Biopsychosocial Science and Medicine Publish Ahead of Print
DOI:10.1097/PSY.0000000000001376

Spirituality and Cardiovascular Health in the HANDLS Study: Evidence for Within-Race Differences

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Total Number of Tables: 1; Total Figures: 2; Total Supplemental Digital files: 1

Article Editor: Youngmee Kim

Source of Funding and Conflicts of Interest:

The study was supported by the following funding sources: the National Institute on Aging Intramural Research Program (Baltimore, MD, US) ZIAG000513 (Evans) and the University of Maryland Claude D. Pepper Older Americans Independence Center (Baltimore, MD, US) P30 AG028747 (subcontract to Waldstein). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the University of Maryland or the National Institute on Aging.

Outside of the current work, Dr. Orfeu M. Buxton discloses that he received subcontract grants to Penn State from Proactive Life (formerly Mobile Sleep Technologies), doing business as SleepSpace (National Science Foundation grant #1622766 and NIH/National Institute on Aging Small Business Innovation Research Program R43AG056250, R44 AG056250), received honoraria/travel support for lectures from Boston University, Boston College, Tufts School of Dental Medicine, New York University, University of Miami, University of South Florida, University of Utah, University of Arizona, Harvard Chan School of Public Health, Eric H. Angle Society of Orthodontists, consulting fees for SleepNumber, and receives an honorarium for his role as the Editor in Chief of the journal Sleep Health. The authors have no relevant financial or non-financial interests to disclose.

Author Contributions

All authors contributed to the study's conception and design. Material preparation and data collection were performed by Michele Evans and Alan Zonderman. Data analyses were conducted by Jason Ashe, Christian Maino Vieytes, and May Beydoun. The first draft of the manuscript was written by Jason Ashe and Rupsha Singh, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Data Availability Statement

Data are available upon request. The IRB approved consent forms that our study participants signed does 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 website page labelled information for collaborators explains the process (https://handls.nih.gov/06Coll.htm). The contact for the study is our clinical study manager: Ms Jennifer Norbeck, MSW, CCRC (norbeckje@grc.nia.nih.gov; 410-558-8622).

Abbreviations:

AA = African American

AfrAm = African American

AHA = American Heart Association

BMI = body mass index

BP = blood pressure

CVD(s) = cardiovascular disease(s)

CVH = cardiovascular health

HANDLS = Healthy Aging in Neighborhoods of Diversity across the Life Span

LS7 = Life's Simple 7

M = mean

PTSD = Post-traumatic stress disorder

SD = standard deviation

SES = socioeconomic status

ST = spiritual transcendence

US = United States

ABSTRACT

Objective: This cross-sectional study explored the associations between spiritual transcendence (ST) – prayer/meditation fulfillment, connectedness, and universality – and the American Heart Association's Life's Simple 7 (LS7), and if variations across and within racial and socioeconomic groups emerged.

Methods: Data were taken from the Healthy Aging in Neighborhoods of Diversity across the Life Span study and included 1,110 midlife and older African American (AA) and White adults (mean [standard deviation] age = 56.13 [8.91] years; 65.0% above poverty; 78.1% ≥ high school education). ST was self-reported. LS7 comprised physical activity, smoking, diet, body mass index, cholesterol, glucose, and blood pressure. Higher LS7 reflects better cardiovascular health (CVH). Multiple linear regression estimated associations between ST and LS7. A 3-way interaction term (ST, race, and either education or poverty status) was included in models adjusted for sex and age.

Results: A 3-way interaction was observed for ST, race, and poverty status (b = 1.29, SE = 0.35, p <.001). Simple slopes showed a positive association for White adults living above poverty only (b = 0.54, SE = 0.15, p < .001). Exploratory analyses found a nonlinear 3-way interactive effect including ST, race, and age (i.e., U-shaped; b = 0.04, SE = 0.02, p = .048). Both lesser and greater ST were associated with higher LS7 for older AA adults exclusively (b = 0.03, SE = 0.01, p = .024).

Conclusion: Although spirituality was associated with overall CVH, it was not beneficial for everyone equally. If tailored appropriately, the integration of spirituality into care practices may promote better CVH.

Key Words

Spirituality; Cardiovascular Health; Racial Health Disparities; Socioeconomic Status

INTRODUCTION

Longstanding disparities show that African American (AA) adults are at a greater risk for more progressive, severe, and fatal cardiovascular diseases (CVDs) compared to White individuals, particularly in midlife adulthood (1,2). AA middle-aged adults are more likely to present with multiple chronic diseases and CVD risk factors, and have a two- to threefold higher chance of experiencing their first stroke by their mid-50s compared to White adults (3–5). Unequivocally, social inequities are fundamental causes of racial health disparities in the United States (US) (6). AA adults are more vulnerable to myriad chronic stressors like interpersonal discrimination, financial strain, work-related stress, and neighborhood disadvantage, all of which drive elevated CVD risk and ill health (6–9). Lower socioeconomic status (SES) also portends dire cardiovascular health (CVH) across multiple major risk factors (e.g., hypertension, cigarette smoking, diabetes, obesity) (10–15), but racial inequalities across SES remain. Although overall poverty in the US has steadily declined within the last few decades, the rate among AA individuals is still high, almost double that of White individuals (16,17). The excess burden of poverty among AA individuals is a likely contributor to their poorer CVH (3,7,18), though several studies have also found that disparities remained if not worsened when comparing CVH outcomes by race across higher SES (19,20). Other psychosocial factors may be inducing stress-related cardiometabolic dysregulation or maladaptive biobehavioral responses among AA individuals, irrespective of, or in tandem with, SES. Targeted prevention efforts seeking to mitigate racial health disparities should identify stressors driving heterogeneity within groups as well as protective factors that can help offset risk (21).

In the US, spirituality is a deeply compelling aspect of life that influences many people's decision-making processes, behaviors, and overall health. Nationally representative surveys

show that at least 70% of all US adults identify as being spiritual, identify with at least one religious tradition, and say that spirituality is important in their daily lives (22,23). Spirituality is often defined as an individualistic approach to understanding one's meaning in life, exploring themes like the afterlife, human connections with one another, and the supernatural world, and trying to find peace in quiet reflection time like during prayers, meditation, or yoga (24). Its definition is quite broad, which is often advantageous in clinical care settings (25). This allows for health care practitioners to authentically converse with their patients about healthy lifestyle choices (e.g., diet, physical activity), medication adherence, and psychological wellness by integrating themes surrounding spirituality and experiencing wholeness without attacking someone's faith beliefs or promoting controversial viewpoints (26). Within the last few decades, accumulating literature has shown protective associations between frequent engagement in both secular- and nonsecular-based spiritual activities (e.g., prayer, religious service attendance, meditation, yoga) with multiple indicators of CVH, including blood pressure (BP), smoking status, and lipid profiles (27–32). Spirituality is thought to act upon multiple, plausible pathways that lead to better health. It is theorized that spirituality helps to temper stress-induced physiological reactivity, increases social support and network, promotes abstinence from cigarette smoking and alcohol drinking, and is linked with better psychological well-being and emotional regulation (25).

