

## Perspectives on Coronary Heart Disease in African Americans

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*Coronary heart disease (CHD) is the leading cause of death in African Americans. CHD mortality rates have not declined in recent years as much as they did from 1970–1990. Significant mortality rate variations exist related to regional, socioeconomic, and sociocultural factors. Risk factors detected in white populations (age, gender, hypertension, lipoprotein levels, cigarette smoking, diabetes, socioeconomic status) all are operative in African Americans. The excess prevalence of hypertension and diabetes enhances CHD risk in African Americans. Left ventricular hypertrophy is a major indicator of excess risk. African Americans are less likely than Whites to undergo cardiac catheterization, percutaneous intervention, and coronary bypass surgery, and to have risk factors detected and treated adequately. CHD mortality in African Americans is unlikely to decline further without significant changes in the awareness, attitudes, and behavior of physicians who treat African American patients.*

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**I**n 1982, Gillum published 2 papers on coronary heart disease (CHD) in populations of African origin, a review of morbidity, mortality, and risk factors.<sup>1,2</sup> The papers drew attention to the frequently neglected fact that CHD is the leading cause of death among African Americans. They set out to revise “old concepts about the relative frequency of CHD in various races.” Awareness of the importance of CHD in African Americans increased as a result of a March 1983 American Heart Association symposium and a September 1983 National

Heart, Lung, and Blood Institute Working Conference.<sup>3</sup> These events stimulated the analysis and presentation of the available data, and led to further research. The Task Force on Black and Minority Health, appointed by the Secretary for Health and Human Services, provided as part of its 1986 report a comprehensive analysis of the available data on cardiovascular and cerebrovascular disease in African

was exposed in a 1997 study by Schulman and colleagues,<sup>7</sup> who studied the management decisions of 720 primary-care physicians (78% white, 4.5% African American) treating patients with chest pain. Eight actors, representing each of the possible combinations of race, sex, age, and type of chest pain, portrayed the patients in the videotaped interviews. White men were significantly more likely to be referred for catheter-

priate behavior in interactions with individuals from cultures other than one's own).<sup>9,10</sup> On another level, efforts to improve the quality of care rendered to all patients by influencing clinician behavior in certain practice settings (using guideline education, process measurement, analysis, and feedback on performance) have been demonstrated for hypertension and dialysis care, for example, simultaneously improving quality and reducing racial/ethnic disparities. It is hoped that the integration of the collection of data on the quality of care into routine processes in physicians' offices, as is now increasingly feasible with electronic health records, might make care more systematic and equal.

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Americans,<sup>4,5</sup> and brought the issue of cardiovascular health disparities, albeit briefly, to center stage. The National Heart, Lung, and Blood Institute subsequently sponsored a variety of initiatives to improve knowledge of risk factor distributions and their impact on African American populations, and to foster the design and implementation of effective cardiovascular health interventions in African American communities.

Investigators in a variety of settings documented racial and ethnic differences in the use of cardiac care. In 2002, a review group, jointly sponsored by the Henry J. Kaiser Family Foundation and the American College of Cardiology Foundation, examined the most methodologically rigorous of these peer-reviewed studies. The reviewers concluded that the studies provided "credible evidence that African Americans are less likely than Whites to receive diagnostic procedures, revascularization procedures, and thrombolytic therapy," and found that "racial-ethnic differences in care remain after adjustment for clinical and socioeconomic differences."<sup>6</sup> The possible role of physician bias in this state of affairs

ization than women and African Americans even after statistical adjustment for symptoms, physicians' estimates of the probability of coronary disease, and clinical characteristics. These data reinforce the notion that the race and sex of the patient affect physicians' decisions about whether to refer those with chest pain for cardiac catheterization.

These considerations are presented at the outset of this article, and as part of the introduction to this supplement, because continuing education of a learned profession should result in improvement in behavior and in the quality of care. This purpose underlies the Kaiser Family Foundation and Robert Wood Johnson Foundation-sponsored website, "Why the Difference?,"<sup>8</sup> which invites physicians to obtain information and reflect on the issue of disparate levels of care. On one level, the imperative is for each physician to cultivate cultural sensitivity (awareness and nonjudgmental acceptance of cultural differences) and to develop cultural competence (the knowledge and interpersonal skills that allow one to understand, appreciate, and incorporate appro-

### **Mortality: It's the Diversity**

In 2001, diseases of the heart and stroke accounted for 30.8% of deaths in African American men and 36.5% of deaths in African American women. Age-adjusted CHD death rates per 100,000 of the population for African American men and women were 262.0 and 176.7, 15% and 28% higher than those observed in Whites.<sup>11,12</sup> Coronary heart disease mortality has declined since 1968, but the rate of decline has slowed in African Americans, especially African American women, in recent years.

To these national observations should be juxtaposed other regional observations that suggest a different picture. Earlier (1960s) observations from rural Evans County, Georgia, wherein the cross-sectional data indicated much lower prevalence of CHD in African American men (and higher stroke incidence), were followed by observations of lower coronary incidence and mortality from CHD in 30 years of follow-up.<sup>13</sup> In contrast, in urban, coastal Charleston, South Carolina, in a similar period, the CHD mortality rates

for African American and white men were similar (4.6 vs 5.2/1000 person-years).<sup>14</sup> In analyses of the combined Evans County and Charleston cohorts,<sup>15</sup> the respective age-adjusted rates were again similar, 5.0 and 6.5/1000 person-years, and a higher level of education was associated with lower CHD mortality in both African American and white men.

Follow-up over 19 years of the cohort evaluated in the National Health and Nutritional Examination Survey I (NHANES I) in 1971<sup>16</sup> revealed age-adjusted incidence of CHD in African American men about 78% of that observed in white men 25–74 years of age. In younger African American women (25–54 years of age), the rate was 76% higher than in Whites. More recent observations in the Atherosclerosis Risk in Communities (ARIC) study,<sup>17</sup> which combines subjects in Forsyth County, North Carolina, the city of Jackson, Mississippi, 8 northern suburbs of Minneapolis, Minnesota, and Washington County, Maryland, over a 10-year follow-up period (1987–1997) reveal age-adjusted incidence rates of CHD of 10.6 and 5.1 per 1000 person-years for African American men and women, respectively. The investigators note that “racial differences in overall incidence rates tended to be small.” Gender differences were small in African Americans because of higher rates in African American women.

