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The Interactive Effects of Race and Depressive symptoms on Calcification in African-American and White Women

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Abstract

Objective—To examine the cross-sectional associations among race, depressive symptoms, and aortic and coronary calcification in a sample of middle-aged women. Depressive symptoms have been associated with atherosclerotic indicators of coronary heart disease (CHD) in white women. Few studies have examined these associations in samples including African-American women, or explored whether any observed associations differ by race.

Methods—Participants were 508 (38% African-American, 62% white) women. Aortic and Coronary Calcification were measured by electron beam tomography and depressive symptoms were assessed with the Center for Epidemiologic Studies Depression Scale (CES-D). Multivariable linear and logistic regression models were conducted to test associations.

Results—In linear regression models adjusted for race, depressive symptoms were associated with a greater amount of aortic calcification ($\beta=.03$, $p=.01$), and there was a significant race $\times$ depressive symptoms interaction ($\beta=.07$, $p=.006$). Findings for depressive symptoms (OR=1.03, 95% CI: 1.0–1.06, $p=.07$), and the race $\times$ depressive symptoms interaction (OR=1.1, 95% CI: 1.01–1.18, $p=.01$) were similar in race-adjusted multinomial logistic regression models predicting high levels of aortic calcification. Race-specific models revealed a significant association between depressive symptoms and aortic calcification in African-American, but not white women. Additional adjustments for education, study site, and CHD risk factors did not alter these results. Depressive symptoms were not associated with coronary calcification for women of either racial group.

Conclusions—African-American women may be particularly vulnerable to the effects of depressive symptoms on early atherosclerotic disease.

Keywords

Depressive symptoms; calcification; atherosclerosis; race; ethnicity; women; atherosclerosis; coronary heart disease (CHD)

Introduction

Coronary Heart Disease (CHD) is the single leading cause of death for women in the United States (1). Among women, African-American women experience rates of CHD that are almost 60% higher than those observed in white women (1–3). Despite decades of research

documenting this phenomenon (1,2), determinants underlying this excess risk remain poorly understood. Because socioeconomic and clinical risk factors do not completely account for these disparities (3), it is important that we begin to identify additional factors that might contribute to poor coronary outcomes in African-American women.

Depressive symptoms have been consistently linked to indicators of CHD and CHD outcomes (myocardial infarction, CHD mortality) in samples of White men (see (4) for a review) and women (5,6). However, with few exceptions (7,8), there have been almost no studies that have explicitly examined the association between depressive symptoms and indicators of CHD in African-American women, despite the fact that many studies report significantly higher rates of depressive symptomatology in African-American compared to White women (3,9,10).

Because most women are asymptomatic for CHD until the onset of an actual clinical event, researchers have argued for the importance of examining early, subclinical markers of CHD, which might be influenced by depressive symptoms long before the onset of a clinical event (11,12). Aortic and coronary calcification are non-invasive markers of subclinical CHD shown to be independent predictors of obstructive coronary artery disease (13), myocardial infarction (14–16), and ischemic stroke (15,16). Aortic calcification in particular is a useful marker in middle-aged women because it occurs earlier in life than some other subclinical markers of CHD and is also fairly common in women (17,18).

To our knowledge, only two studies have examined the association between depressive symptoms and aortic and/or coronary calcification in women (11,12) and both studies had a fairly low representation of African-American women (both $N_s < 60$)¹. Consequently, the primary goal of the current study was to examine the associations among race, depressive symptoms and aortic and coronary calcification in a sample of middle-aged African-American and White women from two sites of the Study of Women's Health Across the Nation (SWAN). We hypothesized that higher rates of depressive symptomatology would be associated with a greater amount of aortic and coronary calcification. Because African-American women may be more vulnerable to both depressive symptoms (9,10) and CHD (1–4), we further hypothesized that these associations would be more pronounced in African-American compared to White women.

Methods

Participants

Participants in the current study were African-American and White women from the Pittsburgh and Chicago sites of SWAN, a longitudinal study of the natural history of the menopausal transition (19). Briefly, women were eligible for participation in SWAN if they were between ages 42–52, had an intact uterus and at least one ovary, and reported a menstrual period in the preceding three months. Women who were pregnant, breastfeeding, or reported exogenous hormone use in the three months preceding the baseline examination were ineligible. The baseline SWAN exam began in 1996–1997 with women from seven sites (Boston, MA; Detroit, MI; Oakland, CA; Los Angeles, CA; Pittsburgh, PA; Chicago, IL; and Newark, NJ). Each site recruited non-Hispanic White women and women from one racial/ethnic minority group. In addition to White women, the Pittsburgh and Chicago sites each recruited non-Hispanic African-American women.

