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Inverse Associations Between Perceived Racism and Coronary Artery Calcification

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Abstract

PURPOSE: To evaluate whether racial discrimination is associated with coronary artery calcification (CAC) in African-American participants of the Coronary Artery Risk Development in Young Adults (CARDIA) study.

METHODS: The study included American Black men ($n = 571$) and women ($n = 791$) aged 33 to 45 years in the CARDIA study. Perceived racial discrimination was assessed based on the Experiences of Discrimination scale (range, 1–35). CAC was evaluated using computed tomography. Primary analyses assessed associations between perceived racial discrimination and presence of CAC using multivariable-adjusted logistic regression analysis, adjusted for age, gender, socioeconomic position (SEP), psychosocial variables, and coronary heart disease (CHD) risk factors.

RESULTS: In age- and gender-adjusted logistic regression models, odds of CAC decreased as the perceived racial discrimination score increased (odds ratio [OR], 0.94; 95% confidence interval [CI], 0.90–0.98 per 1-unit increase in Experiences of Discrimination scale). The relationship did not markedly change after further adjustment for SEP, psychosocial variables, or CHD risk factors (OR, 0.93; 95% CI, 0.87–0.99).

CONCLUSIONS: Perceived racial discrimination was negatively associated with CAC in this study. Estimation of more forms of racial discrimination as well as replication of analyses in other samples will help to confirm or refute these findings.

Keywords

Prejudice; Coronary Disease; African Americans

INTRODUCTION

Despite years of increased attention to prevention and decreasing mortality rates, coronary heart disease (CHD) remains the leading cause of death in the United States (1, 2). Furthermore, African Americans are more likely to have earlier onset of, and to die from, CHD compared with their Hispanic and non-Hispanic White counterparts even when controlling for other potential explanatory factors, such as socioeconomic position (SEP) (3-7). In part, these racial disparities are attributed to differences in CHD risk factors and issues surrounding access and utilization of health services (3). However, embodiment (8) of discrimination and unfair treatment, of which African Americans bear a substantial amount in the United States (9), may act as an additional cause of these disparities. Models of disease causation, including allostatic load and the ecosocial and biopsychosocial models, hypothesize that broader social, economic, and interpersonal insults lead to increased chronic stressors that culminate in somatic malfunction (10-13). Based on those models, researchers have sought to demonstrate how racial discrimination uniquely contributes to disease, including CHD (9, 14, 15). Although several experimental studies found positive associations between exposure to discrimination and cardiovascular reactivity, among other outcomes (16, 17), observational studies have less consistent positive findings. Some studies showed associations between racial discrimination and some CHD risk markers/risk factors, including depression and smoking (9, 12, 18); others found negative and neutral findings (9, 12, 18). Therefore, additional research is needed to address the incongruent findings.

Attention to antecedent risk factors of CHD may further elucidate the biological responses that could occur owing to exposure to racism. An indicator of subclinical CHD is coronary artery calcification (CAC). Atherosclerotic progression is a long-term process in which coronary calcification appears in more advanced lesions (fibroatheroma), occurring as a consequence of lesion instability and rupture, with subsequent calcification as part of the healing process (19). It can be easily quantified and expressed as a coronary artery calcium score (20). The presence of calcification increases cardiovascular events and mortality by 3- to 4-fold (21) and can therefore serve as a marker of atherosclerotic disease progression (22). Mechanistically, CAC progression seems to be consistently associated with the classic CHD risk factors blood pressure, obesity, and lipids; inconsistent relations have been found for CAC progression with smoking and diabetes (19). Given that racial discrimination has been associated with some CHD risk factors/markers, such as cardiovascular reactivity, smoking, and depression, as well as increased hypertension in some studies (15-18, 23), it may be that racial discrimination triggers biologic (e.g., hypertension, obesity) and behavioral (e.g., smoking) mechanisms that could lead to CAC development. Few studies have explicitly evaluated associations of racial discrimination with CAC, and those that have did not demonstrate significant findings (24, 25). Consequently, the objective of this study was to evaluate associations of racial discrimination with CAC in a well-characterized population of Black men and women in the United States. Understanding this relationship may help to explain additional biological and social mechanisms of the CHD disparities between Black and White Americans.