In his 1982 paper,<sup>1</sup> Gillum commented on regional differences in CHD mortality, as well as on the limitations of vital statistics, especially the inaccuracy of death certificate diagnoses and the effects of changes in the International Classification of Diseases for diagnosis reporting. Regional differences persist. In the Appalachian region of the United States, in the period 1980–1997, CHD mortality rates were higher and

rates of decline were lower in the nonmetropolitan areas (with diminished access to social, economic, and medical care resources) than in metropolitan areas.<sup>18</sup> Similarly, in the Atherosclerosis Risk in Communities (ARIC) study,<sup>19</sup> in the period 1987–1996, African American residents of disadvantaged neighborhoods (classified on the basis of a summary score using income, education, and occupation) were at higher risk of CHD mortality on the basis of independent contributions of both neighborhood and personal socioeconomic indicators. These differences persisted, even after statistical adjustment for established biological CHD risk factors.

The trend to increases in CHD mortality in some regions is confirmed in an analysis of national CHD mortality rates for the period 1985–1995.<sup>20</sup> This revealed “moderate-to-strong local increases in CHD mortality in the southern United States,” and this applied most strongly to African American men. Even within regions, interesting and instructive differences emerge when the relationship between birthplace (southern United States, northeastern United States, Caribbean) and CHD mortality is considered.<sup>21</sup> In 1988–1992, Southern-born African American men resident in New York City had CHD death rates similar to Northeastern-born white men (207.9 vs 203.7/100,000). For ages 25–44 years, the rates were 30% higher than for Northeastern-born African American men, and more than 4 times as high as for Caribbean-born men of African descent (30.1, 23.1, and 7.4/100,000, respectively). In subjects 45–64 years of age, Southern-born African Americans still had a CHD death rate more than twice that of Caribbean-born men of African descent (406.5 vs 165.2/100,000). Simply put, the investigators found

that “variation in mortality from cardiovascular disease [and from CHD (author’s note)] within the black population, according to birthplace, far exceeds the interracial differences between blacks and whites,” and that “the apparent interracial differences actually obscure larger variations within the black population.” Despite all of these reports, the dynamic aspect of CHD mortality and the heterogeneity of rates of cardiovascular disease (CVD) among African Americans continue to be neglected. Typically, clinicians who treat African American patients are unaware of such diversity and assume a sociocultural and genetic homogeneity where none exists.

Gillum<sup>22</sup> has advanced a theoretical schema for understanding of the intra-ethnic variation in CVD (and its manifestations in CHD and stroke) and the implications of acculturation, urbanization, and modernization for the differential impact of diet and hypertension on CVD outcomes. This schema is shown in Table 1. It should facilitate integration of disparate observations. Analysis of a contemporaneous (1991) autopsy series of New York City deaths coded as cardiovascular revealed that hypertensive vascular disease was the cause of death in 42% of 340 African American subjects and in 23% of 273 white subjects, whereas arteriosclerotic heart disease was quoted as the cause in 38% and 64% of African American and white subjects, respectively.<sup>23</sup> Consider, too, contemporary reports of lower CHD incidence and mortality in Caribbean migrants of African descent to the United Kingdom compared to the majority white population.<sup>24,25</sup>

### Sudden Death

Sudden, out-of-hospital death is an important component of the CHD experience in African Americans.

**Table 1**  
**Stages in the Epidemiologic Evolution of Patterns of Cardiovascular Disease**  
**Among Persons of Sub-Saharan African Origin**

| Stage | Acculturation | Urbanization | Affluence | Saturated<br>Fat Intake | Salt Intake | Smoking | Cardiovascular Disease |                 |
|-------|---------------|--------------|-----------|-------------------------|-------------|---------|------------------------|-----------------|
|       |               |              |           |                         |             |         | Hypertensive           | Atherosclerotic |
| 1     | 0             | 0            | 0         | +                       | +           | 0       | 0                      | 0               |
| 2     | +             | ++           | +         | ++                      | ++          | +       | ++                     | 0               |
| 3     | ++            | ++           | ++        | ++                      | +++         | ++      | ++++                   | +               |
| 4     | +++           | +            | ++        | +++                     | ++++        | +++     | ++++                   | ++              |
| 5     | +++           | ++++         | +++       | ++++                    | ++++        | ++++    | ++++                   | ++++            |
| 6     | ++++          | ++++         | ++++      | +++                     | +++         | +++     | ++                     | +++             |

The degree to which each factor or disease is present in each stage is shown, with 0 denoting virtually absent and + + + + denoting present at the highest level. Stage 1, Precolonial Africa and traditional African societies; stage 2, modern urban Africans; stage 3, modern Caribbean populations of African descent; stage 4, southern U.S. rural African Americans; stage 5, poor inner-city African Americans; stage 6, affluent suburban/urban African Americans.

Analysis of 1980–1985 national data confirmed that 56% of CHD deaths in adults 35–74 years of age occurred out of hospital (OH) or in the emergency department (ER), more likely in African Americans than in Whites, and in men than in women.<sup>26</sup> In the group 55–64 years of age, 66% of CHD deaths in African American men were OH/ER. In 1987–1988, a Chicago population-based study<sup>27</sup> revealed that in all age groups, African American men and women had higher cardiac arrest rates than white men and women, more than 2-fold in the 32–36-year-old group, and survival rates were less than 1%. ARIC data from 1987–1993 confirmed an excess case fatality from out-of-hospital CHD events in African Americans. An analysis of 1992 data<sup>28</sup> reveals CHD OH/ER death rates of 209 and 108/100,000 for African American men and women, substantially higher than in white men and women (166 and 74); the highest rates were in subjects who were young or single or lived in rural areas.

Some investigators have examined the issue of chest pain and response to chest pain symptoms in

African Americans and Whites. One study<sup>29</sup> of 2416 patients admitted with CHD diagnoses found that African Americans were 64% as likely as Whites to report painful symptoms and 50% as likely to attribute chest pain symptoms to a cardiac cause. These behaviors may contribute to differences in care seeking and medical management.

### **Risk Factors for Coronary Artery Disease**

The prevalence of certain CHD risk factors is greater in African Americans than in the general population, as is the phenomenon of clustering of risk factors. This section will review data on the predictive value of most of the conventional risk factors of CHD in African Americans.

