Relationship between Cardiovascular Disease Knowledge and Race/Ethnicity, Education and Weight Status

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Abstract

Background—Inadequate CVD knowledge has been cited to account for the imperfect decline in CVD among women over 2 decades.

Hypothesis—Due to concerns that at-risk women might not know the leading cause of death or symptoms of a heart attack, our goal was to assess the relationship between CVD knowledge race/ethnicity, education and BMI.

Methods—Using a structured questionnaire, CVD knowledge, socio-demographics, risk factors, and body mass index(BMI) were evaluated in 681 women.

Results—Participants included Hispanic, 42.1%(n=287); non-Hispanic white(NHW) 40.2%(n=274); non-Hispanic black(NHB) 7.3%(n=50) and Asian/Pacific Islander(A/PI) 8.7%(n=59). Average BMI was 26.3±6.1 kg/m². Hypertension was more frequent among overweight (45%) and obese (62%) than normal weight (24%), p<0.0001; elevated total cholesterol was more frequent among overweight (41%), and obese (44%) than normal weight (30%) (p<0.05 and p<0.01 respectively); and diabetes was more frequent among obese (25%) than normal weight (5%) (p<0.0001). Knowledge of the leading cause of death and symptoms of a heart attack varied by race/ethnicity and education (p<0.001), but not BMI. Concerning the leading cause of death among US women: 87.6% (240/274) NHW answered correctly compared to 64% (32/50) NHB (p<0.05); 28.3% (80/283) Hispanics (p<0.0001) and 55.9% (33/59) A/PI (p<0.001). Among participants with ≤ 12 years of education, 21.2% knew the leading cause of death and 49.3% heart attack symptoms vs. 75.7% and 75.5%, respectively for > 12 years (both p <0.0001).

Conclusions—Effective prevention strategies for at-risk populations need to escalate CVD knowledge and awareness among the under-educated and minority women.

Keywords
cardiovascular disease knowledge; race/ethnicity; weight
INTRODUCTION

A daunting phenomenon in the US is the increase in average weight, a health concern affecting nearly 2 of every 3 US women, and a global problem associated with diabetes, hypertension, and hyperlipidemia (1), (2). The health hazards of obesity have been recognized for centuries and in 1998 the American Heart Association (AHA) identified obesity as a major modifiable CVD risk factor (3). Yet, substantial numbers fail to recognize an abnormal weight is a cause for concern (4),(5). Despite reports that an ever-increasing weight is negatively associated with survival, and increases CVD risk, fewer than 50% are aware of healthy levels of risk factors or can name the major risk factors (6). Among participants treated for lipid disorders, 27% did not know their risk and notably, women were less likely to be aware of risk (7). Inadequate health education is a public health concern as CVD risks linked to obesity such as diabetes, hypertension, and hyperlipidemia are on the rise (8, 9). Failure to recognize an abnormal weight makes it less likely that calls for weight control are seen as personally relevant and, might be ignored by the overweight and obese who neither perceive their weight as abnormal nor recognize associated risks.

Knowledge of CVD risk has been linked to preventive actions to maintain good health and empower individuals to adapt healthier lifestyles (10, 11). The percentage of women recognizing that heart disease is the leading cause of death increased from 30% to 46% between 1997 and 2006 (12). By 2009, it improved again such that 54% answered correctly, however, was not superior to the immediate preceding report (57%) (13). Limited CVD knowledge has been reported among those with cardio-metabolic disorders who are at greater risk for CVD events (14). Due to concerns that other at-risk women might not know vital CVD facts, a primary aim was to assess CVD knowledge among overweight and obese participants who might be uninformed of the escalating CVD burden associated with excess weight. (15). Accordingly, we tested whether the overweight or obese have less CVD knowledge and are less likely to correctly perceive body size than normal weight participants.

METHODS AND MATERIALS

Heart Health in Action is a longitudinal observational program whose participants include a convenience sample of 798 individuals attending the outpatient clinical services of Columbia University Medical Center, Northern Manhattan. Data from the baseline interview of 681 adult women without exclusion criteria were analyzed. Exclusion criteria were based on high-risk Framingham Risk Score > 20%(16) including known coronary artery disease, CVD procedure (angioplasty, bypass surgery, stent placement, etc.), myocardial infarction, ischemic cardiac syndrome, stroke, transient ischemic attack, pregnancy, and age ≤18 years. The Institutional Review Board approved the study and participants enrolled from July, 2007 to February, 2010 provided written informed consent. The project is designed to evaluate CVD knowledge and awareness, socio-demographics, CVD risk, and lifestyle (diet, physical activity, attitudes) among women (17), (18).
Measures

All completed a 5-page standardized face-to-face questionnaire in English or Spanish adapted from the validated Centers for Disease Control and Prevention Behavioral Risk Factor Surveillance System (19) that included self-report medical history, socio-demographics, sources of nutrition counseling and diet information. Weight, height, waist circumference and blood pressure were measured. Body mass index (BMI) [weight (kg)/height (m^2)] was calculated and classified as underweight (< 18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2), and obese (> 30 kg/m^2).

