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Executive Summary

Permalink

<https://escholarship.org/uc/item/0dn7011j>

Journal

Circulation, 133(4)

ISSN

0009-7322

Authors

Mozaffarian, Dariush
Benjamin, Emelia J
Go, Alan S
et al.

Publication Date

2016-01-26

DOI

10.1161/cir.0000000000000366

Peer reviewed

Executive Summary: Heart Disease and Stroke Statistics—2016 Update

A Report From the American Heart Association

WRITING GROUP MEMBERS

Dariusz Mozaffarian, MD, DrPH, FAHA; Emelia J. Benjamin, MD, ScM, FAHA; Alan S. Go, MD; Donna K. Arnett, PhD, MSPH, FAHA; Michael J. Blaha, MD, MPH; Mary Cushman, MD, MSc, FAHA; Sandeep R. Das, MD, MPH; Sarah de Ferranti, MD, MPH; Jean-Pierre Després, PhD, FAHA; Heather J. Fullerton, MD, MAS; Virginia J. Howard, PhD, FAHA; Mark D. Huffman, MD, MPH, FAHA; Carmen R. Isasi, MD, PhD; Monik C. Jiménez, ScD; Suzanne E. Judd, PhD; Brett M. Kissela, MD, MS, FAHA; Judith H. Lichtman, PhD, MPH; Lynda D. Lisabeth, PhD, MPH, FAHA; Simin Liu, MD, ScD, FAHA; Rachel H. Mackey, PhD, MPH, FAHA; David J. Magid, MD, MPH; Darren K. McGuire, MD, MHSc, FAHA; Emile R. Mohler III, MD, FAHA; Claudia S. Moy, PhD, MPH; Paul Muntner, PhD; Michael E. Mussolino, PhD, FAHA; Khurram Nasir, MD, MPH; Robert W. Neumar, MD, PhD; Graham Nichol, MD, MPH, FAHA; Latha Palaniappan, MD, MS, FAHA; Dilip K. Pandey, MD, PhD, FAHA; Mathew J. Reeves, PhD, FAHA; Carlos J. Rodriguez, MD, MPH, FAHA; Wayne Rosamond, PhD, FAHA; Paul D. Sorlie, PhD; Joel Stein, MD; Amytis Towfighi, MD; Tanya N. Turan, MD, MSCR, FAHA; Salim S. Virani, MD, PhD; Daniel Woo, MD, MS, FAHA; Robert W. Yeh, MD, MSc, FAHA; Melanie B. Turner, MPH; on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee

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The 2016 Statistical Update full text is available online at <http://circ.ahajournals.org/lookup/doi/10.1161/CIR.0000000000000350>.

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The American Heart Association requests that this document be cited as follows: Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, Das SR, de Ferranti S, Després J-P, Fullerton HJ, Howard VJ, Huffman MD, Isasi CR, Jiménez MC, Judd SE, Kissela BM, Lichtman JH, Lisabeth LD, Liu S, Mackey RH, Magid DJ, McGuire DK, Mohler ER III, Moy CS, Muntner P, Mussolino ME, Nasir K, Neumar RW, Nichol G, Palaniappan L, Pandey DK, Reeves MJ, Rodriguez CJ, Rosamond W, Sorlie PD, Stein J, Towfighi A, Turan TN, Virani SS, Woo D, Yeh RW, Turner MB; on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Executive summary: heart disease and stroke statistics—2016 update: a report from the American Heart Association. *Circulation*. 2016;133:447-454.

A copy of the document is available at <http://my.americanheart.org/statements> by selecting either the “By Topic” link or the “By Publication Date” link. To purchase additional reprints, call 843-216-2533 or e-mail kelle.amsay@wolterskluwer.com.

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(*Circulation*. 2016;133:447-454. DOI: 10.1161/CIR.0000000000000366.)

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Circulation is available at <http://circ.ahajournals.org>

DOI: 10.1161/CIR.0000000000000366

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Summary

Each year, the American Heart Association (AHA), 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 related to heart disease, stroke, and other cardiovascular and metabolic diseases and presents them in its Heart Disease and Stroke Statistical Update. The Statistical Update represents a critical resource for the lay public, policy makers, media professionals, clinicians, healthcare administrators, researchers, and others seeking the best available data on these conditions. Together, cardiovascular disease (CVD) and stroke produce immense health and economic burdens in the United States and globally. The Statistical Update brings together in a single document up-to-date information on the core health behaviors (including diet, physical activity [PA], smoking, and energy balance) and health factors (including blood pressure, cholesterol, and glucose) that define cardiovascular health; a range of major clinical disease conditions (including stroke, congenital heart disease, rhythm disorders, subclinical atherosclerosis, coronary heart disease, heart failure, valvular disease, and peripheral arterial disease); and the associated outcomes (including quality of care, procedures, and economic costs). Since 2006, the annual versions of the Statistical Update have been cited >28 000 times in the literature. In 2014 alone, the various Statistical Updates were cited >5000 times.

