State of Disparities in Cardiovascular Health in the United States

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Background—Reducing health disparities remains a major public health challenge in the United States. Having timely access to current data on disparities is important for policy and program development. Accordingly, we assessed the current magnitude of disparities in cardiovascular disease (CVD) and its risk factors in the United States.

Methods and Results—Using national surveys, we determined CVD and risk factor prevalence and indexes of morbidity, mortality, and overall quality of life in adults ≥18 years of age by race/ethnicity, sex, education level, socioeconomic status, and geographic location. Disparities were common in all risk factors examined. In men, the highest prevalence of obesity (29.2%) 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 (47.3%). Hypertension prevalence was high among blacks (39.8%) regardless of sex or educational status. Hypercholesterolemia was high among white and Mexican American men and white women in both groups of educational status. Ischemic heart disease and stroke were inversely related to education, income, and poverty status. Hospitalization was greater in men for total heart disease and acute myocardial infarction but greater in women for congestive heart failure and stroke. Among Medicare enrollees, congestive heart failure hospitalization was higher in blacks, Hispanics, and American Indians/Alaska Natives than among whites, and stroke hospitalization was highest in blacks. Hospitalizations for congestive heart failure and stroke were highest in the southeastern United States. Life expectancy remains higher in women than men and higher in whites than blacks by ≈5 years. CVD mortality at all ages tended to be highest in blacks.

Conclusions—Disparities in CVD and related risk factors remain pervasive. The data presented here can be invaluable for policy development and in the planning, implementation, and evaluation of interventions designed to eliminate health disparities. **(*Circulation*. 2005;111:1233-1241.)**

Key Words: ethnic groups ■ life expectancy ■ mortality ■ quality of life ■ continental population groups

In its broadest sense, the term "health disparities" refers to preventable differences in the indicators of health of different population groups, often defined by race, ethnicity, sex, educational level, socioeconomic status, and geographic location of residence. The first National Institutes of Health Working Group on Health Disparities defined disparities as including "differences in the incidence, prevalence, mortality, and burden of diseases and other adverse health conditions."[1] These disparities have been documented in the United States throughout most of the past 2 centuries.[2–4] More recently, the National Healthcare Disparities Report[5] and an Institute of Medicine report[6] confirmed that disparities are pervasive and that improvements are possible. Elimination of these disparities is one of the 2 overarching goals of the Healthy People 2010 national public health agenda.[7] Up-to-date surveillance data at the national, state, and local levels are important for the design, implementation, and evaluation of programs designed to reduce these disparities.

Accordingly, we present in this report the most recently available population-based data on disparities in cardiovascular disease (CVD) and related risk factors. Indicators examined include prevalences of major and emerging CVD risk factors, morbidity and mortality for major CVD, overall life expectancy and quality of life, and the prevalence of social and environmental determinants of health. Specific strategies for eliminating CVD-related health disparities are not addressed in this report.

Methods

Self-Reported Behavioral Risk Factors

The Behavioral Risk Factor Surveillance System (BRFSS) is a cross-sectional telephone survey conducted by state health departments with assistance from the Centers for Disease Control and Prevention (CDC). BRFSS questionnaires consist primarily of questions about personal behaviors that increase one's risks for illness and death. The BRFSS uses a multistage cluster design based on

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TABLE 1. Unadjusted Prevalence of Risk Factors for CVD Among US Adults ≥18 Years of Age, BRFSS, 2003

	Whites				Blacks				Mexican Americans			
	<High School		≥High School		<High School		≥High School		<High School		≥High School	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Current smoker												
Men	40.6	1.1	22.9	0.3	41.8	2.7	27.4	1.0	27.3	1.7	22.6	1.1
Women	34.6	0.9	19.9	0.2	25.6	1.6	17.8	0.7	10.6	1.0	12.9	0.7
Total	37.5	0.7	21.4	0.2	33.0	1.5	22.0	0.6	18.6	1.0	17.7	0.7
No physical activity												
Men	40.1	1.0	17.7	0.2	42.1	2.7	24.7	1.0	46.5	1.9	24.9	1.1
Women	45.3	0.9	21.5	0.2	50.7	1.9	32.2	0.8	52.2	1.7	33.3	1.0
Total	42.8	0.7	19.7	0.2	46.8	1.6	28.9	0.6	49.4	1.3	29.1	0.8
≥5 Servings of fruits and vegetables												
Men	13.3	0.7	18.6	0.3	14.6	2.0	18.9	0.9	18.2	1.6	17.4	1.1
Women	20.6	0.7	29.5	0.2	22.5	1.8	25.8	0.8	24.1	1.5	25.3	1.0
Total	17.1	0.5	24.3	0.2	18.9	1.3	22.8	0.6	21.3	1.1	21.4	0.7
Told have diabetes												
Men	11.9	0.7	7.0	0.2	14.6	1.7	10.1	0.7	9.0	1.0	5.6	0.6
Women	13.3	0.5	5.9	0.1	19.2	1.3	10.6	0.5	11.5	1.0	6.4	0.5
Total	12.6	0.4	6.4	0.1	17.1	1.1	10.4	0.4	10.3	0.7	6.0	0.4

random-digit dialing to select a representative sample from each state's noninstitutionalized civilian residents ≥18 years of age. Data from each state are pooled to produce nationally representative estimates. A detailed description of the survey methods is available elsewhere.[8] Because all BRFSS questionnaires, reports, and data also are available elsewhere,[9] they are not discussed here.

We used self-reported weight and height to calculate body mass index (BMI) as weight (kg) divided by height (m^2). A participant was classified as obese if his or her BMI was ≥30 kg/m^2. Diagnosed diabetes was assessed by asking, "Have you ever been told by a doctor that you have diabetes?" The type of diabetes was not assessed. Results from the 2003 BRFSS module on fruit and vegetable consumption were used to classify participants into 4 groups based on their daily fruit and vegetable consumption: (1) <1 serving or none, (2) 1 to <3 servings, (3) 3 to <5 servings, and (4) ≥5 servings. Leisure-time physical activity was assessed by asking a single question: "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?"

