—2006 Update: A Report From the American Heart Association Statistics Committee and Stroke Statistics Subcommittee

Thomas Thom, Nancy Haase, Wayne Rosamond, Virginia J. Howard, John Rumsfeld, Teri Manolio, Zhi-Jie Zheng, Katherine Flegal, Christopher O'Donnell, Steven Kittner, Donald Lloyd-Jones, David C. Goff, Jr, Yuling Hong, Members of the Statistics Committee and Stroke Statistics Subcommittee, Robert Adams, Gary Friday, Karen Furie, Philip Gorelick, Brett Kissela, John Marler, James Meigs, Veronique Roger, Stephen Sidney, Paul Sorlie, Julia Steinberger, Sylvia Wasserthiel-Smoller, Matthew Wilson and Philip Wolf

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Heart Disease and Stroke Statistics—2006 Update

A Report From the American Heart Association Statistics Committee and Stroke Statistics Subcommittee

Writing Group Members

Thomas Thom; Nancy Haase; Wayne Rosamond, PhD; Virginia J. Howard, MSPH, FAHA; John Rumsfeld, MD, PhD, FAHA; Teri Manolio, MD, PhD, FAHA; Zhi-Jie Zheng, MD, PhD*; Katherine Flegal, PhD*; Christopher O'Donnell, MD, MPH, FAHA; Steven Kittner, MD; Donald Lloyd-Jones, MD; David C. Goff, Jr, MD, PhD, FAHA; Yuling Hong, MD, MSC, PhD, FAHA

Members of the Statistics Committee and Stroke Statistics Subcommittee**

Robert Adams, MD; Gary Friday, MD, MPH; Karen Furie, MD, MPH; Philip Gorelick, MD, MPH; Brett Kissela, MD; John Marler, MD; James Meigs, MD; Veronique Roger, MD; Stephen Sidney, MD, MPH; Paul Sorlie, PhD; Julia Steinberger, MD, MSC; Sylvia Wasserthiel-Smoller, PhD; Matthew Wilson, MD; Philip Wolf, MD

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1. About These Statistics

The American Heart Association works with the Centers for Disease Control and Prevention's National Center for Health Statistics (CDC/NCHS), the National Heart, Lung, and Blood Institute (NHLBI), the National Institute of Neurological Disorders and Stroke (NINDS), and other government agencies to derive the annual statistics in this update. This section describes the most important sources we use. For more details and an alphabetical list of abbreviations, see the Glossary and Abbreviation Guide.

*The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

**In addition to these writing group members.

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

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All statistics are for the most recent year available. Prevalence, mortality and hospitalizations are computed for 2003 unless otherwise noted. Mortality as an underlying or contributing cause of death is for 2002. Economic cost estimates are for 2006. Due to late release of data, some disease mortality are not updated to 2003. Mortality for 2003 are underlying preliminary data, obtained from the NCHS publication *National Vital Statistics Report: Deaths: Preliminary Data for 2003* (NVSR, 2005;53:15) and from unpublished tabulations furnished by Robert Anderson of NCHS. US and state death rates and prevalence rates are age-adjusted per 100 000 population (unless otherwise specified) using the 2000 US standard for age standardization.

Morbidity (illness) and mortality (death) data in the United States use a standard classification system—the International Classification of Diseases (ICD). About every 10–20 years, the ICD codes are revised to reflect changes over time in medical technology, diagnosis or terminology. Effective with mortality data for 1999, we're using the tenth revision (ICD/10). It will be a few more years before the tenth revision is used for hospital discharge data.

Prevalence

Prevalence is an estimate of how many people have a disease at a given point in time. Government agencies periodically conduct health examination surveys. Rates for specific diseases are calculated from those surveys. These rates are applied as the population changes for several years, until a new health examination survey is done and new rates are established. It's important to realize that the prevalence *rates do not change* from year to year until there is a new survey.

The annual changes in prevalence as reported in this update only reflect changes in the population. It's impossible to develop a prevalence "trend" by comparing numbers from yearly versions of this update or its precursors. Many of our prevalence estimates come from the NHANES studies of the CDC/NCHS, and the ARIC, CHS and FHS studies of the NHLBI. Coronary heart disease (CHD), myocardial infarction (MI), angina pectoris (AP) and stroke prevalence are based on self-reports in national health interviews.

Incidence

Incidence is an estimate of the number of new cases of a disease that develop in a population in a 1-year period. For some statistics, new and recurrent attacks or cases are combined.

The incidence of a specific cardiovascular disease (CVD) in the United States is estimated by multiplying the incidence rates reported in community- or hospital-based studies by the US population. The rates change only when new data are available; they are not computed annually. The estimates were revised to reflect the 2000 US Census. *Do not compare the incidence or the rates with those in past issues of the Heart and Stroke Statistical Update (renamed Heart Disease and Stroke Statistics Update). Doing so can lead to serious misinterpretation of time trends.*

Our incidence estimates for the various cardiovascular diseases are extrapolations from the Framingham Heart Study (FHS), Atherosclerosis Risk in Communities (ARIC) study and Cardiovascular Health Study (CHS) conducted by the NHLBI and Greater Cincinnati/Northern Kentucky Stroke Study and others conducted by the NIH.

Note: data published by governmental agencies for some racial groups, are considered unreliable due to the small sample size in the studies. Since we try to provide data for as many racial groups as possible, we show these data for informational and comparative purposes, etc.

If you have questions about statistics or any points made in this booklet, please contact the Biostatistics Program Coordinator at the American Heart Association National Center, nancy.haase@heart.org, 214-706-1423. Direct all media inquiries to News Media Relations at inquiries@heart.org or 214-706-1173.

We do our utmost to ensure that this update is error-free. If we discover errors after publication, we'll provide corrections at our Web site, http://www.americanheart.org/statistics.

2. Cardiovascular Diseases

(ICD/9 390–459, 745–747) (ICD/10 I00–I99, Q20–Q28; see Glossary for details and definitions). See Table 2A.

Prevalence

Of the 71 300 000 American adults with 1 or more types of cardiovascular disease (CVD), 27 400 000 are estimated to be age 65 or older (National Health and Nutrition Examination Survey [NHANES 1999–2002], CDC/NCHS). Bullet points below are from NHANES 1999–2002 unless otherwise noted.

The following are the latest estimates of prevalence for these conditions. Due to overlap, it is not possible to add these conditions to arrive at a total.

- High blood pressure (HBP)—65 000 000. (Defined as systolic pressure 140 mm Hg or greater and/or diastolic pressure 90 mm Hg or greater, taking antihypertensive medication or being told at least twice by a physician or other health professional that you have high blood pressure.)
- Coronary heart disease (CHD)—13 200 000.
  - –Myocardial infarction (MI, or heart attack)—7 200 000.
  - –Angina pectoris (AP, or chest pain)—6 500 000.
- Heart failure (HF)—5 000 000.
- Stroke—5 500 000.
- Congenital cardiovascular defects—1 000 000 (Unpublished NHIS survey data, 1993–95, CDC/NCHS).
- 1 in 3 adult men and women has some form of CVD (NHANES 1999–02, CDC/NCHS).
- The following prevalence estimates are for people age 18 and older[1]:
  - –Among whites only, 11.4% have heart disease, 5.9% have CHD, 20.5% have hypertension and 2.3% have had a stroke.
  - –Among blacks or African Americans only, 9.9% have heart disease, 5.3% have CHD, 31.6% have hypertension and 3.5% have had a stroke.
  - –Among Hispanics or Latinos, 7.7% have heart disease, 4.5% have CHD, 19.0% have hypertension and 2.2%

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TABLE 2A. CVD

Population Group	Prevalence 2003	Mortality 2003#	Hospital Discharges 2003	Cost 2006
Total	71 300 000 (34.2%)	910 614	6 434 000	$403.1 billion
Total males	33 100 000 (34.4%)	426 772 (46.9%)*	3 239 000	. . .
Total females	38 200 000 (33.9%)	483 842 (53.1%)*	3 196 000	. . .
NH white males	34.3%	368 182	. . .	. . .
NH white females	32.4%	419 248	. . .	. . .
NH black males	41.1%	49 032	. . .	. . .
NH black females	44.7%	55 803	. . .	. . .
Mexican-American males	29.2%	. . .	. . .	. . .
Mexican-American females	29.3%	. . .	. . .	. . .

Note: (. . .) = data not available. NH = non-Hispanic.

*These percentages represent the portion of total CVD mortality that is for males vs. females.

#Preliminary.

Sources: Prevalence: NHANES (1999–02), CDC/NCHS and NHLBI. Percentages for racial/ethnic groups are age-adjusted for Americans age 20 and older. These data are based on self reports. Estimates from NHANES 1999–2002 applied to 2003 population estimates. Mortality: CDC/NCHS; these data represent underlying cause of death only; data for white and black males and females include Hispanics; data include congenital cardiovascular disease. Hospital discharges: National Hospital Discharge Survey, CDC/NCHS; data include people discharged alive and dead. Cost: NHLBI; data include estimated direct and indirect costs for 2006.

have had a stroke.

–Among Asians, 5.6% have heart disease, 3.8% have CHD, 16.1% have hypertension and 1.8% have had a stroke.

–Among Native Hawaiians or other Pacific Islanders, 16.6% have heart disease, 4.9% have CHD, and 18.2% have hypertension.

–Among American Indians or Alaska Natives, 13.8% have heart disease, 8.2% have CHD, 23.9% have hypertension and 3.1% have had a stroke.

Incidence

- Based on the NHLBI's Framingham Heart Study (FHS) in its 44-year follow-up of participants and the 20-year follow-up of their offspring[2]. . .
  - –The average annual rates of first major cardiovascular events rise from 7 per 1000 men at ages 35–44 to 68 per 1000 at ages 85–94. For women, comparable rates occur 10 years later in life. The gap narrows with advancing age.
  - –Under age 75, a higher proportion of CVD events due to CHD occur in men than in women, and a higher proportion of events due to congestive heart failure (CHF) occur in women than in men.
- Among American Indian men ages 45–74, the incidence of CVD ranges from 15 to 28 per 1000. Among women it ranges from 9 to 15 per 1000.[3]
- Data from the FHS indicate that the lifetime risk for CVD is 2 in 3 for men and more than 1 in 2 for women at age 40 (personal communication, Donald Lloyd-Jones, MD).

Mortality

- Preliminary mortality data show that CVD as the underlying cause of death accounted for 37.3% of all 2 440 000 deaths in 2003 or 1 of every 2.7 deaths in the United States. CVD as an underlying or contributing cause of death (1 408 000 deaths in 2002) was about 58% of all deaths that year.
- Since 1900, CVD has been the No. 1 killer in the United States every year but 1918. Nearly 2500 Americans die of CVD each day, an average of 1 death every 35 seconds. CVD claims more lives each year than the next 4 leading causes of death combined, which are cancer, chronic lower respiratory diseases, accidents, and diabetes mellitus.
- The 2003 overall preliminary death rate from CVD was 308.8. The rates were 359.1 for white males and 479.6 for black males; 256.2 for white females and 354.8 for black females. From 1993–2003, death rates from CVD (ICD/10 I00–I99) declined 22.1%. In the same 10-year period actual CVD deaths declined 4.6%.
- Other causes of death in 2003—cancer 554 643; accidents 105 695; Alzheimer's disease 63 343; HIV (AIDS) 13 544. (preliminary data)
- The 2003 preliminary CVD death rates were 364.2 for males and 262.5 for females. Cancer death rates were 232.3 for males and 160.2 for females. Breast cancer claimed the lives of 41 566 females in 2003; lung cancer claimed 67 894. Death rates for females were 25.2 for breast cancer and 41.1 for lung cancer. One in 30 female deaths are from breast cancer, while 1 in 2.6 are from CVD. Based on preliminary 2003 mortality, CVD caused about a death a minute among females—over 480 000 female lives every year. That's more female lives than were claimed by the next five leading causes of death combined (cancer, COPD, Alzheimer's, diabetes and accidents).
- Over 152 000 Americans killed by CVD each year are under age 65. In 2002, 32% of deaths from CVD occurred prematurely (ie, before age 75, which is close to the average life expectancy).
- In 2002, the age-adjusted death rate for diseases of the heart in American Indians or Alaska Natives was 201.2 for males and 123.6 for females; for Asians or Pacific Islanders it was 169.8 for males and 108.1 for females; for Hispanics

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or Latinos it was 219.8 for males and 149.7 for females (Health, United States, 2004; CDC/NCHS).

- According to the CDC/NCHS, if all forms of major CVD were eliminated, life expectancy would rise by almost 7 years. If all forms of cancer were eliminated, the gain would be 3 years. According to the same study, the probability at birth of eventually dying from major CVD (I00–I78) is 47%, and the chance of dying from cancer is 22%. Additional probabilities are 3% for accidents, 2% for diabetes and 0.7% for HIV.[4]
- Based on revised 2000 population data, the average life expectancy of people born in the United States in 2003 is 77.6 years (preliminary data for 2003. *NSVR*, Vol. 53, No. 15, Hyattsville, Md: National Center for Health Statistics, 2005).
- In 2001, the proportion of premature deaths (<65 years) from diseases of the heart (I00–I09, I11, I13, I20–I51) was greatest among American Indians or Alaska Natives (36%) and blacks (31.5%) and lowest among whites (14.7%). Premature death was higher for Hispanics (23.5%) than non-Hispanics (16.5%), and for males (24%) than females (10%). Hispanic whites (23.3%) had lower proportions than Hispanic blacks (27.5%), and non-Hispanic (NH) whites (14.4%) had lower proportions than NH blacks (31.5%).[5]
- Age-adjusted death rates for diseases of the heart from 1990–98 declined 17% for Hispanics, 15% for NH whites, 14% for Asians/Pacific Islanders, 11% for NH blacks, and 8% for American Indians or Alaska Natives. In 1998 the rate for NH blacks was 2.8 times the rate for Asian or Pacific Islanders.[6]

Out-of-Hospital Cardiac Arrest

There is a wide variation in the reported incidence and outcome for out-of-hospital cardiac arrest. These differences are due to in part to differences in definition and ascertainment of cardiac arrest, as well as differences in treatment after its onset.

Cardiac arrest is the cessation of cardiac mechanical activity as confirmed by the absence of signs of circulation.[6a] Available epidemiological databases do not record deaths due to cardiac arrest or the subset of cases that occur with sudden onset (*sudden cardiac arrest*). Therefore, surrogate data are often used for epidemiological purposes to estimate the incidence of cardiac arrest, especially in the out-of-hospital setting. Those surrogate data include deaths due to "*coronary heart disease"* (ICD codes I20-I25) and "*cardiac arrest*," defined as coronary death that occurred within 1 hour of symptom onset in the out-of-hospital setting, and without other probable cause of death.[6b] Datasets based on either definition are not optimal. Out-of-hospital data that are based on the latter definition of cardiac arrest can be especially unreliable because of the difficulty in determining the duration of symptoms prior to the onset of the episode. The following information summarizes representative data from several sources in an attempt to characterize the incidence and outcome of sudden cardiac arrest and demonstrate the need for a comprehensive system of capturing more meaningful data.

- 330 000 *coronary heart disease deaths* occur out-of-hospital or in hospital emergency departments annually (2002) (ICD-10 codes I20-I25) (personal communication, Thomas Thom, NHLBI/NIH).
- In 1998, 456 076 deaths from cardiac disease (ICD-9 code 390 to 398, 402, or 404 to 429) were reported in the United States (among people aged 35 years and above) in an emergency room, before reaching a hospital, or as "dead on arrival."[7]
- The annual incidence of *sudden cardiac arrest* in North America is about 0.55 per 1000 population.[8,9] With an estimated US population of 296 766 821,[10] this implies that about 163 221 out-of-hospital *sudden cardiac arrests* occur annually in the United States.
- About two thirds of *unexpected cardiac deaths* occur without prior recognition of cardiac disease.[11]
- About 60% of *unexpected cardiac deaths* are treated by EMS.[12]
- Incidence of EMS-treated out-of-hospital *cardiac arrest* is 36/100 000–81/100 000.[12,13] This implies EMS treats 107 000 to 240 000 *cardiac arrests* in the United States annually.
- Of these, 20%–38% have ventricular fibrillation or ventricular tachycardia as the first recorded rhythm. This implies 21 000–91 000 ventricular fibrillation arrests annually.[8,13]
- The incidence of ventricular fibrillation among *cardiac arrest* victims with any first initial rhythm is decreasing over time.[13]
- The median reported survival to discharge after any first recorded rhythm is 6.4%.[14] Survival during a recent one year experience in Seattle of all treated *cardiac arrests, considered to be of cardiac origin*, was reported to be 20%. (personal communication, L. Cobb, Seattle Medic One, December 7, 2005).
- The average proportion of cases of out-of-hospital *cardiac arrest* that receive bystander CPR is 27.4%.[14]
- The incidence of lay responder defibrillation is low, 2.05% in 2002, but increasing over time.[15]
- Unexpected death in the pediatric patient is usually due to trauma, sudden infant death syndrome, respiratory causes or submersion.[16] Ventricular fibrillation is an uncommon cause of *cardiac arrest* in children but it is observed in approximately 5% to 15% of children with out-of-hospital *cardiac arrest*.[17]
- The reported incidences of out-of-hospital pediatric *cardiac arrest* vary widely in number (from 2.6–19.7 annual cases per 100 000) and inclusion criteria (age, cause of arrest, etc).[18]
- Since there are 73 559 232 individuals aged <18 years in the United States,[10] this implies that there are 1 900–14 000 pediatric out-of-hospital *cardiac arrests*, annually, from all causes (including trauma, sudden infant death syndrome, respiratory causes, cardiovascular causes and submersion).
- The incidence of *sudden cardiac arrest* in children in the out-of-hospital setting is unknown. Studies that document voluntary reports of deaths among high school athletes suggest that the incidence of *sudden cardiac arrest* ranges from 0.28–1.0 deaths per 100 000 high school athletes annually nationwide.[19,20] Although incomplete, these num-

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bers provide a basis for estimating the number of deaths in this age range.

- The reported average survival to discharge after pediatric out-of-hospital *cardiac arrest* is 6.7%.[18]

Risk Factors

- Black and Mexican-American women have higher prevalence of CVD risk factors than white women of comparable socioeconomic status (SES).[21]
- Data from the 2003 BRFSS study of adults age 18 and older showed the prevalence of respondents reporting 2 or more risk factors for heart disease and stroke increased among successive age groups. The prevalence of having 2 or more risk factors was highest among blacks (48.7%) and American Indians/Alaska Natives (46.7%) and lowest among Asians (25.9%); prevalence was similar in women (36.4%) and men (37.8%). The prevalence of multiple risk factors ranged from 25.9% among college graduates to 52.5% among those with less than a high school diploma (or equivalent). Persons reporting household income of $50 000 or more had the lowest prevalence (28.8%) and those reporting $10 000 or less had the highest prevalence (52.5%). Adults who reported being unable to work had the highest prevalence (69.3%) of 2 or more risk factors, followed by retired persons (45.1%), unemployed adults (43.4%), homemakers (34.3%) and employed persons (34.0%). Prevalence of 2 or more risk factors varied by state/territory and ranged from 27.0% (Hawaii) to 46.2% (Kentucky). Twelve states and 2 territories had a multiple-risk-factor prevalence of 40% or more: Alabama, Arkansas, Georgia, Indiana, Kentucky, Louisiana, Mississippi, North Carolina, Ohio, Oklahoma, Tennessee, West Virginia, Guam and Puerto Rico.[22]
- Data from the BRFSS study of the CDC showed that young women and men, ages 18–24, had poor health profiles and experienced adverse changes from 1990–2000. After adjustment for education and income, these young people had the highest prevalence of smoking (34–36% current smokers among whites); the largest increases in smoking (10–12% among whites and 9% among Hispanic women); large increases in obesity (4–9% increase in all groups). All groups had high levels of sedentary behavior (approximately 20–30%) and low vegetable or fruit intake (approximately 35–50%). In contrast, older Hispanics and older black men, ages 65–74, showed some of the most positive changes. They had the largest decreases in smoking (Hispanic women), largest decreases in sedentary behavior (Hispanic women and black men), and largest increases in vegetable or fruit intake (Hispanic women and black men).[23]
- Data from the Chicago Heart Association Detection Project (1967–73, with an average follow-up of 31 years) showed that in younger women (ages 18–39) with favorable levels for all 5 major risk factors (blood pressure, serum cholesterol, BMI, diabetes and smoking), future incidence of CHD and CVD is rare, and long-term and all-cause mortality are much lower compared with those who have unfavorable or elevated risk factor levels at young ages. Similar findings applied to men in this study.[24,25]
- Data from the BRFSS study of the CDC showed that in adults age 18 and over, disparities in CVD health were common in all risk factors examined. In men, the highest prevalence of obesity (29.7%) was found in Mexican Americans who had completed a high school education. Black women with or without a high school education had a high prevalence of obesity (48.4%). Hypertension prevalence was high among blacks (41.2%), regardless of sex or educational status. Hypercholesterolemia was high among white and Mexican-American men and white women in both groups of educational status. CHD and stroke were inversely related to education, income and poverty status. Hospitalization was greater in men for total heart disease and acute MI but greater in women for CHF and stroke. Among Medicare enrollees, CHF hospitalization was higher in blacks, Hispanics, and American Indians/Alaska Natives than among whites, and stroke hospitalization was highest in blacks. Hospitalizations for CHF and stroke were highest in the southeastern United States. Life expectancy remains higher in women than in men and higher in whites than blacks by about 5 years. CVD mortality at all ages tended to be highest in blacks.[26]
- In respondents ages 18–74, data from the 2000 BRFSS study showed the prevalence of Healthy Lifestyle Characteristics (HLC) was as follows: nonsmoking, 76.0%; healthy weight, 40.1%; 5 fruits and vegetables per day, 23.3%; and regular physical activity, 22.2%. The overall prevalence of the healthy lifestyle indicator (ie, having all 4 HLCs) was only 3%, with little variation among subgroups.[27]
- Analysis of 5 cross-sectional, nationally representative surveys, from NHES 1960–62 to NHANES 1999–2000, showed that the prevalence of key risk factors, ie, high cholesterol, high blood pressure, current smoking, and total diabetes, decreased over time across all BMI groups, with the greatest reductions observed among overweight and obese groups. Total diabetes prevalence was stable within BMI groups over time. However, the trend has leveled off or been reversed for some of the risk factors in more recent years.[28]
- The aging of the population will undoubtedly result in an increased incidence of chronic diseases, including coronary

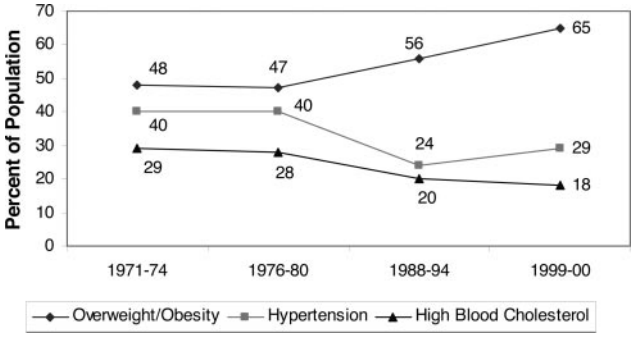

Chart 2A. Trends in the age-adjusted prevalence of health conditions, US adults ages 20–74 (NHANES: 1971–74 to 1999–2000). Source: Briefel and Johnson.[27a] Printed with permission from the *Annual Review of Nutrition*.

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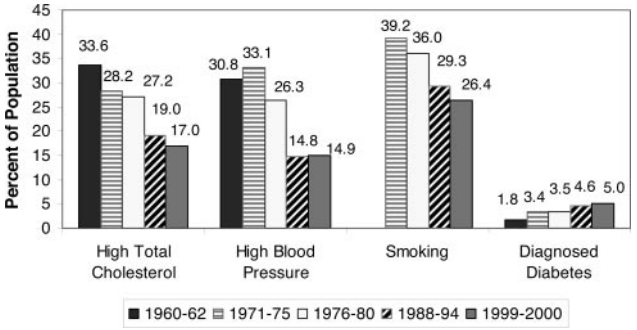

Chart 2B. Trends in cardiovascular risk factors in the US population ages 20–74 (NHES: 1960–62; NHANES: 1971–75 to 1999–2000). Source: Gregg et al.[28] In this study, high total cholesterol was defined as greater than or equal to 240 mg/dL; high blood pressure was defined as greater than or equal to 140/90 mm Hg.

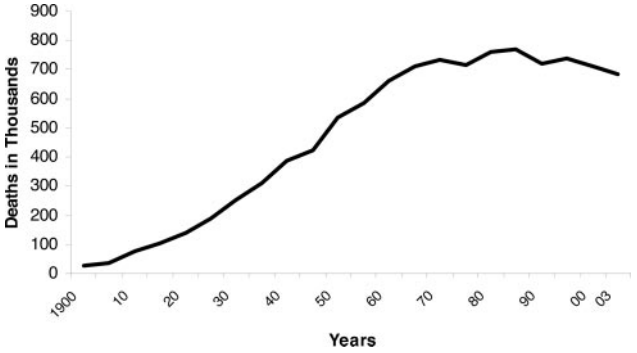

Chart 2C. Deaths from diseases of the heart (United States: 1900–2003). Note: See Glossary for an explanation of "Diseases of the Heart." Total cardiovascular disease data are not available for much of the period covered by this chart. Source: CDC/NCHS. Preliminary mortality for 2003.

artery disease, heart failure and stroke.[29]

–The US Census estimates that there will be 40 million Americans age 65 and older in 2010.

–There's been an explosive increase in the prevalence of obesity and type 2 diabetes. Their related complications—hypertension, hyperlipidemia and atherosclerotic vascular disease—also have increased.

–An alarming increase in unattended risk factors in the younger generations will continue to fuel the cardiovascular epidemic for years to come.

Hospital/Physician/Nursing Home Visits

- From 1979–2003, the number of discharges from short-stay hospitals with CVD as the first listed diagnosis increased 31%. In 2003, CVD ranked highest among all disease categories in hospital discharges.[30]
- In 2003, there were 70 681 000 physician office visits with a primary diagnosis of CVD.[31]
- In 2003, there were 4 497 000 visits to emergency departments with a primary diagnosis of CVD.[32]
- In 1999, 23% of nursing home residents age 65 or older had a primary diagnosis of CVD at admission. This was the highest disease category for these residents.[33]
- In 2002, there were 6 024 000 outpatient department visits with a primary diagnosis of CVD.[34]

Cost

- The estimated direct and indirect cost of CVD for 2006 is $403.1 billion.
- In 2001, $29.3 billion in program payments were made to Medicare beneficiaries discharged from short-stay hospitals with a principal diagnosis of cardiovascular disease. That was an average of $8 354 per discharge.[35]
- A study of the 1987 National Medicaid Expenditure Survey and the 2000 Medical Expenditure Panel Survey, Household Component, showed the 15 most costly medical conditions, and the estimated percent increase in total healthcare spending for each condition from 1987–2000. The following are some of the top 15 conditions, by order of rank, and their percentage impact on health care spending: heart disease (1) +8.06%; cancer (4) +5.36%; hypertension (5) +4.24%; cerebrovascular disease (7) +3.52%; diabetes (9) +2.37%; and kidney disease (15) +1.03%.[36]

Operations and Procedures

- In 2003, an estimated 6 821 000 inpatient cardiovascular operations and procedures were performed in the United States; 3.9 million were performed on males and 2.9 million were performed on females.

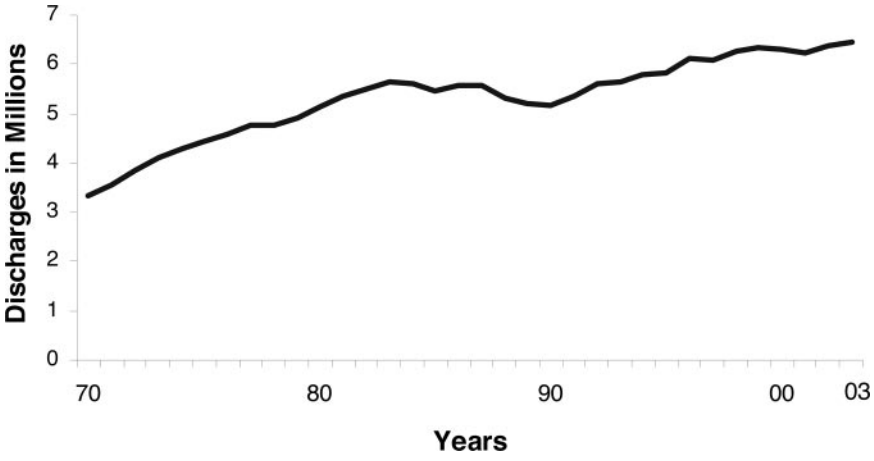

Chart 2D. Hospital discharges for cardiovascular diseases (United States: 1970–2003). Note: Hospital discharges include people discharged alive and dead. Source: National Hospital Discharge Survey, CDC/NCHS and NHLBI.

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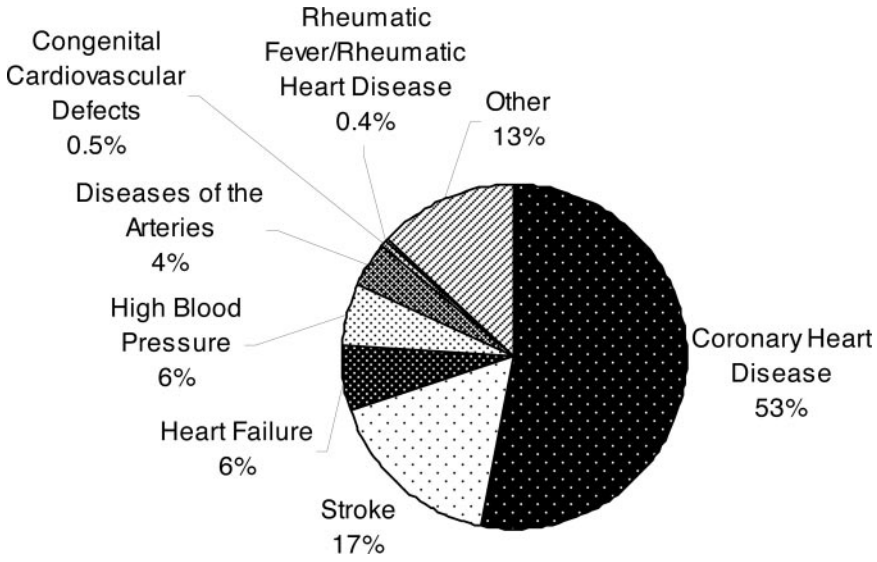

Chart 2E. Percentage breakdown of deaths from cardiovascular diseases (United States: 2003 [preliminary]). Source: CDC/NCHS and NHLBI.

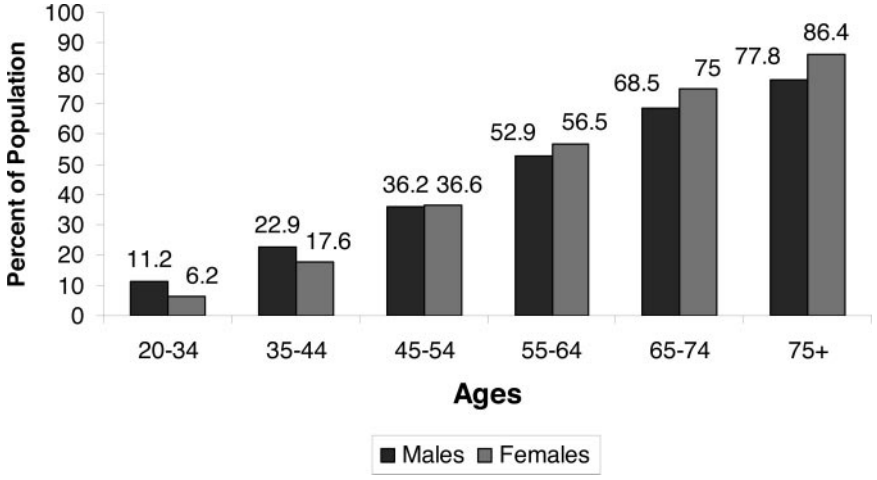

Chart 2F. Prevalence of cardiovascular diseases in Americans age 20 and older by age and sex (NHANES: 1999–2002). Source: CDC/NCHS and NHLBI. These data include CHD, CHF, stroke, and hypertension.

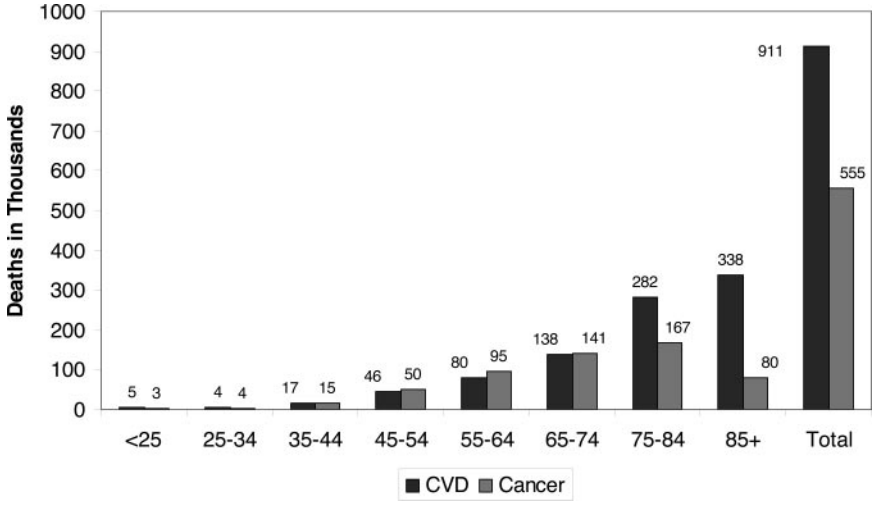

Chart 2G. Charts 2G, 2H, 2I, and 2J make a comparison of total CVD deaths as compared with total cancer deaths for the total US population and also by specific age groups. Overall, there are an estimated 71.3 million people in the United States living with CVD, which causes over 910 000 deaths annually compared to over 554 000 cancer deaths. Chart 2G: CVD deaths versus cancer deaths by age (United States: 2003 [preliminary]). Source: CDC/NCHS and NHLBI. Charts 2H, 2I, and 2J: Source: CDC/NCHS and NHLBI.

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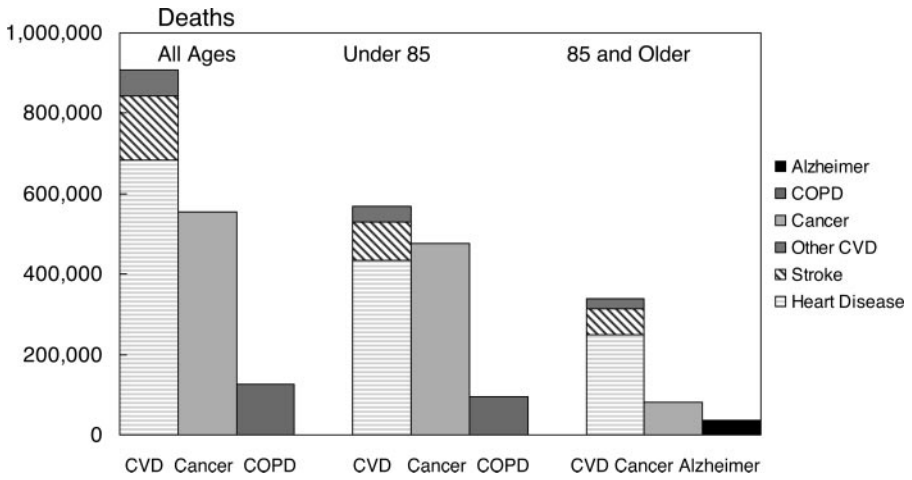

Chart 2H. Three leading causes of death: total, under age 85, and 85 and older. Deaths: both sexes, United States, 2003.

3. Coronary Heart Disease, Acute Coronary Syndrome and Angina Pectoris

Coronary Heart Disease

(ICD/9 410–414, 429.2) (ICD/10 I20–I25; see Glossary for details and definitions). See Table 3A.

Prevalence

- Among Americans ages 40–74, NHANES data found the age-adjusted prevalence of self-reported MI and ECG-MI (verified by electrocardiogram) to be higher among men than women, but angina prevalence to be higher in women than men. Age-adjusted rates of self-reported MI increased among African-American men and women and Mexican-American men, but decreased among white men and women.[38]

Incidence

- This year an estimated 700 000 Americans will have a new coronary attack and about 500 000 will have a recurrent attack.[39] It is estimated that an additional 175 000 silent first heart attacks occur each year.
- The estimated incidence of MI (ICD/9 410) (ICD/10 I21, I22) is 565 000 new attacks and 300 000 recurrent attacks annually.[39]
- The average age of a person having a first heart attack is 65.8 for men and 70.4 for women (ARIC and CHS, NHLBI).

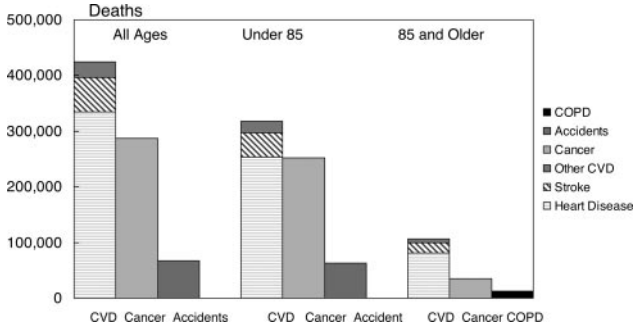

Chart 2I. Three leading causes of death: total, under age 85, and 85 and older. Deaths in males, United States, 2003.

- Based on the NHLBI's FHS in its 44-year follow-up of participants and the 20-year follow-up of their offspring[2]:
  - –CHD comprises more than half of all cardiovascular events in men and women under age 75.
  - –The lifetime risk of developing CHD after age 40 is 49% for men and 32% for women.[40]
  - –The incidence of CHD in women lags behind men by 10 years for total CHD and by 20 years for more serious clinical events such as MI and sudden death.
- In the NHLBI's ARIC study, average age-adjusted CHD incidence rates per 1000 person-years were: white men, 12.5; black men, 10.6; white women, 4.0; and black women, 5.1. Incidence rates excluding revascularization procedures were: white men, 7.9; black men, 9.2; white women, 2.9; and black women, 4.9. Hypertension was a particularly powerful risk factor for CHD in black persons, especially in black women. Diabetes was a weaker predictor of CHD in black than in white persons.[41]
- The annual rates per 1000 population of first heart attack (MI or CHD death) in non-black men are 19.2 for ages 65–74, 28.3 for ages 75–84, and 50.6 for age 85 and older. For non-black women in the same age groups the rates are 6.8, 14.2 and 33.2, respectively. For black men the rates are 21.6, 27.9 and 57.1, and for black women the rates are 8.6, 17.6 and 24.8, respectively (CHS [1989–2000], NHLBI).