Race/Ethnicity

Race and ethnicity were defined by self-identification modeled after the U.S. census (20) and defined by 6 categories: ‘Hispanic/Latino, NHW, Native American, NHB, A/PI and Other.’ Data from groups other than NHW, NHB, Hispanic, and A/PI were collected but excluded from analysis involving race/ethnicity because of small sample size.

Education

Years of education was categorized as: Never attended school or attended < 8 years (elementary); attended 9–12 years (high school); attended > 12 years including college, vocational, or technical school (college).

Residence, Insurance

Suburban or urban residency was determined. Health insurance status was categorized as Medicaid or state, Medicare, commercial or a health maintenance organization, private pay, none, or other.

Stunkard Silhouettes

The 9-figure, sex-specific Stunkard rating scale was used as an adjunct to BMI to evaluate individual awareness of self-size (21). Participants chose silhouettes from underweight; normal weight; overweight; and obese identified as: 1) current body image or self-size, 2) ideal and healthy body image (22). Current body image is the figure selected in response to: “Which figure do you look like?” The “ideal” or healthy body image is the figure chosen in response to: “Which figure do you think is “ideal”? Selected silhouettes were compared to the calculated BMI. National guidelines and normative data link the Stunkard figures with BMI and the scale has validity and test-retest reliability (23, 24).

Assessing Knowledge

Participants were questioned about knowledge of CVD, initiated by the AHA and Healthy People 2010 to improve cardiovascular health and quality of life (Chapter 12, Heart Disease and Stroke, 12.2 & 12.8) (15, 25). Three questions, each with a single correct answer, were asked: 1) what is the leading cause of death among US women; 2) what are early warning symptoms of heart attack and; 3) what are the actions to take if experiencing a heart attack? (15). Choices for the leading cause of death included: a) breast cancer, b) lung cancer, c) HIV/AIDS, d) heart disease, e) stroke. The correct answer is: d) heart disease. Selections for symptoms of a heart attack included: a) shortness of breath, b) dizziness, c) chest pain or
discomfort, d) significant fatigue, e) all of the above. The correct answer is: e) all of the above. Selections for actions to take if experiencing a heart attack included: a) call 911, b) drive yourself to the hospital, c) ask a friend to drive you to the hospital, d) make an appointment with the doctor. The correct answer is: a) call 911.

Statistical Analysis
Analyses were carried out with SAS for Windows 9.2 (SAS Institute, Cary, NC). The results are reported as means and standard deviations for continuous variables (age, education, BMI) and as frequencies and percentages for categorical variables (race/ethnicity, residence, health insurance, CVD knowledge, risk factors, waist size). Differences between participants were assessed using t-tests for continuous variables and Fisher’s exact test for categorical variables. Analyses related to body size were performed for the entire cohort and stratified by BMI category. Multivariable logistic regression analysis was used to test for differences between racial-ethnic groups with respect to: 1) knowledge of the leading cause of death among women, 2) the warning symptoms of a heart attack, and 3) actions to take if experiencing a heart attack, with age, education, and BMI category included as covariates. The significance of the relationship between CVD knowledge and weight categories utilized the calculated BMI based on measured weight and height. A p-value < 0.05 was considered significant for all analyses.

RESULTS
Demographics
Of the 798 participants, 681 had no exclusions including Hispanic women, 42.1% (n=287); NHW 40.2% (n=274); NHB 7.3% (n=50) and A/PI 8.7% (n=59) (Table 1). The mean age was 49±16 yrs and Hispanics (46±15 yrs), (p<0.001) and A/PI (46±16 yrs) (p<0.01) were younger than NHW (52±17 yrs) (Table 1). Mean education was 14.2±4.3 yrs, however, more NHW participants (94.9%) and A/PI (84.5%) (p<0.01) than NHB (66.0%) (p<0.0001) or Hispanics (37.6%), (p<0.0001) attended college. The majority, 80.8 % (n= 550), resided in urban areas. Most had private, state or federal insurance (670/681, 98.4%) including managed care, private pay or other commercial (50.2%); Medicaid (36.4%); Medicare (10.9%); and other (2.5%).

