Discovering the Full Spectrum of Cardiovascular Disease
Minority Health Summit 2003
Report of the Outcomes Writing Group

Emelia J. Benjamin, MD, ScM, Chair; Mariell Jessup, MD, Cochair; John M. Flack, MD; Harlan M. Krumholz, MD, SM; Kiang Liu, PhD; Vinay M. Nadkarni, MD; Dorothy A. Rhoades, MD, MPH; Beatriz L. Rodriguez, MD, MPH, PhD; Rosalyn P. Scott, MD, MSHA; Malcolm P. Taylor, MD; Eric J. Velazquez, MD; Marilyn A. Winkleby, PhD, MPH

Despite the steady decline in cardiovascular disease (CVD) mortality during the past 30 years,[1] CVD remains the No. 1 killer of adults across all racial/ethnic groups in the United States.[2] Observational studies have been central to understanding the epidemiology of CVD, including its incidence, prevalence, predictors, and prognosis. Until recently, the majority of epidemiological studies have been based predominantly, or even exclusively, on middle-class, white, non-Hispanic cohorts. Hence, the generalizability of the findings to all populations has been uncertain. The lack of information on the epidemiology of CVD in racial/ethnic minority groups and people of lower socioeconomic status (SES) is particularly problematic in light of data that underscore the undue burden of CVD and its risk factors in racial/ethnic minorities and poor people.[3–5]

The present report highlights important findings from several of the key observational studies of CVD, which have examined CVD risk in racial/ethnic minority populations. These key studies include the National Health and Nutrition Examination Survey (NHANES), a US population–based study; the Honolulu Heart Program (HHP), a study of Japanese-American men; the Strong Heart Study (SHS), a study of American Indians; and the Multi-Ethnic Study of Atherosclerosis (MESA). The studies were selected to represent a variety of racial/ethnic groups and study designs. It should be emphasized that informative data from many other epidemiological observational studies are included; Internet links to additional cohort studies are available in the Appendix. Key references and Internet resources for the lay public and health professionals also are included in the text and the Appendix. Recommendations for future directions and efforts conclude this article.

Observational Studies

National Health and Nutrition Examination Survey

The NHANES study has conducted periodic national examinations during the past 30 years to understand the epidemiology and temporal trends in CVD and risk factors in the US population. The NHANES study data played a central role in alerting the nation to the startling US epidemic in obesity, which has disproportionately affected racial/ethnic minorities.[6] Kuczmarski et al, using 1988 to 1991 NHANES data, reported that 49% of black women and 47% of Mexican American women were overweight, as compared with 32% of white American women.[6] Many descriptors of racial/ethnic disparities in CVD risk factors have used NHANES III, conducted from 1988 to 1994, which included an oversampling of black, Mexican American, and white non-Hispanic women and men from all socioeconomic levels. The distribution of CVD risk factors by ethnicity was highlighted by Winkleby et al using these data.[7] Black and Mexican American women were more than twice as likely as were white women to be physically inactive during their leisure time and to have diabetes (Figure 1). Furthermore, black and Mexican American women had a higher mean body mass index (BMI) than did their white counterparts (29.2 and 28.6 kg/m^2, respectively, versus 26.3 kg/m^2) and a higher mean systolic blood pressure.[7] The risk factor burden of these racial/ethnic groups remained significant after adjustment for age and years of education, but they were less consistent and of lower magnitude for men (Figure 2).[8] Ethnic minority men, both black and Mexican American, had a higher prevalence of diabetes, higher levels of systolic blood pressure (particularly

This paper represents a summary of a scientific conference sponsored by the American Heart Association. The opinions expressed in this paper are those of the authors and do not necessarily represent those of the editor or the American Heart Association. The publication of these proceedings was approved by the American Heart Association Science Advisory and Coordinating Committee on January 20, 2005. All writing group members were required to complete and submit shortly before the workshop a Faculty Disclosure Questionnaire. These disclosures are available as an online appendix to the Executive Summary.

The Executive Summary and reports of the Basic Science, the Obesity, and the Advocacy Writing Groups are available online at http://www.circulationaha.org (*Circulation*. 2005;111:1339–1349; e120–e123; e134–e139; and e140–e148).

(*Circulation*. 2005;111:e124-e133.)

***Circulation* is available at http://www.circulationaha.org** **DOI: 10.1161/01.CIR.0000157742.95689.65**

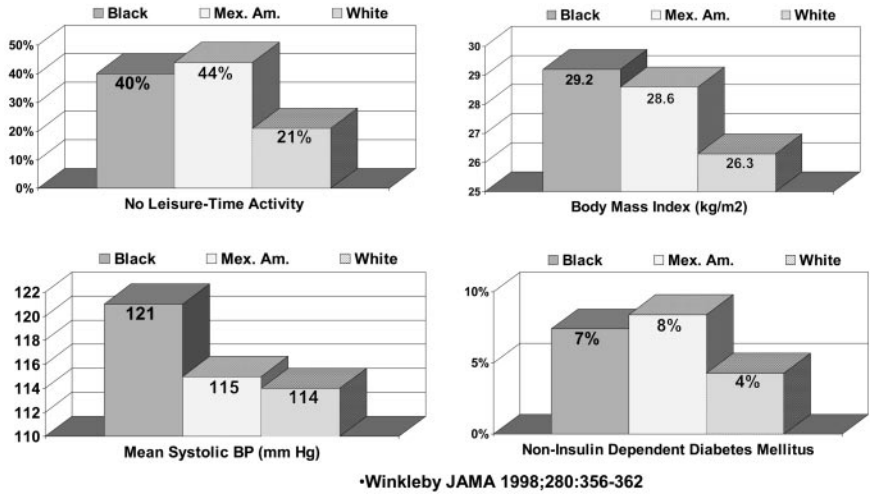

Figure 1. Ethnic differences in risk factors in women 25–64 years old, NHANES 1988–1994. Data derived from Winkleby et al.[7]

black men), and a higher prevalence of leisure-time physical inactivity than nonminority men.

The higher incidence of CVD risk factors in racial/ethnic minorities extended to children and young adults 6 to 24 years of age.[9] BMI levels were significantly higher for black and Mexican American girls and young women than they were for white girls and young women, with ethnic differences evident by the age of 6 to 9 years (a difference of ≈0.5 kg/m^2 BMI). The differences widened at older ages, with a difference of >2 kg/m^2 BMI among 18- to 24-year-olds. Blood pressure levels were higher for black girls than they were for white girls in every age group, and glycosylated hemoglobin levels were highest for black and Mexican American girls and boys in every age group.