Measured Risk Factors

The National Health and Nutrition Examination Survey (NHANES 1999 to 2002) provides data on a representative sample of the noninstitutionalized civilian US population using a stratified multistage sampling design.[10] A detailed description of the methodology and laboratory quality control procedures used in the survey has been published previously.[11] The analyses presented in this report included adult participants ≥18 years of age.

Cardiovascular risk factors examined included obesity (BMI ≥30 kg/m^2), abdominal obesity (waist circumference >102 cm in men, >88 cm in women), hypertension (see definition below), elevated concentrations of total cholesterol (≥200 mg/dL), LDL cholesterol (≥130 mg/dL), triglycerides (≥150 mg/dL), C-reactive protein (>3 mg/L), fibrinogen (>3 g/L), glycosylated hemoglobin (>7%), homocysteine (>10 μmol/L), and low concentrations of HDL cholesterol (<40 mg/dL in men, <50 mg/dL in women). Albuminuria was defined as a urinary albumin-to-creatinine ratio of ≥30 mg/g (microalbuminuria ≥30 to <300 mg/g; macroalbuminuria ≥300 mg/g).

Obesity was calculated from measured height and weight. Waist circumference was measured at the high point of the iliac crest at minimal respiration to the nearest 0.1 cm at the end of normal expiration. Hypertension was defined as the presence of a systolic blood pressure ≥140 mm Hg or a diastolic blood pressure ≥90 mm Hg; the self-reported, current use of antihypertensive medication; or having been told on ≥2 different visits by a doctor or other health professional that the participant had hypertension. We used the average of the last 2 blood pressure measurements for participants who had 3 or 4 measurements, the second one for participants with only 2 measurements, and the only one for participants who had 1 measurement to establish hypertension status.

For most risk factors for CVD, we used all available participants regardless of fasting status. Concentrations of fibrinogen were measured only in participants ≥40 years of age. For concentrations of HDL cholesterol, LDL cholesterol, and triglycerides, only data for 1999 to 2000 were available. For concentrations of triglycerides and LDL cholesterol, we limited the analyses to participants who attended the morning examination and who had fasted ≥10 hours. We calculated the percentage of participants who had a risk factor stratified by race or ethnicity (white, black, and Mexican American), sex, and educational status (less than a high school education versus high school graduate, recipient of a general equivalency diploma, or higher education). To account for the complex sampling design of the survey, we calculated prevalences of risk factors using SUDAAN software (Research Triangle Institute, release 8.0.2, January 2003).

Morbidity

Morbidity data on self-reported heart disease, stroke, and congestive heart failure (CHF) are from the National Health Interview Survey (NHIS).[12] The NHIS, initiated in 1957, is a continuing nationwide sample survey of the civilian noninstitutionalized population. Data are collected through household interviews. Medicare (part A) hospital claims from the Medicare Provider Analysis and Review files and beneficiary enrollment records for 2000 were obtained from the Centers for Medicare and Medicaid Services. Hospitalizations among Medicare enrollees ≥65 years of age include those for the principal (first-listed) diagnosis on hospital claims between January 1 and December 31, 2000. The denominators were US residents

TABLE 2. Prevalence of Traditional Risk Factors for CVD Among US Adults ≥18 Years of Age, NHANES, 1999–2002

	Whites				Blacks				Mexican Americans			
	<High School		≥High School		<High School		≥High School		<High School		≥High School	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Obesity (BMI ≥30 kg/m^2)												
Men	28.4	2.0	27.2	1.1	25.1	1.8	26.9	2.2	22.3	1.7	29.2	2.5
Women	36.8	2.6	29.6	1.5	47.7	3.2	47.1	2.3	37.8	3.0	32.8	2.8
Men and women	32.8	1.7	28.5	1.1	37.2	1.8	38.4	1.6	29.5	1.7	31.0	1.9
Large waist (men >102 cm; women >88 cm)												
Men	44.9	2.6	39.6	1.2	29.4	1.8	27.2	1.7	25.2	1.7	34.2	2.0
Women	68.0	3.3	52.9	1.8	71.9	2.3	67.0	1.6	62.2	2.6	53.9	2.9
Men and women	56.8	2.2	46.4	1.4	51.9	1.6	49.8	1.4	42.3	1.2	43.9	1.6
Hypertension												
Men	39.3	2.5	29.8	1.2	45.9	2.8	31.8	1.7	21.1	2.2	16.5	2.1
Women	47.4	2.6	31.3	1.3	51.2	2.8	37.0	1.9	24.2	2.4	15.5	1.8
Men and women	43.5	1.9	30.6	1.0	48.7	2.4	34.7	1.3	22.6	1.8	16.0	1.3
Total cholesterol ≥200 mg/dL												
Men	45.5	3.0	49.2	1.5	37.7	2.8	41.7	2.3	49.2	2.7	45.5	2.8
Women	56.9	2.5	52.4	1.2	45.8	3.0	42.6	2.2	38.7	2.2	37.9	2.2
Men and women	51.4	2.0	50.8	1.0	41.9	2.0	42.2	1.8	44.4	2.0	41.7	1.6
Glycosylated hemoglobin ≥7%												
Men	7.5	1.3	3.8	0.4	10.1	1.4	3.7	0.7	4.9	0.8	4.3	0.9
Women	6.2	1.2	2.2	0.3	10.9	1.9	6.7	0.9	7.8	1.2	3.6	0.7
Men and women	6.8	0.9	3.0	0.3	10.5	1.5	5.4	0.6	6.3	0.7	4.0	0.6
NHANES 1999–2000												
Low HDL cholesterol (men <40 mg/dL; women <50 mg/dL)												
Men	41.2	3.1	35.9	2.2	27.0	4.3	23.8	3.4	35.6	3.5	25.6	4.6
Women	54.8	4.3	38.8	2.4	33.8	3.9	39.7	3.4	47.4	2.5	45.7	3.6
Men and women	48.0	3.1	37.4	1.9	30.4	2.9	33.0	2.4	41.1	2.4	36.2	3.0
LDL cholesterol ≥130 mg/dL												
Men	49.5	7.0	46.7	2.9	27.2	5.4	31.0	5.8	46.7	4.6	54.3	7.0
Women	33.6	7.5	42.3	2.8	36.3	7.4	25.1	4.3	30.1	4.8	28.0	4.9
Men and women	41.9	5.8	44.4	2.0	31.9	5.0	27.5	4.1	38.8	2.8	41.0	5.2
Triglycerides ≥150 mg/dL												
Men	38.3	7.7	35.7	3.2	...	...	...	...	40.5	4.2	40.2	9.1
Women	39.2	6.2	33.2	3.3	14.0	4.2	11.5	3.0	40.9	5.2	30.0	5.8
Men and women	38.7	4.6	34.4	2.4	15.4	4.2	10.4	2.6	40.7	3.7	35.2	6.6

