



Religious Involvement and Allostatic Resilience: Findings from a Community Study of Black and White Americans

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Abstract

Wide inequities in stress and health have been documented between Black and White women and men in the United States. This study asks: How does religion factor into these inequities? We approach this open question from a biopsychosocial perspective, developing three hypotheses for the stress-coping effects of religiosity between groups. We then test our hypotheses with survey and biomarker data from the Nashville Stress and Health Study (2011–2014), a probability sample of Black and White women and men from Davidson County, Tennessee. We find that Black women score the highest on all indicators of religiosity, followed by Black men, White women, and White men. We also find that increased divine control and religious coping predict higher levels of resiliency biomarkers for Black women only and lower levels for White respondents, especially White men. We discuss how our findings inform broader population health inequities and outline several avenues for future research.

Keywords Allostatic · Black-White inequities · DHEAS · Religion · Resilience · Stress process

Introduction

Despite progress over the twentieth century, wide health inequities persist between Black and White women and men in the United States (US) [1]. As of 2018, Black Americans could expect to live 4 years less than their White peers [2], a gap that has since widened to 6 years after accounting for excess COVID deaths [3]. Women—and especially Black women—also suffer greater stress burdens, increased morbidity, and significantly shorter healthy life expectancy than their male, and White, counterparts [4–11].

A parallel body of research also finds that religious involvement is associated with reduced morbidity and mortality for Black and White adults [12, 13], including diminished biological stress and aging [14]. Moreover, studies find

that Black Americans report the highest levels of religiosity [15], and tend to derive the greatest health benefits from religious involvement [12, 16–20]. Yet, we still know very little about whether or how religion factors into stress and health disparities at the intersection of race *and* gender [21–23].

Our study approaches this open question from a biopsychosocial perspective. Specifically, we develop and test hypotheses for the differential effects of religious involvement on a key biomarker: the ratio of dehydroepiandrosterone sulfate (DHEAS) to cortisol [24, 25]. While not a clinical measure, a lower DHEAS/cortisol ratio is a reliable predictor of increased morbidity and mortality [24, 26–29]. Religious and spiritual practices have also shown to promote higher DHEAS levels [30–32], especially for Black Americans facing discrimination [33, 34]. Taken together, these studies suggest that DHEAS, *vis-à-vis* religious involvement, could be a critical psychobiological mechanism of health disparities between Black and White women and men.

In what follows, we first provide a brief overview of the allostasis model of stress-coping and health. Then, we develop three hypotheses for the stress-coping effects of religiosity among Black and White women and men. Analyzing survey and biomarker data from a Nashville-based community sample, we find that Black women score the highest on all indicators of religiosity and benefit the most

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from increased religious involvement, in terms of higher DHEAS/cortisol levels. We find the opposite patterns for White respondents, especially White men, who report the lowest levels of religiosity, and exhibit lower DHEAS/cortisol levels from greater religious involvement. We close by discussing how our study may inform broader health disparities between Black and White women and men. We also outline several avenues for future research.

Background

The Allostasis Model of Health

The allostasis model has transformed our understanding of health and resilience in recent decades. In broad strokes, this model contends that health and longevity are a function of the brain and nervous system's capacities for anticipating and regulating the body's response to environmental demands. People who experience more chronic anticipatory stress will thereby suffer increased wear-and-tear on their brains and nervous systems and, ultimately, shorter and sicker lives [35–39].

While most research in this area focuses on pathological manifestations of allostasis, or “allostatic load,” there is a growing interest in identifying markers of resilience in allostatic processes [40]. From an allostasis perspective, resilience refers to the organism's capacity not only to respond to stressors, but also to quickly terminate response. Thus, poor health is thought to result, at least partially, from the body's inability to shut off physiological stress responses over time [41, 42].

One noted biomarker of resilience—and the central focus of our study—is the adrenal hormone DHEAS [43]. During a stress response, neurons in the hypothalamus trigger a cascade of hormones that ends with the secretion of cortisol, another adrenal hormone responsible for redirecting energy stores, suppressing long-term bodily functions, and ultimately preparing the body to surmount stressors [44]. Although adaptive in shorter time frames of minutes or hours, an accumulation of cortisol in the bloodstream over months or years can lead to hypercortisolism, immune and cardiometabolic dysfunction, and premature aging [35, 45].

The adrenal glands also produce DHEAS synchronously with cortisol during a stress response. As an antiglucocorticoid, DHEAS helps to suppress cortisol and return the body to a pre-stressor state [46]. Thus, the combination of low DHEAS and high cortisol levels often signals a risk of future health complications. For example, studies of human and non-human animals find that lower circulating DHEAS levels—especially in conjunction with higher cortisol levels—predict subsequent mortality and other aging-related conditions, including heart disease, diminished bone mineral

density, metabolic syndrome, and damage to memory centers of the brain [24, 26–29]. Researchers commonly examine such patterns by taking the ratio of DHEAS to cortisol levels, with the assumption that a higher DHEAS/cortisol ratio indicates greater resilience [24, 25].