The most recent analyses of NHANES data confirm persistent racial/ethnic disparities in CVD risk factors. Flegal et al[10] reported alarming increases in the prevalence of obesity from 1999 to 2000 as compared with 1988 to 1994 for all racial/ethnic groups. The racial/ethnic group with the highest risk for obesity was black women ≥40 years old, among whom >80% were overweight. Although Ford et al[11] reported significant decreases in age-adjusted mean total cholesterol concentrations for black men and for Mexican American women, they concluded that serum cholesterol concentrations showed little or no improvement for the overall US adult population.

The data from the NHANES underscore the clustering of CVD risk factors and unhealthful lifestyle factors among racial/ethnic minority populations. Nevertheless, the reasons for the increased burden of risk factors in ethnic/racial minority communities are complex and incompletely understood.[12] Moreover, only a few comprehensive studies about how to effectively change risk factor patterns have been conducted in these ethnic minority communities.[13,14] Recent work has described how neighborhoods may shape daily experiences, CVD risk factors, and outcomes.[15] Both US and international studies have shown that living in a socioeconomically disadvantaged neighborhood is associated with an increased incidence of coronary heart disease (CHD), after adjustment for individual income, education, and occupation.[16,17] Other studies have shown that the neighborhood socioeconomic environment is associated with multiple CVD risk factors, including hypertension, cholesterol, dietary habits, smoking, physical inactivity, diabetes, and BMI.[18–20] The high CVD rates and risk factors among people living in socioeconomically disadvantaged residential environments has a direct bearing on observed disparities in CVD because

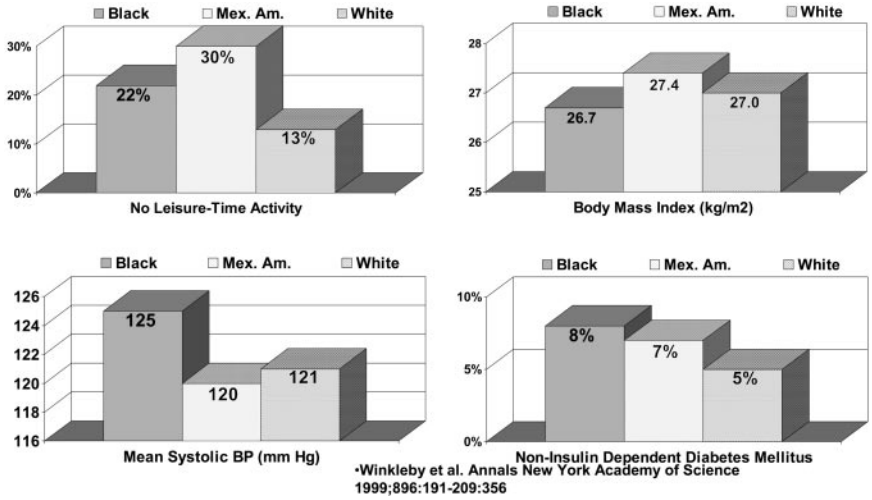

Figure 2. Ethnic differences in risk factors in men 25–64 years old, NHANES 1988–1994. Data derived from Winkleby et al.[8]

TABLE 1. Distribution of CVD Risk Factors by Glucose Tolerance Status

	Normal	IGT	Undiagnosed Diabetes	Diabetes
No.	738	734	428	652
BMI, kg/m^2	23.3	23.9*	24.1*	23.8*
Waist-to-hip ratio	0.94	0.94*	0.95*	0.95*
Triglycerides	130	151*	163*	159*
HDL, mg/dL	53	51*	49*	48*
Hypertension ≥140/90 or medications, %	68	77*	80*	77*
Physical activity index	32	31	31	30*
Fasting glucose, mg/dL	101	105*	120*	146*
2-h Glucose, mg/dL	112	167*	254*	285*

IGT indicates impaired glucose tolerance.
*$P<0.05$.
Data derived from *Diabetes Care*.[22]

racial/ethnic minority populations are much more likely than are whites to live in such environments.[5,18]

Honolulu Heart Program

The HHP was initiated in 1965 to investigate the reasons for reported differences in rates of heart disease and stroke among Japanese men living in Japan, Hawaii, and the US mainland. It had been observed that men of Japanese ancestry residing in the United States appeared to have higher rates of CHD and lower rates of stroke than did their counterparts living in Japan. The HHP studied 8006 men of Japanese ancestry who were 45 to 68 years old in 1965 and lived on the Hawaiian island of Oahu.

The HHP has highlighted the importance of glucose intolerance and diabetes as risk factors for CVD in the Japanese American community. The study investigators observed a continuum of risk by glucose tolerance status, with increasingly unfavorable CVD risk factors as individuals progressed from normal to impaired glucose tolerance to overt diabetes (Table 1).[21,22] In addition, glucose intolerance and overt diabetes were risk factors for thromboembolic and hemorrhagic stroke,[23] CHD,[24] sudden death,[25] and all-cause mortality, independent of coexistent risk factors.[24]

The HHP cohort study also has drawn attention to the impact of different diabetes criteria on the estimates of the number of people with diabetes in a population. In 1997, the American Diabetes Association (ADA) lowered the cutoff point for fasting glucose from 140 to >126 mg/dL to arrive at the diagnosis of diabetes mellitus and suggested that the oral glucose tolerance test was not needed in epidemiological studies. The World Health Organization (WHO) also lowered the threshold for fasting glucose in 1998, but it maintained the use of the 2-hour postload glucose. When the WHO and ADA criteria for diabetes were applied to the HHP older adult cohort, the investigators observed that 66% of the individuals who had diabetes according to the WHO criteria were missed by the ADA criteria.[21] It is anticipated that a substantial increase in diabetes prevalence in the HHP will occur once the new ADA definition is applied.[26] Regardless, in HHP data, the relative risks for total and CVD mortality for people with and without diabetes were similar for both definitions of diabetes (Table 2); however, the absolute number of people identified as being at risk was vastly different. When the fasting and postload glucose measures were analyzed as continuous variables, the 2-hour measurement was a superior predictor of total mortality and was independent of fasting glucose. In contrast, fasting glucose was not an independent predictor in the presence of the 2-hour measurement.[21]

TABLE 2. Risk Factor–Adjusted Relative Risk for Total Mortality by Glucose Tolerance Status

	ADA	WHO	2-Hour Only
IGT/IFG	1.12 (0.80–145)	1.10 (0.84–1.44)	1.12 (0.86–1.46)
Diabetes	1.75 (1.24–2.47)*	1.86 (1.41–2.45)*	1.87 (1.43–2.44)*

IGT indicates impaired glucose tolerance; IFG, impaired fasting glucose. Total mortality was 358 during follow-up, including 103 CVD deaths (n=2034).
*$P<0.05$.
Data derived from *Diabetes Care*.[21]

In addition to underscoring the importance of linking outcome to appropriate definitions of disease, the HHP detected another pathophysiological association in this ethnic population. The investigators reported that the mean BMI of older Japanese men with diabetes, 24 kg/m^2, was in the range that is considered normal by anthropometric standards for whites (Table 1).[22] The observation that diabetes frequently occurs in the normal weight range (18.5 to 25 kg/m^2) in older Japanese men suggests that the BMI thresholds for elevated diabetes risk may be different and need to be revised for different ethnicities, as recommended by the WHO.