Each annual version of the Statistical Update undergoes major revisions to include the newest nationally representative data, add additional relevant published scientific findings, remove older information, add new sections or chapters, and increase the number of ways to access and use the assembled information. This year-long process, which begins as soon as the previous Statistical Update is published, is performed by the AHA Statistics Committee faculty volunteers and staff. For example, this year's edition includes new data on the monitoring and benefits of cardiovascular health in the population, new metrics to assess and monitor healthy diets, additional information in many chapters on the global CVD and stroke burden, new information on stroke in young adults, a new focus on underserved and minority populations, and further evidence-based approaches to changing behaviors, implementation strategies, and implications of the AHA's 2020 Impact Goals. Below are a few highlights from this year's Update.

Current Status of Cardiovascular Health in the United States (Chapter 2)

- The concept of cardiovascular health represents a heightened focus for the AHA, with 3 central and novel emphases:
 - An expanded focus on not only CVD prevention but also promotion of positive cardiovascular health, in addition to the treatment of established CVD
 - The prioritization of both health behaviors (healthy diet pattern, appropriate energy balance, PA, and nonsmoking) and health factors (optimal blood lipids, blood pressure, glucose levels) throughout the lifespan as primary goals unto themselves
 - Population-level health promotion strategies to shift the majority of the public toward greater cardiovascular health, in addition to targeting those individuals at greatest CVD risk, because CVD occurs at all risk levels across the population and because healthy lifestyles are uncommon throughout the US population
- Among children, the prevalence of ideal levels of cardiovascular health behaviors and factors currently varies from <1% for the healthy diet pattern to >80% for the smoking, blood pressure, and fasting glucose metrics.
- Among US adults, the prevalence of ideal levels of cardiovascular health behaviors and factors currently varies from about 1.5% for the healthy diet pattern to up to 78% for the smoking metric (never having smoked or being a former smoker who has quit for >12 months).
- Fewer children over time are meeting the ideal body mass index metric, whereas more are meeting the ideal smoking and total cholesterol metrics. Other metrics do not show consistent trends over time in children.
- More adults over time are meeting the smoking metric, whereas fewer are meeting the body mass index and glucose metrics. Trends for other metrics are not evident over time in adults.

Effective Approaches to Improve Cardiovascular Health (Chapter 2)

- The current evidence supports a range of complementary strategies to improve cardiovascular health, including the following:
 - Individual-focused approaches, which target lifestyle and treatments at the individual level
 - Healthcare systems approaches, which encourage, facilitate, and reward efforts by providers and patients to improve health behaviors and health factors
 - Population approaches, which target lifestyle and treatments in schools or workplaces, local communities, and states, as well as throughout the nation
- Such approaches can focus on both (1) improving cardiovascular health among those who currently have less than optimal levels and (2) preserving cardiovascular health among those who currently have ideal levels (in particular, children, adolescents, and young adults) as they age.
- The metrics with the greatest potential for improvement are health behaviors, including diet quality, PA, and body weight. However, each of the cardiovascular health metrics can be improved and deserves major focus.

Health Behaviors (Chapters 3 to 6)

Based on comparable risk assessment methods, poor lifestyle behaviors and lifestyle-related risk factors are the foremost causes of death and disability in the United States and in the world.

Smoking/Tobacco Use (Chapter 3)

- Although tobacco use has declined substantially in the United States, it remains the second-leading cause of total deaths and disability. The percentage of adults who reported current cigarette use declined from 24.1% in 1998 to 16.9% in 2014; among high school students, the decline was from 36.4% in 1997 to 5.6% in 2013. Still, almost one third of coronary heart disease deaths are attributable to smoking and exposure to secondhand smoke.
- Declines in tobacco usage in the United States may be threatened by the >450 e-cigarette products that were available in 2014. To date, the risks and benefits of e-tobacco products remain controversial but are an area of intense investigation by scientists, as well as scrutiny by the US Food and Drug Administration. Public health experts are concerned that although e-cigarettes are thought to have a lower risk of harmful effects than conventional cigarettes, they may be a gateway to smoking traditional cigarettes or may promote relapse among former smokers, which could erode gains in the public's awareness of the harms of tobacco products.
- Cigarette smoking is associated with 9% of annual aggregated healthcare spending in the United States. Annual smoking-attributable economic costs in the United States, including direct medical costs and lost productivity, are estimated to exceed \$289 billion.

