Distribution of 10-Year and Lifetime Predicted Risks for Cardiovascular Disease in US Adults

Findings From the National Health and Nutrition Examination Survey 2003 to 2006

Amanda K. Marma, MD; Jarett D. Berry, MD, MS; Hongyan Ning, MD, MS; Stephen D. Persell, MD, MPH; Donald M. Lloyd-Jones, MD, ScM

Background—National guidelines for primary prevention suggest consideration of lifetime risk for cardiovascular disease in addition to 10-year risk, but it is currently unknown how many US adults would be identified as having low short-term but high lifetime predicted risk if stepwise stratification were used.

Methods and Results—We included 6329 cardiovascular disease–free and nonpregnant individuals ages 20 to 79 years, representing approximately 156 million US adults, from the National Health and Nutrition Examination Survey 2003 to 2004 and 2005 to 2006. We assigned 10-year and lifetime predicted risks to stratify participants into 3 groups: low 10-year (<10%)/low lifetime (<39%) predicted risk, low 10-year (<10%)/high lifetime (≥39%) predicted risk, and high 10-year (≥10%) predicted risk or diagnosed diabetes. The majority of US adults (56%, or 87 million individuals) are at low short-term but high lifetime predicted risk for cardiovascular disease. Twenty-six percent (41 million adults) are at low short-term and low lifetime predicted risk, and only 18% (28 million individuals) are at high short-term predicted risk. The addition of lifetime risk estimation to 10-year risk estimation identifies higher-risk women and younger men in particular.

Conclusions—Whereas 82% of US adults are at low short-term risk, two thirds of this group, or 87 million people, are at high lifetime predicted risk for cardiovascular disease. These results provide support for use of a stepwise stratification system aimed at improving risk communication, and they provide a baseline for public health efforts aimed at increasing the proportion of Americans with low short-term and low lifetime risk for cardiovascular disease. (Circ Cardiovasc Qual Outcomes. 2010;3:8-14.)

Key Words: cardiovascular diseases ▪ coronary disease ▪ epidemiology

The majority of US adults, particularly women and younger men, are at low short-term risk (<10% in 10 years) for a coronary event by National Cholesterol Education Program/Adult Treatment Panel III (NCEP/ATP III) guidelines.1–3 However, this large “low-risk” population comprises those who remain low risk as well as those who become high risk across the lifespan. We previously developed an algorithm to predict lifetime risk for cardiovascular disease (CVD) and found that risk factors measured at age 50 years effectively stratified Framingham Study participants to a spectrum of observed lifetime CVD rates (5.2% to 68.9%) and median survivals (>39 to 28 years).4 These patterns were similar in contemporary US multi-ethnic cohorts for risk factors measured at various ages.5 Furthermore, we recently used this algorithm to investigate the implications of long-term predicted risk for CVD specifically among those at low 10-year predicted risk for coronary heart disease (CHD).6 Even at younger ages (32 to 50 years), individuals with low (<10%) short-term but high (≥39%) lifetime predicted risk had greater-burden and progression of subclinical CVD compared with the low short-term and low (<39%) lifetime risk group.6

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Recognizing that current risk assessment strategies may inadequately assess CVD risk in many women and younger men, US national guidelines from the NCEP7 and the American Heart Association8 now endorse consideration of lifetime risk in primary prevention. Although pharmacotherapy based on lifetime risk is not specifically recommended in the guidelines, it is recommended that those at high lifetime risk receive intensified lifestyle counseling and risk factor moni...