In the sections that follow, we explain how various aspects of religiosity could be associated with DHEAS/cortisol levels for Black and White women and men. Religious practices and outlooks, especially beliefs about the nature of divinity, can foster psychosocial resources, like self-esteem or meaning in life, that increase resilience to stressors and lead to higher DHEAS levels [47–50]. Nevertheless, some evidence also suggests a potential “dark side” to religious involvement, whereby certain beliefs or practices could exacerbate stress [51–53]. We explain how various dimensions of religiosity could either promote or weaken resilience to stressors. We also consider how a person's position within broader social-stratification hierarchies could further influence the levels and stress-coping effects of religiosity.

Religious Relaxation Hypothesis

Our first hypothesis suggests that religious involvement could promote increased resilience as indicated by higher DHEAS/cortisol levels. The psychologist William James intimated such benefits of religiosity over a century ago. In his now classic work, *Varieties of Religious Experience*, James documented the phenomenology of religious experience in ways wholly consistent with the allostasis model of resilience. James writes that during such an experience:

[the] time for tension in our soul is over, and that of happy relaxation, of calm deep breathing, of an eternal present, with no discordant future to be anxious about, has arrived. Fear is not held in abeyance...., it is positively expunged and washed away. [54, p. 47]

Scholars now refer to this state as a *religious relaxation response*, in contradistinction to a stress response [13, p. 334]. There are numerous dimensions of religious involvement, each with their own distinct health implications [13, 55, 56]. In this section, we consider how beliefs in divine control, private religious practices, and public religious involvements could promote stress resilience.

Perceived divine control refers to a set of beliefs according to which a supernatural deity orchestrates one's life toward a higher purpose, while also offering support and guidance through trying times [57]. Studies find that belief in divine control is associated with various positive mental states, including higher self-esteem [49], sense of mattering [58], and optimism [59], as well as fewer symptoms of depression, anxiety, and loneliness [18, 59]. Beliefs in divine control are thought to produce these states by promoting a vicarious sense of agency and control over

difficult life circumstances, which might otherwise appear insurmountable without the aid of an omnipotent being [16, 60]. Many believers also view God as unconditionally loving, and thus tend to derive positive reflected appraisals from divine relations [47, 61]. The perceived omniscience of God, especially the conviction that all life outcomes reflect “God’s plan,” can also provide a deeper sense of meaning and purpose to stressors that might otherwise seem gratuitous [62, 63].

Private forms of religious identity and coping, including prayer and scripture reading, can also help believers establish routine communion with a perceived divine moral order. For example, prayer allows believers to vent negative emotions to God, who is viewed as a loving person with infinite wisdom and emotional intelligence [64, 65]. Religious persons can also rely on scripture to cope with stressors, as religious texts provide passages for distressed readers to discover a deeper meaning to their hardships, and ultimately reconnect with God [66, 67].

Public religious practices, including attendance at worship services and socializing with co-religionists, have been found to promote similar states. Émile Durkheim recognized long ago the potential for collective religious practices to induce within individual believers a deep sense of social harmony and emotional catharsis, a state he referred to as “collective effervescence” [68]. According to more modern theories, religious social interactions provide opportunities for like-minded believers to cultivate a safe space and shared religious worldview, by which individual stressors can become absorbed and processed among the larger congregation [69, 70]. Religious participants can also call on fellow congregants for emotional support outside of their place of worship, especially in times of crisis or when struggling to cope with a stressor [71]. Consistent with these notions, studies have found cross-sectional and prospective associations between indicators of religious social participation, support, and enhanced subjective well-being and longevity [12, 59, 72–75].

Although few studies have specifically tested links between religious involvement and DHEAS/cortisol levels, research suggests we should find positive associations. First, two studies have found that religious and spiritual practices predict higher DHEAS/cortisol levels, especially for Black Americans reporting greater discrimination [33, 34]. Other work indicates positive effects of mindfulness-based practices on stress-related aging biomarkers, including DHEAS [30–32]. Finally, another study found that religious involvement predicted lower levels of C-reactive protein—a biomarker of chronic inflammation and common symptom of allostatic overload—for Black but not White Americans [76]. While informative, these studies have mostly included worship attendance as the key religion indicator and have not considered the role of beliefs in divine control or private

prayer and religious coping, which is another contribution of our study.

Existential Insecurity Hypothesis

The perspective advanced so far assumes that the health benefits of religiosity will be equal for all groups. But parallel research on religion and health suggests, instead, that structurally disadvantaged groups will benefit disproportionately, especially Black women. According to the *existential insecurity hypothesis*, “feelings of vulnerability to physical, societal, and personal risks” are fundamental drivers of religiosity, which, in turn, provides unique psychosocial resources for people living under recurring threats to security [77, p. 4]. This perspective overlaps conceptually with the “deprivation-compensation thesis” in the sociology of religion, which takes root in Marx’s notion of religion as an “opiate to the masses” [18, 78]. The “resource substitution principle” in medical sociology also suggests that any coping resource will be more valuable for groups who lack viable alternatives [79].

The existential insecurity thesis is unique, however, in its recognition of the distinct value of religious resources for disempowered groups. Indeed, structural disadvantage and insecurity are thought to form reliance on *religious* resources, in particular, due to religion’s unique emphasis on vicarious control and social power through divine agency [57, 62]. In social contexts where efforts at personal control appear futile, the only perceived option may be to “let go and let God,” trusting that things will work themselves out through divine grace [61, 62].