¹The current analysis includes a small subset of women (38%) from one of these studies (12), which was conducted in a slightly different cohort of women from a single SWAN site. Because there were so few African-American women in that subsample, black-white differences were not examined.

Recruitment strategies differed by study site (19). The primary recruitment strategies in Pittsburgh were random-digit dialing and sampling from voter registration lists. In Chicago, participants were recruited from a complete community census of three contiguous neighborhoods that was developed as part of a previous study (20). Using information from that census on age, sex and race, a random sample of women was then selected from each racial group.

During the fourth through seventh annual follow-up exams (2001–2003), the Pittsburgh and Chicago sites collected additional measures of aortic and coronary calcium on a subset of 608 SWAN participants for an ancillary *SWAN Heart Study*. SWAN participants at the two sites were only eligible for the SWAN Heart Study if they had not had a hysterectomy subsequent to their enrollment in the SWAN study, were free of cardiovascular disease (e.g. no history of myocardial infarction, symptoms of angina, intermittent claudication, cerebral ischemia or revascularization), diabetes, and did not report current exogenous hormone use. Retention at both sites was good at the fourth through seventh follow-up exams, ranging from 82.5% (fourth) to 74% (seventh) in Pittsburgh, and 82.3% to 70% in Chicago. Seventy-six percent of SWAN women invited to participate in the SWAN Heart Study ultimately enrolled.

Of the 608 participants who enrolled in the SWAN Heart study, 54 were ultimately deemed ineligible due to clinical CVD or diabetes (N=3), hormone use (N=32) or surgical menopause (N=16). Of the remaining 554 eligible participants, an additional 46 were excluded because of missing data on measures of calcification (N=38) or depressive symptoms (N=12). Women with missing data did not differ from those with complete data on age, race, education, or CHD risk factors. The present analysis includes 508 women (38% African-American, 62% White).

Procedure

At the baseline SWAN exam and annually thereafter, participants underwent a standard protocol that included self- and interviewer-administered questionnaires, measured height and weight, clinical tests, and a fasting blood and urine collection. Interviews included detailed assessments of demographic, psychosocial, and behavioral characteristics. Participants in the SWAN Heart study also underwent Electron Beam Tomographic (EBT) scans to measure the presence and amount of aortic and coronary calcification.

Study procedures were approved by the Institutional Review Boards at both study sites. All participants provided written informed consent.

Measures

Depressive symptoms—Depressive symptoms were assessed with the 20-item Center for Epidemiological Studies Depression scale (CES-D) (21). The CES-D has been widely used in community samples, with high levels of internal consistency and validity (22,23). Scores range from 0 to 60, with higher scores indicative of more depressive symptomatology. Depressive symptoms were modeled continuously in all analyses, but for descriptive purposes were categorized into “high” or “low” scores, using the standard cutoff of ≥ 16 (22).

Aortic and Coronary Calcification—EBT scans were used to quantify calcification in the aortic and coronary arteries. A trained technician at each site performed the scans using an Imatron C-150 Ultrafast CT scanner (Imatron, South San Francisco, CA). The scan obtained 30 to 40 contiguous three-mm-thick transverse images of the coronary arteries from the level of the aortic root to the apex of the heart during maximal breath holding. Electrocardiograph triggering was used so that each 100 millisecond exposure was obtained during the same phase of the cardiac cycle (60% of RR interval). An additional pass was conducted for the aortic arteries. Approximately 30 to 40 six-mm contiguous images of the aorta were obtained from

the aortic arch to the iliac bifurcation using a 300 millisecond exposure time. Aortic and/or coronary calcification was considered to be present on a given image if at least three contiguous pixels were present with more than 130 Hounsfield units. The scores for all images were then summed to create a continuous score. Scans were read at the University of Pittsburgh and scored using the Agatston methodology (24). The reproducibility of the scoring system has been previously demonstrated at the University of Pittsburgh, with an intraclass correlation of .98 and .99 for the aortic and coronary scores, respectively (25).