Physical Inactivity (Chapter 4)

- In 2013, 15.2% of adolescents reported being inactive during the prior week, and inactivity was more likely to be reported by girls (19.2%) than boys (11.2%). Inactivity was more commonly reported by black (27.3%) and Hispanic (20.3%) girls than their white counterparts (16.1%); similarly, black (15.2%) and Hispanic (12.1%) boys reported more inactivity than white boys (9.2%).
- According to 2014 National Health Interview Survey data, only half of American adults met the current aerobic PA guidelines (≥ 150 minutes of moderate PA or 75 minutes of vigorous PA or an equivalent combination each week). Women (47.0%) were less likely to meet the guidelines than men (53.2%), and non-Hispanic blacks (43.5%) and Hispanics (41.3%) were less likely to meet them than non-Hispanic whites (53.5%).
- Unfortunately, the proportion of individuals meeting PA recommendations is likely to be lower than indicated by self-report data. Studies examining actual (with accelerometers, pedometers, etc) versus self-reported PA indicate that both men and women overestimate their PA substantially (by 44% and 138% for men and women, respectively).

Nutrition (Chapter 5)

- The leading risk factor for death and disability in the United States is suboptimal diet quality, which in 2010 led to 678 000 annual deaths attributable to all causes. Major contributors were insufficient intakes of fruits, nuts/seeds, whole grains,

vegetables, and seafood, as well as excess intakes of sodium. In the United States, an estimated 58 000 annual CVD deaths in 2010 were attributable to sodium intake >2.0 g/d, representing 1 in 16 (6.3%) of all CVD deaths and 1 in 8 (13.1%) CVD deaths before age 70 years. Globally, an estimated 1.65 million annual CVD deaths were attributable to sodium intake >2.0 g/d, representing nearly 1 in 10 (9.5%) of all CVD deaths.

- Between 2003 and 2012, certain aspects of diet quality improved in the United States, including increases in whole grains and reductions in sugar-sweetened beverages. The prevalence of both children and adults meeting the dietary goals improved between 2003 to 2004 and 2011 to 2012. The prevalence of ideal levels of diet (healthy diet score >80) increased from 0.2% to 0.6% in children and from 0.7% to 1.5% in adults. During this period, the proportion of youths aged 5 to 19 years with poor scores on the dietary metric for cardiovascular health decreased steadily from 69.2% to 54.6%, whereas for adults, the decrease was from 50.3% to 41.0%.
- Although healthier diets cost modestly more than unhealthful diets, comparing extremes of unhealthful versus healthful food-based diet patterns, the more healthful patterns cost on average $\approx \$1.50$ per day more. Similarly priced options are also common; in a comparison of 20 fruits and vegetables versus 20 common snack foods such as cookies, chips, pastries, and crackers, the average price per portion of fruits and vegetables was 31 cents, with an average of 57 calories per portion, versus 33 cents and 183 calories per portion for snack foods.

Obesity (Chapter 6)

- Although the overall prevalence of obesity in US youth did not change between 2003 to 2004 and 2011 to 2012, the prevalence decreased among those aged 2 to 5 years. Obesity decreased among those of higher socioeconomic status but increased among those of lower socioeconomic status. In addition, the overall prevalence of severe obesity in US youth continued to increase, especially among adolescent boys.
- Overweight and obesity predispose individuals to most major risk factors, including physical inactivity, hypertension, hyperlipidemia, and diabetes mellitus.
- Excess body weight is among the leading causes of death and disability in the United States and globally, with burdens expected to increase in coming years.
- Among overweight and obese individuals, existing cardiometabolic risk factors should be monitored and treated intensively with diet quality, PA, and pharmacological or other treatments as necessary. Each of these interventions provides benefits independent of weight loss and maintenance.
- Estimated mean annual per capita healthcare expenses attributable to obesity are \$1160 for men and \$1525 for women.

Health Factors (Chapters 7 to 12)

The prevalence and control of cardiovascular health factors remains a major issue for many Americans.