Findings from population-based surveys and experiments support this hypothesis. One nationally representative survey in the US found that sick and financially strained groups were more inclined than their advantaged peers to read religious scripture for insights into attaining health and wealth [67]. Cross-national studies have similarly shown that citizens of countries with fewer social safety nets and higher rates of inequality, like the USA, also tend to be more religious than their peers in egalitarian, social-democratic countries [77, 80]. Experiments have also revealed that people become more inclined to endorse the existence of a controlling deity whenever they are manipulated into feeling their sense of personal control is under threat [81].

Similar patterns have been found between different racial-ethnic and socioeconomic groups. In the 2014 Pew Religious Landscape survey, 83% of Black women were classified as “highly religious,” meaning they indicated that religion was “very important” to them, and they attended religious services at least weekly, prayed at least daily, and believed in God with “absolute certainty.” Meanwhile, 70% of Black men, 58% of White women, and 44% of White men were classified as highly religious [15]. Other studies have shown

that lesser educated groups tend to derive greater mental health benefits from religion [73], especially when grappling with chronic anticipatory stressors [59, 82]. Women also tend to derive greater mental health benefits from religion than men [83, 84]. Likewise, older-age Black Americans, especially Black women and low-SES Black adults, typically report greater mental health benefits from religious involvement than their White or high-SES peers [16–20].

The existential insecurity hypothesis makes two predictions: first, that *levels* of religiosity will be higher among more disadvantaged groups, and second, that the beneficial *effects* of religiosity will also be stronger for more disadvantaged groups. In the current context, we expect to find increasingly higher levels and positive effects of religiosity across groups of White men, White women, Black men, and Black women.

Religious Struggles Hypothesis

Though religion and spirituality are typically associated with improved resilience and health, believers may from time-to-time experience religious and spiritual struggles, defined as “tension and conflict about sacred matters within oneself, with others, and with the supernatural” [85, p. 1]. Religious struggles are now recognized as robust predictors of poor physical and mental health due to the distressing nature of uncertainties in faith [51, 86]. Importantly, evidence also suggests significant variation across racial-ethnic groups, such that White Americans appear differentially vulnerable to religious struggles. For example, a recent study found that White Americans tend to report higher levels and experience worse mental health effects of religious struggles than their Black peers [53]. Another study also found that religious struggles are associated with worse mental health outcomes for White than Black adults [87].

Given the inevitability of faith struggles in the lives of believers, we propose the *religious struggles hypothesis* to account for the possibility that certain expressions of religiosity might exacerbate distress. Moreover, we further contend that Black respondents, by virtue of their more positive relationships with God and co-religionists, will be less likely to experience distress from religious struggles than their White peers. Indeed, studies find that White Americans are more inclined to hold punitive images of God, have negative relationships with co-religionists, and express greater uncertainties in their faith [88–90]. Black Americans, by contrast, are more likely to report close, loving relationships with God [91], who is viewed as an involved person who helps them to overcome marginalization and oppression [75]. African American theologies also typically emphasize how believers can collaborate with God to overcome barriers and daily challenges [92]. Such beliefs in an engaged God are likely to provide a

strong sense of consolation and hope for Black Americans coping with structural racism and oppression [20, 93].

In short, the religious struggles hypothesis is distinct from the existential insecurity hypothesis. The latter hypothesis entails that all groups will benefit from religiosity, but Black Americans, and especially Black women, will derive *greater benefits* than their White (and male) peers. In contrast, the religious struggles hypothesis suggests that religiosity may be *detrimental* for White Americans and only beneficial for Black Americans. Although the current study lacks direct measures of religious struggles, we will infer such struggles from any inverse association between religiosity and DHEAS. This would serve as an indicator of increased psychobiological distress tied to higher levels of religiosity.

Methods

Data

Hypotheses are tested using data from the Nashville Stress and Health Study (NSAHS), a cross-sectional probability survey of Black and White women and men who lived in Davidson County, Tennessee, between 2011 and 2014 ($n = 1252$). Two features of the NSAHS data make them ideal for testing our study hypotheses. First, researchers recruited an equal proportion of Black and White women and men. Stratified cluster sampling techniques were used, with census block groups as the primary sampling units. Fifty-nine percent of contacted persons ultimately agreed to participate in the study. The average interview lasted around three hours. Interviews were computer-assisted and conducted in the respondent’s home or on the Vanderbilt campus. Interviewers were professionally trained and matched to respondents based on race.

Second, respondents also provided specimens for biomarker collection. The morning following the survey interview, trained clinicians visited respondents’ homes to collect fasting 12-hour urine and blood samples. Less than 2% of the respondents refused to provide biomarker data. Respondents received \$50 each for participating in the survey and biomarker phases of the interview. All analyses are also weighted for the probability of selection during the household screening phase and for nonresponse during the interviewing phase. Post-stratification weights are incorporated into the design weight to allow generalizability to Davidson County’s population of Black and White adults [94]. Thus, the NSAHS data provide a unique opportunity to test for racialized and gendered disparities in the psychobiological correlates of religious involvement among a population-based sample.