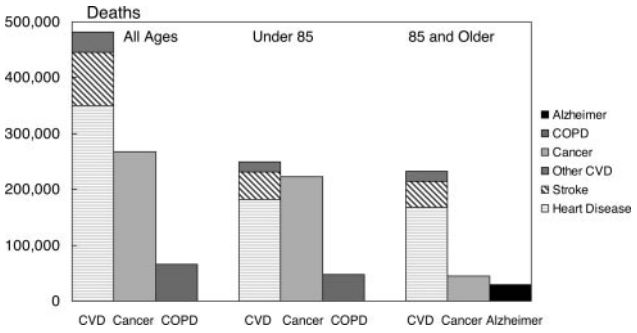

Chart 2J. Three leading causes of death: total, under age 85, and 85 and older. Deaths in females, United States, 2003. Source: CDC/NCHS and NHLBI. Note: 2003 mortality is preliminary.

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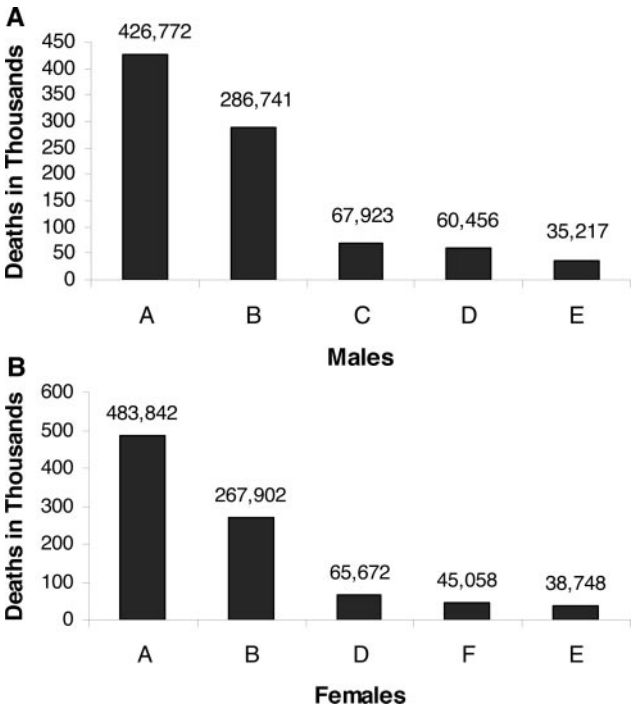

Chart 2K. Leading causes of death for all males and females (United States: 2003 [preliminary]). A, Total CVD; B, cancer; C, accidents; D, chronic lower respiratory diseases; E, diabetes mellitus; F, Alzheimer's disease. Source: CDC/NCHS and NHLBI.

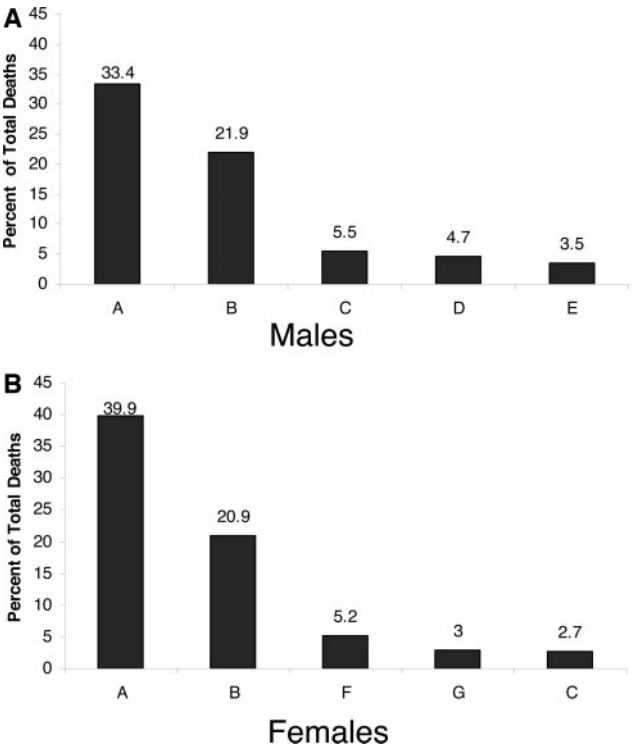

Chart 2M. Leading causes of death for black or African-American males and females (United States: 2003 [preliminary]). A, Total CVD; B, cancer; C, accidents; D, assault (homicide); E, HIV (AIDS); F, diabetes mellitus; G, nephritis, nephrotic syndrome and nephrosis. Note: In 2002, using "Diseases of the Heart and Stroke," which do not constitute total CVD, the percentages of the "A" bars would be 30.6 for males and 36.0 for females. Source: CDC/NCHS and NHLBI.

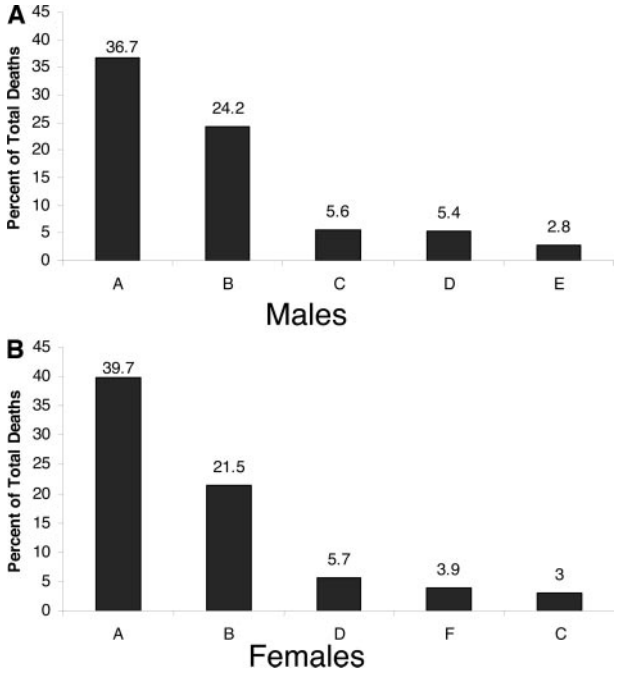

Chart 2L. Leading causes of death for white males and females (United States: 2003 [preliminary]). A, Total CVD; B, cancer; C, accidents; D, chronic lower respiratory diseases; E, diabetes mellitus; F, Alzheimer's disease. Note: In 2002, using "Diseases of the Heart and Stroke," which do not constitute total CVD, the percentages of the "A" bars would be 34.1 for males and 36.8 for females. Source: CDC/NCHS and NHLBI.

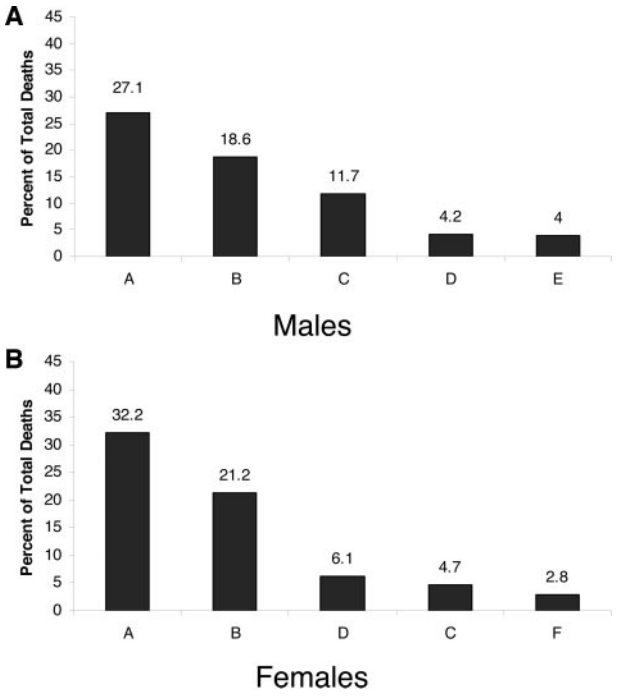

Chart 2N. Leading causes of death for Hispanic or Latino males and females (United States: 2002). A, Diseases of the heart, and stroke; B, cancer; C, accidents; D, diabetes mellitus; E, assault (homicide); F, chronic lower respiratory disease. Source: CDC/NCHS.

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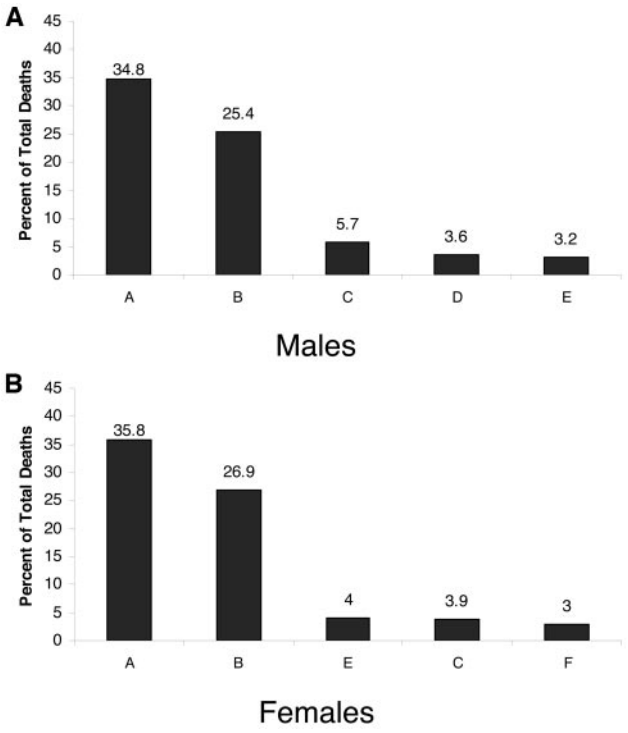

Chart 2O. Leading causes of death for Asian or Pacific Islander males and females (United States: 2002). A, Diseases of the heart, and stroke; B, cancer; C, accidents; D, chronic lower respiratory diseases; E, diabetes mellitus; F, influenza and pneumonia. Note: "Asian or Pacific Islander" is a heterogeneous category that includes people at high CVD risk (e.g., South Asian) and people at low CVD risk (e.g., Japanese). More specific data on these groups aren't available. Source: CDC/NCHS.

- Combining the rates for possible and definite CHD shows that 17 to 25 of every 100 American Indian men ages 45–74 had some evidence of heart disease.[3]
- Among American Indians ages 65–74, the annual rates per 1000 population of new and recurrent heart attacks are 7.6 for men and 4.9 for women (SHS [1989-2002], NHLBI).
- CHD rates in women after menopause are 2–3 times those of women the same age before menopause.[42]

Mortality

CHD caused 1 of every 5 deaths in the United States in 2003. CHD mortality as an underlying or contributing cause of death—653 000. MI mortality as an underlying or contributing cause of death—221 000.

- CHD is the *single* largest killer of American males and females. About every 26 seconds an American will suffer a coronary event, and about every minute someone will die from one. About 40% of the people who experience a coronary attack in a given year will die from it.
- A study of 1275 HMO enrollees ages 50–79 who had cardiac arrest (CA), showed the incidence of out-of-hospital CA was 6.0/1000 subject-years in subjects with any clinically recognized heart disease compared to 0.8/1000 subject-years in subjects without heart disease. In subgroups with heart disease, incidence was 13.6/1000 subject-years in subjects with prior MI and 21.9/1000 subject-years in subjects with heart failure.[43]

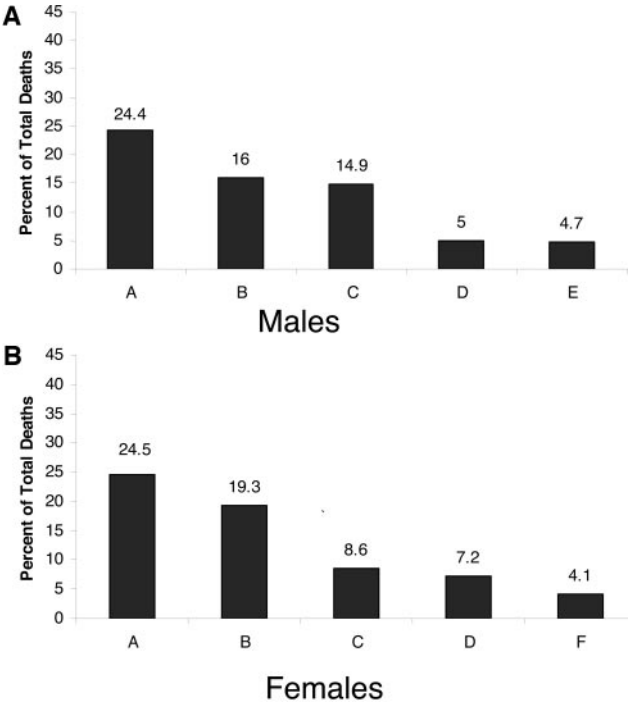

Chart 2P. Leading causes of death for American Indian or Alaska Native males and females (United States: 2002). A, Diseases of the heart, and stroke; B, cancer; C, accidents; D, diabetes mellitus; E, chronic liver disease and cirrhosis; F, chronic lower respiratory diseases. Source: CDC/NCHS.

- An analysis of data from the FHS from 1950–99 showed that overall CHD death rates decreased by 59%. Nonsudden CHD death decreased by 64%, and sudden cardiac death fell by 49%. These trends were seen in men and women, in subjects with and without a prior history of CHD, and in smokers and nonsmokers.[44]
- From 1993–2003, the death rate from CHD declined 30.2%, but the actual number of deaths declined only 14.7%. In 2003, the overall CHD death rate was 162.6 per 100 000 population. The death rates were 209.2 for white males and 241.1 for black males; for white females the rate was 125.1 and for black females it was 160.3. The 2002 death rates for CHD were 138.3 for Hispanics or Latinos, 114.0 for American Indians or Alaska Natives, and 98.6 for Asians or Pacific Islanders (Health, United States, 2004).

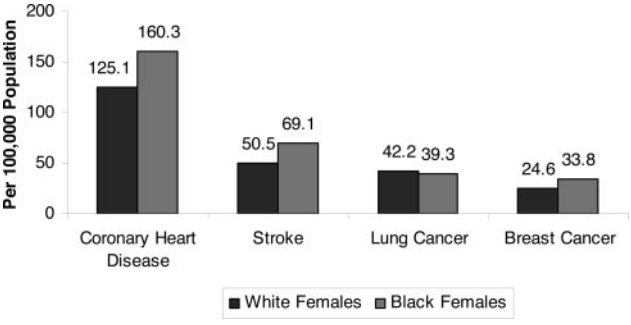

Chart 2Q. Age-adjusted death rates for coronary heart disease, stroke, and lung and breast cancer for white and black females (United States: 2003 [preliminary]). Source: CDC/NCHS and NHLBI.

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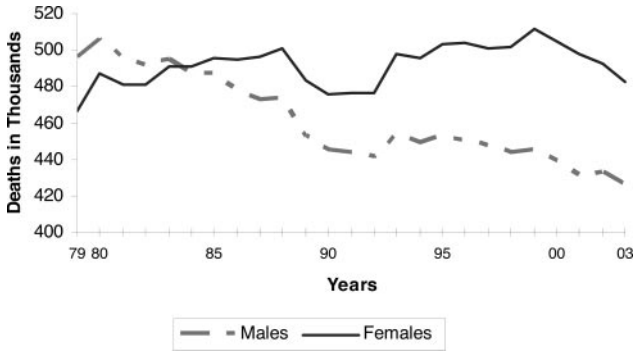

Chart 2R. Cardiovascular disease mortality trends for males and females (United States: 1979–2003 [preliminary]). Source: CDC/NCHS and NHLBI.

- Over 83% of people who die of CHD are age 65 or older (CDC/NCHS).
- The estimated average number of years of life lost due to a heart attack is 14.2 (NHLBI).
- Based on data from the FHS study of the NHLBI[2]:
  - –25% of men and 38% of women will die within 1 year after having an initial recognized MI. In part because women have heart attacks at older ages than men do, they're more likely to die from them within a few weeks. Almost half of men and women under age 65 who have a heart attack (MI) die within 8 years.
  - –50% of men and 64% of women who died suddenly of CHD had no previous symptoms of this disease.
  - –Between 70% and 89% of sudden cardiac deaths occur in men, and the annual incidence is 3–4 times higher in men than in women. However, this disparity decreases with advancing age.
  - –People who've had a heart attack have a sudden death rate that's 4–6 times that of the general population.
  - –Sudden cardiac death accounts for 19% of sudden deaths in children between 1 and 13 years of age and 30% between 14 and 21 years of age. The overall incidence is low, 600 cases per year.
- According to data from the National Registry of Myocardial Infarction[45]:
  - –From 1990–1999, in-hospital AMI mortality declined from 11.2% to 9.4%.[46]
  - –Mortality increases for every 30 minutes that elapse before a patient with ST-segment elevation is recognized and treated.[47]
  - –The median door-to-drug time for thrombolytic therapy was reduced by nearly half, from 61.8 minutes to 37.8 minutes, during the NRMI data collection used in this study. However, many hospitals are still working to meet the goal of 30 minutes set in 1991 (www.nrmi-.org).
  - –Women under 50 are twice as likely to die after an AMI than men in the same age group.[48]

Risk Factors

- A study of men and women in 3 prospective cohort studies found that antecedent major CHD risk factor exposures were very common among those who developed CHD. About 90% of the CHD patients have prior exposure to at least 1 of these major risk factors, which include high total blood cholesterol levels or current medication with cholesterol-lowering drugs, hypertension or current medication with blood pressure-lowering drugs, current cigarette use, and clinical report of diabetes.[49]
- According to a case-control study of 52 countries (INTERHEART), 9 easily measured and potentially modifiable risk factors account for over 90% of the risk of an initial acute MI. The effect of these risk factors is consistent in men and women, across different geographic regions, and by ethnic group, making the study applicable worldwide. These 9 risk factors include cigarette smoking, abnormal blood lipid levels, hypertension, diabetes, abdominal obesity, a lack of physical activity, low daily fruit and vegetable consumption, alcohol overconsumption, and psychosocial index.[50]
- A study of over 3000 members of the FHS offspring cohort without CHD showed that among men with 10-year predicted risk for CHD of 20%, both failure to reach target heart rate and ST-segment depression more than doubled the risk of an event, and each MET (metabolic equivalent) increment in exercise capacity reduced risk by 13%.[51]
- Low CHD risk is defined as blood pressure <120/80 mm Hg, cholesterol <200 mg/dL and not currently smoking. Age-adjusted prevalence was estimated in nondiabetic persons without a history of MI participating in 4 NHANES surveys conducted in 1971–75, 1976–80, 1988–94, and 1999–2000.[52]
  - –The prevalence of low risk rose from 6% in 1971–75 to 17% in 1988–94 and 1999–2000.
  - –Prevalence of low risk was about twice as high in women as in men throughout the period.
  - –Prevalence was initially higher in whites than in blacks (7% versus 3% in 1971–75); it increased more with time in blacks (17% versus 15% in 1999–2000).
  - –Prevalence of low risk in 1999–2000 was lowest in those ages 65–74 (3%) and was progressively greater at younger ages (29% at ages 25–34), with similar increases in prevalence over time across age groups.
  - –The greatest changes in the components of low risk from 1971–2000 were in prevalence of favorable diastolic blood pressure (from 38% to 71%), compared to favorable systolic blood pressure (from 32% to 47%), nonsmoking (from 60% to 79%), and favorable cholesterol (from 33% to 46%).
- Taking into account CHD risk factors in combination provides a very potent predictor of 10-year risk of CHD compared with individual risk factors. Among participants ages 20–79 in the NHANES III study of the CDC/NCHS, without self-reported CHD, stroke, peripheral vascular disease and diabetes, 81.7% had a 10-year risk for CHD of <10%, 15.5% had a risk of 10–20%, and 2.9% had a risk of >20%. Among participants age 60 and over, 40.3% of men and 8.2% of women were at "intermediate risk (10% to 20%)." The proportion of participants with a 10-year risk of CHD of >20% increased with advancing age and was

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CHART 2S. 2002 Age-Adjusted Death Rates for Total Cardiovascular Disease, Coronary Heart Disease and Stroke by State (includes District of Columbia and Puerto Rico)

	Total Cardiovascular Disease*			Coronary Heart Disease**			Stroke#		
State	Rank##	Death Rate	% Change+ 1992 to 2002	Rank##	Death Rate	% Change+ 1992 to 2002	Rank##	Death Rate	% Change+ 1992 to 2002
Alabama	49	378.5	−11.2	22	149.2	−22.1	49	69.7	−6.8
Alaska	3	242.1	−23.8	44	112.7	−36.5	22	55.1	-14.2
Arizona	9	271.9	−20.8	26	153.6	−26.3	8	48.0	−15.7
Arkansas	48	376.0	−12.4	44	192.1	−22.8	52	74.5	−14.3
California	26	305.7	−18.3	34	173.3	−26.2	30	58.1	−14.3
Colorado	7	266.0	−19.3	7	118.6	−34.8	21	54.8	−11.8
Connecticut	15	281.5	−22.9	21	149.1	−28.3	4	45.5	−16.5
Delaware	27	306.5	−20.0	35	173.5	−24.7	12	50.5	−13.6
District of Columbia	45	360.5	−11.9	49	211.6	+26.0	10	49.1	−35.2
Florida	20	289.2	−17.7	31	169.5	−23.9	5	46.1	−18.5
Georgia	42	356.1	−16.2	23	150.6	−31.2	44	65.6	−14.9
Hawaii	6	265.2	−17.2	22	104.8	−32.5	36	60.4	−5.1
Idaho	12	277.9	−18.8	12	136.6	−27.5	32	58.6	−17.2
Illinois	32	324.8	−21.8	36	173.6	−31.6	26	57.2	−16.8
Indiana	37	334.1	−19.9	29	167.8	−30.1	35	60.0	−17.7
Iowa	24	297.9	−18.7	33	171.2	−26.6	28	57.8	−9.5
Kansas	28	308.1	−17.1	13	139.9	−28.4	34	59.6	−9.7
Kentucky	46	372.9	−13.3	42	184.2	−23.5	42	63.9	−11.7
Louisiana	43	357.0	−18.7	32	170.4	−30.9	41	63.0	−14.1
Maine	18	283.0	−21.3	19	147.0	−31.2	16	53.9	−10.6
Maryland	31	316.7	−15.4	38	175.8	−20.1	23	56.5	-4.3
Massachusetts	8	270.6	−23.0	10	134.2	−33.7	9	48.3	−14.5
Michigan	41	348.0	−17.0	46	193.9	−27.1	29	58.0	−15.3
Minnesota	2	237.7	−28.3	3	107.1	−40.2	14	51.0	−27.5
Mississippi	52	420.7	−12.9	45	192.5	−24.9	48	69.6	−9.0
Missouri	44	357.1	−15.3	43	187.6	−24.0	39	62.5	−10.7
Montana	10	273.2	−19.2	6	116.6	−30.9	38	62.0	−14.9
Nebraska	22	290.7	−25.1	8	123.5	−37.4	20	54.6	−13.5
Nevada	35	327.5	−18.5	14	141.9	−32.9	24	56.9	−7.5
New Hampshire	21	290.5	−20.4	30	169.0	−25.0	11	50.1	−20.1
New Jersey	29	308.2	−19.9	40	179.3	−26.5	3	43.6	−21.9
New Mexico	4	255.9	−18.8	15	142.2	−20.9	2	41.7	−20.1
New York	36	333.8	−24.9	51	224.2	−29.0	1	37.4	−26.8
North Carolina	34	327.0	−19.5	28	163.6	−29.7	46	67.9	−16.8
North Dakota	11	276.2	−22.0	24	152.7	−21.5	18	54.3	−18.7
Ohio	40	341.5	−17.0	41	183.6	−25.3	33	59.4	−7.2
Oklahoma	51	398.8	−7.9	52	226.6	−8.8	45	66.4	−6.4
Oregon	19	287.9	−19.5	9	127.9	−34.9	47	69.3	−10.4
Pennsylvania	33	325.1	−20.8	37	173.9	−29.7	19	54.5	−13.7
Puerto Rico	1	233.7	...	5	116.5	...	7	46.2	...
Rhode Island	25	302.4	−19.8	48	202.5	−18.7	6	46.1	−21.9
South Carolina	39	339.4	−22.9	27	155.3	−33.5	51	72.7	−19.8
South Dakota	17	282.1	−23.0	18	146.0	−33.6	17	54.2	−12.1
Tennessee	50	380.8	−13.0	50	214.3	−18.8	50	70.4	−17.9
Texas	38	337.0	−13.9	39	178.6	−22.4	40	62.5	−11.3
Utah	5	262.6	−18.2	1	100.0	−37.0	25	57.0	−10.2
Vermont	14	280.6	−27.8	25	153.3	−35.1	13	50.8	−20.4
Virginia	30	309.7	−23.4	17	144.9	−29.3	37	61.2	−16.6
Washington	13	280.2	−19.6	16	143.8	−23.4	43	65.2	−10.6
West Virginia	47	374.1	−15.1	47	202.2	−23.2	31	58.4	−6.5
Wisconsin	23	295.7	−19.8	20	147.2	−30.9	27	57.6	−16.3
Wyoming	16	281.8	−17.9	11	134.7	−26.2	15	51.9	−25.5
Total United States	...	319.0	−19.7	...	170.8	−27.2	...	56.2	−14.7

Note: The AHRQ has released state level data for heart disease for all 50 states and the District of Columbia. The data is taken from the congressionally mandated 2004 National Healthcare Quality Report (NHQR) at: http://www.qualitytools.ahrq.gov/qualityreport/state. In addition, the Women's Health and Mortality Chartbook of the CDC/NCHS has state-related data for women at: http://www.cdc.gov/nchs/data/healthywomen/womenschartbook_aug2004.pdf. Also, at http://apps.nccd.cdc.gov/brfss-smart/index.asp, Metropolitan/Micropolitan Area Risk (MMSA) data are available for 500 such areas nationwide. BRFSS data is also collected within each state. www.cdc.gov/brfss.

(...) = data not available.

*Total cardiovascular disease is defined here as ICD/10 I00–I99.

**Coronary heart disease is defined here as ICD/10 I20–I25.

#Stroke is defined here as ICD/10 I60–I69.

##Rank is lowest to highest.

+Percent change is based on log linear slope of rates for each year, 1992–2002. For stroke, the death rates in 1992–98 were comparability modified using the ICD/9 comparability ratio of 1.0588.

Source: CDC/NCHS compressed mortality file 1979–2002. Data provided by personal communication with NHLBI.

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higher among men than women but varied little with race or ethnicity.[53]

- A study of NH white persons, ages 35–74, in the Framingham Heart Study and the NHANES III studies, showed that 26% of men and 41% of women had at least 1 borderline risk factor in NHANES III. It is estimated that more than 90% of CHD events will occur in individuals with at least 1 elevated risk factor, and approximately 8% will occur in people with only borderline levels of multiple risk factors. Absolute 10-year CHD risk exceeded 10% in men older than age 45 who had 1 elevated risk factor and 4 more borderline risk factors and in those who had at least 2 elevated risk factors. In women, absolute CHD risk exceeded 10% only in those over age 55 who had at least 3 elevated risk factors.[54]

Aftermath

- Depending on their gender and clinical outcome, people who survive the acute stage of a heart attack have a chance of illness and death that's 1.5–15 times higher than that of the general population. The risk of another heart attack, sudden death, AP, HF and stroke—for both men and women—is substantial (FHS, NHLBI).[2]
- A study conducted by the Mayo Clinic found that cardiac rehabilitation after a heart attack is underused, particularly in women and the elderly. Women were 55% less likely than men to participate in cardiac rehabilitation, and older study patients were less likely than younger participants. Only 32% of men and women age 70 or older participated in cardiac rehabilitation, in comparison to 66% of 60–69-year-olds and 81% of those under age 60.[55]
- Within 6 years after a recognized heart attack (MI) (FHS, NHLBI)[2]. . .
  - –18% of men and 35% of women will have another heart attack.
  - –7% of men and 6% of women will experience sudden death.
  - –About 22% of men and 46% of women will be disabled with heart failure.
  - –8% of men and 11% of women will have a stroke.

Hospital Discharges

- From 1979–2003, the number of discharges from short-stay hospitals with CHD as the first listed diagnosis increased 16% (National Hospital Discharge Survey, CDC/NCHS).
- From 1990–99, the median duration of hospital stay related to acute myocardial infarction dropped from 8.3 days to 4.3 days, according to an analysis of the NRMI. Findings were similar for both patients receiving primary PTCA and those receiving thrombolytic therapy.[46]
- Data from Ambulatory Care Visits to Physician Offices, Hospital Outpatient Departments, and Emergency Departments: US, 1999–2000, showed the number of visits for CHD were 12.2 million.[56]

Awareness of Warning Signs and Risk Factors for Heart Disease

- Surveys conducted by the AHA between 1997 and 2003 showed the awareness of heart disease as the leading cause of death in women rose from 30% in 1997 to 46% in 2003. Awareness in white women (55%) was nearly twice as high as among African-American (30%) and Hispanic (27%) women.[57]
- In 2003, 46% of respondents to a nationally representative telephone survey of women age 25 and older, identified heart disease as the leading killer of women, up from 30% in 1997 and 34% in 2000.[57]
- In 1997, a telephone survey of 1000 US households found that only 8% of women respondents identified heart disease as their greatest health concern; less than 33% identified heart disease as the leading cause of death.[58]
- Data from the Women Veteran Cohort, age 35 and over, showed 42% of women were concerned about heart disease. Only 8–20% were aware that coronary artery disease (CAD) is the major cause of death for women.[59]
- Data from the 2001 BRFSS study of the CDC showed that 95% of respondents recognized chest pain as a heart attack symptom. However, only 11% correctly classified all symptoms and knew to call 911 when someone was having a heart attack. This random digit-dialed telephone survey was conducted in 17 states and the US Virgin Islands.[60]
- A study of public knowledge of CVD risk factors and risk-reduction techniques in 2 New England communities showed that prevention knowledge improved significantly over time in both locations and in every demographic subgroup. Scores were higher for native-born citizens, women, more educated individuals and English-speaking people. There was an increase in the identification of physical inactivity, and blood cholesterol/high-fat diet as CVD risk factors, while there was a decrease in the identification of overweight and blood pressure.[61]
- Three population-based cross-sectional surveys in 2 northern California cities were conducted between 1980 and 1990. Significant differentials in baseline knowledge widened over the 10-year period. Individuals with less than 12 years of education had only slight improvement in their knowledge of CVD risk factors; those with more than 16 years of education had twice as much improvement. There were similar time-effect disparities in knowledge of risk-reduction strategies. In contrast, interest in risk modification was high for all educational groups and remained uniform across time.[62]
- A national study of physician awareness and adherence to CVD prevention guidelines, conducted in late 2004, showed that fewer than 1 in 5 physicians knew that more women than men die each year from CVD.[63]
- A recent community surveillance study in 4 US communities reported that in 2000, the overall proportion of persons with delays from onset of symptoms of acute MI to hospital arrival of 4 or more hours was 49.5%. The study also reported that there was no statistically significant change in the proportion of patients delaying 4 or more hours from 1987–2000, indicating that there has been little improve-

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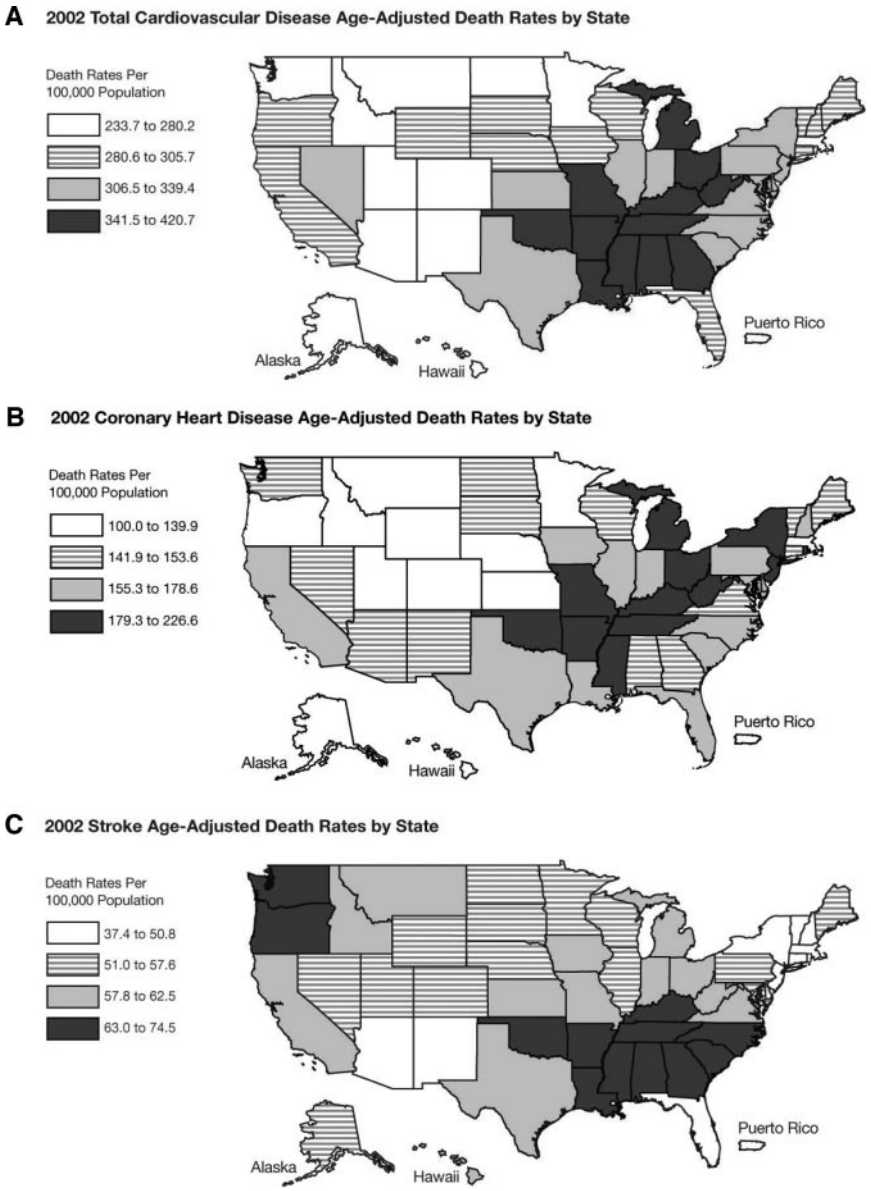

Chart 2T. US maps corresponding to state death rates.

ment in the speed at which patients with MI symptoms arrive at the hospital after onset. Although the proportion of MI patients who arrived at the hospital by emergency medical services increased over this period from 37% in 1987 to 55% in 2000, the total time between onset and hospital arrival did not change appreciably.[64]

Cost

- In 2006, the estimated direct and indirect cost of CHD is $142.5 billion.
- In 2001, $11.6 billion was paid to Medicare beneficiaries for CHD ($11 201 per discharge for acute MI; $11 308 per discharge for coronary atherosclerosis; and $3513 per discharge for other ischemic heart disease).[35]

Operations and Procedures

- In 2003, an estimated 1 244 000 inpatient angioplasty procedures, 467 000 inpatient bypass procedures, 1 414 000 inpatient diagnostic cardiac catheterizations, 64 000 inpatient implantable defibrillators and 197 000 inpatient pacemaker procedures were performed in the United States.

Acute Coronary Syndrome (ACS)

(ICD/9 codes 410, 411)

The term "acute coronary syndrome" (ACS) is increasingly used to describe patients who present with either acute MI or UA. (UA is chest pain or discomfort that's unexpected and usually occurs while at rest. The discomfort may be more severe and prolonged than typical angina or be the first time a person has angina.)

- A conservative estimate for the number of discharges with ACS from hospitals in 2003 is 879 000. Of these, an estimated 497 000 are male and 382 000 are female. This estimate is derived by adding the first listed hospital discharges for myocardial infarction (767 000) to those for unstable angina (112 000) (CDC/NCHS).

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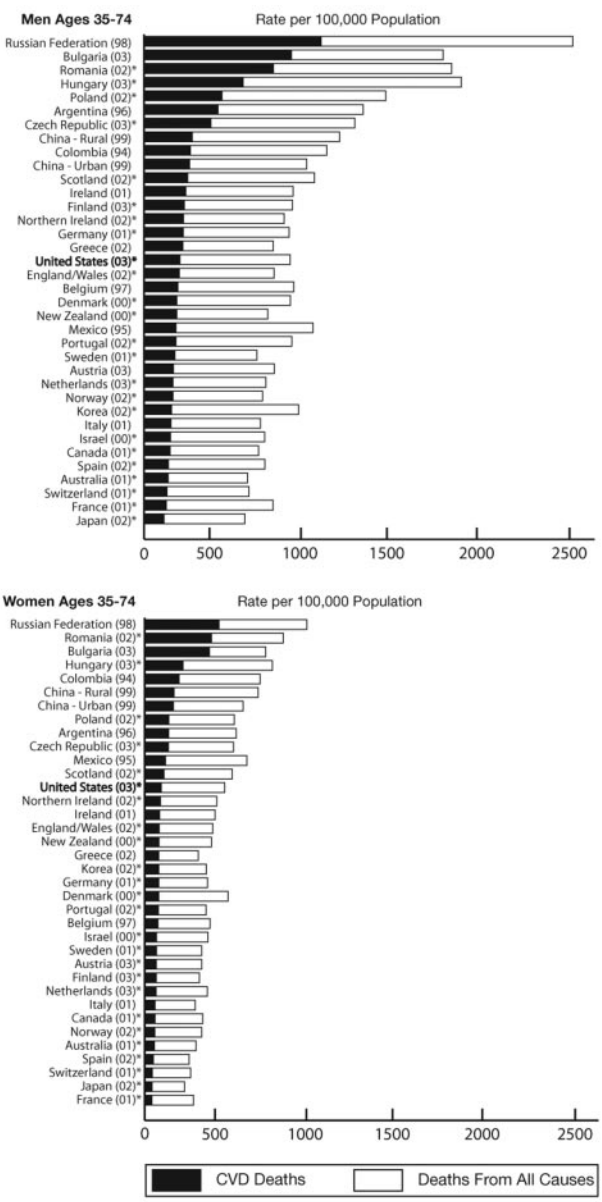
International Cardiovascular Disease Statistics

Death Rates for Total Cardiovascular Disease, Coronary Heart Disease, Stroke and Total Deaths in Selected Countries (most recent year available) (Revised 2005)



CVD Deaths	CHD Deaths	Stroke Deaths	Total Deaths
1167	639	361	2502
937	284	238	1622
850	342	275	1783
714	358	181	1860
567	236	122	1501
531	140	116	1344
507	247	106	1297
413	64	243	1260
397	190	90	1166
389	106	217	1003
373	247	61	1084
356	228	48	920
345	219	59	924
322	217	53	876
317	170	47	924
314	161	74	792
307	**187**	**36**	**943**
301	196	49	811
289	143	50	991
280	164	53	972
279	190	40	779
273	137	61	1172
272	105	104	993
264	162	42	702
251	147	41	863
248	113	40	794
248	146	42	765
236	57	143	1085
229	102	44	767
227	126	43	805
222	150	29	757
208	102	43	826
206	138	31	679
195	101	24	702
190	76	35	914
170	53	67	692

CVD Deaths	CHD Deaths	Stroke Deaths	Total Deaths
540	230	229	1001
456	152	181	861
450	105	138	762
303	133	91	807
286	110	84	748
279	41	152	799
273	71	147	663
229	70	72	623
227	39	63	642
226	91	61	618
197	73	52	773
183	98	48	649
158	**77**	**28**	**593**
150	79	41	534
141	66	32	528
138	68	36	509
136	71	33	498
134	44	47	375
133	24	87	452
133	55	28	464
133	52	39	659
129	34	58	455
126	44	35	494
111	45	27	490
111	52	29	430
110	48	26	432
109	53	32	411
108	38	27	487
98	30	26	381
97	51	21	455
95	43	27	446
92	47	22	396
81	26	24	341
72	27	14	363
71	17	32	308
69	18	19	394

Note: Rates adjusted to the European Standard population. ICD/9 codes are 390-459 for cardiovascular disease; 410-414 for coronary heart disease; and 430-438 for stroke. Countries using ICD/10 are noted with *.