METHODS

Sample

The study sample was from the Coronary Artery Risk Development in Young Adults (CARDIA) Study; the described in detail elsewhere (26). Data were obtained from the National Heart, Lung and Blood Institute. At baseline (1985–1986) study participants included 2,637 Black and 2,478 White young adults, all of whom were 18 to 30 years old, and were recruited in 4 U.S. cities. Data used for this study are from the 15-year follow-up

assessment. Among the 3,672 participants who were assessed in the year 15 examination, CAC data were obtained on 3,041 participants, including 1,376 African Americans. Because of missing responses on 14 racial discrimination questionnaires, the final sample for this analysis consisted of 1,362 African-American men and women. Included participants were slightly older (39.7 vs. 39.2 years; $P = .03$), more likely to be female (58.5% vs. 54.04%; $P = .04$), nonsmoking (70.8% vs. 57.7%; $P < .0001$), have at least some college education (61.2% vs. 49.5%; $P < .0001$), as well as lower depressive symptomology (10.2 vs. 11.6; $P = .01$) and body mass index (BMI; 30.2 vs. 31.3 kg/m²; $P = .03$), compared with excluded participants. There were no differences between the included and excluded participants for CAC ($P = .95$), diabetes (7.8% vs. 8.3%; $P = .76$), total cholesterol (183.1 vs. 180.7 mg/dL; $P = .28$), high-density lipoprotein (HDL) cholesterol (51.1 vs. 52.7 mg/dL; $P = .07$), cholesterol medication (1.9% vs. 1.4%; $P = .48$), systolic blood pressure (116.9 vs. 117.7 mmHg; $P = .40$), father's occupation (16.1% vs. 14.8%; $P = .42$), anger expression (5.6 vs. 5.8; $P = .33$), or reactive responding (14.1 vs. 14.3; $P = .33$).

Exposure Variable

Perceived racial discrimination was measured based on the Experiences of Discrimination questionnaire (27). At the year 15 examination, each participant was asked to provide a yes/no response to "Have you ever experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior in any of the following seven situations because of your race or color?" (28) The situations included at school, getting a job, getting housing, at work, at home, getting medical care, and on the street or in a public setting (29). Each participant indicated the frequency (e.g., "rarely," "sometimes," or "often") of experiencing the discrimination in each of the settings. For this study, a summary perceived racism score (range, 0–35) was developed based on weightings (1, rarely; 2.5, sometimes; and 5, often) described in detail elsewhere (27), with higher summary scores corresponding with higher levels of perceived racial discrimination. The score was evaluated as a continuous variable and in quartiles: None, low (range, 1–3), moderate (3.5–7.5), or high levels (8–35) of perceived racial discrimination (28). A similar form of the perceived racial discrimination measure used in CARDIA has been validated and found reliable in a study conducted by Krieger et al (27). The questionnaire had a Cronbach alpha of 0.74 or greater, a test-retest reliability of 0.70, and a high correlation ($r = 0.79$) with the discrimination construct compared with other standard discrimination questionnaires (27).

In a sensitivity analysis, the year 7 examination (1995–1996) perceived discrimination questionnaire was investigated. The year 7 scale differed from the year 15 examination in 2 ways. First, the year 7 examination lacked the setting "getting housing" found in the year 15 examination. Second, the year 7 examination did not ask for the frequency ("rarely," "sometimes," or "often") of discrimination for each setting as with the year 15 examination. For the sensitivity analyses, the year 15 examination discrimination score was altered and did not use the frequency of experiencing racism in particular settings, and excluded the setting of "getting housing." Thus, the year 7 and altered year 15 perceived racial discrimination scores ranged from 0 to 6.

Outcome Variable

Coronary artery calcium was measured at the year 15 examination (2000–2001) by computed tomography. Computed tomography scanners obtained contiguous 2.5- to 3-mm thick transverse images from the root of the aorta to the apex of the heart in 2 sequential electrocardiogram-gated scans. A total calcium score was computed by summing the Agatston score of calcified lesions within each artery and across all arteries (30). Details of the scanning protocol are published elsewhere, demonstrating high between- and within-

reader reproducibility (31). For the purposes of the analysis, we dichotomized CAC as either present or not present.