Family History and Genetics (Chapter 7)

- Familial aggregation of CVD is related to clustering of specific lifestyle and other risk factors, each of which

has environmental and genetic contributors. Patients with a family history of coronary artery disease have a higher prevalence of traditional CVD risk factors, underscoring opportunities for prevention.

- The risk of most CVD conditions is higher in the presence of a family history, including CVD (45% higher odds with sibling history), stroke (50% higher odds with history in a first-degree relative), atrial fibrillation (AF; 80% higher odds with parental history), heart failure (70% higher odds with parental history), and peripheral arterial disease (80% higher odds with family history). This excess risk reflects genetic, epigenetic, and shared behavioral and environmental risk factors.

High Blood Cholesterol and Other Lipids (Chapter 8)

- 75.7% of children and 46.6% of adults have ideal cholesterol levels (untreated total cholesterol <170 mg/dL for children and <200 mg/dL for adults). Prevalence of ideal levels has improved over the past decade in children but remained the same in adults.
- According to 2009 to 2012 data, >100 million US adults ≥20 years of age have total cholesterol levels ≥200 mg/dL; almost 31 million have levels ≥240 mg/dL.
- During 2003 to 2012, the percentage of adults aged ≥40 years who had used a cholesterol-lowering medication in the past 30 days increased from 20% to 28%.

High Blood Pressure (Chapter 9)

- Based on 2009 to 2012 data, 32.6% of US adults ≥20 years of age have hypertension, which represents ≈80.0 million US adults. African American adults have among the highest prevalence of hypertension in the world. Among non-Hispanic black men and women, the age-adjusted prevalence of hypertension was 44.9% and 46.1%, respectively.
- National Health and Nutrition Examination Survey (NHANES) data from 2009 to 2012 revealed that among US adults with hypertension, 54.1% were controlled, 76.5% were currently treated, 82.7% were aware they had hypertension, and 17.3% were undiagnosed.
- From 2003 to 2013, the death rate attributable to high blood pressure increased 8.2%, and the actual number of deaths rose 34.7% (National Heart, Lung, and Blood Institute tabulation). During this 10-year period, the corresponding values were a 14.4% and 30.9% increase in non-Hispanic whites; a 1.7% and 75.5% increase in Hispanics; and a 9.1% decrease and 18.4% increase in non-Hispanic blacks.

Diabetes Mellitus (Chapter 10)

- Diabetes mellitus affects 1 in 10 US adults, with 90% to 95% of cases being type 2 diabetes mellitus. Diabetes mellitus disproportionately affects racial/ethnic minorities. Type 2 diabetes mellitus is increasingly common in children and adolescents; the disease historically was diagnosed primarily in adults ≥40 years of age. The prevalence of type 2 diabetes mellitus in children/adolescents has increased by 30.5% between 2001 and 2009, and it now constitutes ≈50% of all childhood diabetes mellitus.
- Diabetes mellitus is associated with reduced longevity; men and women with diabetes mellitus live an average of

7.5 and 8.2 years less, respectively, than their counterparts without diabetes mellitus.

Metabolic Syndrome (Chapter 11)

- From 1999 to 2010, the age-adjusted national prevalence of metabolic syndrome in the United States peaked (in 2001–2002) and began to fall. This is attributable to decreases in the age-adjusted prevalence among women and no change in men. In addition, there has been variation in the trends over time for each individual component of the metabolic syndrome. Generally, the national prevalences of hypertriglyceridemia and elevated blood pressure have decreased, whereas hyperglycemia and elevated waist circumference have increased. However, these trends also vary significantly by sex and race/ethnicity.
- Perhaps most importantly with respect to meeting the 2020 goals, the prevalence of metabolic syndrome increases with greater cumulative life-course exposure to sedentary behavior and physical inactivity; screen time, including television viewing; fast food intake; short sleep duration; and intake of sugar-sweetened beverages. Each of these risk factors is reversible with lifestyle change.

Cardiovascular Conditions/Diseases (Chapters 13 to 22)

Rates of death attributable to CVD have declined in the United States, but the burden remains high.