Strong Heart Study

Vital event information for CVD among American Indians has traditionally relied on data that were highly flawed because of racial[16,17] and event misclassification. For example, people who died from alcohol or ill-defined causes were more likely to be correctly identified as American Indian on their death certificates than were people who died from other causes. Both forms of misclassification led to an underestimation of CVD mortality rates (Figure 3),[27] and the inadequate data collection contributed to the erroneous appearance of a CVD mortality advantage for American Indians, despite a well-documented high prevalence of CVD risk factors.[28] Moreover, US epidemiological studies rarely included adequate representation of American Indians because of numerous logistic barriers such as a population comprising >500 tribes, a marked heterogeneity of culture and linguistics, and widely dispersed geography.

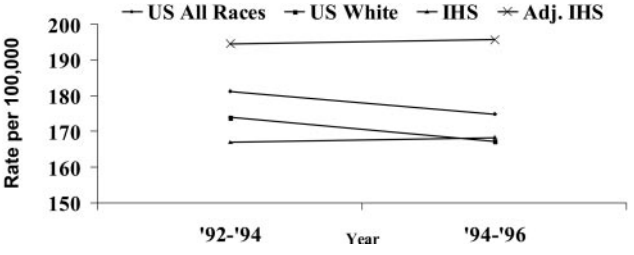

Figure 3. Age- and misclassification-adjusted CVD mortality rates by population. IHS indicates Indian Health Service. Data derived from *Trends in Indian Health*.[27]

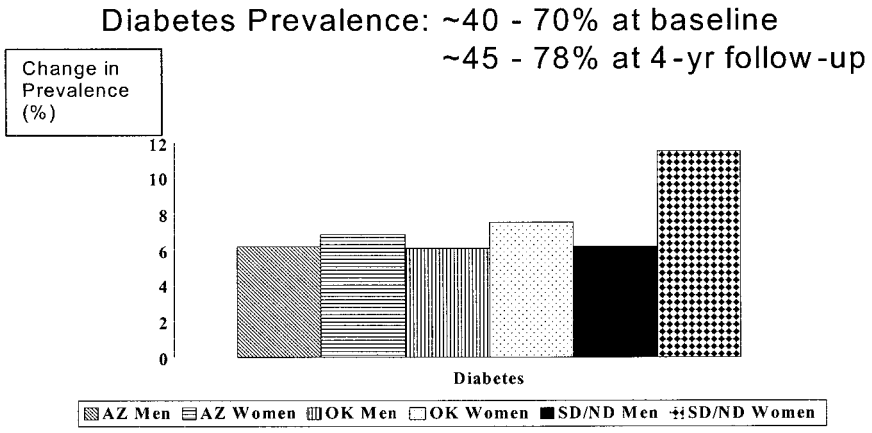

Figure 4. Changes in diabetes prevalence in the SHS cohort, 1989–1991 and 1993–1995. Data derived from Welty et al.[32]

The SHS was designed to address the deficiency in data on CVD and its associated risk factors in American Indians.[29] Supported since 1988 by the National Heart, Lung, and Blood Institute (NHLBI), the SHS is the largest epidemiological study of American Indians ever undertaken. The SHS includes 13 tribes and communities in 3 culturally and geographically diverse areas of Arizona, North and South Dakota, and Oklahoma, and uses standardized methodology to assess risk factors in longitudinal analyses. The problem of racial misclassification was essentially eliminated by this study.[30] The SHS data have demonstrated that American Indian CHD mortality rates either exceed or closely approximate rates in comparable regional populations as well as in the general US and white populations.[30] The SHS also provided further evidence of a widening ethnic disparity in CVD burden: Incidence rates of fatal CHD are rising in American Indians[31] in contrast to declining rates in the US population overall. The SHS also allows comparisons among the 3 geographic regions, as well as the ability to observe trends through time. For example, incidence rates of nonfatal CHD and stroke were shown to be lower among the male Arizona participants, but the rates of fatal events were similar.

Analysis of SHS data through time reveals that CVD risk factors change in a complex pattern. SHS participants have gradually decreased their total cholesterol levels, improved hypertension treatment rates, and decreased smoking rates; however, hypertension and dyslipidemia, which were once less common among older American Indians, increased in prevalence in the cohort. Furthermore, the cohort experienced increases in an already markedly disproportionate burden of diabetes (Figure 4).[32] Although the general US population also is experiencing an increase in diabetes, the diabetes prevalence in the SHS cohort is dramatically higher than it is in the general population.[33] Information on the interacting influences of risk factors, especially diabetes, on CVD continues to be gathered,[30,31] but overall findings from the SHS portend a continued widening in disparities in CVD.[34]

Other important lessons from the SHS include the early involvement of tribal and community members at all stages of the study.[35] For example, rumors that DNA samples would be used to prove or disprove an individual's degree of Indian blood, a sensitive and politically charged subject, were allayed by regularly scheduled community meetings. The meetings served to provide and elicit feedback from tribal members, including the manner in which blood samples would be handled according to the tribes' beliefs. In addition, all publications relating to the SHS are reviewed not only by the Indian Health Service Institutional Review Boards and the NHLBI but also by the tribes.

Multi-Ethnic Study of Atherosclerosis

Results from epidemiological studies indicate that almost all people who die from CVD have ≥1 of the major established risk factors, including hypertension, high cholesterol, cigarette smoking, and diabetes[36]; however, a large proportion of people who do not have symptomatic CVD also have ≥1 of the CVD risk factors. Scientists have examined the role of noninvasive measures to identify people who have subclinical CVD (ie, people with cardiac or vascular structural abnormalities before the onset of clinical disease) and have studied risk factors associated with the progression of subclinical CVD to the symptomatic state.[37] Researchers hypothesize that information on subclinical structural markers may improve the identification of high-risk subgroups for primary and secondary CVD prevention efforts.