Covariates

All covariates, unless otherwise stated, were collected at the year 15 examination. Trained, certified technicians measured systolic blood pressure in the right arm with participants in a resting state using 3 measurements with a random-zero sphygmomanometer. The mean of the second and third measurements was used for analysis. Antihypertensive medication use was coded as taking antihypertensive medications (yes/no). Total cholesterol was measured in fasting plasma samples on the Abbott Spectrum Analyzer (Abbott Laboratories, Irving, TX) (32). HDL molecules were separated from plasma and the resulting supernatant was assayed for cholesterol (33, 34). Participants were considered to have diabetes if they reported using glucose lowering medication and/or insulin, had a fasting glucose of 126 mg/dL or greater (7.0 mmol/L), or a self-reported diagnosis of diabetes by a doctor or nurse. BMI was calculated as the weight in kilograms divided by the square of the height in meters (kg/m^2). Well-established internal quality control practices at individual sites were implemented, and CARDIA's Central Laboratory performed external quality control on each site's activities and equipment using in-person reviews as well as monitoring of laboratory samples and collected data (35, 36).

Adulthood SEP was estimated using education and income at year 15 examination. Education was categorized as 12 or fewer, 13 to 16, or 17 or more years. Income was assessed using self-reported total combined family income over the past 12 months. Childhood SEP was estimated using father's occupation, dichotomized as managerial/professional (U.S. Census occupational codes: 199) versus other forms of labor (i.e., administrative support/clerical work, service occupations, precision production support, operators, fabricators, and laborers; U.S. Census occupational codes: 389, 469, 699, and 889). Self-reported current smoking was dichotomized as current smoker (yes/no).

Psychosocial variables included anger expression, reactive responding, and depressive symptomatology. Anger expression was evaluated based on the 8-item Anger-Out subscale of the Spielberger–Trait Anger Expression Inventory. Reactive responding was assessed using the 9 MacArthur Networks Reactive Responding questionnaire. Depressive symptomatology was measured based on the Center for Epidemiologic Studies Depression 20-item Scale (37).

Analytic Plan

Primary analyses assessed associations between perceived racial discrimination and CAC using multivariable-adjusted logistic regression. The first analytic model adjusted for age and gender. Additional models separately adjusted for SEP (childhood SEP, participant's highest achieved education, and income), psychosocial variables (including anger expression, depressive symptomatology, and reactive responding), or conventional CHD risk factors (including smoking, obesity, total cholesterol, HDL cholesterol, cholesterol-lowering medications, systolic blood pressure, antihypertensive medications, and diabetes). A final model included all of these covariates. Variance inflation factors and collinearity statistics for the models were assessed and little evidence of multicollinearity was detected. Formal tests for effect modification by gender were not significant ($P = .50$). Consequently, the sexes were pooled in the analysis. All analyses were performed using SAS 9.1.3 (SAS Institute, Inc., Cary, NC).

A sensitivity analysis was conducted with the year 7 examination and the altered year 15 examination perceived racial discrimination scores and the presence of CAC at year 15.

Logistic regression was used to estimate potential associations between separate and combined assessments of the year 7 and year 15 perceived racial discrimination scores with CAC.

RESULTS

Characteristics of the sample stratified by quartiles of perceived racial discrimination scores are shown in Table 1. Perceived racial discrimination was positively associated with educational attainment, income, father's occupation, anger expression score, reactive responding score, and depressive symptomatology. There were no marked associations between perceived racial discrimination and age, gender, blood pressure, hypertensive medication use, diabetes, BMI, total cholesterol, HDL cholesterol, cholesterol-lowering medication use, or smoking.

Linear regression analyses on the relation between the perceived racial discrimination score and CAC, demonstrated 0.06 lower odds of CAC per 1-unit increase in the perceived racial discrimination score (odds ratio [OR], 0.94; 95% confidence interval [CI], 0.90–0.98) after adjustment for age and gender (Perceived Racial Discrimination Score range, 0–35; Table 2). This relationship was unchanged after additional adjustment for SEP (OR, 0.94; 95% CI, 0.90–0.99), psychosocial variables (OR, 0.93; 95% CI, 0.87–0.99), and CHD risk factors (OR, 0.94; 95% CI, 0.89–0.98). Adjustment for all covariates produced odds of calcification of 0.93 (95% CI, 0.87–0.99).

