



Mechanisms of Racial Health Disparities: Evidence on Coping and Cortisol from MIDUS II

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Abstract

Objective Blunted patterns of daily cortisol, an indicator of hypothalamic-pituitary-adrenal (HPA) axis stress response system dysregulation, are implicated in poor health outcomes and racial health disparities. It is unknown how coping—an important, but understudied, component of the stress-health disparities relationship—relates to these biological mechanisms of health.

Methods This study investigated relationships, including racial differences, between 12 coping strategies and early-day cortisol changes (diurnal cortisol slopes from peak to before lunch) among 700 35–85-year-old Black and White male participants in the National Survey of Midlife Development in the United States (MIDUS) II. Cognitive-oriented (e.g., positive reinterpretation, denial, religious/spiritual) and behavioral (e.g., stress eating, substance use) coping strategies were examined.

Results Overall, Black and White men used similar coping strategies. Most coping strategies were not associated with men's cortisol slopes. Religious/spiritual coping was associated with steeper (more robust) cortisol slopes among White ($b = -0.004$, $t = -3.28$, $p = 0.001$) but not Black men. Drug use was associated with steeper cortisol slopes among Black ($b = -0.095$, $t = -2.87$, $p = 0.004$) but not White men.

Conclusions This exploratory study increases our understanding of relationships between coping and stress-related biological mechanisms underlying racial health disparities among men in later life. With some notable exceptions, men's coping strategies were not associated with their diurnal cortisol slopes. This suggests that the coping strategies currently used by older Black and White men may not be important factors, as determinants or intervention targets, in disparities in diurnal cortisol slopes and associated health outcomes among men in this age group.

Keywords Health status disparities · Coping skills · Coping behaviors · Men's health · Cortisol · African Americans

Racial disparities in morbidity and mortality among men in the USA are well documented [1]. The average life expectancy for Black men continues to lag behind White and Latino men (71.5 years compared with 76.1 and 79.1 years, respectively), and the gender gap is even wider [2]. Although Black

men share many of the same leading causes of death as other groups, there are notable differences in patterns of health and longevity [1]. For example, chronic diseases are, on average, more severe, poorly controlled, and likely to result in premature death for Black men than for men of most other racial/ethnic groups and for women [1]. Although race and sex, alone and in conjunction, are consistently some of the strongest predictors of health in the USA [3, 4], essential biological and genetic differences related to these characteristics account for a comparatively small portion of documented differences [3, 5]. This suggests that psychosocial and behavioral factors patterned by or linked to race and male gender may be important determinants of men's health [3, 4, 6]. Questions remain about the mechanisms through which these socially defined and meaningful characteristics get “under the skin” to affect men's health and contribute to racial health disparities among men.

A growing body of evidence suggests that stress and coping with pervasive social inequities cause physiological

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deterioration and accelerated aging, including dysregulation of the biological systems involved in the stress response such as the hypothalamic-pituitary-adrenal (HPA) axis [7–11]. This, in turn, is associated with the development of a variety of adverse health outcomes and premature mortality in mid- and later life [12]. Since racial categories serve as proxies for shared experiences of discrimination or privilege [6, 13], the health of socially marginalized groups is believed to deteriorate more rapidly than the health of the dominant racial group, thereby generating racial health disparities that widen with increasing age [14, 15]. Coping is an important, but understudied, component of the stress-health disparities relationship that may intersect with these biological stress processes. The goal of this exploratory study was to investigate whether the coping strategies and behaviors used by midlife and older men account, in part, for biological pathways, specifically HPA axis dysregulation as indicated by diurnal cortisol slopes, implicated in health disparities between US Black and White men in this age group.