Previous studies have demonstrated that measures of subclinical vascular abnormalities are predictive of adverse outcomes. For example, it has long been appreciated that both clinically and noninvasively detected peripheral arterial disease are predictors of CVD death[38] and overall mortality.[39] What is less well appreciated is that blacks have a high prevalence of peripheral arterial disease.[40] In addition, the variation in treatment for peripheral arterial disease is marked. Black patients are more likely to undergo amputation and are less likely to undergo revascularization than are their white counterparts.[41]

Many questions are unanswered with regard to the epidemiology and prognosis of subclinical disease; data have been collected in many community-based cohorts. The single-site or single-race/ethnicity design of most previous studies limits comparisons across racial/ethnic groups; the observed disparities may be attributable to variation in the performance or measurement of the subclinical disease in different centers as opposed to being attributable to ethnic differences. To address this uncertainty, the current American Heart Association (AHA) guidelines state that more definitive data on the

incremental predictive value of subclinical disease measures above that of established CVD risk factors are needed before routine screening can be advocated in asymptomatic individuals.[42,43]

The need for additional data on multiple measures of subclinical disease provided the motivation for MESA. MESA is the NHLBI-sponsored, multicenter study designed to investigate the prevalence, correlates, and progression of subclinical CVD in multiple ethnicities.[37] Six field centers recruited a population-based sample of 6814 men (47%) and women free from symptomatic CVD. The sample was 45 to 84 years old at baseline (2000 to 2002) and from the following groups: white (38%), black (28%), Hispanic American (22%), and Chinese American (12%). The MESA study examines the extent to which ethnic differences exist in the prevalence, amount, and progression of subclinical atherosclerosis. Data have been collected at baseline, and repeat examinations of coronary calcium by electron-beam computed tomography, ultrasound carotid intimal-medial thickness, and ankle-brachial index and a noninvasive measure of endothelial function are scheduled. The study also investigates whether any observed ethnic differences can be correlated to established CVD risk factors or socioeconomic characteristics. Moreover, the MESA study will provide important data on the independent prognostic importance of various forms of subclinical CVD.

The first cycle of the MESA study was recently completed, and most of the published data are in abstract form. Findings to date reveal significant ethnic variation in the prevalence of CVD risk factors and age-adjusted prevalence of coronary artery calcification. One of the first publications on the MESA study revealed that blacks have higher mean maximal thoracic aortic wall thickness as compared with age-controlled whites (3.74 versus 3.42 mm, $P=0.02$).[44]

Conclusions From Observational Studies

By consensus, the conference attendees agreed to define a disparity in CVD as a difference that is associated with a disadvantageous or adverse outcome. Therefore, the role of observational studies to delineate risk factor profiles, patterns of care, and outcomes of various groups in our population is critical. Observational studies have the potential to provide a population-based perspective and a sense of the differences in and similarities among these groups. As we seek to achieve a truly equitable US healthcare system, it is imperative that we understand where the needs and results are uneven and what progress is being made. We need to continue making investments into studies of surveillance, with detailed information about patient characteristics that in the past have made some groups vulnerable to second-tier care and an increased risk for adverse outcomes. The summarized observational studies reveal that profound disparities exist in CVD and CVD risk factor prevalence and incidence in the many racial and ethnic minority groups in the United States. The genesis of the disparities in CVD, CVD risk factors, and CVD treatment is still incompletely understood. Such disparities are undoubtedly multifactorial, involving a complex interplay of behavioral, biological, and societal factors.

Many methodological challenges remain in undertaking observational studies in different racial/ethnic groups. No uniform standards exist for identifying race/ethnicity in an increasingly multicultural US society. Many individuals identify with multiple racial/ethnic groups, and most studies have used participant-identified racial/ethnic categories. Whereas self-identification with multiple ethnicities is undoubtedly more accurate, definitions need to be standardized or tailored to the appropriate populations. The issue of analyzing subgroups highlights another challenge in observational study design. If studies aim for representative numbers of racial/ethnic groups, then most will be underpowered to make inferences about differences among various groups. Alternatively, because of the inherent variation in data collection across sites and studies, large studies of single racial/ethnic groups may compromise the ability to make cross-racial/ethnic comparisons. An additional methodological issue is that although epidemiological studies have effectively measured many biological risk factors, the techniques for assessing behavioral, psychosocial, SES, and community factors have been less thoroughly developed and standardized. The challenge remains to precisely measure and quantify the influences of social, economic, political, and other potentially substantive forces. Moreover, most epidemiological studies have not carefully analyzed and accounted for the influence of socioeconomic, neighborhood, and community factors. Hence, marked racial/ethnic disparities in CVD, health behaviors, and risk factors almost certainly are confounded by SES and community factors. Incomplete analysis of such factors may have the effect of overestimating risk for racial/ethnic minority populations and underestimating the risk of low SES white populations.

Future studies need to determine more precisely the contribution of SES to ethnic disparities in CVD. As in all studies of racial/ethnic disparities, residual confounding by SES is likely in the studies reviewed.[45] Thus, it is possible that the racial/ethnic disparities would be reduced if more comprehensive measures of SES had been available (ie, accumulated assets, quality of schooling, occupational status, neighborhood factors). The existence of residual confounding by SES, however, does not render race/ethnicity any less important because certain ethnic/racial groups disproportionately bear the burden of low SES. Rather, the identification of the role of SES may inform interventions to diminish ethnic/racial disparities in CVD.

Future studies also need to expand the focus from the individual to include factors in communities that may influence health behaviors and risk factors related to CVD. Knowledge about the communities in which people live can provide health professionals with valuable insights about how residential environments can influence behaviors and health.[5,16,46,47] For example, ethnic/racial minority populations may encounter significant barriers to adopting and maintaining healthy behaviors (eg, few or no grocery stores with affordable fresh produce, few or no pharmacies, few safe places to exercise, limited public transportation, poor access to health care, targeted tobacco advertising and promotions). In addition, ethnic/racial minority populations may be more likely than whites to be exposed to hazardous environments

(eg, crime, poor air quality) that in turn influence health behaviors and risk factors. In response to such inequalities, health professionals can be important advocates in promoting healthy schools, neighborhoods, and communities. Two crucial strategies likely to reduce ethnic disparities in CVD are an approach tailored to a high-risk subgroup and an approach that is geared toward the population as a whole.[48]

Recommendations

I. Research

A. *Participation of racial/ethnic groups in research*: The scientific community must support efforts to increase minority participation in scientific studies, broaden the racial/ethnic groups included, and increase the validity of the studies. Although it would not be economically feasible for all studies to achieve the objectives that follow, investigators should ask themselves whether they have addressed the inclusion of racial/ethnic minorities appropriately.

1. Grants should be evaluated by recruitment goals and specific plans to recruit and retain racial/ethnic minorities.

   Has the investigator designed the study appropriately to recruit racial/ethnic minorities, if pertinent to the study hypothesis?

   Have the study instruments been validated in racial/ethnic minority populations? If not, do the investigators have a plan to develop instruments that are culturally appropriate?

   Does the research or advisory staff include members of the community?