Hypertension was defined as the presence of a systolic blood pressure ≥140 mm Hg or a diastolic blood pressure ≥90 mm Hg; the self-reported, current use of antihypertensive medication; or having been told on ≥2 different visits by a doctor or other health professional that the participant had hypertension.

living in the 50 states, District of Columbia, and US territories who were ≥65 years of age and entitled to Medicare part A benefits on July 1, 2000 (excluding members of health maintenance organizations). Acute myocardial infarction was defined as a diagnosis with *International Classification of Diseases*, ninth revision, clinical modification (ICD-9-CM) code 410. Heart failure was defined as ICD-9-CM code 428, and stroke was defined as ICD-9-CM codes 430 to 434 or 436 to 438. Age-adjusted prevalences of hospitalizations were directly age standardized to the 2000 US standard population ≥65 years of age.[13,14]

Mortality

Mortality data for 2001 are presented as summarized in several CDC publications.[15] In cooperation with state vital statistics offices, mortality data are compiled by the CDC National Center for Health Statistics and processed in accordance with regulations from the World Health Organization. Demographic data on death certificates were reported by funeral directors or provided by family members of the decedent. Heart disease–related deaths are those for which the underlying cause listed on the death certificate by a physician or a coroner is classified according to the ICD-10 codes I00 through I09, I11, I13, and I20 through I51. Stroke deaths were those classified as ICD-10 codes I60 through I69. For the years 1980 to 1995, heart disease deaths were categorized as ICD-9 codes 390 to 398, 402, and 404 to 429; stroke deaths, as codes 430 to 438. Death rates for the total population and by sex and race/ethnicity were age adjusted to the 2000 US standard population.[13,14,16] Years of potential life lost, a measure of premature mortality, is presented for persons <75 years

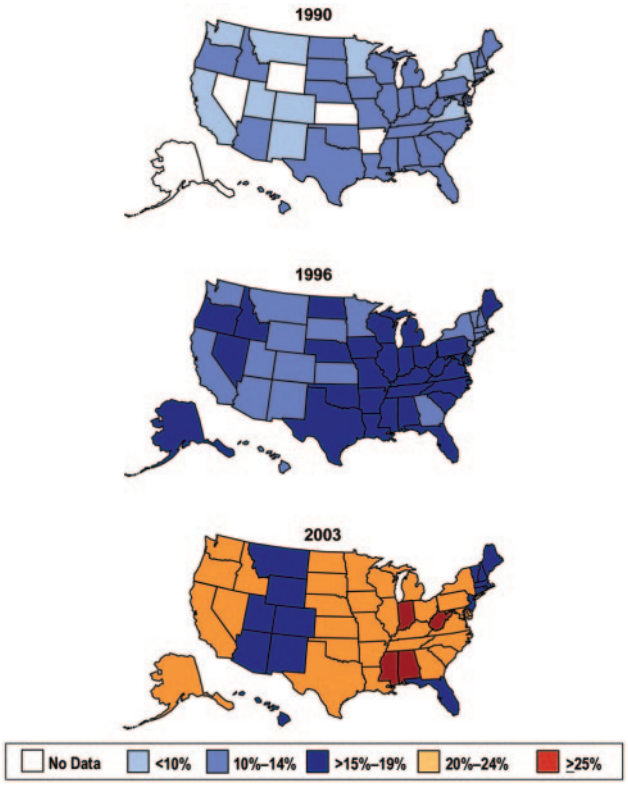

Figure 1. Trends in obesity (defined as BMI ≥30 kg/m^2) among US Adults, BRFSS 1990, 1996, and 2003. Source: Behavioral Risk Factor Surveillance System, CDC.

of age because the average life expectancy in the United States is ≥75 years.[16]

Results

Self-Reported Risk Factors

Self-reported risk factors for CVD stratified by sex, race/ethnicity, and education level are presented in Table 1. All self-reported risk factors varied by race/ethnicity and education level. The prevalence of "no physical activity" was common in all groups, especially in women with less than a high school education. However, women consumed more fruits and vegetables than men. Daily intake of ≥5 servings of fruits and vegetables was low in all groups and lowest in black and white men with less than a high school education. Persons with less than a high school education were more likely to smoke and to report that they had been diagnosed with diabetes. Black men had the highest rate of smoking. Blacks had the highest self-reported prevalence of diagnosed diabetes and high blood pressure.

Self-reported measures of obesity are not presented in Table 1 because of the availability of BMI calculated from measured heights and weights from NHANES (shown in Table 2). However, BMI calculated from self-reported height and weight in BRFSS is used to demonstrate state-based geographic disparities in obesity and overweight (Figure 1) because state-based data are not available from NHANES. Comparisons of 1990 with 1996 show the gradual and continued increase in the prevalence of obesity throughout the United States (Figure 1).