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Risk Factor Definitions and Lifetime Risk Stratification

<table>
<thead>
<tr>
<th>CVD RFs</th>
<th>Optimal RF</th>
<th>Not Optimal RF</th>
<th>Elevated RF</th>
<th>Major RF*</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP and DBP, mm Hg</td>
<td>SBP &lt;120 and DBP &lt;80</td>
<td>AND OR</td>
<td>OR</td>
<td>OR</td>
</tr>
<tr>
<td>Total cholesterol, mg/dL</td>
<td>&lt;180</td>
<td>AND</td>
<td>AND</td>
<td>OR</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Current smoking</td>
<td>No</td>
<td>No</td>
<td>AND</td>
<td>OR</td>
</tr>
</tbody>
</table>

Lifetime Risk Stratification

<table>
<thead>
<tr>
<th>Predicted lifetime risk at age 50 y</th>
<th>All Optimal RF</th>
<th>≥1 RF Not Optimal</th>
<th>≥1 Elevated RF</th>
<th>1 Major RF</th>
<th>≥2 Major RF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>5%</td>
<td>36%</td>
<td>46%</td>
<td>50%</td>
<td>69%</td>
</tr>
<tr>
<td>Women</td>
<td>8%</td>
<td>27%</td>
<td>39%</td>
<td>39%</td>
<td>50%</td>
</tr>
</tbody>
</table>

RF indicates risk factor; SBP, systolic blood pressure; and DBP, diastolic blood pressure.

Definitions of Risk Strata

We determined the distribution of 3 risk strata in the US population: low 10-year/low lifetime, low 10-year/high lifetime, and high 10-year predicted risk, as defined below. For the main analysis, we calculated 10-year predicted risk for hard CHD (myocardial infarction or coronary death) for all participants using the ATP III risk assessment tool and we defined a calculated risk of ≥10% as “high 10-year predicted risk” because individuals with this level of predicted risk would potentially be eligible for intensive preventive measures, including drug therapy. Among the participants with low (<10%) 10-year predicted risk (and no diabetes), we assigned lifetime predicted risk for CVD (myocardial infarction, coronary insufficiency, angina, atherothrombotic stroke, intermittent claudication, or CVD death) using our previously published algorithm, as shown in Table 1. We defined “low predicted lifetime risk” as the 2 lower risk strata (“all optimal” or “≥1 not optimal” risk factors), which, according to our prior work, have predicted lifetime risk <39% and ≥39% This stratification was chosen a priori based on the previously observed apparent natural separation in lifetime risks of these 2 groups in the Framingham cohorts as well as in a large pooled sample of US multi-ethnic cohorts. It has been further justified with recent work demonstrating differential burden and progression of subclinical atherosclerosis in younger adults using the identical stratification algorithm.

In further analyses, we also included obesity (body mass index ≥30 kg/m²) and low HDL cholesterol (<40 mg/dL for men, <50 mg/dL for women) as major risk factors. To examine whether a more stringent definition of low short-term risk would weaken the distinc-
tion of different lifetime predicted risk groups among those at low
short-term predicted risk, we also repeated the primary stratification
described above using 2 additional definitions of short-term risk. For
the first, we defined low short-term risk as/110216% predicted 10-year
risk for hard CHD (and absence of diabetes) using the ATP III risk
assessment tool.10 For the second, we defined low short-term risk as
/1102120% predicted 10-year risk for total CVD (coronary death,
myocardial infarction, coronary insufficiency, angina, ischemic
stroke, hemorrhagic stroke, transient ischemic attack, intermittent
claudication, or heart failure) (and absence of diabetes) using the risk
functions published by D’Agostino et al.11

Statistical Analysis
We used survey procedures in SAS version 9.1 (SAS Institute, Cary,
NC) to generate accurate frequencies and variances accounting for
the complex, multistage design of the NHANES. We used the survey
weights to estimate the number of noninstitutionalized, CVD-free
and nonpregnant US adults ages 20 to 79 years in each group.
Analyses were performed for all eligible adults and were stratified by
age, sex, and race subgroups. For some subgroup analyses, we split
the population into fewer categories to avoid presenting data from
cells with fewer than 30 subjects, as recommended by the NHANES
Analytic Guidelines.9 When results from fewer subjects are provided,
this is noted in the tables. Differences between groups in the distribution
of risk strata were assessed using the /92732 test, and a 2-tailed probability
value/110210.05 was considered statistically significant.