Total Cardiovascular Diseases (Chapter 13)

- The 2013 overall rate of death attributable to CVD was 222.9 per 100 000 Americans. The death rates were 269.8 for males and 184.8 for females. The rates were 270.6 for non-Hispanic white males, 356.7 for non-Hispanic black males, 197.4 for Hispanic males, 183.8 for non-Hispanic white females, 246.6 for non-Hispanic black females, and 136.4 for Hispanic females.
- From 2003 to 2013, death rates attributable to CVD declined 28.8%. In the same 10-year period, the actual number of CVD deaths per year declined by 11.7%. Yet in 2013, CVD still accounted for 30.8% (800 937) of all 2 596 993 deaths, or ≈1 of every 3 deaths in the United States.
- On the basis of 2013 death rate data, >2200 Americans die of CVD each day, an average of 1 death every 40 seconds. Approximately 155 000 Americans who died of CVD in 2013 were <65 years of age. In 2013, 35% of deaths attributable to CVD occurred before the age of 75 years, which is younger than the current average life expectancy of 78.8 years.
- For the first time since 1983, more males (402 851) died of CVD than females (398 086).

Stroke (Chapter 14)

- In 2013, stroke fell from the fourth to the fifth leading cause of death in the United States, behind diseases of the heart, cancer, chronic lower respiratory diseases, and unintentional injury.
- From 2003 to 2013, the relative rate of stroke death fell by 33.7% and the actual number of stroke deaths declined

by 18.2%. Yet each year, $\approx 795\,000$ people continue to experience a new or recurrent stroke (ischemic or hemorrhagic). Approximately 610 000 of these are first events and 185 000 are recurrent stroke events. In 2013, stroke caused ≈ 1 of every 20 deaths in the United States. On average, every 40 seconds, someone in the United States has a stroke, and someone dies of one approximately every 4 minutes.

- The decline in stroke mortality over the past decades, a major improvement in population health observed for both sexes and all race and age groups, has resulted from reduced stroke incidence and lower case fatality rates. The significant improvements in stroke outcomes are concurrent with cardiovascular risk factor control interventions. The hypertension control efforts initiated in the 1970s appear to have had the most substantial influence on the accelerated decline in stroke mortality, with lower blood pressure distributions in the population. Control of diabetes mellitus and high cholesterol and smoking cessation programs, particularly in combination with hypertension treatment, also appear to have contributed to the decline in stroke mortality.
- Approximately 10% of all strokes occur in people 18 to 50 years of age. Between 1995 and 2008, National Health Interview Survey data reveal that hospitalizations for ischemic stroke increased among adolescents and young adults (aged 5–44 years), whereas subarachnoid hemorrhage hospitalizations decreased during that same time period.
- Stroke death rates declined more among people aged ≥ 65 years (-54.1% ; from 534.1 to 245.2 per 100 000) than among those aged 45 to 64 years (-53.6% ; from 43.5 to 20.2 per 100 000) or those aged 18 to 44 years (-45.9% ; from 3.7 to 2.0 per 100 000).

Atrial Fibrillation (Chapter 16)

- Multiple lines of evidence have increased awareness of the burden of unrecognized AF. In individuals without a history of AF with recent pacemaker or defibrillator implantation, subclinical atrial tachyarrhythmias were detected in 10.1% of patients. Subclinical atrial tachyarrhythmias were associated with a 5.6-fold higher risk of clinical AF and $\approx 13\%$ of ischemic strokes or embolism. A recent systematic review suggested that one needs to screen 170 community-based individuals at least 65 years of age to detect 1 case of AF.
- In the Framingham Heart Study, there have been striking temporal trends in the epidemiology of AF documented over 50 years. The age-adjusted incidence and prevalence of AF in the white participants increased ≈ 4 -fold, yet the multivariable adjusted hazard of stroke (74%) and death (25%) associated with AF declined over the same time period. Less is known about the epidemiology of AF over time in ethnic/racial minorities.
- Secondary analyses of observational and randomized data generally support benefits of risk factor modification for primary prevention of AF. There is also growing evidence supporting the value of risk factor reduction, particularly weight management and exercise, in secondary prevention of AF recurrences and symptoms.

Sudden Cardiac Arrest (Chapter 17)

- Each year $\approx 359\,800$ people experienced emergency medical services—assessed out-of-hospital cardiac arrests in the United States. Survival to hospital discharge after nontraumatic emergency medical services—treated cardiac arrest with any first recorded rhythm was 10.6% for patients of any age. Of the $\approx 20\,150$ bystander-witnessed out-of-hospital cardiac arrests in 2011, 31.4% of victims survived to hospital discharge.
- Each year, $\approx 209\,000$ people are treated for in-hospital cardiac arrest.