* ICD/10 codes are I00-I99 for cardiovascular disease; I20-I25 for coronary heart disease; and I60-I69 for stroke.

*Source: The World Health Organization Web page, **who.int/whosis/**, NCHS and NHLBI.*

Chart 2U. International death rates.

- When including secondary discharge diagnoses, the corresponding number of hospital discharges was 1 555 000 unique hospitalizations for ACS, 946 000 for MI, and 650 000 for UA (31 000 hospitalizations received both diagnoses) (CDC/NCHS).

Decisions regarding medical and interventional treatments are based on specific findings noted when a patient presents with ACS. Such patients are classified clinically into 1 of 3 categories according to the presence or absence of ST segment elevation on the presenting electrocardiogram and abnormal ("positive") elevations of myocardial biomarkers such as troponins, as follows:

- ST elevation myocardial infarction (STEMI)
- non-ST elevation myocardial infarction
- unstable angina

Studies evaluating the percentage of ACS patients who have STEMI range from 30–45%.[65] These are only preliminary estimates, in part because of dramatically changing

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TABLE 3A. CHD

Population Group	Prevalence CHD 2003	Prevalence MI 2003	New and Recurrent Heart Attacks and Fatal CHD	New and Recurrent MI	Mortality CHD 2003#	Mortality MI 2003#	Hospital Discharges CHD 2003	Cost CHD 2006
Total	13 200 000 (6.9%)	7 200 000 (3.5%)	1 200 000	865 000	479 305	170 961	2 011 000	$142.5 billion
Total males	7 200 000 (8.4%)	4 200 000 (5.0%)	715 000	520 000	245 419 (51.2%)*	89 670 (52.3%)*	1 175 000	...
Total females	6 000 000 (5.6%)	3 000 000 (2.3%)	485 000	345 000	233 886 (48.8%)*	81 291 (47.7%)*	834 000	...
NH white males	8.9%	5.1%	650 000	...	216 220	79 387	...	...
NH white females	5.4%	2.4%	425 000	...	204 971	71 054	...	...
NH black males	7.4%	4.5%	65 000	...	23 957	8376	...	...
NH black females	7.5%	2.7%	60 000	...	24 897	8908	...	...
Mexican-American males	5.6%	3.4%	...	...	...	...	...	...
Mexican-American females	4.3%	1.6%	...	...	...	...	...	...
Hispanic or Latino**	4.5%	...	...	...	...	...	...	...
Asian**	3.8%	...	...	...	...	...	...	...
American Indian/Alaska Native**	8.2%	...	...	...	...	...	...	...

Note: CHD = coronary heart disease; includes acute myocardial infarction, other acute ischemic (coronary) heart disease, angina pectoris, atherosclerotic cardiovascular disease, and all other forms of heart disease. MI = myocardial infarction (heart attack). NH = non-Hispanic.

(...) = data not available.

*These percentages represent the portion of total CHD mortality that is for males vs. females.

**NHIS (2003) — data are estimates for Americans age 18 and older.

#Preliminary.

Sources: Prevalence: NHANES (1999–02), CDC/NCHS and NHLBI. Total data are for Americans age 20 and older; percentages for racial/ethnic groups are age-adjusted for age 20 and older. These data are based on self report. Estimates from NHANES 1999–2002 applied to 2003 population estimates. Incidence: ARIC (1987–2000), NHLBI. Mortality: CDC/NCHS; these data represent underlying cause of death only; data for white and black males and females include Hispanics. Hospital discharges: National Hospital Discharge Survey, CDC/NCHS; data include people discharged alive and dead. Cost: NHLBI; data include estimated direct and indirect costs for 2006.

practices in the unstable angina discharge diagnosis in the past decade. Factors affecting the UA diagnosis include changes in reimbursement policies, the advent of more sensitive assays for myocardial injury (leading to increased diagnosis of MI over UA), and greater care of patients in same-day "chest pain units" and same-day catheterization procedures.

- A study of over 1300 elderly patients admitted to all intensive cardiovascular care units (CCUs) and cardiology departments in Israel, showed the mean age of women versus men was comparable. Comorbidities were more frequent in women, whereas previous coronary disease and typical anginal pain on admission were more frequent in men. Medical treatment and revascularization procedures during the index hospitalization were comparable. Crude and covariate-adjusted mortality rates were higher in women at 7 days, but not at 6 months. This difference was attributed to ST elevation (STE)-ACS in women versus men. Seven-day mortality rates were higher in patients with STE-ACS who were denied coronary angiography, especially women.[66]

Angina Pectoris

(ICD/9 413) (ICD/10 I20). See Table 3B.

Prevalence

- A study of 4 national cross-sectional health examination studies found that, among Americans ages 40–74, the age-adjusted prevalence of AP was higher among women than men. Increases in the prevalence of AP occurred for Mexican-American men and women, and African-American women, but were not statistically significant for the latter.[38]

Incidence

- Only 20% of coronary attacks are preceded by long-standing angina.[2]
- The annual rates per 1000 population of new and recurrent episodes of angina for non-black men are 44.3 for ages 65–74, 56.4 for ages 75–84, and 42.6 for age 85 and older. For non-black women in the same age groups the rates are 18.8, 30.8 and 19.8, respectively. For black men the rates are 26.1, 52.2 and 43.5, and for black women the rates are 29.4, 37.7 and 15.2, respectively (CHS, NHLBI).

Mortality

A small number of deaths due to CHD are coded as being from AP. These are included as a portion of total deaths from CHD.

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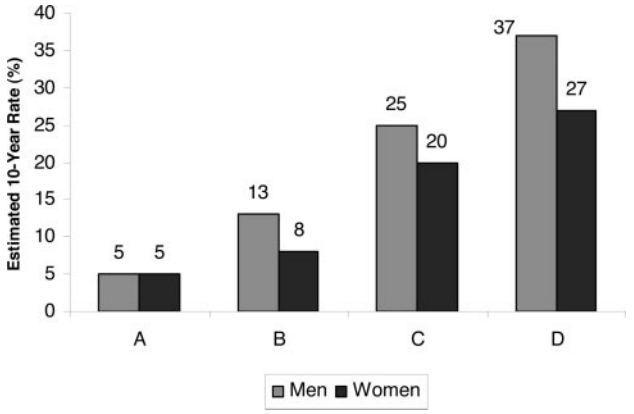

	A	B	C	D
Blood pressure, mm Hg	120/80	140/90	140/90	140/90
Total cholesterol, mg/dL	200	240	240	240
HDL cholesterol, mg/dL	50	50	40	40
Diabetes	No	No	Yes	Yes
Cigarettes	No	No	No	Yes

mm Hg = millimeters of mercury. mg/dL = milligrams per deciliter of blood.

Chart 3A. Estimated 10-year CHD risk in 55-year-old adults according to levels of various risk factors (Framingham Heart Study). Source: Wilson et al.[67]

4. Stroke

(ICD/9 430–438) (ICD/10 I60–I69). See Table 4A.[68]

Prevalence

- From the early 1970s to the early 1990s, the estimated number of noninstitutionalized stroke survivors increased from 1.5 million to 2.4 million.[69]
- The prevalence of stroke in American Indian men ages 45–74 ranges from 0.2–1.4% and in women from 0.2–0.7%.[3]
- 1999–2003 data from the NHIS study of the CDC/NCHS showed that 3.6% of American Indians/Alaska Natives, age 18 and over, have had a stroke. Among blacks or African Americans it was 3.3%, among whites it was 2.2%, and among Asians it was 2.0%.[70]

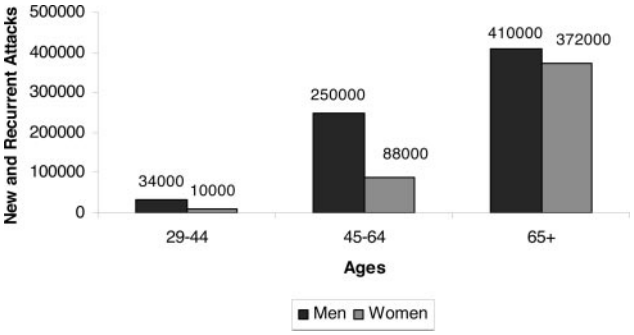

Chart 3B. Annual number of Americans having diagnosed heart attack by age and sex (ARIC: 1987–2000). Source: Extrapolated from rates in the NHLBI's ARIC surveillance study, 1987–2000. These data don't include silent MIs.

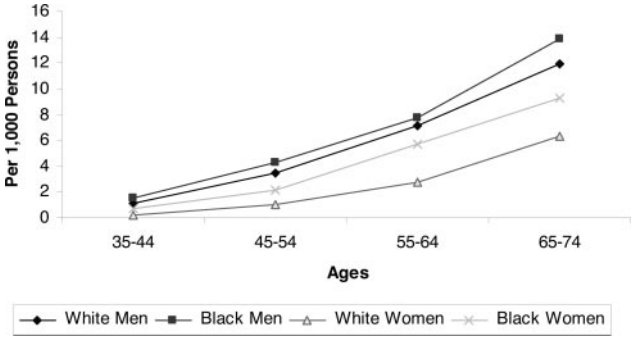

Chart 3C. Annual rate of first heart attacks by age, sex and race (ARIC: 1987–2000). Source: NHLBI's ARIC surveillance study, 1987–2000.

- 2003 data from the BRFSS survey of the CDC showed a higher prevalence of stroke in 10 southeastern states than in 13 non-southeastern states and the District of Columbia. Prevalence was higher in blacks than in whites. The highest age-adjusted prevalence of stroke was among southeastern blacks, followed by non-southeastern blacks, southeastern whites and non-southeastern whites.[71]
- The prevalence of silent cerebral infarction between ages 55–64 is about 11%. This prevalence increases to 22% between ages 65 and 69, 28% between ages 70 and 74, 32% between ages 75 and 79, 40% between ages 80 and 85, and 43% above age 85. Applying these rates to 1998 US population estimates results in an estimated 13 million people with prevalent silent stroke.[71a,71b]

Transient Ischemic Attack (TIA)

- The prevalence of transient ischemic attacks (TIA) in men is 2.7% for ages 65–69 and 3.6% for ages 75–79. (A TIA, or transient ischemic attack, is a mini-stroke that lasts less than 24 hours.) For women, TIA prevalence is 1.6% for ages 65–69 and 4.1% for ages 75–79.[72]
- Approximately 15% of all strokes are heralded by a TIA.[73]
- A third of spells characterized as TIAs using the classic definition (focal neurological deficits resolving within 24 hours) would be considered infarctions based on diffusion-weighted MRI findings.[74]
- In population-based studies, the age and gender adjusted incidence rates for TIA range from 68.2–83/100 000. Males and blacks have higher rates of TIA.[75,76]

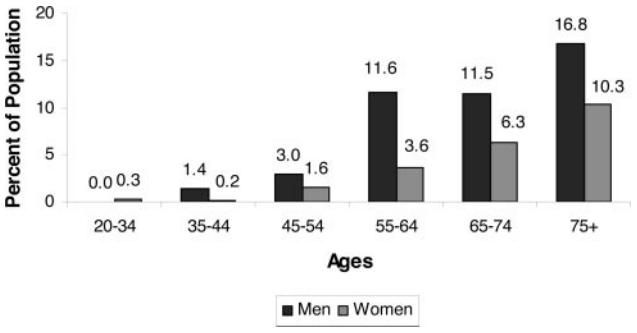

Chart 3D. Prevalence of coronary heart disease by age and sex (NHANES: 1999–2002). Source: CDC/NCHS and NHLBI.

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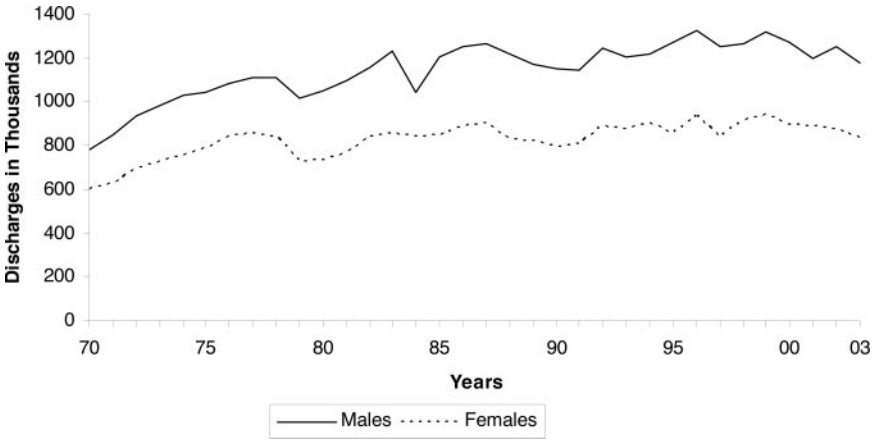

Chart 3E. Hospital discharges for coronary heart disease by sex (United States: 1970–2003). Note: Hospital discharges include people discharged alive and dead. Source: National Hospital Discharge Survey, CDC/NCHS and NHLBI.

- Approximately half of patients who experience a TIA fail to report it to their healthcare providers.[77,78]
- After TIA, the 90-day risk of stroke is 3–17.3%, highest within the first 30 days.[75–77,79,80]
- Within a year of TIA, up to a quarter of patients will die.[76,81]
- Individuals who have a TIA have a 10-year stroke risk of 18.8%, and a combined 10-year stroke, MI or vascular death risk of 42.8% (4% a year).[82]
- In the North American Symptomatic Carotid Endarterectomy Trial (NASCET) study, patients with a first-ever hemispheric TIA had a 90-day stroke risk of 20.1%. The risk of stroke after TIA exceeded the risk after hemispheric stroke.[83]

Incidence

- Each year about 700 000 people experience a new or recurrent stroke. About 500 000 of these are first attacks, and 200 000 are recurrent attacks (GCNKSS, FHS, ARIC).

TABLE 3B. Angina Pectoris

Population Group	Prevalence 2003	Incidence of Stable Angina	Hospital Discharges 2003*
Total	6 500 000 (3.8%)	400 000	63 000
Total males	3 200 000 (4.2%)	. . .	27 000
Total females	3 300 000 (3.6%)	. . .	36 000
NH white males	4.5%	. . .	. . .
NH white females	3.5%	. . .	. . .
NH black males	3.1%	. . .	. . .
NH black females	4.7%	. . .	. . .
Mexican-American males	2.4%	. . .	. . .
Mexican-American females	2.2%	. . .	. . .

Note: Angina pectoris is chest pain or discomfort due to insufficient blood flow to the heart muscle. Stable angina is predictable chest pain on exertion or under mental or emotional stress. The incidence estimate is for angina without MI.

(. . .) = data not available. NH = non-Hispanic.

Sources: Prevalence: NHANES (1999–02), CDC/NCHS and NHLBI; percentages for racial/ethnic groups are age-adjusted for Americans age 20 and older. Estimates from NHANES 1999–2002 applied to 2003 population estimates. Incidence: FHS, NHLBI. Hospital discharges: National Hospital Discharge Survey, CDC/NCHS; data include people discharged alive and dead.

*There were 123 000 days of care for discharges with angina from short-stay hospitals in 2002.

- On average, every 45 seconds someone in the United States has a stroke.
- Each year, about 46 000 more women than men have a stroke (GCNKSS).
- Men's stroke incidence rates are 1.25 times greater than women's. The difference in incidence rates between the sexes is somewhat higher at younger ages but nonexistent at older ages. The male/female incidence was 1.59 for ages 65–69; 1.46 for ages 70–74; 1.35 for ages 75–79 and 0.74 for age 80 and older (CHS, NHLBI).
- Of all strokes, 88% are ischemic, 9% are intracerebral hemorrhage, and 3% are subarachnoid hemorrhage (GCNKSS, FHS, ARIC).
- Blacks have almost twice the risk of first-ever stroke compared with whites. The age-adjusted stroke incidence rates (per 100 000) for first-ever strokes are 167 for white males, 138 for white females, 323 for black males and 260 for black females (GCNKSS, FHS, ARIC).
- The Brain Attack Surveillance in Corpus Christi project (BASIC) clearly demonstrated an increased incidence of stroke among Mexican Americans compared with NH whites in this community. The crude cumulative incidence was 168/10 000 in Mexican Americans and 136/10 000 in NH whites. Specifically, Mexican Americans have an increased incidence of intracerebral hemorrhage and subarachnoid hemorrhage compared with NH whites adjusted for age, as well as an increased incidence of ischemic stroke and TIA at younger ages when compared with NH whites.[86]
- The age-adjusted annual incidence rate (per 1000) for total stroke in Japanese-American men has declined markedly from 5.1 to 2.4; for thromboembolic stroke, from 3.5 to 1.9; and for hemorrhagic stroke, from 1.1 to 0.6. The estimated average annual declines are 5% for total stroke, 3.5% for thromboembolic stroke, and 4.3% for hemorrhagic stroke. The decline in stroke mortality in the Honolulu Heart Program (HHP) target population was similar to that reported for US white males ages 60–69 during the same period (during the 1969–88 follow-up period of the HHP, NHLBI).
- Among American Indians ages 65–74, the annual rates per 1000 population of new and recurrent strokes are 6.1 for men and 6.6 for women (SHS [1989–2002], NHLBI).

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TABLE 4A. Stroke

Population Group	Prevalence 2003	New and Recurrent Attacks	Mortality 2003#	Hospital Discharges 2003	Cost 2006
Total	5 500 000 (2.6%)	700 000	157 804	965 000	$57.9 billion
Total males	2 400 000 (2.5%)	327 000 (47%)*	61 561 (39.0%)*	455 000	. . .
Total females	3 100 000 (2.6%)	373 000 (53%)*	96 243 (61.0%)*	510 000	. . .
NH white males	2.3%	277 000	51 849	. . .	. . .
NH white females	2.6%	312 000	83 187	. . .	. . .
NH black males	4.0%	50 000	7791	. . .	. . .
NH black females	3.9%	61 000	10 834	. . .	. . .
Mexican-American males	2.6%	. . .	. . .	. . .	. . .
Mexican-American females	1.8%	. . .	. . .	. . .	. . .
Hispanic or Latino**	2.2%	. . .	. . .	. . .	. . .
Asian**	1.8%	. . .	. . .	. . .	. . .
American Indian/Alaska Native**	3.1%	. . .	. . .	. . .	. . .

Note: (. . .) = data not available. NH = non-Hispanic.

*These percentages represent the portion of total stroke incidence or mortality that is for males vs. females.

**NHIS (2003) — data are estimates for Americans age 18 and older.

#Preliminary.

Sources: Prevalence: NHANES (1999–2002), CDC/NCHS and NHLBI. Total data include children; percentages for racial/ethnic groups are age-adjusted for Americans age 20 and older. These data are based on self report. Estimates from NHANES 1999–2002 applied to 2003 population estimates. Incidence: Broderick et al (GCNKSS).[68] Mortality: CDC/NCHS; these data represent underlying cause of death only; data for white and black males and females include Hispanics. Hospital discharges: National Hospital Discharge Survey, CDC/NCHS; data include people discharged alive and dead. Cost: NHLBI; data include estimated direct and indirect costs for 2006.

- Data from the Northern Manhattan Study showed the age-adjusted incidence of first ischemic stroke per 100 000 was 88 in whites, 149 in Hispanics and 191 in blacks. Among blacks compared with whites, the relative rate of intracranial atherosclerotic stroke was 5.85; extracranial atherosclerotic stroke, 3.18; lacunar stroke, 3.09; and cardioembolic stroke, 1.58. Among Hispanics compared with whites, the relative rate of intracranial atherosclerotic stroke was 5.00; extracranial atherosclerotic stroke, 1.71; lacunar stroke, 2.32; and cardioembolic stroke, 1.42.[87]

Mortality

Stroke accounted for about 1 of every 15 deaths in the United States in 2003. About 50% of these deaths occurred out of hospital. Stroke as an underlying or contributing cause of death—about 273 000.

- When considered separately from other cardiovascular diseases, stroke ranks No. 3 among all causes of death, behind diseases of the heart and cancer (CDC/NCHS).
- On average, about every 3 minutes someone dies of a stroke.
- Eight to 12% of ischemic strokes and 37–38% of hemorrhagic strokes result in death within 30 days.[88]
- From 1993–2003, the stroke death rate fell 18.5%, and the actual number of stroke deaths declined 0.7% (CDC/NCHS).
- The 2003 overall death rate for stroke was 54.3. Death rates were 51.9 for white males and 78.8 for black males; for white females it was 50.5 and for black females it was 69.1.
- 2002 age-adjusted death rates for stroke were 44.3 for Hispanic or Latino males and 38.6 for females; 50.8 for Asian or Pacific Islander males and 45.4 for females; and 37.1 for American Indians or Alaska Native males and 38.0 for females (Health, United States, 2004, CDC/NCHS).
- Because women live longer than men, more women than men die of stroke each year. Women accounted for 61.0% of US stroke deaths in 2003.
- From 1995–98, age-standardized mortality rates for ischemic stroke, subarachnoid hemorrhage and intracerebral hemorrhage were higher among blacks than whites. Death rates from intracerebral hemorrhage were also higher among Asian or Pacific Islanders than among whites. All minority populations had higher death rates from subarachnoid hemorrhage than did whites. Among adults ages 25–44, blacks and American Indians or Alaska Natives had higher risk ratios than did whites for all 3 stroke subtypes.[90]
- In 2002, the mean age of stroke death was 79.6 years; however, males had a younger mean age at stroke death than females. Blacks, American Indians/Alaska Natives, and Asians/ Pacific Islanders had younger mean ages than whites, and the mean age at stroke death was also younger among Hispanics than non-Hispanics.[85]

Risk Factors

- TIAs carry a substantial short-term risk of stroke, hospitalization for cardiovascular events and death. Of 1707 TIA patients evaluated in the emergency department (ED) of a large health care plan, 180 patients, or 10%, developed stroke within 90 days. Ninety-one patients, or 5%, did so within 2 days. Predictors of stroke: more than 60 years of

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age, having diabetes mellitus, focal symptoms of weakness or speech impairment, and TIA lasting longer than 10 minutes.[91]

- The relative risk (RR) of stroke in heavy smokers (more than 40 cigarettes a day) is twice that of light smokers (less than 10 cigarettes per day). Stroke risk decreases significantly after 2 years and is at the level of nonsmokers by 5 years after cessation of cigarette smoking.[92]
- Atrial fibrillation (AF) is an independent risk factor for stroke, increasing risk about 5-fold. For details, see Section VII a: Arrhythmias.[93]
- In adults over 55, the lifetime risk for stroke is greater than 1 in 6. Women have a higher risk than men, perhaps due to their survival advantage. Blood pressure (BP) is a powerful determinant of stroke risk. Subjects with BP less than 120/80 mm Hg have about half the lifetime risk of stroke, compared to subjects with hypertension.[94]
- Data from the GCNKSS study shows that ischemic stroke patients with diabetes are younger, more likely to be African American, and more likely to have hypertension, MI, and high cholesterol than nondiabetic patients. Age-specific incidence rates and rate ratios show that diabetes increases ischemic stroke incidence at all ages, but this risk is most prominent before age 55 in African Americans and before age 65 in whites. One-year case fatality rates after ischemic stroke are not different between those patients with and without diabetes.[95]

Physical Activity

- Physical activity reduces stroke risk. Results from the Physicians' Health Study showed a lower stroke risk associated with vigorous exercise among men (RR of total stroke = 0.86 for exercise 5 times a week or more).[96] The Harvard Alumni Study showed a decrease in total stroke risk in men who were highly physically active (RR = 0.82).[97]
- For women in the Nurses' Health Study, RR for total stroke from the lowest to the highest physical activity levels were: 1.00, 0.98, 0.82, 0.74 and 0.66, respectively.[98]
- The Northern Manhattan Study—which included whites, blacks and Hispanics, and men and women in an urban setting—showed a decrease in ischemic stroke risk associated with physical activity (PA) levels across all racial/ethnic and age groups, and for each gender (odds ratio = 0.37).[99]
- A follow-up of the ARIC cohort found that PA —be it from sports, during leisure time, or at work—was related to reduced risk of ischemic stroke.[100]

Pregnancy and Stroke

- The Baltimore–Washington Cooperative Young Stroke Study found the risk of ischemic stroke or intracerebral hemorrhage during pregnancy and the first 6 weeks postpartum was 2.4 times greater than for nonpregnant women of similar age and race. The risk of ischemic stroke during pregnancy was not increased during pregnancy per se, but was increased 8.7-fold during the 6 weeks postpartum. Intracerebral hemorrhage showed a small RR of 2.5 during pregnancy, but increased dramatically to an RR of 28.3 in the 6 weeks postpartum. The excess risk of stroke (all types except subarachnoid hemorrhage) attributable to the combined pregnant/post-pregnant period was 8.1 per 100 000 pregnancies.[101]
- Using Swedish administrative data, it was found that ischemic stroke and intracerebral hemorrhage, including subarachnoid hemorrhage, are increased in association with pregnancy. Compared to the risk of stroke among women who were not pregnant or in early pregnancy (up to the first 27 gestational weeks), women in the peripartum (from 2 days before to 1 day after delivery), and the puerperium (from 2 days before to 6 complete weeks after delivery) periods were at increased risk for all 3 major stroke types. The 3 days surrounding delivery were the time of highest risk.[102]
- Data from the HHP found that in elderly Japanese men ages 71–93, low concentrations of high-density lipoprotein (HDL) cholesterol were more likely to be associated with a future risk of thromboembolic stroke than were high concentrations.[103]
- In the US Nationwide Inpatient Sample from 2000–01, the rate of events per 100 000 pregnancies was 9.2 for ischemic stroke, 8.5 for intracerebral hemorrhage, 0.6 for cerebral venous thrombosis and 15.9 for the ill-defined category of pregnancy-related cerebrovascular events, or a total rate of 34.2/100 000, not including subarachnoid hemorrhage. The risk was increased in African Americans and among older women. Among women with these events, death during hospitalization occurred in 4.1%, and in 22% of survivors after discharge to a facility other than home.[104]

Postmenopausal Women

- Stroke is a major health issue for women, particularly for postmenopausal women, raising the question whether increased incidence is due to aging or to hormone status, and whether hormone therapy affects risk.[105,106]
- Among postmenopausal women who are generally healthy, the Women's Health Initiative primary prevention clinical trial among 16 608 women (95% of whom had no pre-existing CVD) found that estrogen plus progestin (Prem-Pro) increased ischemic stroke risk by 44%, with no effect on hemorrhagic stroke. The excess risk was apparent in all

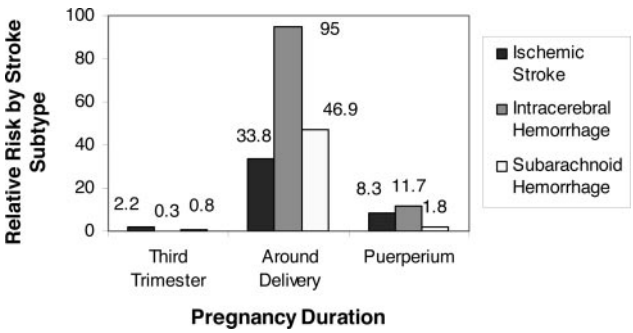

Chart 4A. Risk of stroke in women in the third trimester, peri- and post-partum period versus risk of nonpregnant women and women in the first 2 trimesters. Source: Salonen et al.[102]

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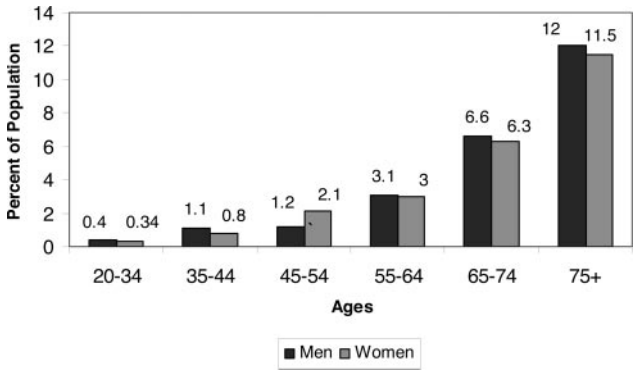

Chart 4B. Prevalence of stroke by age and sex (NHANES: 1999–2002). Source: CDC/NCHS and NHLBI.

age groups, in all categories of baseline stroke risk, and in women with and without hypertension, or prior history of CVD.[107]

- In the Women's Health Initiative trial of estrogen alone, among 10 739 women with hysterectomy, it was found that conjugate equine estrogen alone (Premarin) increased risk of stroke by 39%. The excess risk conferred by estrogen alone was 12 additional strokes per 10 000 person-years.[108]
- In postmenopausal women with known CHD, the Heart and Estrogen/progestin Replacement Study (HERS), a secondary CHD prevention trial, found that a combination of estrogen plus progestin (conjugated equine estrogen [0.625 mg] and medroxyprogesterone acetate [2.5 mg] hormone therapy did not reduce stroke risk.[109]
- The Women's Estrogen for Stroke Trial (WEST) found that estrogen alone (1 mg of 17B-estradiol) in women of mean age 71 years, also had no significant overall effect on recurrent stroke or fatality, but there was an increased rate of fatal stroke and an early rise in overall stroke rate in the first 6 months.[110]
- Clinical trials data indicate that estrogen plus progestin as well as estrogen alone increase stroke risk in postmenopausal, generally healthy women and provide no protection for women with established heart disease.[107,108,111]

Aftermath

- Stroke is a leading cause of serious, long-term disability in the United States.[112]
- The median time from stroke onset to arrival in an ER is between 3 and 6 hours, according to a study of at least 48 unique reports of prehospital delay time for patients with stroke, TIA or stroke-like symptoms. The study included data from 17 countries, including the United States. Improved clinical outcome at 3 months was seen for patients with acute ischemic stroke when intravenous thrombolytic treatment was started within 3 hours of the onset of symptoms.[113]
- In 1999, more than 1 100 000 American adults reported difficulty with functional limitations, activities of daily living, etc, resulting from stroke (*MMWR*, Vol 50, No 7, Feb 23, 2001, CDC).
- According to the NHLBI's FHS[2]. . .
  - –14% of persons who survive a first stroke or TIA will have another one within 1 year.
  - –22% of men and 25% of women who have an initial stroke die within a year. This percentage is higher among people age 65 and older.
  - –51% of men and 53% of women under age 65 who have a stroke die within 8 years.
  - –The length of time to recover from a stroke depends on its severity. From 50–70% of stroke survivors regain functional independence, but 15–30% are permanently disabled, and 20% require institutional care at 3 months after onset.
- In the NHLBI's FHS, among ischemic stroke survivors who were at least 65 years old, these disabilities were observed at 6 months post-stroke[114]:
  - –50% had some hemiparesis.
  - –30% were unable to walk without some assistance.
  - –26% were dependent in activities of daily living.
  - –19% had aphasia.
  - –35% had depressive symptoms.
  - –26% were institutionalized in a nursing home.
- Data from the Paul Coverdell National Acute Stroke Registry showed the majority of stroke admissions were ischemic strokes (52–70%) with TIA and intracerebral hemorrhage comprising the bulk of the remainder. Between 19% and 26% of admissions were under 60 years of age, and between 52% and 58% were female. Blacks varied from 7–31% depending on state of residence. Between 20% and 25% of admissions arrived at the emergency

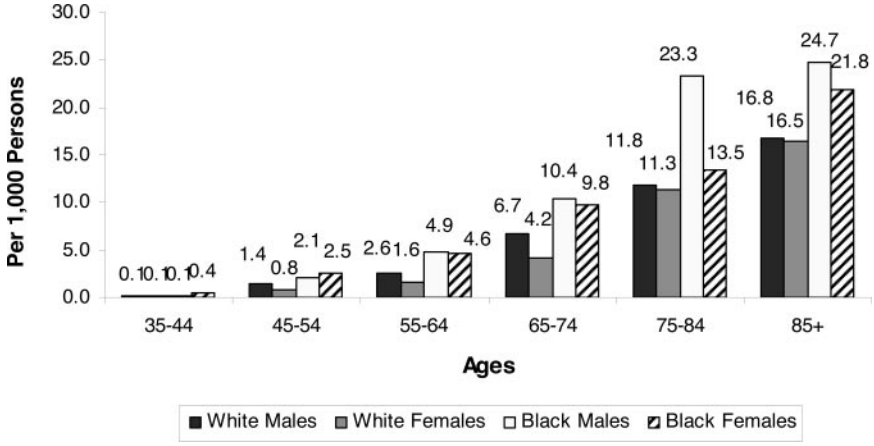

Chart 4C. Annual rate of first cerebral infarction by age, sex and race (Greater Cincinnati/Northern Kentucky Stroke Study: 1993–94). Sources: Unpublished data from the GCNKSS; Kissela et al.[143]

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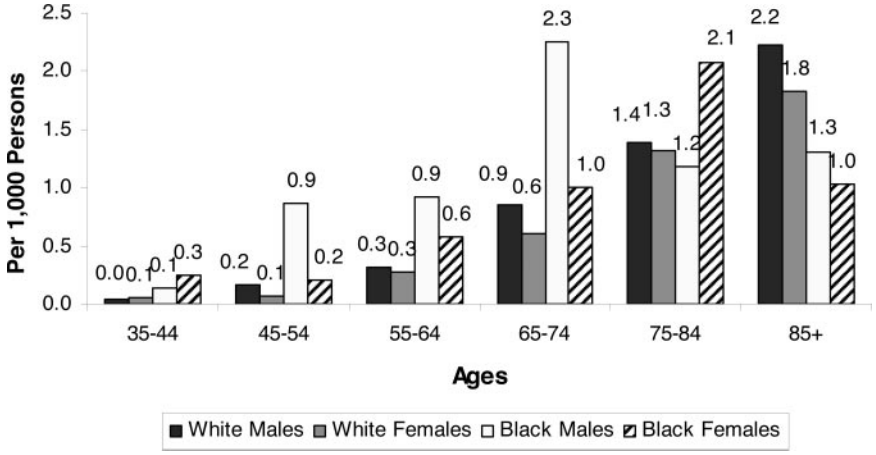
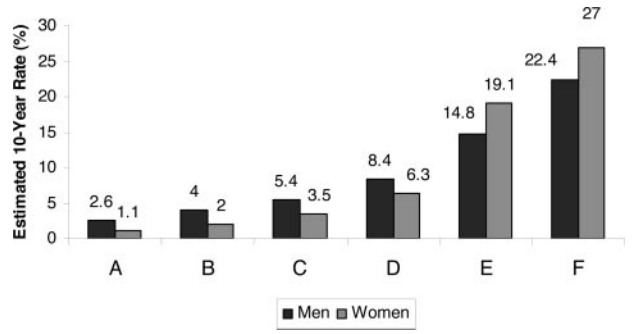


Chart 4D. Annual rate of first intracerebral hemorrhage by age, sex and race (Greater Cincinnati/Northern Kentucky Stroke Study: 1993–94). Source: Kissela et al.[143]

department within 3 hours of onset. Treatment with recombinant tissue plasminogen activator (rtPA) was administered to between 3% and 8.5% of ischemic stroke admissions. Of those treated with rtPA, less than 20% received it within 60 minutes of arrival. Compliance with secondary prevention practices was poorest for smoking cessation counseling and best for antithrombotics.[115]

- Of patients with ischemic stroke in the California Acute Stroke Pilot Registry, 23.5% arrived at the ER within 3 hours of symptom onset, and 4.3% received thrombolysis. If all patients had called 911 immediately, the expected overall rate of thrombolytic treatment within 3 hours would have increased to 28.6%. If all patients with known onset had arrived within 1 hour and had been optimally treated, 57% could have been treated.[116]
- Patients with a discharge diagnosis of ischemic stroke were identified in 7 California hospitals participating in the California Acute Stroke Pilot Registry. Six points of care were tracked: thrombolysis, receipt of antithrombotic medications within 48 hours, prophylaxis for deep vein thrombosis, smoking cessation counseling, and prescription of lipid-lowering and antithrombotic medications at discharge. Overall, rates of optimal treatment improved for patients treated in year 2 compared to year 1, with 63% of patients receiving a perfect score in year 2 compared to 44% in year 1. Rates significantly improved in 4 of the 6 hospitals and for 4 of the 6 interventions. A seventh hospital that participated in the registry but did not implement standardized orders showed no improvement in optimal treatment.[117]



	A	B	C	D	E	F
Systolic BP*	95–105	130–148	130–148	130–148	130–148	130–148
Diabetes	No	No	Yes	Yes	Yes	Yes
Cigarettes	No	No	No	Yes	Yes	Yes
Prior atrial fibrillation	No	No	No	No	Yes	Yes
Prior CVD	No	No	No	No	No	Yes

*Blood pressures are in millimeters of mercury (mm Hg).