However, these associations are not always uniform. Some reports have documented mixed findings across racial groups, suggesting effects were only present among AA individuals and not White individuals (33,34), null relationships or nonlinear associations (e.g., U-shaped), or that spirituality was negatively related to health outcomes (35–39). Indeed, although spirituality is a multidimensional construct, both vernacularly and operationally, it is actually

quite complex (26). For instance, demographic reports suggest a steadying decline in religiousness across the US (beginning in the early 2000s to present day) but note an uptick in individuals claiming to be "spiritual" but not "religious" (40,41). These trends are less apparent among AA individuals, who commonly express being both "spiritual and religious" (22,42–45), while White adults are more likely to identify as being only "spiritual." AA individuals seemingly draw a stronger overlap between nonsecular and secular themes of spirituality. In a 2023 survey released by the Pew Research Center, more than half of all US adults claim they communicate with dead relatives in dreams or other supernatural experiences (46). But Black respondents (members of historically Black churches) and Catholics were among the most likely to have felt the presence of dead loved ones or believed they would be reunited with dead relatives in the afterlife (46). Given that AA individuals die earlier than their White counterparts (4), research suggests that AA individuals are consequently exposed to untimely death disproportionately, too, which may be an understudied source of social disadvantage affecting health and quality of life (47,48). In this way, spirituality is foundational to comprehending loss, especially for the AA community, whose resilience has withstood centuries of social adversity and longstanding suffering. AA spirituality embodies cultural practices rooted in African diasporic customs that link religious themes back to elements of Black-affirming religious traditions like the historical Black Church (49,50). For some, the ability to transcend this world and be connected to a greater hope in an afterlife or otherworldliness is powerful. While literature has shown varying degrees of spirituality's influence on overall CVH, less is known about transcendent aspects.

Therefore, the present study sought to explore this research inquiry by examining cross-sectional relationships between spiritual transcendence (ST) – "the motivational capacity to

create a broad sense of personal meaning for one's life" (51) – and the American Heart Association (AHA) Life's Simple 7 (LS7) in a sample of AA and White adults from Baltimore, Maryland. The AHA developed a clinical measurement called LS7 to monitor overall CVH for all American adults (52). LS7 consists of seven modifiable risk factors: body mass index (BMI), smoking, physical activity, diet, BP, cholesterol, and glucose level. It provides clear metrics for achieving ideal CVH, categorizing scores into poor, intermediate, and ideal; higher LS7 scores reflect better CVH (52). Lower LS7 has been shown to robustly predict incident CVDs and risk, especially among AA adults (53–55). Here, we examined if ST was positively related to overall CVH, but specifically investigated if these relations were modified by race and at least one other indicator of SES (poverty status, education). Exploratory analyses also tested for potential nonlinearity and additional effect modification by other social categories (sex and age), given that older adults and women tend to be more engaged with their spirituality than their respective counterparts (23,44,56). Lastly, we conducted sensitivity testing, given the potential for confounding across psychological affect (depressive and post-traumatic stress disorder symptoms), health behaviors (alcohol drinking, illicit drug use, and substance use coping), social support (relationship status, emotional and instrumental social support), and medical history (health insurance, prior diagnosis of CVDs). Studies have shown that greater spirituality may improve mental health, increase social network, encourage healthy lifestyle choices, and diminish odds of comorbid conditions and risk (25,57). Due to the cross-sectional nature of the study, mediation was not tested.

METHODS

Begun in 2004, Healthy Aging in Neighborhoods of Diversity across the Life Span (HANDLS) Study is an ongoing longitudinal cohort study focused on underlying biological and

psychosocial pathways contributing to racial and SES-driven health disparities (58). Participants were selected from 13 Baltimore, Maryland neighborhoods using an area probability sampling strategy and represented a wide range of household incomes (both below and above the federal poverty threshold). The study protocol was approved by the Institutional Review Board at the National Institutes of Health and all participants provided written informed consent. At baseline, HANDLS enrolled 3,720 adults aged 30 – 64 years old. The current study analyzed data from wave 4 (2013 – 2017). We excluded individuals who did not fast prior to blood draw, were renal dialysis patients, or had been previously diagnosed with HIV/AIDS. We used a complete case analysis. Our final sample included 1,110 White and AA adults who had data on all variables of interest. There were no significant differences across race, education, or poverty status by completer status, but the final study sample was slightly younger and had more women than men compared to those who had missing data on the outcome variable.

Participants self-identified their race (White [reference] vs. AA) and reported their health insurance status (uninsured [reference] vs. insured) and annual household income as a function of household size. Poverty status was classified as either above (reference) or below 125% of the US federal poverty threshold. Sex was defined as sex assigned at birth (women [reference] vs. men). Educational attainment was a dichotomous variable reflecting having earned a high school (HS) diploma or GED (<HS [reference] vs. ≥ HS).

Using the AHA's guidelines, LS7 scores were calculated using available data for: (1) diet, (2) physical activity, (3) BMI, (4) cholesterol, (5) glucose, (6) BP, and (7) smoking (52). Diet was estimated using the average food and nutrient intake across two 24-hour dietary recalls of the following five healthful components: fruits and vegetables, fish, fiber-rich whole grains, sodium, and sugar sweetened beverages; as described in Fanelli Kuczmarski et al. (2019) (59). Physical

activity was measured using the Baecke questionnaire (60). BMI was calculated using body height and weight measurements collected by a clinician [kg/m^2]. Blood serum samples were taken from an antecubital vein following overnight fasting. Both cholesterol and glucose were analyzed using standard laboratory methods at Quest Diagnostics. Cholesterol and glucose were derived using a spectrophotometer. BP readings were recorded using standard brachial artery auscultation methods. The arithmetic mean was used for both left and right systolic and diastolic pressures taken from the seated position. Smoking behavior was self-reported. Each LS7 component was categorized using the assigned metrics of ideal = 2, intermediate = 1, and poor = 0. Total LS7 scores were calculated by summing the components together. Total scores ranged from 0 – 14, whereby higher scores reflected optimal CVH. These LS7 metrics have been previously defined and used for HANDLS participants (61). Additional information on the LS7 components and total score calculation is listed in the Supplemental Digital Content, Methods, http://links.lww.com/PSYMED/B75.

ST was taken from the Assessment of Spirituality and Religious Sentiments (ASPIRES) Scale (62). ST is a nine-item measurement scale spanning experiences and beliefs encompassing purpose in life, a sense of meaning-making, feeling inner peace during quiet practices, and viewpoints on human connections. Example items include: “In the quiet of my prayers or meditations, I find a sense of wholeness;” “Although dead, memories and thoughts of some of my relatives continue to influence my current life;” and “I feel that on a higher level all of us share a common bond.” Likert-type responses ranged from [1] strongly disagree to [5] strongly agree. Item responses were summed and averaged; higher scores represented a greater extent of feeling and experiencing ST. In the study’s full sample, reliability for ST was good (Cronbach’s $\alpha = 0.73$), though it was slightly higher among White participants (Cronbach’s $\alpha = 0.78$) than AA

participants (Cronbach's $\alpha = 0.70$). We calculated Tucker's Congruence Coefficient to assess the similarity of item response patterns for White and AA participants using the first unrotated factor from principal component analyses that were race stratified (63). The coefficient was 0.96 indicating a high degree of congruence in the pattern of factor loadings.

Depressive symptoms were characterized using the Center for Epidemiological Studies-Depression scale (CES-D) (64), which assessed depressive symptoms within the past week. Post-traumatic stress disorder (PTSD) symptoms were self-reported using the PTSD Checklist – Civilian questionnaire for nonmilitary individuals, with higher scores indicating greater symptoms (65). Relationship status was coded as a dichotomous variable (unmarried/single vs. married/partnered). Substance use coping as well as instrumental and emotional social support coping were each two-item subscales taken from the Brief COPE Inventory (66). Responses were summed and then standardized (mean-centered) prior to analyses. Cronbach's α for these subscales ranged from 0.74 – 0.89. Alcohol drinking status was self-reported ("never consumed" or "has consumed"). Illicit drug use (marijuana, opiates, cocaine) was a dichotomous variable reflecting past use ("ever used" vs. "never used"). Participants self-reported prior diagnoses of CVDs (coronary artery disease, claudication, heart attack/myocardial infarction, congestive heart failure, and atrial fibrillation). Medical history of CVDs was coded as a binary variable ("no prior diagnosis" vs. "any history of CVDs").

