## ORIGINAL RESEARCH

# Burden of Unfair Treatment and Subclinical Atherosclerotic Risk Among Black Adults: The Moderating Role of Religious Coping

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**BACKGROUND:** This study examined whether religious coping modified the longitudinal associations between lifetime discrimination and subclinical atherosclerotic cardiovascular disease risk among Black individuals, and if these effects differed by sex.

**METHODS:** Data were collected from 753 Black adult participants (44.5% men; mean age=49.3 years) in the Healthy Aging in Neighborhoods of Diversity across the Life Span study. Carotid intima-media thickness (CIMT) was measured using ultrasonography at baseline (Wave 1: 2004–2009) and a subsequent follow-up visit (Wave 4: 2013–2017). Abnormal CIMT was defined as ≥1.0 mm of plaque buildup. Religious coping, racial discrimination, and burden of lifetime discrimination were self-reported at baseline.

**RESULTS:** Mixed-effects multivariable logistic regression analyses estimated the longitudinal associations between a 3-way interaction term (discrimination, religious coping, and sex) and abnormal CIMT in models adjusted for age and socioeconomic status. For Black men, those who engaged in religious coping the least had higher odds of abnormal CIMT for both racial (OR=1.22, 95% CI [1.02–1.48], P=0.03) and burden of lifetime discrimination (OR=1.75, 95% CI [1.14–2.69], P=0.01). The associations were attenuated at higher levels of religious coping. No associations were found among women.

**CONCLUSIONS:** The effects of discrimination on abnormal CIMT lessened as religious coping increased for Black men. Future research is needed to disentangle how aspects of religious coping might yield benefits linked with atherosclerotic cardiovascular disease risk for this group and identify alternative psychosocial resources effective in mitigating discrimination effects on health for Black women.

**Key Words:** African Americans ∎ atherosclerosis ∎ discrimination ∎ intima-media thickness ∎ religion

Stroke and atherosclerotic cardiovascular diseases (aCVDs) are leading causes of death in the United States, but are disproportionately prevalent among Black individuals.[1] Compared with White adults, Black adults have a 50% greater likelihood of experiencing a stroke,[2] with the discrepancy greatest among men and middle-aged individuals.[1] Carotid ultrasound measures plaque accumulation to estimate stroke and aCVD risk.[3]

Carotid intima-media thickness (CIMT) is a strong predictor of stroke,[4] and, notably, Black individuals in general and men, particularly, have higher CIMT than other racial and/or ethnic groups and women, respectively.[5] These disparities across race and sex have been tied to the undue burden of psychosocial stress exposure, which adversely affects risk for developing subclinical aCVD and associated factors.[6]

## CLINICAL PERSPECTIVE

### What Is New?

- In this cohort study of Black middle-aged and older adults, the associations between lifetime discrimination and subclinical atherosclerotic disease risk were modified by religious coping and sex, demonstrating sex-specificity across the interplay between biological health outcomes underlying cardiovascular disease risk, psychosocial stress, and resilience resources.
- Whereas greater racial discrimination and lifetime burden of discrimination were associated with higher odds of subclinical atherosclerotic disease risk (carotid intima-media thickness ≥1.0 mm) among Black men who engaged in religious coping the least, these associations lost significance and were attenuated among those who reported turning to religious coping more frequently.

### What Are the Clinical Implications?

- Religion may serve as a unique protective mechanism for Black men, for whom heightened atherosclerotic cardiovascular disease risk and susceptibility to lifetime racial discrimination are pronounced; one way of addressing cardiovascular disease disparities disproportionately affecting Black adults might be to identify salient, sociocultural resources, like religion, that draw upon themes of resilience and strength in the face of social and interpersonal adversity.

### Nonstandard Abbreviations and Acronyms

| | |
|---|---|
| **aCVD(s)** | atherosclerotic cardiovascular disease(s) |
| **HANDLS** | Healthy Aging in Neighborhoods of Diversity across the Life Span |

Alongside the legacy of systemic racism in the United States, Black individuals are disproportionately exposed to social disadvantage and marginalization vis-à-vis their race. In addition to structural disenfranchisement and social inequalities, bigoted social interactions remain commonplace, lending to Black individuals' experiences with discrimination—unfair treatment—based on race. Compared with all other racial and/or ethnic and historically marginalized groups in the United States, Black individuals are more likely to report experiencing discrimination, regardless of attribution, at some point in their lives, and that discrimination has made their lives harder,[7] a trend especially common among Black men.[8] Whereas chronic,

nonspecific day-to-day unfair treatment has been linked with physiological dysregulation among Black individuals,[9] racial discrimination uniquely, and its incumbering effects on Black individuals' livelihoods thereafter, is a potential driver of aCVD disparities.[10] Racial discrimination and greater burden of lifetime discrimination (ie, feeling as though discrimination interfered with one's life overall and abilities and opportunities for upward social mobility)[11] are among the most salient social determinants of health linked with Black individuals' risk for aCVDs,[6,12] gravely affecting cardiometabolic processes and arterial integrity, including elevated blood pressure, coronary artery calcification, and higher CIMT levels.[13,14]

However, positive coping strategies potentially mitigate or offset the deleterious effects of discrimination on the body.[15] Religious coping may be one important protective factor to consider, since religion has been historically venerated in the Black community.[16] Black-affirming religions (ie, religions that are not just predominantly Black but prioritize the spiritual needs and social context of the Black community) remain committed to racial empowerment and equality grounded in faith beliefs, practices, language, and rhetoric that can offer salubrious effects in the face of racial discrimination. When confronted with racial discrimination, Black individuals turn to religious coping behaviors and spirituality as sources of strength, comfort, and meaning-making.[16,17] Frequent religious involvement has been linked with better cardiovascular health outcomes among Black individuals.[18] Within a stress and coping framework, religion might seemingly weaken the impact of discrimination on myriad health outcomes,[19,20] though prior reports have been cross-sectional, limiting our understanding of how these associations manifest over time, and have also not explored subclinical risk. Various measures of religious and spiritual activities have yielded protective effects on multiple aCVD risk factors,[18] but less is known about subclinical aCVD endpoints.[21–23] It is possible that the biological harms associated with racial discrimination and the burden of lifetime discrimination may be diminished, in part, attributable to religious coping.

Lastly, these potential health benefits vis-à-vis certain coping behaviors might be sex-specific. Black men exhibit higher CIMT levels than women[5] and demonstrate a unique susceptibility to stroke[2] and racial discrimination across their lifetimes.[8] Whereas Black men might accept racial discrimination as a part of life or internalize these experiences, Black women turn to a range of coping strategies, including social support, when they face any unfair treatment.[24] However, despite men's less frequent adherence to religion compared with Black women,[25] Black-affirming religions have traditionally fought and preached against racial inequality, more so than sexism and sex-based

injustices.[26,27] Turning to religion to cope with racial discrimination and the burden of lifetime discrimination might be saliently advantageous for Black men with respect to subclinical aCVD endpoints. The present study explored whether religious coping and sex moderated the associations between dimensions of lifetime discrimination and abnormal CIMT in a longitudinal cohort of middle-aged and older Black adults.

# METHODS

## Ethics Approval

The study protocol was approved by the Institutional Review Board at the National Institute of Environmental Health Sciences.