Risk Factors
One or more self- reported risk factors included: hypertension (249/651, 38.3%); hypercholesterolemia (233/650, 35.9%); smoking (92/678, 13.6%); diabetes mellitus (66/649, 10.2%) and overweight/obesity (326/681, 47.9%) (Table 1). Compared to normal weight participants (24%), hypertension (≥140/90 mm Hg) (26) was more frequent among overweight (45%) and obese (62%), (p<0.0001). Similarly, elevated total cholesterol (>200 mg/dL) (27) was more frequent among overweight (41%), and obese (44%) than normal weight participants (30%) (p<0.05 and p<0.01 respectively); and diabetes mellitus (fasting plasma glucose ≥100/mg/DL) (28) was more frequent among obese (25%) (p<0.0001) than normal weight (5%) (Fig. 1).
CVD Knowledge and Race-ethnicity

Responses concerning the leading cause of death among US women varied by race/ethnicity: 87.6% (240/274) NHW answered correctly compared to 64% (32/50) NHB (p<0.05); 28.3% (80/283) Hispanics, (p<0.0001) and 55.9% (33/59) A/PI (p<0.001) (Fig. 2). Responses concerning the early warning symptoms of a heart attack varied by race/ethnicity: 80.7% (221/274) NHW answered correctly compared to 68% (34/50) NHB (p<0.001); 56.7% (161/284) Hispanics, (p<0.001) and 49.2% (29/59) A/PI (p<0.001). The majority (89.1%) knew to call 911 if experiencing symptoms of a heart attack; however, fewer A/PI, 74.6% (44/59), responded correctly (p<0.05).

CVD Knowledge and Education

Among participants with ≤ 12 years of education, 21.2% identified the leading cause of death and 49.3% knew the symptoms of a heart attack vs. 75.7% and 75.5%, respectively for those with > 12 years of education (both p < .0001) (Fig. 3). Knowledge of the need to call 911 did not relate to years of education (≤12 yrs: 90.7%; > 12 yrs: 88.1%). Among participants with >12 years of education, there was no significant difference in knowledge of the leading cause of death (normal weight: 75.2%; overweight: 76.9%; obese: 76.4%) or knowledge of the symptoms of a heart attack (normal weight: 73.6%; overweight: 75.9%; obese: 80.6%).

CVD Knowledge and BMI

The leading cause of death among US women was answered correctly by 53.2% of overweight and 47.5% of obese vs. 65.9% of normal weight women (p < 0.001 and p <0 .01, respectively). Overall 66.7% answered correctly concerning warning symptoms of a heart attack, however, overweight (59.6%) and obese participants (65.7%) were less likely to answer correctly than normal weight women (71.1%), but the difference was significant for overweight women only (p < 0.01). The need to call 911 did not vary by weight classification. While in the univariate analyses CVD knowledge differed by race/ethnicity, education, and BMI, when all factors are analyzed simultaneously there is no significant difference among BMI classifications.

BMI and Race/Ethnicity

The average BMI was 26.3±6.1 kg/m². Compared to NHW women, 24.8±5.1 kg/m², the BMI was higher among Hispanic, 28.0±6.2 kg/m² and NHB women, 30.3±7.6 kg/m² (p<0.0001), and lower among A/PI, 22.1±3.6 kg/m² (p<0.01) (Table 1). Compared to NHW (36.9%), Hispanic (61.3%) and NHB participants (76.0%) were more likely to have BMI ≥ 25 (p<0.0001) while A/PI (18.6%) were less likely to have BMI ≥25 (p<0.001). A similar pattern was observed for waist size ≥35 inches: NHW (30.0%), NHB (59.2%), Hispanics (55.7%) (Both p<0.0001), and A/PI (13.8%) (p<0.05)(Table 1).

BMI and Size Awareness

Overall, 62.6% selected a silhouette appropriate for their BMI; 28.4% chose a silhouette underestimating BMI and 9.0% chose a silhouette overestimating BMI. Obese women were less likely to select an appropriate body silhouette (41.1%) than normal weight women.
(69.7%) (p < 0.001). Underestimation of body size was greatest among overweight (31.9%) and obese (58.9%) compared to normal weight women (14.4%) (both p < 0.001). Obese women were more likely than normal weight women to choose overweight or obese silhouettes as “ideal” (20.6% vs. 0.3%, p < .0001).