Results

Participant Characteristics
A total of 6329 individuals (representing approximately 156
million US adults) met inclusion criteria and had complete

| Table 2. Distribution of Combined 10-Year CHD and Lifetime CVD Predicted Risk Strata in the CVD-Free, Nondiabetic, Nonpregnant, 20- to 79-Year-Old US Population |
|------------------|------------------|------------------|
| Percentage (SE) of US Population in Risk Stratum | Low 10-Year CHD/Low Lifetime CVD Predicted Risk | Low 10-Year CHD/High Lifetime CVD Predicted Risk |
| | All Optimal | ≥1 Not Optimal | ≥1 Elevated | 1 Major | ≥2 Major |
| Total | 6329 | 156 100 000 | 11.4 (0.4) | 15.1 (0.7) | 17.5 (0.7) | 29.7 (0.7) | 8.3 (0.5) | 18.0 (0.8) | <0.001 |
| Sex | | | | | | | | | |
| Men | 3254 | 77 760 000 | 8.4 (0.6) | 14.8 (1.0) | 16.9 (1.0) | 27.9 (0.9) | 5.8 (0.7) | 26.2 (1.2) | <0.001 |
| Women | 3075 | 78 370 000 | 14.3 (0.7) | 15.3 (0.9) | 18.2 (0.9) | 31.6 (0.9) | 10.8 (0.6) | 9.9 (0.6) | |
| Age, y | | | | | | | | | |
| Men | | | | | | | | | |
| 20–29 | 686 | 16 400 000 | 18.8 (1.8) | 21.6 (1.5) | 14.4 (1.4) | 42.1 (2.1) | 2.7 (0.7)* | 0.4 (0.2)* | <0.001 |
| 30–39 | 641 | 17 400 000 | 10.4 (1.5) | 21.7 (2.3) | 23.8 (2.3) | 33.1 (1.6) | 8.7 (1.4) | 2.3 (0.6)* | |
| 40–49 | 662 | 18 800 000 | 5.6 (1.1) | 14.9 (1.9) | 20.6 (2.3) | 32.1 (2.4) | 8.2 (1.3) | 18.7 (1.9) | |
| 50–59 | 469 | 14 000 000 | 3.4 (0.9)* | 9.0 (1.7) | 16.8 (2.1) | 19.0 (2.6) | 6.5 (1.6)* | 45.4 (2.7) | |
| 60–79 | 796 | 11 300 000 | 3.0 (0.8)* | | | | | | 89.6 (1.1) |
| Women | | | | | | | | | |
| 20–29 | 582 | 13 900 000 | 35.5 (2.3) | 20.1 (1.8) | 10.6 (1.1) | 31.0 (2.4) | 1.4 (0.6)* | 1.4 (0.5)* | <0.001 |
| 30–39 | 564 | 16 600 000 | 21.5 (1.4) | 20.9 (1.9) | 20.4 (2.0) | 28.7 (2.3) | 6.1 (1.0)* | 2.4 (0.6)* | |
| 40–49 | 626 | 18 400 000 | 11.3 (1.8) | 18.2 (1.9) | 23.4 (2.1) | 30.8 (2.0) | 9.3 (1.2) | 7.0 (1.1) | |
| 50–59 | 466 | 14 400 000 | 3.2 (0.7)* | 10.6 (1.5) | 20.9 (2.6) | 35.6 (2.7) | 20.1 (2.0) | 9.6 (1.5) | |
| 60–79 | 837 | 15 000 000 | 0.9 (0.4)* | 5.6 (0.9) | 13.7 (1.4) | 32.4 (1.7) | 17.6 (1.4) | 29.8 (1.4) | |
| Race | | | | | | | | | |
| Men | | | | | | | | | |
| White | 1611 | 56 340 000 | 8.0 (0.8) | 13.7 (1.3) | 16.5 (1.4) | 28.0 (1.1) | 6.0 (0.9) | 27.9 (1.5) | <0.001 |
| Black | 699 | 7 880 000 | 8.3 (1.1) | 18.7 (1.7) | 16.1 (1.5) | 27.9 (1.9) | 5.1 (1.1) | 24.0 (1.5) | |
| Mexican-American | 836 | 10 800 000 | 11.7 (1.3) | 17.0 (1.8) | 16.6 (1.5) | 28.4 (1.8) | 6.4 (1.2) | 20.0 (1.9) | |
| Other | 108 | 2 700 000 | 23.7 (4.8)* | 52.0 (4.0) | | | 24.3 (4.2)* | |
| Women | | | | | | | | | |
| White | 1520 | 56 420 000 | 12.3 (0.8) | 14.8 (1.2) | 18.1 (1.1) | 33.7 (1.2) | 11.6 (0.8) | 9.6 (0.7) | <0.001 |
| Black | 674 | 8 840 000 | 14.9 (1.9) | 18.0 (1.1) | 14.8 (1.5) | 28.8 (2.1) | 12.2 (1.0) | 11.4 (1.7) | |
| Mexican-American | 776 | 10 000 000 | 24.7 (2.3) | 16.4 (1.5) | 19.8 (2.2) | 22.3 (1.7) | 7.6 (1.3) | 9.3 (1.2) | |
| Other | 105 | 3 090 000 | 28.1 (4.0)* | 59.8 (4.1) | | | 12.2 (2.1)* | |