Sensitivity analyses evaluated differences in associations between years 7 and 15 perceived racial discrimination scores and CAC presence among those participants with racial discrimination data at both time points. The year 7 score showed similar effects with CAC presence at year 15 as the year 15 score, but with larger statistical variance (e.g., OR, 0.88; 95% CI, 0.78–1.00, adjusted for age and gender; Table 3). The year 15 score as well as a cumulative score combining the years 7 and 15 perceived racial discrimination scores were both negatively associated with CAC presence (year 15: 0.80; 95% CI, 0.73–0.92; cumulative score [year 7 and year 15]: 0.90; 95% CI, 0.84–0.97, adjusted for age and gender). A comparison of participants who only completed year 7 racial discrimination questions versus those who completed the questionnaire at years 7 and 15 ($n = 418$) showed no difference by levels of perceived racial discrimination ($\chi^2_{df=3} = 3.1$; $P = .37$; Appendix 1).

DISCUSSION

This study hypothesized that CAC presence would increase with higher levels of perceived discrimination. However, our analyses found an inverse relationship between racial discrimination and CAC (OR, 0.94; 95% CI, 0.90–0.98) after adjusting for age and gender. Furthermore, adjusting for psychosocial variables, SEP, and CHD risk factors (e.g., blood pressure, cholesterol, and BMI) had little impact on the findings, suggesting that these variables may not be important explanatory pathways.

Prior Literature

Lewis et al. found marginal positive associations between chronic everyday discrimination (the discrimination items were framed in the context of general mistreatment, without reference to race, ethnicity, or gender) and CAC in a study of middle-aged African-American women, after adjusting for education, study site, Framingham Risk score, and BMI (odds of CAC, 2.90; 95% CI, 0.99–6.47 per unit increase in the Detroit Area Study Everyday Discrimination Scale) (24). Furthermore, the analyses which focused specifically on associations of racial/ethnic discrimination with CAC found no relation (OR, 0.86; 95%

CI, 0.35–2.09). Similarly, Albert et al. found nonsignificant associations between experiences of racism and all-cause mortality (38) and between perceived racism and CAC (25). Our point estimates for associations between perceived racial discrimination and CAC were in the same direction as in Lewis et al.'s and Albert et al.'s studies, although effect measures in our study were significant. Other studies assessing associations between racial discrimination and other indicators of cardiovascular disease have demonstrated mixed findings. Recent reviews report negative, no, and positive associations between racial discrimination and blood pressure (15, 18). Thus, definitive answers on racial discrimination and blood pressure are elusive. Perceived racial discrimination has been positively associated with smoking in CARDIA and several other studies (15, 18, 23). There is little consistent evidence on associations of perceived racial discrimination with total and HDL cholesterol (39, 40), diabetes (15, 18), or BMI (39, 40).

Potential Mechanisms

In this study, findings demonstrated that racial discrimination was inversely associated with CAC. We anticipated that SEP may be an important explanatory mechanism given that high SEP was associated with greater perceived racial discrimination. The actual perception of racial discrimination among African Americans has been shown to differ across SEP. It has been demonstrated that higher educated Black mothers were more likely to practice racial socialization, wherein children are brought up to be aware of barriers to success, like racial discrimination, compared with mothers with lower education (41). Thus, children of higher SEP may be taught to be aware of and thereby perceive more racial discrimination than children of lower SEP. This disposition toward greater discrimination awareness may explain why participants in this study with fathers in managerial/professional positions reported greater amounts of perceived racial discrimination. Furthermore, better educated and higher wage earners are more likely to live/work in more racially heterogeneous neighborhoods and workplaces, and thereby may be exposed to more racial discrimination (42-44). However, statistical adjustment for SEP in this study had little impact on the strength of association between perceived racial discrimination and CAC, suggesting SEP may not be an important explanatory mechanism.

Depressive symptomology and outward forms of hostility have been associated with racial discrimination in other studies (15, 45) and may be risk markers for CHD (46-48). However, in our study, psychosocial variables (depressive symptomatology, anger expression, and reactive responding) were weakly correlated with perceived racial discrimination ($r = 0.16$, 0.18 , and 0.09 for depressive symptomatology, anger expression and reactive responding, respectively). Furthermore, statistical adjustment for these variables had virtually no effect on the strength of association between perceived racial discrimination and CAC, suggesting these may not be explanatory mechanisms.