Data are available upon request due to ethical restrictions imposed by the National Institutes of Health Institutional Review Board. The IRB-approved consent forms that our study participants signed do not permit unrestricted public data sharing. However, it does permit data sharing through a Data Use Sharing Agreement. Data Use Sharing Agreements protect the privacy of human research participants and the confidentiality of their data. Our use of these agreements incorporates confidentiality standards to ensure data security at the agreement holder's facility and prohibits manipulation of the data for the purpose of identifying study participants. The HANDLS (Healthy Aging in Neighborhoods of Diversity across the Life Span) Study website page labeled information for collaborators explains the process (https://handls.nih.gov/06Coll.htm). The contact for the study is our clinical study manager: Ms. Nicolle Mode, MS nicolle.mode@nih.gov; 202-937–5243).

Participants in the HANDLS study provided IRB-approved informed consent for data sharing only for projects approved by the principal investigators. Per the instructions at https://handls.nih.gov/06Coll.htm, data are available for sharing upon submission of an approved manuscript proposal and execution of an institutional data sharing agreement.

## Study Sample

Participant data are from the HANDLS study, an ongoing longitudinal cohort study that was initiated in 2004.[28] Using an area probability sampling strategy, HANDLS enrolled 3720 Black and White adult participants aged 30–64 years old at baseline, who were selected from 13 neighborhoods in Baltimore, Maryland. All participants provided written informed consent. The study protocol was approved by the Institutional Review Board at the National Institutes of Health. The current study analyzed Black participant data from baseline (2004–2009) and the wave 4 follow-up visit (2013–2017). We excluded individuals who did not identify as Black, reported a history of surgical endarterectomy, did not fast before blood draw, and had missing data on any relevant clinical and biomedical variables. At baseline, 587 participants had complete data on lifetime racial discrimination, burden of lifetime discrimination, religious coping, CIMT, and all biological measures included in the analyses. Of these, 194 returned to complete their follow-up assessment approximately 8.5 years later, and an additional 166 participants underwent ultrasonography for CIMT assessment for the first time at wave 4 only (not during intake). The final analytic sample included 753 Black adults who had complete data on all self-reported items of interest and at least one wave of CIMT assessment. The primary statistical analyses included a total of 947 observations across both waves.

# MEASURES

## Carotid Intima-Media Thickness

CIMT was measured at waves 1 and 4 using a high-resolution B-mode ultrasonography of the left common carotid artery. Sonography measurements were performed according to standard procedures.[29] The distance between the intimal-luminal and medial-adventitial interfaces was evaluated as the far wall arterial intima-media thickness in a region 1.5 cm proximal to the carotid bifurcation and in areas devoid of plaque. CIMT was then measured on a frozen-frame image, wherein five contiguous sites at approximately 1-mm intervals were obtained and averaged for analyses. CIMT ≥1.0 mm is considered abnormal and is indicative of plaque buildup and increased aCVD risk.[30] CIMT values were recoded to reflect "normal" (<1.0 mm) versus "abnormal" (≥1.0 mm) CIMT per a dichotomous outcome variable for analyses.

## Racial Discrimination and Burden of Lifetime Discrimination

Two separate dimensions of interpersonal discrimination were assessed at Wave 1. The adapted Experiences of Discrimination Scale captured the occurrence of racial discrimination within six distinct settings where discrimination could occur ("Have you ever experienced discrimination because of your race… at school, when getting a job, at work, getting medical care, getting housing, from police/ judicial courts").[31] Participants endorsed racial discrimination (ie, yes/no), and these six items were summed (possible score range: 0–6); higher scores indicated more experiences of racial discrimination (Cronbach's $\alpha=0.82$).[8] Burden of lifetime discrimination comprised 2 items adapted from the MacArthur Major Experiences of Discrimination Questionnaire ("How much has discrimination interfered with you having a full and productive life?" and "How much harder

has your life been because of discrimination?").[8] Basis of discrimination (eg, attributed to race) was not assessed in this measurement. Responses spanned a 4-point Likert scale (1—"not at all" to 4—"a lot") that were summed and averaged (possible score range: 1–4). Higher scores indicated greater overall burden of lifetime discrimination (Cronbach's $\alpha$=0.74).[8]

## Religious Coping

The Coping Orientation to Problems Experienced Inventory (Brief-COPE) was used to measure religious coping at baseline. The scale assessed the frequency of turning to prayer/meditation and finding comfort in religion/spirituality when in stressful situations using a 4-point Likert scale (1—"not at all" to 4—"a lot").[32] The 2 items were summed, with higher scores reflecting greater religious coping (possible score range: 2–8; Cronbach's $\alpha$=0.75). This instrument has been previously validated in large epidemiologic cohort studies and demonstrates strong reliability.[33] Prior to analyses, religious coping was mean-centered for ease of interpretation. Religious coping was administered at Wave 1 only.

## Sociodemographic Covariates

Sociodemographic information was collected at baseline. Sex referred to sex assigned at birth. Age was recorded in years (continuous). Age was uniformly (ie, symmetrically, evenly) distributed in this sample. Prior to regression analyses, each age was subtracted from 50 and divided by 10 so the resulting variable was centered at 50 and represents decade units. Socioeconomic status (SES) was a composite binary variable comprising poverty status and educational attainment. Poverty status was defined as annual household income "above" or "below" 125% of the 2004 federal poverty level relative to family size. Participants self-reported the number of years of education. Participants were classified as having high SES if they were above the federal poverty level and completed at least 12 years of education (ie, obtained a high school diploma or General Equivalency Diploma). If participants were either below the federal poverty level, earned less than 12 years of education, or both, then they were classified as having low SES.

## Sensitivity Analysis Variables

Religion offers several possible coping mechanisms in response to discrimination and its harmful effects on overall and biological health, including encouraging abstinence from cigarette smoking or binge drinking, clergy and congregational support, less psychological distress, and modulating the sympathetic nervous system's response to stress.[34] Therefore, supplementary

analyses adjusted for biomedical/clinical, psychological, health behavior-related, and social support covariates in a series of sensitivity analyses. Hypertension was defined as resting systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg, use of antihypertensive medications, and/or a previous diagnosis from a physician. Diabetes was defined as blood glucose levels ≥126 mg/dL (7 mmol/L), use of diabetes medications, and/or a previous diagnosis of diabetes from a physician. A medical history of cardiovascular outcomes was self-reported and was coded as either yes or no if there was a self-reported physician diagnosis to any of the following conditions: stroke/transient ischemic attack, coronary artery and/or heart disease, claudication, heart attack/myocardial infarction, atrial fibrillation, or congestive heart failure. Using standard laboratory methods, serum total cholesterol levels (mg/dL) were measured at Quest Diagnostics and derived using a spectrophotometer. Participants self-reported antilipidemic medication use. Body mass index was calculated using measures of height and weight (kg/m²) using calibrated equipment with participants standing in an upright position. Depressive symptoms were assessed using the Center for Epidemiological Studies-Depression scale, a widely validated instrument that measured the number of depressive symptoms within the past week.[35] Cigarette smoking was self-reported (response options included "never tried," "tried, but never used regularly," "former user," and "current user"). A 2-item scale measuring substance use coping asked participants whether they had ever used alcohol/other drugs to make themselves feel better or help them get through difficult or stressful situations (Cronbach's $\alpha$=0.83).[32] Relationship status was coded as a binary variable to reflect single/unpartnered or married/partnered. Instrumental and emotional social support were 2 subscales in the Brief COPE Inventory that asked participants about getting advice or help from others and getting emotional support or comfort and understanding from others during stressful events, respectively (Cronbach's $\alpha$=0.70, 0.64).[32]

## Statistical Analysis

The distribution of participant characteristics was described for the study population. Continuous and categorical variables were compared using Student t-tests and Chi-squared tests, respectively. Mixed-effects multivariable logistic regression models estimated associations between the fixed effects of discrimination (racial discrimination and burden of lifetime discrimination) and changes in abnormal CIMT across the follow-up examination periods (Waves 1 and 4, between 2004 and 2017). The advantages of mixed-effects regression modeling are that this approach accounts for the inclusion of non-independent observations (ie,

repeated measures), allows for the analysis of all available data while still handling missing data effectively, and provides estimates for fixed and random effects.[36] Fixed effects in base models included the predictor and moderator variables (both dimensions of lifetime discrimination, religious coping, and sex), and SES. Age and abnormal CIMT were time-varying variables. Models also included a participant-specific random effect that was intended to capture and account for intra-participant correlation of repeated longitudinal observations.