2. Studies should include diverse racial/ethnic groups

   Does the study include calculations that demonstrate sufficient power to analyze racial/ethnic differences? If appropriate, has the investigative team made provisions to oversample racial/ethnic groups?

   Are racial/ethnic minority and nonminority participants from all SES levels adequately represented to allow for adequate examination of the role of SES?

   Has the investigative team demonstrated an awareness of the influence of SES and clearly defined and justified the measurement of indicators of SES?

   Is the definition of ethnicity (eg, Mexican American versus Hispanic American) and justification for including the ethnic group to be recruited clear?

B. *Evaluation of grants*: Grant applications should be evaluated by the integrity of their plans to include partnerships with racial/ethnic minority groups that are involved in the studies and should include a community outreach and education program.

1. Does the grant application include a meaningful community outreach and education program (including active partnerships in the design, implementation, interpretation, and dissemination of results)?
2. Does the grant application include meaningful feedback to participants, the community, or both about the results of the study via newsletters, town meetings, or end-of-study visits?

C. *Workforce issues*: The scientific community must increase the number of qualified minority investigators by increasing the training, recruitment, and retention of such investigators. This increase can be accomplished only by enlarging the "pipeline" of investigators and providing outreach and training programs to high school (or younger) students.

1. The AHA and other organizations should gather statistics on the number of minority investigators by ethnicity, age, sex, and their research accomplishments (eg, grants) to assess changes in organizational progress.
2. The AHA and other organizations should expose high school and college students to the importance of research careers in CVD.

   The AHA should encourage the National AHA Scientific Sessions and local AHA affiliates to sponsor "high school days" in which students visit research sites, attend scientific sessions, and meet role models/mentors.

   The AHA and NHLBI should promote mentoring opportunities to minority investigators.
3. The AHA and NHLBI should support "pipeline" programs to increase the number of minority investigators and promote the replication of effective programs.
4. Minority investigators should receive training in grant and scientific writing and feedback on research ideas and applications at symposia and luncheons at scientific sessions and through pamphlets available on accessible web sites (eg, AHA and NHLBI).
5. Mentoring of minority junior investigators by senior investigators should be encouraged.

   Encourage intensive study of the elements that constitute effective mentoring of minorities.

   Explore effective incentives for senior investigators to mentor minority junior investigators.
6. The AHA and other organizations should sponsor grants for ethnic/racial minority fellows to travel to scientific meetings.
7. Minority junior faculty, fellows, and practicing health professionals should be encouraged to file research grant applications.

D. *Full disclosure in studies*: Research bodies, including the AHA, should strongly encourage disclosure of the ages, sexes, races/ethnicities, and SESs of study participants.

1. For publications, such disclosure should be encouraged or an explanation of why it is not possible should be provided.
2. For abstracts, such disclosure should be strongly encouraged.

E. *Research on disparities*: The AHA, National Institutes of Health, and other organizations should encourage research on racial/ethnic disparities in CVD risk factors, outcomes, and access to health care.

1. Research on identifying and eliminating disparities in CVD and its risk factors, including economic, political, social, family, school, work site, and community

influences, with due consideration of the influence of individual-level indicators of SES, should be funded.
2. Development of a national database on CVD by ethnicity, similar to the cancer registries, with indicators of SES when possible, should be encouraged.
3. Publication of racial/ethnic disparities research in the AHA's and other journals should be encouraged.
4. Coverage of racial/ethnic and SES disparities in CVD in scientific sessions should be more heavily promoted. Late-breaking trials should include epidemiology or observational studies. Plenary sessions on racial/ethnic disparities in CVD should be organized.
5. An abstract category of SES, sex, racial/ethnic, and geographic disparities in CVD risk factors and outcomes should be created.

II. Advocacy

A. *Federal funding*: The AHA and other organizations should advocate for federal funding for the identification of gaps in access to and the quality of health care and services offered to racial/ethnic minorities; the identification of ways to improve quality; and an increased focus on environmental, systems-level, and policy-level research.

B. *Mission statement*: The AHA should commit to crafting a mission statement dedicated to eliminating racial/ethnic and SES disparities in CVD and its attendant health behaviors and risk factors, and post the mission statement and minimal standards of care on the AHA's web site.

C. The AHA and healthcare provider should advocate for the following changes.
1. Systems should be held accountable for eliminating racial/ethnic disparities.
2. Incentives/reimbursement for primary and secondary prevention should be increased to all segments of the population, including racial/ethnic minorities.
3. Community outreach programs should be established.
4. Reimbursement for physician's assistant/registered nurse practitioner staff and healthcare teams should be expanded.
5. There should be a focus on the prevention and treatment of obesity and diabetes by emphasizing attendant risk factors, prevention, and community influences.
6. Clinical centers of excellence that have developed effective programs to eliminate racial/ethnic/SES disparities in CVD care should be identified.

D. *Universal access*: The AHA should advocate for universal access to high-quality health care.

E. *Universal health*: The AHA should target their advocacy efforts to promote child and adult health across races/ethnicities in schools, families, and communities.
1. Schools

Participation in physical education should be mandated.

The types and amounts of healthful food and drink choices should be increased, and junk food and soda vending machines should be eliminated.

Gymnasiums and schoolyards should be open to children and adolescents after school and on weekends.

Equal access to competitive and noncompetitive sports for girls and boys, regardless of their ability to pay, should be promoted.

2. Families

The amount of time spent watching television should be reduced.

Targeted advertising of junk food and soft drinks to children should be eliminated.

Pediatricians should communicate to parents (in person and via the media) the benefits of heart-healthy behaviors for their infants and children.

3. Communities

Healthy neighborhoods should be established, with safe, convenient, and affordable environments in which to exercise and access to affordable and nutritious food.

Healthy work sites should be established that offer employees smoke-free environments and exercise breaks and gyms.

Nutritional reform should be undertaken, including moderating portion sizes, labeling fast food containers with their nutritional content, regulating advertising and promotions that counter heart-healthy behaviors, and linking AHA primary and secondary prevention strategies (eg, heart-healthy food certification program) with AHA acute event education and treatment programs (eg, Layperson Basic Life Support education and training).

Encourage the entertainment industry to promote healthy role models in radio, movies, and television shows with characters who follow a healthy diet, avoid smoking and other unhealthy behaviors, and pursue a regimen of regular exercise.

III. Education

A. *Annual report*: The AHA should issue an annual report on disparities in CVD.
1. The report should be stratified by race/ethnicity, age, sex, and indicators of SES.
2. The report should examine the interrelationship between racial/ethnic disparities and SES.
3. The report should underscore CVD in racial/ethnic minorities and low-SES populations.
4. The report should create a national CVD database that is stratified by race/ethnicity.
5. The report should outline progress in the areas of research, education, clinical practice, advocacy, and legislation, focused on racial/ethnic disparities.