Subclinical Atherosclerosis (Chapter 18) and Coronary Heart Disease (Chapter 19)

- CAC was noted as highly predictive of CHD event risk across all age groups, suggesting that once CAC is known, chronological age has less importance. Compared with a CAC score of 0, CAC >100 imparted an increased multivariable-adjusted CHD event risk in younger individuals (45–54 years old) with an HR of 12.4. The respective risk was similar even in the very elderly (75–84 years of age) with an HR of 12.1.
- Coronary heart disease alone caused ≈ 1 of every 7 deaths in the United States in 2013. In 2013, 370 213 Americans died of coronary heart disease. Each year, an estimated $\approx 660\,000$ Americans have a new coronary attack (defined as first hospitalized myocardial infarction or coronary heart disease death) and $\approx 305\,000$ have a recurrent attack. It is estimated that an additional 160 000 silent myocardial infarctions occur each year. Approximately every 34 seconds, 1 American has a coronary event, and approximately every 1 minute 24 seconds, an American will die of one.

Heart Failure (Chapter 20)

- In 2013, 1 in 9 death certificates (284 388 deaths) in the United States mentioned heart failure. Heart failure was the underlying cause in 58 309 of those deaths. The number of any-mention deaths attributable to heart failure was approximately as high in 1995 (287 000) as it was in 2013 (284 000). Additionally, hospital discharges for heart failure remained stable from 2000 to 2010, with first-listed discharges of 1 008 000 and 1 023 000, respectively.
- Mortality declines in heart failure have been documented, likely related to evidence-based approaches to treat heart failure risk factors and to implementation of angiotensin-converting enzyme inhibitors, β -blockers, coronary revascularization, implantable cardioverter-defibrillators, and cardiac resynchronization therapeutic strategies.

Valvular, Venous, and Aortic Diseases (Chapter 21) and Peripheral Artery Disease (Chapter 22)

- Data suggest that the prevalence of any valve disease is 2.5%, with no difference between men and women.
- In 2013, 50 222 deaths were related to valvular HD. Of those, 67.5% were due to aortic valve disorders.
- PAD affects ≈ 8.5 million Americans aged ≥ 40 years and is associated with significant morbidity and mortality.
- In 2013, PAD any-mention mortality was 61 097. PAD was the underlying cause in 13 639 of those deaths.

- The risk factors for PAD are similar but not identical to those for CHD. DM and cigarette smoking are stronger risk factors for PAD than for CHD. Most studies suggest that the prevalence of PAD is similar in men and women. Metabolic syndrome in older persons (driven most prominently by the HBP component) and elevated inflammation markers are also risk factors.

Cardiovascular Quality of Care, Procedure Utilization, and Costs (Chapters 23 to 25)

The Statistical Update provides critical data in several sections on the magnitude of healthcare delivery and costs, as well as the quality of healthcare delivery, related to CVD risk factors and conditions.

Quality-of-Care Metrics for CVD (Chapter 23)

- The Institute of Medicine has identified 6 domains of quality of care, including safety, effectiveness, patient-centered care, timely care, efficiency, and equitable care.
- According to the Medicare Patient Safety Monitoring System, between 2005 and 2011, adverse event rates in hospitalized patients declined for both myocardial infarction (from 5.0% to 3.7%) and congestive heart failure (from 3.7% to 2.7%).
- However, in the Practice Innovation and Clinical Excellence (PINNACLE) outpatient registry, only 66.5% of eligible patients with coronary artery disease received the optimal evidence-based combination of medications.
- A randomized trial of post-acute coronary care syndrome that used multiple modalities to enhance adherence to 4 indicated medications (clopidogrel, statins, angiotensin-converting enzyme inhibitors/angiotensin receptor blockers, and β -blockers) demonstrated better adherence in the intervention group (89.3% versus 73.9%) at 1 year.
- A recent study from a Veterans Health Administration national cohort of CVD patients showed that women with CVD were less likely than men to receive statins (57.6% versus 64.8%) or high-intensity statins (21.1% versus 23.6%) as recommended in the 2013 American College of Cardiology/AHA cholesterol management guidelines. The authors concluded that although women with CVD are less likely to receive evidence-based statin and high-intensity statins than men, their use remains low in both sexes.
- Similar or larger challenges persist in the outpatient setting in discussion and counseling for PA and dietary habits.