Random intercept models that were adjusted for age and SES included 3-way interaction terms (ie, racial discrimination × religious coping × sex; burden of lifetime discrimination × religious coping × sex) to test the moderating role of religious coping and sex on the prospective associations of either racial discrimination or burden of lifetime discrimination with change in abnormal CIMT between baseline and the subsequent follow-up visit. Mixed-effects multivariable logistic regression models yielded estimated odds ratios (ORs) and corresponding 95% CIs to reflect the relative increased or decreased likelihood of abnormal CIMT development over time. Interactive plots were produced, and simple slope regressions were used to probe significant interactions, which provided conditional effects of the predictor on the outcome at values of the moderator at the mean and one SD above and below the mean. Additionally, the Johnson-Neyman technique detected regions of significance, allowing a more precise inspection of the moderator's effects, especially when the moderator is a continuous variable.

Sensitivity analyses adjusted for biomedical/clinical (body mass index, total cholesterol, antilipidemic medication use, medical history, hypertension, and diabetes), psychological (depressive symptoms), health behavior-related (cigarette use and substance use coping), and social support factors (relationship status and instrumental and emotional social support) in a set of 4, separate regression analyses per the respective dimension of lifetime discrimination. Sensitivity analyses allowed us to assess the independence of any significant interactive associations, irrespective of other potentially confounding factors, and accounted for potentially reduced statistical power in analyses. Missing data for psychosocial and biobehavioral sensitivity variables were handled via multiple imputation by chained equations, which was implemented with the *mice* package.[37] A total of 5 imputed data sets were generated to account for missingness across depressive symptoms, cigarette smoking history, and relationship status. Sex, age, SES, burden of lifetime discrimination, lifetime racial discrimination, and religious coping were used for multiple imputation. Statistical significance was set to a probability value of <0.05, and all statistical tests were 2-tailed and adequately powered to detect a small effect size (Cohen's $f^2$=0.02, which is equivalent to an OR=1.04).[38,39] All analyses were performed using R software version 4.4.0.[40]

## RESULTS

Participant characteristics for the overall sample are described in Table 1. Among the 753 Black adults in this study (mean age=49.34 years old, SD=9.77, 39.9% high SES), men were more likely to report having ever experienced racial discrimination and a burden attributable to lifetime discrimination compared with women (Table 1). However, women endorsed more frequent religious coping use and had lower mean levels of CIMT than men. Notably, though, no significant sex differences emerged across prevalence of abnormal CIMT. Tables S1 and S2 describe overall participant characteristics of all study variables at baseline and the subsequent follow-up visit, respectively.

Mixed-effects multivariable logistic regression model estimates are displayed in Table 2. Findings revealed 2 significant 3-way interactions of racial discrimination × religious coping × sex (OR=0.82, CI

**Table 1. Sample Characteristics of HANDLS Participants**

| Characteristic | Range | Overall sample (N=753) | Women (N=418) | Men (N=335) | P value |
|---|---|---|---|---|---|
| Men, n (%) | … | 335 (44.5) | … | … | … |
| High SES, n (%) | … | 299 (39.7) | 158 (37.8) | 141 (42.1) | 0.26 |
| Age (y) | 30.20–66.00 | 49.34±9.77 | 49.66±9.96 | 48.95±9.52 | <0.01 |
| Racial discrimination | 0–6 | 1.59±1.89 | 1.19±1.72 | 2.08±1.97 | 0.05 |
| Ever experienced any racial discrimination, n (%) | … | 396 (52.6) | 176 (42.1) | 220 (65.7) | <0.01 |
| Burden of lifetime discrimination | 1–4 | 1.86±0.87 | 1.71±0.84 | 2.06±0.88 | <0.01 |
| Religious coping | 2–8 | 6.14±2.02 | 6.46±1.90 | 5.73±2.09 | <0.01 |
| CIMT | 0.40–1.30 | 0.75±(0.17) | 0.75±0.17 | 0.76±0.17 | <0.01 |
| Abnormal CIMT, n (%) | … | 73 (9.7) | 39 (9.3) | 34 (10.1) | 0.80 |

Values are presented as mean±SD, unless otherwise indicated. CIMT indicates carotid intima-media thickness; HANDL, Healthy Aging in Neighborhoods of Diversity across the Life Span; and SES, socioeconomic status.

**Table 2. Multivariable Logistic Regression Models Estimating 3-Way Interactive Associations Between Dimensions of Discrimination × Religious Coping × Sex and Abnormal CIMT**

| Model predictors | Racial discrimination | |
| --- | --- | --- |
| | Odds ratios [95% CI] | P value |
| Racial discrimination × Religious coping × Sex | 0.82 [0.70–0.95]* | 0.01 |
| Religious coping × Sex | 1.29 [0.96–1.73] | 0.09 |
| Racial discrimination × Sex | 1.28 [1.00–1.71] | 0.07 |
| Racial discrimination × Religious coping | 1.16 [1.03–1.34]* | 0.03 |
| Religious coping | 0.81 [0.68–0.98]* | 0.02 |
| Racial discrimination | 0.88 [0.68–1.07] | 0.25 |
| Socioeconomic status† | 1.19 [0.79–1.78] | 0.40 |
| Age‡ | 2.03 [1.64–2.55]* | <0.001 |
| Sex† | 0.91 [0.51–1.58] | 0.73 |
| Burden of lifetime discrimination × Religious coping × Sex | 0.70 [0.54–0.88]* | 0.004 |
| Religious coping × Sex | 2.15 [1.28–3.71]* | 0.005 |
| Model predictors | Burden of lifetime discrimination | |
| | Odds ratios [95% CI] | P value |
| Burden of lifetime discrimination × Sex | 1.10 [0.70–1.76] | 0.68 |
| Burden of lifetime discrimination × Religious coping | 1.16 [0.99–1.41] | 0.09 |
| Religious coping | 0.70 [0.50–0.97]* | 0.04 |
| Burden of lifetime discrimination | 1.06 [0.77–1.47] | 0.63 |
| Socioeconomic status† | 1.16 [0.77–1.74] | 0.46 |
| Age‡ | 2.00 [1.62–2.54]* | <0.001 |
| Sex† | 1.00 [0.37–2.69] | 0.99 |

*P<0.05.

†SES=low SES, reference group; Sex=women, reference group.

‡Age=Odds ratio for age (years) reflects 10 years (1 decade unit).

CIMT indicates carotid intima-media thickness; and SES, socioeconomic status.

[0.70–0.95], P=0.01) and burden of lifetime discrimination × religious coping × sex (OR=0.70, CI [0.54–0.88], P=0.004) with relative change in abnormal CIMT development over time. Age was also significantly associated with increased odds of developing abnormal CIMT in both models that separately tested the 2 dimensions of lifetime discrimination (P<0.001).