STATISTICAL ANALYSIS

Participant characteristics were described overall for the sample and stratified by race. Student's t-tests and chi-squared tests (χ^2) were used to compare group means for continuous and categorical variables respectively. Multiple linear regression models were fit and examined up to 3-way interactions for linear ST, race, and one other indicator of SES (i.e., ST × race × poverty

status, ST × race × education) in relation to participants' LS7 scores while adjusting for sociodemographic characteristics (sex, age, and poverty status and education when not examined as moderators). All base models included the highest-order 3-way interaction term, all 2-way interaction terms, and main effects. If the 3-way interaction term was statistically significant, interaction plots were used to visualize effects and race-stratified analyses followed. The 2-way interaction term of interest was retested (e.g., ST × poverty status) within each racial group. Simple slope tests were conducted to probe the interactions. Exploratory analyses examined sex and age as additional effect modifiers, and examined potential nonlinearity (i.e., ST^2).

Finally, sensitivity tests examined potential confounding by psychological affect (depressive and PTSD symptoms), biobehavioral coping responses (alcohol drinking, illicit drug use, and substance use coping), social support network (instrumental and emotional social support coping and relationship status), and biomedical history (health insurance status and medical history of prior CVDs). Each set of clustered sensitivity variables was entered into the model individually, in separate regression analyses, due to potentially reduced statistical power. All statistical tests and analyses were two-tailed, and statistical significance was a probability value < .05. All analyses were performed using R software version 4.4.0 (67).

RESULTS

Among the 1,110 White and AA study participants (58.1% AA; 59.1% women; mean age = 56.13 years, standard deviation = 8.91), most were classified as living above poverty (65.0%), earning at least a high school diploma or GED (71.8%), and had health insurance coverage (88.6%) (Table 1). LS7 appeared to follow a normal distribution in the study sample (mean = 7.58, standard deviation = 1.98). ST (mean = 3.62, standard deviation = 0.71) did not statistically differ by race in the full sample. AA adults were more likely to be living below poverty,

hypertensive, single/unpartnered, have a history of illicit drug use, and less likely to report instrumental social support coping when compared to White adults.

In analyses adjusted for sex, age, and education, a significant 3-way interaction effect of ST × race × poverty status with LS7 emerged (b = 1.29, SE = 0.35, p < .001; Table S1, Supplemental Digital Content, http://links.lww.com/PSYMED/B75). Interactive plots were produced (**Figure 1**). We subsequently conducted race-stratified analyses and found that the 2-way interaction term of ST × poverty status was statistically significant for both AA (b = 0.46, SE = 0.21, p = .031) and White adults (b = -0.80, SE = 0.29, p = .005) (Table S2). Simple slopes regression tests revealed that ST was positively related to LS7 for White adults living above poverty (b = 0.54, SE = 0.15, p < .001). ST was not associated with LS7 for AA adults living below the federal poverty level (b = 0.29, SE = 0.16, p = .07), AA adults living above poverty (b = -0.17, SE = 0.14, p = .22), or White adults living below poverty (b = -0.25, SE = 0.24, p = .30) (Table S3). Education was not a significant modifier of these associations (b = -0.12, SE = 0.36, p = .74) (Table S4); the 3-way interaction terms including sex and age were also nonsignificant (Table S5, Table S6).

We also explored nonlinearity, such that analyses tested up to the 3-way interaction level of quadratic ST, race, and one indicator of SES (e.g., ST^2 × race × poverty status) predicting LS7 scores. For both poverty status and education, neither interactive relationship was statistically significant (Table S7, Table S8, Supplemental Digital Content, http://links.lww.com/PSYMED/B75). We additionally examined sex and age as effect modifiers. Although the interaction term including sex was not statistically significant (Table S9), in analyses adjusted for sex, poverty status, and education, ST^2 × race × age was significantly related to LS7 scores (b =0.04, SE = 0.02, p = .048; Table S10). Race-stratified analyses showed

that the 2-way interaction term (ST^2 × age) was only significant for AA adults (b =0.03, SE = 0.01, p = .024), not White adults (b = -0.01, SE = 0.01, p = .55) (Table S11). We selected two integer values of age nearest to one standard deviation above and below the mean (i.e., 50 and 65 years old) to graphically represent these interaction effects. The interaction plot in Figure 1 demonstrates a U-shaped relation between ST and LS7 among 65-year-old AA adults. Both lower and higher ST were related to higher LS7 scores. ST was unrelated to LS7 among 50-year-old AA adults. For White adults, irrespective of age, ST was positively related to LS7.

In sets of clustered groupings, we conducted sensitivity testing to determine if the primary findings withstood further adjustment for: (A) psychological affect (depressive and PTSD symptoms); (B) biobehavioral coping responses (alcohol consumption, history of illicit drug use, and substance use coping); (C) social support network (relationship status, instrumental and emotional social support coping use); and (D) biomedical history (medical history of CVDs and health insurance status). All findings remained statistically significant (Supplemental Digital Content Tables S12 – S14, http://links.lww.com/PSYMED/B75).

DISCUSSION

Although spirituality is widely considered a protective factor for mental and physical health, results have been mixed and few studies have examined the unique contributions of transcendent spiritual beliefs and experiences on overall CVH. Our cross-sectional study explored whether ST was related to AHA's LS7 in a sample of White and AA middle-aged and older adults, and specifically interrogated if these relationships differed across racial and SES groups, with the possibility for nonlinearity. We identified two significant themes. First, the effects of ST on LS7 were modified by both race and poverty status. ST was negatively associated with LS7 for AA adults living above poverty and White adults living below poverty

but was positively associated with LS7 for AA adults living below poverty and White adults living above poverty. Simple slope analyses were only significant for White adults living above poverty. Second, among AA adults only, both lesser and greater ST were related to better CVH as age increased (i.e., U-shaped relationship). These findings were independent of other sociodemographic, psychosocial, biobehavioral, and biomedical factors, including sex, education, depressive and PTSD symptoms, substance use coping, alcohol drinking and illicit drug use, relationship status and social support, medical history of CVDs, and health insurance status.

Our findings support the growing body of evidence that shows spiritual beliefs and practices may be positively associated with CVH. Practicing mindfulness-based interventions (e.g., transcendental meditation, yoga) can reduce stress and promote movement, which in turn lowers BP levels and risk for coronary heart disease (68–71). Spirituality also positively influences lifestyle choices and health behaviors, and it can help moderate the brain's responsiveness to stressful events by diminishing cardiac reactivity and neuroendocrine dysregulation (57,72,73). In our study, we found the most striking salubrious effects due to ST on CVH among White adults living above the federal poverty level. Even though the bedrock of spirituality may be stemming from two divergent cultural traditions and backgrounds for White and AA adults (43,45), these findings were still intriguing. For some White individuals, combining secular-based spiritual health practices (e.g., meditation, Tai Chi) into self-regulation and stress management have appeared helpful (74,75). Additionally, prosocial behaviors, like spending money on others, and generosity have been found to be advantageous across indicators of CVH (76). Prior work also suggests an interplay between social health and spirituality among White individuals (77,78). It is possible that for White adults living above poverty in this study,

the protective effects of higher SES may also be playing a major role in shaping social networks, access to certain privileged resources, and engagement in spirituality that are underlying these observed outcomes.

Diverging associations by poverty status were also observed among AA adults in this sample, too. Although marginal effects were detected, studies suggest that even a one-point unit change increase in the overall LS7 score (in other words, modifying only one component of CVH such that the score improves from either poor to intermediate or intermediate to ideal), can lower stroke risk by approximately 8% (79). A study using AA participant data from the Jackson Heart Study (N = 2,967) found that greater nontheistic spirituality and frequent spiritual experiences were associated with optimal weekly physical activity and a lower likelihood of being a former or current cigarette smoker (28). Interestingly, they did not find that SES moderated these associations or on CVH overall. The inconsistencies across our report with prior research may be due to differences in population characteristics, study measurements, or analytic approach (odds of achieving intermediate/ideal CVH and LS7 components; frequency of daily spiritual experiences versus ST). Our results suggest nuanced health advantages across SES subgroups within AA individuals, further implicating the potential influences of social health and stress exposure on overall CVH.