Education—Education was used as a marker of socioeconomic status (SES). Because the cost of living varies across cities in the United States, education is a useful measure of SES in multi-site studies, as it allows for more comparability across sites than financial indices. It is also fairly stable throughout adulthood and less prone to missing or distorted values than other markers of SES such as income or wealth (26). Education may be a particularly valid indicator of SES for middle-aged and older women because it is available for women who are retired, recently widowed, or not employed outside of the home. Highest level of education was assessed via self-report at SWAN baseline and categorized as: high school degree or less, some college, college degree, or more than a college degree (referent).

Framingham Risk Score—The Framingham Risk Score (FRS) was derived using a standard algorithm for women incorporating age, total cholesterol, high density lipoprotein cholesterol (HDL-c), systolic blood pressure, treatment for hypertension, and current cigarette smoking (27). Possible scores range from -8 to +27, with higher scores indicating more cardiovascular risk factors. Measurements of total serum cholesterol and HDL-c were taken from blood specimens obtained between the second and fifth days of each participant's menstrual cycle, following a 12-hour fast. Total cholesterol was analyzed using enzymatic methods on a Hitachi 747 analyzer (Boehringer Mannheim Diagnostics, Indianapolis, IN) (28), Lipid and lipoprotein fractions were analyzed on EDTA-treated plasma (28,29), and HDL-c was isolated using heparin-2m manganese chloride (29). Blood samples were all analyzed at the same central laboratory (Medical Research Laboratories, Highland Heights, KY), that conforms to the quality control standards of the National Heart, Lung and Blood Institute and the Centers for Disease Control (30). Blood pressure measurements were obtained by a trained technician and standardized for cuff size, position and rest period. Two blood pressure readings were taken for each participant the average score was used in the FRS. All FRS components were assessed at the SWAN Heart baseline exam via self-report (age, current smoking, and medications for high blood pressure) or clinical exam (total cholesterol, HDL-c and systolic blood pressure).

Body Mass Index—Body mass index (BMI) from the SWAN Heart baseline exam was calculated as weight in kilograms divided by height in meters squared. BMI was categorized as normal ($BMI \leq 24.9$), overweight ($BMI 25-29.9$) and obese ($BMI \geq 30$) for descriptive purposes, but was modeled continuously in all analyses.

Analyses

We used descriptive statistics to characterize participants on age, education, depressive symptoms, CHD risk factors, and aortic and coronary calcification scores. T-tests and Chi-squared tests were conducted to test for black-white differences on these characteristics.

Aortic and coronary calcification scores were analyzed as both continuous and categorical outcomes, because scores on these variables were highly skewed towards zero. We chose both approaches to: 1) Adhere to the recommended statistical guidelines for these data which advocate for the use of continuous outcomes (31); and also 2) Remain consistent with previously published reports using categorical outcomes (14,15,18), which are believed to have

more clinical relevance than continuous scores. In order to analyze aortic and coronary calcification as continuous outcomes, we conducted logarithmic transformations on each calcification score + 1 (31). In creating categorical outcomes, aortic calcium scores were categorized as “none,” “low,” “moderate,” and “high” using standard cutoffs (0, 1–9, 10–99, 100 and up), with scores ≥ 100 representing “high” levels of calcification (15). Because of the relatively restricted range of coronary calcium scores in our cohort (only 30% of participants had scores above 10, and less than 5% had scores above 100), we were unable to use similar categories for coronary calcium scores. Consequently, coronary calcium was categorized as present or absent.

Multivariable linear regression models were conducted to examine the relationships among race, depressive symptoms and (log-transformed) aortic and coronary calcification, after adjusting for demographics and CHD risk factors. The initial model tested the main effect of depressive symptoms on calcium scores, after adjusting for race. The second model added a term for the race $\times$ depressive symptoms interaction. The third, fully-adjusted model added a term for education, which in addition to race, is a demographic variable that has been consistently associated with both depressive symptoms (9,32) and CHD risk (including calcification) in women (33,34). These terms were followed by the FRS and BMI -- potential mediators of the association between depressive symptoms and calcification. Separate models were run for aortic and coronary artery calcification.

Multinomial logistic regression models were used to analyze the associations among race, depressive symptoms and categories of aortic calcification, after adjusting for demographics and CHD risk factors. We used this approach rather than ordinal logistic regression because the proportional odds assumption was not met (i.e. the association between a given predictor and aortic calcification differed across categories of calcification) (35,36). The multinomial models estimated the likelihood of being in each of the calcification categories (1–9, 10–99, ≥ 100) relative to the referent group (0 calcification) as a function of depressive symptoms and the race $\times$ depressive symptoms interaction. Similar to the multiple regression models, the initial model included depressive symptoms adjusted for race, followed by a second model that added a term for the race $\times$ depressive symptoms interaction. The final model adjusted for education, the FRS and BMI.