Ten-year hard CHD risk calculated based on D’Agostino et al,10 with “low” defined as <10% 10-year predicted CHD risk and absence of diabetes.
*Estimate unstable because of subsample size <30.

The P value in the first row is for the comparison across columns (risk categories); all other P values are for the comparison across the rows below (demographic categories).

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information to determine their short-term and lifetime risk strata (Supplemental Figure 1). Exclusion on the basis of missing variables was somewhat more likely for blacks (19.4%) compared with whites (12.1%). The final study sample was representative of 86.4% of the noninstitutionalized, nonpregnant, CVD-free US population ages 20 to 79 years. Specific participant characteristics, weighted to reflect the US population, are shown in Supplemental Tables 1 and 2.

Distribution of Risk Strata
Among the overwhelming majority (82.0%) of US adults with low short-term predicted risk (Table 2), two thirds are at high lifetime predicted risk, whereas only one third are at low lifetime predicted risk (see Table 1). Of note, the proportion of US adults with very low lifetime risk due to all optimal risk factors is small, at 11.4%; the proportion is smaller in men than in women and is dramatically smaller in older compared with younger adults (Table 2). The estimated size of the US population in each risk stratum is shown in Figure 1.

Effect of Demographic Variables on Risk Strata
At the youngest ages, almost all men and women are at low short-term predicted risk, and further stratification by lifetime predicted risk produces 2 groups of substantial sizes in both sexes (Table 2). For example, as shown in Figure 2, the majority of men younger than 60 years and women younger than 80 years old are at low 10-year predicted risk, and among this large group the majority have low 10-year but high lifetime predicted risk. However, at older ages the proportion at high short-term predicted risk is markedly higher in men than in women, such that in the oldest age group (60 to 79 years) only 10.4% of men but 70.2% of women are at low-short-term predicted risk. Thus, at older ages, lifetime risk stratification identifies a much larger group of women (63.7% of women ages 60 to 79 years) with low short-term/high lifetime risk compared with men (7.4% of men ages 60 to 79 years) (Table 2 and Figure 2). Patterns of predicted risks are similar among races; although Mexican-Americans had lower predicted risk compared with other racial groups (Table 2), this is probably the result of their younger age distribution (Supplemental Table 1).

Effect of Including Low HDL Cholesterol and Obesity as Major Risk Factors
When low HDL cholesterol and obesity are also counted as major risk factors, the proportion with high lifetime predicted risk is larger, though modestly so (Table 3). For example, including both risk factors causes ~10.3% of adults to move from the low short-term/low lifetime risk group to the low short-term/high lifetime predicted risk group.

Distribution of Major Risk Factors
Table 4 gives the proportion and absolute numbers of US adults affected with each of the elevated and major risk factors. The wide distribution of isolated risk factors indicates that no single risk factor is responsible for determining the lifetime risk stratification. For example, despite its high prevalence (especially among younger adults), smoking as the sole risk factor results in high lifetime predicted risk status in only 9.8% of individuals who have low short-term predicted risk.