Frequent engagement in spiritual practices like praying for others, attending religious services, and beliefs about the afterlife have been linked with a reduction in disease risk, even among individuals experiencing financial problems (80,81). For many AA families, spirituality is a source of coping and meaning-making (50). It provides a foundation for calmed assurance, a framework for how to withstand life's hardships, and when possible, transcend the surrounding stress to achieve inner peace and wholeness. Historically, there is tremendous overlap between

AA spirituality and religious traditions. Even in describing abstinence from risky behaviors (e.g., drinking alcohol), experiences with severe illnesses, or grief, AA individuals invoke strong sentiments and reflections about faith alongside their spirituality (82–85). AA adults and lower SES individuals also turn to spiritual practices like prayer when dealing with health-related concerns (86). Being able to feel like rising above life's circumstances is possible may glean positive outcomes on overall CVH for this subgroup. For AA adults living above poverty in this study, other psychosocial and environmental stressors may be affecting their health and coping mechanisms. For example, AA individuals, regardless of income, are more likely to live in poverty-dense neighborhoods, due to systemic factors like gentrification and housing discrimination (87,88). Even among those living in higher SES neighborhoods (i.e., lower proportions of families living below the federal poverty line), AA individuals are more prone to interpersonal discrimination from neighbors, which can lead to increased biological dysregulation and CVD risk (89). AA individuals are less likely to consider neighborhood-related disadvantage as a reason to turn to spirituality for coping (90), perhaps because it is more structural in nature. Also, additional strains linked with ill health might be more prevalent among this group, such as workplace demands, caregiver stress, or discrimination (3). Because racial and SES-driven CVD disparities remain, future work is needed to understand how these psychosocial factors manifest as detrimental or protective for some subgroups and not others.

In addition to our findings across race and poverty status, to our knowledge, this is also the first study to show curvilinear relations between ST and an indicator of overall CVH among older AA adults, too. A small body of literature, mostly focused on mental health outcomes, (e.g., depressive symptoms, psychological distress) has documented nonlinear (i.e., U-shaped) relationships, wherein those who were least and most spiritual shared similar health profiles (35–

37). Compared to younger individuals, older adults engage in more spiritual activities and related coping behaviors, especially when dealing with chronic or terminal illnesses, death(s) of loved ones, end-of-life care, and reflecting on the afterlife (91,92). When older AA adults regularly turn to prayer for health concerns, their faith has a strong effect on their self-worth and life satisfaction (86,93–96). Our results confirm possible direct salutary effects that ST might have on overall CVH for older AA adults. Still, lesser ST was also linked with better CVH among older AA adults. We interpret this with caution for several concerns. First, expressing fewer transcendent spiritual beliefs and experiences may be too broadly open for interpretation. Although this group could represent AA individuals who are atheist or agnostic, it is also possible that non-Western frameworks and African-based forms of spirituality may not be well captured in our study's measurement of ST. Also, in this study, we were unable to distinguish nonsecular spiritual beliefs and activities from secular-based spirituality. Though unlikely, lesser ST could plausibly reflect AA adults who are "religious but not spiritual" (42). Frequent religious participation could still be linked with better CVH (29–31), but some theological viewpoints could clash with aspects of ST (e.g., universalism versus eternal salvation or damnation). Moreover, other positive factors (e.g., optimism) might similarly associate with better CVH, even if individuals are neither spiritual nor religious (97). Sometimes, individuals who are neutral on spirituality, as well as those who are moderately religious (i.e., attend religious services occasionally), may actually display signs of poorer health because of underlying spiritual struggles or for lacking strong faith convictions (35). For these reasons, we implore future studies to try and replicate these nonlinear relations to offer helpful interpretations of these findings.

By leveraging aspects of spirituality in culturally tailored programs, clinical interventions and community-based programs can effectively reduce CVD disparities (98,99). However, its potential favorable influences on CVH are still unclear. Similar to our study's results, other reports have found null or inverse relationships between spirituality and CVD-related endpoints, including BP and BMI (100–103). When an individual experiences a stressful life event, reflecting on spiritual beliefs and engaging in meditative practices can help them reevaluate and reframe what has happened (104). But since spirituality is usually defined broadly, its complexities might be overlooked in clinical settings, and could lead to muddled interpretations in empirical work, too (24). For example, sometimes people experience spiritual struggles in their relationships with others, their health, or with their beliefs in a higher power. These inner doubts and questions have been linked with signs of psychological distress and cardiometabolic dysregulation (105–108). Correspondingly, it is equally important to note that there are lived experiences germane to specific subgroups that might influence their overall engagement with spirituality and health. Conceivably, there may also be some bidirectionality occurring, wherein individuals who are suffering from multiple chronic conditions or facing overwhelming social or environmental stressors turn to spirituality as a means of coping, but these ongoing burdens continue to drive their poorer health (109); or that conversely, there may be health biases emerging as a function of social health and capital, exposure to psychosocial and environmental stressors, and how spirituality is defined. By reinforcing select practices and coping behaviors, especially among those who are experiencing substantial stress, individuals might either feel encouraged or doubtful about maintaining healthy habits (104,110). If individuals express that spirituality is an important aspect of their life, then discussing aspects of ST with them in clinical care settings or community-wide health promotion interventions might expose vulnerability to

social or chronic stressors, cultural nuances, and biobehavioral coping responses to foster helpful lifestyle changes.

We acknowledge that this study has several limitations. First, we were unable to compare distinct influences of nonsecular and secular aspects of spirituality due to measurement constraints. There is evidence to suggest that religious affiliation and intra-racial denominational differences may also be related to CVD risk (111). Such knowledge would have been helpful to explore, as there may be unique and possibly synergistic influences of secular and nonsecular spirituality on CVH concurrently. Second, because spirituality is multidimensional, we encourage future research to consider other dimensions and unique cultural practices to better understand how these linkages manifest on health outcomes observable at the population level. Also, given that the data were cross-sectional, we could not confirm the temporality of these associations or rule out reverse causality. Finally, as with any observational study design, we cannot exclude the possibility of residual confounding by other measured or unmeasured characteristics, nor can we imply any causal relationships from the results we present.

In sum though, our study found that ST may be an important conduit linked with CVH, but that diverse relationships across racial and SES groups emerged. By leveraging LS7, targeted interventions can identify social determinants of CVH that aid in reducing racial and SES-related CVD disparities. Health care practitioners can address spirituality with individuals if they detect signs of spiritual struggles or fatalistic views that interfere with medical advice (112,113). Additionally, because public health scholars and activists have historically leveraged congregational partnerships to implement health promotion strategies, church-based screening and exercise programs can reduce stress, and have proven to be beneficial intervention strategies for AA communities in particular (114). Incorporating spirituality into clinical care and

community-based interventions can help individuals achieve a better quality of life and lower risk of CVDs at the population level.

Acknowledgements

The authors would like to thank staff, investigators, and participants in HANDLS as well as the NIA internal reviewers.

REFERENCES:

1. Kurian AK, Cardarelli KM. Racial and ethnic differences in cardiovascular disease risk factors: A systematic review. Ethn Dis. 2007;17(1):143–52.

2. Virani SS, Alonso A, Aparicio HJ, Benjamin EJ, Bittencourt MS, Callaway CW, et al. Heart Disease and Stroke Statistics—2021 Update: A Report From the American Heart Association. Circulation [Internet]. 2021 Feb 23 [cited 2022 Aug 21];143(8). Available from: https://www.ahajournals.org/doi/10.1161/CIR.0000000000000950

3. Carnethon MR, Pu J, Howard G, Albert MA, Anderson CAM, Bertoni AG, et al. Cardiovascular Health in African Americans: A Scientific Statement From the American Heart Association. Circulation. 2017;136(21):e423.