In our final set of analyses, binary logistic regression models were conducted to examine the associations among race, depressive symptoms and the likelihood of having any coronary calcification after adjusting for demographic variables and CHD risk factors. Similar to models described above, the first model tested the main effects of depressive symptoms on the likelihood of having any calcification, after adjusting for race. The second model added the race $\times$ depressive symptoms interaction. The final model added adjustments for education, the FRS and BMI.

For each of the above models, we followed up on all significant race $\times$ depressive symptom interaction terms by testing within-group associations in race-stratified models.

Because the sampling design differed between Pittsburgh and Chicago, all final models were adjusted for study site.

Results

Participant Characteristics

Participant characteristics for the full sample and by race are presented in Table 1. On average, women were 50 years old, well-educated, and overweight, with a mean BMI of 29.3. Overall years of education did not differ for African-American compared to White women; however

African-American women were less likely than White women to have achieved a college education or higher (45.4% compared to 58.3%). African-American and White women had similar levels of depressive symptoms, but African-American women had a higher FRS, higher systolic blood pressures, and were heavier than their White counterparts. African-American women were also more likely than White women to have any aortic or coronary calcification, but were not more likely to have high aortic calcification scores (i.e. scores ≥ 100).

Depressive Symptoms and Calcification

Aortic Calcification—In multivariable linear regression models adjusted for race, depressive symptoms were significantly associated with aortic calcification ($\beta=.03$, $p=.01$), and there was a significant race $\times$ depressive symptoms interaction ($\beta=.07$, $p=.006$). The race $\times$ depressive symptoms interaction remained significant ($\beta=.06$, $p=.01$), after adjusting for education, site, the FRS and BMI. Race-stratified models revealed a significant association between depressive symptoms and aortic calcification in African-American ($\beta=.06$, $p<.0001$), but not White ($\beta=-.00$, $p=.88$), women (Table 2).

In multinomial logistic regression models adjusted for race, depressive symptoms were only marginally associated with an increased odds of having high aortic calcification (OR=1.03, 95% CI: 1.0–1.06, $p=.07$), however there was a significant race $\times$ depressive symptoms interaction (OR=1.1, 95%CI: 1.01–1.18, $p=.01$). This association is depicted graphically in Figure 1, with CES-D scores dichotomized into low (0–15) and high (16 or greater) categories for descriptive purposes. In African-American women, a high level of depressive symptoms was associated with an increased prevalence of high aortic calcification (i.e scores ≥ 100). There was no apparent association in White women.

The race $\times$ depressive symptoms interaction remained significant after adjusting for education, site, the FRS and BMI (OR=1.1, 95% CI: 1.02–1.19, $p=.02$). In race-stratified models (Table 3), depressive symptoms were associated with an increased odds of having high aortic calcification for African-American women (OR=1.13, 95%CI: 1.05–1.21, $p=.001$), such that every one unit increase in depressive symptoms was associated with a 13% increased likelihood of having a high level of aortic calcification. There was no significant association between depressive symptoms and the likelihood of high aortic calcification in White women (OR=.98, 95%CI: .94–1.04, $p=.6$). Depressive symptoms were not associated with an increased odds of having moderate or low aortic calcification in either racial group (Table 3).

Coronary Calcification—There were no significant associations between depressive symptoms and coronary calcification in linear regression models adjusted for race ($\beta=.01$, $p=.16$) or after further adjustments for education, site, the FRS and BMI ($\beta=.01$, $p=.22$). Similarly, there was no race $\times$ depressive symptoms interaction in either race adjusted ($\beta=-.01$, $p=.78$) or fully adjusted ($\beta=-.01$, $p=.57$) models.

In logistic regression models adjusted for race, depressive symptoms were not associated with an increased likelihood of having any coronary calcification (OR=1.01; 95% CI: .98–1.03). Results were similar in fully adjusted models (OR=1.0; 95% CI: .98–1.03). The race $\times$ depressive symptoms interaction was also non-significant in race -adjusted (OR=.98; 95% CI: .93–1.03) and fully adjusted (OR=.97; 95% CI: .91–1.03) models. Despite this, we ran additional, race-stratified models, in order to allow for comparisons with our race-specific aortic calcification results. Findings from these models were also non-significant (see Table 4).