Chart 4E. Estimated 10-year stroke risk in 55-year-old adults according to levels of various risk factors (Framingham Heart Study). Source: Wolf et al.[144]

Hospital Discharges

- From 1979–2003, the number of discharges from short-stay hospitals with stroke as the first listed diagnosis increased 29% (National Hospital Discharge Survey, CDC/NCHS).
- During 1988–97, the age-adjusted stroke hospitalization rate increased 18.6% (from 560 to 664 per 100 000), while total hospitalizations increased 38.6% (from 592 811 to 821 760). Hospitalization rates did not change for ages 35–64 but increased for persons age 65 and older. This increase was greater for men than for women. The average length of hospital stay fell from 11.1 to 6.2 days. Total person-days in hospital decreased 22%.[118] (Stroke in this study includes ICD/9 431–434 and 436–438. The American Heart Association uses 430–438.)
- Between 1980 and 1999, hospital discharge rates for stroke increased for blacks and whites; the in-hospital mortality

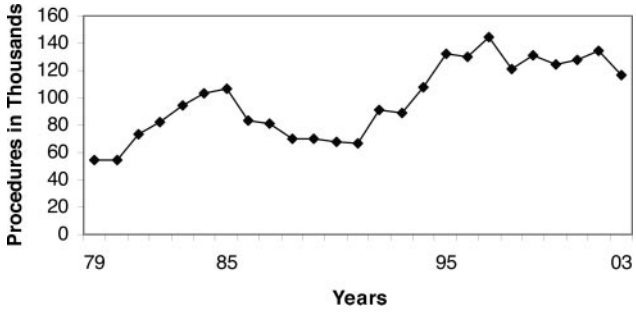


Chart 4F. Trends in carotid endarterectomy procedures (United States: 1979–2003). Source: CDC/NCHS and NHLBI.

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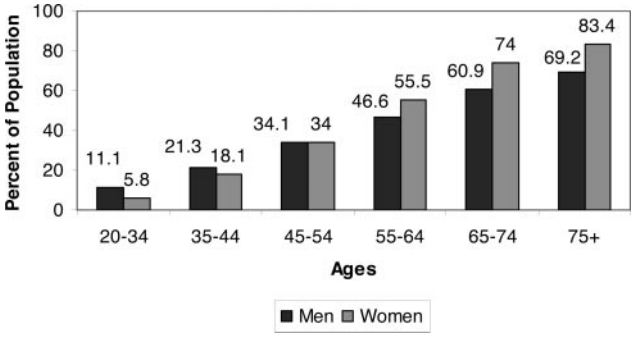

Chart 5A. Prevalence of high blood pressure in Americans by age and sex (NHANES: 1999–2002). Source: CDC/NCHS and NHLBI.

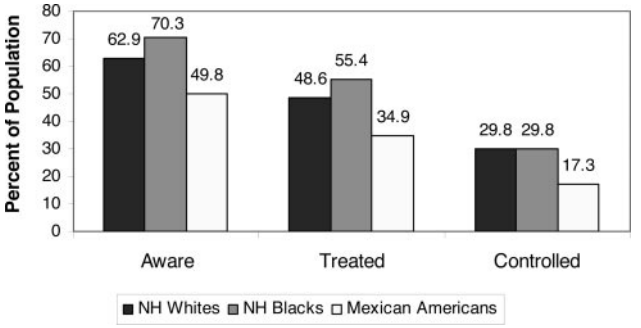

Chart 5C. Extent of awareness, treatment and control of high blood pressure by race/ethnicity (NHANES: 1999–2002). Source: MMWR.[158] NH indicates non-Hispanic.

rates decreased for both black and white patients. Generally, the risk of a stroke hospitalization was more than 70% greater for blacks than for whites. Both groups were similar in terms of in-hospital mortality rates.[119] Note: Estimates by race, especially time trends, are affected by the increasing underreporting of race in the National Hospital Discharge Survey.[120]

- Data from *Ambulatory Care Visits to Physician Offices, Hospital Outpatient Departments, and Emergency Departments: U.S., 1999–2000*, showed the number of visits for stroke was 3.0 million.[56]

Awareness of Stroke Warning Signs and Risk Factors

- 2001 data from the BRFSS study of the CDC, in 17 states and the US Virgin Islands, showed that public awareness of the major stroke warning signs was high.
  - –Sudden numbness or weakness of the face, arm or leg—94.1%
  - –Sudden confusion, trouble speaking or understanding—87.9%
  - –Sudden trouble walking, dizziness or loss of balance or coordination—85%
  - –Sudden trouble seeing in 1 or both eyes—68.1%
  - –Sudden severe headache with no known cause—61.3%

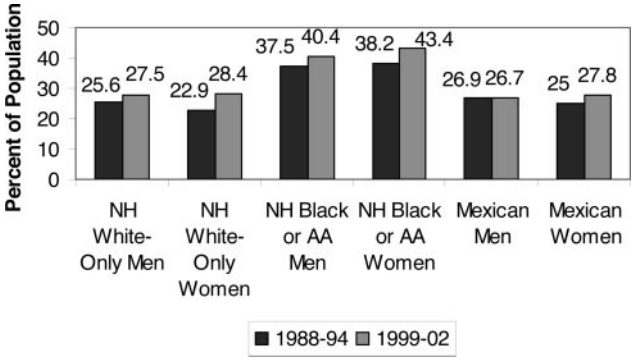

Chart 5B. Age-adjusted prevalence trends for high blood pressure in Americans age 20 and older by race/ethnicity, sex and survey (NHANES: 1988–94 and 1999–2002). Source: Health, United States, 2004, CDC/NCHS. Data based on 3 measures of blood pressure. NH indicates non-Hispanic; AA, African American.[157]

  - –37.8% incorrectly reported sudden chest pain as a sign of stroke.[121]
- A study was conducted of patients admitted to an emergency department with possible stroke, to determine knowledge of the signs, symptoms and risk factors of stroke. Of the 163 patients able to respond, 39% did not know a single sign or symptom. Patients above age 65 were less likely than those under 65 to know a sign or symptom of stroke (47% versus 28%). Forty-three percent did not know a single risk factor for stroke. Overall, almost 40% of patients admitted with a possible stroke did not know the signs, symptoms and risk factors of stroke.[122]
- A study of over 2100 respondents to a random-digit telephone survey in Cincinnati, Ohio, in 2000, showed that 70% of respondents correctly named at least 1 established stroke warning sign versus 57% in 1995, and 72% correctly named at least 1 established risk factor versus 68% in 1995.[123]
- The Heart and Stroke Foundation of Ontario, Canada, conducted a public opinion polling in 4 communities to determine the level of awareness of the warning signs of stroke and to determine the impact of different media strategies. Television advertising significantly increased the ability to name the warning signs. There was no significant change in communities receiving print advertising.[124]
- 2001 BRFSS data from over 61 000 adults showed that only 17.2% overall correctly classified all stroke symptoms and indicated that they would call 911 if they thought someone was having a stroke.[125]
- In 1995, a telephone survey was conducted in the Greater Cincinnati area. Fifty-seven percent of demographically eligible individuals correctly listed at least 1 of the established warning signs and 68% correctly listed 1 of the established risk factors. Respondents age 75 or older were less likely to correctly list 1 warning sign and were less likely to list 1 stroke risk factor.[126]
- Patients were recruited from the Academic Medical Center Consortium, the Cardiovascular Health Study and United HealthCare. Only 41% were aware of their increased risk for stroke. About 74% of patients recalled being told of their increased stroke risk by a physician in comparison with 28% who did not recall. Younger patients, depressed

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patients, those in poor current health, and those with a history of TIA were most likely to be aware of their risk.[127]
- An AHA-sponsored random-digit dialing telephone survey was conducted in mid 2003. Only 26% of women over age 65 reported being well informed about stroke. Correct identification of the warning signs of stroke was low among all racial/ethnic and age groups.[128]
- Among participants in a study by the National Stroke Association, 2.3% reported having been told be a physician that they had a TIA. Of those with a TIA, only 64% saw a physician within 24 hours of the event. Only 8.2% correctly related the definition of TIA and 8.6% could identify a typical symptom. Men, nonwhites, and those with lower income and fewer years of education were less likely to be knowledgeable about TIA.[75]
- Participants in the 1999 World Senior Games received 1 or more free screening tests and completed an awareness questionnaire. Results indicate that stroke education should be targeted at the very elderly, those who have less than a college education and those who do not have a history of chronic disease. It also may be effectively directed toward those with higher cholesterol.[129]

Cost

- The estimated direct and indirect cost of stroke for 2006 is $57.9 billion.
- In 2001, $3.7 billion ($6037 per discharge) was paid to Medicare beneficiaries discharged from short-stay hospitals for stroke.[35]
- The mean lifetime cost of ischemic stroke in the United States is estimated at $140 048. This includes inpatient care, rehabilitation and follow-up care necessary for lasting deficits. (All numbers converted to 1999 dollars using the medical component of CPI.)[130]
- In a population study of stroke costs within 30 days of an acute event, the average cost was $13 019 for mild ischemic strokes and $20 346 for severe ischemic strokes (4 or 5 on the Rankin Disability Scale).[131]
- Inpatient hospital costs for an acute stroke event account for 70% of the first-year post-stroke costs.[130]
- The largest components of acute care costs were room charges (50%), medical management (21%) and diagnostic costs (19%).[132]
- Mortality within 7 days, subarachnoid hemorrhage, and stroke while hospitalized for another condition are associated with higher costs in the first year. Conversely, lower costs are associated with mild cerebral infarctions or residence in a nursing home prior to the stroke.[131]
- Demographic variables (age, sex and insurance status) are not associated with stroke cost. Severe strokes (NIHSS score greater than 20) cost twice as much as mild strokes, despite similar diagnostic testing. Co-morbidities such as ischemic heart disease and AF predict higher costs.[132,133]

Operations and Procedures

- In 2003, an estimated 117 000 inpatient endarterectomy procedures were performed in the United States. Carotid endarterectomy is the most frequently performed surgical procedure to prevent stroke.

Stroke in Children

- Stroke in children has a peak in the perinatal period. In the National Hospital Discharge Survey from 1980–98, the rate of stroke for infants less than 30 days old (per 100 000 live births per year) was 26.4, with rates of 6.7 for hemorrhagic stroke and 17.8 for ischemic stroke.[134]
- A history of infertility, preeclampsia, prolonged rupture of membranes, and chorioamnionitis were found to be independent risk factors for radiologically confirmed perinatal arterial ischemic stroke in the Kaiser Permanente Medical Care Program. The risk of perinatal stroke increased approximately 25-fold with an absolute risk of 1 per 200 deliveries when 3 or more of the following antenatally determined risk factors were present: infertility, preeclampsia, chorioamnionitis, prolonged rupture of membranes, primiparity, oligohydramnios, decreased fetal movement, prolonged second stage of labor, and fetal heart rate abnormalities.[135]
- The Greater Cincinnati/Northern Kentucky Stroke Study found the stroke rate per 100 000 for children ages 1–14 was 2.7. The rate of ischemic stroke and intracerebral hemorrhage is similar in this age group.[136,137]
- Stroke in childhood and young adulthood has a disproportionate impact on the affected patients, their family and society, compared to stroke at older ages. Outcome of childhood stroke was a moderate or severe deficit in 42% of cases.[138]
- Compared to the stroke risk of white children, black children have a higher relative risk of 2.12, Hispanics have a lower relative risk of 0.76, and Asians have a similar risk. Boys have a 1.28-fold higher risk of stroke than girls. There are no ethnic differences in stroke severity or case-fatality, but boys have a higher case-fatality rate for ischemic stroke. The increased risk among blacks is not fully explained by the presence of sickle cell disease, nor is the excess risk among boys fully explained by trauma.[139]
- Despite current treatment, 1 out of 10 children with ischemic stroke will have a recurrence within 5 years.[140]
- Cerebrovascular disorders are among the top 10 causes of death in children, with rates highest in the first year of life. Stroke mortality in children under 1 year of age has remained the same over the last 40 years.[134]
- From 1979–98 in the United States, childhood mortality from stroke declined by 58% overall, with reductions in all major subtypes.[141]
  - –Ischemic stroke decreased by 19%, subarachnoid hemorrhage by 79%, and intracerebral hemorrhage by 54%.
  - –Black ethnicity was a risk factor for mortality from all stroke types.
  - –Male sex was a risk factor for mortality from subarachnoid hemorrhage and intracerebral hemorrhage but not from ischemic stroke.
- Sickle cell disease is the most important cause of ischemic stroke among African-American children. The Stroke Prevention Trial in Sickle Cell Anemia (STOP) demonstrated

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TABLE 5A. High Blood Pressure

Population Group	Prevalence 2003	Mortality 2003#	Hospital Discharges 2003	Cost 2006
Total	65 000 000 (32.3%)	52 602	520 000	$63.5 billion
Total males	29 400 000 (31.5%)	21 537 (40.9%)*	221 000	. . .
Total females	35 600 000 (32.8%)	31 065 (59.1%)*	299 000	. . .
NH white males	30.6%	15 565	. . .	. . .
NH white females	31.0%	23 920	. . .	. . .
NH black males	41.8%	5441	. . .	. . .
NH black females	45.4%	6490	. . .	. . .
Mexican-American males	27.8%	. . .	. . .	. . .
Mexican-American females	28.7%	. . .	. . .	. . .
Hispanic or Latino**	19.0%	. . .	. . .	. . .
Asian**	16.1%	. . .	. . .	. . .
American Indians/Alaska Natives**	23.9%	. . .	. . .	. . .

Note: (. . .) = data not available. NH = non-Hispanic.

*These percentages represent the portion of total HBP mortality that is for males vs. females.

Sources: Prevalence: NHANES (1999–2002), Fields et al,[145] and NHLBI; data are age-adjusted for age 20 and older. Estimates from NHANES 1999–2002 applied to 2003 population estimates. **NHIS (2003), CDC/NCHS; data are estimates for Americans age 18 and older. Mortality: CDC/NCHS; these data represent underlying cause of death only; data for white and black males and females include Hispanics. Hospital discharges: National Hospital Discharge Survey, CDC/NCHS; data include people discharged alive and dead. Cost: NHLBI; data include estimated direct and indirect costs for 2006.

the efficacy of blood transfusions for primary stroke prevention in high-risk children with sickle cell disease in 1998. First admission rates for stroke in California among persons under age 20 with sickle cell disease showed a dramatic decline subsequent to the publication of the STOP study. For the study years 1991–98, 93 children with sickle cell disease were admitted to California hospitals with a first stroke; 92.5% were ischemic and 7.5% were hemorrhagic. The first-stroke rate was 0.88 per 100 person-years during 1991–98, compared to 0.50 in 1999 and 0.17 in 2000 ($P<0.005$ for trend).[142]

5. High Blood Pressure

(ICD/9 401–404) (ICD/10 I10–I15). See Table 5A.

Prevalence

- HBP is defined as:
  - –systolic pressure of 140 mm Hg or higher, or diastolic pressure of 90 mm Hg or higher
  - –taking antihypertensive medicine
  - –being told at least twice by a physician or other health professional that you have HBP
- "Prehypertension" is systolic pressure of 120–139 mm Hg, or diastolic pressure of 80–89 mm Hg, and both not taking antihypertensive medication, or not being told on 2 occasions by a doctor or other health professional that you have hypertension.
- Nearly 1 in 3 adults has HBP.[145]
- About 28% of American adults age 18 and older, or about 59 million people, have "prehypertension" (NHANES 1999–2002, CDC/NCHS, NHLBI).
- In a study conducted in 1999–2000, 39% of persons were normotensive, 31% were prehypertensive, and 29% were hypertensive. The age-adjusted prevalence of prehypertension was greater in men (39%) than in women (23.1%). African Americans ages 20–39 had a higher prevalence of prehypertension (37.4%) than whites (32.2%) and Mexican Americans (30.9%), but their prevalence was lower at older ages because of a higher prevalence of hypertension.[146]
- A higher percentage of men than women have HBP until age 45. From ages 45–54, the percentage of women is slightly higher. After that a much higher percentage of women have HBP than men do (CDC/NCHS).
- HBP is 2–3 times more common in women taking oral contraceptives, especially in obese and older women, than in women not taking them (JNC 5 and 6).
- Data from the BRFSS study of the CDC showed that in 2003, 24.8% of respondents had been told they had HBP (CDC Web site).

Race/Ethnicity and HBP

- The prevalence of hypertension in blacks in the United States is among the highest in the world. Compared with whites, blacks develop HBP earlier in life and their average blood pressures are much higher. As a result, compared with whites, blacks have a 1.3-times greater rate of nonfatal stroke, a 1.8-times greater rate of fatal stroke, a 1.5-times greater rate of heart disease death and a 4.2-times greater rate of end-stage kidney disease (JNC 5 and 6).
- Within the African-American community, rates of hypertension vary substantially.[147]
  - –Those with the highest rates are more likely to be middle aged or older, less educated, overweight or obese, physically inactive, and to have diabetes.
  - –Those with the lowest rates are more likely to be younger, but also overweight or obese.
  - –Those with uncontrolled HBP who are not on antihy-

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pertensive medication tend to be male, younger and have infrequent contact with a physician.
- Compared with white women, black women have an 85% higher rate of ambulatory medical care visits for HBP.[148]
- A study from 1988–94 to 1999–2000, of children and adolescents ages 8–17 showed that among NH blacks, mean systolic BP levels increased 1.6 mm Hg among girls and 2.9 mm Hg among boys, when compared with NH whites. Among Mexican Americans, girls' systolic BP increased 1.0 mm Hg and boys' increased 2.7 mm Hg when compared with NH whites.[149]
- Data from the 1999–2003 NHIS study of the CDC/NCHS showed that American Indian or Alaska Native adults age 18 and older were less likely (29.7%) than black adults (33.9%) and more likely than white adults (22.8%) and Asian adults (19.3%) to ever have been told they had hypertension.[150]
- The prevalence of HBP among blacks and whites in the southeastern United States is greater and death rates from stroke are higher than among those in other regions (JNC 5 and 6) .

Mortality

HBP was listed as a primary or contributing cause of death in about 277 000 of over 2 440 000 US deaths in 2003.

- From 1993–2003, the age-adjusted death rate from HBP increased 29.3%, and the actual number of deaths rose 56.1%.
- The 2003 overall death rate from HBP was 18.1. Death rates were 14.9 for white males, 49.7 for black males, 14.5 for white females and 40.8 for black females.
- As many as 30% of all deaths in hypertensive black men and 20% of all deaths in hypertensive black women may be due to HBP (JNC 5 and 6).

Control

- In NHANES 1999–2000, rates of control were lower in Mexican Americans (17.7%) compared with NH whites (33.4%) and NH blacks (28.1%).[151]
- The awareness, treatment and control of HBP among those in the CHS age 65 and older improved during the 1990s. The percentages who were aware of and treated for HBP were higher among blacks than among whites. Prevalences with HBP under control were similar. For both groups combined, the control of BP to lower than 140/90 mm Hg increased from 37% in 1990 to 49% in 1999. Improved control was achieved by an increase in antihypertensive medications per person and by increasing the proportion of the CHS population treated for hypertension from 34.5% to 51.1%.[152]
- Data from the FHS study of the NHLBI show that in Americans age 80 and older, only 38% of men and 23% of women had BP that met targets set forth in the National High Blood Pressure Education Program's clinical guidelines.[153]

Aftermath

- About 69% of people who have a first heart attack, 77% who have a first stroke, and 74% who have CHF have BP higher than 140/90 mm Hg (NHLBI unpublished estimates from ARIC, CHS and FHS Cohort and Offspring Studies).
- People with systolic BP of 160 mm Hg or higher and/or diastolic BP of 95 mm Hg or higher have a RR for stroke about 4 times greater than for those with normal BP.[154]
- Hypertension precedes the development of CHF in 91% of cases. HBP is associated with a 2–3 times higher risk for developing CHF (FHS, NHLBI, Levy et al[155]).

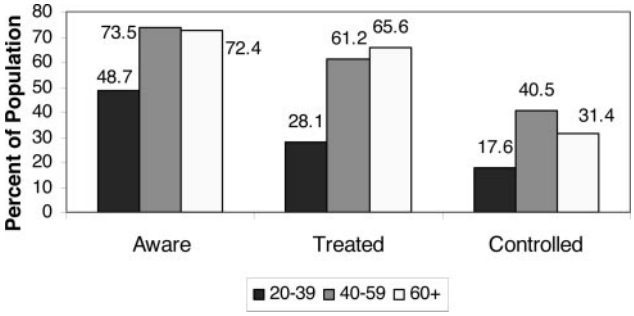

Chart 5D. Extent of awareness, treatment and control of high blood pressure by age (NHANES: 1999–2002). Source: MMWR.[158]

Hospital Discharge

- Data from *Ambulatory Care Visits to Physician Offices, Hospital Outpatient Departments, and Emergency Departments: U.S., 1999–2000*, showed the number of visits for essential hypertension was 37.5 million.[56]

Awareness

- Data from NHANES 1999–2002 showed that of those with hypertension, 63.4% were aware of their condition, 45.3% were under current treatment, 29.3% had it under control, and 70.7% did not have it controlled.[158]

Cost

- The estimated direct and indirect cost of HBP for 2006 is $63.5 billion.

End-Stage Renal Disease (ESRD)

(ICD/10 N18.0)

ESRD (also called end-stage kidney disease) is a condition closely related to high blood pressure, and occurs when the kidneys can no longer function normally on their own. When this happens, patients are required to undergo treatment such as kidney dialysis or a kidney transplant. ESRD morbidity rates vary dramatically among different age, race, ethnicity and sex population groups. Morbidity rates tend to increase with age, then fall off for the oldest age group. The age group with the highest incidence rate is ages 75–79; for prevalence rates, it's ages 70–74. Chronic kidney disease (categorized in stages by level of estimated glomerular filtration rate and urine proteins), which eventually progresses to ESRD, is also a substantial public health burden in the United States. The excess CVD risk in people with chronic renal disease is caused, in part, by a higher prevalence of CVD risk factors in this group than in the general population. The main factors

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include older age, HBP, high blood cholesterol and lipids, diabetes and physical inactivity. An independent, graded association was observed between a reduced estimated glomerular filtration rate (GFR, an indicator of kidney function) and the risk of death, cardiovascular events and hospitalization in a large, community-based population of over 1 million men and women.[159]

- The incidence of reported ESRD has almost doubled in the past 10 years (NHLBI from usrds.org Web site).
- In 2003, 102 567 new cases of ESRD were reported.
- Nearly 453 000 patients were being treated for ESRD by the end of 2003.
- 82 588 patients died from ESRD in 2003.
- More than 15 700 kidney transplants were performed in 2003.
- Diabetes continues to be the most common reported cause of ESRD.
- An estimated 11%, or 19.2 million American adults, have between stage 1–4 chronic kidney disease.[160]
- Between 1996 and 1997, 3.2% of the Medicare population had a diagnosis of chronic kidney disease, representing 63.6% of persons who progressed to ESRD after 1 year.[161]

Age, Sex, Race and Ethnicity

- The average incidence rates for pediatric ESRD are more than twice as high among children ages 15–19 as for children ages 10–14. The rates are more than 3 times higher than those for children ages 0–4 and 5–9.
- Children with pediatric ESRD have high transplantation rates. More than 44% of children starting therapy received a transplant during the first year of therapy, compared with 10% of patients ages 20–64 at ESRD incidence.
- The median age of the prevalent population is 58.1 years (59.2 for whites, 56.1 for blacks, 56.7 for Hispanics, 58.9 for Asians and 57.5 for Native Americans) (USRDS 2004 Annual Data Report. NIH, NIDDK).
- Treatment of ESRD is more common in men than in women.
- Blacks and Native Americans have much higher rates of ESRD than whites and Asians. Blacks represent 29% of treated ESRD patients.
- Without treatment, ESRD is fatal. Even with dialysis treatment, 20% of ESRD patients die yearly (2004 National Healthcare Disparities Report, AHRQ, USDHHS).
- Expenditures for ESRD totaled almost $23 billion in 2001 (2004 National Healthcare Disparities Report, AHRQ, USDHHS).
- Performance for urea reduction ratio of 65 or greater in hemodialysis patients increased from 74% in 1996 to 90% in 2002 (2004 National Healthcare Disparities Report, AHRQ, USDHHS).
- In both 2001 and 2002, the proportion of adult hemodialysis patients who received adequate dialysis was lower among blacks and higher among Asians compared with whites. The proportion who received adequate dialysis was similar among Hispanics and NH whites.

6. Congenital Cardiovascular Defects

(ICD/9 745–747) (ICD/10 Q20–Q28). See Table 6A.

Congenital cardiovascular defects, also known as congenital heart defects, are structural problems arising from abnormal formation of the heart or major blood vessels. At least 15 distinct types of congenital defects are recognized, with many additional anatomic variations.

Defects range in severity from tiny pinholes between chambers that are nearly irrelevant and often resolve spontaneously, to major malformations that result in fetal loss or death in infancy or childhood. Common complex defects include:

- tetralogy of Fallot (9–14%)
- transposition of the great arteries (10–11%)
- atrioventricular septal defects (4–10%)
- coarctation of the aorta (8–11%)
- hypoplastic left heart syndrome (4–8%)
- ventricular septal defects (VSDs), the most common defect. Many close spontaneously, but VSDs still account for 14–16% of defects requiring an invasive procedure within the first year of life.[162]

Prevalence

About 1 million Americans, or 3.4 per 1000, reported being told by a physician that they had a congenital cardiovascular defect, according to a national interview survey in 1993–95. The current prevalence is likely to be higher, since both diagnosis and treatment for all types of defects have improved substantially over the past decade, and since some patients may have been unaware of their diagnosis at the time of the survey (CDC/NCHS, HIS Survey, 1993–95. Unpublished data).

Incidence

Major defects are usually apparent in the neonatal period, but minor defects may not be detected until adulthood. Thus, true measures of incidence for congenital heart disease would need to record new cases of defects presenting anytime in fetal life through adulthood. However, estimates are only

TABLE 6A. Congenital Cardiovascular Defects

Population Group	Mortality 2002	Hospital Discharges 2003
Total	4178	60 000
Total males	2201 (52.7%)*	30 000
Total females	1977 (47.3%)*	31 000
White males	1724	. . .
White females	1583	. . .
Black males	379	. . .
Black females	327	. . .

Note: (. . .) = data not available.

*These percentages represent the portion of total congenital CV mortality that is males vs. females.

Sources: Mortality: CDC/NCHS; these data represent underlying cause of death only; data for white and black males and females include Hispanics. Hospital discharges: National Hospital Discharge Survey, CDC/NCHS; data include people discharged alive and dead.

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available for new cases detected between birth and 30 days of life, known as birth prevalence, or as new cases detected in the first year of life only. Both of these are typically reported as cases per 1000 live births per year, and do not distinguish between tiny defects that resolve without treatment and major malformations. To distinguish more serious defects, some studies also report new cases of sufficient severity to undergo an invasive procedure or result in death within the first year of life. Despite the absence of true incidence figures, some data are available, and are shown in Table 6B.

- According to the CDC, 1 in every 110 babies in the metropolitan Atlanta area was born with a congenital heart defect, including some infants with tiny defects that resolved without treatment. Some defects occur more commonly in males or females, or in whites or blacks.[163]
- Nine (9.0) defects per 1000 live births are expected, or 36 000 babies per year in the United States. Of these, several studies suggest that 9200, or 2.3 per 1000 live births, require invasive treatment or result in death in the first year of life.[164]
- Estimates are also available for bicommisural aortic valves, occurring in 13.7 per 1000 people; these defects may not require treatment in infancy, but can cause problems later in adulthood.[165,166]
- Some studies suggest that as many as 5% of newborns, or 200 000 per year, are born with tiny muscular ventricular septal defects, almost all of which close spontaneously.[167,168] These defects nearly never require treatment, so they aren't included in Table 6B.

TABLE 6B. Annual Incidence of Congenital Cardiovascular Defects

Type of Presentation	Rate per 1000 Live Births	Number
Fetal loss	Unknown	Unknown
Invasive procedure during the first year	2.3	9200
Detected during first year*	9.0	36 000
Bicommisural aortic valve	13.7	54 800
Other defects detected after first year	Unknown	Unknown
Total	Unknown	Unknown

*Includes stillbirths and pregnancy termination at less than 20 weeks gestation; includes some defects that resolve spontaneously or don't require treatment.

Mortality

- As an underlying or contributing cause of death—6110.
- Congenital cardiovascular disease is the most common cause of infant death from birth defects; 1 in 3 infants who die from a birth defect have a heart defect (NVSS Final Data for 2000).
- The 2002 overall death rate for congenital cardiovascular defects was 1.4. Death rates were 1.5 for white males, 1.9 for black males, 1.3 for white females and 1.6 for black females. Crude infant death rates (under 1 year) were 41.5 for white babies and 51.7 for black babies.
- In 2000, 213 000 life years were lost before age 65 due to deaths from congenital cardiovascular disease. This is nearly equivalent to the life years lost from leukemia, prostate cancer and Alzheimer's disease combined (CDC/NCHS; NHLBI).
- In 2000, over 25 000 cardiovascular operations for congenital heart disease were performed on children less than 20 years of age. Inpatient mortality after all types of cardiac surgery was 4.7%. However, mortality risk varies substantially for different defect types, from 0.3% for atrial septal defect repair to 20.1% for first stage palliation for hypoplastic left heart syndrome. Of these operations, 54% were performed in males. In unadjusted analyses, mortality after cardiac surgery was somewhat higher for females than for males (4.8% versus 4.6%) (Healthcare Cost and Utilization Project, HCUP KID2000).
- Mortality from congenital defects has been declining. From 1979–97, age-adjusted death rates from all defects declined 39%, and deaths tended to occur at progressively older ages. However, 43% of deaths still occurred in infants of less than 1 year of age. Mortality varies considerably according to type of defect.[169]
- From 1992–2002, death rates for congenital cardiovascular defects declined 25.0%, while the actual number of deaths declined 24.1%.

Hospitalizations

In 2000, over 130 000 hospitalizations, as a primary or secondary diagnosis, were for infants or children with congenital cardiovascular disease; hospital charges were $6.5 billion (HCUPKID2000).

7. Heart Failure

(ICD/9 428) (ICD/10 I50). See Table 7A.

Prevalence

- In a study conducted in Minnesota, 20.8% of the population had mild diastolic dysfunction, 6.6% had moderate diastolic dysfunction, 0.7% had severe diastolic dysfunction, and 5.6% had moderate or severe diastolic dysfunction with normal ejection fraction (EF). The prevalence of any systolic dysfunction was 6.0% and moderate or severe systolic dysfunction was 2.0%. CHF was much more common among those with systolic or diastolic dysfunction than in those with normal ventricular function. Even among those with moderate or severe diastolic or systolic dysfunction, less than half had recognized CHF. Mild diastolic dysfunction and moderate or severe diastolic dysfunction were predictive of all-cause mortality.[170]

Incidence

- Based on the 44-year follow-up of the NHLBI's FHS[2]. . .
  - –HF incidence approaches 10 per 1000 population after age 65.
  - –Seventy-five percent of HF cases have antecedent hypertension.
  - –About 22% of male and 46% of female heart attack (MI) victims will be disabled with HF within 6 years.

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TABLE 7A. Heart Failure

Population Group	Prevalence 2003	Incidence (New Cases)	Mortality 2003#	Hospital Discharges 2003	Cost 2006
Total	5 000 000 (2.3%)	550 000	57 218	1 093 000	$29.6 billion
Total males	2 400 000 (2.6%)	...	22 313 (39.0%)*	496 000	...
Total females	2 600 000 (2.1%)	...	34 905 (61.0%)*	597 000	...
NH white males	2.5%	...	18 894	...	...
NH white females	1.9%	...	33 381	...	...
NH black males	3.1%	...	2138	...	...
NH black females	3.5%	...	3159	...	...
Mexican-American males	2.7%	...	...	...	...
Mexican-American females	1.6%	...	...	...	...

Note: (...) = data not available. NH = non-Hispanic.

*These percentages represent the portion of total HF mortality that is for males vs. females.

#Preliminary.

Sources: Prevalence: NHANES (1999–2002), CDC/NCHS and NHLBI; percentages are age-adjusted for Americans age 20 and older. These data are based on self reports. Estimates from NHANES 1999–2002 applied to 2003 population estimates. Incidence: FHS, NHLBI. Mortality: CDC/NCHS; these data represent underlying cause of death only; data for white and black males and females include Hispanics. Hospital discharges: National Hospital Discharge Survey, CDC/NCHS; data include people discharged alive and dead. Cost: NHLBI; data include estimated direct and indirect costs for 2006.

- Based on 1971–96 data from the NHLBI's FHS[171]. . .
  - –At age 40, the lifetime risk of developing CHF for both men and women is 1 in 5.
  - –At age 40, the lifetime risk of CHF occurring without antecedent MI is 1 in 9 for men and 1 in 6 for women.
  - –The lifetime risk doubles for people with BP greater than 160/90 mm Hg versus those with BP less than 140/90 mm Hg.
- The annual rates per 1000 population of new and recurrent HF events for non-black men are 21.5 for ages 65–74, 43.3 for ages 75–84, and 73.1 for age 85 and older. For non-black women in the same age groups the rates are 11.2, 26.3 and 64.9, respectively. For black men the rates are 21.1, 52.0 and 66.7, and for black women the rates are 18.9, 33.5 and 48.4, respectively (CHS, NHLBI).
- A community-based cohort study conducted in Olmsted County, Minn., showed that the incidence of HF (ICD9/428) has not declined during 2 decades, but survival after onset has increased overall, with less improvement among women and elderly persons.[172]

Risk Factors

- A study of the predictors of HF among women with CHD found that diabetes was the strongest risk factor. Diabetic women with elevated body mass index (BMI) or depressed creatinine clearance were at highest risk with annual incidence rates of 7% and 13% respectively. Among nondiabetic women with no risk factors, the annual incidence rate was 0.4%. The rate increases with each additional risk factor, and nondiabetic women with 3 or more risk factors had an annual incidence of 3.4%. Among diabetic participants with no additional risk factors, the annual incidence of HF was 3.0% compared with 8.2% among diabetics with at least 3 additional risk factors. Diabetics with fasting glucose >300 mg/dL had a 3-fold adjusted risk of developing HF, compared with diabetics with controlled fasting blood sugar levels.[173]

Mortality

As an underlying or contributing cause of death—286 700.

- Based on the 44-year follow-up of the NHLBI's FHS. . .
  - –Eighty percent of men and 70% of women under age 65 who have HF will die within 8 years.
  - –After HF is diagnosed, survival is poorer in men than in women, but fewer than 15% of women survive more than 8–12 years. The 1-year mortality rate is high, with 1 in 5 dying.
  - –In people diagnosed with HF, sudden cardiac death occurs at 6–9 times the rate of the general population.
- From 1993–2003, deaths from HF (ICD 428) increased 20.5%. In the same time period, the death rate declined 2.0%.
- The 2003 overall death rate for HF was 19.7. Death rates were 20.5 for white males, 23.4 for black males, 18.4 for white females and 20.4 for black females.

Hospital Discharges

- Hospital discharges for HF rose from 399 000 in 1979 to 1 093 000 in 2003, an increase of 174% (National Hospital Discharge Survey, CDC/NCHS).
- Data from *Ambulatory Care Visits to Physician Offices, Hospital Outpatient Departments, and Emergency Departments: US, 1999–2000*, showed the number of visits for CHF was 3.4 million.[56]

Cost

- The estimated direct and indirect cost of HF in the United States for 2006 is $29.6 billion.
- In 2001, $4.0 billion ($5912 per discharge) was paid to Medicare beneficiaries for CHF.[35]

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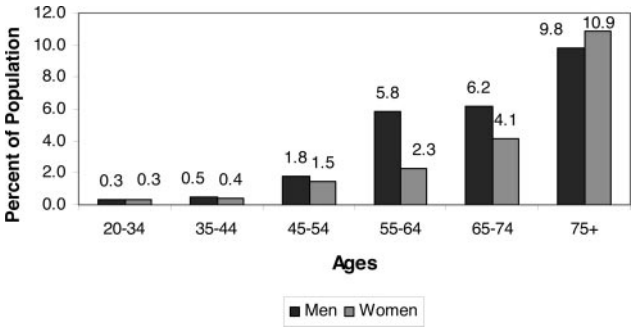

Chart 7A. Prevalence of heart failure by sex and age (NHANES: 1999–2002). Source: CDC/NCHS and NHLBI.

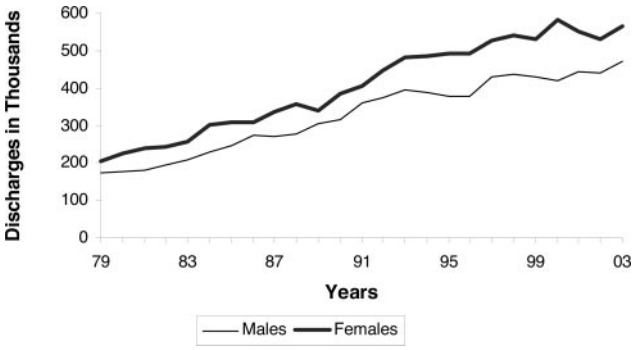

Chart 7B. Hospital discharges for heart failure by sex (United States: 1970–2003). Note: Hospital discharges include people discharged alive and dead. Source: National Hospital Discharge Survey, CDC/NCHS and NHLBI.

8. Other Cardiovascular Diseases

Mortality, prevalence and death rate data in this section are for 2002 or 2003. Mortality for 2003 is preliminary. Mortality as an underlying or contributing cause of death is for 2002. Hospital discharge data for 2003 are based on ICD/9 codes.

Arrhythmias (Disorders of Heart Rhythm)

(ICD/9 426, 427) (ICD/10 I46–I49)

Mortality—38 698. Mortality as an underlying or contributing cause of death—479 700 of over 2 440 000 US deaths. Hospital discharges—856 000. In 2001, $2.7 billion ($6634 per discharge) was paid to Medicare beneficiaries for cardiac dysrhythmias.[35]

Atrial fibrillation and flutter (ICD/9 427.3) (ICD/10 I48). Mortality—10 089. Mortality as an underlying or contributing cause of death—77 800. Prevalence—>2 200 000. Incidence—>75 000.[174] Hospital discharges—470 000.