Measurement

DHEAS/Cortisol Ratio Our main outcome is a biomarker for the ratio of serum concentrations of DHEAS to 12-hour fasting urinary cortisol. DHEAS is measured in micrograms per deciliter of blood ($\mu\text{g}/\text{dL}$). Cortisol is measured in micrograms per liter of urine ($\mu\text{g}/\text{L}$). To calculate DHEAS/cortisol ratios, DHEAS levels are first divided by 10 to match the cortisol scale, and then divided by cortisol levels. Finally, we take the natural log of ratio scores to adjust for extreme skewness and kurtosis [25]. This results in a continuous and normal distribution of logged ratios, ranging from -3.24 to 3.54 and with a sample mean of 0.36 ($\text{SD}=1.06$; skewness= 0.09 ; kurtosis= 3.11). Logged scores can be exponentiated to derive the original ratio. For example, the average NSAHS respondent exhibits $1.43 \mu\text{g}$ of DHEAS per liter of blood, for every microgram of cortisol per liter of urine [$\exp(0.36)=1.43$].

Religious Involvement We gauge religious involvement with seven indicators. First, *perceived divine control* is measured with the following four items: (1) I decide what to do without relying on God (reverse-scored); (2) When good or bad things happen, I see it as part of God's plan for me; (3) God has decided what my life shall be; and (4) I depend on God for help and guidance [19]. Response options range from "strongly agree" ($=4$) to "strongly disagree" ($=1$). We average responses to create scaled scores ($\alpha=0.82$).

We also include three indicators of religious coping, prayer, and religious identity. Religious coping is measured by asking "How often do you turn to your religion or your spiritual beliefs to help you deal with your daily problems?" Response options range from "always" ($=5$) to "never" ($=1$). Prayer is measured by asking "About how often do you pray?" Response choices range from "several times a day" ($=6$) to "never" ($=1$). Religious identity is measured by asking "How religious are you?" Response options range from "very religious" ($=4$) to "not at all religious" ($=1$).

We finally include three indicators of religious attendance, socializing with congregants, and religious social support. The religious attendance item asks "How often do you attend services at a church/temple/synagogue/mosque?" Responses range from "every week or more" ($=6$) to "never" ($=0$). The religious socializing item asks "How often do you see, write, or talk on the telephone with members of your church (place of worship)?" Response choices range from "nearly every day" ($=6$) to "never" ($=0$). The religious social support item asks "How often do people in your church (place of worship) help you out?" Responses range from "very often" ($=4$) to "never" ($=0$).

Race and Gender Categories for race include self-identified, US-born non-Hispanic Black and White. Categories for

gender include female and male. Both indicators are combined to create separate categories for Black women (reference), Black men, White women, and White men.

Covariates Multiple regression analyses include covariates for *age* (in years), *marital status* (1=married, 0=not married), *employment status* (1=employed, 0=non-employed), *college attainment* (1=college/postgraduate degree, 0=less than college), and *household income* (ordinal, 0=no income, 15=\$135,000 or more). We center age and household income on their means in our regression analyses to allow for an interpretable intercept.

Analytic Strategies

Hypotheses are tested within a multiple regression framework using statistical interaction terms. Separate models are tested for each religiosity indicator. In each model, logged DHEAS/cortisol levels are regressed on (1) race/gender dummy variables, with Black women as the reference; (2) the focal religiosity indicator centered on its mean; (3) interaction terms between race/gender and religiosity; and (4) covariates. The non-interacted race/gender coefficients represent average between-group differences in DHEAS/cortisol ratios when religiosity is held at the mean. The non-interacted religiosity coefficients represent associations between religious involvement and DHEAS/cortisol ratios for *Black women*, who are the omitted group. The interaction terms test for average between-group differences in the associations between religiosity and DHEAS/cortisol levels, relative to Black women. The intercept represents single, non-employed, and less than college-educated Black women who are of average age, annual household income, and religiosity.

All statistical analyses are conducted in Stata 14. We use the `sem` package to conduct linear regressions and replace all missing observations with full information maximum likelihood (FIML) procedures using the "method(mlmv)" option [95]. Results are comparable if we use listwise deletion to deal with missing observations. All analyses adjust for post-stratification weights and clustering by census block groups to account for the complex design of the NSAHS and to allow generalizability to the Nashville population of Black and White adults.

Results

Characteristics of the NSAHS Sample

Table 1 reports weighted descriptive statistics of variables. Statistics are reported in separate columns for Black and White women and men. Accompanying these statistics are