Discussion

The current study examined the associations among race, depressive symptoms and aortic and coronary calcification in a sample of middle-aged African-American and White women. We

observed a significant association between depressive symptoms and aortic calcification in African-American, but not White women. In African-American women, higher levels of depressive symptoms were associated with a greater amount of aortic calcification, independent of traditional CHD risk factors and BMI. In fully adjusted categorical models, every one-point increase on the depressive symptoms scale was associated with a 13% increased likelihood of a having high level of aortic calcification in African-American women. Consistent with prior research (11,12,37,38), depressive symptoms were not associated with coronary calcification in either racial group.

Unlike other studies (3,9,10), we did not observe black-white differences in depressive symptoms, perhaps because of the similarity in educational attainment for African-American and White women in this sample. This indicates that our results are not simply due to African-American women having a greater severity of depressive symptomatology. Overall levels of depressive symptoms in African-American and White women were similar, but the impact of depressive symptoms on aortic calcification differed by race. These findings suggest that African-American women may be more vulnerable to the effects of depressive symptoms on aortic calcification than White women.

Our findings are consistent with several previous studies of race, depressive symptoms and non-atherosclerotic indicators of CHD risk. In a recent analysis of middle-aged women, Everson-Rose et al. (7), found that depressive symptoms were associated with an increased risk of incident diabetes over follow-up in African-American women, but did not observe a similar association in White women. Similarly, using a “negative affect” index that combined depressive symptoms and anxiety, Jonas and Lando (8) found an association between baseline negative affect and incident hypertension over a 9-year follow-up that was particularly pronounced in African-American women, compared to White women and men of both racial groups. Other studies examining overall black-white differences in the association between depressive symptoms and CHD risk (without taking into account gender effects) have observed similar patterns (10,39,40). Most of these studies have focused on diabetes (7,10) or hypertension (8,39) as indicators of CHD risk, however, because we excluded women with diabetes from our cohort and controlled for hypertensive medication and blood pressure in our analyses, it is unlikely that these pathways alone account for our effects. Consequently, other mechanisms are likely playing a role.

How might depressive symptoms differentially influence aortic calcification for African-American compared to White women? Depressive symptoms have been associated with decreased heart rate variability (41), increased inflammation (42), and the hypersecretion of cortisol (43), all potential pathways through which depressive symptoms might influence CHD risk (42,44,45). To date, however, there is limited information on whether these pathways differ for African-Americans compared to Whites. In a recent study of male veterans, Boyle et al. (40), found significant black-white differences in the association between depressive symptoms and cortisol. Depressive symptoms were positively associated with cortisol in both racial groups; however, the magnitude of the effect was considerably larger in African-Americans (40). Because these findings were limited to men it is unclear whether they would generalize to women. However, they provide some preliminary evidence that depressive symptoms may have a different physiological impact on African-Americans compared to Whites -- via cortisol. Cortisol is also believed to be associated with aortic calcification (46), therefore it is possible that our observed association between depressive symptoms and aortic calcification in African-American women is mediated by increased cortisol secretion. Additional research in this area is warranted.

Physiological “weathering” may also play a role. Several researchers have argued that at a given chronological age, African-American women are actually physiologically older than

their White counterparts, and are therefore more vulnerable to disease (47). This accelerated aging process, or “weathering” of the physiological system in African-American women may cause them to be more vulnerable to the effects of depressive symptoms on early atherosclerotic disease – in this instance aortic calcification. To our knowledge, the only other study to find a significant association between depressive symptoms and aortic calcification was conducted by Matthews et al. (12) in a sample of White women, who were on average 65 years of age. Although the women in our cohort are almost 15 years younger than the women in that sample, it is possible that on a physiological level our African-American women are comparable to the White women in that sample. In this respect, “race” in the current study may actually be serving as a proxy for physiological aging.

Unmeasured psychosocial stressors might also contribute to the differential vulnerability to depressive symptoms observed in our cohort of African-American women. These additional psychosocial stressors could reduce African-American women’s ability to effectively cope with depressive symptoms, and thereby increase their risk of atherosclerotic disease. In exploratory analyses, we examined the role of negative life events, low social support and experiences of discrimination as possible background psychosocial stressors that might contribute to our associations (data not shown). All of these factors are known to have a negative impact on atherosclerotic disease (37,38,48) and are more prevalent in African-American compared to White women (48,49). Nonetheless, the addition of these variables did not influence our results. However, other psychosocial stressors could potentially play a role.

