Heart Disease and Stroke Statistics—2009 Update

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

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Acknowledgments

We thank Drs Sean Coady, Eric L. Ding, Brian Eigel, Gregg C. Fonarow, Linda Geiss, Cherie James, Michael Mussolino, and Michael Wolz for their valuable comments and contributions. We

*The findings and conclusions of this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention. The 2009 Update is available online at http://circ.ahajournals.org/cgi/content/full/119/3/e21.

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.

A copy of the statement is available at http://www.americanheart.org/presenter.jhtml?identifier=3003999 by selecting either the "topic list" link or the "chronological list" link (LS-1992). To purchase additional reprints, call 843-216-2533 or e-mail kelle.ramsay@wolterskluwer.com.

(*Circulation.* 2009;119:480-486.)

***Circulation* is available at http://circ.ahajournals.org** **DOI: 10.1161/CIRCULATIONAHA.108.191259**

acknowledge Tim Anderson and Tom Schneider for their editorial contributions, and Karen Modesitt for her administrative assistance.

Summary

Each year, the American Heart Association, in conjunction with the Centers for Disease Control and Prevention, the National Institutes of Health, and other government agencies, brings together the most up-to-date statistics on heart disease, stroke, other vascular diseases, and their risk factors and presents them in its Heart Disease and Stroke Statistical Update. The Statistical Update is a valuable resource for researchers, clinicians, healthcare policy makers, media professionals, the lay public, and many others who seek the best national data available on disease morbidity and mortality and the risks, quality of care, medical procedures and operations, and costs associated with the management of these diseases in a single document. This year's edition includes several areas not covered in previous editions. Below are a few highlights from this year's Update.

Death Rates From Cardiovascular Disease Have Declined, Yet the Burden of Disease Remains High

- The 2005 overall death rate from cardiovascular disease (CVD) (*International Classification of Diseases 10*, I00–I99) was 278.9 per 100 000. The rates were 324.7 per 100 000 for white males, 438.4 per 100 000 for black males, 230.4 per 100 000 for white females, and 319.7 per 100 000 for black females. From 1995 to 2005, death rates from CVD declined 26.4%. Preliminary mortality data for 2006 show that CVD (I00–I99; Q20–Q28) accounted for 34.2% (829 072) of all 2 425 900 deaths in 2006, or 1 of every 2.9 deaths in the United States.
- On the basis of 2005 mortality rate data, nearly 2400 Americans die of CVD each day—an average of 1 death every 37 seconds. The 2006 overall preliminary death rate from CVD was 262.9. More than 150 000 Americans killed by CVD (I00–I99) in 2005 were <65 years of age. In 2005, 32% of deaths from CVD occurred before the age of 75 years, which is well before the average life expectancy of 77.9 years.
- Coronary heart disease (CHD) caused about 1 of every 5 deaths in the United States in 2005. CHD mortality in 2005 was 445 687. In 2009, an estimated 785 000 Americans will have a new coronary attack, and about 470 000 will have a recurrent attack. It is estimated that an additional 195 000 silent first myocardial infarctions occur each year. About every 25 seconds, an American will have a coronary event, and about every minute someone will die from one.
- Each year, about 795 000 people experience a new or recurrent stroke. About 610 000 of these are first attacks, and 185 000 are recurrent attacks. Preliminary data from 2006 indicate that stroke accounted for about 1 of every 18 deaths in the United States. On average, every 40 seconds someone in the United States has a stroke. From 1995 to 2005, the stroke death rate fell 29.7%, and the actual number of stroke deaths declined 13.5%.
- In 2005, 1 in 8 death certificates (292 214 deaths) in the United States mentioned heart failure.

Control of Risk Factors Remains an Issue for Many Americans

- Data from the National Health and Nutrition Examination Survey 2005–2006 found that between 1999–2000 and 2005–2006, mean serum total cholesterol levels in adults ≥20 years of age declined from 204 mg/dL to 199 mg/dL. This decline was observed for men ≥40 years of age and for women ≥60 years of age. There was little change over this time period for other sex/age groups. In 2005–2006, approximately 65% of men and 70% of women had been screened for high cholesterol in the previous 5 years. In 2005–2006, 16% of adults had serum total cholesterol levels of ≥240 mg/dL.
- Despite recommendations that some proportion of activity be vigorous (activity that causes heavy sweating and a large increase in breathing and/or heart rate), 62% of adults >18 years of age who responded to the 2006 National Health Interview Survey reported no vigorous activity lasting >10 minutes per session.
- On the basis of data from the National Health and Nutrition Examination Survey (National Center for Health Statistics), the prevalence of overweight (body mass index–for–age values at or above the 95th percentile) in children 6 to 11 years of age increased from 4.0% in 1971–1974 to 17.0% in 2003–2006. The prevalence of body mass index–for–age values at or above the 95th percentile in adolescents 12 to 19 years of age increased from 6.1% to 17.6% in that same time frame. Among infants and children between the ages of 6 and 23 months, the prevalence of high weight-for-age was 7.2% in 1976–1980 and 11.5% in 2003–2006 (National Health and Nutrition Examination Survey, National Center for Health Statistics).
- Just over 12% of preschool children 2 to 5 years of age were overweight in 2003–2006.