#### *Age, Gender, and Family History*

CHD incidence and mortality in African Americans increase with age. The age-adjusted risk is greater in African American women 25–54 years of age than in white women, but is lower in African American men than in white men of similar age. The higher risk at younger ages in African American women than in

African American men is explained by the higher prevalence of CHD risk factors in younger women.

It is presumed that a family history of premature CHD in first-degree relatives has a similar impact on increasing risk in African Americans.

#### *Blood Lipids and Lipoproteins*

In population studies, the risk of CHD mortality conferred by levels of cholesterol is continuous and graded, and rises more steeply at levels greater than 200 mg/dL than at lower levels. The prevalence of various characteristics of dyslipidemia in African American adults is reported in Table 2. Total cholesterol was not predictive of CHD incidence and mortality in analyses of the combined Charleston and Evans County cohorts.<sup>15</sup> The pooled data from two national cohorts, the NHANES I Follow-Up and the NHANES II Mortality Study included 940 African American men and 1463 African American women, 30–74 years of age, followed for 20 and 15 years, respectively. The Cox regression coefficients for total cholesterol were similar in African American men and women.<sup>30</sup>

**Table 2**  
**Age-Adjusted Prevalence of Dyslipidemia in**  
**African American Adults 20–74 Years of Age (%)**

|                               | Men  | Women |
|-------------------------------|------|-------|
| Total cholesterol > 200 mg/dL | 45   | 46    |
| Total cholesterol > 240 mg/dL | 15   | 18    |
| LDL cholesterol > 130 mg/dL   | 46.3 | 41.6  |
| LDL cholesterol > 160 mg/dL   | 19.3 | 18.8  |
| HDL cholesterol < 40 mg/dL    | 24.3 | 13.0  |

Source: NHANES III 1988–1996.<sup>31</sup>

The risk of CHD is most clearly related to levels of low-density lipoprotein (LDL) cholesterol. In the Atherosclerosis Risk in Communities (ARIC) study, LDL cholesterol was similarly predictive of CHD events in all races and in both sexes.<sup>17</sup> There is an inverse relationship between CHD incidence and high-density lipoprotein (HDL) cholesterol in epidemiologic studies. On average, higher levels of HDL cholesterol are observed in African American adults compared to white adults. National data and data from the Multiple Risk Factor Intervention Trial (MRFIT) participants demonstrate an inverse relationship between HDL levels and education, income, and measures of socioeconomic status that is common to both African Americans and Whites. In ARIC, there is a similar, though slightly less protective, effect of HDL in African American than in white persons.<sup>17</sup>

In NHANES III 1988–1994, 50% of African American adults reported having had cholesterol screening.<sup>31</sup> The poor, less educated, and uninsured were less likely to undergo screening. Of those African Americans screened, 29% were told that their cholesterol was high, and 22% of those diagnosed were told to take medications. Only 29% of these were actually taking medications.

Having a regular source of care was the strongest predictor of reporting cholesterol screening or taking the medication. African American adults are less likely than Whites to have increased cholesterol treated.

In the Antihypertensive and Lipid Lowering Treatment to Prevent Heart Attack Trial (ALLHAT), a statistically significant 27% reduction in CHD event rates was observed only in African American study participants (treated with pravastatin sodium) compared to those subjected to usual care in the community.<sup>32</sup> The major contributor to this isolated positive outcome was that African American hypertensive patients in the community were less likely to be treated with lipid-lowering drugs than were white patients.

#### *Hypertension*

Hypertension has an age-adjusted prevalence of 36.7% in African American men 20–74 years of age and 36.6% in African American women in NHANES 1999–2000.<sup>33</sup> The age-specific prevalence exceeds 40% in both sexes for 40–59-year-olds, and exceeds 70% for African American adults over age 60 (Figure 1). African Americans develop hypertension earlier in life and have a higher prevalence of more severe hypertension. Among them, those with the

highest pressures are more likely to be middle-aged, less educated, overweight, less active, and to have diabetes.<sup>34</sup> Awareness of hypertensive status was present in 73.9% of African Americans, with 63% being under treatment and 44.6% of those being treated also controlled. Overall, 26.5% of all hypertensive African American men and 29.4% of hypertensive African American women had blood pressure under control. Control rates were slightly higher in African American adults over age 60 than in those 40–59 years of age, a trend that is the reverse of that observed in Whites (Figure 2).

Systolic blood pressure was a predictor of CHD mortality and incidence in NHANES I/NHANES II combined follow-up,<sup>30</sup> and in the Charleston Heart Study.<sup>14</sup> In ARIC,<sup>17</sup> hypertension was a strong predictor of CHD incidence, more so in African American than in white subjects, and especially in women. The hazard rate ratios after adjustment for LDL-C, cigarette smoking, and diabetes were 4.8 in women and 2.0 in men.

#### *Cigarette Smoking*

In 2001, self-reported data from the National Health Interview Survey indicated that approximately 22.8% of American adults are current smokers.<sup>35</sup> The results are similar to those in the 1999–2001 National Survey on Drug Use and Health, wherein 25.7% of African American adults, age 18 and over, report current cigarette use.<sup>36</sup> Among youths, 12–17 years of age, 8.2% of African American males and 5.9% of African American females reported cigarette smoking. The prevalence is declining among adults, overall, and consumption per day has always been consistently lower in African Americans than in Whites.