Additional forms of racism could lead to physiologic embodiment of disease (8, 15). The Experiences of Discrimination scale used in this study does not differentiate between explicit and implicit racism, or institutional and internalized racism. Taking into account these additional forms of racism may provide an improved understanding of the full association of racism and CAC (49). Indeed, Chae et al. (50) found that internalization of racist beliefs in the absence of reported racial discrimination was associated with worse cardiovascular disease. Research also should acknowledge the complex nature of racial identity and how it can buffer the individual from racism, while at the same time leading to increased awareness of racial discrimination (51, 52). Furthermore, measurements of racial identity and perceived racial discrimination in its many forms should take place in a cumulative fashion so as to acknowledge how chronic and acute stressors combine to lead to disease over time (53).

Strengths and Limitations

CARDIA is a well-designed study with good quality control and assurance practices (39). The Experiences of Discrimination questionnaire measures perceived racism; however, there are other aspects to racial discrimination, such as institutional racism and implicit racism, that would provide further information on the overarching relation between racism and CHD risk (54). Lastly, our study cannot rule out chance as a reason for our findings. With any analysis in which a large number of comparisons are made, a certain number of significant findings will be due to type I error (55). Replication of analyses in other studies will help to establish the overall relation between racial discrimination and CAC.

FUTURE DIRECTIONS

Although this study has added to the literature on associations of racial discrimination with risk for CHD, future work should implement more comprehensive measures of racial discrimination that incorporate not just explicit perceived racial discrimination, but also implicit, institutional, and internalized racism (15, 54). Capturing these forms of racism requires multiple quantitative and qualitative methods of assessing racism in longitudinal studies. This analysis contributes new findings to the relationship between discrimination and CHD, but not in the direction in which we expected. Regardless, this work adds to the literature on racial discrimination and its potential effect on heart disease and serves as an example of the complexity of studying such difficult and important factors in people's lives.

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APPENDIX

APPENDIX 1

Perceived racial discrimination scores for participants who answered the year 7 perceived racial discrimination questionnaire, and did not complete the year 15 racial discrimination score versus those who completed the year 7 perceived racial discrimination questionnaire

Year 7 perceived racial discrimination score	Population	
	Completed racial discrimination questionnaire in year 7 only; n = 418; % (n)	Completed racial discrimination questionnaire in years 7 and 15; n = 1,370, % (n)
None (score = 0)	20.33 (85)	24.31 (333)
Low (score = 1–2)	33.49 (140)	31.02 (425)
Medium (score = 3–4)	29.19 (122)	28.98 (397)
High (score = 5–6)	16.99 (71)	15.69 (215)

$$\chi^2_{df=3} = 3.1; p = .37.$$

Selected Abbreviations and Acronyms

BMI body mass index

CAC	coronary artery calcification
CARDIA	Coronary Artery Risk Development in Young Adults
CHD	coronary heart disease
CI	confidence interval
HDL	high-density lipoprotein
OR	odds ratio
SEP	socioeconomic position

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TABLE 1

Demographics and covariates by perceived racial discrimination, CARDIA Study, United States (Year 15 Examination: 2000–2001)