Table 1 Weighted descriptive statistics of study variables: NSAHS, 2011–2014

	Black women (<i>n</i> = 330)		Black men (<i>n</i> = 297)		White women (<i>n</i> = 333)		White men (<i>n</i> = 292)				
DHEAS/cortisol ratio	1.08	(2.86)	1.44	(2.67)	*	1.35	(2.61)	*	1.92	(2.95)	***
Perceived divine control (1 = min., 4 = max.)	3.37	(.50)	3.23	(.57)	**	2.94	(.77)	***	2.60	(.88)	***
Private prayer (0 = min., 5 = max.)	4.27	(1.09)	3.64	(1.44)	***	3.54	(1.49)	***	2.76	(1.83)	***
Religious coping (0 = min., 4 = max.)	3.29	(1.12)	3.00	(1.12)	***	2.82	(1.15)	***	2.19	(1.36)	***
Religious salience (0 = min., 3 = max.)	2.07	(.70)	2.01	(.71)		1.88	(.88)	*	1.65	(.97)	***
Religious attendance (0 = min., 3 = max.)	3.89	(1.93)	3.31	(2.06)	**	3.00	(2.21)	***	2.61	(2.32)	***
Religious socializing (0 = min., 5 = max.)	2.21	(1.90)	1.81	(1.76)		1.96	(1.90)		1.55	(1.84)	*
Religious support (0 = min., 3 = max.)	.89	(1.07)	.79	(.97)		.86	(1.03)		.71	(.91)	
Age (in years)	43.77	(11.30)	43.33	(11.57)		44.93	(12.19)		44.29	(11.43)	
Married (vs. not)	.26	(.44)	.46	(.50)	**	.59	(.49)	***	.73	(.44)	***
Employed (vs. non-employed)	.69	(.46)	.72	(.45)		.74	(.44)		.83	(.38)	**
College (vs. less than college)	.24	(.43)	.21	(.41)		.51	(.50)	***	.47	(.50)	**
Household income (0 = min., 15 = max.)	6.41	(3.56)	7.04	(3.66)		9.41	(3.79)	***	10.19	(3.51)	***

Means/proportions are reported with standard deviations in parentheses. NSAHS, Nashville Stress and Health Study

* $p < .05$, ** $p < .01$, *** $p < .001$ difference between Black women (two-tailed)

chi-square and ANOVA tests of between-group differences in means/proportions relative to Black women. Findings are consistent with prior research on racialized and gendered disparities in health, socioeconomic status, and religiosity. We find significant differences in DHEAS/cortisol levels, such that Black women exhibit the lowest levels ($\bar{x} = 1.08$), followed by White women ($\bar{x} = 1.35$), Black men ($\bar{x} = 1.44$), and White men ($\bar{x} = 1.92$). Black women are less likely to be college-educated (24%) than White women (51%) or White men (47%). Black women are the least likely to be married (26%) or employed (69%), while White men are the most likely to be married (73%) and employed (83%). Black women report the lowest average household incomes at around \$25 k–34.9 k ($n = 6$), and White men report the highest incomes at \$65 k–74.9 k ($n = 10$). Finally, Black women are also the most religious group by all indicators, followed typically by Black men, White women, and finally White men.

Multiple Regression Results

Tables 2 and 3 report unstandardized linear regression coefficients with robust standard errors clustered by block group in parentheses. First, the race/gender coefficients reveal the same hierarchical distribution of DHEAS/cortisol ratios found in Table 1. For example, exponentiating the intercept coefficient [$\exp(-0.232)$] in model 1 of Table 2 reveals that average DHEAS/cortisol levels are 0.79 for Black women who are single, non-employed, less than college-educated, and of average age, household income, and belief in divine control. On the other hand, these same levels are around 1.15 for Black men and White women [$=\exp(-0.232+0.375)$] and 1.53 for White men [$\exp(-0.232+0.657)$]. Substantively,

lesser advantaged Black women are the only group, on average, to secrete a larger proportion of cortisol relative to the cortisol-suppressing hormone, DHEAS, which is a potential indicator of hypercortisolism or unabated neuroendocrine stress response [44].

Results are more nuanced after we account for interactions with religiosity. First, we find positive associations between DHEAS/cortisol and divine control ($b = 0.274$; $p < 0.05$), as well as religious coping ($b = 0.099$; $p < 0.05$), for Black women. After exponentiating these coefficients, DHEAS/cortisol ratios are expected to increase by 32% for every one-unit increase in perceived divine control [$\exp(0.274) = 1.32$] and 10% for every ordinal unit increase in religious coping [$\exp(0.099) = 1.10$]. Second, consistent with the existential insecurity hypothesis, the interaction terms tend to follow an inverse hierarchy with the magnitude of associations tapering across Black men, White women, and White men. Finally, although patterns are comparable, we do not find significant between-group associations with the other religion indicators, except for one instance in Table 3 where socializing more frequently with co-religionists is associated with significantly lower DHEAS/cortisol for White than Black women ($b = -0.114$; $p < 0.05$).

Figures 1 and 2 visually confirm patterns for perceived divine control and religious coping. Perhaps the most striking finding in these figures is the DHEAS/cortisol ratios for the *least religious* Black women. Moreover, we should stress that even the *most religious* Black women have lower DHEAS/cortisol levels than Black men, White women, and White men of all religiosity levels. Another interesting finding is that patterns are inverted for White women and especially White men, for whom higher levels of religiosity

Table 2 Linear regression estimates of logged DHEAS/cortisol ratios: NSAHS, 2011–2014 (*n* = 1252)