Cigarette smoking was a significant predictor of CHD mortality in

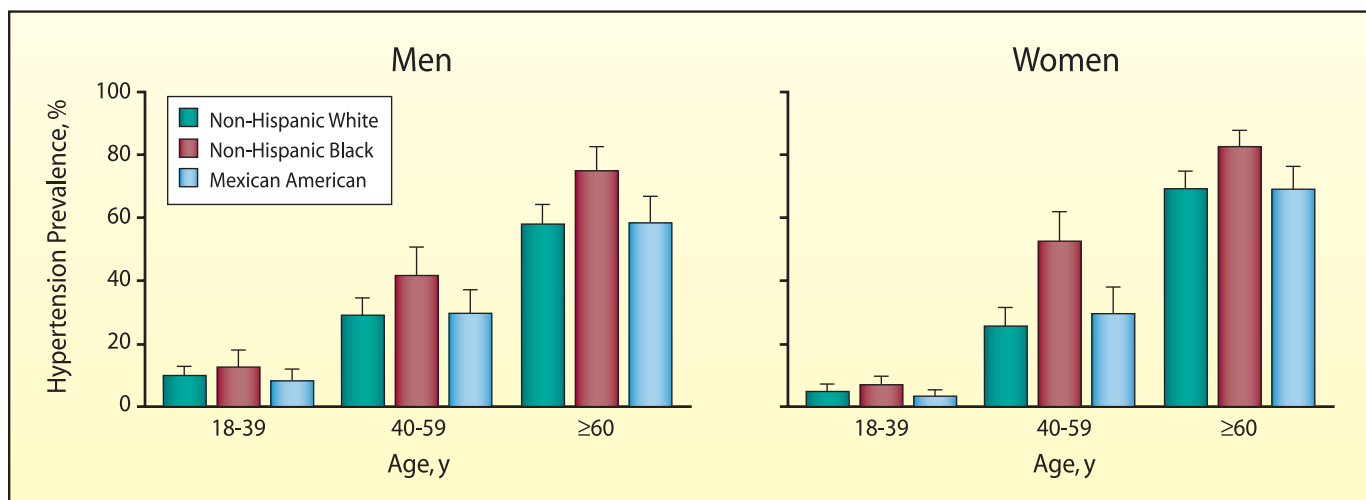


Figure 1. Hypertension prevalence by age and race/ethnicity in men and women. Reprinted with permission from Hajjar and Kotchen.<sup>33</sup>

the combined NHANES I/NHANES II follow up in men,<sup>30</sup> in the Charleston Heart Study for Men,<sup>14</sup> and in a New York hypertension work site cohort. In ARIC,<sup>17</sup> the adjusted hazard rate ratios for CHD incidence were 1.9 and 2.6 when African American men and women smokers were compared to those who had never smoked.

#### Diabetes Mellitus

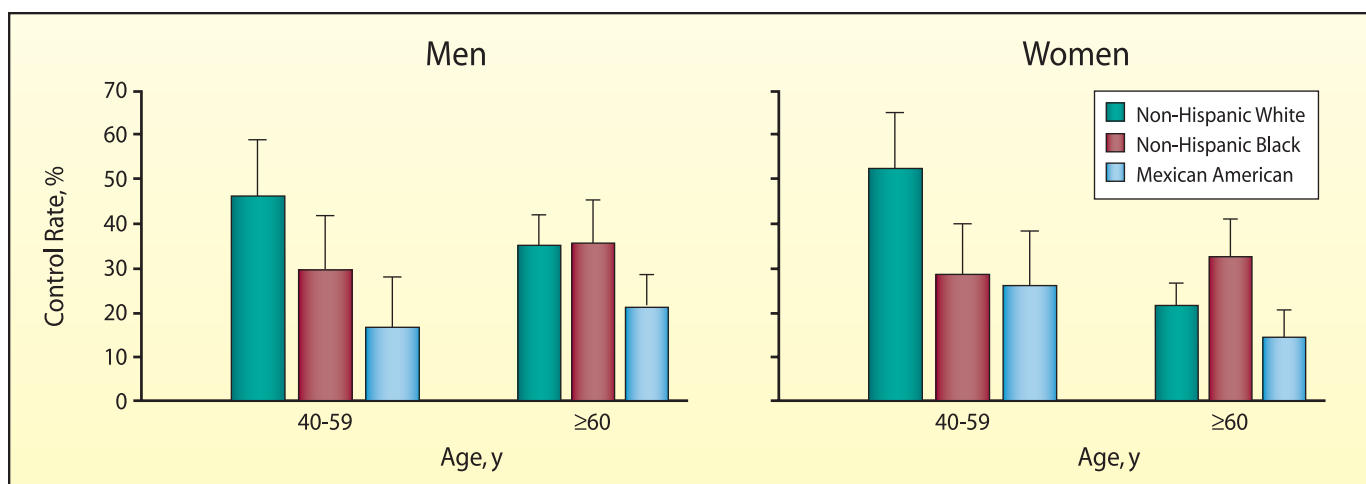
The age-adjusted prevalence of diabetes (diagnosed and undiagnosed) in African American adults in NHANES 1999–2000 was 14.9%.<sup>35</sup> The preva-

lence of physician-diagnosed diabetes in NHANES III 1988–1994 was 7.6% in African American men and 9.5% in African American women.<sup>36</sup>

In ARIC,<sup>37</sup> wherein diabetes was more than twice as common in African Americans as in Whites, the relative risk of CHD incidence over 4–7 years of follow up conferred by diabetes was 2.52 for men and 3.45 for women, lower in African Americans than in Whites. However, because of the higher prevalence of diabetes, 27.8% of African American female cases were attrib-

utable to diabetes, and only 8% of African American male cases. Over 22 years of follow-up of the NHANES I cohort,<sup>38</sup> heart disease was listed as the cause of death on 69.5% of diabetic subjects, and mortality rates were 27% higher for diabetic African Americans than diabetic Whites. Serum cholesterol, blood pressure, and cigarettes smoked enhanced CHD mortality risk similarly in diabetic African American and white men screened for participation in MRFIT.<sup>39</sup> NHANES 1999–2000 detected poor control of risk factors

Figure 2. Overall hypertension control rates in 1999–2000 by age and race/ethnicity in men and women. Reprinted with permission from Hajjar and Kotchen.<sup>33</sup>



for cardiovascular disease among all adults with diagnosed diabetes.<sup>40</sup> Smaller studies reveal a greater likelihood of poor diabetic control and poor blood pressure control in African American than white diabetic subjects.<sup>41</sup>

#### *Metabolic Syndrome*

The metabolic syndrome, which is identified as a clustering of cardiovascular risk factors that include central obesity, elevated blood pressure, glucose intolerance, hypertriglyceridemia, and low HDL cholesterol, has been linked to elevated insulin levels and resistance to the peripheral effects of insulin. The prevalence in African American men is 16% and in African American women 26% in the NHANES 1999–2000 data.<sup>42</sup> The high prevalence of metabolic syndrome, especially in African American women, is driven by the increasing prevalence of obesity. The age-adjusted prevalence of obesity (body mass index  $\geq 30$  kg/m<sup>2</sup>) in African American adults 20–74 years of age in NHANES 1999–2000 was 28.1% in African American men and 49.7% in African American women.<sup>43</sup> In ARIC, the incidence of type 2 diabetes was 2.4-fold higher in African American women than in white women, almost half of the risk being conferred by adiposity.<sup>44</sup>

#### *Left Ventricular Hypertrophy (LVH)*

In a 1990–1998 series, East and colleagues<sup>45</sup> studied 2461 patients (19% African American) who had CHD diagnosed at cardiac catheterization. In a 3-year follow-up period, patients with LVH had higher mortality rates than those without, 42% versus 34%. Statistical adjustment for other risk factors did not eliminate the independent impact of LVH, the hazard ratio remaining at 1.56. LVH was similar in impact to left ventricular ejection fraction.