Total sample (n = 1,362)	Perceived racial discrimination score							
	None (n = 330)		Low (range, 1–3; n = 340)		Moderate (range, 3.5–7.5; n=379)		High (range, 8; n = 313)	
	Mean or %	95% CI	Mean or %	95% CI	Mean or %	95% CI	Mean or %	95% CI
Age at examination (y)	39.7	39.2–40.1	39.3	38.8–39.7	39.8	39.4–40.2	40.0	39.6–40.4
% Female	62.7	56.1–69.3	60.7	53.4–68.0	52.8	45.7–59.9	57.1	50.6–63.6
Participant education								
High school diploma/GED	41.2	32.9–49.5	22.9	12.7–33.1	30.5	21.9–39.2	24.5	15.9–33.2
Some college or college degree	54.8	47.6–62.1	66.5	59.8–73.3	62.7	56.4–69.1	61.2	55.0–67.4
>College degree	3.9	0.0–14.5	10.6	0.0–21.6	6.7	0.0–16.7	14.2	5.0–23.4
Participant income (income per \$1,000)	43.5 †	40.3–46.7	54.9	51.4–58.3	49.5	46.5–52.5	53.4	50.4–56.5
Father's occupation*								
Managerial, professional	9.2	0.0–21.2	16.2	4.3–28.0	16.7	5.8–27.6	21.2	11.1–31.4
Manual laborers, service jobs	90.8	87.0–94.7	83.8	78.6–89.0	83.3	78.5–88.2	78.8	73.5–84.1
Systolic blood pressure (mmHg)	116.8	115.2–118.5	116.1	114.3–118.0	119.2	117.4–121.1	115.4	114.0–116.9
Hypertensive medications (yes)	14.2	4.3–24.2	7.0	0.0–18.2	13.3	3.7–23.0	12.7	3.4–22.0
Diabetes ‡ (yes)	9.1	0.0–19.4	7.4	0.0–18.6	6.5	0.0–16.6	8.1	0.0–17.7
BMI (kg/m ²)	30.4	29.6–31.1	30.0	29.2–30.7	30.4	29.7–31.0	30.0	29.4–30.7
Total cholesterol (mg/dL)	181.1	177.3–185.0	183.6	179.3–187.9	185.1	181.2–189.0	182.6	179.2–186.0
HDL cholesterol (mg/dL)	51.0	49.5–52.6	52.1	50.4–53.7	50.9	49.4–52.3	50.8	49.4–52.2
Cholesterol-lowering medications (yes)	1.5	0.0–12.2	1.1	0.0–12.6	1.9	0.0–12.2	2.8	0.0–12.7
Current smokers (yes)	34.4	25.3–43.6	22.6	11.4–33.7	29.6	20.4–38.8	28.8	19.9–37.8
Anger Expression Score †	5.3	4.9–5.6	5.0	4.7–5.3	5.6	5.3–6.0	6.4	6.0–6.8
Reactive Responding Score §	13.9	13.6–14.3	13.6	13.2–14.1	14.1	13.7–14.5	14.6	14.2–15.0
Depressive symptomatology //	9.8	9.0–10.6	8.7	7.8–9.5	10.0	9.2–10.8	12.0	11.1–13.0
CAC present ¶	10.0	0.0–20.2	7.0	0.0–18.2	8.3	0.0–18.2	5.2	0.0–14.9

BMI = body mass index; CAC = coronary artery calcification; CI = confidence interval; GED = Graduate Equivalency Diploma; HDL = high-density lipoprotein.

Bolded values represent comparisons where the 95% confidence intervals do not overlap between extreme comparison groups (none versus high perceived racial discrimination score).

* Father's occupation was based on Census Occupation Codes.

‡ Diabetes diagnosis obtained by self-report, fasting plasma glucose levels ≥ 126 mg/dL, and/or use of glucose-lowering medications.

† The anger expression score is based on responses to 4-level Likert scale (range, 0–3) questions on how often they generally react or behave when feeling angry or furious.

§ This score was based on responses to the MacArthur Networks Reactive Responding questionnaire.

// The Depressive Symptomatology Score used the Center for Epidemiologic Studies Depression Scale (CES-D).

¶ CAC was present if the sum of the Agatston scores was greater than 0.

TABLE 2
 Logistic regression analyses for the association between perceived racial discrimination and presence of coronary artery calcification (CAC), CARDIA Study, United States (2000–2001)