Effect of Altering Low Short-Term Risk Definitions
When low short-term risk is defined either as <6% predicted 10-year risk for hard CHD (and absence of diabetes) using the ATP III risk assessment tool10 or as <20% predicted 10-year risk for total CVD (and absence of diabetes) using the risk functions published by D’Agostino et al,11 the distribution of lifetime predicted risk among those at low short-term predicted risk does not change meaningfully (data not shown).

Discussion
The present report represents the first analysis of the distribution of lifetime CVD risk strata in the US population, and it has 2 major findings. First, the overwhelming majority (82%) of US adults are at low (<10%) short-term predicted
risk for a coronary event, but this majority comprises 2
groups: one third in the low short-term CHD/low lifetime
CVD predicted risk group and two thirds (ie, 87 million
individuals) in the low short-term CHD/high lifetime CVD
predicted risk group. Among those 40 to 59 years of age, a

population, and the present study demonstrates the striking
departure of this distribution from that of 10-year CHD risk.

Although these studies are valuable for their outcome
measurements, a strength of the present study is that the contem-
porary nationally representative sample provides more rele-

tant information about the current distribution of lifetime risk
strata in the US States.

Previous reports have provided the distribution of short-

risk strata in the US population, with about three
fourths of US adults consistently classified as “low risk” by
ATP III guidelines. However, there has been no prior
report of the distribution of lifetime CVD risk strata in the US
population, and the present study demonstrates the striking
departure of this distribution from that of 10-year CHD risk.

Whereas 82% of CVD-free US adults are at “low risk” based
on 10-year CHD predicted risk alone, the group at “low/low
risk” based on stepwise stratification by lifetime CVD pre-
dicted risk is much smaller, at 26%.

Significance of Demographic Variables and Risk
Factor Definitions

Although the Framingham Risk Score for 10-year predicted
risk of CHD represents an important advance in primary

prevention that has allowed clinicians to match intensity of
therapy to absolute risk, it has well-recognized limitations,
particularly in women and younger men. The stepwise
stratification system used in the present analysis identifies
a low short-term/high lifetime predicted risk group that is
highly prevalent in the US population, particularly in women
and younger men. This is because the lifetime risk algorithm
comprising the “second step” in our stratification is not
dependent on sex or age and stratifies observed lifetime risk
similarly for both sexes and all adult age groups studied to
date, whereas the Framingham Risk Score (and the related
ATP III tool) is overwhelmingly dependent on the weighting
of the sex and age variables. In fact, we showed in the present

analysis that the lifetime risk algorithm is not driven by any
single risk factor and that it identifies a substantial low

short-term/high lifetime risk group even when stringent
definitions of low short-term risk are applied.

Clinical and Public Health Implications

We therefore believe that our results provide support for
adoption of this stratification system by healthcare profes-

sionals to aid risk communication for a large segment of the
US population. Assigning a lifetime predicted risk status to
US adults presenting for primary prevention would change
the message to those 87 million individuals with low short-
term but high lifetime predicted risk. As an example of what
these individuals may be counseled to expect in terms of absolute risk, 50-year-old participants in the Framingham
Heart Study with “high predicted lifetime risk” had absolute

lifetime risks for CVD of 45.5% to 68.9% for men and 39.1%
to 50.2% for women. For a specific illustration of the

motivational utility of the lifetime risk estimate, consider a
50-year-old nonsmoking, nondiabetic woman with total cho-

lesterol of 240 mg/dL, HDL cholesterol of 58 mg/dL, and
untreated systolic blood pressure of 160 mm Hg. Her 10-year

hard CHD risk is 2% according to ATP III, but her lifetime

CVD risk is a more motivating 50%. Additionally, individ-

uals with low short-term/high lifetime predicted risk could be

informed that at present, even at young ages, they probably
have significantly greater subclinical disease burden com-
pared with those with low short-term/low lifetime predicted
risk due to a more favorable risk factor profile. Such facts may
be useful for motivating lifestyle changes or adherence to

<table>
<thead>
<tr>
<th>Percentage (SE) of U.S. Population in Risk Stratum</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Neither included</td>
</tr>
<tr>
<td>Both included</td>
</tr>
<tr>
<td>Obesity only</td>
</tr>
<tr>
<td>Low HDL-C only</td>
</tr>
</tbody>
</table>

Ten-year hard CHD risk calculated based on D’Agostino et al. with “low” defined as <10% 10-year predicted CHD risk and absence of diabetes. Obesity is defined as body mass index ≥30 kg/m². Low HDL-C is defined as <40 mg/dL for men and <50 mg/dL for women.