	Model 1			Model 2			Model 3			Model 4		
	<i>b</i>	s.e	<i>p</i>	<i>b</i>	s.e	<i>p</i>	<i>b</i>	s.e	<i>p</i>	<i>b</i>	s.e	<i>p</i>
Race/gender												
Black women (reference)	–			–			–			–		
Black men	.375	(.092)	***	.332	(.086)	***	.339	(.106)	**	.310	(.098)	**
White women	.370	(.078)	***	.316	(.078)	***	.329	(.082)	***	.284	(.088)	**
White men	.657	(.099)	***	.596	(.100)	***	.602	(.104)	***	.589	(.103)	***
Religious involvement												
Perceived divine control	.274	(.123)	*	–			–			–		
Private prayer	–			.057	(.066)		–			–		
Religious coping	–			–			.099	(.043)	*	–		
Religious salience	–			–			–			.099	(.080)	
Interactions [religion × ...]												
Black men	–.234	(.157)		–.097	(.088)		–.091	(.087)		–.134	(.101)	
White women	–.307	(.155)	*	–.087	(.077)		–.142	(.066)	*	–.286	(.102)	**
White men	–.448	(.140)	**	–.138	(.074)		–.214	(.060)	***	–.278	(.099)	**
Covariates												
Age	–.022	(.003)	***	–.021	(.003)	***	–.021	(.003)	***	–.021	(.003)	***
Married	–.040	(.074)		–.037	(.073)		–.038	(.073)		–.024	(.071)	
Employed	.203	(.095)	*	.201	(.095)	*	.189	(.096)	*	.167	(.097)	
College educated	.014	(.073)		.018	(.073)		.023	(.073)		.043	(.074)	
Household income	–.014	(.010)		–.014	(.010)		–.014	(.010)		–.014	(.010)	
Intercept	–.232	(.100)	*	–.165	(.092)		–.167	(.100)		–.129	(.102)	
<i>R</i> -squared	.131			.130			.131			.138		

Unstandardized coefficients (*b*) are reported with robust standard errors (s.e.) clustered by block group in parentheses. Age, household income, and the religion indicators are centered on their means. NSAHS, Nashville Stress and Health Study

* *p* < .05, ** *p* < .01, *** *p* < .001 (two-tailed)

Table 3 Linear regression estimates of logged DHEAS/cortisol ratios: NSAHS, 2011–2014 (*n* = 1252)

	Model 1			Model 2			Model 3		
	<i>b</i>	s.e	<i>p</i>	<i>b</i>	s.e	<i>p</i>	<i>b</i>	s.e	<i>p</i>
Race/gender									
Black women (reference)	–			–			–		
Black men	.295	(.102)	**	.289	(.093)	**	.294	(.094)	**
White women	.251	(.094)	**	.286	(.083)	**	.288	(.081)	***
White men	.580	(.108)	***	.604	(.104)	***	.620	(.105)	***
Religious involvement									
Religious attendance	.009	(.053)		–			–		
Religious socializing	–			.038	(.035)		–		
Religious support	–			–			.077	(.089)	
Interactions [religion × ...]									
Black men	–.061	(.069)		–.073	(.058)		–.126	(.120)	
White women	–.076	(.060)		–.114	(.047)	*	–.161	(.105)	
White men	–.049	(.060)		–.082	(.047)		–.131	(.111)	
Intercept	–.152	(.110)		–.152	(.100)	.129	–.135	(.097)	
<i>R</i> -squared	.131			.129			.125		

Unstandardized coefficients (*b*) are reported with robust standard errors (s.e.) clustered by block group in parentheses. All religion indicators are centered on their means. Estimates adjust for covariates (not shown). NSAHS, Nashville Stress and Health Study

* *p* < .05, ** *p* < .01, *** *p* < .001 (two-tailed)