People with higher education were more likely to have health insurance. Among the racial groups, Hispanics were least likely to have health insurance. Hispanics were also least likely to receive a flu or pneumonia vaccination. Those with less than a high school education were most likely to report limitation of activities and the highest number of days with physical and mental health problems. Hispanics had the highest prevalence of poor or fair health (data not presented).

Measured Risk Factors

Table 2 summarizes the prevalence of the major established risk factors for CVD stratified by sex, race/ethnicity, and education level. Among men who had not completed a high school education, white men tended to have a high prevalence of obesity and abdominal obesity, whereas among men who had completed a high school education, these prevalences tended to be high among whites and Mexican Americans. In contrast, black women had a high prevalence of obesity and abdominal obesity regardless of educational status.

Generally, the prevalence of hypertension was high among blacks regardless of sex or educational status. The prevalence of hypercholesterolemia was generally high among white and Mexican American men and white women in both education groups. The prevalence of low concentrations of HDL cholesterol and hypertriglyceridemia was most favorable among black participants, although among the most educated women, whites and blacks had a similar prevalence of low concentration of HDL cholesterol. The prevalence of measured levels of glycosylated hemoglobin ≥7% was highest in black men (except among the most educated men and women; Table 2).

Table 3 summarizes the prevalence of the emerging risk factors for CVD stratified by sex, race/ethnicity, and education level. Among men who had not completed a high school education, the prevalence of elevated concentrations of C-reactive protein was high among white men. Among men who had completed high school, the prevalence of elevated concentrations of C-reactive protein was highest among black men. Among women who had not completed high school, the prevalence was variable among the 3 racial or ethnic groups, whereas among women who had completed high school, black and Mexican American women tended to have a high prevalence of elevated concentrations of C-reactive protein. Similar patterns were observed for the prevalence of elevated concentrations of fibrinogen. Mexican American men and women had low concentrations of elevated concentrations of homocysteine regardless of educational status. Albuminuria was highest in blacks.

Morbidity

In 2002, ≈11.2% of people reported having heart disease and 2.4% reported ever having had a stroke.[12,16] In the NHIS, reported heart disease, ischemic heart disease, hypertension, and stroke were inversely related to poverty status, education, and income (Table 4).[12] Discharges from short-stay hospitals in 2002 were greater in men than women for total heart disease and for acute myocardial infarction but greater for women for CHF and stroke (data not shown).[12]

TABLE 3. Prevalence of Emerging Risk Factors for CVD Among US Adults ≥18 Years of Age, NHANES, 1999–2002

	Whites				Blacks				Mexican Americans			
	<High School		≥High School		<High School		≥High School		<High School		≥High School	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
C-reactive protein >3 mg/L												
Men	37.9	2.9	26.2	1.1	31.7	2.0	32.0	2.2	22.3	2.1	25.6	2.1
Women	53.8	2.6	42.6	1.2	50.1	2.3	50.3	2.5	54.0	2.8	48.9	2.5
Men and women	46.1	1.6	34.6	0.9	41.4	1.5	42.6	1.9	37.0	1.9	37.2	1.8
Fibrinogen >3 g/L												
Men ≥40 y	89.5	2.2	76.2	1.8	84.3	3.6	78.1	2.4	68.8	2.9	73.0	3.5
Women ≥40 y	91.6	1.9	81.7	1.7	95.1	1.7	88.9	2.2	84.5	1.7	87.3	2.5
Men and women ≥40 y	90.6	1.6	79.1	1.5	90.1	2.1	84.3	1.6	76.6	2.1	80.3	2.1
Homocysteine >10 μmol/L												
Men	34.4	2.4	25.2	1.2	31.9	3.4	23.0	1.7	17.7	1.7	15.2	2.2
Women	25.1	2.2	13.7	0.8	22.5	1.9	11.5	1.5	7.9	1.4	4.7	1.4
Men and women	29.6	1.8	19.3	0.8	26.9	1.8	16.4	1.3	13.1	1.2	10.0	1.4
Microalbuminuria ≥30–<300 mg/g or macroalbuminuria ≥300 mg/g												
Men	12.0	1.6	7.8	0.6	16.5	1.7	9.2	1.3	8.1	0.9	8.9	1.7
Women	16.2	1.5	8.7	0.8	19.6	1.4	10.5	1.0	12.0	1.6	9.6	1.6
Men and women	14.2	1.0	8.2	0.5	18.2	1.0	9.9	0.8	9.9	0.8	9.3	1.0

Among Medicare enrollees ≥65 years of age, the prevalence rates of hospitalizations with acute myocardial infarction, CHF, and stroke were higher in men than women[12,16] (data not presented). Whites had the highest prevalence rate of hospitalization for acute myocardial infarction, but the prevalence rate of hospitalization for CHF was higher in blacks, Hispanics, and American Indians/Alaska Natives than among whites. Blacks had the highest prevalence rate of hospitalization for stroke in the Medicare population. Among Medicare enrollees ≥65 years of age, the prevalence rate of hospitalizations for acute myocardial infarction varied between states, with some clustering along the Appalachians. The highest prevalence rates of hospitalizations for acute myocardial infarction, heart failure, and stroke were clustered primarily in the southeastern United States (Figure 2).

Life Expectancy and Mortality

In 2001, overall US life expectancy at birth was 77.2 years. Life expectancy was higher in women than men by 5.4 years and higher in whites than blacks by 5.5 years.[15] Age-adjusted death rates for both diseases of the heart and stroke in 2001 were higher among men than women and higher among blacks than whites (Figure 3). Men and blacks also had more premature mortality compared with women and whites, as measured by years of potential life lost before 75 years of age, because of these conditions (Figure 4). Age-specific death rates for diseases of the heart (Figure 5) suggest that black adults had higher death rates at all ages compared with whites. Asians/Pacific Islanders tended to have lower heart disease death rates in all age groups (Figure 5A) but higher stroke death rates, particularly at young ages (Figure 5B).