To interpret the interaction, simple slopes for discrimination were calculated at 3 values of the moderator variable per sex group and were plotted to visualize how the relationships varied at different levels of religious coping. As shown in Table 3, simple regression slopes indicated that among men who engaged in religious coping the least (i.e., one SD below the mean), higher odds of abnormal CIMT were observed among those who reported racial discrimination (OR=1.22, CI [1.02–0.48], P=0.03) and greater burden of lifetime

discrimination (OR=1.75, CI [1.14–2.69], P=0.01). At higher levels of religious coping (i.e., one SD above the mean), odds of abnormal CIMT development trajectories attenuated and were no longer significant for either racial discrimination (OR=1.03, CI [0.82–1.27], P=0.80) or burden of lifetime discrimination (OR=0.81, CI [0.50–1.31], P=0.39). Johnson-Neyman intervals revealed these associations were significant when religious coping values were less than 0.59 and −0.79 for models including racial discrimination and burden of lifetime discrimination as the predictor variables, respectively. The interactive plot is illustrated in the Figure 1. Notably, no such associations were observed among women. Exploratory analyses included models using categorical, dichotomous predictor variables that reflected "none" versus "any" racial discrimination and "not much" versus "at least some" burden of lifetime discrimination. Findings were largely unchanged (data not shown).

Finally, supplementary sensitivity analyses assessed the independence of these interactive associations in a series of separate models that included relevant biomedical/clinical, psychological, health behavior-related,

**Table 3. Simple Regression Slope Analyses Decomposing the 3-Way Interactive Associations Between Dimensions of Discrimination and Abnormal CIMT at Varying Levels of Religious Coping: Differences by Sex**

| | Racial discrimination | |
| --- | --- | --- |
| | Odds ratios [95% CI] | P value |
| Women | | |
| Low religious coping (mean − 1 SD) | 0.67 [0.44–1.03] | 0.07 |
| Mean religious coping | 0.88 [0.70–1.09] | 0.25 |
| High religious coping (mean + 1 SD) | 1.13 [0.95–1.38] | 0.16 |
| Men | | |
| Low religious coping (mean − 1 SD) | 1.22 [1.02–1.48]* | 0.03 |
| Mean religious coping | 1.13 [0.97–1.30] | 0.12 |
| High religious coping (mean + 1 SD) | 1.03 [0.83–1.27] | 0.80 |
| | Burden of lifetime discrimination | |
| | Odds ratios [95% CI] | P value |
| Women | | |
| Low religious coping (mean − 1 SD) | 0.82 [0.49–1.39] | 0.46 |
| Mean religious coping | 1.08 [0.79–1.49] | 0.63 |
| High religious coping (mean + 1 SD) | 1.42 [0.98–2.08] | 0.06 |
| Men | | |
| Low religious coping (mean − 1 SD) | 1.75 [1.14–2.69]* | 0.01 |
| Mean religious coping | 1.20 [0.86–1.67] | 0.30 |
| High religious coping (mean + 1 SD) | 0.81 [0.50–1.31] | 0.39 |

*P<0.05.

CIMT indicates carotid intima-media thickness.
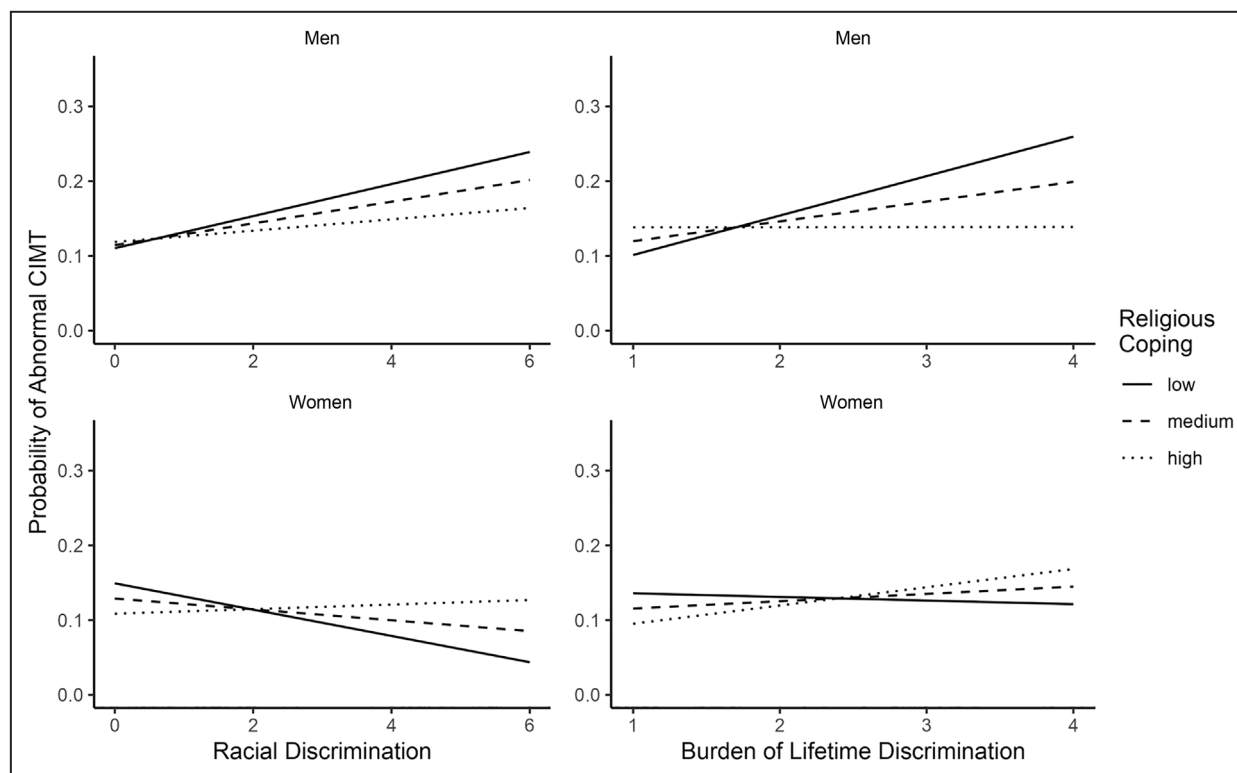
**Figure 1.** Panel figures demonstrating significant interactions of Racial Discrimination × Religious coping × Sex and Burden of Lifetime Discrimination × Religious coping × Sex associated with Odds of Abnormal CIMT.
CIMT indicates carotid intima-media thickness.

and social support variables as covariates. The results show that these interactive associations withstood adjustment for body mass index, total cholesterol, antilipidemic medication use, medical history, hypertension, diabetes, depressive symptoms, cigarette use, substance use coping, relationship status, and social support (instrumental, emotional) (see Data S1, Tables S3 and S4). Body mass index, antilipidemic medication use, and medical history of cardiovascular outcomes (eg, atrial fibrillation) emerged as significant sensitivity variables (*P*-values <0.05) in both models assessing racial and burden of lifetime discrimination. Because of the nature of the study and available data (ie, 2 time points of data collection, fixed effects of predictor variables, etc.), mediation was not explored. Listwise deletion (ie, primary analyses restricted to participants with complete data for all variables of interest) showed that our findings remained largely unchanged (data not shown).