It is important to note that our findings were limited to aortic calcification, which is believed to be an earlier marker of atherosclerotic disease, particularly in women (25,50). We did not observe significant associations between depressive symptoms and coronary calcification, perhaps because of the low prevalence of coronary calcification in our sample. Our categorical findings with aortic calcification suggest that the primary associations between depressive symptoms and calcification may actually be with “high” calcification scores, i.e. scores above 100. Thus, we may have been underpowered to detect associations with coronary calcification. It also is possible that depressive symptoms affect aortic and coronary calcification differently, although the mechanisms underlying this difference have yet to be elucidated. Matthews et al. (12) found that depressive symptoms were associated with aortic, but not coronary calcification in older White women. As one possible explanation for these findings they posited that the risk factors for aortic and coronary calcification might differ, with psychosocial factors playing a stronger role in aortic calcification (12). Additional research is needed to further explore this hypothesis.

Our study has several limitations. Because of the SWAN study design, we did not have measures of physical activity that were concurrent with our assessments of depressive symptoms and aortic calcification. Physical activity levels are known to be influenced by depressive symptoms (7,10) and race (51), and may serve as an important mediator of the observed association. Exploratory analyses with measures of physical activity taken prior to our SWAN Heart baseline assessment did not alter our results (data not shown); however, these non-concurrent measures would only capture previous levels of physical activity and would not account for any changes in physical activity due to depressive symptomatology. An additional limitation of our study is the demographic makeup of our sample. The African-American and White women in our cohort were healthy and well-educated, which may limit the generalizability of our results. Finally, our data were cross-sectional. Because calcification takes some time to develop, our study would have benefited from data on lifetime history of depression and depressive symptomatology. Longitudinal studies are needed to determine the temporality of our observed associations, and whether they persist over time.

Despite these limitations, our study has a number of strengths. We used a well-validated measure of depressive symptoms and controlled for a number of potential confounds. We examined both aortic and coronary calcification, using state-of-the-art assessment, in a community-dwelling, rather than clinic-based sample. Finally, our sample featured a fairly large number of African-American women, who are typically underrepresented in studies of psychosocial factors and CHD.

To our knowledge, this study is the first to examine the associations among race, depressive symptoms and atherosclerotic disease in a biracial cohort. In sum, we found that depressive symptoms were associated with a greater amount of aortic calcification in African-American women, even after controlling for a number of potential explanatory variables. Depressive symptoms were not associated with aortic calcification in White women, providing some support for the notion that African-American women may be particularly vulnerable to the effects of depressive symptoms on early atherosclerotic disease.

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Abbreviations

CHD	Coronary Heart Disease (CHD)
SWAN	Study of Women's Health Across the Nation
EBT	Electron Beam Tomographic
CES-D	Center for Epidemiological Studies Depression
SES	Socioeconomic Status
FRS	Framingham Risk Score
HDL-c	High Density Lipoprotein Cholesterol
BMI	Body Mass Index
OR	Odds Ratio

CI Confidence Interval

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Percent with calcification above 100

Figure 1.
Depressive symptoms and prevalence of “High” Aortic Calcification by Race

Table 1

Participant Characteristics.

	All Participants (N=508)	African-Americans (N=194)	Whites (N=314)	p-value
Age *	50.2 (2.9)	50.4 (2.8)	50.1 (2.9)	.27
Educational Level, %				
Hs or less	14.4	14.9	14.0	.03
Some College	32.3	39.7	27.7	
College Degree	21.3	18.6	22.9	
Graduate School	32.1	26.8	35.4	
Education (years)	15.7 (2.1)	15.5 (2.0)	15.8 (2.1)	.14
Depressive symptoms	7.2 (7.9)	7.4 (8.2)	7.1 (7.8)	.66
Depressive Symptoms ≥ 16 , %	11.8	11.3	12.1	.46
Current Smoker, % *	16.9	18.6	15.9	.50
Total Cholesterol, mg/dL *	199.4 (37.8)	195.4 (36.4)	201.7 (38.4)	.12
HDL Cholesterol, mg/dL *	58.3 (15.8)	58.4 (15.6)	58.2 (15.9)	.86
Systolic BP, mm/Hg *	119.5 (16.6)	126.3 (18.0)	115.3 (14.1)	<.0001
Framingham Risk Score	9.8 (4.0)	10.5 (4.3)	9.4(3.7)	.001
BMI (kg/m ²)	29.3 (6.3)	31.0 (6.6)	28.2 (5.9)	<.0001
Aortic Calcification, %	68.9	76.8	64.0	.002
Aortic Calcification ≥ 100 , %	22.2	23.7	21.3	.30
Coronary Calcification, %	48	58.8	41.4	<.0001

Note. Values shown are mean (SD) or N (%). P-values are from t-tests or chi-square tests comparing Whites and African-Americans.