B. *Internet*: The AHA and other organizations should develop web-based downloadable health education materials on CVD for racial/ethnic minorities and low-SES communities, including slides and pamphlets.
1. Materials prepared for the lay audience should be culturally sensitive and linguistically appropriate and should consist of

Educational materials for schoolchildren and educators

Materials for patients and health professionals
Materials translated into numerous languages
Content: CVD signs and symptoms, risk factors/ health behaviors, disparities in CVD

2. Materials prepared for the professional audience should include
CVD risk factors and health behaviors
Disparities in CVD
Community influences (eg, portion sizes, availability of fast foods, promotion of tobacco products)
3. The AHA web site should include either a downloadable pamphlet on or a link to the National Institutes of Health clinical trials web site (http://www.clinicaltrials.gov/ct/info/resources), which answers questions such as what is a clinical trial? and what are the benefits of participating in clinical research?

C. *Public education campaign*: The AHA should pursue culturally and linguistically appropriate public education on CVD prevention and disparities; the message should include that CVD occurs disproportionately in racial/ethnic minorities and low-SES populations.
1. The advertising campaign should include traditional and nontraditional outlets (eg, consider language, age, sex, religion).
2. Materials should be funded and disseminated.
3. Patients and community members should be used as health educators.
4. Community organizations and churches should be recruited to help spread the message.
5. The content of the campaign should be tailored to each population group.

Appendix

Cardiovascular Epidemiology Facts and Figures

- 2004 NHLBI Morbidity and Mortality Chartbook: http://www.nhlbi.nih.gov/resources/docs/cht-book.htm
- AHA 2004 Heart and Stroke Statistical Update: http://www.americanheart.org/statistics/

Clinical Trials

- ALLHAT (Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial): http://allhat.sph.uth.tmc.edu/
- Clinical trials information: http://www.clinicaltrials. gov/ct/info/resources
- A-HeFT (African American Heart Failure Trial): http://www.clinicaltrials.gov/ct/show/NCT00047775

Observational Studies

- ARIC (Atherosclerosis Risk in Communities): http://www.cscc.unc.edu/aric/
- Cardiovascular Health Study: http://128.208.129.3/CHS/
- Framingham Heart Study: http://www.framingham.com/heart/
- Health Disparities Information National Center on Minority and Health Disparities: http://www.ncmhd.nih.gov/
- HHP (Honolulu Heart Program): http://www.nhlbi.nih.gov/ resources/deca/descriptions/ honolulu.htm
- Jackson Heart Study: http://www.nhlbi.nih.gov/about/jackson/index.htm
- MESA (Multi-Ethnic Study of Atherosclerosis): http://www.mesa-nhlbi.org/default.aspx
- NHANES (National Health and Nutrition Examination Survey): http://www.cdc.gov/nchs/nhanes.htm
- Nurses' Health Study: http://www.channing.harvard.edu/nhs/
- Physicians' Health Study: http://phs.bwh.harvard.edu/index.html
- SHS (Strong Heart Study): http://strongheart.ouhsc.edu/
- WHO MONICA Project (Multinational MONItoring of trends and determinants in CArdiovascular disease): http://www.ktl.fi/monica/index.html
- Women's Health Initiative: http://www.nhlbi.nih.gov/whi/index.html

Health Disparities Information

- Healthy People 2010 (goals, including eliminating health disparities among different segments of the population by 2010): http://www.healthypeople.gov/About/goals.htm
- Henry J. Kaiser Family Foundation and The Robert Wood Johnson Foundation Initiative to raise physician awareness about disparities in medical care, beginning with cardiac care: http://www.kff.org/whythedifference/
- National Center on Minority and Health Disparities: http://www.ncmhd.nih.gov/
- National Healthcare Disparities Report: http://www.ahrq.gov/qual/nhdr03/nhdrsum03.htm
- NHLBI Strategy for Addressing Health Disparities FY 2002 to 2006: http://www.nhlbi.nih.gov/resources/docs/plandisp.htm
- *Racial/Ethnic Differences in Cardiac Care: The Weight of the Evidence*, Henry J. Kaiser Family Foundation: http://www.kff.org/uninsured/20021009c-index.cfm
- *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*, Institute of Medicine: http://www.IMedu/report.asp?id =4475

Genetics

- CardioGenomics site for cardiovascular genetics: http://cardiogenomics.med.harvard.edu/home
- Genome database tutorials: http://www.ornl.gov/sci/techresources/ Human_ Genome/posters/chromosome/tools.shtml
- Genome glossary: http://www.ornl.gov/sci/techresources/Human_ Genome/glossary/
- Human Genome Project: http://www.ornl.gov/sci/techresources/ Human_ Genome/home.shtml
- *Nature*'s guide to the human genome: http://www.nature.com/nature/focus/humangenome/

Risk Factors

- Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: http://www.nhlbi.nih.gov/guidelines/obesity/ob_home. htm
- National Diabetes Information Clearinghouse: http://diabetes.niddk.nih.gov/index.htm
- Prevention Conference VI: Diabetes and Cardiovascular Disease: http://circ.ahajournals.org/cgi/content/full/105/18/2231
- Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7): http://www.nhlbi.nih.gov/guidelines/hypertension/index. htm
- Tobacco Information and Prevention Source: http://www.cdc. gov/tobacco/
- Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III; including 2004 update): http://www.nhlbi.nih.gov/guidelines/cholesterol/

Risk Assessment

- Risk assessment tool: http://www.americanheart.org/presenter.jhtml?identifier =3003500

Organizations and Programs

- American Heart Association http://www.americanheart.org
  - Cholesterol Low Down program: http://www.s2mw.com/cholesterollowdown/
  - Discovering the Full Spectrum of Cardiovascular Disease Disparities Conference Archive Material: http://www.americanheart.org/presenter.jhtml?identifier =3019526
  - The Heart of Diabetes program: http://www.s2mw.com/heartofdiabetes/index.html
  - Search Your Heart/De Corazon a Corazon: http://www.americanheart.org/presenter.jhtml?identifier =3018184
- American Medical Association: http://www.ama-assn.org/
- American Medical Student Association (diversity resources): http://www.amsa.org/div/divres.cfm
- Asian American Physicians Association: http://www.aapamd.org/
- Association of American Indian Physicians: http://www.aaip.com/
- Association of Black Cardiologists: http://www.abcardio.org/
- Centers for Disease Control and Prevention: http://www.cdc.gov/
  - CDC Office of Minority Health http://www.cdc.gov/omh/
  - CDC Office of Minority and Women's Health http://www.cdc.gov/ncidod/omwh/
  - CDC WISEWOMAN Program http://www.cdc.gov/wisewoman/
- Indian Health Service: http://www.ihs.gov/index.asp
- International Society of Hypertension in Blacks: http://www.ishib.org/
- National Center on Minority Health and Health Disparities: http://ncmhd.nih.gov/
- NHLBI: http://www.nhlbi.nih.gov/
  - Healthy People 2010 Initiative: http://www.healthypeople.gov
  - NHLBI Office of Minority Health Affairs: http://www.nhlbi.nih.gov/about/omha/
  - National Institute of Neurological Disorders and Stroke (NINDS): http://www.ninds.nih.gov/
  - NINDS Office of Minority Health and Research: http://www.ninds.nih.gov/funding/minorities_and_ disabilities.htm
- National Hispanic Medical Association: http://www.nhmamd.org/
- National Medical Association: http://www.nmanet.org/index.htm
- National Minority Health Month Foundation: http://www.nmhm.org/