The relative risk of LVH did not differ by race, but the greater prevalence of LVH in African Americans confers a greater attributable risk in this population. These findings are consistent with the 1998 review findings of Devereux and associates,<sup>46</sup> who also noted a higher risk of morbid events in individual patients in whom LVH progresses.

#### *Socioeconomic Status and Sociocultural Factors*

Lower rates of CHD incidence and mortality were observed in African American men of higher socioeconomic status in the epidemiologic cohorts of NHANES I,<sup>16</sup> the Charleston Heart Study,<sup>14</sup> and the Multiple Risk Factor Intervention Trial Usual Care cohort. In the Heart and Estrogen/Progestin Replacement study,<sup>47</sup> African American women of higher socioeconomic status similarly had lower rates. In ARIC,<sup>17</sup> there was also an inverse relationship between socioeconomic status and coronary risk. The data are consistent with observations in white populations of lower risk in individuals of higher socioeconomic status.

Mortality rates from CHD are higher in patients of lower socioeconomic status in clinical series, post myocardial infarction, post coronary angioplasty, and post coronary bypass surgery. The effects of low socioeconomic status on CHD outcomes are mediated, at least in part, by a higher prevalence of hypertension, dyslipidemia, cigarette smoking, diabetes, and obesity. Reduced rates of access to medical care (because of being uninsured or underinsured) and, for a large segment of the African American population, not having a single usual source of care, militate against patients receiving the long-term follow-up and monitoring that adequate risk factor intervention requires.

Sociocultural factors, including typical dietary components or exercise patterns, or norms concerning physical appearance in women, vary by region and in different socioeconomic classes, and contribute further to variations in rates of obesity, hypertension, and diabetes.

#### **Risk Factor Clustering**

In the Behavioral Risk Factor Surveillance System, the percentage of African American adults reporting 1 or more risk factors (high blood cholesterol, high blood pressure, diabetes, cigarettes smoking, obesity) was 71.2% in 2001.<sup>48</sup> In the 1999 survey, the age-adjusted prevalence of 2 or more risk factors was 37.8% in African American adults.<sup>49</sup> The most common combination among persons with 2 risk factors was high blood pressure and high cholesterol, and of 3 risk factors, high blood pressure, high cholesterol, and obesity. Risk factor clustering is more common in African Americans than in Whites, especially among women. In NHANES III 1988–1994, African American adults had the highest prevalence of 3 or more risk factors, almost 1 in 5.<sup>50</sup>

#### **Ethnic Differences in the Natural History of Coronary Atherosclerotic Disease**

The epidemiologic observations on CHD mortality, sudden and otherwise, indicate that there are differences in the natural history of coronary atherosclerotic disease between African Americans and Whites in the United States, that these differences are dynamic, and that an epidemiologic transition is in progress.<sup>51</sup> Moreover, they expose a diversity in the African American experience of CHD, which may be driven by sociocultural factors. This should put the clinician on notice that a monolithic perception of

African Americans will not serve well in clinical decision making.

The difficulty of constructing a reliable picture of the natural history of CHD in African American subjects or patients is enhanced by the now incontrovertible evidence of systematic differences in rates at which African American patients are likely to undergo cardiac catheterization, percutaneous coronary intervention

White patients, but had smaller mean reference vessel size, longer mean lesion length, and higher mean percentage diameter stenoses.

It is hoped by some investigators that studies of coronary calcification might yield insights on ethnic differences in plaque burden.<sup>57</sup> It should be borne in mind that the most reliable data on this subject are obtainable from population-based

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(PCI), or coronary bypass surgery.<sup>6</sup> Socioeconomic differentials in access to care ensure that the African American patients who undergo such evaluation and intervention are not necessarily representative of the general population or directly comparable to white patients on whom invasive and interventional data are available.

Reports on series of patients undergoing cardiac catheterization at a variety of institutions, including urban public hospitals and Veterans Administration hospitals, in the 1980s and 1990s can best be summarized by the statement that there is both a high rate of nonobstructive coronary disease and a frequent occurrence of multivessel disease.<sup>52-55</sup> In African American patients with significant obstructions, the distributions of 1-2-3-vessel disease were similar to those observed in white patients. In the not necessarily representative National Heart, Lung, and Blood Institute (NHLBI) Dynamic Registry of Percutaneous Coronary Intervention (1997-1999),<sup>56</sup> which oversampled women and minorities, African American patients had fewer significant stenoses than

investigations, of which few are currently available. Grab samples are interesting and generate hypotheses, but cannot by their nature yield definitive data.

Mortality follow-up of African American patients who underwent coronary arteriography yielded a number of interesting findings. In 1233 consecutively catheterized African American patients at Cook County Hospital, Chicago, 59% had significant obstruction.<sup>53</sup> Of these, 68% had LVH detected by echocardiography (echo LVH). Survival was related to the number of diseased vessels, presence of echo LVH, and the left ventricular ejection fraction.

In the NHLBI Dynamic Registry of PCI, success and complication rates were similar in African American and white patients, but at 2 years, African American patients had almost double (14.2% vs 7.9%) the mortality rate of Whites.<sup>56</sup> Similar observations of impaired survival were made in a group of veterans.

### **Coronary Artery Bypass Surgery**

African American patients who undergo coronary artery bypass surgery have been shown in some

series to have worse long-term outcomes. In a 1984-1992 series of 3228 patients at a Los Angeles hospital, 115 (3.6%) were African American.<sup>58</sup> Although operative mortality was similar, the death rate in African Americans at 5 years (36%) was twice that in Whites. The African American group was of similar age, had similar insurance coverage, and similar degree of vessel involvement, but 84% were hypertensive and 21% smoked. In this middle-class population, age, previous myocardial infarction, and history of hypertension were significant univariate predictors of mortality. Statistical adjustment for clinical risk factors left the African American excess risk unchanged.

In the Cook County Hospital cohort of poor working-class African Americans, coronary artery bypass surgery was performed in 152 patients.<sup>53</sup> The survival rate at 3 years (82%) was similar for those with 2-3-vessel disease who did not undergo surgery. Left ventricular mass and pulmonary hypertension were strong predictors of mortality in the surgical group.