TABLE 4. Age-Adjusted Prevalence of Circulatory Diseases by Poverty Status* Among Persons ≥18 Years of Age: United States, 2002[12]

	Age-Adjusted Percentage, %			
Poverty Status*	Reported Heart Disease†	Reported Coronary Heart Disease‡	Reported Hypertension	Reported Stroke
Poor	14.0 ± 0.7	9.4±0.6	26.1±0.8	4.1±0.4
Near poor	12.4±0.5	7.5±0.4	23.1±0.7	3.6±0.3
Not poor	11.4±0.3	6.3±0.2	20.6±0.3	2.2±0.2

*Poverty status is based on family income and family size using the US Census Bureau's poverty thresholds for the previous calendar year. "Poor" persons are defined as having incomes below the poverty threshold. "Near poor" persons have incomes of 100% to <200% of the poverty threshold. "Not poor" persons have incomes that are ≥200% of the poverty threshold.

†Heart disease includes coronary heart disease, angina pectoris, heart attack, or any other heart condition or disease.

‡Coronary heart disease includes coronary heart disease, angina pectoris, or heart attack.

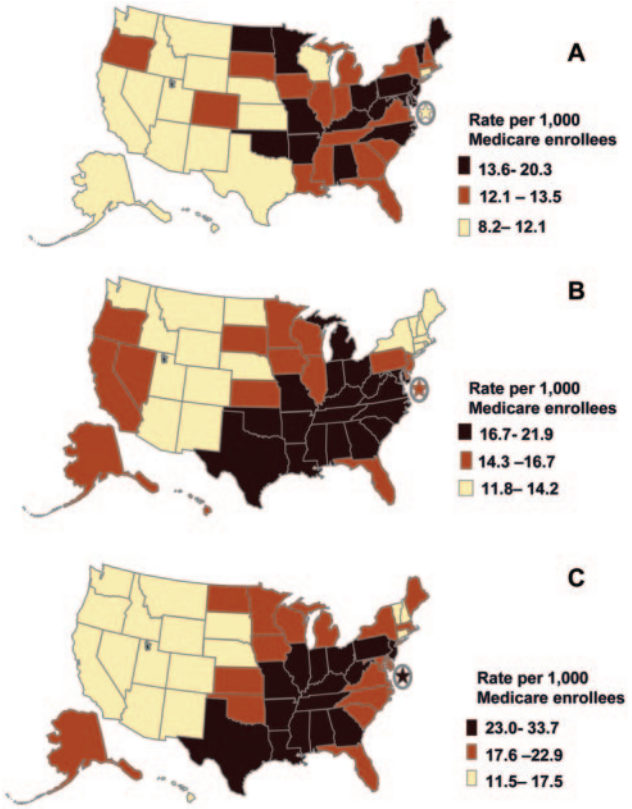

Figure 2. Medicare hospitalizations per 1000 enrollees for acute myocardial infarction (A; ICD-9-CM code 410), stroke (B; ICD-9-CM codes 430 to 434, 436 to 438), and heart failure (C; ICD-9-CM code 428), United States, 2000. Age adjusted to the 2000 US standard population.

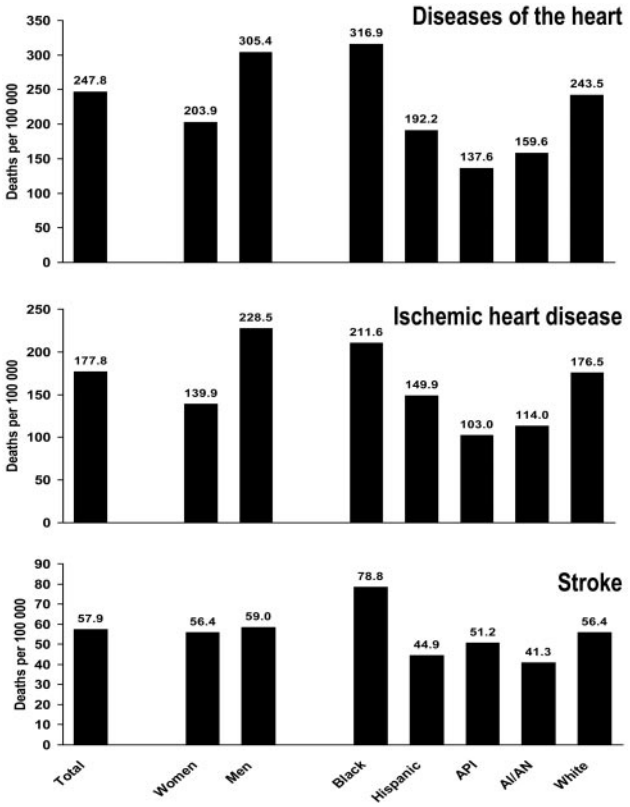

Figure 3. Death rates from diseases of the heart, ischemic heart disease, and stroke, United States, 2001. Age adjusted to the 2000 US population. API indicates Asian or Pacific Islander; AI/AN, American Indian or Alaska Native. Source: CDC, Health United States, 2003.

Age-adjusted heart disease death rates since 1980 did not decline as rapidly for blacks, particularly men, compared with whites (Figure 6). Stroke death rates for American Indians/Alaska Natives, Asians and Pacific Islanders, and Hispanics have not declined as rapidly as for whites and blacks (Figure 6). Coding of race/ethnicity on death certificates is known to be imprecise, particularly for American Indians/Alaska natives and Asians/Pacific Islanders.[17] In general, age-adjusted mortality for stroke and heart disease tended to be higher in the southeastern United States than the rest of the country (Figure 7).