	Model adjustment											
	Age and gender		Age, gender, and socioeconomic position*		Age, gender, and psychosocial [†]		Age, gender, and CHD risk factors [‡]		All [§]			
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Perceived racial discrimination (score, 0–35)	0.94	0.90 0.98	0.94	0.90 0.99	0.93	0.87 0.99	0.94	0.89 0.98	0.93	0.87 0.99		
Age at examination (y)	1.25	1.17 1.34	1.25	1.15 1.35	1.21	1.11 1.32	1.20	1.12 1.29	1.20	1.10 1.31		
Gender (female vs. male)	0.34	0.22 0.52	0.27	0.16 0.46	0.31	0.17 0.57	0.37	0.22 0.62	0.32	0.17 0.61		
Participant education												
High school diploma/GED	1.0	—	—	—	—	—	—	—	—	—	—	—
Some college or college degree	0.91	0.53 1.57	0.91	0.53 1.57					1.12	0.59 2.11		
>College degree	0.30	0.06 1.40	0.30	0.06 1.40					0.70	0.14 3.50		
Participant income (income per \$1,000)	0.98	0.98 0.99	0.98	0.98 0.99					0.98	0.97 1.00		
Father's occupation [¶]												
Managerial, professional	1.14	0.53 2.46	1.14	0.53 2.46					0.68	0.25 1.88		
Manual laborers, service jobs	1.0	—	—	—					1.0	—		
Anger Expression Score [#]					1.09	1.00 1.19			1.04	0.96 1.14		
Reactive Responding Score ^{***}					1.04	0.96 1.13			0.98	0.90 1.07		
Depressive symptomatology ^{††}					0.99	0.95 1.03			0.98	0.95 1.02		
Systolic blood pressure (mmHg)							1.02	1.01 1.03	1.02	1.00 1.04		
Hypertensive medications (yes vs no)							3.04	1.60 5.77	2.59	1.19 5.65		
Diabetes ^{‡‡} (yes vs. no)							0.98	0.42 2.25	0.95	0.33 2.79		
BMI (kg/m ²)							0.97	0.93 1.02	0.98	0.93 1.03		
Total cholesterol (mg/dL)							1.01	1.00 1.01	1.00	0.99 1.01		
HDL cholesterol (mg/dL)							0.99	0.97 1.00	0.98	0.96 1.00		
Cholesterol-lowering medications (yes vs. no)							1.81	0.45 7.24	0.87	0.11 6.99		
Current smokers (yes vs. no)							3.72	2.27 6.10	4.07	2.19 7.54		

BMI = body mass index; CI = confidence interval; GED = Graduate Equivalency Diploma; HDL = high-density lipoprotein; OR = odds ratio.

* Socioeconomic position includes age, gender, father's occupation, and participant's education, and household income.

[†] Psychosocial variables include depressive symptomatology, anger expression, and reactive responding.

[‡] Coronary heart disease (CHD) risk factors includes current smoking status, diabetes, systolic blood pressure, hypertensive medications, total cholesterol, HDL cholesterol, lipidlowering medication, and BMI.

[§] Includes all variables from previous models.

// Each odds ratio (OR) represents the increased odds for the presence of CAC for a 1-unit increase in the perceived racial discrimination score.

[¶] Father's occupation was based on Census Occupation Codes.

[#] The anger expression score is based on responses to a 4-level Likert scale (range, 0–3) questions on how often they generally react or behave when feeling angry or furious.

** This score was based on responses to the MacArthur Networks Reactive Responding questionnaire.

^{††} The Depressive Symptomatology Score used the Center for Epidemiologic Studies Depression Scale (CES-D).

^{‡‡} Diabetes diagnosis obtained by self-report, fasting plasma glucose levels ≥ 126 mg/dL, and/or use of glucose-lowering medications.

TABLE 3

Logistic regression analyses adjusted for age and gender comparing year 7, year 15, and cumulative (years 7 and 15) racial discrimination scores on coronary artery calcification (CAC), CARDIA study, United States (1992, 2000)*

	Year 7 [†]		Year 15 [‡]		Cumulative score [§]	
	OR ^{//}	95% CI	OR	95% CI	OR	95% CI
Perceived Racial Discrimination Score	0.88	0.78–1.00	0.82	0.73–0.92	0.90	0.84–0.97

CI = confidence interval.

* Includes only participants with responses at both the years 7 and 15 examinations. All models adjusted for age at year 15 and gender.

[†] Responses to the year 7 examination perceived racial discrimination scale (range, 0–6).

[‡] Responses to the year 15 examination perceived racial discrimination scale. For comparability with the year 7 scale, this score excludes the frequency of perceiving racial discrimination in each setting. It also excludes the setting "experiencing discrimination due to your race or color at home," which was not found in the year 7 examination (range, 0–6).

[§] The cumulative score is the summation of the perceived racial discrimination scores from years 7 and 15 (range, 0–12).

^{//} Each odds ratio (OR) represents the increased odds for the presence of CAC for a 1-unit increase in the perceived racial discrimination score.