Coping and Racial Health Disparities Among Men

A robust literature suggests significant differences in exposure to stressors when comparing Black and White men [4, 6, 11, 13, 16, 17]. Whether Black and White men cope differently is less clear, in part, because the preponderance of research examines coping differences by race or by sex but not at their intersection, especially among men [18]. We know that men tend to cope in ways that are consistent with traditional masculine ideologies (e.g., avoidance and behavioral disengagement, physical activity/inactivity, substance abuse), many of which increase risk for adverse health outcomes [3]. Furthermore, masculine socialization discouraging vulnerability and attention to health may account for why men have been shown to sometimes respond to stressors unconsciously or in ways that they did not identify as “coping” (e.g., stress eating) [19]. The coping strategies men adopt may also reflect their race/ethnicity and the economic, social, and geographic contexts they live in [19]. For example, Black men may rely more heavily on coping strategies consistent with the limited opportunities and resources available in disadvantaged communities, where they are more likely to live, that are also consistent with masculine and racial ideologies (e.g., eating unhealthy comfort foods, religious/spiritual coping, using alcohol or drugs, or smoking) [19, 20]. A deeper dive into within-group (i.e., males) coping differences is necessary to understand the patterning of men’s health and health disparities. If Black men do, in fact, use coping strategies linked to poor health more often than White men, this provides one possible mechanism linking coping to racial disparities in men’s health. Previous research on this topic conducted with mixed sex

samples, however, suggests that race-based differences in coping do not fully account for racial health disparities [20, 21].

Alternatively, or in conjunction, coping may interact with race, as a proxy of social disadvantage, to differentially affect men’s health outcomes. Researchers have developed several hypotheses on mechanisms causing racial health disparities that can be applied to an investigation of how race may moderate the coping-health relationship. The social vulnerabilities hypothesis suggests that Blacks are especially susceptible to harms associated with unhealthy coping strategies [21], while the diminished returns hypothesis suggests that Blacks may also reap fewer benefits from healthy coping strategies relative to Whites [22]. The Blaxter hypothesis proposes that the health of Blacks is largely unaffected by all types of coping, because the poor health of Blacks is predominantly determined by social and structural disadvantage, leaving little variation to be affected by proximal factors such as coping; the health of Whites, on the other hand, may be more amenable to change and affected by coping [23]. Finally, the Environmental Affordances Framework [20, 24] suggests that the same coping strategy may be protective for one health outcome (e.g., mental health) while harmful for another (e.g., physical health), and these relationships may differ by race, thereby complicating common categorizations of coping strategies as either healthy or maladaptive. Empirical findings regarding the social vulnerabilities and Blaxter hypotheses and the Environmental Affordances Framework are mixed [21, 25]. While a moderate amount of evidence supports the diminished returns hypothesis, the premise has been largely tested for economic and psychological assets and not in the context of coping [22].

The Current Study

The purpose of this exploratory study was to examine relationships between coping strategies and diurnal cortisol slopes, including racial differences, among midlife and older (35–85 years old) Black and White US men. First, we documented race-based differences in men’s reported use of 12 coping strategies and behaviors that are commonly included in research examining relationships between coping and health [26] and have been identified as commonly relied upon by men in this age range [3, 19]. We examined individual coping strategies rather than categories, as researchers lack consensus on the dimensions of coping (e.g., problem-focused vs. emotional regulation and adaptive “healthy” vs. maladaptive “unhealthy”) [26] and categorizing coping strategies risks masking subgroup differences. Next, we investigated which coping strategies predicted men’s diurnal cortisol slopes, and then whether race moderated these relationships. Three hypotheses were tested. H1: Black men would report using “unhealthy” strategies accessible in disadvantaged communities (i.e., stress eating, alcohol abuse, drug use, and smoking) more frequently than White men. H2: Coping

behaviors that affect the body through direct pathways (e.g., stress eating, alcohol abuse, drug use, physical activity, smoking) would be more closely associated with diurnal cortisol slopes than cognitively oriented coping strategies (e.g., positive reinterpretation, denial). H3: Compared with White men, Black men would demonstrate weaker associations between diurnal cortisol slopes and healthy coping strategies, but stronger relationships between slopes and unhealthy coping strategies.

Methods

This study used linked participant data from the second waves of the National Survey of Midlife in the United States (MIDUS II) and the National Study of Daily Experiences (NSDE II). MIDUS II (2004–2006) consisted of an interview and self-administered questionnaire that assessed a range of sociodemographic, psychosocial, and health topics. NSDE II (2004–2009) was an in-depth study of daily stressors, cortisol biomarkers collected from saliva, and health indicators [27]. The present study was Internal Review Board exempt because it involved secondary analysis of publicly available, deidentified data.