4. Cunningham TJ, Croft JB, Liu Y, Lu H, Eke PI, Giles WH. Vital signs: Racial disparities in age-specific mortality among blacks or African Americans — United States, 1999–2015. Morb Mortal Wkly Rep. 2017;66(17):444–56.

5. Howard G, Moy CS, Howard VJ, McClure LA, Kleindorfer DO, Kissela BM, et al. Where to Focus Efforts to Reduce the Black–White Disparity in Stroke Mortality: Incidence Versus Case Fatality? Stroke. 2016 Jul;47(7):1893–8.

6. Javed Z, Haisum Maqsood M, Yahya T, Amin Z, Acquah I, Valero-Elizondo J, et al. Race, Racism, and Cardiovascular Health: Applying a Social Determinants of Health Framework to Racial/Ethnic Disparities in Cardiovascular Disease. Circ Cardiovasc Qual Outcomes. 2022 Jan;15(1):e007917.

7. Williams DR. Race, socioeconomic status, and health the added effects of racism and discrimination. In: Annals of the New York Academy of Sciences. New York Academy of Sciences; 1999. p. 173–88.

8. Sims M, Glover LSM, Gebreab SY, Spruill TM. Cumulative psychosocial factors are associated with cardiovascular disease risk factors and management among African Americans in the Jackson Heart Study. BMC Public Health. 2020 Apr 28;20(1):566.

9. Berkowitz J, Khetpal V, Echouffo-Tcheugui JB, Bambs CE, Aiyer A, Kip KE, et al. Associations between cumulative social risk, psychosocial risk, and ideal cardiovascular health: Insights from the HeartSCORE study. Am J Prev Cardiol. 2022 Sep;11:100367.

10. Kanjilal S. Socioeconomic Status and Trends in Disparities in 4 Major Risk Factors for Cardiovascular Disease Among US Adults, 1971-2002. Arch Intern Med. 2006 Nov 27;166(21):2348.

11. Odutayo A, Gill P, Shepherd S, Akingbade A, Hopewell S, Tennankore K, et al. Income Disparities in Absolute Cardiovascular Risk and Cardiovascular Risk Factors in the United States, 1999-2014. JAMA Cardiol. 2017 Jul 1;2(7):782.

12. Krueger PM, Reither EN. Mind the Gap: Race/Ethnic and Socioeconomic Disparities in Obesity. Curr Diab Rep. 2015 Nov;15(11):95.

13. Hamad R, Penko J, Kazi DS, Coxson P, Guzman D, Wei PC, et al. Association of Low Socioeconomic Status With Premature Coronary Heart Disease in US Adults. JAMA Cardiol. 2020 Aug 1;5(8):899–908.

14. Khan SU, Nguyen RT, Javed Z, Singh M, Valero-Elizondo J, Cainzos-Achirica M, et al. Socioeconomic status, cardiovascular risk profile, and premature coronary heart disease. Am J Prev Cardiol. 2022 Sep;11:100368.

15. Osibogun O, Ogunmoroti O, Turkson-Ocran RA, Okunrintemi V, Kershaw KN, Allen NB, et al. Financial strain is associated with poorer cardiovascular health: The multi-ethnic study of atherosclerosis. Am J Prev Cardiol. 2024 Mar;17:100640.

16. Iceland J. Racial and Ethnic Inequality in Poverty and Affluence, 1959–2015. Popul Res Policy Rev. 2019 Oct;38(5):615–54.

17. Beech BM, Ford C, Thorpe RJ, Bruce MA, Norris KC. Poverty, Racism, and the Public Health Crisis in America. Front Public Health. 2021 Sep 6;9:699049.

18. Sells ML, Blum E, Perry GS, Eke P, Presley-Cantrell L. Excess Burden of Poverty and Hypertension, by Race and Ethnicity, on the Prevalence of Cardiovascular Disease. Prev Chronic Dis. 2023 Nov 22;20:230065.

19. Bell CN, Thorpe RJ, Bowie JV, LaVeist TA. Race disparities in cardiovascular disease risk factors within socioeconomic status strata. Ann Epidemiol. 2018 Mar;28(3):147–52.

20. Ciciurkaite G. Race/ethnicity, gender and the SES gradient in BMI: The diminishing returns of SES for racial/ethnic minorities. Sociol Health Illn. 2021 Apr 22;1467-9566.13267.

21. Whitfield KE, Allaire JC, Belue R, Edwards CL. Are Comparisons the Answer to Understanding Behavioral Aspects of Aging in Racial and Ethnic Groups? J Gerontol B Psychol Sci Soc Sci. 2008 Sep;63(5):P301–8.

22. Pew Research Center. Spirituality Among Americans [Internet]. 2023 Dec. Available from: https://www.pewresearch.org/religion/2023/12/07/spirituality-among-americans/

23. Pew Research Center. Religious landscape study. [Internet]. Washington, DC: Pew Forum on Religion and Public Life.; 2014. Available from: http://www.pewforum.org/religious-landscape-study/

24. Hill PC, Pargament KIi, Hood RW, McCullough Jr Michael E, Swyers JP, Larson DB, et al. Conceptualizing Religion and Spirituality: Points of Commonality, Points of Departure. J Theory Soc Behav. 2000 Mar;30(1):51–77.

25. Koenig HG. Religion, Spirituality, and Health: The Research and Clinical Implications. ISRN Psychiatry. 2012;2012:1–33.

26. Koenig HG, Carey LB. Religion, Spirituality and Health Research: Warning of Contaminated Scales. J Relig Health. 2024 Aug 28;

27. Holt-Lunstad J, Steffen PR, Sandberg J, Jensen B. Understanding the connection between spiritual well-being and physical health: an examination of ambulatory blood pressure, inflammation, blood lipids and fasting glucose. J Behav Med. 2011;34:477–88.

28. Brewer LC, Bowie J, Slusser JP, Scott CG, Cooper LA, Hayes SN, et al. Religiosity/Spirituality and Cardiovascular Health: The American Heart Association Life's Simple 7 in African Americans of the Jackson Heart Study. J Am Heart Assoc. 2022 Aug 24;e024974.

29. Gillum RF, Ingram DD. Frequency of attendance at religious services, hypertension, and blood pressure: The third national health and nutrition examination survey. Psychosom Med. 2006;68(3):382–5.

30. Bell CN, Bowie JV, Thorpe RJ. The Interrelationship Between Hypertension and Blood Pressure, Attendance at Religious Services, and Race/Ethnicity. J Relig Health. 2012 Jun;51(2):310–22.

31. Maselko J, Kubzansky L, Kawachi I, Seeman T, Berkman L. Religious Service Attendance and Allostatic Load Among High-Functioning Elderly: Psychosom Med. 2007 Jun;69(5):464–72.

32. Gillum RF. Frequency of attendance at religious services and cigarette smoking in American women and men: the Third National Health and Nutrition Examination Survey. Prev Med. 2005;41(2):607–13.

33. Steffen PR, Hinderliter AL, Blumenthal JA, Sherwood A. Religious Coping, Ethnicity, and Ambulatory Blood Pressure. Vol. 63, Psychosomatic Medicine. 2001 p. 523–30.

34. Ferraro KF, Kim S. Health benefits of religion among black and white older adults? Race, religiosity, and C-reactive protein. Soc Sci Med. 2014;120:92–9.

35. Galen LW, Kloet JD. Mental well-being in the religious and the non-religious: evidence for a curvilinear relationship. Mental Health, Religion & Culture. 2011;14(7):673–89.

36. Henderson WM, Kent BV. Attachment to God and Psychological Distress: Evidence of a Curvilinear Relationship. J Sci Study Relig. 2022;61(1):161–77.