## DISCUSSION

An accumulating body of literature continues to substantiate that experiencing discrimination is harmful for Black individuals' cardiovascular health, while also pointing to religion's potential to bestow protective health benefits. However, longitudinal studies exploring these interactive associations with subclinical aCVD

risk endpoints, rather than self-reported cardiovascular outcomes, remain sparse. To our knowledge, this is the first study to examine the moderating effects of religious coping on the associations between dimensions of lifetime discrimination and odds of developing subclinical atherosclerosis vis-à-vis abnormal CIMT (≥1.0 mm) over time. In a sample of urban-dwelling, middle-aged and older Black adults, findings suggest that these associations were sex-specific, such that greater lifetime racial discrimination and burden of lifetime discrimination were associated with higher probabilities of abnormal CIMT development trajectories among Black men who engaged in religious coping the least. At higher levels of religious coping, these associations were attenuated. No such associations were found among Black women. These associations were independent of other sociodemographic characteristics and biomedical/clinical, psychological, health behavior-related, and social support covariates. Our findings suggest that for Black men who have experienced racial discrimination and feel that discrimination has negatively impacted their lives, turning to religion to cope may potentially bestow protective health effects with respect to subclinical aCVD risk and development over time.

Our study contributes to existing research that the detrimental effects of lifetime racial discrimination and the burden of lifetime discrimination on cardiovascular

health may be abated among Black men who turn to religion to cope. Previous studies assessing the relationships between experienced discrimination or religious participation and aCVD risk factors have not always yielded consistent results. Although greater racial discrimination and burden of lifetime discrimination have been adversely linked with several aCVD endpoints among Black individuals, including elevated blood pressure levels, higher prevalence of chronic comorbid conditions, and CIMT,[14,41–44] several studies reported null or contradictory results.[10,45,46] Heterogeneity among Black individuals, differences across types of discrimination (eg, everyday versus major lifetime episodes), and sex-specific associations may be underscoring these differences.[8,10,11,46] Also, the few studies exploring religious participation and CIMT have similarly been inconclusive. One cross-sectional study of mostly older European adults and a longitudinal report from the CARDIA study observed that greater religious engagement and spirituality were associated with lower CIMT values,[21,22] but another longitudinal report from the MESA study found no associations.[23] Given the potential for religious coping to moderate the associations between racial discrimination and burden of lifetime discrimination with aCVD risk factors, it is possible that the disagreement across prior work's results may have missed aspects of the diversity across Black individuals, sex-specificity, and respective coping strategies.

Whereas one prior cross-sectional study using participant data from the HANDLS study data set similarly noted that the interactive associations between racial discrimination and religious coping with clinical aCVD risk factors were most pronounced among Black men but not Black women,[19] another study found that religious coping styles did not moderate the associations between lifetime unfair treatment and hypertension prevalence.[47] Importantly, however, their study sample was mixed race (ie, included White, Black, and Caribbean American individuals), and it is unclear whether race and sex differences were also explored.[47] By and large, Black adults are the most religious individuals in the United States.[25] When faced with a range of adversity, including racial injustice and discrimination, religious Black adults are likely to turn to religious practices like prayer as a means of coping.[17,48,49] Historically, Black men have benefited greatly from Black-affirming religions' reclamation of their racial identity rooted in faith language attached to liberation, empowering rhetoric delivered during homilies or social gatherings, and religious text interpretations that help to esteem the humanity of the Black community.[27] Religious coping might offer an opportunity for Black men, in particular, to recreate and restore positive images of Black manhood, spirituality, and psychological wellbeing, irrespective of whether these are reinforced within sacred spaces or in the confines of their own homes. Indeed, religion's potential ability to offer blunting effects on the associations between dimensions of lifetime discrimination and poorer cardiovascular health for Black men is a testament to its historical psychological, socioecological, and emotional significance in and relationship to the broader Black community.

These potentially protective associations, however, were not observed among women in this study population. In our study, although men had on average, higher CIMT levels than women, a finding that was concordant with established literature,[5] abnormal CIMT prevalence in this study sample did not differ by sex, suggesting an equivalent distribution of subclinical aCVD risk across men and women. Prior research has documented deleterious effects on Black women's health attributable to racial and sex-based discrimination (ie, gendered racism), too,[50] even though similarly contradictory or null findings have been observed as well.[10] Curiously, compared with Black men, Black women are less likely to report having experienced discrimination solely based on racial identity,[8] despite a tremendous body of work demonstrating their invisibility and diminished voices in the area of racial equality and justice.[26] Accordingly, scholarship on intersectionality and Black women's health argues that their multiplicative experiences with racism and sexism are largely misrepresented and not well understood in epidemiological studies assessing racial discrimination, among others, as the sole primary predictor variables of interest.[8,50] And paradoxically, despite their greater religiousness and spirituality compared with their male counterparts,[25] Black women more readily turn to other forms of coping when they experience interpersonal discrimination, like social support and redefining minority womanhood.[24,51] In fact, qualitative research and sociological inquiry detailing the salience of religion as an anchor for Black women's inner strength and coping highlight the tension between their relying on faith for comfort while also battling social norms, religious ideologies, and stereotypes that lend to the harmful expectations that they must endure hardships over and over again, more so than men.[26] While religion may offer health advantages to Black women, too, additional work is needed to determine if and how the interplay of religion, social norms, and experienced discrimination—due to their intersectional identities—can explain mixed findings and heterogeneity among Black women, who similarly demonstrate heightened risk for aCVD when compared with their White counterparts.[44]

This is the first study to examine the interplay between dimensions of lifetime discrimination and religious coping behaviors with a subclinical marker of aCVD using longitudinal analyses. Despite the nation's growing social progress and critical awareness of racial inequalities, many Black individuals have experienced

some form of discrimination during their lifetime and have been subjected to such treatment across multiple settings in society. The use of CIMT vis-à-vis ultrasound imaging is a significant strength of this work, as some have argued that subclinical disease measurements provide greater detail to how psychosocial risk and resilience factors "get under the skin" and affect biological underpinnings driving aging-related disease pathogenesis. Because it is well established that CIMT is highly sensitive to various forms of psychological stress, our findings point to the biological plausibility that engaging in certain coping strategies, namely religion, might help stave off the onset of subclinical disease risk over time. Faith-based communities seeking to teach parishioners how to manage stress should continue to focus on positive coping responses to discriminatory experiences, as this might lead to long-term health benefits. Public health partnerships and intervention programs situated in congregational settings can promote culturally tailored healthy lifestyle choices and improve cardiovascular health in response to the pressures and needs salient to the Black community. Additionally, clinicians can be attentive to religion as a means of coping with health-related stressors, knowing that for some, encouraging individuals to turn to it may be an important aspect of their lives and how they handle stress. This work corroborates the growing body of literature that responds to how addressing social determinants of health may play an important role in reducing health disparities, especially among historically marginalized groups and communities.

This study is not without its limitations. First, even though lifetime discrimination and religious coping were treated as fixed effects predicting trajectories of abnormal CIMT development, it is possible these psychosocial variables were time-varying. Markedly, although prior work has shown public measures of religiosity remain relatively stable over time,[52] turning to religion and prayer as coping might be more common among older adults. Religion becomes more salient as we age, especially as we experience new, chronic health crises.[34,53] To this end, Black men display some of the poorest health profiles compared with any other race and sex group in the United States, especially in older adulthood,[54] supporting the notion that increased religious coping among Black men is quite likely with age and comorbidities. We were unable to explore how this bidirectional phenomenon may ring true idiosyncratically for Black men.[55] In addition, the religious coping items did not specify how participants responded to racial discrimination explicitly nor did the frequency of behaviors reflect positive or negative coping styles. Additional measurements of religiosity, religious coping styles, and responses to racial discrimination would have been helpful information to explore and contrast the sex-specific effects. Qualitative research would

also provide further details into how these behaviors manifest. Moreover, other stressors that are germane to Black individuals, and those in this community specifically, may be driving worse health, too, beyond interpersonal discrimination. Environmental inequalities and institutionalized racism are palpable in the greater Baltimore metropolitan area. Future work should examine other forms of multilevel racism and chronic stress. Lastly, the HANDLS study, like many longitudinal cohorts, encountered issues with attrition (loss of participants over time). This may raise concerns about incomplete data and generalizability. Despite our advantages in using mixed-effects regression modeling, our findings may still not be applicable to the broader Black population in the United States. It is plausible that unexplained and residual confounding might also explain these associations. Our unique study comprises urban-dwelling adults residing in Baltimore, Maryland. We encourage replica studies to use large epidemiological cohort data that represent geographic diversity among Black individuals to confirm these findings or document additional nuances that may emerge.