Cardiovascular Procedure Use and Costs (Chapters 24 and 25)

- The total number of inpatient cardiovascular operations and procedures increased 28% between 2000 and 2010, from 5 939 000 to 7 588 000.
- Data on Medicare beneficiaries undergoing a coronary revascularization procedure between 2008 and 2012 indicate that the rapid growth in nonadmission percutaneous coronary interventions (from 60 405 to 106 495) has been

more than offset by the decrease in percutaneous coronary intervention admissions (from 363 384 to 295 434).

- According to the 2012 National Healthcare Cost and Utilization Project statistics, the mean hospital charge for a vascular or cardiac surgery or procedure in 2012 was \$78 897: cardiac revascularization cost \$149 480, and percutaneous interventions cost $\approx$ \$70 027.
- For 2011 to 2012, the estimated annual costs for CVD and stroke were \$316.6 billion, including \$193.1 billion in direct costs (hospital services, physicians and other professionals, prescribed medications, home health care, and other medical durables) and \$123.5 billion in indirect costs from lost future productivity (cardiovascular and stroke premature deaths). CVD costs more than any other diagnostic group.
- By comparison, in 2011, the estimated direct cost of all cancer was \$88.7 billion (50% for outpatient or doctor office visits, 35% for inpatient care, and 11% for prescription drugs).

Conclusions

The AHA, 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 information available in the Statistical Update. This annual Statistical Update is the product of a full year's worth of effort by dedicated volunteer physicians and scientists, committed government professionals, and outstanding AHA staff members, without whom publication of this valuable resource would be impossible. Their contributions are gratefully acknowledged.

Dariusz Mozaffarian, MD, DrPH, FAHA, Chair
Emelia J. Benjamin, MD, ScM, FAHA, Vice-Chair
Melanie B. Turner, MPH, AHA Science & Medicine Advisor
On behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee

Note: Population data used in the compilation of NHANES prevalence estimates are for the latest year of the NHANES survey being used. Extrapolations for NHANES prevalence estimates are based on the census resident population for 2012 because this is the most recent year of NHANES data used in the Statistical Update.

Acknowledgments

We wish to thank our NHLBI colleagues Lucy Hsu, Michael Wolz, and Sean Coady; CDC colleagues Cathleen Gillespie, Sheila Franco, Sherry Farr, and Matthew Ritchey; Colin Rehm and Lorena Egan; and the dedicated staff of the Centers for Disease Control and Prevention and the National Heart, Lung, and Blood Institute for their valuable comments and contributions.

KEY WORDS: AHA Scientific Statements ■ cardiovascular diseases ■ epidemiology ■ risk factors ■ statistics ■ stroke

Disclosures

Writing Group Disclosures

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/Honoraria	Expert Witness	Ownership Interest	Consultant/Advisory Board	Other
Dariusz Mozaffarian	Tufts University	None	None	Bunge*; Haas Avocado*	None	None	Amarin*; Life Sciences Research Organization*; AstraZeneca*; Boston Heart Diagnostics*; GOED*; Unilever North America*; Elysium Health*	None
Emelia J. Benjamin	Boston University School of Medicine	NIH†; NHLBI†	None	None	None	None	None	None
Alan S. Go	Kaiser Permanente	CSL Behring†; Sanofi†; iRhythm†	None	None	None	None	None	None
Donna K. Arnett	University of Alabama at Birmingham	None	None	None	None	None	None	None
Michael J. Blaha	Johns Hopkins University School of Medicine	Aetna†	None	None	None	None	Pfizer*; Novartis*	American College of Cardiology*
Mary Cushman	University of Vermont, Department of Medicine	None	None	None	None	None	None	None
Sandeep R. Das	University of Texas Southwestern Medical Center	None	None	None	None	None	None	None
Sarah de Ferranti	Children's Hospital, Boston	None	None	None	None	None	None	None
Jean-Pierre Després	Centre de recherche de l'Institut universitaire de cardiologie et de pneumologie de Québec	None	None	Abbott Laboratories†; AstraZeneca†; GlaxoSmithKline†; Merck†; Pfizer Canada Inc†	None	None	Abbott Laboratories†; Sanofi†; Torrent Pharmaceuticals Ltd†	None
Heather J. Fullerton	University of California, San Francisco	NIH†; AHA†	None	None	None	None	None	None
Virginia J. Howard	University of Alabama at Birmingham	None	None	None	None	None	None	None
Mark D. Huffman	Northwestern University School of Medicine	World Heart Federation†; JR Alberts Foundation†; NHLBI†	None	None	None	None	None	None
Carmen R. Isasi	Albert Einstein College of Medicine	None	None	None	None	None	None	None
Monik C. Jiménez	Brigham and Women's Hospital	None	None	None	None	None	None	None
Suzanne E. Judd	University of Alabama at Birmingham	None	None	None	None	None	None	None
Brett M. Kissela	University of Cincinnati Academic Health Center	None	None	None	None	None	None	None
Judith H. Lichtman	Yale School of Public Health	None	None	None	None	None	None	None
Lynda D. Lisabeth	University of Michigan	None	None	None	None	None	None	None
Simin Liu	Brown University	None	None	None	None	None	None	None
Rachel H. Mackey	University of Pittsburgh	None	None	None	None	None	None	None
David J. Magid	Kaiser Permanente of Colorado Institute for Health Research	NIH*; PCORI*; Angen*; NHLBI*; NIA*	None	None	None	None	None	None
Darren K. McGuire	University of Texas—Southwestern Medical Center	None	None	None	None	None	AstraZeneca†; Merck*; Takeda*; Novo Nordisk†; Boehringer Ingelheim†; Sanofi Aventis†; Glaxo Smith Kline*; Lexicon†; Regeneron*; Janssen†; Eli Lilly*	None
Emile R. Mohler III	University of Pennsylvania Vascular Medicine Hospital	None	None	None	None	Cytovas*	None	None
Claudia S. Moy	NIH/NINDS	None	None	None	None	None	None	None