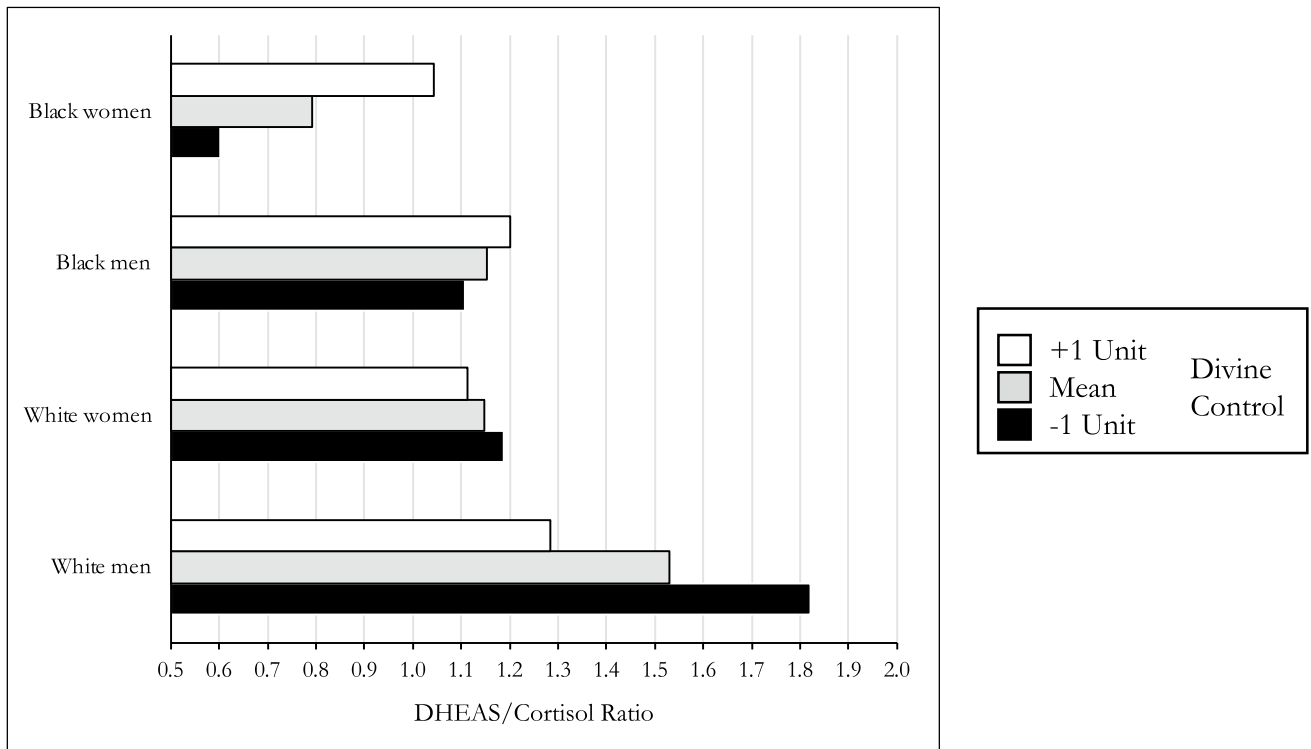


Fig. 1 DHEAS/cortisol by race, gender, and divine control

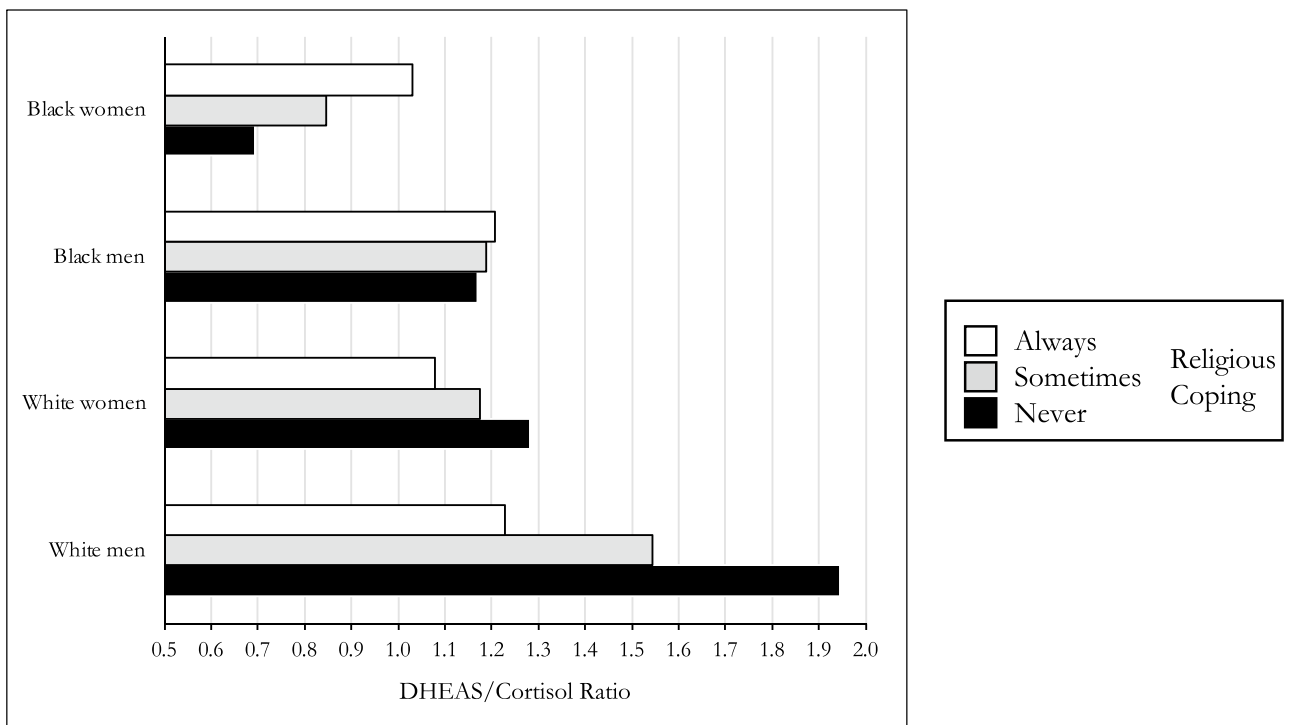


Fig. 2 DHEAS/cortisol by race, gender, and religious coping

predict *lower* DHEAS/cortisol levels, a potential sign of religious struggles and increased distress. We also find essentially null associations between religiosity and DHEAS/cortisol among Black men. We unpack these findings in the discussion to follow.

Discussion

Our study developed and tested three hypotheses. According to the *religious relaxation hypothesis*, dimensions of religious involvement could produce a relaxation response that triggers beneficial antigluccorticoid hormones for all groups, regardless of race and gender. In contrast, the *religious struggles hypothesis* suggests that certain expressions of religiosity could trigger stress. The *existential insecurity hypothesis* further posits that disadvantaged groups will rely on and benefit the most from religious involvement, particularly in terms of stress-coping and health. We tested these hypotheses with data from a representative sample of Black and White women and men in Nashville.

We uncovered three key findings in support of our hypotheses. First, consistent with the existential insecurity hypothesis, levels of religiosity were highest among Black women, followed by Black men, White women, and White men. In further support of the existential insecurity hypothesis, increased religious involvement—particularly divine control and religious coping—also predicted higher levels of the antigluccorticoid DHEAS, relative to cortisol, but only for Black women. Third, we found that these same religiosity indicators predicted *lower* DHEAS/cortisol levels for White women and men, a sign of religious struggles and increased distress.