Counseling
Nutritional advice from physicians was acknowledged by 54% (351/650), and did not vary by weight classification. More overweight (77.6%) and obese participants were concerned about weight compared to normal weight (51.2%) (p < 0.01 and p < 0.001 respectively), and a greater percentage of overweight (76.0%) and obese (90.0%) than normal weight women (48.5%) were trying to lose weight (both p < 0.001). Hispanics reported less counseling: 48% (137/287) compared to 58% (158/274) NHW, 64% (32/50) NHB, and 62% (24/39) A/PI (p < 0.02).

DISCUSSION
Knowledge
Attention has focused on inadequate awareness and knowledge of CVD to account for the imperfect decline in CVD among women over two decades (13, 29). Knowledge of the leading cause of death and warning symptoms of a heart attack are critical for activating emergency systems and receiving time-dependent therapies to reduce morbidity and improve survival (13, 29). While recognition of CVD as the leading cause of death among women has almost doubled since 1997 (13), it continues to lag particularly amongst racial-ethnic minorities and those with ≤ high school education (18) (30). Here, fewer Hispanic and NHB women, and those with ≤ 2 years of education identified the leading cause of death and symptoms of a heart attack. An unexpected finding was that A/PI women had the lowest recognition of symptoms of a heart attack and were less likely to know to call 911; however, the sample size was small and definitive conclusions cannot be drawn. CVD is now the leading cause of death in Chinese women and rates of awareness are low (31).

While in the univariate analyses, knowledge differed by race/ethnicity, education, as well as BMI, when all factors are analyzed simultaneously there is no significant difference among BMI classifications. Rather, the differences are due to race/ethnicity and education. Among college educated women responding to the questions, there were no differences among BMI categories, and from this we conclude that educational efforts regarding heart disease should be directed at less educated minority women.

Awareness
Figural stimuli were utilized as an adjunct to the BMI to understand awareness of personal size (21). Underestimation of size was greatest among overweight and obese women, and the obese were less likely to select appropriate silhouettes. Failure to recognize an above-standard size makes it less likely that weight control is seen as personally relevant or those likely to benefit from weight control recognize the consequences with respect to long-term effects including diminished weight gain (32), weight maintenance (33), or risk control. A troubling finding was that a substantial minority of obese women felt an overweight
silhouette was “ideal” suggesting current normal standards are shifting to larger sizes (34) and raising concerns that obese women might be unaware of the escalating CVD morbidity and mortality associated with excess weight (4), (5) or that behavioral changes such as diet and increased activity diminish risk (18). We did not ask about excess weight and escalating CVD morbidity and mortality which might give insight into attitudes about weight and risk.

Although substantial numbers were concerned about weight or trying to lose weight, physicians provided nutritional information in slightly more than half. In contrast, 70% who smoke acknowledge receiving medical guidance and counseling about tobacco use (35). The missed opportunity to discuss a key preventive health measure eliminates an important step (36), since counseling is effective and those who receive guidance are more likely to attempt weight loss, increase physical activity, or both (37, 38).

Limitations

The Heart Health in Action questionnaire is self-reported and subject to recall, is gender-specific, and participants are primarily urbanites. Self-report responses can be biased due to forgetfulness or exaggeration, social desirability, or affected by feelings at the time of the interview. Whether results would be similar among men and participants from broader geographic areas is unclear. The Stunkard figure rating scale is widely used among racial/ethnic groups, but may not detect subtle differences in perception. Some participants do not use the full range of the scale, those with the highest BMI may not choose larger figures, and NHB women may perceive themselves as thinner than similarly sized NHW with equivalent BMI (39), (40). Since physicians and patients may differ in recollections, it is possible patients received more nutritional guidance than reported (36).

Conclusions

Improving CVD knowledge and enhancing awareness are worthy targets in efforts to decrease CVD morbidity and mortality. Vigilance in targeting minority women with low levels of education provides opportunities to broaden the scope for risk reduction and advance the goal of diminished adverse CVD outcomes.