- In the FHS study, the lifetime risk for development of AF is 1 in 4 for men and women 40 years of age and older. Lifetime risks for AF are high (1 in 6), even in the absence of antecedent CHF or MI.[175]
- Data from the National Hospital Discharge Survey (1996–2001) on cases that included AF as a primary discharge diagnosis found that[176]:
  - –About 44.8% of patients were men.
  - –The mean age for men was 66.8 years versus 74.6 for women.
  - –The racial breakdown for admissions was 71.2% white, 5.6% black, 2.0% other races (20.8% were not specified).
  - –African-American patients were much younger than patients of other races.
  - –The incidence in men ranged from 20.58/100 000 persons per year for patients ages 15–44 to 1077.39/100 000 persons per year for patients age 85 and older. In women, the incidence ranged from 6.64/100 000 persons per year for patients ages 15–44 to 1 203.7/100 000 persons per year for those age 85 and older.
  - –From 1996–2001, hospitalizations with AF as the first-listed diagnosis increased 34%.
- Age-adjusted death rates for AF were highest among whites (25.7) and blacks (16.4) and higher for men (34.7) than women (22.8).[177]
- The most common diseases listed as the primary diagnosis for persons hospitalized with AF were CHF (11.8%), followed by AF (10.9%), CHD (9.9%), and stroke (4.9%).[177]
- AF is an independent risk factor for stroke, increasing risk about 5-fold. The risk for stroke attributable to AF increases with age.[93]
- AF is responsible for about 15–20% of all strokes.[178]
- AF is also an independent risk factor for stroke recurrence and stroke severity. A recent report showed people who had AF and were not treated with anticoagulants had a 2.1-fold increase in risk for recurrent stroke and a 2.4-fold increase in risk for recurrent severe stroke.[179]
- People who have strokes caused by AF have been reported as 2.23 times more likely to be bedridden compared to those who have strokes from other causes.[180]
- Participants in the FHS Offspring Study of the NHLBI were examined between 1984 and 1987 and monitored for 10 years. Data show that symptoms of anger and hostility were predictive of 10-year incidence of AF in men.[181]
- Participants in the FHS study of the NHLBI were followed from 1968–99. At age 40, lifetime risks for AF were 26.0% for men and 23.0% for women. At 80 years, lifetime risks for AF were 22.7% for men and 21.6% for women. In further analysis, counting only those who had development of AF without prior or concurrent CHF or MI, lifetime risk for AF was approximately 16%.[175]
- **Tachycardia** (ICD/9 427.0,1,2) (ICD/10 I47.0,1,2,9). Mortality—610. Mortality as an underlying or contributing cause of death—7200. Hospital discharges—84 000.
- **Paroxysmal supraventricular tachycardia** (ICD/9 427.0) (ICD/10 I47.1). Mortality—151. Mortality as an underlying or contributing cause of death—1454. Hospital discharges—28 000.
- **Ventricular fibrillation** (ICD/9 427.4) (ICD/10 I49.0). Mortality—1264. Mortality as an underlying or contributing cause of death—13 100. Hospital discharges—8000. Ventricular fibrillation is listed as the cause of relatively few deaths, but the overwhelming number of sudden cardiac deaths from coronary disease (estimated at about 330 000 per year) are thought to be from ventricular fibrillation.

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Arteries, Diseases of

(ICD/9 440–448) (ICD/10 I70–I79) (Includes peripheral arterial disease)

Mortality—37 647. Mortality as an underlying or contributing cause of death—115 400. Hospital discharges—262 000.

Aortic aneurysm (ICD/9 441) (ICD/10 I71). Mortality—14 751. Mortality as an underlying or contributing cause of death—20 800. Hospital discharges—53 000.

Atherosclerosis (ICD/9 440) (ICD/10 I70) is a process that leads to a group of diseases characterized by a thickening of artery walls. Preliminary mortality (2003)—13 030. Mortality as an underlying or contributing cause of death—66 000. Hospital discharges—118 000. Atherosclerosis causes many deaths from heart attack and stroke and accounts for nearly three-fourths of all deaths from CVD (FHS, NHLBI).

- In 1999 US community hospitals billed $26.2 billion for coronary atherosclerosis, more than for any other condition (AHRQ Electronic Newsletter, June 14, 2002).

Other diseases of arteries (ICD/9 442–448) (ICD/10 I72–I78). Preliminary mortality (2003)—9867. Mortality as an underlying or contributing cause of death—10 109. Hospital discharges—91 000.

- **Kawasaki disease** (ICD/9 446.1) (ICD/10 M30.3). Mortality—9. Mortality as an underlying or contributing cause of death—14. Hospital discharges—5000, primary plus secondary diagnoses.
  - –About 76% of Kawasaki disease patients are under age 5.[182]
  - –Up to 2500 cases of Kawasaki disease are diagnosed yearly. Kawasaki disease occurs more often among boys (63%) and among those of Asian ancestry.[183]
  - –The highest incidence in the United States is in Hawaii. A hospitalization rate of 47.7 per 100 000 children under age 5 was reported during the mid-1990s. In the continental United States, the estimated incidence is from 9–19 per 100 000 children.[184]

Peripheral arterial disease (PAD) affects about 8 million Americans and is associated with significant morbidity and mortality.[185,186]

- A study from the NHANES 1999–2000 data found that PAD affects about 5 million adults. Prevalence increases dramatically with age and disproportionately affects blacks.[187] However, the measurement of systolic BP utilizing the right arm only and the omission of queries for surgical procedures to correct PAD in this study led to an underestimate of the true PAD prevalence. Experts in the field generally agree that PAD affects approximately 8 million Americans.[185,186]
- PAD affects 12–20% of Americans age 65 and older. Despite its prevalence and cardiovascular risk implications, only 25% of PAD patients are undergoing treatment.[188]
- In the general population, only about 10% of persons with PAD have the classic symptoms of intermittent claudication (IC). About 40% do not complain of leg pain, while the remaining 50% have a variety of leg symptoms different from classic claudication.[185,189] However, in an older, disabled, population of women, as many as two-thirds of individuals with PAD had no exertional leg symptoms.[190]
- The risk factors for PAD are similar to those for CHD, although diabetes and cigarette smoking are particularly strong risk factors for PAD.[191]
- Persons with PAD have impaired function and quality of life. This is true even for persons who do not report leg symptoms. Furthermore, PAD patients, including those who are asymptomatic, experience significant decline in lower extremity functioning over time.[192,193]
- PAD is a marker for systemic atherosclerotic disease. Persons with PAD, compared to those without, have 4–5 times the risk of dying of a CVD event, resulting in 2–3 times higher total mortality risk.[186,194]
- In the Framingham Heart Study (FHS), the incidence of PAD was based on symptoms of IC in subjects ages 29–62. Annual incidence of IC per 10 000 subjects at risk rose from 6 in men and 3 in women ages 30–44 to 61 in men and 54 in women ages 65–74.[195] IC incidence has declined since 1950, but mortality has remained high and unchanged.[196]
- Several studies have evaluated both symptomatic and asymptomatic PAD using the ankle brachial index. The prevalence of asymptomatic PAD was 25.5% among 1537 participants of the Systolic Hypertension in the Elderly Program (SHEP).[195]
- In the FHS, the annual mortality rate was almost 4 times greater in subjects with IC. In a major cohort study, investigators observed a risk for all-cause mortality in these subjects that was 3.1 times higher than that for patients without PAD. In addition, PAD patients had a 5.9-times higher risk for death from CVD complications and a 6.6-times higher risk for death from CHD specifically.[186,195]
- African-American ethnicity was a strong and independent risk factor for PAD, and was not explained by higher levels of diabetes, hypertension, and BMI. African Americans had a higher PAD prevalence than NH whites (OR= 2.3). There was no evidence of a greater susceptibility of African Americans to CVD risk factors as a reason for their higher PAD prevalence.[197]
- Data from NHANES 1999–2000 (CDC/NCHS), show that even low blood levels of lead and cadmium may increase the risk of PAD. Exposure to these 2 metals is possible through cigarette smoke. The risk was 2.8 for high levels of cadmium and 2.9 for high levels of lead. The odds ratio of PAD for current smokers was 4.13 compared to people who had never smoked.[198] Results from the NHANES 1999–2000 survey of the CDC/NCHS showed a remarkably high prevalence of PAD among patients with renal insufficiency. Accurate identification of patients with renal insufficiency combined with routine ABI measurement in this group would greatly enhance efforts to detect subclinical PAD.[199]

Bacterial Endocarditis

(ICD/9 421.0) (ICD/10 I33.0)

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TABLE 8A. Rheumatic Fever/Rheumatic Heart Disease

Population Group	Mortality 2003#	Hospital Discharges 2003
Total	3554	43 000
Total males	1152 (32.4%)*	15 000
Total females	2402 (67.6%)*	28 000
White males	1021	. . .
White females	2146	. . .
Black males	113	. . .
Black females	185	. . .

Note: (. . .) = data not available.

*These percentages represent the portion of total mortality that is for males vs. females.

#Preliminary.

Sources: Mortality: CDC/NCHS; these data represent underlying cause of death only; data for white and black males and females include Hispanics. Hospital discharges: National Hospital Discharge Survey, CDC/NCHS; data include people discharged alive and dead.

Mortality as an underlying or contributing cause of death—2370. Hospital discharges—29 000, primary plus secondary diagnoses.

Cardiomyopathy

(ICD/9 425) (ICD/10 I42)

Mortality—27 728. Mortality as an underlying or contributing cause of death—54 700. Hospital discharges—39 000.

- Eighty-seven percent of cases are congestive or dilated cardiomyopathy. Of patients with dilated cardiomyopathy, 50% are alive 5 years after their initial diagnosis and 25% are alive 10 years after the diagnosis (Facts About Cardiomyopathy, NIH, NHLBI, 1995).
- Mortality from cardiomyopathy is highest in older persons, men and blacks (FHS, NHLBI).
- Tachycardia-induced cardiomyopathy develops slowly and appears reversible, but recurrent tachycardia causes rapid decline in left ventricular function and development of HF. Sudden death is possible.[200]
- Since 1996, the NHLBI's Pediatric Cardiomyopathy Registry has collected data on all children with newly diagnosed cardiomyopathy in New England and the Central Southwest (Texas, Oklahoma and Arkansas).[201]
  - –The overall incidence of cardiomyopathy is 1.13 cases per 100 000 in children younger than age 18.
  - –In children under 1 year of age, the incidence is 8.34 and in children ages 1–18 it's 0.70 per 100 000.
  - –The annual incidence is lower in white than in black children; higher in boys than in girls; and higher in New England (1.44 per 100 000) than in the Central Southwest (0.98 per 100 000).
- Studies show that 36% of young athletes who die suddenly have probable or definite hypertrophic cardiomyopathy.[202]

Rheumatic Fever/Rheumatic Heart Disease

(ICD/9 390–398) (ICD/10 I00–I09). See Table 8A.

Incidence

- Many operations on heart valves are related to rheumatic heart disease (RHD).
- The incidence of rheumatic fever (RF) remains higher in African Americans, Puerto Ricans, Mexican Americans and American Indians.[2]

Mortality

- Mortality as an underlying or contributing cause of death—7440.
- In 1950, about 15 000 Americans (adjusted for changes in ICD codes) died of RF/RHD compared with about 3500 today.
- From 1993–2003 the death rate from RF/RHD fell 36.8%, while actual deaths declined 24.6%.
- The 2003 overall death rate for RF/RHD was 1.2. Death rates were 1.0 for white males and 0.9 for black males, 1.4 for white females and 1.2 for black females.

Valvular Heart Disease

(ICD/9 424) (ICD/10 I34–I38)

Mortality—19 989. Mortality as an underlying or contributing cause of death—42 590. Hospital discharges—95 000.

- Aortic valve disorders (ICD/9 424.1) (ICD/10 I35). Mortality—12 471. Mortality as an underlying or contributing cause of death—about 26 336. Hospital discharges—48 000.
- Mitral valve disorders (ICD/9 424.0) (ICD/10 I34). Mortality—2759. Mortality as an underlying or contributing cause of death—about 6600. Hospital discharges—43 000.
  - –The NHLBI's FHS reports that among people ages 26–84, prevalence is about 1–2% and equal between women and men.
- Pulmonary valve disorders (ICD/9 424.3) (ICD/10 I37). Mortality—11. Mortality as an underlying or contributing cause of death—35.
- Tricuspid valve disorders (ICD/9 424.2) (ICD/10 I36). Mortality—16. Mortality as an underlying or contributing cause of death—69.

Operations and Procedures

- In 2003, an estimated 95 000 inpatient valve procedures were performed in the United States.

Venous Thromboembolism

- Venous thromboembolism (VTE) occurs for the first time in about 100 persons per 100 000 each year in the United States. About one-third of patients with symptomatic VTE manifest pulmonary embolism (PE), whereas two-thirds manifest deep vein thrombosis (DVT) alone.[203]
- Caucasians and African Americans have a significantly higher incidence than Hispanics and Asians or Pacific Islanders.[203]
- In studies conducted in Worcester, Mass., and Olmsted County, Minn., the incidence of VTE was about 1 in 1000. In both studies, VTE was more common in men; for each 10-year increase in age, the incidence doubled. By extrapolation, it's estimated that more than 250 000 patients are hospitalized annually with VTE.[204]

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- The crude incidence rate per 1000 person-years was 0.80 in the ARIC study, 2.15 in the CHS and 1.08 in the combined cohort. Half of the participants who developed incident VTE were women and 72% were white.[205]
- Over 200 000 new cases of VTE occur annually. Of these, 30% die within 30 days, one-fifth suffer sudden death due to PE, and about 30% develop recurrent VTE within 10 years. Independent predictors for recurrence include increasing age, obesity, malignant neoplasm and extremity paresis.[206]
- Data from the ARIC study of the NHLBI showed the 28-day fatality from DVT is 9%; from PE, 15%; from idiopathic DVT or PE, 5%; from secondary non-cancer-related DVT or PE, 7%; and secondary cancer-related DVT or PE, 25%.[207]
- **Deep vein thrombosis** (ICD/9 451.1) (ICD/10 I80.2). Mortality—2809. Mortality as an underlying or contributing cause of death—10 530. Hospital discharges—9000.
- A review of 9 studies conducted in the United States and Sweden showed that the mean incidence of first DVT in the general population was 5.04 per 10 000 person-years. The incidence was similar in males and females and increased dramatically with age from about 2–3 per 10 000 person-years at ages 30–49 to 20 at ages 70–79.[208]
- Death occurs in about 6% of DVT cases within 1 month of diagnosis.[203]
- **Pulmonary embolism** (ICD/9 415.1) (ICD/10 I26). Mortality—8620. Mortality as an underlying or contributing cause of death—26 600. Hospital discharges —124 000.
- In the Nurses' Health Study, nurses age 60 or older in the highest BMI quintile had the highest rates of pulmonary embolism. Heavy cigarette smoking and high blood pressure were also identified as risk factors for PE.[204]
- Death occurs in about 12% of PE cases within 1 month of diagnosis.[203]
- A study of Medicare recipients age 65 and older reported 30-day case fatality rates in patients with PE. Overall, men had higher fatality rates than women (13.7% versus 12.8%), and blacks had higher fatality rates than whites (16.1% versus 12.9%).[204]
- In the International Cooperative Pulmonary Embolism Registry, the 3-month mortality rate was 17.5%. In contrast, the overall 3-month mortality rate in the Prospective Investigation of Pulmonary Embolism Diagnosis was 15%, but only 10% of deaths during 1 year of follow-up were ascribed to PE.[204]
- The age-adjusted rate of deaths from pulmonary thromboembolism (PTE) decreased from 191 per million in 1979 to 94 per million in 1998 overall, decreasing 56% for men and 46% for women. During this time, the age-adjusted mortality rates for blacks were consistently 50% higher than those for whites, and those for whites were 50% higher than those for people of other races (Asian, American Indian, etc.). Within racial strata, mortality rates were consistently 20–30% higher among men than among women.[209]

9. Risk Factors

Tobacco

See Tables 9A and 9B.[210–212]

Prevalence

Youth

- In 2003, for grades 9–12, 30.3% of male students and 24.6% of female students reported current tobacco use; 19.9% of males and 9.4% of females reported current cigar use; and 11.0% of males and 2.2% of females reported current smokeless tobacco use.[213]
- White youths ages 18–24 from families with lower educational attainment report substantially higher smoking rates than black and Mexican-American youths from families with similar educational attainment. Seventy-seven percent of young white men and 61% of young white women are smokers compared with 35% of minority youth.[214]
- From 1980–2003, the percentage of high school seniors who smoked in the past month decreased 20%. This percentage decreased by 2.2% in males, 23.7% in females, 9% in whites and 64.3% in blacks or African Americans (Health, United States, 2004, CDC/NCHS).
- An estimated 150 000–300 000 children younger than 18 months of age have respiratory tract infections because of exposure to secondhand smoke (CDC/NCHS).
- Children's exposure to secondhand smoke, as indicated by cotinine levels, dropped between 1988–94 and 1999–2002. Overall, 59% of children ages 4–11 had cotinine in their blood in 1999–2002, down from 88% in 1988–94. In 1999–2002, 84% of NH black children ages 4–11 had cotinine in their blood compared to 58% of NH white children and 47% of Mexican-American children. The percentage of homes with children under age 7 in which someone smokes on a regular basis decreased from 29% in 1994 to 11% in 2003.[215]

Adults

- Since 1965 smoking in the United States has declined by 47% among people age 18 and older (Health, United States, 2004, CDC/NCHS).
- Among Americans age 18 and older, 23.4% of men and 18.5% of women are smokers, putting them at increased risk of heart attack and stroke.[210]
- Use of any tobacco product in 2002 was 32.0% for white only, 28.8% for black or African-American only, 44.3% for American Indian or Alaska Native only, 28.8% for Native Hawaiian or other Pacific Islander only, 18.6% for Asian only and 25.2% for Hispanic or Latino, any race (Health, United States, 2004, CDC).
- Smoking prevalence is higher among those with 9–11 years of education (34.0%) compared with those with more than 16 years of education (8.0%). It's highest among persons living below the poverty level (29.1%) compared with other income groups.[213]
- Compared with results from 1988–91, median cotinine levels measured from 1999–2002 in nonsmokers have decreased 68% in children, 69% in adolescents, and about 75% in adults. NH blacks have levels more than twice as high as those of NH whites and Mexican Americans. Children's levels are more than twice those of adults.[216]
- Data from the BRFSS study of the CDC show that more than one-third of white men and women ages 18–24

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TABLE 9A. Cigarette Smoking

Population Group	Prevalence 2004#	Cost* 1997 to 2001
Total	44 300 000 (20.9%)	$167 billion per year
Total males	24 100 000 (23.4%)	. . .
Total females	20 200 000 (18.5%)	. . .
NH white males	24.1%	. . .
NH white females	20.4%	. . .
NH black males	23.9%	. . .
NH black or females	17.2%	. . .
Hispanic males	18.9%	. . .
Hispanic females	10.9%	. . .
Asian only males	17.8%	. . .
Asian only females	4.8%	. . .
American Indian/Alaska Native males	37.3%	. . .
American Indian/Alaska Native females	33.4%	. . .

NH = non-Hispanic.

#Data are for 2004 for Americans age 18 and older. NHIS percents applied to 2003 population estimates. MMWR.[210]

*MMWR.[211]

smoked, the highest rate among all the groups covered in the survey in 2000. Those young people and Hispanic women the same age had the largest increases in smoking rates from 1990–2000. More than half of men and women ages 18–24 from all ethnic groups failed to quit smoking in 2000. Younger white women and men ages 18–44 had higher overall risk levels for noncommunicable diseases, probably due to increased smoking and obesity.[23]

- According to the World Health Organization (WHO), 1 year after quitting, the risk of CHD decreases by 50%. Within 15 years, the relative risk of dying from CHD for an ex-smoker approaches that of a long-time (lifetime) nonsmoker (World No-Tobacco Day 1998, www.who.ch/ntday/ntday98).
- Data from the 2004 NHIS study of the CDC/NCHS showed that American Indian or Alaska Native adults age 18 and older were more likely (33.4%) to be current smokers than NH white adults (22.2%), black adults (20.2%) and Asian adults (11.3%).[210]

TABLE 9B. Cigarette Smoking Prevalence by Race/Ethnicity, Age, and Sex in the United States, 1999 to 2001

	Ages 12 to 17		Age 18 and Older	
Population Group	Males	Females	Males	Females
NH white	14.9%	17.2%	29.1%	25.9%
NH black	8.2%	5.9%	30.1%	22.2%
Hispanic	11.4%	10.2%	29.2%	17.3%
Mexican	11.4%	10.6%	29.8%	15.6%
Puerto Rican	11.2%	10.4%	34.2%	27.3%
Central or South American	9.9%	9.3%	26.3%	16.9%
Cuban	14.3%	10.0%	21.1%	17.5%
Asian	8.8%	7.3%	24.1%	9.1%
Chinese	6.3%	5.4%	19.3%	5.9%
Filipino	5.8%	8.9%	. . .	6.9%
Japanese	. . .	. . .	18.3%	. . .
Asian Indian	10.1%	6.8%	20.0%	3.0%
Korean	13.8%	7.3%	. . .	. . .
Vietnamese	. . .	8.0%	. . .	. . .
American Indian/Alaska Native	29.5%	26.3%	40.9%	40.0%
Hawaiian/Other Pacific Islander	7.0%	NR	NR	NR
Total	13.3%	14.2%	29.2%	24.1%

Note: (. . .) = data not available; NR = data considered unreliable.

Source: percentage of persons ages 12–17 and age 18 and older reporting cigarette use during the preceding month, by race/ethnicity and sex (National Survey on Drug Use and Health[212]).

Incidence

- A survey conducted in 2002 found that an estimated 1.4 million Americans began smoking cigarettes daily in 2001. This translates to close to 4000 new regular smokers per day, including more than 2000 youths under age 18 (National Survey on Drug Use and Health, samhsa.gov).
- About 80% of people who use tobacco begin before age 18. The most common age of initiation is 14–15.[220]
- Information from the CDC Health Effects of Cigarette Smoking Fact Sheet, February 2004:
  - –Cigarette smokers are 2–4 times more likely to develop CHD than nonsmokers.
  - –Cigarette smoking approximately doubles a person's risk for stroke.
  - –Cigarette smokers are more than 10 times as likely as nonsmokers to develop peripheral vascular disease.

Mortality

- From 1997–2001, an estimated 437 902 Americans died each year of smoking-related illnesses, and 34.7% of these deaths were cardiovascular-related.[221]
- On average, male smokers die 13.2 years earlier than male nonsmokers, and female smokers die 14.5 years earlier than female nonsmokers.[222]
- From 1997–2001, smoking caused 3.3 million years of potential life lost for men and 2.2 million years for women annually.[223]
- From 1997–2001, smoking during pregnancy resulted in an estimated 523 male and 387 female infant deaths annually.[221]
- Current cigarette smoking is a powerful independent predictor of sudden cardiac death in patients with CHD.[224]
- Cigarette smoking results in a 2–3-fold risk of dying from CHD.[225]
- After up to 14.5 years of follow-up of participants in the Lung Health Study (LHS) of the NHLBI, all-cause mortality was significantly lower (15%) compared to those who received usual care.[226]
- An estimated 35 052 nonsmokers die from CHD each year as a result of exposure to environmental tobacco smoke (MMWR, Vol. 54, No. 25, 2005, CDC).

Health Consequences

- Data from *The Health Consequences of Smoking, 2004—A Report of the Surgeon General* (CDC/NCHS): A study of

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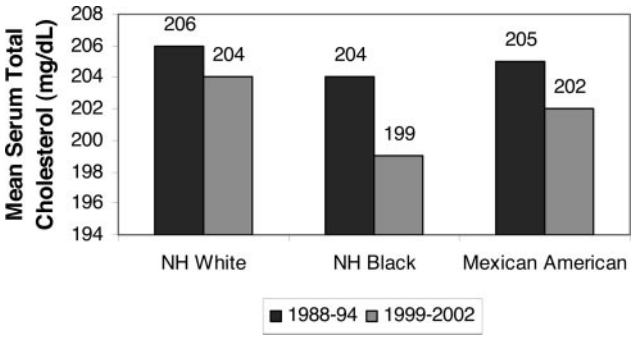

Chart 9C. Trends in mean total serum cholesterol among adults age 20 and older by race/ethnicity, sex and survey (NHANES: 1988–94 and 1999–2002). Source: Carroll et al.[234]

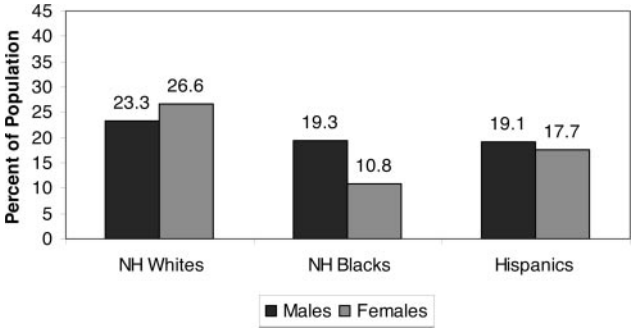

Chart 9A. Prevalence of high school students in grades 9–12 reporting current cigarette smoking by sex and race/ethnicity. (YRBS: 2003) Source: MMWR.[228] NH indicates non-Hispanic.

women younger than 44 years of age found there was a strong dose-relationship for MI, with a risk of 2.5 for those smoking 1–5 cigarettes per day, rising to 74.6 for those smoking more than 40 cigarettes per day, compared with nonsmokers.

—Another study on female smokers found the highest risk (6.8) for MI was in women younger than 55 years of age.

—One-third of those who receive percutaneous coronary artery vascularization are current smokers, and 50–60% continue to smoke after the procedure.

—Cigarette smoking remains a major cause of stroke in the United States. The evidence is sufficient to infer a causal relationship between smoking and subclinical atherosclerosis.

—The 2004 Health Consequences of Smoking Report of the Surgeon General states that the risk of stroke decreases steadily after smoking cessation. Former smokers have the same risk as nonsmokers after 5–15 years.[227]

Chewing Tobacco

- About 5 million American men and women use chewing tobacco (NHANES III [1988–94], CDC/NCHS).
  - –Rates are highest in the South and rural areas.
  - –Men use chewing tobacco at 10 times the rate for women. For men, the percentages who use chewing tobacco are 6.8 for whites, 3.1 for blacks, 1.5 for Hispanics, 1.2 for Asians or Pacific Islanders and 7.8 for American Indians or Alaska Natives.
  - –For women, the percentages are 0.3 for whites, 2.9 for blacks, 0.1 for Hispanics, almost none for Asians or Pacific Islanders and 1.2 for American Indians or Alaska Natives.
  - –Use rates increase as years of education decrease for both men and women.

Cost

- Direct medical costs ($75.5 billion) and lost productivity costs associated with smoking ($92 billion) total an estimated $167 billion per year.[221]

High Blood Cholesterol and Other Lipids

See Table 9C.[230]

Prevalence

For information on dietary cholesterol, total fat, saturated fat and other factors that affect blood cholesterol levels, see Nutrition section.

Youth

- Among children and adolescents ages 4–19 (NHANES III [1988–94], CDC):
  - –Females have significantly higher average total cholesterol and low-density lipoprotein (LDL) cholesterol (bad cholesterol) than do males.
  - –NH black children and adolescents have significantly higher mean total cholesterol, LDL (bad) cholesterol and HDL (good) cholesterol levels when compared with NH white and Mexican-American children and adolescents.
- Among children and adolescents ages 4–19, the mean total blood cholesterol level is 165 mg/dL. For boys, it's 163 mg/dL and for girls, it's 167 mg/dL. The racial/ethnic breakdown is (NHANES III [1988–94], CDC/NCHS):
  - –For NH whites, 162 mg/dL for boys and 166 mg/dL for girls.
  - –For NH blacks, 168 mg/dL for boys and 171 mg/dL for girls.
  - –For Mexican Americans, 163 mg/dL for boys and 165 mg/dL for girls.

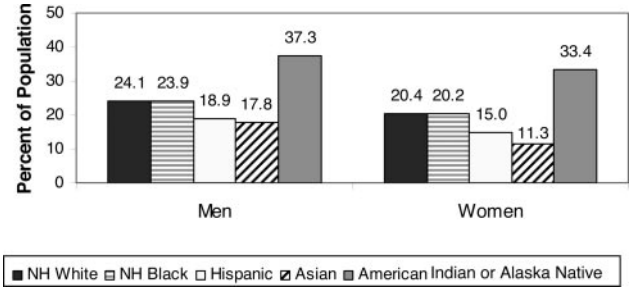

Chart 9B. Prevalence of current smoking for Americans age 18 and older by race/ethnicity and sex (NHIS: 2004). Source: MMWR.[210] NH indicates non-Hispanic.

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TABLE 9C. High Blood Cholesterol and Other Lipids

Population Group	Prevalence of Total Cholesterol 200 mg/dL or Higher 2003	Prevalence of Total Cholesterol 240 mg/dL or Higher 2003	Prevalence of LDL Cholesterol 130 mg/dL or Higher 2003	Prevalence of HDL Cholesterol Less Than 40 mg/dL 2003
Total*	99 900 000 (49.8%)	34 500 000 (17.3%)	76 100 000 (39.5%)	46 000 000 (22.6%)
Total males*	48 400 000 (48.9%)	16 400 000 (16.3%)	39 100 000 (43.1%)	33 200 000 (33.6%)
Total females*	51 500 000 (50.2%)	18 100 000 (17.8%)	37 000 000 (35.8%)	12 800 000 (12.6%)
NH white males	48.9%	16.5%	43.8%	34.5%
NH white females	52.1%	18.4%	36.9%	12.4%
NH black males	41.6%	12.2%	36.0%	22.7%
NH black females	46.8%	17.4%	34.5%	11.3%
Mexican-American males	51.9%	16.7%	43.7%	34.4%
Mexican-American females	44.8%	13.6%	31.3%	15.4%
Total Hispanics#	. . .	25.6%	. . .	. . .
Total Asian/Pacific Islanders#	. . .	27.3%	. . .	. . .
Total American Indians/Alaska Natives, Alaska#	. . .	26.0%	. . .	. . .
Total American Indians/Alaska Natives, Oklahoma#	. . .	28.6%	. . .	. . .
Total American Indians/Alaska Natives, Washington#	. . .	26.5%	. . .	. . .

Note: mg/dL = milligrams per deciliter of blood. Prevalence of total cholesterol 200 mg/dL or higher includes people with total cholesterol of 240 mg/dL or higher. In adults, levels of 200–239 mg/dL are considered borderline-high cholesterol. Levels of 240 mg/dL or higher are considered high cholesterol.

(. . .) = data not available. NH = non-Hispanic.

*Total data for total cholesterol are for Americans age 20 and older. Data for LDL cholesterol, HDL cholesterol and all racial/ethnic groups are age-adjusted for age 20 and older.

#BRFSS (1997), MMWR[230]; data are for Americans age 18 and older.

Source for total cholesterol 200 mg/dL or higher; 240 mg/dL or higher; LDL and HDL: NHANES (1999–2002), CDC/NCHS and NHLBI. Estimates from NHANES 1999–2002 applied to 2003 population estimates.

- About 10% of adolescents ages 12–19 have total cholesterol levels exceeding 200 mg/dL (NHANES III [1988–94], CDC/NCHS).

Adults

- BRFSS data from 1991–2003 showed the prevalence of cholesterol screening during the preceding 5 years increased from 67.3% in 1991 to 73.1% in 2003. The age-standardized prevalence of high blood cholesterol awareness among persons screened increased from 25.3% in 1991 to 31.1% in 2003.[231]
- A 10% decrease in total cholesterol levels (population-wide) may result in an estimated 30% reduction in the incidence of CHD.[232]
- Data from NHANES 1999–2002 showed that overall, 63.3% of participants whose test results indicated high blood choleserol or who were taking a cholesterol-lowering medication had been told by a professional that they had high cholesterol. Women were less likely than men to be aware of their condition; blacks and Mexican Americans were less likely to be aware of their condition than whites. Less than half of Mexican Americans with high cholesterol were aware of their condition.[233]
- Between 1988–94 and 1999–2002, the age-adjusted mean total serum cholesterol level of adults age 20 and over decreased from 206 mg/dL to 203 mg/dL and LDL cholesterol levels decreased from 129 mg/dL to 123 mg/dL.[234]

Adherence

Based on data from the Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults[235]:

- Less than half of persons who qualify for any kind of lipid-modifying treatment for CHD risk reduction are receiving it.
- Less than half of even the highest-risk persons, those who have symptomatic CHD, are receiving lipid-lowering treatment.
- Only about a third of treated patients are achieving their LDL goal; less than 20% of CHD patients are at their LDL goal.

LDL (Bad) Cholesterol

Youth

- Mean LDL cholesterol levels among children and adolescents ages 12–19 are (NHANES III [1988–94], CDC/NCHS):
  - –Among NH whites, 91 mg/dL for boys and 100 mg/dL for girls.
  - –Among NH blacks, 99 mg/dL for boys and 102 mg/dL for girls.
  - –Among Mexican Americans, 93 mg/dL for boys and 92 mg/dL for girls.

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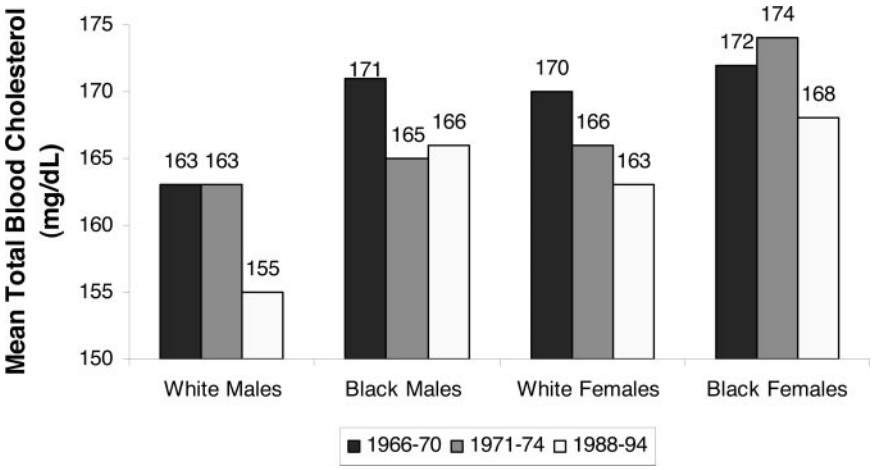

Chart 9D. Trends in mean total serum cholesterol among adolescents ages 12–17 by race, sex and survey (NHES III: 1966–70, NHANES I & III: 1971–74, 1988–94). Source: CDC/NCHS. Hickman et al.[236]

Adults

- The mean level of LDL cholesterol for American adults age 20 and older is 123 mg/dL. Levels of 130–159 mg/dL are considered borderline high. Levels of 160–189 mg/dL are classified as high, and levels of 190 mg/dL and higher are very high.[234]
- According to NHANES 1999–2002
  - — Among NH whites, the mean LDL cholesterol level was 126 mg/dL for men and 121 mg/dL for women.
  - — Among NH blacks, the mean LDL cholesterol level was 121 mg/dL for both men and women.
  - — Among Mexican Americans, the mean LDL cholesterol level was 125 mg/dL for men and 117 mg/dL for women.

HDL (Good) Cholesterol

The higher a person's HDL cholesterol level is, the better. A level of less than 40 mg/dL in adults is considered low HDL cholesterol, which is a risk factor for heart disease and stroke.

Youth

- Mean HDL cholesterol levels among children and adolescents ages 4–19 are (NHANES III [1988–94], CDC/NCHS):
  - –Among NH whites, 48 mg/dL for boys and 50 mg/dL for girls.
  - –Among NH blacks, 55 mg/dL for boys and 56 mg/dL for girls.
  - –Among Mexican Americans, 51 mg/dL for boys and 52 mg/dL for girls.

Adults

- The mean level of HDL cholesterol for American adults age 20 and older is 51.3 mg/dL.[234]
- According to NHANES 1999–2002
  - — Among NH whites, the mean HDL cholesterol level was 45.5 mg/dL for men and 52.9 for women.
  - — Among NH blacks, the mean HDL cholesterol level was 51.0 mg/dL for men and 57.3 for women.
  - — Among Mexican Americans, the mean HDL cholesterol level was 45.0 mg/dL for men and 52.9 for women.

Physical Activity

See Tables 9D and 9E.

Prevalence

Youth

- In 2003, 58.5% of male and 52.8% of female high school students, grades 9–12, were enrolled in physical education (PE) classes. Among these students, 30.5% of males and 26.4% of females attended classes daily and 84.5% of males and 75.3% of females exercised or played sports during an average PE class.[237]
- 2002 data from the Youth Media Campaign Longitudinal Study (YMCLS) of the CDC showed that 61.5% of children ages 9–13 don't participate in any organized physical activity (PA) during their nonschool hours and that 22.6% don't engage in any free-time PA. NH black and Hispanic children are significantly less likely than NH white children to report involvement in organized activities, as are children with parents who have lower incomes and education levels.[239]
- By the age of 16 or 17, 31% of white girls and 56% of black girls report no habitual leisure-time activity.[240]
  - –Lower levels of parental education are associated with greater decline in activity for white girls at both younger and older ages. For black girls, this association is seen only at the older ages.
  - –Cigarette smoking is associated with decline in activity among white girls. Pregnancy is associated with decline in activity among black girls but not among white girls.
  - –A higher BMI is associated with greater decline in activity among girls of both races.