MIDUS originated with a stratified probability sampling design. MIDUS II included 5555 English-speaking, community-residing adults from the contiguous USA who were between 35 and 85 years old and members of the core sample (i.e., participated in the first wave of MIDUS data collection in 1995–1996) or the Milwaukee African American sample [28]. A random subsample of MIDUS II participants was recruited for NSDE II an average of 21 months after they completed MIDUS II. A total of 2022 participants provided data for NSDE II (78% response rate), and 1735 (85.8%) of these provided saliva samples [27]. For the current study, the analytic sample included the 59 Black and 641 White men who completed the MIDUS II interview and questionnaire and provided sufficient salivary cortisol data for calculating diurnal cortisol slopes. Compared with the analytic sample, the 126 excluded men (i.e., 38 MIDUS II questionnaire non-participants, 104 non-participants in saliva collection, 2 with insufficient salivary cortisol data) were more likely to be Black (17.5% vs. 8.4%), slightly younger (54.6 vs. 57.0 years old), and had lower median household incomes (\$53,875 vs. \$63,250), but were otherwise comparable.

Cortisol Data Collection Salivary cortisol was collected using Salivette kits (Sarstedt, Rommelsdorf, Germany) four times each day for four consecutive days. Participants collected samples upon waking (T1), 30 min later (T2), before lunch (T3), and at bedtime (T4). Salivary cortisol samples were collected using standard procedures used in large-scale epidemiological research [27]. Participants recorded sample collection

times in written logs and nightly telephone interviews (correlation > 0.90) [27]. Luminescence immunoassays measured raw salivary cortisol concentrations in the samples; intra- and inter-assay coefficients were < 5%.

Measures

Diurnal cortisol slopes

Reflected the rapid declining cortisol slope from 30 min after waking (T2), when cortisol levels typically peak, to before lunch (T3). Diurnal cortisol slopes have demonstrated good predictive validity for a variety of health outcomes [12], and early-day declining slopes demonstrate significant Black-White disparities [7, 29]. Although cortisol levels and patterns fluctuate daily, diurnal cortisol slopes are more reliable than other commonly used cortisol measures, especially when data from several days are averaged to increase stability [30]. Accordingly, we averaged slopes (i.e., difference in T2 to T3 cortisol levels divided by time elapsed between sample collection) from the four days cortisol was collected. Raw cortisol values were natural log transformed to adjust for skew prior to slope calculations. More blunted (i.e., horizontal, closer to 0) diurnal cortisol slopes reflect less robust dynamic range, which is an indicator of HPA axis dysregulation [12].

Coping strategies

Examined the following: (1) eight strategies men reported using for the explicit purpose of coping with non-specific stressors, and (2) four coping behaviors men have been shown to both consciously and unconsciously adopt in response to stressors [19]. *Positive reinterpretation*, *active coping*, *planning*, *venting*, *denial*, and *behavioral disengagement* were measured with COPE Inventory subscales; each comprised 4 items [31]. Participants evaluated how often they tended to respond to difficult or stressful events in their lives in specific ways. Cronbach's alphas were positive reinterpretation $\alpha = 0.803$, active coping $\alpha = 0.728$, planning $\alpha = 0.832$, venting $\alpha = 0.801$, denial $\alpha = 0.707$, and behavioral disengagement $\alpha = 0.750$. *Stress eating* was assessed with the same question stem and two items: "I eat more than I usually do," and "I eat more of my favorite foods to make myself feel better." Cronbach's $\alpha = 0.835$ (standardized $\alpha = 0.703$). *Religious/spiritual coping* was assessed with six items asking participants how often they turned to religious or spiritual practices and beliefs to deal with major problems in their lives [32]. Cronbach's $\alpha = 0.897$. *Alcohol abuse* was a dichotomous variable indicating whether participants reported drinking-related problems in the past 12 months, based on a four-item version of the Michigan Alcohol Screening Test (MAST) [33]. *Drug use* was a dichotomous variable indicating whether participants reported using any