37. Tabak MA, Mickelson KD. Religious service attendance and distress: The moderating role of stressful life events and race/ethnicity. Sociol Relig Q Rev. 2009 Mar;70(1):49–64.

38. Buck AC, Williams DR, Musick MA, Sternthal MJ. An examination of the relationship between multiple dimensions of religiosity, blood pressure, and hypertension. Soc Sci Med. 2009 Jan;68(2):314–22.

39. Fitchett G, Powell LH. Daily Spiritual Experiences, Systolic Blood Pressure, and Hypertension among Midlife Women in SWAN. Ann Behav Med. 2009 Jun;37(3):257–67.

40. Jones J. Gallup.com. 2021 [cited 2022 Jun 26]. U.S. Church Membership Falls Below Majority for First Time. Available from: https://news.gallup.com/poll/341963/church-membership-falls-below-majority-first-time.aspx

41. Jones J. Gallup.com. 2021 [cited 2022 Jun 26]. How Religious Are Americans? Available from: https://news.gallup.com/poll/358364/religious-americans.aspx

42. McIntosh RC, Ironson G, Krause N. Do religious and spiritual identity confer risk for hypertension via psychosocial and lifestyle factors? J Health Psychol. 2020 Jul 1;25(8):1082–97.

43. Chatters LM, Taylor RJ, Bullard KM, Jackson JS. Spirituality and Subjective Religiosity Among African Americans, Caribbean Blacks, and Non-Hispanic Whites. J Sci Study Relig. 2008 Dec;47(4):725–37.

44. Taylor RJ, Chatters LM, Jackson JS. Religious and Spiritual Involvement Among Older African Americans, Caribbean Blacks, and Non-Hispanic Whites: Findings From the National Survey of American Life. J Gerontol B Psychol Sci Soc Sci. 2007 Jul;62(4):S238–50.

45. Taylor RJ, Chatters LM. Importance of religion and spirituality in the lives of African Americans, Caribbean Blacks and Non-Hispanic Whites. J Negro Educ. 2010;79(3):280–94.

46. Tevington P, Corichi M. Pew Research Center. 2023 [cited 2024 Feb 8]. Many Americans report interacting with dead relatives in dreams or other ways. Available from: https://www.pewresearch.org/short-reads/2023/08/23/many-americans-report-interacting-with-dead-relatives-in-dreams-or-other-ways/

47. Umberson D. Black Deaths Matter: Race, Relationship Loss, and Effects on Survivors. J Health Soc Behav. 2017;58(4):405–20.

48. Umberson D, Olson JS, Crosnoe R, Liu H, Pudrovska T, Donnelly R. Death of family members as an overlooked source of racial disadvantage in the United States. Proc Natl Acad Sci U S A. 2017 Jan;114(5):915–20.

49. Lewis-Coles MEL, Constantine MG. Racism-related stress, Africultural coping, and religious problem-solving among African Americans. Cultur Divers Ethnic Minor Psychol. 2006;12(3):433–43.

50. Chandler DJ. African American Spirituality : Through Another Lens. 2017;10(2):159–81.

51. Piedmont RL. Does Spirituality Represent the Sixth Factor of Personality? Spiritual Transcendence and the Five-Factor Model. J Pers. 1999;67(6):985–1013.

52. Lloyd-Jones DM, Hong Y, Labarthe D, Mozaffarian D, Appel LJ, Van Horn L, et al. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. Circulation. 2010 Feb 2;121(4):586–613.

53. Egan BM, Li J, Sutherland SE, Jones DW, Ferdinand KC, Hong Y, et al. Sociodemographic Determinants of Life's Simple 7: Implications for Achieving Cardiovascular Health and Health Equity Goals. Ethn Dis. 2020;30(4):637–50.

54. Lassale C, Cené CW, Asselin A, Sims M, Jouven X, Gaye B. Sociodemographic determinants of change in cardiovascular health in middle adulthood in a bi-racial cohort. Atherosclerosis. 2022 Apr;346:98–108.

55. Ommerborn MJ, Blackshear CT, Hickson DA, Griswold ME, Kwatra J, Djoussé L, et al. Ideal Cardiovascular Health and Incident Cardiovascular Events: The Jackson Heart Study. Am J Prev Med. 2016 Oct;51(4):502–6.

56. Mohamed B, Cox K, Diamant J, Gecewicz C. Faith Among Black Americans [Internet]. Pew Research Center's Religion & Public Life Project. 2021 [cited 2022 Jun 26]. Available from: https://www.pewresearch.org/religion/2021/02/16/faith-among-black-americans/

57. Mishra SK, Togneri E, Tripathi B, Trikamji B. Spirituality and Religiosity and Its Role in Health and Diseases. J Relig Health. 2017;56(4):1282–301.

58. Evans MK, Lepkowski JM, Powe NR, LaVeist T, Kuczmarski MF, Zonderman AB. Healthy aging in neighborhoods of diversity across the life span (HANDLS): Overcoming barriers to implementing a longitudinal, epidemiologic, urban study of health, race, and socioeconomic status. Ethn Dis. 2010;20(3):267–75.

59. Fanelli Kuczmarski M, Brewer BC, Rawal R, Pohlig RT, Zonderman AB, Evans MK. Aspects of Dietary Diversity Differ in Their Association with Atherosclerotic Cardiovascular Risk in a Racially Diverse US Adult Population. Nutrients. 2019 May 8;11(5):1034.

60. Baecke JA, Burema J, Frijters JE. A short questionnaire for the measurement of habitual physical activity in epidemiological studies. Am J Clin Nutr. 1982 Nov;36(5):936–42.

61. Beydoun MA, Georgescu MF, Hossain S, Beydoun HA, Fanelli-Kuczmarski MT, Evans MK, et al. Life's simple 7 and its association with trajectories in depressive symptoms among urban middle-aged adults. J Affect Disord. 2023 Jul;333:447–58.

62. Piedmont RL. Aspires: Assessment of Spirituality and Religious Sentiments. 2010;(November):67–67.

63. Lorenzo-Seva U, Ten Berge JMF. Tucker's Congruence Coefficient as a Meaningful Index of Factor Similarity. Methodology. 2006 Jan;2(2):57–64.

64. Radloff LS. The CES-D Scale: A Self-Report Depression Scale for Research in the General Population. Appl Psychol Meas. 1977;1(3):385–401.

65. Weathers FW, Litz BT, Herman DS, Huska JA, Keane TM. The PTSD Checklist (PCL): Reliability, validity, and diagnostic utility. Vol. 462 presented at: annual convention of the international society for traumatic stress studies; 1993 Oct; San Antonio, TX.

66. Carver CS. You Want to Measure Coping But Your Protocol's Too Long: Consider the Brief COPE. Vol. 4, INTERNATIONAL JOURNAL OF BEHAVIORAL MEDICINE. Lawrence Erlbaum Assoeiate.~, Inc; 1997.

67. R Core Team. _R: A Language and Environment for Statistical Computing_. [Internet]. Vienna, Austria; 2024. Available from: <https://www.R-project.org/>

68. Black DS, Slavich GM. Mindfulness meditation and the immune system: a systematic review of randomized controlled trials: Mindfulness meditation and the immune system. Ann N Y Acad Sci. 2016 Jun;1373(1):13–24.

69. Manchanda SC, Madan K. Yoga and meditation in cardiovascular disease. Clin Res Cardiol. 2014 Sep;103(9):675–80.

70. Levine GN, Lange RA, Bairey-Merz CN, Davidson RJ, Jamerson K, Mehta PK, et al. Meditation and Cardiovascular Risk Reduction: A Scientific Statement From the American Heart Association. J Am Heart Assoc. 2017 Oct 11;6(10):e002218.

71. Khabiri R, Jahangiry L, Abbasian M, Majidi F, Farhangi MA, Sadeghi-Bazargani H, et al. Spiritually Based Interventions for High Blood Pressure: A Systematic Review and Meta-analysis. J Relig Health. 2024 Oct;63(5):3474–500.