Adults

- 2001–2003 data from the BRFSS study of the CDC showed that among Asians and Native Hawaiians or Other Pacific Islanders, 21.2% of men and 27.0% of women reported no

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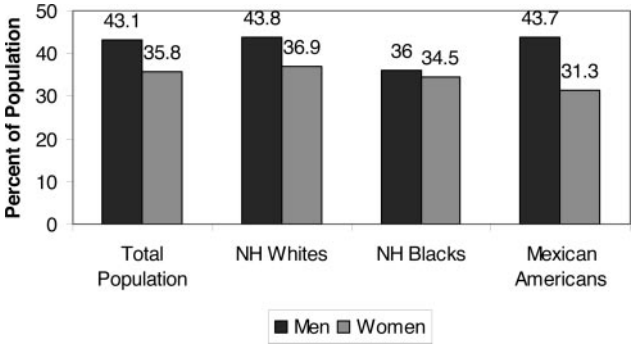

Chart 9E. Age-adjusted prevalence of Americans age 20 and older with LDL cholesterol of 130 mg/dL or higher by race/ethnicity and sex (NHANES: 1999–2002). Source: CDC/NCHS and NHLBI. NH indicates non-Hispanic.

leisure-time PA. Of these, 21.5% were overweight (BMI 25.0–29.9) and 23.8% were obese (BMI 30.0 and over).[241]

- 2004 data from the BRFSS study of the CDC showed that 77.1% of respondents had participated in any PA in the past month. Of these, the median percentage that were male was 79.2, and 74.8% were female; 79.7% were white, 66.1% were black, and 61.5% were Hispanic (CDC Web site).
- Based on data from the 1999–2001 NHIS survey of the CDC/NCHS[242]. . .
  - –31.3% of US adults age 18 and older engage in any regular leisure-time PA.
  - –Men (64.2 %) were more likely than women (59.0%) to engage in at least some leisure-time PA.
  - –Engaging in any PA declined steadily with age from 39.7% of adults ages 18–24 to 15.6% age 75 and older.
  - –Engaging in any regular leisure-time PA was more prevalent among white adults (32.7%) than among Asian adults (27.8%) and black adults (23.9%).
  - –NH white adults (65.7%) were more likely than NH black adults (49.3%) and Hispanic adults (45.0%) to engage in at least some leisure-time PA.
  - –Adults with a graduate degree (80.6%) were about twice as likely as adults with less than a high school diploma (41.0%) to engage in at least some leisure-time PA.
  - –Adults who had incomes 4 times the poverty level or more (39.9%) were about twice as likely as adults with incomes below the poverty level (22.6%) to engage in any regular PA.
  - –Widowed adults (23.6%) were less likely than never-married adults (33.0%), married adults (31.1%), and divorced or separated adults (29.1%) to engage in regular PA.
  - –Adults living in the West (65.3%) were more likely than adults living in the South (56.4%) to engage in at least some leisure-time PA.
- The relative risk of CHD associated with physical inactivity ranges from 1.5–2.4, an increase in risk comparable to that observed for high blood cholesterol, HBP or cigarette smoking.[243]

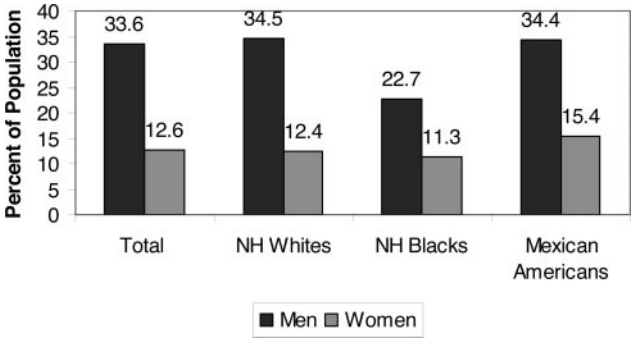

Chart 9F. Age-adjusted prevalence of Americans age 20 and older with HDL cholesterol under 40 mg/dL by race/ethnicity and sex (NHANES: 1999–2002). Source: CDC/NCHS and NHLBI. NH indicates non-Hispanic.

TABLE 9D. Regular Leisure-Time Physical Activity

Population Group	Prevalence 2004
Total	30.1%
Total males	31.4%
Total females	29.0%
NH white only males	33.4%
NH white only females	31.8%
NH black only males	29.5%
NH black only females	19.6%
Hispanic or Latino males	24.9%
Hispanic or Latino females	21.8%

Note: Regular leisure-time physical activity is defined as light–moderate activity for ≥30 minutes, ≥5 times per week or vigorous activity for ≥20 minutes, ≥3 times per week. (Early Release of Selected Estimates on Data from the 2004 NHIS, CDC/NCHS.)

Data are age-adjusted for adults age 18+. NH = non-Hispanic or non-Latino.

Source: NHIS 2004 (Personal communication, Susan Jack, CDC/NCHS.)

TABLE 9E. Leisure-Time Physical Inactivity

Population Group	Prevalence 2004	2000 Cost**
Total	23.7%	$76.6 billion
Total males	21.4%	. . .
Total females	25.9%	. . .
NH white males	18.4%	. . .
NH white females	21.6%	. . .
NH black males	27.0%	. . .
NH black females	33.9%	. . .
American Indian/Alaska Native males	23.8%	. . .
American Indian/Alaska Native females	31.8%	. . .
Hispanic males	32.5%	. . .
Hispanic females	39.6%	. . .
Asian/Pacific Islander males	20.4%	. . .
Asian/Pacific Islander females	24.0%	. . .

Note: Prevalence is the percentage of population who report no leisure-time physical activity.

NH = non-Hispanic.

Source: BRFSS (2004), CDC; data are age-adjusted for Americans age 18 and older. MMWR, Vol.54/No.39. Oct. 7, 2005.

**CDC/NCHS.

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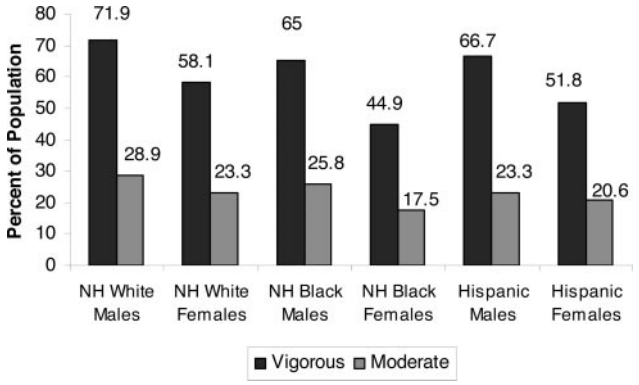

Chart 9G. Prevalence of students in grades 9–12 who participated in sufficient vigorous or moderate physical activity during the past 7 days by race/ethnicity and sex (YRBS: 2003). Note: "Sufficient vigorous activity" is defined as activity causing sweating and hard breathing for at least 20 minutes on 3 or more of the 7 days of the week. "Sufficient moderate activity" is defined as activities that did not cause sweating or hard breathing, lasting for at least 30 minutes on 5 or more of the 7 days of the week. Source: MMWR.[237]

- A study of over 72 000 female nurses indicates that moderate-intensity PA such as walking is associated with a substantial reduction in risk of total and ischemic stroke.[98]
- The prevalence of physical inactivity during leisure time among Mexican Americans is higher than in the general population.[244]
  - –The prevalence of physical inactivity among those whose main language is English is 15% of men and 28% of women. This is similar to that of the general population (17% of men and 27% of women).
  - –Those whose main language is Spanish have the highest prevalence of physical inactivity (38% of men and 58% of women).
- Data from the 1999–2003 NHIS study of the CDC/NCHS showed that American-Indian or Alaska Native (AIAN) adults, age 18 and older, were as likely (50.3%) as black adults (49.9%) and more likely than Asian adults (38.1%) and white adults (36.6%) to never engage in any leisure-time PA.[150]

Cost

- The annual estimated direct medical cost of physical inactivity in 2000 was $76.6 billion (www.cdc.gov).

Overweight and Obesity

See Table 9F.

Prevalence

Youth

- An estimated 9.2 million children and adolescents ages 6–19 are considered overweight or obese, based on the 95th percentile or higher of BMI values in the 2000 CDC growth chart for the United States (NHANES [1999–2002], CDC/NCHS).
- Based on data from NHANES (1999–2002), the prevalence of overweight in children ages 6–11 increased from 4.2% to 15.8% compared with data from 1963–65. The prevalence of overweight in adolescents ages 12–19 increased from 4.6% to 16.1% (CDC/NCHS).
- Over 10% of preschool children ages 2–5 are overweight, up from 7% in 1994.[245]
  - –Among preschool children, the following are overweight: 8.6% of NH whites, 8.8% of NH blacks and 13.1% of Mexican Americans.
  - –Among children ages 6–11, the following are overweight: 13.5% of NH whites, 19.8% of NH blacks and 21.8% of Mexican Americans.

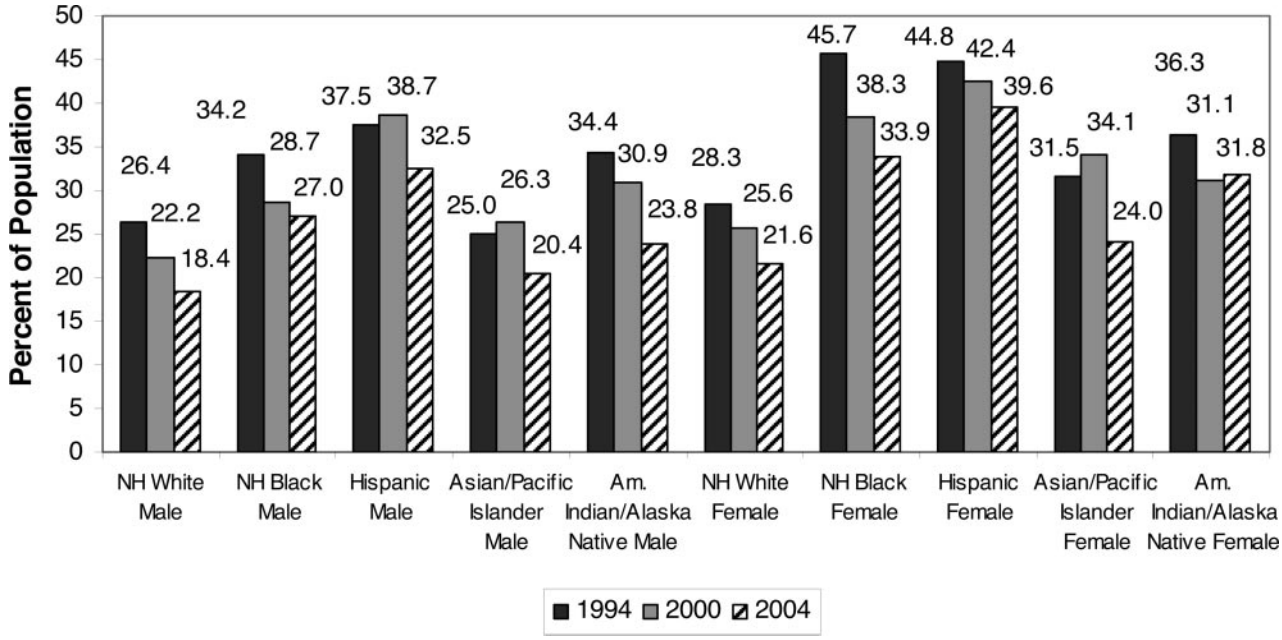

Chart 9H. Prevalence of leisure-time physical inactivity in Americans age 18 and older by race/ethnicity and sex. BRFSS: 1994, 2000, 2004. Source: MMWR.[238] NH indicates non-Hispanic.

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TABLE 9F. Obesity and Overweight

Population Group	Prevalence of Overweight and Obesity in Adults 2003	Prevalence of Obesity in Adults 2003	Prevalence of Overweight in Children Ages 6–11 2003	Prevalence of Overweight in Adolescents Ages 12–19 2003	Cost** 2001
Total	136 500 000 (65.1%)	64 000 000 (30.4%)	3 840 000 (15.8%)	5 330 000 (16.1%)	$117 billion
Total males	69 600 000 (68.8%)	27 900 000 (27.6%)	2 100 000 (16.9%)	2 840 000 (16.7%)	. . .
Total females	66 900 000 (61.6%)	36 100 000 (33.2%)	1 740 000 (14.7%)	2 490 000 (15.4%)	. . .
NH white males	69.4%	28.2%	14.0%	14.6%	. . .
NH white females	57.2%	30.7%	13.1%	12.7%	. . .
NH black males	62.9%	27.9%	17.0%	18.7%	. . .
NH black females	77.2%	49.0%	22.8%	23.6%	. . .
Mexican-American males	73.1%	27.3%	26.5%	24.7%	. . .
Mexican-American females	71.7%	38.4%	17.1%	19.9%	. . .
Hispanic or Latino*	38.9%	24.7%	. . .	. . .	. . .
Asian only*	25.1%	6.0%	. . .	. . .	. . .
American Indian/Alaska Native*	33.5%	32.9%	. . .	. . .	. . .

Note: BMI (body mass index) = weight in kilograms divided by height in meters squared (kg/m^2).

Data for white, black or African-American, and Asian or Pacific Islander males and females are for non-Hispanics.

(. . .) = data not available. NH = non-Hispanic.

Overweight and obesity in adults is BMI 25 and higher. Obesity in adults is BMI 30.0 or higher. Overweight in children and adolescents was defined as being at or above the 95th percentile of the sex-specific BMI-for-age CDC 2000 growth chart.

*NHIS (2003), CDC/NCHS; data are crude percent distributions for Americans age 18 and older.

**www.win.niddk.nih.gov.

Sources: NHANES (1999–2002), (Hedley et al[245]); CDC/NCHS data in adults are for age 20 and older. Estimates from NHANES 1999–2002 applied to 2003 population estimates.

  - –Among adolescents ages 12–19, the following are overweight: 13.7% of NH whites, 21.1% of NH blacks and 22.5% of Mexican Americans.
  - –In addition, the data show that another 31% of children and teens ages 6–19 are considered at risk of becoming overweight (BMI from the 85th–95th percentile).
- 43% of adolescents watch more than 2 hours of television each day. Overweight adolescents have a 70% chance of becoming overweight adults. This increases to 80% if 1 or both parents are overweight or obese (www.surgeongeneral.gov).
- Data from the YRBS 2003 survey showed that the prevalence of being overweight was higher among black (16.2%) and Hispanic (16.4%) than white (10.4%) students; higher among black female (14.2%) and Hispanic female (11.5%) than white female (6.5%) students; and higher among black male (18.2%) and Hispanic male (21.3%) than white male (14.0%) students. The prevalence of being at risk for overweight was higher among black (18.2%) and Hispanic (17.4%) than white (13.3%) students; higher among black female (21.2%) than white female (12.4%) and Hispanic female (15.7%) students; and higher among Hispanic male (19.1%) and black male (15.1%) than white male (14.0%) students.[246]
- Among all overweight children and teens ages 2–19 (or their parents), 36.7% reported ever having been told by a doctor or healthcare professional that they were overweight. For ages 2–5, 17.4%; for ages 6–11, 32.6%; for ages 12–15, 39.6%; and for ages 16–19, 51.6% were told that they were overweight. Similar trends were seen for males and females. Among racial/ethnic populations, overweight NH black females were significantly more likely to be told that they were overweight than NH white females (47.4% versus 31.0%). Among those informed of overweight status, 39% of NH black females were severely overweight compared with 17% of NH white females.[247]

Adults

- Analysis of the FHS, 1971–2001, showed the 4-year rates of developing overweight varied from 14–19% in women and 26–30% in men. Four-year rates of developing obesity were from 5–7% in women and 7–9% in men. The 30-year risk was similar for both sexes; with some variation by age. Overall, the 30-year risk exceeded 1 in 2 persons for "overweight or more," 1 in 4 for obesity, and 1 in 10 for stage II obesity (BMI ≥30), across different age groups. The 30-year estimates correspond to the lifetime risk for overweight or more or obesity for participants 50 years of age.[248]
- The age-adjusted prevalence of overweight increased from 55.9% in NHANES III (1988–94) to 65.1% in NHANES (1999–2002). The prevalence of obesity also increased during this period from 22.9% to 30.4%. Extreme obesity (BMI of 40.0 or higher) increased from 2.9% to 4.9%.[245]
- Since 1993, the prevalence of those who are obese increased over 61%. Among states in 2002, West Virginia had the highest rate of obesity and Colorado had the lowest (www.cdc.gov/brfss).
- Data from the BRFSS study of the CDC showed that in participants ages 18–24, studied from 1990–2000, obesity increased among every ethnic group, especially in black women. Almost 20% of black women were obese by ages 18–24, increasing to over 35% by ages 25–44. Between one-third and one-half of those surveyed ate fewer than 3 servings of fruits and vegetables a day, although older

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black men and older Hispanic men and women improved dramatically in that regard between 1990 and 2000.[23]

- Abdominal obesity is an independent risk factor for ischemic stroke in all race/ethnic groups with an odds ratio (OR) about 3 times greater when comparing the first and fourth quartiles. This effect was larger for those under age 65 (OR=4.4) than over age 65 (OR=2.2). (NOMASS).[249]
- A recent comparison of risk factors in both the HHP and FHS showed a BMI increase of around 3 kg/m^2 raised the risk of hospitalized thromboembolic stroke by 10–30%.[251]
- In 1998–99, surveys of people in 8 states and the District of Columbia by the BRFSS study of the CDC indicated that obesity rates are significantly higher among people with disabilities, especially blacks and those ages 45–64.[252]
- Data from the FHS showed that overweight and obesity were associated with large decreases in life expectancy. Forty-year-old female nonsmokers lost 3.3 years and 40-year-old male nonsmokers lost 3.1 years of life expectancy because of overweight. In 40-year-old nonsmokers, females lost 7.1 years and males lost 5.8 years due to obesity. Obese female smokers lost 7.2 years and obese male smokers lost 6.7 years when compared to normal-weight nonsmokers.[253]
- Data from the 1999–2003 NHIS study of the CDC/NCHS showed that American Indian or Alaska Native (AIAN) adults, age 18 and older, were as likely (30.4%) as black adults (30.8%) and less likely than white adults (40.9%) and Asian adults (62.8%) to be at a healthy weight.[150]
- Data from the 1999–2003 NHIS study of the CDC/NCHS showed that American Indian or Alaska Native (AIAN) women, age 18 and older, were less likely (29.4%) than black women (36.6%) and more likely than white women (20.3%) and Asian women (5.8%) to be obese.[150]
- According to the WHO, the number of overweight and obese people worldwide is set to increase to 1.5 billion by 2015 if current trends continue. Excessive weight and obesity are major risk factors for CVD, the No. 1 cause of death worldwide, claiming more than 17 million lives a year.[254]

Mortality

Obesity was associated with nearly 112 000 excess deaths (95% confidence interval [CI], 53 754–170 064) and underweight with nearly 34 000 excess deaths (95% CI, 15 726–51 766).[255]

Risk Factors

- Among people diagnosed with type 2 diabetes, 67% have a BMI ≥27 and 46% have a BMI ≥30. An estimated 70% of diabetes risk in the United States can be attributed to excess weight (win.niddk.nih.gov).
- The age-adjusted prevalence of hypertension in overweight US adults is 22.1% for men with BMI >25 and <27; 27.0% for men with BMI ≥27 and <30; 27.7% for women with BMI ≥25 and <27; and 32.7% for women with BMI ≥27 and <30. In comparison, the prevalence in adults who are obese (BMI ≥30) is 41.9% for men and 37.8% for women (win.niddk.nih.gov/statistics).

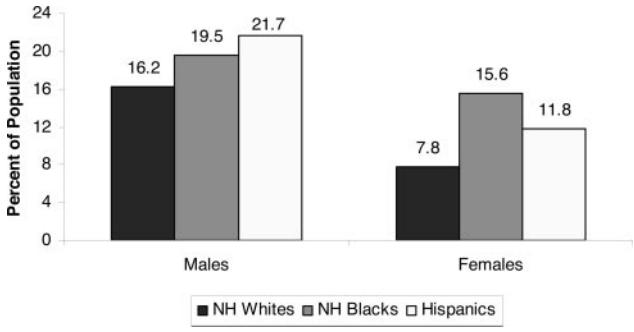

Chart 9I. Prevalence of overweight among students in grades 9–12 by sex and race/ethnicity (YRBS: 2003). Source: BMI 95th percentile or higher by age and sex of the CDC 2000 growth chart. MMWR.[237] NH indicates non-Hispanic.

- The age-adjusted prevalence of high blood cholesterol (≥240 mg/dL) in overweight US adults is 19.1% for men with BMI ≥25 and <27; 21.6% for men with BMI ≥27 and <30; 30.5% for women with BMI ≥25 and <27; and 29.6% for women with BMI ≥27 and <30. In comparison, the prevalence of high cholesterol in adults who are not overweight (BMI <25) is 13.0% for men and 13.4% for women. The prevalence for adults who are obese (BMI ≥30) is 22.0% for men and 27.0% for women (win.niddk.nih.gov/statistics).

Cost

- Among children and adolescents, annual hospital costs related to obesity were $127 million during 1997–99. (CDC. "Preventing Obesity and Chronic Diseases Through Good Nutrition and Physical Activity"[256])
- The estimated cost of overweight and obesity, in 2001 dollars, is $117 billion. Direct cost is $61 billion and the indirect cost is $56 billion. The direct cost of heart disease related to overweight and obesity, independent of stroke, is $8.8 billion. For type 2 diabetes, it's $98 billion. For hypertension, it's $4.1 billion. The cost of lost productivity related to obesity (BMI >30) among Americans ages 17–64 is $3.9 billion (www.win.niddk.nih.gov).

Diabetes Mellitus

(ICD/9 250) (ICD/10 E10–E14). See Table 9G.

Prevalence

- The prevalence of diabetes increased by 8.2% from 2000–01. Since 1990, the prevalence of those diagnosed with diabetes increased 61%. In 2001, Alabama had the highest rate of diagnosed diabetes (10.5%) and Minnesota had the lowest (5.0%).[257]
- From 1994–2002, the age-adjusted prevalence of diabetes increased 54.0% for US adults (from 4.8% to 7.3%), and increased 33.2% (from 11.5% to 15.3%) among American Indian or Alaska Native adults. The overall age-adjusted prevalence for American Indian or Alaska Native adults was more than twice that of US adults overall.[258]
- Based on data from the NHANES studies of the CDC/NCHS, in 1976–80, total diabetes prevalence in African

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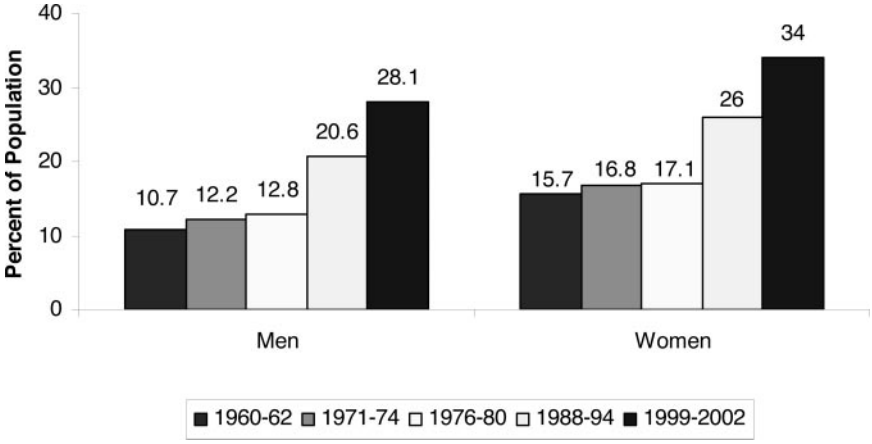

Chart 9J. Age-adjusted prevalence of obesity in Americans ages 20–74 by sex and survey (NHES 1960–62; NHANES: 1971–74, 1976–80, 1988–94 and 1999–2002). Note: Obesity is defined as a BMI of 30.0 or higher. Source: Health, United States, 2004. CDC/NCHS.

Americans ages 40–74 was 8.9%; in 1988–94 the rate was 18.2%, a doubling of the rate in just 12 years. In 1988–94, among people ages 40–74, the prevalence rate was 18.2% for African Americans compared to 11.2% for whites.[259]

- Data from the NHANES (1999–2000) study of the CDC/NCHS showed a disproportionately high prevalence of diabetes in NH blacks and Mexican Americans when compared to NH whites. For previously diagnosed diabetes the percentage was 11.7 for NH blacks and 9.6 for Mexican Americans compared to 4.8 for NH whites. For undiagnosed diabetes the percentages were 3.2, 2.4 and 2.6, respectively. For impaired fasting glucose the percentages were 6.3, 6.7 and 5.7, respectively.[260]
- BRFSS data in selected areas, 1998–2002, showed that diabetes disproportionately affects Hispanics in the United States and Puerto Rico. Hispanics were twice as likely to have diabetes as NH whites of similar age (9.8% versus 5.0%). This disparity, however, varied by geographic location—it was lowest in Florida and higher in California, Texas, and Puerto Rico. Among Hispanic adults in California, Florida, Illinois, New York/New Jersey, Puerto Rico and Texas, the overall prevalence of diabetes was 7.4%; it ranged from 6.2% in Illinois and New York/New Jersey to 9.3% in Puerto Rico.[261]
- About 15% of American Indians or Alaska Natives who receive care from the Indian Health Service have been diagnosed with diabetes. On average, American Indians or Alaska Natives are 2.6 times as likely to have diagnosed diabetes as NH whites of the same age (niddk.nih.gov, 2004).
- The prevalence of diabetes for all age groups worldwide was estimated to be 2.8% in 2000 and a projected 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030.[262]
- Type 2 diabetes may account for 90–95% of all diagnosed cases of diabetes (niddk.nih.gov, 2004).
- In April 2004, the USDHHS announced that about 40% of US adults ages 40–74, or 41 million, currently have pre-diabetes, a condition that raises a person's risk of developing type 2 diabetes, heart disease and stroke. Many don't know that they are at risk or that they have pre-diabetes.[263]

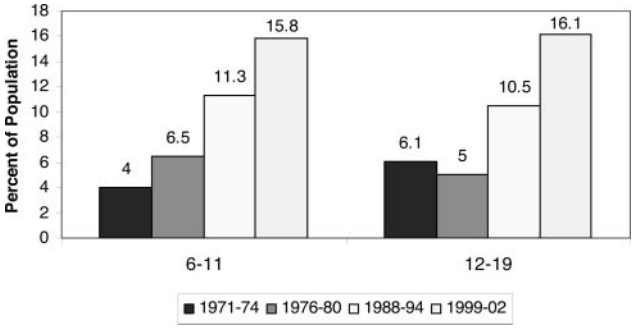

Chart 9K. Trends in the prevalence of overweight among US children and adolescents by age and survey (NHANES: 1971–74, 1976–80, 1988–94 and 1999–2002; NHANES: 1971-74 to 1999-2002). Source: Health, United States, 2004. CDC/NCHS.

Incidence

- In the United States each year, over 13 000 children are diagnosed with type 1 diabetes. Increasingly, healthcare providers are finding more and more children and teens with type 2 diabetes. Some clinics report that one-third to one-half of all new cases of childhood diabetes are now type 2. African-American, Hispanic or Latino and American Indian children who are obese and have a family history of type 2 diabetes are at especially high risk for this type of diabetes (niddk.nih.gov, 2004).

Mortality

Mortality as an underlying or contributing cause of death—224 100.

- The 2003 overall death rate from diabetes was 25.2. Death rates were 26.8 for white males, 50.5 for black males, 20.0 for white females and 47.3 for black females.
- At least 65% of people with diabetes mellitus die of some form of heart or blood vessel disease.[264]
- Heart disease death rates among adults with diabetes are 2–4 times higher than the rates for adults without diabetes (diabetes.niddk.nih.gov).
- Death rates for people with diabetes are 27% higher for African Americans compared with whites (niddk.nih.gov, 2004).

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Aftermath

- The age-adjusted prevalence of major CVD for women with diabetes is twice that for women without diabetes, and the age-adjusted major CVD hospital discharge rate for women with diabetes is almost 4 times the rate for women without diabetes.[265]
- A population-based study of over 13 000 men and women in Denmark showed that in people with type 2 diabetes, the RR of first, incident and admission for MI was increased 1.5–4.5-fold in women and 1.5–2-fold in men. The RR of first, incident and admission for stroke was increased 2–6.5-fold in women and 1.5–2-fold in men, with a significant difference between the sexes. In both men and women the RR of death was increased 1.5–2 times.[266]
- Diabetes increases the risk of stroke, with the RR ranging from 1.8 to almost 6.0.[267]
- Ischemic stroke patients with diabetes are younger, more likely to be African American and more likely to have hypertension, MI, and high cholesterol than nondiabetic patients. Diabetes increases ischemic stroke incidence at all ages, but this risk is most prominent before age 55 in African Americans and before age 65 in whites.[95]
- Compared with white women, black women have a 138% higher rate of ambulatory medical care visits for diabetes.[268]
- Based on data from the CDC Diabetes Surveillance System, 1997–2000:
  - –In 2000, the age-standardized prevalence of any self-reported cardiovascular condition among persons with diabetes age 35 and older was 37.5% for white men, 32.2% for white women, 31.4% for black men, 34.0% for black women, 23.9% for Hispanic men and 22.9% for Hispanic women.
  - –In 2000, the self-reported prevalence of any cardiovascular condition was 28.8 per 100 diabetic population among persons ages 35–64, 45.7 per 100 diabetic population among persons ages 65–74, and 53.5 per 100 diabetic population among persons age 75 and older.
  - –In 2000, among persons with diabetes age 35 and older, 37.2% reported being diagnosed with a cardiovascular condition, (ie, CHD, stroke or other cardiovascular condition).
  - –In 2000, among persons with diabetes age 35 and older, the age-standardized prevalence of self-reported CHD, angina or heart attack, was almost 3 times that of self-reported stroke (22.1% versus 8.0%).
  - –In 2000, 4.4 million persons age 35 and older with diabetes reported being diagnosed with a cardiovascular condition, 2.9 million were diagnosed with CHD (ie, self-reported CHD, angina or heart attack) and 1.1 million reported being diagnosed with a stroke.
  - –Approximately one-third of adults with diabetes received all 5 interventions recommended for comprehensive diabetes care in 2001. The proportion receiving all 5 interventions was lower among blacks compared with whites and among Hispanics compared with NH whites (2004 National Healthcare Disparities Report, AHRQ, USDHHS).
  - –The difference in hospital admissions for long-term complications between men and women is highly significant, with women 22% less likely than men to be admitted (2004 National Healthcare Disparities Report, AHRQ, USDHHS).
  - –In multivariate models controlling for age, gender, income, education, insurance and residence location, blacks were 38% less likely, and Hispanics were 33% less likely than their respective comparison groups to receive all services in 2001 (2004 National Healthcare Disparities Report, AHRQ, USDHHS).

Risk Factors

- Among US adults with diabetes, data from the NHANES surveys from 1971–74 to 1999–2000 showed that mean total cholesterol declined from 5.95 mmol/liter to 5.48 mmol/liter. The proportion with high cholesterol decreased from 72% to 55%. Mean blood pressure declined from 146/86 mm Hg to 134/72 mm Hg. The proportion with HBP decreased from 64% to 37%, and smoking prevalence decreased from 32% to 17%. Although these trends are encouraging, still 1 of 2 people with diabetes had high cholesterol, 1 of 3 had HBP, and 1 of 6 was a smoker.[269]
- Data from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) of the NIH stated:
  - –Heart disease is the leading cause of diabetes-related death. Adults with diabetes have heart disease death rates about 2–4 times higher than adults without diabetes.
  - –The risk for stroke is 2–4 times higher among people with diabetes.
  - –About 73% of adults with diabetes have BP greater than or equal to 130/80 mm Hg or use prescription medication for hypertension.
  - –An estimated 49–69 million adults in the United States may have insulin resistance (personal communication with Earl Ford, MD, CDC/NCHS, 2003), and 1 in 4 of them will develop type 2 diabetes (ndep.nih.gov).

Cost

In 2002, the direct and indirect cost of diabetes was $132 billion.[270]

10. Metabolic Syndrome

Adolescents

The prevalence of metabolic syndrome (MetS) among 12–19-year-old US adolescents was estimated in an analysis of NHANES III data, by applying a modification of the ATP III definition (Third Report of the National Cholesterol Education Program [NCEP] Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults [ATP III, NHLBI]) for adults. MetS during adolescence was defined as 3 or more of the following abnormalities:

—Serum triglyceride level of 110 mg/dL or higher.

—High-density lipoprotein (HDL) cholesterol level of 40

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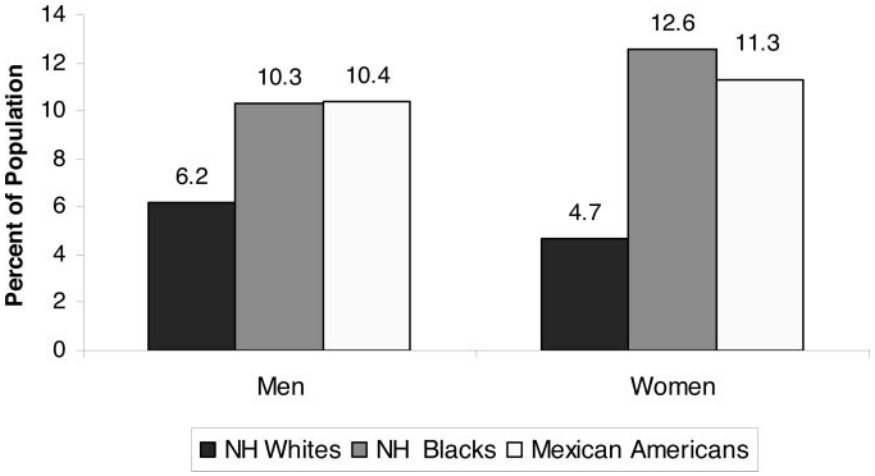

Chart 9L. Age-adjusted prevalence of physician-diagnosed diabetes in Americans age 20 and older by race/ethnicity and sex (NHANES: 1999–2002). Source: CDC/NCHS and NHLBI. NH indicates non-Hispanic.

mg/dL or lower.
—Elevated fasting glucose of 110 mg/dL or higher.
—Blood pressure at or above the 90th percentile for age, sex and height.
—Waist circumference at or above the 90th percentile for age and sex (NHANES III data set)

- An estimated 1 million 12–19-year-old adolescents in the United States have MetS, or 4.2% overall (6.1% of males and 2.1% of females).[272]
  - –Of adolescents with MetS, 73.9% were overweight and 25.2% were at risk of overweight.
  - –The mean BMI of adolescents with the MetS (30.1%) was just above the 95th percentile of the CDC Growth Chart; thus they are likely to represent a fairly common clinical problem in pediatrics.
  - –MetS was present in 28.7% of overweight adolescents (BMI 95th percentile of CDC Growth Chart) compared with 6.8% of at-risk-of-overweight adolescents, and 0.1% of those with BMI below the 85th percentile ($P<0.001$).
  - –Among adolescents with MetS, 40.9% had 1 criterion; 14.2% had 2 criteria; 4.2% had 3 criteria and 0.9% had 4 criteria for MetS. For overweight adolescents, 88.5% had 1 criterion; 54.4% had 2 criteria; 28.7% had 3 criteria and 5.8% had 4 criteria for MetS.

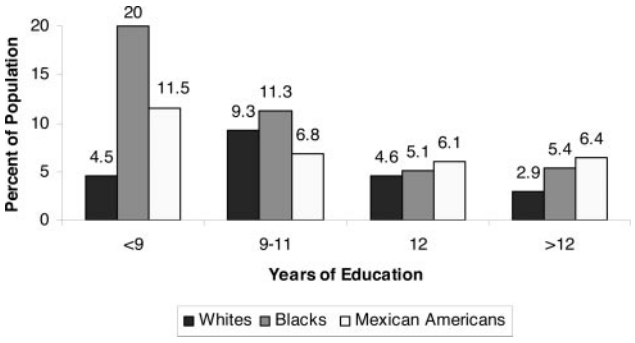

Chart 9M. Prevalence of non–insulin-dependent (type 2) diabetes in women* ages 25–64 by race/ethnicity and education (NHANES III: 1988–94). *Findings for men are similar but of lower magnitude. See: Winkleby et al.[21,271]

- Among more than 3400 children examined in 1 study, 1 in 10 had MetS.[273]
- Using a sample of adolescents from NHANES III, the overall prevalence of MetS was 38.7% in moderately obese subjects and 49.7% in severely obese subjects. The prevalence of MetS in severely obese black subjects was 39%.[274]

Adults

People with MetS are at increased risk for developing diabetes and cardiovascular disease as well as increased mortality from CVD and all causes. Unless otherwise stated, the following data are based on the definition of the metabolic syndrome as determined in the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (ATP III, NHLBI).

- An estimated 47 million US residents have MetS.[275]
- The age-adjusted prevalence of MetS for adults is 23.7%.[275]
  - –The prevalence ranges from 6.7% among people ages 20–29 to 43.5% for ages 60–69 and 42.0% for those age 70 and older.
  - –The age-adjusted prevalence is similar for men (24.0%) and women (23.4%).
  - –Mexican Americans have the highest age-adjusted prevalence of MetS (31.9%). The lowest prevalence is among whites (23.8%), African Americans (21.6%) and people reporting an "other" race or ethnicity (20.3%).
  - –Among African Americans, women had about a 57% higher prevalence than men. Among Mexican Americans, women had a 26% higher prevalence than men did.
- The prevalences of people with MetS are 24.3%, 13.9% and 20.8 % for white, black and Mexican-American men, respectively. For women the percentages are 22.9, 20.9 and 27.2, respectively.[276]
- In a study of over 15 000 men and women, ages 45–64, in the ARIC study, MetS prevalence was 30% and 27% using ATP III and modified WHO definitions with substantial variation across race and gender subgroups. CHD prevalence was greater in those with than without MetS (ATP III

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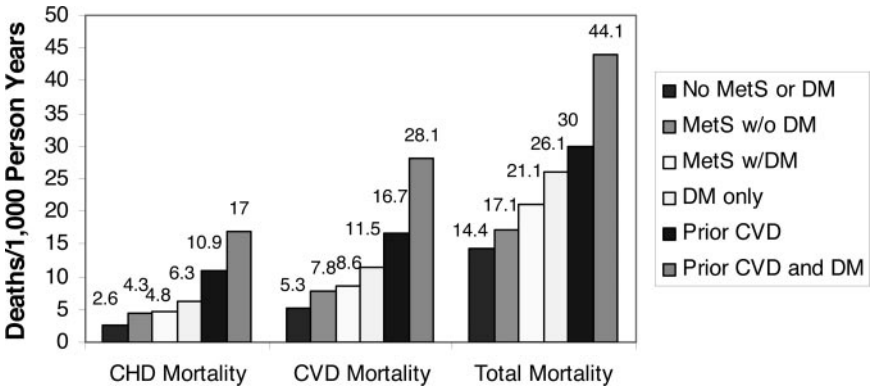

Chart 10A. Total mortality rates in US adults, ages 30–75, with metabolic syndrome (MetS), with and without diabetes mellitus (DM) and pre-existing CVD (NHANES II 1976–80 Follow-Up Study*). Source: Malik et al.[278] *Average of 13 years of follow-up.

7.4% versus 3.6%; WHO 7.8% versus 3.6%, both $P<0.0001$). Using either definition, subjects with MetS were about 2 times more likely to have prevalent CHD than those without the syndrome after adjustment for established risk factors. Among individuals free of CVD, the average age, sex, and race/center-adjusted intima-media thickness (IMT) was greater among individuals with the syndrome (ATP III 747 versus 704, WHO 750 versus 705 micrometers, both $P<0.0001$). These data suggest that MetS was significantly associated with the presence of CHD and carotid IMT.[277]

11. Nutrition

See Table 11A.