* Components of the Framingham Risk Score.

Table 2

Multivariable Linear Regression Analysis of Depressive symptoms and Log-transformed Aortic Calcification by Race

	African-Americans		Whites	
	β	p	β	p
Educational Level				
Hs or less	.32	.43	.50	.32
Some College	-.28		.44	
College Degree	-.00		.13	
Graduate School (ref)	--			
Depressive Symptoms	.06	<.0001	-.002	.88
Framingham Risk Score	.15	<.0001	.17	<.0001
BMI	.17	<.0001	.15	<.0001

Note: Model is adjusted for study site.

Table 3
Multivariable Multinomial Logistic Regression Models: Depressive Symptoms and Categories of Aortic Calcification by Race

	African-Americans				Whites							
	Low Aortic Calcium (scores 1-9.9)		Moderate Aortic Calcium (scores 10-99.99)		High Aortic Calcium (scores ≥100)		Low Aortic Calcium (scores 1-9.9)		Moderate Aortic Calcium (scores 10-99.99)		High Aortic Calcium (scores ≥100)	
	O.R (CI) *	p	O.R (CI)	p	O.R (CI)	p	O.R (CI)	p	O.R (CI)	p	O.R (CI)	p
Educational Level												
Hs or less	.64 (.12-3.37)	.60	.90 (.16-4.96)	.90	1.20 (.17-8.62)	.85	.42 (.10-1.67)	.22	.70 (.22-2.20)	.54	1.94 (.66-5.71)	.23
Some College	.44 (.11-1.71)	.24	.19 (.05-.84)	.03	.20 (.04-1.04)	.06	.69 (.27-1.80)	.45	1.70 (.75-3.83)	.21	1.57 (.62-3.97)	.34
College Degree	1.00 (.25-3.99)	.99	.94 (.21-4.16)	.93	.70 (.11-4.61)	.71	1.03 (.42-2.53)	.95	1.21 (.50-2.88)	.68	1.23 (.45-3.37)	.69
Grad School (ref)	--		--		--		--		--		--	
Depressive Symptoms	1.00 (.93-1.09)	.90	1.05 (.98-1.13)	.19	1.13 (1.05-1.21)	.001	1.00 (.95-1.05)	.89	1.02 (.98-1.07)	.27	1.00 (.96-1.05)	.60
Framingham Risk Score	1.15 (.99-1.32)	.06	1.28 (1.11-1.48)	.001	1.49 (1.26-1.76)	<.0001	1.10 (.98-1.23)	.097	1.09 (.98-1.20)	.09	1.30 (1.17-1.44)	<.0001
BMI	1.26 (1.08-1.46)	.003	1.63 (1.4-1.91)	<.0001	1.76 (1.48-2.09)	<.0001	1.19 (1.08-1.30)	<.0001	1.35 (1.24-1.46)	<.0001	1.31 (1.2-1.42)	<.0001

* Note: The referent for each category is "no calcium" (calcium scores=0).
Model is adjusted for study site.

Multivariable Binomial Logistic Regression Models: Depressive Symptoms and Any Coronary Calcification by Race

Table 4

	African-Americans		Whites	
	O.R (CI)*	p	O.R (CI)	p
Educational Level				
Hs or less	.83 (.23–3.03)	.77	2.48 (1.07–5.78)	.04
Some College	.45 (.16–1.24)	.12	.96 (.50–1.85)	.90
College Degree	.45 (.15–1.36)	.15	.97 (.47–2.02)	.95
Grad School (ref)	--		--	
Depressive Symptoms	.98 (.93–1.03)	.45	1.01 (.98–1.04)	.60
Framingham Risk Score	1.11 (1.10–1.23)	.03	1.10 (1.02–1.19)	.02
BMI	1.41 (1.28–1.57)	<.0001	1.29(1.21–1.37)	<.0001

Note: Model is adjusted for study site.