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Writing Group Disclosures (Continued)

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/Honoraria	Expert Witness	Ownership Interest	Consultant/Advisory Board	Other
Paul Muntner	University of Alabama at Birmingham	Amgen Inc†	None	None	None	None	None	None
Michael E. Mussolino	NIH/NHLBI	None	None	None	None	None	None	None
Khurram Nasir	Baptist Health Medical Group Center for Healthcare Advancement & Outcomes	None	None	None	None	None	Regeneron*	None
Robert W. Neumar	University of Michigan	None	None	None	None	None	None	None
Graham Nichol	University of Washington—Harborview Center for Prehospital Emergency Care	Sotera Wireless—Patient Health and Resuscitation Surveillance (PHAROS) Network, PI*; Food and Drug Administration, Cardiac Science Corp, Heartsine Technologies Inc, Philips Healthcare Inc, Physio-Control Inc, Zoll Medical Inc*; National Heart, Lung, and Blood Institute—Resuscitation Outcomes Consortium Data Coordinating Center, U01 HL077863-07, Co-PI†; NeuroproteXon Inc—Xenon After Resuscitation from Ventricular Fibrillation (Xena) Trial, PI†	None	None	None	None	None	University of Washington—Leonard A Cobb Medical Center Foundation Endowed Chair in Prehospital Emergency Care†
Latha Palaniappan	Stanford University	None	None	None	None	None	None	None
Dilip K. Pandey	University of Illinois at Chicago	Centers for Disease Control and Prevention (CDC)†	None	None	None	None	None	University of Illinois†
Mathew J. Reeves	Michigan State University	None	None	None	None	None	None	None
Carlos J. Rodriguez	Wake Forest University	None	None	None	None	None	None	None
Wayne Rosamond	University of North Carolina School of Public Health	None	None	None	None	None	None	None
Paul D. Sorlie	National Heart, Lung, and Blood Institute	None	None	None	None	None	None	None
Joel Stein	Columbia University	Nexstim*; Tyromotion, Inc*; Myomo, Inc*; Columbia—Coulter Translational Research Partnership*; National Science Foundation*; PCORI*; McDonnell Foundation*; New York State Spinal Cord Injury Research Program*	None	None	None	None	Myomo*	None
Amytis Towfighi	University of Southern California	None	None	None	None	None	None	None
Tanya N. Turan	Medical University of South Carolina	None	None	None	None	None	None	None
Salim S. Virani	Michael E. DeBakey VA Medical Center	American Heart Association†; American Diabetes Association†; Department of Veterans Affairs†; Baylor College of Medicine Center for Globalization Grant†; Baylor College of Medicine Academy of Distinguished Educators*	None	None	None	None	None	Patient and Provider Assessment of Lipid Management (PALM) Registry at Duke Clinical Research Institute (DCRI)*
Daniel Woo	University of Cincinnati	None	None	None	None	None	None	None
Robert W. Yeh	Massachusetts General Hospital	None	None	None	Merck (defendant, 2015, Clinical Trial Execution)†	None	None	None
Melanie B. Turner	American Heart Association	None	None	None	None	None	None	American Heart Association†

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.