The 2009 Update Expands Data Coverage of Congenital Cardiovascular Defects and Nutritional/Dietary Intake and Adds a New Chapter on Epidemiology and Statistics of Subclinical Atherosclerosis and a Subsection on Family History of CVD

Several chapters and sections that have been added or revised for this year's Update merit specific mention. First, we have added a new chapter (Chapter 3) that describes the epidemiology of subclinical atherosclerosis. It has been known for decades that atherosclerosis, the underlying cause of the majority of clinical CVD events, is typically present for decades before the onset of a clinical CVD event or symptoms. As discussed in Chapters 2 and 4, the initial manifestation of clinical atherosclerotic CVD too often is a fatal event, such as sudden cardiac death, or a devastating nonfatal event, such as a large nonfatal myocardial infarction or a disabling stroke. Advances in imaging technology over the past several decades have made it possible to detect and evaluate the burden of subclinical atherosclerosis in a variety of different vascular beds. Two modalities, ultrafast com-

puted tomography for imaging of coronary artery calcification (CAC) and B-mode ultrasound for measurement of carotid intima-media thickness (IMT), have been studied widely in diverse population samples and have greatly enhanced our understanding of the development and progression of subclinical atherosclerosis, as well as its relationship to subsequent clinical events. The American Heart Association Statistics Committee felt that, given the extensive literature in this area and the increasing consideration of use of these modalities in clinical practice, it was time to provide a review of the epidemiological data from representative, nonreferral population samples to provide a measure of context for the data on subclinical atherosclerosis in the scientific and lay media.

For example, the National Heart, Lung, and Blood Institute's Coronary Artery Risk Development in Young Adults (CARDIA) study and Multi-Ethnic Study of Atherosclerosis (MESA) have helped to define age-, sex-, and race-specific levels of CAC in a diverse population. In younger adults in CARDIA, 33 to 45 years of age, 15.0% of men and 5.1% of women already had CAC, and 1.6% had a CAC score >100. Among older adults in MESA, the prevalence and 75th percentile levels of CAC were highest in white men and lowest in black and Hispanic women, as shown in Table 3-1 in Chapter 3. Significant ethnic differences persisted after adjustment for risk factors, with the relative risk of having CAC being 22% lower in blacks, 15% lower in Hispanics, and 8% lower in Chinese, as compared with whites. Longitudinal data from MESA also highlight the risks associated with the presence and extent of CAC. Chart 3-3 in Chapter 3 shows the relative risks or hazard ratios associated with CAC scores of 1 to 100, 101 to 300, and >300 compared with those without CAC (score=0), after adjustment for standard risk factors. Persons with CAC scores of 1 to 100 were approximately 4 times more likely and those with CAC scores >100 were 7 to 10 times more likely to suffer a coronary event than those without CAC.

Carotid IMT, in the absence of frank atherosclerotic plaque, is thought to represent an earlier and more continuous manifestation of atherosclerosis than CAC. Analyses from the Bogalusa Heart Study, CARDIA, MESA, and the Cardiovascular Health Study have helped to describe the epidemiology of carotid IMT across the spectra of age, sex, and race. Concurrent levels of risk factors in young adulthood and early levels of risk factors, even those measured in people 4 to 17 years of age, were significantly associated with carotid IMT at a mean age of 32 years. Higher body mass index and low-density lipoprotein cholesterol levels measured at 4 to 17 years of age were associated with increased risk for being above the 75th percentile for carotid IMT later on in young adulthood. Higher systolic blood pressure and low-density lipoprotein cholesterol and lower high-density lipoprotein cholesterol in young adulthood were also associated with having high carotid IMT. These data highlight the importance of adverse risk factor levels and obesity in early childhood and young adulthood in the early development of atherosclerosis. In the Cardiovascular Health Study, among older Americans, after a mean follow-up of 6.2 years, those with maximal carotid IMT in the highest quintile had a 4- to 5-fold greater risk for incident heart attack or stroke than that of those in the bottom quintile. After adjustment for other risk factors, there was still a 2- to 3-fold greater risk for the top versus the bottom quintile. These data should help to provide some context for physicians and patients to help understand the evolving roles of subclinical atherosclerosis imaging in research and clinical practice.