Racial health inequalities remain a public health crisis. Our study stands alongside prior work demonstrating that experienced discrimination may be a fundamental driver of aCVD disparities among Black individuals, but that turning to religion as a form of coping may yield health benefits for Black men. Additional longitudinal studies with added assessments of discrimination and/or racism, and religious engagement and various coping styles, may improve our understanding of how the interaction between chronic stress and coping strategies influence biological health to capture how these mechanisms manifest. Acknowledgement of within-group heterogeneity will also lend to further analysis of why certain coping behaviors appear helpful for some but innocuous, or even harmful, for others.

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# Supplemental Material

**Data S1.**

**SUPPLEMENTAL METHODS**

In addition to the main findings shown in Tables 1—3, we sequentially adjusted for additional biomedical, psychological, health behavior, and social support covariates to assess the potential for confounding. These variables were clustered into four separate groups, and included the following: (1) body mass index, total cholesterol, antilipidemic medication use, diagnoses of hypertension and diabetes, and medical history; (2) depressive symptoms; (3) cigarette smoking and substance use coping; and (4) relationship status and instrumental and emotional social support coping. We describe these variables in greater detail below. We also define the parameters of our socioeconomic status (SES) variable, which was included in all base models and sensitivity analyses.

**Measurements.**

Base model Covariate:

*Socioeconomic Status (SES).* A binary variable was created that included both poverty status and educational attainment to account for participants' SES. Poverty status was defined as annual household income "above" or "below" 125% of the 2004 federal poverty level relative to family size. Participants self-reported the number of years of education completed. Participants considered "above" the federal poverty level who had completed at least 12 years of education (i.e., obtained a high school diploma or GED) were classified as high SES. However, if participants were either "below" the federal poverty level or completed fewer than 12 years of education, or both, then they were classified as low SES.

Sensitivity Analysis Variables – Biomedical/Clinical Covariates:

*Body Mass Index* (BMI). BMI was calculated using measures of height and weight (kg/m$^2$) using calibrated equipment with participants standing in an upright position. Participants were draped in a lightweight hospital gown and were not wearing shoes. Weight was recorded in kilograms and was divided by their height in meters squared to obtain BMI.

*Cholesterol and Antilipidemic Medication Use.* All participants consented to blood samples, which were drawn from an antecubital vein. Participants were asked to fast overnight prior to blood draws and were coded accordingly. Using standard laboratory methods, serum total cholesterol levels (mg/dL) were measured at Quest Diagnostics and derived using a spectrophotometer. Additionally, participants self-reported use of antilipidemic medication.

*Diagnoses of Hypertension and Diabetes.* Hypertension was defined by resting systolic blood pressure $\geq$ 140 mmHg or diastolic blood pressure $\geq$ 90mmHg, self-reported a previous diagnosis by a healthcare provider, and/or used antihypertensive medications. Diabetes was classified per previous diagnosis by a healthcare provider, use of diabetes medications, and/or blood glucose levels $\geq$ 126mg/dl (7 mmol/liter).

*Medical History.* Medical history of cardiovascular diseases (CVDs) was self-reported and coded as either any or no prior diagnosis. Participants were asked if a healthcare provider ever diagnosed them with any of the following conditions: stroke/transient ischemic attack, coronary artery and/or heart disease, claudication, heart attack/myocardial infarction, atrial fibrillation, or congestive heart failure.

Sensitivity Analysis Variables – Psychological Covariate:

*Depressive Symptoms.* Depressive symptoms within the past week were assessed using the Center for Epidemiological Studies-Depression (CES-D) scale.[2] The CES-D scale has been extensively and widely used,

having been validated in several community-based epidemiological studies. It is a 20-item inventory that assesses depressive symptoms within the past week. Participants responded to each item on a 4-point scale ranging from 0 (Rarely) to 3 (Mostly), with possible total scores ranging from 0 to 60, higher scores indicating greater depressive symptomatology.

Sensitivity Analysis Variables – Health Behavior-Related Covariates:

*Cigarette Smoking.* History of cigarette smoking was self-reported. Participants endorsed one of four response options: 1 – "Never tried," 2 – "Tried but never used regularly," 3 – "former user (used but over 6 months ago)," and 4 – "current user (used within the past 6 months)."

*Substance Use Coping.* The Brief COPE Inventory[1] assessed substance use coping using two items: (1) When I am confronted with a difficult or stressful event, I usually use alcohol or other drugs to make myself feel better; and (2) When I am confronted with a difficult or stressful event, I usually use alcohol or other drugs to help me get through it. Item responses included 1 – "Not at all", 2 – " Little bit", 3 – "Medium amount", and 4 – "Very often". These two items were averaged and mean-centered prior to analyses. In this sample, reliability was good (Cronbach's α = 0.83).

Sensitivity Analysis Variables – Social Support Covariates:

*Relationship Status*. Participants self-reported their relationship status (options included married, partnered, divorced, separated, widowed, single, or never). We subsequently coded as a binary variable reflecting either single/unpartnered = 1 or married/partnered = 2.

*Instrumental and Emotional Social Support Coping*. Instrumental and emotional social support were assessed using the Brief COPE Inventory.[1] The items for instrumental social support include: (1) When I am confronted with a difficult or stressful event, I usually get help and advice from other people; and (2) When I am confronted with a difficult or stressful event, I usually try to get advice or help from other people about what to do. The items for emotional social support included: (1) When I am confronted with a difficult or stressful event, I usually get emotional support from others; and (2) When I am confronted with a difficult or stressful event, I usually get comfort and understanding from someone. As previously stated (*see substance use coping*), item responses were based on a 4-point Likert scale. For each subscale, the two items were averaged and mean-centered prior to analyses. In this sample, reliability for the instrumental and emotional social support coping subscales were adequate (Cronbach's α = 0.70 and 0.64, respectively).

**Data Analytic Plan**

Base model analyses are described in the main manuscript. Missing data across sensitivity variables were handled via multiple imputation by chained equations, which was implemented with the *mice* package in R. For participants to be included in primary analyses, complete data on all predictor, moderator, and outcome variables (racial discrimination, burden of lifetime discrimination, religious coping, CIMT), sociodemographic characteristics (sex, age, socioeconomic status [poverty status and education]), and biological/clinical measures (BMI, cholesterol) was imperative. Of note, in the final sample for this study, missingness were only observed across relationship status (*n* = 26), cigarette status (*n* = 27), and depressive symptoms (*n* = 61). A total of 5 imputed data sets were generated to account for missingness across the noted variables. All sociodemographic characteristics (race, sex, age, socioeconomic status) and the predictor and moderator variables (racial discrimination, burden of lifetime discrimination, religious coping) were used for multiple imputation.