References

1. National Heart, Lung, and Blood Institute. *Morbidity and Mortality: 2002 Chart Book on Cardiovascular, Lung, and Blood Diseases*. Available at: http://www.nhlbi.nih.gov/resources/docs/02_chtbk.pdf. Accessed December 1, 2004.
2. American Heart Association. *Heart Disease and Stroke Statistics—2004 Update*. Available at: http://www.americanheart.org/downloadable/heart/1072969766940HSStats2004Update.pdf. Accessed December 1, 2004.
3. Centers for Disease Control and Prevention (CDC). Disparities in premature deaths from heart disease—50 States and the District of Columbia, 2001. *MMWR Morb Mortal Wkly Rep*. 2004;53:121–125.
4. Wong MD, Shapiro MF, Boscardin WJ, Ettner SL. Contribution of major diseases to disparities in mortality. *N Engl J Med*. 2002;347:1585–1592.
5. Winkleby MA, Cubbin C. Influence of individual and neighbourhood socioeconomic status on mortality among black, Mexican-American, and white women and men in the United States. *J Epidemiol Community Health*. 2003;57:444–452.
6. Kuczmarski RJ, Flegal KM, Campbell SM, Johnson CL. Increasing prevalence of overweight among US adults. The National Health and Nutrition Examination Surveys, 1960 to 1991. *JAMA*. 1994;272:205–211.
7. Winkleby MA, Kraemer HC, Ahn DK, Varady AN. Ethnic and socioeconomic differences in cardiovascular disease risk factors: findings for women from the Third National Health and Nutrition Examination Survey, 1988–1994. *JAMA*. 1998;280:356–362.
8. Winkleby MA, Cubbin C, Ahn DK, Kraemer HC. Pathways by which SES and ethnicity influence cardiovascular disease risk factors. *Ann N Y Acad Sci*. 1999;896:191–209.
9. Winkleby MA, Robinson TN, Sundquist J, Kraemer HC. Ethnic variation in cardiovascular disease risk factors among children and young adults: findings from the Third National Health and Nutrition Examination Survey, 1988–1994. *JAMA*. 1999;281:1006–1013.
10. Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among US adults, 1999–2000. *JAMA*. 2002;288:1723–1727.
11. Ford ES, Mokdad AH, Giles WH, Mensah GA. Serum total cholesterol concentrations and awareness, treatment, and control of hypercholesterolemia among US adults: findings from the National Health and Nutrition Examination Survey, 1999 to 2000. *Circulation*. 2003;107:2185–2189.
12. Miller NH, Hill M, Kottke T, Ockene IS. The multilevel compliance challenge: recommendations for a call to action. A statement for healthcare professionals. *Circulation*. 1997;95:1085–1090.
13. Hill MN, Bone LR, Hilton SC, Roary MC, Kelen GD, Levine DM. A clinical trial to improve high blood pressure care in young urban black men: recruitment, follow-up, and outcomes. *Am J Hypertens*. 1999;12:548–554.
14. Benjamin EJ, Smith SC Jr, Cooper RS, Hill MN, Luepker RV. Task force #1—magnitude of the prevention problem: opportunities and challenges. 33rd Bethesda Conference. *J Am Coll Cardiol*. 2002;40:588–603.
15. Pickett KE, Pearl M. Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *J Epidemiol Community Health*. 2001;55:111–122.
16. Diez Roux AV, Merkin SS, Arnett D, Chambless L, Massing M, Nieto FJ, Sorlie P, Szklo M, Tyroler HA, Watson RL. Neighborhood of residence and incidence of coronary heart disease. *N Engl J Med*. 2001;345:99–106.
17. Sundquist K, Winkleby M, Ahlen H, Johansson SE. Neighborhood socioeconomic environment and incidence of coronary heart disease: a follow-up study of 25,319 women and men in Sweden. *Am J Epidemiol*. 2004;159:655–662.
18. Cubbin C, Hadden WC, Winkleby MA. Neighborhood context and cardiovascular disease risk factors: the contribution of material deprivation. *Ethn Dis*. 2001;11:687–700.
19. Yen IH, Kaplan GA. Poverty area residence and changes in physical activity level: evidence from the Alameda County Study. *Am J Public Health*. 1998;88:1709–1712.
20. Diez-Roux AV, Nieto FJ, Caulfield L, Tyroler HA, Watson RL, Szklo M. Neighbourhood differences in diet: the Atherosclerosis Risk in Communities (ARIC) Study. *J Epidemiol Community Health*. 1999;53:55–63.
21. Rodriguez BL, Abbott RD, Fujimoto W, Waitzfelder B, Chen R, Masaki K, Schatz I, Petrovitch H, Ross W, Yano K, Blanchette PL, Curb JD; American Diabetes Association; World Health Organization. The American Diabetes Association and World Health Organization classifications for diabetes: their impact on diabetes prevalence and total and cardiovascular disease mortality in elderly Japanese-American men. *Diabetes Care*. 2002;25:951–955.
22. Rodriguez BL, Curb JD, Burchfiel CM, Huang B, Sharp DS, Lu GY, Fujimoto W, Yano K. Impaired glucose tolerance, diabetes, and cardiovascular disease risk factor profiles in the elderly. The Honolulu Heart Program. *Diabetes Care*. 1996;19:587–590.
23. Burchfiel CM, Curb JD, Rodriguez BL, Abbott RD, Chiu D, Yano K. Glucose intolerance and 22-year stroke incidence. The Honolulu Heart Program. *Stroke*. 1994;25:951–957.
24. Rodriguez BL, Lau N, Burchfiel CM, Abbott RD, Sharp DS, Yano K, Curb JD. Glucose intolerance and 23-year risk of coronary heart disease and total mortality: the Honolulu Heart Program. *Diabetes Care*. 1999;22:1262–1265.
25. Curb JD, Rodriguez BL, Burchfiel CM, Abbott RD, Chiu D, Yano K. Sudden death, impaired glucose tolerance, and diabetes in Japanese American men. *Circulation*. 1995;91:2591–2595.
26. Genuth S, Alberti KG, Bennett P, Buse J, Defronzo R, Kahn R, Kitzmiller J, Knowler WC, Lebovitz H, Lernmark A, Nathan D, Palmer J, Rizza R, Saudek C, Shaw J, Steffes M, Stern M, Tuomilehto J, Zimmet P; Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Follow-up report on the diagnosis of diabetes mellitus. *Diabetes Care*. 2003;26:3160–3167.
27. U.S. Department of Health and Human Services, Indian Health Service, Office of Planning, Evaluation, and Legislation. *Trends in Indian Health 1997*. Available at: http://www.ihs.gov/PublicInfo/publications/trends97/trends97.asp; *Trends in Indian Health 1998–99*. Available at: http://www.ihs.gov/PublicInfo/Publications/trends98/trends98.asp. Accessed January 31, 2005.
28. Rhoades DA, Rhoades ER, Welty T. The rise of cardiovascular diseases. In: Rhoades ER, ed. *American Indian Health: Innovations in Health*