Discussion

These surveillance data suggest that marked disparities exist in the prevalence, morbidity, and mortality associated with CVD and their major risk factors. The disparities are found in both self-reported and measured risk factors. Both biological risk factors and social and environmental determinants of CVD demonstrate important disparities in the population subgroups examined. These disparities appear to play a key role in the observed differences in the overall life expectancy and quality of life of population subgroups.

In general, population subgroups most significantly and adversely affected include blacks, Hispanics/Mexican Americans, persons with low socioeconomic status, and residents of the southeastern United States and the Appalachians. Similarly, persons with less than a high school education tend to have a higher burden of CVD and related risk factors regardless of race/ethnicity. The limited data available from the national and state-based surveillance system presented here on American Indian/Alaska Natives obscure the burden of CVD and risk factors in this population group. However, data from the Racial and Ethnic Approaches to Community Health (REACH) 2010 Risk Factor Survey[18] demonstrate a high prevalence of self-reported CVD, hypertension, high blood cholesterol, and diabetes. For example, in that survey, the median prevalence of obesity was 39.2% and 37.5% of American Indian men and women, respectively, compared with only 2.9% and 3.6% of Asian/Pacific Islander men and women, respectively.[18] Similarly, cigarette smoking was common in American Indian communities, with a median of 42.2% for men and 36.7% for women.[18]

Data on the disparities in the prevalence, awareness, treatment, and control of high blood pressure are not presented here because of the recent CDC publication of the 1999 to 2002 analysis of the NHANES data.[19] In that report, the age-adjusted prevalence of hypertension was highest in non-Hispanic blacks (40.5%) compared with 27.4% and 25.1% in non-Hispanic whites and Mexican Americans, respectively.[19] The age adjusted proportion of persons who reported current treatment was also highest in non-Hispanic blacks (55.4%) compared with 48.6% and 34.9% in non-Hispanic whites and Mexican Americans, respectively. The proportion with controlled blood pressure was similar among non-Hispanic

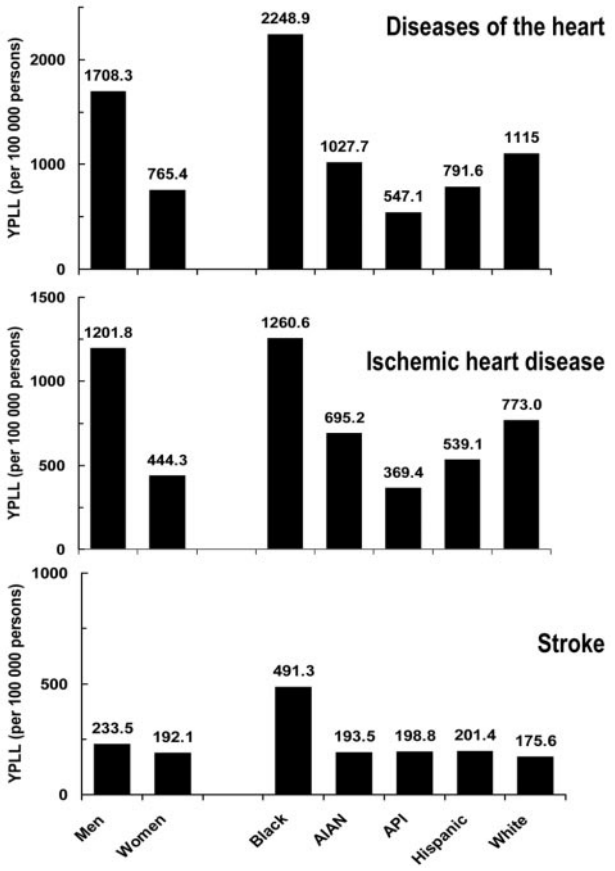

Figure 4. Years of potential life lost (YPLL) before 75 years of age resulting from diseases of the heart, ischemic heart disease, and stroke, United States, 2001. API indicates Asian or Pacific Islander; AIAN, American Indian or Alaska Native. Source: CDC, Health United States, 2003.

blacks (29.8%) and non-Hispanic whites (29.8%) but substantially lower among Mexican Americans (17.3%).[19] Blood pressure control increased with increasing age and was substantially higher in women (35.5%) than in men (27.5%).[19]

No data are presented here on access to care, disease management, or indicators of the delivery of quality cardiac care. However, several recent publications,[20–26] an Institute of Medicine summary of the literature,[6] and one review that focused specifically on cardiac care, conducted jointly by the American College of Cardiology Foundation and Kaiser Family Foundation,[27] concluded—after examining the most rigorous studies investigating racial/ethnic differences in angiography, angioplasty, CABG surgery, and thrombolytic therapy—that disparities in the quality of medical care are pervasive and that they persist even after adjustment for potentially confounding factors.

The primary purpose of this report was to assess current epidemiology of the disparities in CVD and its risk factors in the United States, not to determine the reason for the differences. The causes of these disparities are complex and are not identified or discussed in this report. The lack of complete information on all population subgroups is also an important limitation. Although the most recent national and state-level population-based surveillance data are reported, sample size limitations preclude reporting of several important disparities data. Several emerging risk factors are also not reported for all age groups and some nonwhite racial/ethnic groups.