- The Economic Research Service of the USDA suggests that the average daily calorie consumption in the United States increased by 12% between 1985 and 2000, or roughly 300 calories. Of that increase, grains (mainly refined grains) accounted for 46%, added fats 24%, added sugars 23%, fruits and vegetables 8%, and the meat and dairy groups together declined 1%. Per capita availability of total dietary fat, after remaining steady from 1985–99, jumped 6% in 2000. American diets tend to be low in whole grains and other nutritious foods.[279]
- Between 1965 and 1991, among US adults age 18 and older, total daily calories declined from 2049 to 1807, but then rebounded to 2000 calories in 1996. This contributed to the marked increase in obesity levels in the past decade.[280]
- In 1999–2000, among children ages 2–6, 20% had a good diet, 74% had a diet that needed improvement, and 6% had a poor diet. For those ages 7–12, 8% had a good diet, 79%

TABLE 9G. Diabetes

Population Group	Prevalence of Physician-Diagnosed Diabetes 2003	Prevalence of Undiagnosed Diabetes 2003	Prevalence of Pre-Diabetes 2003	Incidence of Diagnosed Diabetes	Mortality (Diabetes) 2003#	Hospital Discharges 2003	Cost 2002++
Total	14 100 0000 (6.7%)	6 000 000 (2.9%)	14 700 000 (7.0%)	1 500 000	73 965	597 000	$132 billion
Total males	7 000 000 (7.2%)	3 000 000 (3.0%)	8 600 000 (8.9%)	. . .	35 257 (47.7%)*	286 000	. . .
Total females	7 100 000 (6.3%)	3 000 000 (2.7%)	6 100 000 (5.4%)	. . .	38 748 (52.4%)*	314 000	. . .
NH white males	6.2%	3.0%	8.6%	. . .	28 765	. . .	. . .
NH white females	4.7%	2.7%	4.6%	. . .	30 189	. . .	. . .
NH black males	10.3%	1.3%	8.3%	. . .	5 401	. . .	. . .
NH black females	12.6%	6.1%	5.9%	. . .	7 419	. . .	. . .
Mexican-American males	10.4%	3.5%	8.7%	. . .	. . .	. . .	. . .
Mexican-American females	11.3%	1.8%	7.2%	. . .	. . .	. . .	. . .
Hispanic or Latino**	8.6%	. . .	. . .	. . .	. . .	. . .	. . .
Asian**	6.5%	. . .	. . .	. . .	. . .	. . .	. . .
American Indians/Alaska Natives**	12.2%	. . .	. . .	. . .	. . .	. . .	. . .

Note: Undiagnosed diabetes is defined here for those whose fasting glucose is 126 mg/dL or higher but who did not report being told they had diabetes by a health care provider. Pre-diabetes is a fasting blood glucose of 100 to less than 126 mg/dL (impaired fasting glucose). Pre-diabetes also includes impaired glucose tolerance.

(. . .) = data not available. NH = non-Hispanic.

*These percentages represent the portion of total DM mortality that is males vs. females.

**NHIS (2003), CDC/NCHS; data are estimates for Americans age 18 and older.

#Preliminary.

Sources: Prevalence: NHANES (1999–2002), CDC/NCHS and NHLBI; percentages for racial/ethnic groups are age-adjusted for Americans age 20 and older. Estimates from NHANES 1999–2002 applied to 2003 population estimates. Incidence: NIDDK estimates. Mortality: CDC/NCHS; these data represent underlying cause of death only; data for white and black males and females include Hispanics. Hospital discharges: National Hospital Discharge Survey, CDC/NCHS; data include people discharged alive and dead.

++CDC/NCHS.

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had a diet that needed improvement, and 13% had a poor diet.[281]

- Between 1988–94 and 1999–2000, the median caloric intake rose in boys ages 8–11 and 12–19. It rose a small amount in girls ages 6–11 and basically remained constant in girls ages 12–19.[282]
- Between 1977 and 1996, portion sizes for key food groups grew markedly in the United States, not only at fast-food outlets but also in homes and at conventional restaurants. One study of portion sizes for typical items showed that:
  - –Salty snacks increased from 132 calories to 225 calories.
  - –Soft drinks increased from 144 calories to 193 calories.
  - –French fries increased from 188 calories to 256 calories.
  - –Hamburgers increased from 389 calories to 486 calories.[283]

Fat/Meat Consumption

- Between 1965 and 1996 among adults, total fat as a proportion of daily calorie intake fell steadily from 39.1% to 33.1%. Saturated fat fell from 14.4% to 11.0%. However, total calorie intake increased between 1991 and 1996. Over the same period daily total fat consumption rose from 70.9 grams (g) to 74.8 g.[280]
- The average daily intake of total fat in the United States is 81.4 grams (96.5 g for males and 67.3 g for females) (NHANES III [1988–94], CDC/NCHS).
  - –For NH whites the average is 82.7 g (99.0 g for males and 67.4 g for females).
  - –For NH blacks the average is 82.0 g (94.6 g for males and 71.2 g for females).
  - –For Mexican Americans the average is 77.6 g (88.0 g for males and 66.5 g for females).
- The average daily intake of saturated fat in the United States is 27.9 g (33.1 g for males and 23.0 g for females) (NHANES III [1988–94], CDC/NCHS).
  - –For NH whites the average is 28.4 g (34.1 g for males and 23.1 g for females).
  - –For NH blacks the average is 27.5 g (31.7 g for males and 23.8 g for females).
  - –For Mexican Americans the average is 26.7 g (30.1 g for males and 23.1 g for females).
- The proportion of fat calories from beef, pork, dairy products and eggs fell from 50% in 1965 to 33% in 1994–96. The proportion of fat calories from poultry increased from 4% to 7%. Calories from fruits and vegetables rose from 8% to 13%.[280]
- In 1994–96, pizza, Mexican food, Chinese food, hamburgers, French fries and cheeseburgers accounted for 10.8% of total fat intake. These 6 foods accounted for only 1.9% of fat intake in 1965.[280]
- The major sources of saturated fat in the diet are red meat, butter, whole milk and eggs. Intake of these foods has fallen markedly since 1965. The decline in whole milk consumption from 21.3 gallons in 1972–76 to 8.2 gallons in 1997 accounts for most of the reduction in saturated fat.[280]
- According to USDA data, in 2001 total meat consumption (red meat, poultry and fish) amounted to 194 pounds per person, 16 pounds above the level in 1970. Each American consumed an average of 21 pounds less red meat (mostly beef) than in 1970, 34 pounds more poultry and 3.4 pounds more fish.[279]

Cholesterol

- The average daily intake of dietary cholesterol in the United States is 269.6 milligrams (mg). For males it's 323.5 mg and for females it's 218.9 mg (NHANES III [1988–94], CDC/NCHS).
  - –For NH whites the average is 259.3 mg (312.6 mg for males and 209.1 mg for females).
  - –For NH blacks the average is 297.9 mg (358.8 mg for males and 245.6 mg for females).
  - –For Mexican Americans the average is 316.2 mg (365.9 mg for males and 263.8 mg for females).

Fiber

- The recommended daily intake of dietary fiber is 25 g or more. Americans consume a daily average of 15.6 g of dietary fiber (17.8 g for males and 13.6 g for females) (NHANES III [1988–94], CDC/NCHS).
  - –For NH whites the average is 15.8 g (18.1 g for males and 13.7 g for females).
  - –For NH blacks the average is 13.4 g (15.0 g for males and 12.0 g for females).
  - –For Mexican Americans the average is 18.5 g (21.0 g for males and 15.9 g for females).
- Analysis of participants in the Cardiovascular Health Study (CHS) showed that cereal fiber consumption late in life was associated with lower risk of incident CVD, supporting recommendations for elderly people to increase consumption of dietary cereal fiber.[284]
- Despite USDA Food Pyramid recommendations to consume several daily servings of whole grains, in 1994–96, intake of whole grains for children was 1 serving or less.[285]
- Most Americans consume less than 1 serving of whole grains a day, but between the early 1980s and 2000, consumption of refined grains increased. (Refined grains include white, whole wheat and durum flour, all of which have less nutritional value than whole grains).[282]

Fruits/Vegetables

- In 2000, 81% of men and 73% of women reported eating fewer than 5 servings of fruits and vegetables a day. More than 60% of young people eat too much fat, and less than 20% eat the recommended 5 or more servings of fruits and vegetables each day (CDC, BRFSS, 2000).
- Only 22.7% of adults consumed fruits and vegetables at least 5 times a day in 1996. This was an increase from 19.0% in 1990 (BRFSS [1990–96], CDC).
- The highest proportion of adults who consumed fruits and vegetables at least 5 times a day were those age 65 and older, whites, college graduates, those actively engaged in leisure-time physical activity, and nonsmokers.[280]

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- The percentage of males who consumed fruits and vegetables at least 5 times a day was 17.7 in 2003. For females the percentage was 27.0 (BRFSS 2003, CDC).
- From 1990–96, the percentage of obese adults who consumed at least 5 servings of fruits and vegetables a day dropped from 16.8% to 15.4%.[280]
- Recent studies support the intake of up to 9 servings of fruits and vegetables per day.[286]
- In 2003, the percentage of students in grades 9–12 who reported eating fruits and vegetables 5 or more times per day was 23.6% for males and 20.3% for females.[287]
  - –Black students (24.5%) were more likely than white students (20.2%) to have eaten 5 or more servings per day. This racial/ethnic difference was significantly higher for male students.
- From 1994–96 for children ages 6–19, only 14% met then-current USDA Food Pyramid recommendations for daily fruit intake (2–4 servings per day). Only 20% got enough vegetables (3–5 servings per day).[288]
- In 1980, about 50% of high school seniors reported eating green vegetables "nearly every day or more." By 2003, that figure had dropped to about 30%.[289]

Costs

Each year over $33 billion in medical costs and $9 billion in lost productivity due to heart disease, cancer, stroke and diabetes are attributed to diet (CDC).

12. Quality of Care

The Institute of Medicine defines quality of care as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge."[290]

This section of the Update highlights national data on quality of care for several cardiovascular conditions. It is intended to serve as a benchmark for current care and to stimulate efforts to improve the quality of cardiovascular care nationally. Where possible, data is reported from standardized quality indicators (ie, those consistent with the methods for quality performance measures endorsed by the American College of Cardiology and American Heart Association[291] Additional data on aspects of quality of care such as compliance with ACC/AHA clinical practice guidelines is also included to provide a spectrum of quality-of-care data.

Other

- Nearly 3800 patient medical records from 38 US hospitals showed that among patients with AF and at high risk for stroke, only 54.7% received warfarin sodium, and 20.6% received neither aspirin nor warfarin. Of patients with AMI, only 75.5% received aspirin on hospital arrival. After orthopedic surgery procedures, only 85.6% received prophylaxis with a parenteral anticoagulant agent or warfarin. In 49.4% of patients with DVT, PE, or both, unfractionated or low-molecular-weight heparin use was discontinued before an international normalized ratio of 2.0 or greater was achieved for 2 consecutive days. Patients with DVT or PE were rarely discharged from the hospital with bridge therapy (an injectable anticoagulant agent plus warfarin), although the length of hospitalization was significantly shorter than if discharged taking warfarin alone.[294]
- During the 7-year study period of data from all managed care plans administered by Medicare, clinical performance

TABLE 11A. Nutrition

Mean Dietary Intake of Energy and 10 Key Nutrients for Public Health	Total Population	Males	Females
Energy, kcal	2146	2475	1833
Protein, % of calories	14.7%	14.9%	14.6%
Carbohydrate, % of calories	51.9%	50.9%	52.8%
Total fat, % of calories	32.7%	32.7%	32.6%
Saturated fat, % of calories	11.2%	11.2%	11.1%
Cholesterol, mg	265	307	225
Calcium, mg	863	966	765
Folate, μg	361	405	319
Iron, mg	15.2	17.2	13.4
Zinc, mg	11.4	13.3	9.7
Sodium, mg	3375	3877	2896

Source: NHANES (1999–2000), CDC/NCHS, 2003. (Advance Data, Vital and Health Statistics, No. 334, April 17, 2003).

TABLE 12A. JCAHO Standardized Measures. Data were recently published on Joint Commission on Accreditation of Healthcare Organization (JCAHO) standardized "core" quality measures. (Williams et al[292]) Below are summary data on inpatient measures for acute MI and heart failure from the 2nd quarter of 2004 from 3377 hospitals nationally.

	Percent of Inpatients/Time
Acute myocardial infarction	
Aspirin at admission	95%
Aspirin at discharge	95%
ACE inhibitor for LV systolic dysfunction	80%
Smoking cessation counseling	84%
β-Blocker at admission	91%
β-Blocker at discharge	93%
Mean time to thrombolysis	54 min
Mean time to PCI	293 min
Inpatient death	8%
Heart failure	
Discharge instructions	55%
Assessment of LV function	88%
ACE inhibitor for LV systolic dysfunction	77%
Smoking cessation counseling	72%

Mean rates for rate-based measures are based on aggregate calculations (dividing all patients who met the criterion by the total number of patients. Mean values for continuous variables are based on aggregated mean rates for each participating hospital weighted by the total number of patients included by each hospital. The average number of patients per hospital per quarter on which the summary data above were based ranged from 4 (for mean time to thrombolysis for acute MI) to 69 (for assessment of LV function for heart failure).

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TABLE 12B. National Medicare and Medicaid Data. As part of the Hospital Quality Alliance Program, data is collected by the Centers for Medicare and Medicaid Services on quality-of-care indicators for conditions including acute MI and heart failure. Data from hospital admissions from the first half of 2004 from 3558 hospitals were recently published (Jha et al[293]) and are summarized as follows:

	Percent of Inpatients
Acute myocardial infarction	
Aspirin at admission	92±12
Aspirin at discharge	87±19
ACE inhibitor for LV systolic dysfunction	75±26
β-Blocker at admission	85±20
β-Blocker at discharge	84±19
Heart failure	
Assessment of LV function	80±18
ACE-inhibitor for LV dysfunction	74±20

Plus-minus values are mean±standard deviation. Measures based on discharge data from at least 25 patients (per hospital) were defined as stable.

improved on all measures for both white and black enrollees. However, racial disparities did not decrease for glucose control among patients with diabetes or for cholesterol control among patients with cardiovascular disorders.[295]

- Using Medicare data from 1992–2001, the rates of receipt for 9 surgical procedures previously shown to have dispar-

TABLE 12C. National Veterans Health Administration Data. The VA collects national quality performance data related to cardiovascular disease. Aggregate data from 158 VA hospitals for the period between January 2004 and March 2005 are listed below (Office of Quality and Performance, Veterans Health Administration). Only patients who were candidates for each quality indicator were considered (ie, patients with contraindications to a given therapy were not considered).

	Percent of Inpatients
Acute myocardial infarction	
Aspirin within 24 hours of admission	97%
Aspirin at discharge	98%
β-Blocker within 24 hours of admission	96%
β-Blocker at discharge	98%
ACE inhibitor for patients with LVEF <40%	93%
Smoking cessation advice given	93%
Heart failure	
Documentation of LVEF	99%
ACE inhibitor for patients with LVEF <40%	93%
Complete discharge instructions	83%
Smoking cessation advice given	88%
Hypertension	
Blood pressure at goal (<140/90)	72%
Cholesterol	
Cholesterol screening in all patients	94%
Cholesterol measured after acute MI	96%
LDL cholesterol <100 mg/dL after acute MI	60%

TABLE 12D. American Heart Association GWTG–CAD Program. Get With The GuidelinesSM (GWTG)–Coronary Artery Disease (CAD) is a national quality improvement initiative of the American Heart Association to help hospitals redesign systems of care to improve guidelines adherence in patients admitted with a cardiovascular event. The table below summarizes performance on the selected quality-of-care indicators for CAD events. These were collected from 74 848 patients who were admitted to 336 hospitals participating in the GWTG–CAD program from Jan.1, 2004–Dec. 31, 2004.

Performance Indicator	Percent of Inpatients
Aspirin at discharge	92%
β-Blocker at discharge	86%
ACE inhibitor at discharge	67%
ACE inhibitor at discharge for AMI patients	71%
Lipid therapy at discharge	71%
Lipid therapy at discharge if LDL >100 mg/dL	79%
Blood pressure control (to <160/90) at discharge	74%
Smoking cessation counseling	82%
Referral to cardiac rehabilitation	64%

These data demonstrate the treatment gaps for each of the quality-of-care indicators. GWTG aims to bridge these gaps in care. Information on GWTG can be found on the American Heart Association Web site, www.americanheart.org.

TABLE 12E. American Stroke Association GWTG–Stroke Program. Get With The GuidelinesSM (GWTG)–Stroke is a national quality improvement initiative of the American Heart Association to help hospitals redesign systems of care to improve guidelines adherence in patients admitted with an ischemic stroke or transient ischemic attack (TIA). The table below summarizes performance on the selected treatment and quality-of-care indicators for acute stroke and secondary prevention. There were 40 615 clinically identified patients who were admitted to 297 hospitals participating in the GWTG–Stroke program from Jan. 1, 2004–Dec. 31, 2004.

Performance Indicator	Percent of Inpatients
IV tPA in patients who arrived <2 hr after symptom onset*	45%
IV tPA in patients who arrived <3 hr after symptom onset	36%
Documentation of ineligibility (why no tPA)	87%
Symptomatic intracranial hemorrhage after IV tPA**	5%
Antithrombotics <48 hr*	95%
DVT prophylaxis <48 hr	78%
Antithrombotics at discharge*	97%
Anticoagulation for atrial fibrillation at discharge*	97%
Therapy at discharge if LDL >100 mg/dL or on therapy at admit*	76%
Counseling for smoking cessation*	60%
Lifestyle changes recommended for BMI >25 kg/m^2	30%

* indicates the 7 key performance measures targeted in GWTG–Stroke.
**A smaller denominator for IV tPA measures in the study population.

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TABLE 12F. Acute Stroke Care Registry Data. The Paul Coverdell National Acute Stroke Registry has published results from 4 pilot registries, representing 6867 admissions from 98 hospitals for the years 2001–02. (The Paul Coverdell Prototype Registries Writing Group.[115]) Data on select in-hospital and secondary preventive measures are summarized below:

Performance Indicator	Percent of Inpatients
Screening for dysphagia[1]	44%
Lipid profile checked[2]	40%
Smoking cessation counseling[3]	23%
Antithrombotic medication at discharge[4]	94%
Anticoagulation medication at discharge[5]	79%

[1]Excludes TIA patients.

[2]Includes patients who were discharged alive with final diagnosis of ischemic stroke or TIA.

[3]Includes patients who were discharged alive who were current smokers.

[4]Includes patients who were discharged alive with no physician-documented contraindication to treatment, and who had final diagnosis of ischemic stroke or TIA.

[5]Includes patients who had atrial fibrillation during hospitalization, who were discharged alive, who had no physician-documented contraindication to treatment, and who had final diagnosis of ischemic stroke or TIA.

ities in the rates at which they were performed in white and black patients, was examined. The rates of receipt for all 9 procedures were higher among whites than blacks. The difference between the rates among whites and blacks increased significantly between 1992 and 2001 for 5 of the 9 procedures, remained unchanged for 3 procedures, and narrowed significantly for 1 procedure. Rates of CABG, carotid endarterectomy and total hip replacement in 158 hospital-referral regions were examined. In the early 1990s, whites had higher rates for these procedures than blacks in every hospital-referral region. By 2001, the disparity in the rates of these procedures narrowed significantly in 22 hospital-referral regions, widened significantly in 42, and was not significantly changed in the remaining regions. At the end of the study period, no hospital-referral region was found in which the difference in rates between whites and blacks was eliminated for men or women with regard to any of those 3 procedures.[296]

- Using data from 1994–2002 from the National Registry of Myocardial Infarction (NRMI), sex and racial differences in the treatment of patients deemed to be "ideal candidates" for particular treatments, and differences in deaths among 598 911 patients hospitalized with MI were examined. It was found that rates of reperfusion therapy, coronary angiography, and in-hospital death after MI, but not the use of aspirin and beta-blockers, vary according to race and sex, with no evidence that the differences have narrowed in recent years.[297]

Care Centers/Personnel

- Based on data from the American Board of Psychiatry and Neurology (ABPN), there are 240 board-certified vascular neurologists (August 2005).
- In 2002, there were 16 989 doctors of medicine with a specialty of cardiovascular diseases (Health, United States, 2004. CDC/NCHS).

TABLE 12G. Heart Failure Registry Data. The ADHERE (Acute Decompensated HEart Failure National REgistry) Registry is a national observational registry of patients hospitalized with acute decompensated heart failure (www.adhereregistry.com). Hospitals from all regions of the country participate, including community, tertiary and academic. The demographics of the 169 hospitals participating are representative of the nation's hospitals as a whole. The Joint Commission on Accreditation of Health Care Organizations (JCAHO) has created, tested and validated a set of heart failure core quality-of-care measures. Mean performance of the JCAHO quality indicators from a data set of 36 353 patients enrolled May 2004–April 2005 from these 169 U.S. hospitals was as follows:

	Percent of Inpatients
JCAHO performance indicators	
HF-1: Complete set of discharge instructions	61%
HF-2: Measure of LV function	89%
HF-3: ACE inhibitor at discharge for patients with LVSD, no contraindications to ACE inhibitors	74%
HF-4: Smoking cessation counseling, current smokers	67%
Additional measures	
ACE inhibitor or ARB at discharge for patients with LVSD, no contraindications to ACE inhibitors	83%
β-Blockers at discharge for patients with LVEF $<$40%, no contraindications	77%

These patients were hospitalized with a primary diagnosis of heart failure. The mean age was 72.3 years and 51% of them were female. Fifty-nine percent of HF patients had a medical history of coronary artery disease. Of patients with LV function measured (n=31 454), 50.3% had LVEF $<$ 40% or showed moderate-to-severe impairment. Mechanical ventilation was required in 3.7% of patients. In-hospital mortality was 3.4% and mean length of hospital stay was 5.6 days (median 4.2 days).

Further information on the ADHERE registry can be found at adhereregistry.com.

- As of Sept. 28, 2005, there were 175 total certified primary stroke centers by JCAHO standards.

13. Medical Procedures

Cardiac Catheterization

- From 1979–2003, the total number of inpatient cardiovascular operations and procedures increased 470%.
- From 1979–2003, the number of cardiac catheterizations increased 373%.
- An estimated 1 414 000 inpatient cardiac catheterizations were performed in 2003.
- The mean charge for patients hospitalized for diagnostic cardiac catheterization increased from $11 611 in 1993 to $24 893 in 2003. The total number of patients increased from 628 962 to 728 786, while the average length of stay decreased from 4.9 days to 3.7 days.[298]

Coronary Artery Bypass Surgery

In the United States in 2003, the NCHS estimates that 467 000 of these procedures were performed on 268 000 patients.

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TABLE 12H. Acute Coronary Syndrome Registry Data. CRUSADE (Can Rapid Stratification of Unstable Angina Patients Suppress ADverse Outcomes with Early Implementation of the ACC/AHA Guidelines) is a national quality improvement initiative designed to increase adherence to guideline-recommended care for patients hospitalized with non-ST-segment elevation myocardial infarction or unstable angina (www.CRUSADEQI.com). Data on treatment measures from the CRUSADE registry on 138 719 patients from 521 hospitals from July 2001–March 2005 are as follows:

	Overall	"Leading" Centers (Top 25%)	"Lagging" Centers (Bottom 25%)
Acute Medications* (Within 24 Hours)			
Aspirin	93%	96%	87%
β-Blocker	83%	90%	74%
Heparin, any	85%	91%	76%
Glycoprotein IIb/IIIa inhibitor, any	41%	57%	21%
Discharge medications**			
Aspirin	91%	96%	80%
Clopidogrel	60%	68%	41%
β-Blocker	86%	92%	74%
ACE-I, overall	59%	68%	45%
ACE-I, among recommended#	62%	71%	48%
Lipid-lowering agent, overall	71%	81%	50%
Lipid-lowering agent, recommended+	83%	88%	67%
Procedures***			
Cardiac catheterization, overall	73%	84%	43%
Cardiac catheterization, within 48 hours of presentation	52%	64%	26%

*Excluding patients with contraindications to these therapies.
**Excluding patients with contraindications, transfers out, and deaths.
#Including only patients with history of hypertension, diabetes, CHF, and LVEF <40%.
+Including only patients with history of hyperlipidemia or LDL >100mg/dL.
***Excluding patients with contraindications to cardiac catheterization.
Note that not all of the treatment measures reported above are established quality indicators. Further information on the CRUSADE registry can be found at its Web site (www.CRUSADEQI.com).

- Compared with Canadian patients, US patients were older, more likely to be female, and discharged from the hospital sooner. In-hospital costs of treatment were substantially higher in the United States than in Canada. After controlling for demographic and clinical differences, length of stay in Canada was 16.8% longer than in the United States; there was no difference in in-hospital mortality; and the cost in the United States was 82.5% higher than in Canada.[299]

Heart Transplants

In 2004, 2016 heart transplants were performed in the United States. There are 309 organ transplant centers in the United States, 186 of which perform heart transplants.

- In the United States, 72.6% of heart transplant patients are male, 70.4% are white, 20.0% are ages 35–49, and 46.1% are ages 50–64.
- As of July 15, 2005, the 1-year survival rate for males was 86.4% and for females it was 84.6%; the 3-year rate was 78.9% for males and 76.1% for females, and the 5-year rate was 72.2% for males and 68.5% for females.
- As of July 15, 2005, there were 3142 heart patients on the transplant waiting list.

Percutaneous Coronary Intervention (PCI, previously referred to as PTCA)

- An estimated 664 000 PCI procedures were performed on 652 000 patients in 2003 in the United States. From 1987–2003, the number of procedures increased 326%.
- In 2003, 65% of PCI procedures were performed on men, and 52% were performed on people age 65 and older.
- The rate of coronary stent insertion increased 147% between 1996 and 2000. Among the elderly, this procedure increased 168% during the same period. The rate of stent insertion also more than doubled for the population 45–64 years of age, increasing from 157 to 318 per 100 000.[300]
- In 2003, approximately 84% of 660 000 hospitalized patients who underwent a coronary angioplasty received a stent. Black and white patients were equally likely to receive a stent. However, white patients were more likely than black patients to receive a drug-eluting stent.[301]

14. Economic Cost of Cardiovascular Diseases

The cost of cardiovascular diseases and stroke in the United States for 2006 is estimated at $403.1 billion. This figure includes health expenditures (direct costs, which include the

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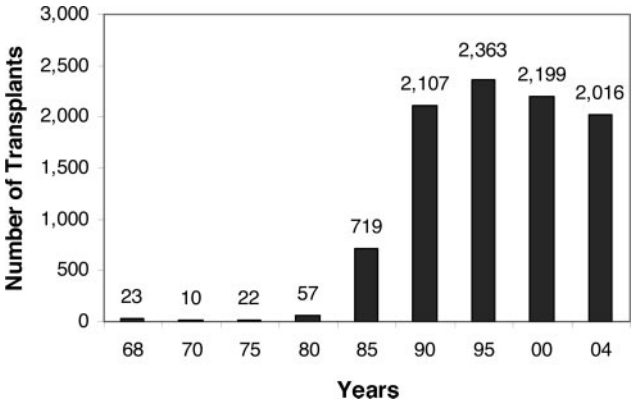

Chart 13A. Trends in heart transplants (UNOS: 1968–2004). Source: United Network for Organ Sharing (UNOS), scientific registry data.

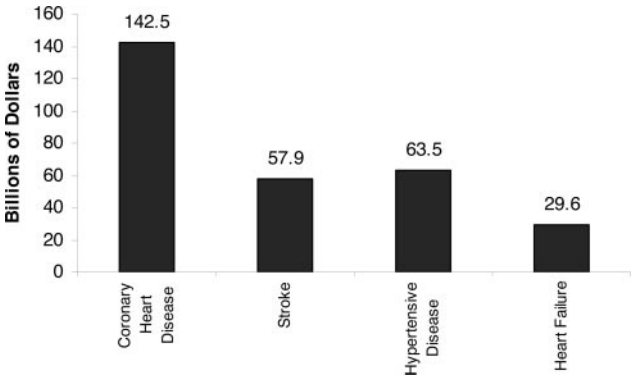

Chart 14A. Estimated direct and indirect costs (in billions of dollars) of major cardiovascular diseases and stroke (United States: 2006).

cost of physicians and other professionals, hospital and nursing home services, the cost of medications, home health care and other medical durables) and lost productivity resulting from morbidity and mortality (indirect costs). By comparison, in 2004 the estimated cost of all cancers was $190 billion ($69 billion in direct costs, $17 billion in morbidity indirect costs and $104 billion in mortality indirect costs). In 1999, the estimated cost of HIV infections was $28.9 billion ($13.4 billion direct and $15.5 billion indirect).

See Chart 14A and Table 14A.[302–305]

15. At-a-Glance Summary Tables

See Tables 15A through 15D.[292,293,143,157]

16. Glossary

- **Age-Adjusted Rates—**Used mainly to compare the rates of two or more communities, population groups or the nation as a whole, over time. The American Heart Association uses a standard population (2000), so that these rates aren't affected by changes or differences in the age composition of the population.
- **AHRQ—Agency for Healthcare Research and Quality—**A part of the US Department of Health and Human Services, this is the lead agency charged with supporting research designed to improve the quality of healthcare, reduce its cost, improve patient safety, decrease medical errors, and broaden access to essential services. AHRQ sponsors and conducts research that provides evidence-based information on healthcare outcomes; quality; and cost, use, and access. The information helps healthcare decisionmakers—patients and clinicians, health system leaders, and policymakers—make more informed decisions and improve the quality of healthcare services.
- **Bacterial Endocarditis—**An infection of the heart's inner lining (endocardium) or the heart valves. The bacteria that most often cause endocarditis are streptococci, staphylococci, and enterococci.
- **Body Mass Index (BMI)—**A mathematical formula to assess body weight relative to height. The measure correlates highly with body fat. Calculated as weight in kilograms divided by the square of the height in meters (kg/m^2).
- **Centers for Disease Control and Prevention/National Center for Health Statistics (CDC/NCHS)—**An agency

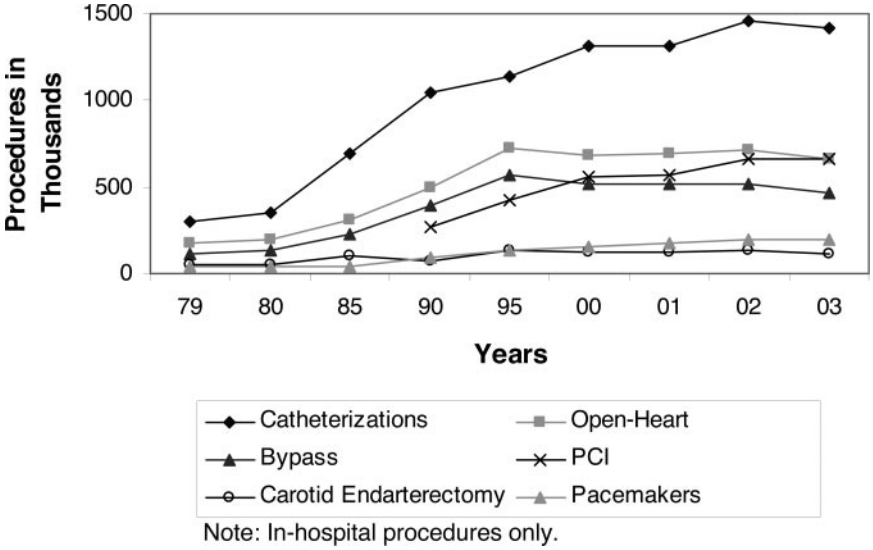

Chart 13B. Trends in cardiovascular inpatient operations and procedures (United States, 1979–2003). Source: CDC/NCHS and NHLBI. Note: In-hospital procedures only.

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TABLE 12I. ACC–NCDR Cardiac Catheterization and PCI Data. The American College of Cardiology maintains a number of clinical data registries as part of the ACC–National Cardiovascular Data Registry (ACC-NCDR®). Among them is the CathPCI Registry™, which is composed of diagnostic cardiac catheterizations and interventional (PCI) procedures harvested from participating facilities across the nation. Listed below are aggregated data of patients discharged in 2004 from 359 participating facilities. Only records with valid responses to indicators were considered. For more information, visit www.acc.org or call 1–800–253–4636, ext 451.

	Overall		"Leading" Centers	"Lagging" Centers
Diagnostic Cardiac Catheterization	Mean	Median	(Mean Top 25%)	(Mean Bottom 25%)
In-lab mortality[1]	0.05%	0.00%	0.00%	0.06%
Major complications[2]	2.74%	1.67%	0.54%	3.98%
PCI (percutaneous coronary intervention)				
Major complications[3]	4.80%	3.93%	2.33%	6.13%
Vascular complications[4]	2.20%	1.91%	1.13%	2.89%
Antiplatelet drug administration[5]	94.14%	97.03%	98.59%	93.81%
Emergency CABG[6]	0.40%	0.31%	0.00%	0.56%
DBT (door-to-balloon time)[7]	123.84 min	95.00 min	71.00 min	133.00 min
Pct. patients with DBT <90 minutes[8]	44.79%	44.44%	60.00%	29.81%
Pct. patients with DBT <120 minutes[9]	67.75%	70.83%	82.05%	57.03%
In-hospital risk-adjusted mortality[10]	1.13%	1.01%	0.71%	1.44%

[1]Mortality in lab.

[2,3]Cerebrovascular accident, myocardial infarction, congestive heart failure, cardiac tamponade, renal failure.

[4]Bleeding, vessel occlusion, loss of distal pulse, dissection, psuedoaneurysm, arteriovenous fistula.

[5]Percentage of patients receiving antiplatelet therapy such as clopidogrel (Plavix) or ticlopidine (Ticlid) during admission.

[6]Percentage of PCI patients requiring emergency or coronary artery bypass surgery within same admission for: ischemic dysfunction including rest angina despite maximal medical therapy and/or intraaortic balloon pump; acute evolving MI within 24 hours before intervention; pulmonary edema requiring intubation; or shock with or without circulatory support.

[7]Often called "door-to-balloon time" or DBT, this is the elapsed time between entry to facility and reperfusion of the affected coronary vessel for patients with acute myocardial infarction treated with primary percutaneous coronary intervention (primary PCI).

[8]Percentage of Primary PCI patients with coronary reperfusion within 90 minutes of entry to facility.

[9]Percentage of Primary PCI patients with coronary reperfusion within 120 minutes of entry to facility.

[10]In-hospital mortality rate adjusted by ACC–NCDR Risk Adjustment Algorithm. This includes mortality for any reason whether or not related to the procedure.

within the US Department of Health and Human Services (USDHHS). The CDC conducts the:

–*Behavioral Risk Factor Surveillance System (BRFSS),* an ongoing study.

- The NCHS conducted the:

–*National Ambulatory Medical Care Survey (NAMCS).*

–*National Health Examination Survey (NHES).*

–*National Health and Nutrition Examination Survey I (NHANES I, 1971–74).*

–*National Health and Nutrition Examination Survey II (NHANES II,1976–80).*

–*National Health and Nutrition Examination Survey III (NHANES III, 1988–94).* Prevalence estimates for coronary heart disease, stroke and congestive heart failure are based on the self-reported questionnaire portion of this study. Exam-based estimates are being developed.

–*National Health and Nutrition Examination Survey (NHANES, 1999–2002).*

- The NCHS also conducts these ongoing studies (among others):

–*National Health Interview Survey (NHIS)*

–*National Hospital Ambulatory Medical Care Survey*

–*National Home and Hospice Care Survey*

–*National Hospital Discharge Survey*

- **Centers for Medicare and Medicaid Services (CMS), formerly Health Care Financing Administration (HCFA)—**The federal agency that administers the Medicare, Medicaid and

TABLE 13A. 2003 National HCUP Statistics. Data from the latest Healthcare Cost and Utilization Project (HCUP) provide data for the mean charges and in-hospital death rate for the following (hcup.ahrq.gov):

Procedure	Mean Charges	In-Hospital Death Rate
Coronary artery bypass graft	$ 83 919	2.2%
PCI	$ 38 203	0.8%
Diagnostic cardiac catheterization	$ 24 893	1.0%
Cardiac pacemaker	$ 41 075	1.1%
Implantable defibrillator	$103 680	1.0%
Endarterectomy	$ 21 742	0.6%
Valves	$118 656	5.6%

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TABLE 13B. Estimated* Inpatient Cardiovascular Operations, Procedures and Patient Data by Sex, Age and Region—United States: 2003 (in Thousands)

			Sex		Age				Region#			
Operations/Procedures/Patients (ICD/9 Code)		Total	Male	Female	<15	15–44	45–64	≥65	Northeast	Midwest	South	West
Angioplasty (36.0)	Procedures	1244	812	431	. . .	73	524	646	201	352	454	238
PCI (36.01, .02, .05) **(a) (f)**	Procedures	664	430	220	. . .	33	278	342	106	187	240	122
	Patients	652	422	230	. . .	38	274	340	107	183	237	125
Stenting (36.06, .07) **(g)**	Procedures	574	378	196	. . .	34	244	296	93	160	210	111
Cardiac revascularization (bypass)												
(36.1–36.3) **(b)**	Procedures	467	346	121	. . .	14	196	257	95	104	185	83
	Patients	268	196	71	. . .	9	110	149	53	60	108	46
Diagnostic cardiac catheterizations												
(37.2) **(a)**	Procedures	1414	874	540	14	116	582	702	253	344	563	254
Endarterectomy (38.12)	Procedures	117	73	45	. . .	. . .	30	87	22	25	54	17
Implantable defibrillators (37.94–.99)	Procedures	64	50	11	. . .	. . .	18	32	12	13	22	8
Open-heart surgery **(c)**	Procedures	666	460	208	30	33	250	348	141	140	252	122
Pacemakers (37.8) **(d)**	Procedures	197	89	107	. . .	. . .	23	169	48	41	71	37
Valves (35.1, .2, .99) **(e)**	Procedures	95	54	42	. . .	6	27	53	20	14	33	24
Total vascular and cardiac surgery and Procedures (35–39)**		**6821**	**3929**	**2892**	**229**	**647**	**2414**	**3530**	**1323**	**1508**	**2640**	**1350**

Note: (. . .) = data not available.

*Breakdowns are not available for some procedures, so entries for some categories don't add to totals. These data include codes where the estimated number of procedures is fewer than 5000. Categories of such small numbers are considered unreliable by CDC/NCHS and in some cases may have been omitted.

**Totals include procedures not shown here.

#Regions: Northeast — Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont; Midwest — Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin; South — Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia; West — Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

(a) Does not include procedures in the outpatient or other non-hospitalized setting; thus, excludes some cardiac catheterizations and PCIs.

(b) Because one or more procedure codes are required to describe the specific bypass procedure performed, it's impossible from this (mixed) data to determine the average number of grafts per patient.

(c) Includes valves, bypass and 104 000 "other" open-heart procedures (Codes 35 [less 35.1–35.2, 35.4, 35.96, 35.99]; 36 [less 36.0–36.1]; 37.1, 37.3–37.5).

(d) There are additional insertions, revisions and replacements of pacemaker leads, including those associated with temporary (external) pacemakers.

(e) Open heart valvuloplasty without replacement; replacement of heart valve; other operations on heart valves.

(f) Previously referred to as PTCA.

(g) 36.06: insertion of non–drug-eluting stents; 36.07: insertion of drug-eluting stents.