### **Additional Risk Factors in African Americans**

A recurring theme in the evaluation of clinical and autopsy data on cardiovascular disease in African Americans is the importance and prognostic significance of LVH.<sup>45,59-62</sup> Burke and colleagues,<sup>60</sup> in a systematic examination of sudden cardiac deaths (SCDs) in Maryland in 1994-1999, found that "rates of SCD caused by coronary thrombus were fairly similar in both races: The increase in Blacks is due largely to an increase in deaths with stable plaque. The majority of SCD in Blacks caused by stable plaque are associated with LVH and hypertension." Different anatomic substrates

**Table 3**  
**Attitudes and Interventions Most Likely to Reduce**  
**CHD Mortality in African Americans**

- Treat hypertension vigorously, with special focus on reducing systolic blood pressure to recommended goals, less than 140 mm Hg in the majority of patients, and less than 130 mmHg in patients with diabetes, renal dysfunction, or left ventricular hypertrophy.
- Perform global risk assessment, and treat LDL cholesterol to recommended goals: LDL cholesterol less than 100 mg/dL in patients with CHD or CHD risk equivalent, and in those with EKG/echo left ventricular hypertrophy. Treat LDL cholesterol to less than 130 mg/dL in patients with global risk of a 10-year event in the range 10%–20%.
- Insist on smoking cessation, especially in patients with established CHD.
- Encourage regular exercise and weight control. Recommend strict, even Ornish-type diets, in the highest risk patients. Perform waist circumference measurements on a routine basis for diagnosis of metabolic syndrome.
- Treat diabetes to obtain glycohemoglobin goal of less than 6%.
- Perform exercise tests, ideally with nuclear scintigraphy, on patients with complaints of chest pain and perform cardiac catheterization on individuals with significant perfusion defects.

lead to the same result. Even in the absence of acute thrombosis, increased ventricular premature beat frequency and increased risk of sudden death have been demonstrated in clinical series to be associated with LVH.

Cooper and coworkers<sup>62</sup> have sug-

gested that the high rate of nonobstructive coronary arteries and the frequent occurrence of multivessel CHD suggest the presence of 2 distinct groups of patients. One group is comprised of African American patients with chest pain (especially women) in whom the high preva-

lence of hypertension and LVH may be a cause of angina-like pain associated with diastolic dysfunction and decreased coronary reserve. The other group with multivessel disease is more likely to undergo catheterization later in the clinical course of their disease, and, if LVH is present, has a poorer prognosis.

This scenario suggests that the leverage to reduce CVD morbidity and mortality in African Americans should be exerted especially in the area of blood pressure control, with potential impact on stroke, sudden death, and myocardial infarction case fatality.

### **Undertreatment of African American Patients: Implications and Disparities**

There is evidence of undertreatment of African American patients in community settings<sup>63</sup> and even in recent cardiovascular randomized, controlled trials. In ALLHAT, African American patients were less likely to attain blood pressure goal than were white patients. There is evidence of systematic failure to titrate medications when goal systolic blood pressure was not attained.<sup>64</sup>

### **Main Points**

- In 2001, diseases of the heart and stroke accounted for 30.8% of deaths in African American men and 36.5% of deaths in African American women. Coronary heart disease (CHD) mortality has declined since 1968, but the rate of decline has slowed in African Americans, especially African American women, in recent years.
- Sudden, out-of-hospital death is an important component of the CHD experience in African Americans. Analysis of 1980–1985 national data confirmed that 56% of CHD deaths in adults 35–74 years of age occurred out-of-hospital or in the emergency department, more likely in African Americans than in Whites, and in men than in women.
- The prevalence of certain CHD risk factors (age, gender, and family history; blood lipids and lipoproteins; hypertension; cigarette smoking; diabetes mellitus; metabolic syndrome; left ventricular hypertrophy) is greater in African Americans than in the general population, as is the phenomenon of clustering of risk factors.
- The epidemiologic observations on CHD mortality, sudden and otherwise, indicate that there are differences in the natural history of coronary atherosclerotic disease between African Americans and Whites in the United States and that these differences are dynamic, and an epidemiologic transition is in progress. This should put the clinician on notice that a monolithic perception of African Americans will not serve well in clinical decision making.
- Disparities in cardiovascular disease outcomes between African Americans and Whites persist in part because of the inadequacies of the current health system, and failure to focus adequate efforts on populations most in need.

The African American subgroup of statin-treated patients in the ALL-HAT-LLT (Lipid Lowering Trial)<sup>32</sup> was the only subgroup with a CHD event rate lower than that of the comparison usual care group in the community because African American patients in the community had lipid-lowering treatment initiated by their physicians much less frequently than did white patients. In the Heart and Estrogen/Progestin Replacement Study,<sup>47</sup> African American women had higher rates of diabetes, hypertension, and hypercholesterolemia, but were less likely to receive aspirin or statin drugs, and were less likely at follow up to have optimal blood pressure or LDL cholesterol control. The outcomes reflected a 2-fold increase in CHD event rates in African Americans, and higher CVD mortality.

Recent data (1999–2001)<sup>65</sup> on the impact of race on the acute management of chest pain in 7935 subjects in 8 emergency departments confirm that African Americans with unstable angina or non-ST elevation myocardial infarction received glycoprotein IIb/IIIa receptor inhibitors and underwent cardiac catheterization less often than Whites, and those with non-acute coronary syndrome chest pain were less likely to have prompt EKG evaluation, to have cardiac markers drawn, to have anti-ischemic medications given, and to have invasive evaluation.