72. Chinnaiyan KM, Revankar R, Shapiro MD, Kalra A. Heart, mind, and soul: spirituality in cardiovascular medicine. Eur Heart J. 2021 Aug 17;42(31):2965–8.

73. Shattuck EC, Muehlenbein MP. Religiosity / Spirituality and Physiological Markers of Health. J Relig Health [Internet]. 2018;0123456789. Available from: https://doi.org/10.1007/s10943-018-0663-6

74. Gillum F, Griffith DM. Prayer and spiritual practices for health reasons among American adults: The role of race and ethnicity. J Relig Health. 2010;49(3):283–95.

75. Harvey IS, Silverman M. The role of spirituality in the self-management of chronic illness among older African and Whites. J Cross-Cult Gerontol. 2007;22(2):205–20.

76. Whillans AV, Dunn EW, Sandstrom GM, Dickerson SS, Madden KM. Is spending money on others good for your heart? Health Psychol Off J Div Health Psychol Am Psychol Assoc. 2016 Jun;35(6):574–83.

77. Krause N. Studying Forgiveness Among Older Whites, Older Blacks, and Older Mexican Americans. J Relig Spiritual Aging. 2012;24(4):325–44.

78. Krause N, Hayward RD. Social Factors in the Church and Positive Religious Coping Responses: Assessing Differences among Older Whites, Older Blacks, and Older Mexican Americans. Rev Relig Res. 2012;54(4):519–41.

79. Kulshreshtha A, Vaccarino V, Judd SE, Howard VJ, McClellan WM, Muntner P, et al. Life's Simple 7 and risk of incident stroke: the reasons for geographic and racial differences in stroke study. Stroke. 2013 Jul;44(7):1909–14.

80. Bradshaw M, Ellison CG. Financial hardship and psychological distress: exploring the buffering effects of religion. Soc Sci Med 1982. 2010 Jul;71(1):196–204.

81. Krause N. Praying for Others, Financial Strain, and Physical Health Status in Late Life. J Sci Study Relig. 2003 Sep;42(3):377–91.

82. Krentzman AR, Farkas KJ, Townsend AL. Spirituality, Religiousness, and Alcoholism Treatment Outcomes: A Comparison between Black and White Participants. Alcohol Treat Q. 2010 Apr 8;28(2):128–50.

83. Hidalgo I, Brooten D, Youngblut JM, Roche R, Li J, Hinds AM. Practices following the death of a loved one reported by adults from 14 countries or cultural/ethnic group. Nurs Open. 2021 Jan;8(1):453–62.

84. Moore SE, Jones-Eversley SD, Tolliver WF, Wilson B, Harmon DK. Cultural responses to loss and grief among Black Americans: Theory and practice implications for clinicians. Death Stud. 2022 Jan 2;46(1):189–99.

85. Coats H, Crist JD, Berger A, Sternberg E, Rosenfeld AG. African American Elders' Serious Illness Experiences: Narratives of "God Did," "God Will," and "Life Is Better". Qual Health Res. 2017 Apr;27(5):634–48.

86. Tait EM, Laditka SB, Laditka JN, Nies MA, Racine EF. Praying for Health by Older Adults in the United States: Differences by Ethnicity, Gender, and Income. J Relig Spiritual Aging. 2011 Oct;23(4):338–62.

87. Reardon SF, Fox L, Townsend J. Neighborhood Income Composition by Household Race and Income, 1990–2009. Ann Am Acad Pol Soc Sci. 2015 Jul;660(1):78–97.

88. Intrator J, Tannen J, Massey DS. Segregation by race and income in the United States 1970–2010. Soc Sci Res. 2016 Nov;60:45–60.

89. DeAngelis RT. "Moving on Up? Neighborhood Status and Racism-Related Distress among Black Americans." Soc Forces Sci Medium Soc Study Interpret. 2022 Jun;100(4):1503–32.

90. Brenner AB, Diez-Roux AV, Gebreab SY, Schulz AJ, Sims M. The Epidemiology of Coping in African American Adults in the Jackson Heart Study (JHS). J Racial Ethn Health Disparities. 2017;1–17.

91. Agli O, Bailly N, Ferrand C. Spirituality and religion in older adults with dementia: A systematic review. Int Psychogeriatr IPA. 2014 Aug 26;27:1–11.

92. de Vries K, Banister E, Dening KH, Ochieng B. Advance care planning for older people: The influence of ethnicity, religiosity, spirituality and health literacy. Nurs Ethics. 2019 Nov 1;26(7–8):1946–54.

93. Krause N. Assessing the Relationships Among Prayer Expectancies, Race, and Self-Esteem in Late Life. J Sci Study Relig. 2004;43(3):395–408.

94. Krause N, Hayward RD. Prayer beliefs and change in life satisfaction over time. J Relig Health. 2013 Jun;52(2):674–94.

95. Skarupski KA, Fitchett G, Evans DA, Mendes De Leon CF. Race differences in the association of spiritual experiences and life satisfaction in older age. Aging Ment Health. 2013;17(7):888–95.

96. Upenieks L. Never more than I can handle? A longitudinal consideration of racial differences in trust-based prayer expectancies of god and satisfaction in later life. J Relig Spiritual Aging. 2022 Oct 2;34(4):299–322.

97. Sims M, Glover LM, Norwood AF, Jordan C, Min YI, Brewer LC, et al. Optimism and cardiovascular health among African Americans in the Jackson Heart Study. Prev Med. 2019 Dec;129:105826.

98. Haidar A, Nwosisi E, Burnett-Zeigler I. The Role of Religion and Spirituality in Adapting Mindfulness-Based Interventions for Black American Communities: A Scoping Review. Mindfulness. 2023 Aug;14(8):1852–67.

99. Levin J. Partnerships between the faith-based and medical sectors: Implications for preventive medicine and public health. Prev Med Rep. 2016;4:344–50.

100. Cozier YC, Yu J, Wise LA, VanderWeele TJ, Balboni TA, Argentieri MA, et al. Religious and spiritual coping and risk of incident hypertension in the black women's health study. Ann Behav Med. 2018;52(12):989–98.

101. Dodor BA, Robinson MA, Watson R, Meetze D, Whicker R. The Impact of Religiosity on Substance Abuse and Obesity in African Americans. J Relig Health. 2018 Aug;57(4):1315–28.

102. Feinstein M, Liu K, Ning H, Fitchett G, Lloyd-Jones DM. Burden of Cardiovascular Risk Factors, Subclinical Atherosclerosis, and Incident Cardiovascular Events Across Dimensions of Religiosity: The Multi-Ethnic Study of Atherosclerosis. Circulation. 2010 Feb 9;121(5):659–66.

103. Reeves RR, Adams CE, Dubbert PM, Hickson DMA, Wyatt SB. Are religiosity and spirituality associated with obesity among African Americans in the Southeastern United States (the Jackson Heart Study)? J Relig Health. 2012 Mar;51(1):32–48.

104. Pargament KI. The psychology of religion and coping: theory, research, practice. New York London: The Guilford Press; 2001. 548 p.

105. Ai AL, Seymour EM, Tice TN, Kronfol Z, Bolling SF. Spiritual struggle related to plasma interleukin-6 prior to cardiac surgery. Psychol Relig Spiritual. 2009;1(2):112–28.

106. Ellison CG, Lee J. Spiritual Struggles and Psychological Distress: Is There a Dark Side of Religion? Soc Indic Res. 2010;98(3):501–17.

107. Krause N, Pargament KI, Hill PC, Ironson G. Assessing the role of race/ethnicity in the relationships among spiritual struggles, health, and well-being. Am J Orthopsychiatry. 2018;88(2):132–41.

108. Tobin ET, Slatcher RB. Religious Participation Predicts Diurnal Cortisol Profiles 10 Years Later via Lower Levels of Religious Struggle. 2017;25(5):1032–57.