As in prior years, we continue to highlight (in Chapter 2) the importance of maintaining low risk factor burden through young adulthood to middle and older ages. An extensive body of literature has demonstrated that individuals who survive to middle age (eg, age 50) without developing traditional CVD risk factors, such as hypercholesterolemia, hypertension, diabetes, or smoking, enjoy a broad array of health benefits, including substantially greater longevity, substantially reduced short- and long-term and remaining lifetime risks for CVD events even in the face of greater longevity, lower risks for both CVD death and non-CVD death, better health-related quality of life in older age, and substantially reduced total and annual Medicare expenditures.

A new section in Chapter 2 also highlights some of the increasing knowledge available about the complex association between family history of CVD and future risk for CVD among offspring and siblings. In future updates, we anticipate including greatly expanded information and discussion of results from genetic studies that may help elucidate novel underlying mechanisms and pathways of atherosclerosis and CVD development.

The chapter on congenital cardiovascular disease (Chapter 7) has been completely revised to provide updated and more useful information. Whereas surveillance for congenital heart defects is incomplete, these data reflect more contemporary estimates and represent the best available data. For example, on the basis of present estimates, 9 congenital heart defects per 1000 live births, or 36 000 infants born with congenital heart defects, are expected in the United States per year. 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.

We have substantially revised and updated the chapter (Chapter 17) describing current nutritional intake data, trends and changes in intakes, estimated effects on cardiovascular risk factors and cardiovascular outcomes, and current costs and trends for all foods. New tables and charts added to the chapter this year include: Table 17-1, on dietary consumption by US adults (>20 years of age) of selected foods and nutrients related to cardiometabolic health; Table 17-2, on dietary consumption by US children and teenagers of selected foods and nutrients related to cardiometabolic health; Chart 17-1, on age-adjusted trends in macronutrients and total calories consumed by US adults (20 to 74 years of age); Chart 17-2, on per capita calories consumed from different beverages by US adults (≥19 years of age); and Chart 17-3, on total US food expenditures away from home and at home.

Reporting and monitoring quality-of-care measures stratified by patient's race/ethnicity and sex are important steps toward addressing disparities in health care through organizational quality improvement. In Chapter 18, new data on quality of care and quality-of-care measures stratified by race/ethnicity and sex, are reported for hospitals participating in Get With The Guidelines from January 1, 2007, through December 31, 2007 (Tables 18-3, 18-9, and 18-10) for the first time in our annual Statistics Update.

Other new data that are of note in this year's Update include:

- The 10 leading diagnoses from the National Hospital Discharge Survey (Chapter 2).
- Extent of awareness, treatment, and control of high blood pressure, by race/ethnicity and sex (Chapter 6).
- Trends in the prevalence of total serum cholesterol in adults ≥20 years of age, by sex and race/ethnicity (Chapter 11).
- Prevalence of students in grades 9 through 12 who did not meet currently recommended levels of moderate-to-vigorous physical activity during the past 7 days, by race/ethnicity and sex (Chapter 12).
- Prevalence of children 6 to 19 years of age who attained sufficient moderate-to-vigorous physical activity to meet public health recommendations of ≥60 minutes per day on ≥5 of 7 days, by sex and age (Chapter 12).
- Trends in diabetes prevalence in adults ≥20 years of age, by sex (Chapter 14).
- Number of surgical procedures in the 10 leading diagnostic groups (Chapter 19).
- Direct costs of the 10 leading diagnostic groups (Chapter 20).

The American Heart Association, through its Statistics Committee, continuously monitors and evaluates sources of data on heart disease and stroke in the United States to provide the most current data available in the Statistics Update. The 2006 preliminary mortality data have been released. More information can be found at the National Center for Health Statistics Web site, http://www.cdc.gov/nchs/data/nvsr/nvsr56/nvsr56_16.pdf.

Finally, it must be noted that this annual Update is the product of an entire year's worth of effort by dedicated professionals, volunteer physicians and scientists, and outstanding American Heart Association staff members, without whom publication of this valuable resource would be impossible. Their contributions are gratefully acknowledged.