Disparities in CVD outcomes between African Americans and Whites persist in part because of the inadequacies of the current health system, and failure to focus adequate efforts on populations most in need. The global risk management approach recommended by the most recent report of the National Cholesterol Education Program Adult Treatment Panel (ATP III)<sup>66</sup> and the seventh report of the National High

Blood Pressure Education Program Joint National Committee (JNC VII)<sup>67</sup> allows practitioners to identify high-risk subsets of patients, set strict targets, and offers the potential of maximal impact of CVD outcomes. A system-wide response to this challenge would allow a new decline in CHD mortality (Table 3). ■

## References

- Gillum RF. Coronary heart disease in black populations I, mortality and morbidity. *Am Heart J*. 1982;104:839–851.
- Gillum RF, Graham CT. Coronary heart disease in black populations II, risk factors. *Am Heart J*. 1982;104:852–864.
- Johnson KW, Payne GH, eds. Report of National Heart, Lung, and Blood Institute Working Conference on Coronary Heart Disease in Black Populations and Proceedings of a Symposium on Coronary Heart Disease in Black Populations. *Am Heart J*. 108:3:633–862.
- U.S. Department of Health and Human Services. *Report of the Secretary's Task Force on Black and Minority Health, Volume 1: Executive Summary*. Washington, DC: U.S. Department of Health and Human Services; 1986.
- U.S. Department of Health and Human Services. *Report of the Secretary's Task Force on Black and Minority Health, Volume 4: Cardiovascular and Cerebrovascular Diseases*. Washington, DC: U.S. Department of Health and Human Services; 1986.
- The Henry J. Kaiser Family Foundation and American College of Cardiology Foundation. *Racial/Ethnic Differences in Cardiac Care: The Weight of the Evidence* summary report, Menlo Park, CA: The Henry J. Kaiser Family Foundation and American College of Cardiology Foundation; 2002.
- Schulman AA, Berlin JA, Harless W, et al. The effect of race and sex on physicians' recommendations for cardiac catheterization. *N Engl J Med*. 1999;340:618–626.
- <http://www.kff.org/whythedifference> provides information about the initiative to raise physician awareness about racial/ethnic disparities in medical care.
- Fortin, AH. Communication skills to improve patient satisfaction and quality of care. *Ethn Dis*. 2002;12(suppl 3):S3-58–S3-61.
- Misra-Hebert, AD. Physician cultural competence: cross-cultural communication improves care. *Cleve Clin J Med*. 2003;4:289–303.
- Arias E, Anderson RN, Hsiang-Ching K, et al. *Deaths: Final Data for 2001*. Hyattsville, MD: National Center for Health Statistics; 2003. National Vital Statistics Report, Vol. 52, No. 3.
- American Heart Association. *American Heart Association Statistical Fact Sheet—Populations: African-Americans and Cardiovascular Disease Statistics*. Dallas, TX: American Heart Association; 2004.
- Hames, CG, Greenlund, KJ. Ethnicity and cardiovascular disease: the Evans County heart study. *Am J Med Sci*. 1996;311:130–134.
- Keil JE, Sutherland SE, Knapp RG, et al. Mortality rates and risk factors for coronary disease in black as compared with white men and women. *N Engl J Med*. 1993; 329:73–78.
- Keil JE, Sutherland SE, Hames CG, et al. Coronary disease mortality and risk factors in black and white men. Results from the combined Charleston, SC, and Evans County, Georgia, heart studies. *Arch Intern Med*. 1995;155:1521–1527.
- Gillum RF, Mussolino ME, Madans JH. Coronary heart disease incidence and survival in African-American women and men. The NHANES I Epidemiologic Follow-up Study. *Ann Intern Med*. 1997;127:111–118.
- James DW, Chambless LE, Folsom AR, et al. Risk factors for coronary heart disease in African-Americans: the Atherosclerosis Risk in Communities Study, 1987–1997. *Arch Intern Med*. 2002;162:2565–2571.
- Barnett E, Halverson JA, Elmes GA, Brahm VE. Metropolitan and non-metropolitan trends in coronary heart disease mortality within Appalachia, 1980–1997. *Ann Epidemiol*. 2000; 10:370–379.
- Diez Roux AV, Merkin SS, Arnett D, et al. Neighborhood of residence and incidence of coronary heart disease. *N Engl J Med*. 2001;345:99–106.
- Barnett E, Halverson J. Local increases in coronary heart disease mortality among blacks and whites in the United States, 1985–1995. *Am J Public Health*. 2001;91:1499–1506.
- Fang J, Madhavan S, Alderman MH. The association between birthplace and mortality from cardiovascular causes among black and white residents of New York City. *N Engl J Med*. 1996;335:1545–1551.
- Gillum RF. The epidemiology of cardiovascular disease in black americans. *N Engl J Med*. 1996;335:1597–1599.
- Onwuany A, Hodges D, Avancha A, et al. Hypertensive vascular disease as a cause of death in blacks versus whites: autopsy findings in 587 adults. *Hypertension*. 1998;31:1070–1076.
- Balarajan R. Ethnic differences in mortality from ischemic heart disease and cerebrovascular disease in England and Wales. *BMJ*. 1991;302:560–564.
- Wild S, McKeigue P. Cross-sectional analysis of mortality by country of birth in England and Wales. *BMJ*. 1997;314:405–710.
- Gillum RF. Sudden coronary death in the United States: 1980–1985. *Circulation*. 1989;78:756–765.
- Becker LB, Han BH, Meyer PM, et al. Racial differences in the incidence of cardiac arrest and subsequent survival. *N Engl J Med*. 1993;329:600–606.
- Gillum RF. Sudden cardiac death in Hispanic Americans and African-Americans. *Am J Public Health*. 1997;87:1461–1466.
- Raczynski JM, Taylor H, Cutter G, et al. Diagnoses, symptoms, and attribution of symptoms among black and white inpatients admitted for coronary heart disease. *Am J Public Health*. 1994;84:951–956.
- Liao Y, McGee DL, Cooper RS. Prediction of coronary heart disease mortality in blacks and whites: pooled data from two national cohorts. *Am J Cardiol*. 1999;84:31–36.
- Nelson K, Norris K, Mangione CM. Disparities in the diagnosis and pharmacologic treatment of high serum cholesterol by race and ethnicity.