Care, Promotion, and Policy. Baltimore, Md: The Johns Hopkins University Press; 2000:151–178.
29. Lee ET, Welty TK, Fabsitz R, Cowan LD, Le NA, Oopik AJ, Cucchiara AJ, Savage PJ, Howard BV. The Strong Heart Study. A study of cardiovascular disease in American Indians: design and methods. *Am J Epidemiol*. 1990;132:1141–1155.
30. Lee ET, Cowan LD, Welty TK, Sievers M, Howard WJ, Oopik A, Wang W, Yeh J, Devereux RB, Rhoades ER, Fabsitz RR, Go O, Howard BV. All-cause mortality and cardiovascular disease mortality in three American Indian populations, aged 45–74 years, 1984–1988. The Strong Heart Study. *Am J Epidemiol*. 1998;147:995–1008.
31. Howard BV, Lee ET, Cowan LD, Devereux RB, Galloway JM, Go OT, Howard WJ, Rhoades ER, Robbins DC, Sievers ML, Welty TK. Rising tide of cardiovascular disease in American Indians. The Strong Heart Study. *Circulation*. 1999;99:2389–2395.
32. Welty TK, Rhoades DA, Yeh F, Lee ET, Cowan LD, Fabsitz RR, Robbins DC, Devereux RB, Henderson JA, Howard BV. Changes in cardiovascular disease risk factors among American Indians. The Strong Heart Study. *Ann Epidemiol*. 2002;12:97–106.
33. Lee ET, Howard BV, Savage PJ, Cowan LD, Fabsitz RR, Oopik AJ, Yeh J, Go O, Robbins DC, Welty TK. Diabetes and impaired glucose tolerance in three American Indian populations aged 45–74 years. The Strong Heart Study. *Diabetes Care*. 1995;18:599–610.
34. Lee ET, Welty TK, Cowan LD, Wang W, Rhoades DA, Devereux R, Go O, Fabsitz R, Howard BV. Incidence of diabetes in American Indians of three geographic areas: the Strong Heart Study. *Diabetes Care*. 2002;25:49–54.
35. Sambo BH; Strong Heart Study Investigators. The Strong Heart Study: interaction with and benefit to American Indian communities. *Am J Med Sci*. 2001;322:282–285.
36. Greenland P, Knoll MD, Stamler J, Neaton JD, Dyer AR, Garside DB, Wilson PW. Major risk factors as antecedents of fatal and nonfatal coronary heart disease events. *JAMA*. 2003;290:891–897.
37. Bild DE, Bluemke DA, Burke GL, Detrano R, Diez Roux AV, Folsom AR, Greenland P, Jacob DR Jr, Kronmal R, Liu K, Nelson JC, O'Leary D, Saad MF, Shea S, Szklo M, Tracy RP. Multi-ethnic study of atherosclerosis: objectives and design. *Am J Epidemiol*. 2002;156:871–881.
38. Criqui MH, Langer RD, Fronek A, Feigelson HS, Klauber MR, McCann TJ, Browner D. Mortality over a period of 10 years in patients with peripheral arterial disease. *N Engl J Med*. 1992;326:381–386.
39. Criqui MH, Coughlin SS, Fronek A. Noninvasively diagnosed peripheral arterial disease as a predictor of mortality: results from a prospective study. *Circulation*. 1985;72:768–773.
40. Criqui MH, Fronek A, Barrett-Connor E, Klauber MR, Gabriel S, Goodman D. The prevalence of peripheral arterial disease in a defined population. *Circulation*. 1985;71:510–515.
41. Huber TS, Wang JG, Wheeler KG, Cuddeback JK, Dame DA, Ozaki CK, Flynn TC, Seeger JM. Impact of race on the treatment for peripheral arterial occlusive disease. *J Vasc Surg*. 1999;30:417–425.
42. O'Rourke RA, Brundage BH, Froelicher VF, Greenland P, Grundy SM, Hachamovitch R, Pohost GM, Shaw LJ, Weintraub WS, Winters WL Jr, Forrester JS, Douglas PS, Faxon DP, Fisher JD, Gregoratos G, Hochman JS, Hutter AM Jr, Kaul S, Wolk MJ. American College of Cardiology/American Heart Association Expert Consensus document on electron-beam computed tomography for the diagnosis and prognosis of coronary artery disease. *Circulation*. 2000;102:126–140.
43. Smith SC Jr, Greenland P, Grundy SM. AHA Conference Proceedings: Prevention Conference V: Beyond secondary prevention: Identifying the high-risk patient for primary prevention: executive summary. American Heart Association. *Circulation*. 2000;101:111–116.
44. Li AE, Kamel I, Rando F, Anderson M, Kumbasar B, Lima JA, Bluemke DA. Using MRI to assess aortic wall thickness in the multiethnic study of atherosclerosis: distribution by race, sex, and age. *AJR Am J Roentgenol*. 2004;182:593–597.
45. Kaufman JS, Cooper RS, McGee DL. Socioeconomic status and health in blacks and whites: the problem of residual confounding and the resiliency of race. *Epidemiology*. 1997;8:621–628.
46. Link BG, Phelan J. Social conditions as fundamental causes of disease. *J Health Soc Behav*. 1995;Spec No:80–94.
47. Macintyre S, Maciver S, Sooman A. Area, class and health: should we be focusing on places of people? *J Soc Pol*. 1993;22:213–234.
48. Rose GA. *The Strategy of Preventive Medicine*. New York, NY: Oxford University Press; 1992.

KEY WORDS: AHA Conference Proceedings ■ cardiovascular diseases ■ risk factors ■ epidemiology ■ follow-up studies