P is for the comparison to the stratification without HDL-C and obesity included.
We believe that our results may also prove useful on a public health level. Our data might assist in the estimation of estimates shows promise in this regard.

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analysis, and although ATP III focuses on hard CHD as the outcome of interest, the more inclusive outcome of total CVD may be more clinically relevant. We believe that despite the potential limitations, our delineation of short-term and lifetime risk strata among US adults represents valuable information for policy makers and clinicians looking to confront the substantial burden of CVD in the United States.

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Dr Lloyd-Jones and this work are supported in part by grant R21 HL085375 from the National Heart, Lung, and Blood Institute. Dr Berry is the Dedman Family Scholar in Clinical Care, UT Southwestern Medical Center.

Disclosures
None.

References
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Amanda K. Marma, Jarett D. Berry, Hongyan Ning, Stephen D. Persell and Donald M. Lloyd-Jones

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Supplemental Material
Supplemental Table 1. Characteristics of 6,329 Eligible NHANES 2003 to 2006 Participants, Weighted to Reflect the CVD-free, Nonpregnant, 20- to 79-Year Old U.S. Population - by Demographic Stratum

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Mean (SD) of Risk Factor Level</th>
<th>Percentage (SE) with Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TC (mg/dL)</td>
<td>HDL-C (mg/dL)</td>
</tr>
<tr>
<td>Total</td>
<td>44.0 (0.4)</td>
<td>200.6 (0.7)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>43.0 (0.4)</td>
<td>199.7 (0.8)</td>
</tr>
<tr>
<td>Women</td>
<td>45.0 (0.4)</td>
<td>201.5 (1.0)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td>24.3 (0.1)</td>
<td>180.5 (1.7)</td>
</tr>
<tr>
<td>30-39</td>
<td>34.5 (0.2)</td>
<td>200.0 (1.7)</td>
</tr>
<tr>
<td>40-49</td>
<td>44.5 (0.2)</td>
<td>210.6 (1.6)</td>
</tr>
<tr>
<td>50-59</td>
<td>53.7 (0.1)</td>
<td>207.7 (2.1)</td>
</tr>
<tr>
<td>60-69</td>
<td>64.1 (0.1)</td>
<td>201.8 (2.2)</td>
</tr>
<tr>
<td>70-79</td>
<td>74.0 (0.2)</td>
<td>194.7 (2.1)</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td>24.4 (0.2)</td>
<td>178.5 (1.7)</td>
</tr>
<tr>
<td>30-39</td>
<td>34.5 (0.1)</td>
<td>195.9 (1.7)</td>
</tr>
<tr>
<td>40-49</td>
<td>44.3 (0.2)</td>
<td>200.9 (1.6)</td>
</tr>
<tr>
<td>50-59</td>
<td>54.0 (0.1)</td>
<td>215.6 (2.7)</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>White</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>41.3 (0.7)</td>
</tr>
<tr>
<td></td>
<td>Mexican-American</td>
<td>38.6 (0.8)</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>40.5 (1.8)</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>White</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>42.1 (0.7)</td>
</tr>
<tr>
<td></td>
<td>Mexican-American</td>
<td>40.5 (0.5)</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>41.1 (1.3)</td>
</tr>
</tbody>
</table>

SD=standard deviation, SE=standard error, TC=total cholesterol, HDL-C=high-density lipoprotein cholesterol, SBP=systolic blood pressure, DBP=diastolic blood pressure, BMI=body mass index, DM=diabetes mellitus, HTN=hypertension, Tx=treatment.
Supplemental Table 2. Characteristics of 6,329 Eligible NHANES 2003 to 2006 Participants, Weighted to Reflect the CVD-free, Nonpregnant, 20- to 79-Year Old U.S. Population - by Risk Stratum