Descriptive characteristics of all the study variables at baseline (Wave 1) and the follow-up visit at Wave 4 can be found in Table S1 and Table S2, respectively. Sensitivity analyses were performed in four clustered groups. Each group was entered into separate, consecutive regression models to assess potential confounding. In Table S3, wherein models included racial discrimination as the primary predictor variable, Model 1 adjusted for

biomedical/clinical factors (BMI, cholesterol, antilipidemic medication use, hypertension, diabetes, and medical history), Model 2 adjusted for depressive symptoms, Model 3 adjusted for biobehavioral risk (cigarette smoking, substance use coping), and Model 4 adjusted social support (relationship status, instrumental and emotional social support). In Table S4, wherein models included burden of lifetime discrimination as the primary predictor variables, Models 1 – 4 followed the same pattern as described previously. A total of 4 mixed-effects models were conducted for each dimension of lifetime discrimination. As stated in the main manuscript document, the fixed effect interactive associations between discrimination, religious coping, and sex with abnormal CIMT remained statistically significant, withstanding adjustment for all sensitivity analysis variables.

**Table S1.** Sample characteristics for all study variables at Wave 1 (Baseline)

| Characteristic | Range | Overall Sample (N = 587) | Females (N = 313) | Males (N = 274) | $p$-value |
|---|---|---|---|---|---|
| Men, n (%) | | 274 (46.7) | – | – | |
| High SES, n (%) | | 234 (39.9) | 120 (38.3) | 114 (41.6) | 0.47 |
| Age | 30.2 – 66.0 | 47.40 ± 8.98 | 47.36 ± 8.97 | 47.45 ± 9.00 | <0.01 |
| Racial discrimination | 0 – 6 | 1.67 ± 1.92 | 1.19 ± 1.72 | 2.22 ± 1.98 | 0.01 |
|    Ever experienced any racial discrimination, n (% yes) | | 317 (54.0) | 130 (41.5) | 187 (68.2) | <0.01 |
| Burden of lifetime discrimination | 1 – 4 | 1.87 ± 0.89 | 1.70 ± 0.85 | 2.07 ± 0.88 | <0.01 |
| Religious coping | 2 – 8 | 6.15 ± 1.99 | 6.45 ± 1.90 | 5.81 ± 2.04 | <0.01 |
| CIMT | 0.40 – 1.3 | 0.71 ± 0.13 | 0.70 ± 0.12 | 0.72 ± 0.14 | <0.01 |
| Abnormal CIMT, n (%) | | 20 (3.4) | 9 (2.9) | 11 (4.0) | 0.60 |
| Body mass index | 15.6 – 58.5 | 28.97 ± 7.43 | 30.81 ± 8.19 | 26.88 ± 5.81 | <0.01 |
| Total cholesterol | 83.0 – 338.0 | 182.76 ± 40.22 | 185.23 ± 39.73 | 179.93 ± 40.67 | <0.01 |
| Antilipidemic medication use, n (% yes) | | 63 (10.7) | 39 (12.5) | 24 (8.8) | 0.19 |
| Hypertensive status, n (% yes) | | 277 (47.2) | 158 (50.5) | 119 (43.4) | 0.10 |
| Diabetes status, n (%) | | | | | 0.05 |
|   None | | 429 (73.1) | 228 (72.8) | 201 (73.4) | |
|   Prediabetic | | 81 (13.8) | 36 (11.5) | 45 (16.4) | |
|   Diabetic | | 77 (13.1) | 49 (15.7) | 28 (10.2) | |
| Cardiovascular disease medical history, n (% yes) | | 100 (17.0) | 59 (18.8) | 41 (15.0) | 0.25 |
| Depressive symptoms | 0 – 60 | 14.93 ± 10.84 | 15.17 ± 11.45 | 14.66 ± 10.12 | <0.01 |
| Cigarette status | 1 – 4 | 3.03 ± 1.21 | 2.84 ± 1.27 | 3.24 ± 1.10 | <0.01 |
| Substance use coping | 2 – 8 | 2.94 ± 1.49 | 2.79 ± 1.35 | 3.12 ± 1.61 | <0.01 |
| Marital status | 1 – 2 | 1.40 ± 0.49 | 1.34 ± 0.48 | 1.47 ± 0.50 | <0.01 |
| Emotional social support coping | 2 – 8 | 4.69 ± 1.68 | 4.84 ± 1.70 | 4.52 ± 1.65 | <0.01 |
| Instrumental social support coping | 2 – 8 | 4.93 ± 1.72 | 4.90 ± 1.76 | 4.95 ± 1.67 | <0.01 |

Values are presented as Mean ± SD, unless otherwise indicated.
SES = socioeconomic status. CIMT = carotid intima-media thickness.

**Table S2.** Sample characteristics for all study variables at the follow-up visit, Wave 4

| Characteristic | Range | Overall Sample (N = 360) | Females (N = 223) | Males (N = 137) | *p*-value |
|---|---|---|---|---|---|
| Men, n (%) | | 137 (38.1) | – | – | |
| High SES, n (%) | | 136 (37.8) | 76 (34.1) | 60 (43.8) | 0.08 |
| Age | 36.6 – 73.4 | 55.47 ± 9.22 | 55.61 ± 9.44 | 55.24 ± 8.88 | <0.01 |
| Racial discrimination | 0 – 6 | 1.55 ± 1.85 | 1.34 ± 1.80 | 1.90 ± 1.89 | 0.09 |
| Ever experienced any racial discrimination, n (% yes) | | 193 (53.6) | 106 (47.5) | 87 (63.5) | <0.01 |
| Burden of lifetime discrimination | 1 – 4 | 1.90 ± 0.87 | 1.82 ± 0.88 | 2.02 ± 0.83 | <0.01 |
| Religious coping | 2 – 8 | 6.07 ± 2.11 | 6.39 ± 1.96 | 5.55 ± 2.24 | <0.01 |
| CIMT | 0.50 – 2.2 | 0.88 ± 0.20 | 0.87 ± 0.17 | 0.90 ± 0.23 | <0.01 |
| Abnormal CIMT, n (%) | | 102 (28.3) | 56 (25.1) | 46 (33.6) | 0.11 |
| Body mass index | 15.2 – 54.0 | 29.86 ± 7.37 | 31.52 ± 7.61 | 27.16 ± 6.07 | <0.01 |
| Total cholesterol | 83.0 – 338.0 | 185.94 ± 40.72 | 191.37 ± 39.82 | 177.09 ± 40.78 | <0.01 |
| Antilipidemic medication use, n (% yes) | | 80 (22.2) | 58 (26.0) | 22 (16.1) | 0.04 |
| Hypertensive status, n (% yes) | | 227 (63.1) | 148 (66.4) | 79 (57.7) | 0.12 |
| Diabetes status, n (%) | | | | | <0.01 |
| None | | 224 (62.2) | 129 (57.8) | 95 (69.3) | |
| Prediabetic | | 54 (15.0) | 31 (13.9) | 23 (16.8) | |
| Diabetic | | 82 (22.8) | 63 (28.3) | 19 (13.9) | |
| Cardiovascular disease medical history, n (% yes) | | 74 (20.6) | 47 (21.1) | 27 (19.7) | 0.86 |
| Depressive symptoms | 0 – 60 | 14.01 ± 10.19 | 15.00 ± 10.95 | 12.46 ± 8.70 | <0.01 |
| Cigarette status | 1 – 4 | 3.04 ± 1.18 | 2.87 ± 1.23 | 3.30 ± 1.06 | <0.01 |
| Substance use coping | 2 – 8 | 2.94 ± 1.47 | 2.89 ± 1.47 | 3.02 ± 1.47 | <0.01 |
| Marital status | 1 – 2 | 1.31 ± 0.46 | 1.27 ± 0.44 | 1.38 ± 0.49 | 0.05 |
| Emotional social support coping | 2 – 8 | 4.72 ± 1.64 | 4.73 ± 1.70 | 4.72 ± 1.54 | <0.01 |
| Instrumental social support coping | 2 – 8 | 4.83 ± 1.60 | 4.71 ± 1.62 | 5.03 ± 1.56 | <0.01 |

Values are presented as Mean ± SD, unless otherwise indicated.
SES = socioeconomic status. CIMT = carotid intima-media thickness.