Finally, trend data are not presented for most of the indicators examined here or for the disparities found. However, several recent publications show that despite multiple national calls to action for aggressive prevention and control of cardiovascular risk factors, little progress has been made in reducing physical inactivity, poor nutrition, and hypertension prevalence, and adverse trends in epidemic obesity and diagnosed diabetes continue. Most importantly, although some significant improvements such as reductions in gender disparities in CVD mortality have been noted,[28] disparities in CVD mortality based on race/ethnicity have remained largely unchanged,[25] and disparities in the morbidity of major CVD appear to be increasing.[29]

In conclusion, disparities in cardiovascular health remain pervasive. The data presented here can be invaluable for

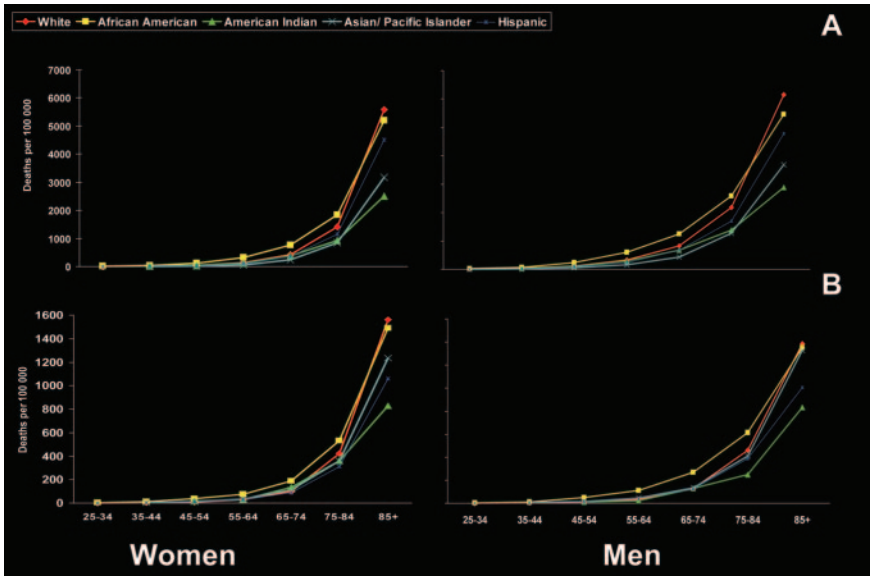

Figure 5. Age-specific death rates for diseases of the heart (A) and stroke (B) by race/ethnicity and sex, United States, 2001. Source: CDC, Health United States, 2003.

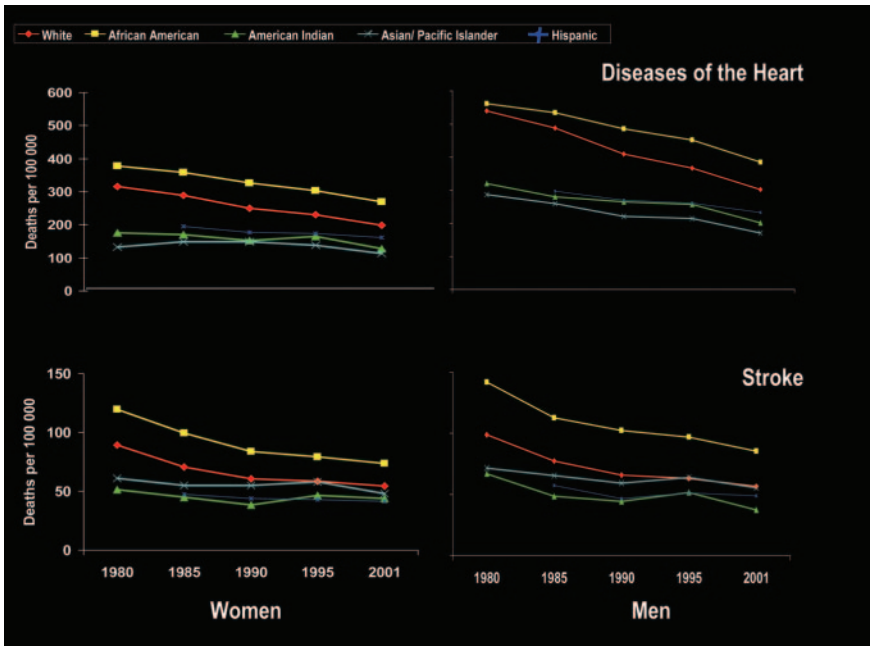

Figure 6. Death rates for diseases of the heart and stroke by race/ethnicity and sex, United States, 1980 to 2001. Age adjusted to the 2000 US population. Source: CDC, Health United States, 2003.

policy development and in the planning, implementation, and evaluation of programs and interventions designed to eliminate health disparities. Continued collection of epidemiological data stratified by race/ethnicity, sex, education level, socioeconomic status, and geographic location of residence is necessary.

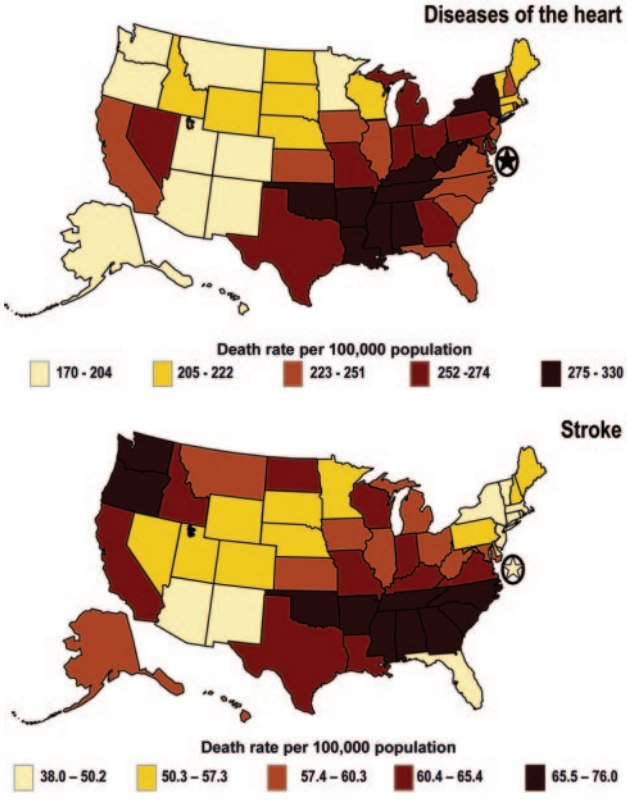

Figure 7. Death rates for diseases of the heart and stroke by state, 2001. Age adjusted to the 2000 US standard population. Source: CDC Wonder, Compressed Mortality Files.