32. ALLHAT Officers and Coordinators of the ALLHAT Collaborative Research Group. Major outcomes in moderately hypercholesterolemic, hypertensive patients randomized to Pravastatin versus usual care. The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT-LLT). *JAMA*. 2002;288:2988-3007.
33. Hajjar I, Kotchen TA. Trends in prevalence, awareness, treatment, and control of hypertension in the United States, 1988-2000. *JAMA*. 2003;290:199-206.
34. Burt VL, Whelton P, Roccella EJ, et al. Prevalence of hypertension in the U.S. adult population. Results from the Third National Health and Nutrition Examination Survey, 1988-1991. *Hypertension*. 1995;25:305-313.
35. Centers for Disease Control. Cigarette smoking among adults—United States, 2001. *MMWR Morb Mortal Wkly Rep*. 2003;52:953-956.
36. Centers for Disease Control. Prevalence of cigarette use among 14 racial/ethnic populations—United States, 1999-2001. *MMWR Morb Mortal Wkly Rep*. 2004;53:49-52.
37. Folsom AR, Szklo M, Stevens J, et al. A prospective study of coronary heart disease in relation to fasting insulin, glucose, and diabetes. The Atherosclerosis Risk in Communities (ARIC) Study. *Diabetes Care*. 1997;20:935-942.
38. Gu K, Cowie CC, Harris MI. Mortality in adults with and without diabetes in a national cohort of the U.S. population, 1971-1993. *Diabetes Care*. 1998;21:1138-1145.
39. Vaccaro O, Stamler J, Neaton JD. Sixteen-year coronary mortality in black and white men with diabetes screened for Multiple Risk Factor Intervention Trial (MRFIT). *Int J Epidemiol*. 1998;27:636-641.
40. Saydha SH, Fradkin J, Cowie CC. Poor control of risk factors for vascular disease among adults with previously diagnosed diabetes. *JAMA*. 2004;291:335-342.
41. Bonds DE, Zaccaro DJ, Karter AJ, et al. Ethnic and racial differences in diabetes care: the Insulin Resistance Atherosclerosis Study. *Diabetes Care*. 2003;26:1040-1046.
42. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among U.S. adults: findings from the Third National Health and Nutrition Examination Survey. *JAMA*. 2002;287:356-359.
43. Flegal KM, Carrol MS, Odgen CL, Johnson CL. Prevalence and trends in obesity among U.S. adults. 1999-2000. *JAMA*. 2002;288:1723-1727.
44. Brancati FL, Kao WH, Folsom AR, et al. Incident type 2 diabetes mellitus in African-American and white adults: the Atherosclerosis Risk in Communities Study. *JAMA*. 2000;283:2253-2259.
45. East MA, Jollis JG, Nelson CL, et al. The influence of left ventricular hypertrophy on survival in patients with coronary artery disease: do race and gender matter? *J Am Coll Cardiol*. 2003;41:949-954.
46. Devereux RB, Okin PM, Roman MJ. Pre-clinical cardiovascular disease and surrogate end-points in hypertension: does race influence target organ damage independent of blood pressure? *Ethn Dis*. 1998;8:138-148.
47. Jha AK, Varosy PD, Kanaya AM, et al. Differences in medical care and disease outcomes among black and white women with heart disease. *Circulation*. 2003;108:1089-1094.
48. Paynter N, Denny CH, Greenlund KJ, et al. Declining prevalence of no known major risk factors for heart disease and stroke among adults: United States, 1991-2001. *MMWR Morb Mortal Wkly Rep*. 2004;53:4-7.
49. Greenlund KJ, Zheng ZJ, Keenan NL. Trends in self reported multiple cardiovascular disease risk factors among adults in the United States, 1991-1999. *Arch Intern Med*. 2004;164:181-188.
50. Sharma S, Malarcher AM, Giles WH, Myers G. Racial, ethnic, and socioeconomic disparities in the clustering of cardiovascular disease risk factors. *Ethn Dis*. 2004;14:43-48.
51. Rosamond, WD, Folsom AR, Chambless LE, Wang CH. Coronary heart disease trends in four United States communities. The Atherosclerosis Risk in Communities (ARIC) Study, 1987-1996. *Int J Epidemiol*. 2001;(suppl 1):S17-S22.
52. Cooper R, Castaner A, Campo A, et al. Severity of coronary artery disease among blacks with acute myocardial infarction. *Am J Cardiol*. 1989;63:788-791.
53. Simmons BE, Castaner A, Mar M, et al. Survival determinants in black patients with angiographically defined coronary artery disease. *Am Heart J*. 1990;119:513-519.
54. Matthew J, Krishna A, Hallak AA, et al. Clinical and angiographic findings in black patients with suspected coronary artery disease. *Int J Cardiol*. 1997;62:251-257.
55. Whittle J, Conigliaro J, Good CB, et al. Black-White differences in severity of coronary artery disease among individuals with acute coronary syndromes. *J Gen Intern Med*. 2002;17:867-873.
56. Slater J, Selzer F, Dorbala S, et al. Ethnic differences in the presentation, treatment strategy, and outcomes of percutaneous coronary intervention (A Report from the National Heart, Lung, and Blood Institute Dynamic Registry). *Am J Cardiol*. 2003;92:773-778.
57. Detrano R. The ethnic-specific nature of mechanisms for coronary heart disease. *J Am Coll Cardiol*. 2003;41:45-46.
58. Gray RJ, Nessim S, Khan SS, et al. Adverse 5-year outcome after coronary artery bypass surgery in blacks. *Arch Intern Med*. 1996;156:769-773.
59. Clark, LT. Anatomical substrate differences between black and white victims of sudden cardiac death: hypertension, coronary artery disease, or both? *Clin Cardiol*. 1989;12:IV13-IV17.
60. Burke AP, Farb A, Pestaner J, et al. Traditional risk factors and the incidence of sudden coronary death with and without coronary thrombosis in blacks. *Circulation*. 2002;105:419-424.
61. Greenberg M, Papademetriou V, Narayan P, et al. Nonsustained ventricular tachycardia as a predictor of cardiovascular events in black men with hypertensive left ventricular hypertrophy. *J Clin Hypertens*. 2000;2:14-19.
62. Cooper RS, Simmons BE, Castaner A, et al. Left ventricular hypertrophy is associated with worse survival independent of ventricular function and number of coronary arteries severely narrowed. *Am J Cardiol*. 1999;65:441-445.
63. Simmons BE, Castaner A, Campo A, et al. Coronary artery disease in blacks of lower socioeconomic status: Angiographic findings from the Cook County Hospital Heart Disease Registry. *Am Heart J*. 1988;116:90.
64. Cushman WC, Ford CE, Cutler JA, et al. Success and predictors of blood pressure control in diverse North American settings: the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). *J Clin Hypertens*. 2002;4:393-400.
65. Venkat A, Hoekstra J, Lindsell C, et al. The impact of race on the acute management of chest pain. *Acad Emerg Med*. 2003;10:1199-1208.
66. ATP III. Executive Summary of the Third Report of the National Cholesterol Evaluation Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). *JAMA*. 2001;285:2486-2497.
67. Chobanian AV, Bakris GL, Black HR, et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, The JNC 7 Report. *JAMA*. 2003;289:2560-2572.