Why did we only find distinct patterns for divine control and religious coping? As we mention again below, we suggest this could be due to measurement error in our other religion indicators. For example, some work suggests that a person's *expectations* surrounding prayer matter more than the frequency of prayer, per se [96]. Other studies suggest that the *quality* of religious interactions within congregations [97], as well as the specific *types* of social support received by congregants [71], also matter more than the mere frequency of interaction or support.

Our findings could still have broader implications for health inequities in the US. For example, researchers have found that Black women tend to suffer disparate stress burdens and exhibit the poorest physical health profiles of all racial and gender groups, especially when compared to White men [4–11]. Despite these disadvantages, Black women also tend to live longer than White and Black men, and exhibit the lowest rates of suicide and substance use of all groups [2, 3, 98, 99]. Our findings suggest that greater levels and health benefits of religiosity among Black women

could help to explain these patterns, at least in some contexts [21, 22].

This is not to suggest that religion should be prescribed to structurally disadvantaged groups such as Black women. As others have pointed out [67], the fact that religion appears to benefit the health of disadvantaged groups the most could just as easily serve as an indictment of the US, particularly, its preoccupations with individualism and contempt for government welfare spending to benefit marginalized groups. Indeed, as mentioned before, other studies have found that disadvantaged groups residing in social-democratic European countries are less inclined than their US counterparts to rely on religion as a coping resource (Norris and Inglehart 2011; Scheve and Stasavage 2006). For Black Americans, and especially Black women, religious coping resources likewise appear to be crucial for promoting resilience in response to social, legal, and historical oppression in the US [23, 47, 92, 100].

This leads to similar points about potential harmful effects of religiosity. For example, we found no associations between public measures of religiosity and DHEAS/cortisol levels for Black women. As others have argued [101], some religious organizations might implement sexist policies or practices that could create distress for female members. Other studies find that many Black churches, in particular, tend to be male-dominated and oppressive for Black women and other sexual minorities [102–104]. Although we lacked measures to test this hypothesis, the null association between public measures of religiosity and DHEAS/cortisol for Black women at least suggests inconsistent health effects for this group, which deserves attention in future studies.

Why do we find opposite patterns for White women and especially men? Some parallel work in the sociology of religion provides a tentative answer. For one, Black theological traditions have long viewed God as a loving person who interacts with human beings to help them overcome barriers and setbacks [93, 100]. In contrast, White religious practitioners in the Deep South, where our study takes place, are more likely to subscribe to conservative evangelical worldviews that view God as judgmental and punishing, which could trigger religious struggles and distress [18]. Future studies could employ more granular measures of “God imagery” and religious coping to test more nuanced hypotheses about how such beliefs and practices affect White Americans [105].

Limitations

Future work is also needed to address three limitations of our study. First, as mentioned before, decades of research show that religious/spiritual beliefs and practices are complex and multidimensional, with multifaceted effects on the mind and body [13, 55, 56]. Although the NSAHS data provided a

unique opportunity to test novel hypotheses for the psychobiological effects of religious involvement between Black and White women and men, we acknowledge that the religion measures available in the NSAHS are still relatively limited. Future work in this area should incorporate richer measures of religious social interactions [97], religious social support [71], attachment to God [106], and prayer expectancies [96], to name a few.

Second, religious involvement and allostasis are dynamic processes that change with time, yet the NSAHS data are cross-sectional and thereby preclude longitudinal analysis. An emergent research program by Upenieks and colleagues finds that *changes* in religious involvement are associated with subsequent changes in self-reported health outcomes across the life course [82, 107, 108]. However, we still know little to nothing about whether changes in religious involvement predict changes in stress biomarkers across race, gender, or other socioeconomic groups. This seems like an area ripe for future research.

A third limitation of our study is that the NSAHS sample is restricted to Black and White adults living in Nashville, Tennessee, a southern US city with a unique history [109, 110]. A recent study by Erving and colleagues found mixed results regarding the stress-buffering properties of religious involvement among a nationally representative sample of Black women [21]. Although their study relied on self-reported health indicators while our study uses biomarkers, another plausible explanation for the mixed results is that religion could be more salient in the lives of southern Black women, for whom studies show religious involvement is often a major social obligation or “semi-involuntary” practice [111]. Thus, the “semi-involuntary” hypothesis suggests that religion may be even more critical of a coping resource for southern Black women. Future work is clearly needed to identify the sociocultural and political contexts in which religion is more or less protective for the health of Black women and other disadvantaged groups [112].

Conclusion

This study uncovered racialized and gendered disparities in the psychobiological correlates of religious involvement. Perceptions of divine control and private religious coping appeared to enhance the well-being of Black women only, specifically by evoking a relaxation response that boosted circulating levels of DHEAS, an antiglucocorticoid hormone and predictor of reduced morbidity and mortality. In contrast, these same measures predicted *lower* DHEAS levels for White women and men, a sign of distress. Future work is needed to determine whether similar patterns generalize to other religion measures, across the life course, and in other regions, as well as why certain religious beliefs and practices appear to harm the health of White Americans.

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Declarations

Conflict of Interest The authors declare no competing interests.

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