109. McCaffrey AM, Eisenberg DM, Legedza ATR, Davis RB, Phillips RS. Prayer for Health Concerns: Results of a National Survey on Prevalence and Patterns of Use. Arch Intern Med. 2004 Apr 26;164(8):858.

110. Lapane KL, Lasater TM, Allan C, Carleton RA. Religion and Cardiovascular Disease Risk. 1997;36(2):155–64.

111. Bentley-Edwards KL, Blackman Carr LT, Robbins PaulA, Conde E, Zaw K, Darity WA. Investigating Denominational and Church Attendance Differences in Obesity and Diabetes in Black Christian Men and Women. J Relig Health. 2020 Dec;59(6):3055–70.

112. De Brito Sena MA, Damiano RF, Lucchetti G, Peres MFP. Defining Spirituality in Healthcare: A Systematic Review and Conceptual Framework. Front Psychol. 2021 Nov 18;12:756080.

113. Frush BW, Eberly Jr JB, Curlin FA. What Should Physicians and Chaplains Do When a Patient Believes God Wants Him to Suffer? AMA J Ethics. 2018 Jul 1;20(7):613–20.

114. Berkley-Patton J, Thompson CB, Bradley-Ewing A, Berman M, Bauer A, Catley D, et al. Identifying health conditions, priorities, and relevant multilevel health promotion intervention strategies in African American churches: A faith community health needs assessment. Eval Program Plann. 2018 Apr;67:19–28.

Table 1. Participant demographic characteristics and descriptive statistics for study variables: HANDLS Study (wave 4, 2013 – 2017)

	Overall (n = 1,110)	White (n = 465)	African American (n = 645)	Sig.
Race (%)	–	41.9	58.1	<.001
Sex (% Men)	40.9	39.8	41.7	.562
Age, years (± SD)	56.13 (8.91)	56.06 (8.39)	56.18 (9.27)	.826
Poverty status (% below)	35.0	31.4	37.5	.041
Education (% ≥ HS)	71.8	68.8	74.0	.070
Health insurance (% insured)	88.6	87.1	89.6	.229
Medical history (% any prior CVD)	21.4	20.4	22.0	.574
Depressive symptoms[a] (± SD)	13.23 (10.75)	13.93 (11.53)	12.72 (10.13)	.063
PTSD symptoms[b] (± SD)	25.47 (11.57)	26.82 (12.47)	24.50 (10.78)	.001
Alcohol drinking (% has or currently)	87.0	87.3	86.8	.881
Illicit drug use (% never used)	49.0	57.2	43.1	<.001
Substance use coping[c] (± SD)	1.29 (0.62)	1.27 (0.61)	1.31 (0.63)	.256
Relationship status (% married/partnered)	45.4	54.6	38.8	<.001
Instrumental social support coping[c] (± SD)	2.21 (0.85)	2.29 (0.88)	2.16 (0.83)	.016
Emotional social support coping[c] (± SD)	2.14 (0.88)	2.16 (0.92)	2.12 (0.86)	.373
Spiritual transcendence[d] (ST) (± SD)	3.62 (0.71)	3.59 (0.74)	3.65 (0.69)	.183
Life's Simple 7[e] (LS7) (± SD)	7.58 (1.98)	7.55 (2.12)	7.60 (1.87)	.655
Cardiovascular disease risk factors				
Hypertension	62.8	55.7	67.9	<.001
Diabetes	22.3	20.9	23.3	.382
Obese	52.7	53.5	52.1	.676
Smoker status	67.2	64.5	69.1	.120

Note. Significance mean differences across sex were examined with independent samples t-tests and chi-square tests of independence.

Abbreviations. CVD = cardiovascular disease. HANDLS = Healthy Aging in Neighborhoods of Diversity across the Life Span. LS7 = Life's Simple 7. PTSD = post-traumatic stress disorder. SD = standard deviation. ST = spiritual transcendence.

[a] = Center for Epidemiological Studies-Depression scale (CES-D; Radloff, 1977) (64).

[b] = Brief-Cope Inventory (Carver, 1997) (66).

[c] = PTSD Checklist – Civilian questionnaire (Weathers et al., 1993) (65).

[d] = Taken from the Assessment of Spirituality and Religious Sentiments (ASPIRES) Scale (Piedmont, 2010) (62).

[e] = American Heart Association's (AHA's) Life's Simple 7 (LS7) scores calculated using the metrics described in Lloyd-Jones et al. (2010) and Beydoun et al. (2023). (52,61)

FIGURE 1. Interaction Plot Demonstrating Linear Relations of Spiritual Transcendence with American Heart Association's Life's Simple 7: Differences by Race and Poverty Status.

Abbreviations. "AA" = African American.

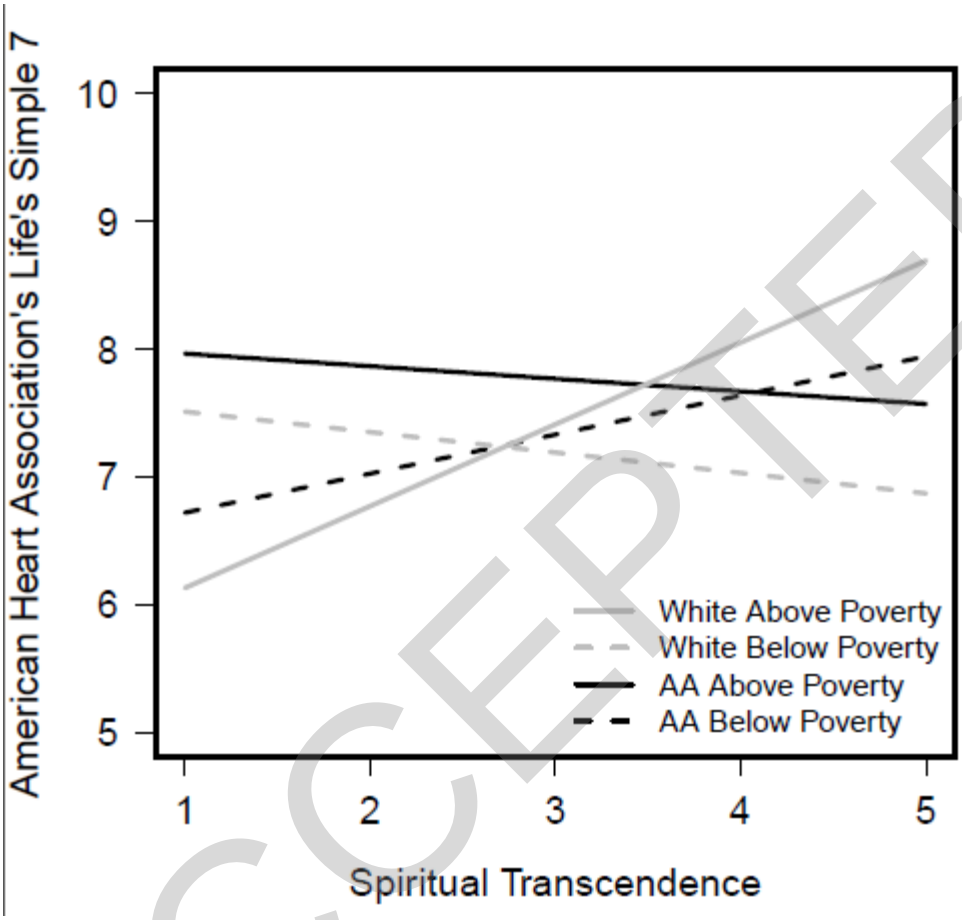

FIGURE 2. Interaction Plot Demonstrating Curvilinear Relations of Spiritual Transcendence with the American Heart Association's Life's Simple 7: Differences by Race and Age.

Abbreviations. "AA" = African American, "yo" = years old.