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>TC (mg/dL)</th>
<th>HDL-C (mg/dL)</th>
<th>SBP (mm Hg)</th>
<th>DBP (mm Hg)</th>
<th>BMI (kg/m²)</th>
<th>DM (%)</th>
<th>Smoking (%)</th>
<th>Anti-HTN tx (%)</th>
<th>Lipid-lowering Tx (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>44.0 (0.4)</td>
<td>200.6 (0.7)</td>
<td>54.2 (0.3)</td>
<td>121.0 (0.3)</td>
<td>71.1 (0.2)</td>
<td>28.2 (0.2)</td>
<td>5.6 (0.4)</td>
<td>25.9 (1.0)</td>
<td>16.5 (0.6)</td>
</tr>
<tr>
<td>Low 10-yr CHD risk*</td>
<td>40.6 (0.3)</td>
<td>198.4 (0.7)</td>
<td>55.4 (0.3)</td>
<td>118.4 (0.3)</td>
<td>71.0 (0.2)</td>
<td>27.9 (0.2)</td>
<td>-</td>
<td>24.5 (1.0)</td>
<td>10.7 (0.5)</td>
</tr>
<tr>
<td>All Optimal</td>
<td>32.6 (0.6)</td>
<td>156.5 (1.0)</td>
<td>54.4 (0.5)</td>
<td>107.3 (0.3)</td>
<td>65.0 (0.4)</td>
<td>25.6 (0.2)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>≥1 Not Optimal</td>
<td>38.0 (0.5)</td>
<td>179.7 (0.9)</td>
<td>54.5 (0.6)</td>
<td>118.0 (0.4)</td>
<td>71.2 (0.4)</td>
<td>27.9 (0.3)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>≥1 Elevated</td>
<td>42.7 (0.5)</td>
<td>213.4 (0.5)</td>
<td>57.3 (0.6)</td>
<td>120.2 (0.5)</td>
<td>73.1 (0.4)</td>
<td>28.4 (0.3)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1 Major</td>
<td>41.4 (0.4)</td>
<td>206.2 (1.3)</td>
<td>54.9 (0.4)</td>
<td>119.7 (0.5)</td>
<td>71.0 (0.4)</td>
<td>27.9 (0.2)</td>
<td>-</td>
<td>52.7 (1.5)</td>
<td>13.9 (1.0)</td>
</tr>
<tr>
<td>≥2 Major</td>
<td>49.0 (0.7)</td>
<td>230.2 (2.4)</td>
<td>56.1 (0.8)</td>
<td>126.2 (1.2)</td>
<td>74.3 (0.7)</td>
<td>29.6 (0.3)</td>
<td>-</td>
<td>53.1 (2.5)</td>
<td>56.2 (2.4)</td>
</tr>
<tr>
<td>High 10-yr CHD risk*</td>
<td>59.7 (0.4)</td>
<td>210.8 (1.8)</td>
<td>48.8 (0.5)</td>
<td>132.5 (0.6)</td>
<td>71.7 (0.5)</td>
<td>29.8 (0.2)</td>
<td>31.2 (1.7)</td>
<td>32.5 (1.8)</td>
<td>42.6 (1.5)</td>
</tr>
</tbody>
</table>

*10-year hard coronary heart disease risk calculated based on D'Agostino et al 2001, with “low” defined as <10% 10-year predicted CHD risk and absence of diabetes.

SD=standard deviation, SE=standard error, TC=total cholesterol, HDL-C=high-density lipoprotein cholesterol, SBP=systolic blood pressure, DBP=diastolic blood pressure, BMI=body mass index, DM=diabetes mellitus, HTN=hypertension, Tx=treatment, CHD=coronary heart disease.
Supplemental Figure 1. Selection of study sample. CVD=cardiovascular disease, HDL=high-density lipoprotein.