**Table S3.** Multivariable logistic regression models estimating 3-way interactive associations between racial discrimination × religious coping × sex and abnormal CIMT: Sensitivity analyses

| | OR [95% CI] | | | |
|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 |
| Racial discrimination × Religious coping × Sex | 0.85 [0.72 - 0.98]* | 0.83 [0.70 - 0.95]* | 0.83 [0.70 - 0.95]* | 0.83 [0.70 - 0.95]* |
| Religious coping × Sex | 1.19 [0.89 - 1.60] | 1.29 [0.96 - 1.73] | 1.28 [0.95 - 1.71] | 1.27 [0.95 - 1.71] |
| Racial discrimination × Sex | 1.26 [0.97 - 1.68] | 1.28 [1.00 - 1.71] | 1.26 [0.98 - 1.69] | 1.28 [0.99 - 1.71] |
| Racial discrimination × Religious coping | 1.14 [1.02 - 1.32] | 1.16 [1.03 - 1.34]* | 1.15 [1.02 - 1.34]* | 1.16 [1.03 - 1.35]* |
| Religious coping | 0.84 [0.70 - 1.02] | 0.81 [0.68 - 0.98]* | 0.81 [0.68 - 0.97]* | 0.77 [0.64 - 0.93]* |
| Racial discrimination | 0.89 [0.70 - 1.09] | 0.88 [0.68 - 1.07] | 0.89 [0.69 - 1.08] | 0.88 [0.68 - 1.08] |
| Socioeconomic status† | 1.11 [0.73 - 1.68] | 1.21 [0.80 - 1.83] | 1.14 [0.75 - 1.72] | 1.17 [0.78 - 1.76] |
| Age | 1.81 [1.43 - 2.31]* | 2.04 [1.65 - 2.58]* | 2.00 [1.62 - 2.52]* | 2.12 [1.70 - 2.67]* |
| Sex† | 1.40 [0.80 - 2.48] | 0.91 [0.51- 1.58] | 0.96 [0.53 - 1.69] | 0.89 [0.50 - 1.57] |
| Body mass index | 1.05 [1.03 - 1.08]* | | | |
| Cholesterol | 1.00 [0.99 - 1.01] | | | |
| Antilipidemic medication use† | 1.80 [1.08 - 2.96]* | | | |
| Hypertensive status† | 1.67 [1.01 - 2.79]* | | | |
| Prediabetic† | 0.61 [0.31 - 1.12] | | | |
| Diabetic† | 1.24 [0.75 - 2.05] | | | |
| Cardiovascular disease medical history† | 0.75 [0.44 - 1.25] | | | |
| Depressive symptoms | | 1.00 [0.98 - 1.02] | | |
| Cigarette status | | | 0.95 [0.79 - 1.13] | |
| Substance use coping | | | 0.93 [0.79 - 1.09] | |
| Marital status | | | | 1.01 [0.65 - 1.54] |
| Emotional social support coping | | | | 1.12 [0.96 - 1.31] |
| Instrumental social support coping | | | | 1.05 [0.90 - 1.23] |

* *p* < .05.

† = Socioeconomic status (SES) = low SES, reference group; Sex = females, reference group; Antilipidemic medication use = no medication use, reference group; Hypertensive status = normotensive, reference group; Prediabetic & Diabetic = nondiabetic, reference group; Cardiovascular disease medical history = no history of cardiovascular disease, reference group.

**Table S4.** Multivariable logistic regression models estimating 3-way interactive associations between burden of lifetime discrimination × religious coping × sex and abnormal CIMT: Sensitivity analyses

| | OR [95% CI] | | | |
|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 |
| Burden of lifetime discrimination × Religious coping × Sex | 0.73 [0.59 - 0.88]* | 0.70 [0.54 - 0.88]* | 0.71 [0.55 - 0.90]* | 0.70 [0.54 - 0.89]* |
| Religious coping × Sex | 1.90 [1.12 - 3.21]* | 2.15 [1.27 - 3.70]* | 2.07 [1.22 - 3.58]* | 2.13 [1.26 - 3.67]* |
| Burden of lifetime discrimination × Sex | 1.08 [0.69 - 1.68] | 1.11 [0.70 - 1.76] | 1.08 [0.68 - 1.72] | 1.09 [0.68 - 1.74] |
| Burden of lifetime discrimination × Religious coping | 1.14 [0.97 - 1.32] | 1.16 [0.99 - 1.41] | 1.15 [0.98 - 1.40] | 1.18 [0.99 - 1.43] |
| Religious coping | 0.74 [0.55 - 1.02] | 0.70 [0.50 - 0.97]* | 0.70 [0.50 - 0.98]* | 0.65 [0.46 - 0.92]* |
| Burden of lifetime discrimination | 1.15 [0.87 - 1.52] | 1.08 [0.77 - 1.47] | 1.11 [0.79 - 1.51] | 1.09 [0.77 - 1.49] |
| Socioeconomic status[†] | 1.12 [0.74 - 1.69] | 1.17 [0.78 - 1.77] | 1.13 [0.74 - 1.70] | 1.14 [0.76 - 1.72] |
| Age | 1.74 [1.38 - 2.23]* | 2.01 [1.62 - 2.55]* | 1.97 [1.59 - 2.51]* | 2.10 [1.68 - 2.68]* |
| Sex[†] | 1.56 [0.61 - 4.09] | 1.00 [0.37 - 2.68] | 1.07 [0.39 - 2.90] | 1.01 [0.37 - 2.73] |
| Body mass index | 1.05 [1.03 - 1.08]* | | | |
| Cholesterol | 1.00 [0.99 - 1.01] | | | |
| Antilipidemic medication use[†] | 1.85 [1.11 - 3.06]* | | | |
| Hypertensive status[†] | 1.76 [1.06 - 2.94]* | | | |
| Prediabetic[†] | 0.59 [0.30 - 1.09] | | | |
| Diabetic[†] | 1.28 [0.77 - 2.09] | | | |
| Cardiovascular disease medical history[†] | 0.77 [0.45 - 1.28] | | | |
| Depressive symptoms | | 1.00 [0.98 - 1.02] | | |
| Cigarette status | | | 0.97 [0.81 - 1.16] | |
| Substance use coping | | | 0.92 [0.78 - 1.07] | |
| Marital status | | | | 1.05 [0.68 - 1.60] |
| Emotional social support coping | | | | 1.12 [0.95 - 1.30] |
| Instrumental social support coping | | | | 1.05 [0.90 - 1.24] |

* $p < .05$.

[†] = Socioeconomic status (SES) = low SES, reference group; Sex = females, reference group; Antilipidemic medication use = no medication use, reference group; Hypertensive status = normotensive, reference group; Prediabetic & Diabetic = nondiabetic, reference group; Cardiovascular disease medical history = no history of cardiovascular disease, reference group.