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On behalf of the American Heart Association Heart Disease and Stroke Statistics Writing Group

Disclosures

Writing Group Disclosures

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/Honoraria	Expert Witness	Ownership Interest	Consultant/ Advisory Board	Other
Donald Lloyd Jones	Northwestern	NIH/NHLBI†	None	Pfizer* (educational honoraria)	None	None	Abbott*	None
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Nancy Haase	American Heart Association	None	None	None	None	None	None	None
Susan Hailpern	Northrop Grumman	None	None	None	None	None	None	None

(*Continued*)

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Yuling Hong	American Heart Association	None	None	None	None	None	None	None
Virginia Howard	University of Alabama at Birmingham	Co-investigator, Etiology of Geographic and Racial Differences in Stroke (REGARDS) NIH/NINDS U01 NS041588†; Carotid Revascularization Endarterectomy vs. Stenting Trial (CREST) NIH/NINDS R01 NS 38384†	None	None	None	None	None	None
Brett Kissela	University of Cincinnati	NIH-NINDS R-01 NS30678, "Hemorrhagic and Ischemic Strokes Among Blacks and Whites"†; NIH-NINDS R-01 NS039987, "Siblings with Ischemic Stoke Study (SWISS)" (James Meschia, PI)†; NIH-NINDS U-01 NS041588, "Etiology of Geographic and Racial Differences in Stroke"; (REasons for Geographic and Racial Differences in Stroke, or REGARDS Study) (George Howard, PI)†	None	Boehringer-Ingelheim†	Has served as an expert witness and performed record review for medicolegal cases related to stroke*	None	Advisor to Northstar Neuroscience, Inc (without pay)*	None
Steven Kittner	University of Maryland School of Medicine/Baltimore Department of Veterans Affairs Medical Center	AHA Grant-in-Aid†; NIH grant†	None	Grand Rounds presentations at a variety of medical institutions on topics relating to stroke epidemiology and prevention*	None	None	None	None
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(*Continued*)

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Wayne Rosamond	University of North Carolina	None	None	None	None	None	None	None
Ralph Sacco	University of Miami Medical School	NINDS R37 29993 Northern Manhattan Study†; NINDS R01 040807 Family Study of Stroke Risk and Carotid Atherosclerosis†	None	Boehringer Ingelheim*; sanofi-aventis*	None	None	Boehringer Ingelheim for design of clinical trial on stroke prevention†; GlaxoSmithKline*; sanofi-aventis*	None
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(*Continued*)

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This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives $10 000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $10 000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

*Modest.

†Significant.

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Circulation. 2009;119:480-486
doi: 10.1161/CIRCULATIONAHA.108.191259
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

Print ISSN: 0009-7322. Online ISSN: 1524-4539

Correction

In the AHA Statistical Update by Lloyd-Jones et al, "Heart Disease and Stroke Statistics—2009 Update: A Report From the American Heart Association Statistics Committee and Stroke Statistics Subcommittee," which published ahead of print December 15, 2008, and appears in this issue (*Circulation.* 2009;119:480–486, e21–e181), several corrections were needed.

1. On pages 480 and e21, Dr Stafford's first name was misspelled and several degrees were not included. It has been updated to read: Randall Stafford, MD, PhD, FAHA.
2. On pages 480 and e21, Michael Mussolino has been added to the Acknowledgments section.
3. On pages 485 and e26, Dr Stafford's first name was misspelled in the disclosure table. It has been updated to read, "Randall Stafford."
4. In chapter 2, references 70 to 75 were inadvertently duplicated. This error has been corrected.
5. In chapters 2, 13, 14, 15, and 18, the definition for "kg/m^2" in the abbreviations tables has been standardized to read, "kilograms per square meter."
6. On page e160, in the abbreviations table, "mm/dL" has been changed to "mg/dL."
7. On page e170, in Table 19-2, the sixth and tenth footnotes ("‖Previously referred to as percutaneous transluminal coronary angioplasty or PTCA" and "††There are additional insertions, revisions, and replacements of pacemaker leads, including those associated with temporary (external) pacemakers") were deleted and the corresponding symbols were removed from the table. In the eighth footnote (denoted with a #), angioplasty was changed to PCI.
8. On page e171, chart 19-3, in the legend, "millions of discharges" has been changed to "millions of procedures."
9. On page e173, chart 20-2, in the legend, "(billions of dollars)" has been inserted after "groups."

DOI: 10.1161/CIRCULATIONAHA.108.191898

(*Circulation.* 2009;119:e182.)

***Circulation* is available at http://circ.ahajournals.org**