References

1. National Institutes of Health. Addressing health disparities: the NIH program of action. Available at: http://healthdisparities.nih.gov/whatare.html. Accessed on March 31, 2004.
2. Ewbank DC. History of black mortality and health before 1940. *Milbank Q*. 1987;65(suppl 1):100–128.
3. Krieger N. Shades of difference: theoretical underpinnings of the medical controversy on black/white differences in the United States, 1830–1870. *Int J Health Serv*. 1987;17:259–278.
4. Kochanek KD, Maurer JD, Rosenberg HM. Why did black life expectancy decline from 1984 through 1989 in the United States? *Am J Public Health*. 1994;84:938–944.
5. US Department of Health and Human Services. National healthcare disparities report. Available at: http://www.qualitytools.ahrq.gov/disparitiesreport/documents/Report%207.pdf. Accessed on July 1, 2003.
6. Institute of Medicine. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*. Washington, DC: National Academies Press; 2003.
7. US Department of Health and Human Services. *Healthy People 2010*. 2nd ed. Washington, DC: US Government Printing Office; 2000.
8. Mokdad AH, Stroup DF, Giles WH. Public health surveillance for behavioral risk factors in a changing environment: recommendations from the Behavioral Risk Factor Surveillance Team. *MMWR Recomm Rep*. 2003;52:1–12.
9. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System: turning information into action. Available at: http://www.cdc.gov/brfss/. Accessed on October 11, 2004.
10. Centers for Disease Control and Prevention. National Health and Nutrition Examination Survey (NHANES 1999–2004). Available at: http://www.cdc.gov/nchs/about/major/nhanes/nhanes99–02.htm. Accessed on October 5, 2004.
11. Centers for Disease Control and Prevention. *National Health and Nutrition Examination Survey: Laboratory Procedures Manual*. Available at: http://www.cdc.gov/nchs/data/nhanes/LAB7–11.pdf. Accessed on October 5, 2004.
12. Lethbridge-Çejku M, Schiller JS, Bernadel L. Summary health statistics for U.S. adults: National Health Interview Survey, 2002. Hyattsville, MD: National Center for Health Statistics. *Vital Health Stat 10*. 2004;2:1–160.
13. Klein RJ, Schoenborn CA. Age adjustment using the 2000 projected US population. *Healthy People 2010 Statistical Notes*. No. 20. Hyattsville, Md: National Center for Health Statistics; 2001.
14. Anderson RN, Rosenberg HM. *Age-Standardization of Death Rates: Implementation of the Year 2000 Standard*. Hyattsville, Md: National Center for Health Statistics; 1998.
15. Anderson RN, Smith BL. Deaths: leading causes for 2001. *Natl Vital Stat Rep*. 2003;52:1–85.

16. National Center for Health Statistics. *Health, United States, 2003*. In: *Chartbook on Trends in the Health of Americans*. Hyattsville, Md: National Center for Health Statistics; 2003.
17. Rosenberg HM, Maurer JD, Sorlie PD, Johnson NJ, MacDorman MF, Hoyert DL, Spitler JF, Scott C. Quality of death rates by race and Hispanic origin: a summary of current research, 1999. *Vital Health Stat 2*. 1999;Sept:1–13.
18. Liao Y, Tucker P, Okoro CA, Giles WH, Mokdad AH, Harris VB. REACH 2010 Surveillance for Health Status in Minority Communities: United States, 2001–2002. *MMWR Surveill Summ*. 2004;53:1–36.
19. Centers for Disease Control and Prevention. Racial/ethnic disparities in prevalence, treatment, and control of hypertension: United States, 1999–2002. *MMWR Morb Mortal Wkly Rep*. 2005;54:7–9.
20. Gordon HS, Paterniti DA, Wray NP. Race and patient refusal of invasive cardiac procedures. *J Gen Intern Med*. 2004;19:962–966.
21. Martin R, Lemos C, Rothrock N, Bellman SB, Russell D, Tripp-Reimer T, Lounsbury P, Gordon E. Gender disparities in common sense models of illness among myocardial infarction victims. *Health Psychol*. 2004;23:345–353.
22. Rothenberg BM, Pearson T, Zwanziger J, Mukamel D. Explaining disparities in access to high-quality cardiac surgeons. *Ann Thorac Surg*. 2004;78:18–24.
23. Walker DR, Stern PM, Landis DL. Examining healthcare disparities in a disease management population. *Am J Manag Care*. 2004;10:81–88.
24. Grace SL, Abbey SE, Bisaillon S, Shnek ZM, Irvine J, Stewart DE. Presentation, delay, and contraindication to thrombolytic treatment in females and males with myocardial infarction. *Womens Health Issues*. 2003;13:214–221.
25. O'Connell L, Brown SL. Do nonprofit HMOs eliminate racial disparities in cardiac care? *J Health Care Finance*. 2003;30:84–94.
26. Litaker D, Koroukian SM. Racial differences in lipid-lowering agent use in Medicaid patients with cardiovascular disease. *Med Care*. 2004;42:1009–1018.
27. Lillie-Blanton M, Maddox TM, Rushing O, Mensah GA. Disparities in cardiac care: rising to the challenge of Healthy People 2010. *J Am Coll Cardiol*. 2004;44:503–508.
28. Pearcy JN, Keppel KG. A summary measure of health disparity. *Public Health Rep*. 2002;117:273–280.
29. Davis SK, Liu Y, Gibbons GH. Disparities in trends of hospitalization for potentially preventable chronic conditions among African Americans during the 1990s: implications and benchmarks. *Am J Public Health*. 2003;93:447–455.

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