Source: Hospital Care Statistics Branch, CDC/NCHS. Estimates are based on a sample of inpatient records from short-stay hospitals in the United States (National Hospital Discharge Survey).

Note: These data do not reflect any procedures performed on an outpatient basis. Many more procedures are being performed on an outpatient basis. Some of the lower numbers in the table probably reflect this trend. Outpatient procedure data are not available at this time.

Child Health Insurance Programs, which provide health insurance for more than 74 million Americans.

- **Comparability Ratio—**Provided by the NCHS to allow time-trend analysis from one ICD revision to another. It compensates for the "shifting" of deaths from one causal code number to another. Its application to mortality based on one ICD revision means that mortality is "comparability-modified" to be more comparable to mortality coded to the other ICD revision.
- **Coronary Heart Disease (ICD/10 codes I20–I25)—**This category includes acute myocardial infarction (I21–I22); other acute ischemic (coronary) heart disease (I24); angina pectoris (I20); atherosclerotic cardiovascular disease (I25.0); and all other forms of chronic ischemic heart disease (I25.1–I25.9).
- **Death Rate—**The relative frequency with which death occurs within some specified interval of time in a population. National death rates are computed per 100 000 population. Dividing the mortality by the population gives a crude death rate. It's restricted because it doesn't reflect a population's composition with respect to such characteristics as age, sex, race or ethnicity. Thus rates calculated within specific subgroups, such as age-specific or sex-specific rates, are often more meaningful and informative. They allow well-defined subgroups of the total population to be examined.
- **Diseases of the Circulatory System—**ICD codes (I00–I99); included as part of what the American Heart Association calls "Cardiovascular Disease." Mortality data for states can be obtained from cdc.gov/nchs, by direct communication with the CDC/NCHS, or from our National Center Biostatistics Program Coordinator on request. (See "Total Cardiovascular Disease" in this Glossary.)
- **Diseases of the Heart—**Classification the NCHS uses in compiling the leading causes of death. Includes acute rheumatic fever/chronic rheumatic heart diseases (I00–I09); hypertensive heart disease (I11) and hypertensive heart and renal disease (I13); coronary heart disease (I20–

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TABLE 14A. Estimated Direct and Indirect Costs (in Billions of Dollars) of Cardiovascular Diseases and Stroke: United States: 2006

	Heart Diseases**	Coronary Heart Disease	Stroke	Hypertensive Disease	Heart Failure	Total Cardiovascular Disease*
Direct costs						
Hospital	$81.3	$41.8	$15.5	$6.2	$15.4	$114.8
Nursing home	$20.7	$10.9	$14.3	$4.2	$3.9	$42.6
Physicians/other professionals	$19.7	$11.1	$3.1	$11.0	$2.0	$38.3
Drugs/other						
Medical durables	$21.2	$9.8	$1.3	$24.4	$3.1	$50.1
Home health care	$5.2	$1.6	$3.1	$1.7	$2.4	$11.8
Total expenditures*	$148.1	$75.2	$37.3	$47.5#	$26.8	$257.6
Indirect costs						
Lost productivity/morbidity	$21.9	$9.6	$6.4	$7.7	N/A	$35.6
Lost productivity/mortality##	$88.5	$57.7	$14.2	$8.3	$2.8	$109.9
Grand totals*	$258.5	$142.5	$57.9	$63.5	$29.6	$403.1

Note: N/A = data not available.

*Totals do not add up due to rounding and overlap.

**This category includes coronary heart disease, congestive heart failure, part of hypertensive disease, cardiac dysrhythmias, rheumatic heart disease, cardiomyopathy, pulmonary heart disease, and other or ill-defined "heart" diseases.

#Tom Hodgson and Liming Cai (Medical Care 2001) estimated that healthcare expenditures attributed to hypertension that could be allocated to cardiovascular complications and other diagnoses totaled $108 billion in 1997.

##Lost future earnings of persons who will die in 2006, discounted at 3%.

Sources: Hodgson and Cohen.[302]

National Health Expenditures Amounts, and Average Annual Percent Change, by Type of Expenditure: Selected Calendar Years 1990–2013.[303]

Rice et al.[304]

Historic Income Tables — People (census.gov).

Deaths for 358 Selected Causes by 5-Year Age Groups, Race, and Sex, United States, 2002.[305]

Rice, Max, Michel, and Sung. Present Value of Lifetime Earnings, U.S. 2003 Unpublished tables, Institute for Health and Aging, University of California, San Francisco, 2005.

All estimates prepared by Thomas Thom, NHLBI.

I25); pulmonary heart disease and diseases of pulmonary circulation (I26–I28); heart failure (I50); and other forms of heart disease (I29–I49, I50.1–I51). "Diseases of the Heart" is not equivalent to "Total Cardiovascular Disease," which the American Heart Association prefers to use to describe the leading causes of death. "Diseases of the Heart" represents about three-fourths of "Total Cardiovascular Disease" mortality.

- **Health Care Financing Administration (HCFA)—**See Centers for Medicare and Medicaid Services (CMS).
- **Hispanic Origin—**In US government statistics, "Hispanic" includes persons who trace their ancestry to Mexico, Puerto Rico, Cuba, Spain, the Spanish-speaking countries of Central or South America, the Dominican Republic or other Spanish cultures, regardless of race. It doesn't include people from Brazil, Guyana, Suriname, Trinidad, Belize and Portugal because Spanish is not the first language in those countries. Much of our data are for Mexican Americans or Mexicans, as reported by government agencies or specific studies. In many cases, data for all Hispanics are more difficult to obtain.
- **Hospital Discharges—**The number of inpatients discharged from short-stay hospitals where some type of disease was the first listed diagnosis. Discharges include people discharged alive and dead.
- **ICD Codes—**A classification system in standard use in the United States. The "International Classification of Diseases" (ICD) is published by the World Health Organization. This system is reviewed and revised about every 10 to 20 years to ensure its continued flexibility and feasibility. The tenth revision (ICD/10) began with the release of 1999 final mortality data. The ICD revisions can cause considerable change in the number of deaths reported for a given disease. The NCHS provides "comparability ratios" to compensate for the "shifting" of deaths from one ICD code to another. In this update the reported mortality is used for one year's data. To compare the number or rate of deaths with that of an earlier year, the "comparability-modified" number or rate is used.
- **Incidence—**An estimate of the number of new cases of a disease that develop in a population in a one-year period. For some statistics, new and recurrent attacks or cases are combined. The incidence of a specific disease is estimated by multiplying the incidence rates reported in community- or hospital-based studies by the US population. **The rates change only when new data are available; they are not computed annually.**
- **Major Cardiovascular Diseases—**Disease classification commonly reported by the NCHS; represents ICD codes I00–I78. The American Heart Association doesn't use "Major CVD" for any calculations. See "Total Cardiovascular Disease" in this Glossary.
- **Metabolic Syndrome*—**The metabolic syndrome is defined as having any 3 of the following 5 diagnostic measures: elevated waist circumference (≥102 cm. in men or ≥88 cm. in women); elevated triglycerides (≥150 mg/dL [1.7 mmol/L] or drug treatment for elevated triglycerides); reduced HDL (high density lipoprotein) cholesterol

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TABLE 15A. Males and Cardiovascular Diseases: At-a-Glance Table

Diseases and Risk Factors	Total	Total Males	White Males	Black Males	Mexican-American Males
Total CVD					
Prevalence 2003	71.3 M (34.2%)	33.1 M (34.4%)	34.3%	41.1%	29.2%
Mortality 2003[#]	910.6 K	426.8 K	368.2 K	49.0 K	. . .
Coronary heart disease					
Prevalence 2003 CHD	13.2 M (6.9%)	7.2 M (8.4%)	8.9%	7.4%	5.6%
Prevalence 2003 MI	7.2 M (3.5%)	4.2 M (5.0%)	5.1%	4.5%	3.4%
Prevalence 2003 AP	6.5 M (3.8%)	3.2 M (4.2%)	4.5%	3.1%	2.4%
New and recurrent CHD*	1.2 M	715.0 K	650.0 K	65.0 K	. . .
New and recurrent MI	865.0 K	520.0 K	. . .	. . .	. . .
Incidence AP (stable angina)	400.0 K	. . .	. . .	. . .	. . .
Mortality 2003 CHD[#]	479.3 K	245.4 K	216.2 K	24.0 K	. . .
Mortality 2003 MI[#]	171.0 K	89.7 K	79.4 K	8.4 K	. . .
Stroke					
Prevalence 2003	5.5 M (2.6%)	2.4 M (2.5%)	2.3%	4.0%	2.6%
New and recurrent strokes	700.0 K	327.0 K	277.0 K	50.0 K	. . .
Mortality 2003[#]	157.8 K	61.6 K	51.8 K	7.8 K	. . .
High blood pressure					
Prevalence 2003	65.0 M (32.3%)	29.4 M	30.6%	41.8%	27.8%
Mortality 2003[#]	52.6 K	21.5 K	15.6 K	5.4 K	. . .
Heart failure					
Prevalence 2003	5.0 M (2.3%)	2.4 M (2.6%)	2.5%	3.1%	2.7%
Mortality 2003[#]	57.2 K	22.3 K	18.9 K	2.1 K	. . .
Tobacco					
Prevalence 2004	44.3 M (20.9%)	24.1 M (23.4%)	24.1%	23.9%	18.9%[†]
Blood cholesterol					
Prevalence 2003					
Total cholesterol 200 mg/dL+	99.9 M (49.8%)	48.4 M (48.9%)	48.9%	41.6%	51.9%
Total cholesterol 240 mg/dL+	34.5 M (17.3%)	16.4 M (16.3%)	16.5%	12.2%	16.7%
LDL cholesterol 130 mg/dL+	76.1 M (39.5%)	39.1 M (43.1%)	43.8%	36.0%	43.7%
HDL cholesterol <40 mg/dL	46.0 M (22.6%)	33.2 M (33.6%)	34.5%	22.7%	34.4%
Physical activity[††]					
Prevalence 2004	30.1%	31.4%	33.4%	29.5%	24.9%[†]
Overweight and obesity					
Prevalence 2003					
Overweight BMI 25.0 or higher	136.5 M (65.1%)	69.6 M (68.8%)	69.4%	62.9%	73.1%
Obesity BMI 30.0 or higher	64.0 M (30.4%)	27.9 M (27.6%)	28.2%	27.9%	27.3%
Diabetes mellitus					
Prevalence 2003					
Physician-diagnosed diabetes	14.1 M (6.7%)	7.0 M (7.2%)	6.2%	10.3%	10.4%
Undiagnosed diabetes	6.0 M (2.9%)	3.0 M (3.0%)	3.0%	1.3%	3.5%
Pre-diabetes	14.7 M (7.0%)	8.6 M (8.9%)	8.6%	8.3%	8.7%
Incidence	1.5 M	. . .	. . .	. . .	. . .
Mortality 2003[#]	74.0 K	35.3 K	28.8 K	5.4 K	. . .

Note: AP = angina pectoris (chest pain); BMI = body mass index; CHD = coronary heart disease; includes heart attack, angina pectoris (chest pain) or both; CVD = cardiovascular disease; K = thousands; M = millions; MI = myocardial infarction (heart attack); mg/dL = milligrams per deciliter; (. . .) = data not available.

*New and recurrent heart attacks and fatal CHD.

[#]Preliminary.

[†]Hispanic.

[††]Regular leisure-time physical activity.

Sources: See summary tables for each chapter in this update. For data on men in other ethnic groups, see other chapters and Statistical Fact Sheets (http://www.americanheart.org/presenter.jhtml?identifier=2007).

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TABLE 15B. Females and Cardiovascular Diseases: At-a-Glance Table

Diseases and Risk Factors	Total	Total Females	White Females	Black Females	Mexican-American Females
Total CVD					
Prevalence 2003	71.3 M (34.2%)	38.2 M (33.9%)	32.4%	44.7%	29.3%
Mortality 2003#	910.6 K	483.8 K	419.2 K	55.8 K	. . .
Coronary heart disease					
Prevalence 2003 CHD	13.2 M (6.9%)	6.0 M (5.6%)	5.4%	7.5%	4.3%
Prevalence 2003 MI	7.2 M (3.5%)	3.0 M (2.3%)	2.4%	2.7%	1.6%
Prevalence 2003 AP	6.5 M (3.8%)	3.3 M (3.6%)	3.5%	4.7%	2.2%
New and recurrent CHD*	1.2 M	485.0 K	425.0 K	60.0 K	. . .
New and recurrent MI	865.0 K	345.0 K	. . .	. . .	. . .
Incidence AP (stable angina)	400.0 K	. . .	. . .	. . .	. . .
Mortality 2003 CHD#	479.3 K	233.9 K	205.0 K	24.9 K	. . .
Mortality 2003 MI#	171.0 K	81.3 K	71.1 K	8.9 K	. . .
Stroke					
Prevalence 2003	5.5 M (2.6%)	3.1 M (2.6%)	2.6%	3.9%	1.8%
New and recurrent strokes	700.0 K	373.0 K	312.0 K	61.0 K	. . .
Mortality 2003#	157.8 K	96.2 K	83.2 K	10.8 K	. . .
High blood pressure					
Prevalence 2003	65.0 M (32.3%)	35.6 M	31.0%	45.4%	28.7%
Mortality 2003#	52.6 K	31.1 K	23.9 K	6.5 K	. . .
Heart failure					
Prevalence 2003	5.0 M (2.3%)	2.6 M (2.1%)	1.9%	3.5%	1.6%
Mortality 2003#	57.2 K	34.9 K	33.4 K	3.2 K	. . .
Tobacco					
Prevalence 2004	44.3 M (20.9%)	20.2 M (18.5%)	20.4%	20.2%	10.9%†
Blood cholesterol					
Prevalence 2003:					
Total cholesterol 200 mg/dL+	99.9 M (49.8%)	51.5 M (50.2%)	52.1%	46.8%	44.8%
Total cholesterol 240 mg/dL+	34.5 M (17.3%)	18.1 M (17.8%)	18.4%	17.4%	13.6%
LDL cholesterol 130 mg/dL+	76.1 M (39.5%)	37.0 M (35.8%)	36.9%	34.5%	31.3%
HDL cholesterol <40 mg/dL	46.0 M (22.6%)	12.8 M (12.6%)	12.4%	11.3%	15.4%
Physical activity††					
Prevalence 2004	30.1%	29.0%	31.8%	19.6%	21.8%†
Overweight and obesity					
Prevalence 2003:					
Overweight BMI 25.0 or higher	136.5 M (65.1%)	66.9 M (61.6%)	57.2%	77.2%	71.7%
Obesity BMI 30.0 or higher	64.0 M (30.4%)	36.1 M (33.2%)	30.7%	49.0%	38.4%
Diabetes mellitus					
Prevalence 2003:					
Physician-diagnosed diabetes	14.1 M (6.7%)	7.1 M (6.3%)	4.7%	12.6%	11.3%
Undiagnosed diabetes	6.0 M (2.9%)	3.0 M (2.7%)	2.7%	6.1%	1.8%
Pre-diabetes	14.7 M (7.0%)	6.1 M (5.4%)	4.6%	5.9%	7.2%
Incidence	1.5 M	. . .	. . .	. . .	. . .
Mortality 2003#	74.0 K	38.7 K	30.2 K	7.4 K	. . .

Note: AP = angina pectoris (chest pain); BMI = body mass index; CHD = coronary heart disease; includes heart attack, angina pectoris (chest pain) or both; CVD = cardiovascular disease; K = thousands; M = millions; MI = myocardial infarction (heart attack); mg/dL = milligrams per deciliter; (. . .) = data not available.

*New and recurrent heart attacks and fatal CHD.

#Preliminary.

†Hispanic

††Regular leisure-time physical activity.

Sources: See summary tables for each chapter in this update. For data on women in other ethnic groups, see other chapters and Statistical Fact Sheets (http://www.americanheart.org/presenter.jhtml?identifier=2007).

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TABLE 15C. Ethnic Groups and Cardiovascular Diseases: At-a-Glance Tables

		Whites		Blacks		Mexican Americans		Hispanics/Latinos	
Diseases and Risk Factors	Total	Males	Females	Males	Females	Males	Females	Males	Females
Total CVD									
Prevalence 2003	71.3 M (34.2%)	34.3%	32.4%	41.1%	44.7%	29.2%	29.3%	...	...
Mortality 2003#	910.6 K	368.2 K	419.2 K	49.0 K	55.8 K	...	...	...	...
Coronary heart disease									
Prevalence 2003 CHD	13.2 M (6.9%)	8.9%	5.4%	7.4%	7.5%	5.6%	4.3%	4.5%	
Prevalence 2003 MI	7.2 M (3.5%)	5.1%	2.4%	4.5%	2.7%	3.4%	1.6%	...	...
Prevalence 2003 AP	6.5 M (3.8%)	4.5%	3.5%	3.1%	4.7%	2.4%	2.2%	...	...
New and recurrent CHD*	1.2 M	650.0 K	425.0 K	65.0 K	60.0 K	...	...	...	...
Mortality 2003 CHD#	479.3 K	216.2 K	205.0 K	24.0 K	24.9 K	...	...	...	...
Mortality 2003 MI#	171.0 K	79.4 K	71.1 K	8.4 K	8.9 K	...	...	...	...
Stroke									
Prevalence 2003	5.5 M (2.6%)	2.3%	2.6%	4.0%	3.9%	2.6%	1.8%	2.2%	
New and recurrent strokes	700.0 K	277.0 K	312.0 K	50.0 K	61.0 K	...	...	...	...
Mortality 2003#	157.8 K	51.8 K	83.2 K	7.8 K	10.8 K	...	...	...	...
High blood pressure									
Prevalence 2003	65.0 M (32.3%)	30.6%	31.0%	41.8%	45.4%	27.8%	28.7%	19.0%	
Mortality 2003#	52.6 K	15.6 K	23.9 K	5.4 K	6.5 K	...	...	...	...
Heart failure									
Prevalence 2003	5.0 M (2.3%)	2.5%	1.9%	3.1%	3.5%	2.7%	1.6%	...	...
Mortality 2003#	57.2 K	18.9 K	33.4 K	2.1 K	3.2 K	...	...	...	...
Tobacco									
Prevalence 2004	44.3 M (20.9%)	24.1%	20.4%	23.9%	20.2%	...	...	18.9%	10.9%
Blood Cholesterol									
Prevalence 2003:									
Total cholesterol 200 mg/dL+	99.9 M (49.8%)	48.9%	52.1%	41.6%	46.8%	51.9%	44.8%	...	...
Total cholesterol 240 mg/dL+	34.5 M (17.3%)	16.5%	18.4%	12.2%	17.4%	16.7%	13.6%	25.6%†	
LDL cholesterol 130 mg/dL+	76.1 M (39.5%)	43.8%	36.9%	36.0%	34.5%	43.7%	31.3%	...	...
HDL cholesterol <40 mg/dL	46.0 M (22.6%)	34.5%	12.4%	22.7%	11.3%	34.4%	15.4%	...	...
Physical activity††									
Prevalence 2004	30.1%	33.4%	31.8%	29.5%	19.6%	...	...	24.9%	21.8%
Overweight and obesity									
Prevalence 2003:									
Overweight BMI 25.0 or higher	136.5 M (65.1%)	69.4%	57.2%	62.9%	77.2%	73.1%	71.7%	38.9%	
Obesity BMI 30.0 or higher	64.0 M (30.4%)	28.2%	30.7%	27.9%	49.0%	27.3%	38.4%	24.7%	
Diabetes mellitus									
Prevalence 2003:									
Physician-diagnosed diabetes	14.1 M (6.7%)	6.2%	4.7%	10.3%	12.6%	10.4%	11.3%	8.6%	
Undiagnosed diabetes	6.0 M (2.9%)	3.0%	2.7%	1.3%	6.1%	3.5%	1.8%	...	...
Pre-diabetes	14.7 M (7.0%)	8.6%	4.6%	8.3%	5.9%	8.7%	7.2%	...	...
Incidence	1.5 M	...	...	...	...	...	...	...	...
Mortality 2003#	74.0 K	28.8 K	30.2 K	5.4 K	7.4 K	...	...	...	...

Note: AP = angina pectoris (chest pain); BMI = body mass index; CHD = coronary heart disease; includes heart attack, angina pectoris (chest pain) or both; CVD = cardiovascular disease; K = thousands; M = millions; MI = myocardial infarction (heart attack); mg/dL = milligrams per deciliter; (...) = data not available.

*New and recurrent heart attacks and fatal CHD.

#Preliminary.

†BRFSS (1997). *MMWR*, Vol. 49, No. SS-2, March 24, 2000.

††Regular leisure-time physical activity.

Sources: See summary tables for each chapter in this update. For data on other ethnic groups, see other chapters and Statistical Fact Sheets (http://www.americanheart.org/presenter.jhtml?identifier=2007).

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TABLE 15D. Children, Youth, and Cardiovascular Diseases: At-a-Glance Table

Diseases and Risk Factors	Total	Total Males	Total Females	Whites		Blacks		Mexican Americans	
				Males	Females	Males	Females	Males	Females
Congenital CV defects									
Mortality 2002 (all ages)	4.2 K	2.2 K	2.0 K	1.7 K	1.6 K	0.4 K	0.3 K	...	...
Mortality 2002 (< age 15)	2.1 K	1.2 K	0.9 K	0.9 K	0.7 K	0.2 K	0.2 K	...	...
Tobacco									
Prevalence ages 12–17:									
Current cigarette use 1999–2001	...	13.3%	14.2%	14.9%	17.2%	8.2%	5.9%	11.4%	10.6%
High school students grades 9–12:									
Current cigarette smoking 2003	...	21.8%	21.9%	23.3%	26.6%	19.3%	10.8%	19.1%*	17.7%*
Current cigar smoking 2003	...	19.9%	9.4%	21.3%	8.6%	19.5%	10.3%	14.9%*	12.2%*
Smokeless tobacco use 2003	...	11.0%	2.2%	13.2%	1.6%	4.1%	2.0%	6.1%*	3.3%*
Blood cholesterol									
Ages 4–19:									
Mean total cholesterol mg/dL	165	163	167	162	166	168	171	163	165
Mean HDL cholesterol mg/dL	...	...	...	48	50	55	56	51	52
Ages 12–19:									
Mean LDL cholesterol mg/dL	...	...	...	91	100	99	102	93	92
Physical activity†									
Prevalence 2003 grades 9–12:									
Vigorous activity last 7 days	62.6%	70.0%	55.0%	71.9%	58.1%	65.0%	44.9%	66.7%*	51.8%*
Moderate activity last 7 days	24.7%	27.2%	22.1%	28.9%	23.3%	25.8%	17.5%	23.3%*	20.6%*
Overweight									
Prevalence 2003:									
Preschool children ages 2–5††	>10%	...	...	8.6%		8.8%		13.1%	
Children ages 6–11	3.8 M (15.8%)	2.1 M (16.9%)	1.7 M (14.7%)	14.0%	13.1%	17.0%	22.8%	26.5%	17.1%
Adolescents ages 12–19	5.3 M (16.1%)	2.8 M (16.7%)	2.5 M (15.4%)	14.6%	12.7%	18.7%	23.6%	24.7%	19.9%
Students grades 9–12	13.5%	17.4%	9.4%	16.2%	7.8%	19.5%	15.6%	21.7%*	11.8%*

Note: K = thousands; M = millions; mg/dL = milligrams per deciliter; overweight in children is body mass index (BMI) 95th percentile of the CDC 2000 growth chart; (...) = data not available.

*Hispanic

†Regular leisure-time physical activity.

††1999–2002.

Sources: See summary tables for related chapters in this update. For more data on congenital defects, see Chapter 6, and our Statistical Fact Sheet, Congenital Cardiovascular Defects (http://www.americanheart.org/presenter.jhtml?identifier=3020898).

(<40 mg/dL [0.9 mmol/L] in men or <50 mg/dL [1.1 mmol/L] in women or drug treatment for reduced HDL cholesterol); elevated blood pressure (≥130 mm Hg systolic blood pressure or ≥85 mm Hg diastolic blood pressure or drug treatment for hypertension); elevated fasting glucose (≥100 mg/dL or drug treatment for elevated glucose). *According to criteria established by the American Heart Association/National Heart, Lung, and Blood Institute, in "Diagnosis and Management of the Metabolic Syndrome: An American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement," published in *Circulation*. (2005, Vol. 112, pages 2735-2752)

- **Morbidity—**Incidence and prevalence rates are both measures of morbidity, that is, measures of various effects of disease on a population.
- **Mortality—**The total number of deaths from a given disease in a population during a specific interval of time, usually a year. These data are compiled from death certificates and sent by state health agencies to the NCHS. The process of verifying and tabulating the data takes about two years. For example, 2002 mortality statistics, the latest available, didn't become available until late 2004. Mortality is "hard" data, so it's possible to do time-trend analysis and compute % changes over time.
- **National Heart, Lung, and Blood Institute (NHLBI)—**An institute in the National Institutes of Health in the US Department of Health and Human Services. The NHLBI conducts such studies as the:
  - *–Framingham Heart Study (FHS) (1948 to date).*
  - *–Honolulu Heart Program (HHP) (1965–97).*
  - *–Cardiovascular Health Study (CHS) (1988 to date).*
  - *–Atherosclerosis Risk in Communities (ARIC) study (1985 to date).*
  - *–Strong Heart Study (SHS) (1989–92; 1991–98).*

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- The NHLBI also publishes: The reports of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. JNC 7 is the most recent. The report of the National Cholesterol Education Program, Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III, or ATP III).
- **National Institute of Neurological Disorders and Stroke (NINDS)—**An institute in the National Institutes of Health in the US Department of Health and Human Services. The NINDS sponsors and conducts research studies such as these:
  - *–Greater Cincinnati/Northern Kentucky Stroke Study (GCNKSS)*
  - *–Rochester (Minnesota) Stroke Epidemiology Project*
  - *–Northern Manhattan Stroke Study (NOMASS)*
  - *–Brain Attack Surveillance in Corpus Christi (BASIC) Project*
- **Prevalence—**An estimate of the total number of cases of a disease existing in a population at a specific point in time. Prevalence is sometimes expressed as a percentage of population. Rates for specific diseases are calculated from periodic health examination surveys that government agencies conduct. Annual changes in prevalence as reported in this booklet only reflect changes in the population; **rates do not change until there's a new survey.**
- **NOTE: In the data tables which precede the different disease and risk factor categories, if the percentages shown are age-adjusted, they will not add to the total.**
- **Race and Hispanic Origin—**Race and Hispanic origin are reported separately on death certificates. In this publication, unless otherwise specified, deaths of Hispanic origin are included in the totals for whites, blacks, American Indians or Alaska Natives and Asian or Pacific Islanders, according to the race listed on the decedent's death certificate. Data for Hispanic persons include all persons of Hispanic origin of any race. See "Hispanic Origin" in this Glossary.
- **Stroke (ICD/10 codes I60–I69)—**This category includes subarachnoid hemorrhage (I60); intracerebral hemorrhage (I61); other nontraumatic intracranial hemorrhage (I62); cerebral infarction (I63); stroke, not specified as hemorrhage or infarction (I64); occlusion and stenosis of precerebral arteries, not resulting in cerebral infarction (I65); occlusion and stenosis of cerebral arteries, not resulting in cerebral infarction (I66); other cerebrovascular diseases (I67); cerebrovascular disorders in diseases classified elsewhere (I68) and sequalae of cerebrovascular disease (I69).
- **Total Cardiovascular Disease (ICD/10 codes I00–I99, Q20–Q28)—**This category includes rheumatic fever/rheumatic heart disease (I00–I09); hypertensive diseases (I10–I15); ischemic (coronary) heart disease (I20–I25); pulmonary heart disease and diseases of pulmonary circulation (I26–I28); other forms of heart disease (I30–I52); cerebrovascular disease (stroke) (I60–I69); atherosclerosis (I70); other diseases of arteries, arterioles and capillaries (I71–I79); diseases of veins, lymphatics and lymph nodes, not classified elsewhere (I80–I89); and other and unspecified disorders of the circulatory system (I95–I99). When data are available, we include congenital cardiovascular defects (Q20–Q28).

Abbreviation Guide

ACE—angiotensin-converting enzyme
ACS—acute coronary syndrome
ADHERE—Acute Decompensated HEart Failure National REgistry
AED—automated external defibrillator
AF—atrial fibrillation
AHA—American Heart Association
AHRQ—Agency for Healthcare Research and Quality
AIDS—acquired immune deficiency syndrome
AJC—American Journal of Cardiology
AP—angina pectoris
ARIC—Atherosclerosis Risk in Communities
ATP—Adult Treatment Panel
BMI—body mass index
BP—blood pressure
BRFSS—Behavioral Risk Factor Surveillance System
BWIS—Baltimore-Washington Infant Study
CAD—coronary artery disease
CDC—Centers for Disease Control and Prevention
CHD—coronary heart disease
HF—heart failure
CHS—Cardiovascular Health Study
CMS—Centers for Medicare and Medicaid Services
COPD—Chronic obstructive pulmonary disease
CPI—Consumer Price Index
CPR—cardiopulmonary resuscitation
CVD—cardiovascular disease
DVT—deep vein thrombosis
ED—emergency department
EMS—emergency medical services
ER—emergency room
ESRD—end-stage renal disease
FHS—Framingham Heart Study
GCNKSS—Greater Cincinnati/Northern Kentucky Stroke Study
GWTG—Get With The GuidelinesSM
HBP—high blood pressure
HCFA—Health Care Financing Administration
HCUP—Healthcare Cost and Utilization Project
HDL—high-density lipoprotein
HHP—Honolulu Heart Program
HIV—human immunodeficiency virus
ICD—International Classification of Diseases
ICDA—International Classification of Diseases, Adapted
ICH—intracerebral hemorrhage
JACC—Journal of the American College of Cardiology
JAMA—Journal of the American Medical Association
JCAHO—Joint Commission on Accreditation of Health Care Organizations
JNC—Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure
kcal—kilocalories
LDL—low-density lipoprotein
LV—left ventricular
LVEF—left ventricular ejection fraction

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MACDP—Metropolitan Atlanta Congenital Defects Program
MetS—metabolic syndrome
mg/dL—milligrams per deciliter
MI—myocardial infarction
mm Hg—millimeters of mercury
MMWR—Morbidity and Mortality Weekly Report
NCEP—National Cholesterol Education Program
NCHS—National Center for Health Statistics
NCQA—National Committee for Quality Assurance
NEJM—New England Journal of Medicine
NHANES—National Health and Nutrition Examination Survey
NHES—National Health Examination Survey
NHIS—National Health Interview Survey
NHLBI—National Heart, Lung, and Blood Institute
NIDDK—National Institute of Diabetes and Digestive and Kidney Diseases
NIHSS—National Institutes of Health Stroke Scale
NINDS—National Institute of Neurological Disorders and Stroke
NOMASS—Northern Manhattan Stroke Study
NRMI—National Registry of Myocardial Infarction
NVSS—National Vital Statistics System
OR—odds ratio
PA—physical activity
PAD—peripheral arterial disease
PTCA—percutaneous transluminal coronary angioplasty
PE—pulmonary embolism
PTE—pulmonary thromboembolism
PVD—peripheral vascular disease
RF—rheumatic fever
RHD—rheumatic heart disease
RR—relative risk
SAH—subarachnoid hemorrhage
SCD—sudden cardiac death
SES—socioeconomic status
SHS—Strong Heart Study
STEMI—ST elevation myocardial infarction
TIA—transient ischemic attack
UA—unstable angina
UNOS—United Network for Organ Sharing
USDA—United States Department of Agriculture
USDHHS—United States Department of Health and Human Services
VF—ventricular fibrillation
VSD—ventricular septal defect
VTE—venous thromboembolism
WHO—World Health Organization
YLL—years of life lost
YMCLS—Youth Media Campaign Longitudinal Study
YRBS—Youth Risk Behavior Surveillance

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Writing Group Member Name	Employment	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/Advisory Board	Other
Thomas Thom	NHLBI	None	None	None	None	None
Nancy Haase	American Heart Association	None	None	None	None	None
Wayne Rosamond	UNC	None	None	None	None	None
Virginia J. Howard	University of Alabama at Birmingham	NIH, NINDS	None	None	None	Amgen
John Rumsfeld	University of Colorado at Denver and Health Sciences	None	None	None	Pfizer, Inc, CV Therapeutics, Inc., United Healthcare	None
Teri Manolio	NIH	None	None	None	None	None
Zhi-Jie Zheng	CDC	None	None	None	None	None
Katherine Flegal	CDC	None	None	None	None	None
Christopher O'Donnell	NHLBI	None	None	None	None	None
Steven Kittner	University of Maryland School of Medicine	None	None	None	None	None
Donald M. Lloyd-Jones	Northwestern University Feinberg School of Medicine	None	Pfizer	None	Pfizer, Novartis	None
David Goff	Wake Forest University	None	Pfizer	None	Pfizer	None
Yuling Hong	American Heart Association	None	None	None	None	None

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Correction

In the article "Heart Disease and Stroke Statistics—2006 Update: A Report From the American Heart Association Statistics Committee and Stroke Statistics Subcommittee," by Thomas Thom et al, which published online before print on January 11, 2006, and appeared in the February 14, 2006, issue of *Circulation* (*Circulation*. 2006;113:e85–e151), the following items require correction:

1. In the third footnote of Table 5A on page e109, the text "NHANES (1999–2002), Fields et al,[145] and NHLBI; data are age-adjusted for age 20 and older" should be replaced by "Numbers of persons are from NHANES (1999–00), Fields et al[145]; age-adjusted rates for age 20 and older were computed by NHLBI from NHANES 1999–2002," to read: "Sources: Prevalence: Numbers of persons are from NHANES (1999–00), Fields et al[145]; age-adjusted rates for age 20 and older were computed by NHLBI from NHANES 1999–2002. Estimates from NHANES 1999–2002 applied to 2003 population estimates. **NHIS (2003), CDC/NCHS; data are estimates for Americans age 18 and older. Mortality: CDC/NCHS; these data represent underlying cause of death only; data for white and black males and females include Hispanics. Hospital discharges: National Hospital Discharge Survey, CDC/NCHS; data include people discharged alive and dead. Cost: NHLBI; data include estimated direct and indirect costs for 2006."

2. In the first footnote of Table 9G on page e129, "100" should be replaced by "110," to read: "Note: Undiagnosed diabetes is defined here for those whose fasting glucose is 126 mg/dL or higher but who did not report being told they had diabetes by a health care provider. Pre-diabetes is a fasting blood glucose of 110 to less than 126 mg/dL (impaired fasting glucose). Pre-diabetes also includes impaired glucose tolerance."

In addition, Table 13B contained several errors that were corrected in a previous erratum (*Circulation*. 2006;113:696). All of these errors have been corrected in the current online version of the article.

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Correction

In "Heart Disease and Stroke Statistics—2006 Update: A Report From the American Heart Association Statistics Committee and Stroke Statistics Subcommittee," by Thomas Thom et al, which published online before print on January 11, 2006, and appeared in the February 14, 2006, issue of *Circulation* (*Circulation*. 2006;113:e85–e151), two errors occurred in Table 13B. In the corrected table shown below, the "Stenting" row has been replaced with new data, and a new footnote [footnote (g)] has been added. A revised version of this article has been posted online. (The original version of the article is available at the "All Versions of this Article" link for reference; select CIRCULATIONAHA.105.171600v1.)

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TABLE 13B. Estimated* Inpatient Cardiovascular Operations, Procedures and Patient Data by Sex, Age and Region—United States: 2003 (in Thousands)

			Sex		Age				Region#			
Operations/Procedures/Patients (ICD/9 Code)		Total	Male	Female	<15	15–44	45–64	≥65	Northeast	Midwest	South	West
Angioplasty (36.0)	Procedures	1244	812	431	. . .	73	524	646	201	352	454	238
PCI (36.01, .02, .05) **(a) (f)**	Procedures	664	430	220	. . .	33	278	342	106	187	240	122
	Patients	652	422	230	. . .	38	274	340	107	183	237	125
Stenting (36.06, .07) **(g)**	Procedures	574	378	196	. . .	34	244	296	93	160	210	111
Cardiac revascularization (bypass)												
(36.1–36.3) **(b)**	Procedures	467	346	121	. . .	14	196	257	95	104	185	83
	Patients	268	196	71	. . .	9	110	149	53	60	108	46
Diagnostic cardiac catheterizations												
(37.2) **(a)**	Procedures	1414	874	540	14	116	582	702	253	344	563	254
Endarterectomy (38.12)	Procedures	117	73	45	. . .	. . .	30	87	22	25	54	17
Implantable defibrillators (37.94–.99)	Procedures	64	50	11	. . .	. . .	18	32	12	13	22	8
Open-heart surgery **(c)**	Procedures	666	460	208	30	33	250	348	141	140	252	122
Pacemakers (37.8) **(d)**	Procedures	197	89	107	. . .	. . .	23	169	48	41	71	37
Valves (35.1, .2, .99) **(e)**	Procedures	95	54	42	. . .	6	27	53	20	14	33	24
Total vascular and cardiac surgery and Procedures (35–39)**		**6821**	**3929**	**2892**	**229**	**647**	**2414**	**3530**	**1323**	**1508**	**2640**	**1350**

Note: (. . .) = data not available.

*Breakdowns are not available for some procedures, so entries for some categories don't add to totals. These data include codes where the estimated number of procedures is fewer than 5000. Categories of such small numbers are considered unreliable by CDC/NCHS and in some cases may have been omitted.

**Totals include procedures not shown here.

#Regions: Northeast — Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont; Midwest — Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin; South — Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia; West — Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

(a) Does not include procedures in the outpatient or other non-hospitalized setting; thus, excludes some cardiac catheterizations and PCIs.

(b) Because one or more procedure codes are required to describe the specific bypass procedure performed, it's impossible from this (mixed) data to determine the average number of grafts per patient.

(c) Includes valves, bypass and 104 000 "other" open-heart procedures (Codes 35 [less 35.1–35.2, 35.4, 35.96, 35.99]; 36 [less 36.0–36.1]; 37.1, 37.3–37.5).

(d) There are additional insertions, revisions and replacements of pacemaker leads, including those associated with temporary (external) pacemakers.

(e) Open heart valvuloplasty without replacement; replacement of heart valve; other operations on heart valves.

(f) Previously referred to as PTCA.

(g) 36.06: insertion of non–drug-eluting stents; 36.07: insertion of drug-eluting stents.

Source: Hospital Care Statistics Branch, CDC/NCHS. Estimates are based on a sample of inpatient records from short-stay hospitals in the United States (National Hospital Discharge Survey).

Note: These data do not reflect any procedures performed on an outpatient basis. Many more procedures are being performed on an outpatient basis. Some of the lower numbers in the table probably reflect this trend. Outpatient procedure data are not available at this time.

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