Acknowledgments

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Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>CVD</td>
<td>cardiovascular disease</td>
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<tr>
<td>BMI</td>
<td>body mass index</td>
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<tr>
<td>NHW-</td>
<td>non-Hispanic white</td>
</tr>
<tr>
<td>NHB</td>
<td>non-Hispanic black</td>
</tr>
<tr>
<td>A/PI</td>
<td>Asian/Pacific Islanders</td>
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</table>
AHA American Heart Association

References


Figure 1.
Risk factors and BMI classification: *p<0.0001, †p<0.05, ‡p<0.01
Figure 2.
Compared to Non-Hispanic White women (NHW), knowledge of the leading cause of death and knowledge of heart attack symptoms differed by race-ethnicity. Asian Pacific Islanders were less likely to know to call 911 in case of an emergency, *p<0.0001, †p<0.05
Figure 3.
Compared to those with >12 years of education, knowledge of the leading cause of death among women and heart attack symptoms differed compared to those with ≤12 years. Knowing to call 911 differed between those with <8 years of education and those with >12 years, * p<0.0001, †p<0.05
### Table 1
Baseline Characteristics of Participants (n = 681)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N (%) or Mean ± SD</th>
<th>p-value</th>
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<tbody>
<tr>
<td><strong>Race-Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NHW, n (%)</td>
<td>274 (40.2)</td>
<td></td>
</tr>
<tr>
<td>NHB, n (%)</td>
<td>50 (7.3)</td>
<td></td>
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<tr>
<td>Hispanic, n (%)</td>
<td>287 (42.1)</td>
<td></td>
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<tr>
<td>Asian/Pacific Islander, n (%)</td>
<td>59 (8.7)</td>
<td></td>
</tr>
<tr>
<td>Other, n (%)</td>
<td>11 (1.6)</td>
<td></td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
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<tr>
<td>NHW</td>
<td>52 ± 17</td>
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</tr>
<tr>
<td>NHB</td>
<td>49 ± 15</td>
<td>.2839</td>
</tr>
<tr>
<td>Hispanic</td>
<td>46 ± 15</td>
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</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>46 ± 16</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Education (years)$^\dagger$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NHW</td>
<td>16.9 ± 2.1</td>
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<tr>
<td>NHB</td>
<td>14.6 ± 2.8</td>
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<tr>
<td>Hispanic</td>
<td>11.1 ± 4.2</td>
<td>&lt;0.0001</td>
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<tr>
<td>Asian/Pacific Islander</td>
<td>16.2 ± 4.1</td>
<td>.1563</td>
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<tr>
<td><strong>College (&gt; 12 years)$^\dagger$</strong></td>
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<td>NHW</td>
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<td>31 (66.0)</td>
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<tr>
<td>Hispanic</td>
<td>106 (37.6)</td>
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<tr>
<td>Asian/Pacific Islander, n (%)</td>
<td>49 (84.5)</td>
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<td><strong>Body Mass Index (kg/m$^2$)</strong></td>
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<td>NHW (271)</td>
<td>24.8 ± 5.1</td>
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<td>170 (62.7)</td>
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<tr>
<td>NHB (50)</td>
<td>30.3 ± 7.6</td>
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<td>12 (24)</td>
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<tr>
<td>Over-weight or Obese (BMI ≥25kg/m$^2$)</td>
<td>38 (76)</td>
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<td>Hispanic (278)</td>
<td>28.0 ± 6.2</td>
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<tr>
<td>Under-weight or Normal</td>
<td>102 (37)</td>
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<td>Over-weight or Obese (BMI ≥25kg/m$^2$)</td>
<td>176 (63)</td>
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<tr>
<td>Asian/Pacific Islander (59)</td>
<td>22.1 ± 3.6</td>
<td>&lt;0.001</td>
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<td>48 (81.4)</td>
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<td>Over-weight or Obese (BMI ≥25kg/m$^2$)</td>
<td>11 (18.6)</td>
<td>–</td>
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<td><strong>Waist Size ≥35 inches (measured)</strong></td>
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<td>NHW (270)</td>
<td>81 (30.0)</td>
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<tr>
<td>Characteristic</td>
<td>N (%) or Mean ± SD</td>
<td>p-value</td>
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<tr>
<td>--------------------------------</td>
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<tr>
<td>NHB (49)</td>
<td>29 (59.2)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hispanic (280)</td>
<td>156 (55.7)</td>
<td>&lt;0.0001</td>
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<tr>
<td>Asian Pacific Islander (59)</td>
<td>8 (13.8)</td>
<td>&lt;0.05</td>
</tr>
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</table>

Abbreviations: NHW = Non-Hispanic White; NHB = Non-Hispanic Black

Data are presented as number (n); percent (%), mean ± SD

Definition Criteria: Hypertension (≥140/90 mm Hg); Elevated total cholesterol (>200 mg/dL); Diabetes mellitus (fasting plasma glucose ≥100 mg/dL)

Non-Hispanic White Reference for P value –
* Age unavailable in 2 Hispanic subjects;
† Education unavailable in 2 NHW, 3 NHB, 5 Hispanic, and 1 Asian/Pacific Islander