illegal drugs or prescription medications without a prescription or inconsistent with instructions in the past 12 months, including sedatives, tranquilizers, stimulants, painkillers, antidepressants, inhalants, marijuana, cocaine/crack, LSD/hallucinogens, and heroin. *Physically active* was a dichotomous variable indicating whether participants engaged in moderate and/or vigorous leisure time physical activity at least several times a week during summer and/or winter (four questions, ≥ 2 questions considered active). *Smoking* was a dichotomous variable indicating whether participants currently smoked. Continuous measures described above were calculated such that higher summed scores indicated more frequent use of that coping strategy and with the same range of possible scores (4–16). Missing item values were imputed using person-mean substitution, which was suitable given the characteristics of this data [34].

Covariates We included sociodemographic and confounding variables consistently associated with diurnal cortisol in previous research and that preliminary analyses indicated meaningfully contributed to our models. Sociodemographic covariates included *age*, in years; *race*, self-reported as Black or White; and highest level of *education attained*, categorized as no high school diploma or GED, high school graduate/GED, BA/BS degree, or advanced or professional degree. Four behaviors were examined as potential confounders when they occurred on cortisol collection days: cigarette *smoking*; *atypical sleep schedule*, indicated by waking before 4 am or after 11 am or being awake > 20 h or < 12 h [35]; use of *medications* that can affect cortisol (i.e., containing steroids or hormones; treatments for allergies, depression, or anxiety); and *protocol non-adherent*, indicated by T3 cortisol values > 10 nanomoles/liter higher than corresponding T2 values, signaling protocol non-adherence (e.g., eating prior to T3 sample collection).

Data Analysis

We conducted exploratory analyses to identify confounding variables, examine missing data, explore variable distributions and conduct appropriate transformations as needed, and ensure we used the most psychometrically sound scales. Multiple imputation was deemed unnecessary due the small amount of missing data (0.6% overall) [36]. We calculated basic descriptive statistics and compared Black and White men in the sample using two-tailed t , χ^2 , and Mann-Whitney tests.

We used a series of ordinary least squares hierarchical regression models to examine racial similarities and differences in relationships between coping strategies and men's diurnal cortisol slopes. We regressed diurnal cortisol slopes on each coping strategy, in turn, accounting for covariates. Model sample sizes varied ($n = 691$ – 700 ; Table 2) based on the number of men who completed items related to each coping strategy. We investigated the moderating role of race by adding interaction terms created by taking products of the race-indicator variable and coping

strategy measures. We adjusted for multiple comparisons with the Benjamini-Hochberg procedure (0.25 false discovery rate) to identify interactions warranting additional investigation [37]. We were willing to accept a high false discovery rate because we intended subsequent simple slopes tests to more accurately identify race-based coping differences associated with men's diurnal cortisol slopes. For the simple slopes tests, we conducting t tests of the slopes divided by their standard errors and used a significance level of $\alpha < 0.05$ [38]. We graphed the interactions with other variables at the sample average, providing a conservative depiction of race-based differences given the differing profiles of Black and White men in the sample (Table 1). Continuous coping measures were graphed at the sample average and at one standard deviation above and below the average.

We conducted sensitivity analyses to determine if findings differed (1) stratified by race; (2) calculated for the subsample ($n = 669$) with complete data on all coping measures; (3) when excluding the smoking control variable; (4) when excluding participants with atypical sleep schedules, medications, or protocol non-adherence; and (5) when taking into account stressor exposure (i.e., Stressful Life Events Inventory, which was created for the MIDUS study, and the Everyday and Lifetime Discrimination scales [40]). Statistical analyses were conducted in SPSS 24 (IBM Corp., Armonk, NY).

Results

Table 1 compares participant sociodemographic and health characteristics by race. The sample included 700 men and was 8.4% Black ($n = 59$) and 91.6% White ($n = 641$). Average age was in the mid-50s. Black participants were slightly younger than White participants, less likely to be married or cohabitating with romantic partners, and lower socioeconomic status across multiple indicators including education, occupational prestige, and household income. Black men reported more stressor exposure, including stressful life events and both everyday and lifetime discrimination, than White men. Black men exhibited more blunted diurnal cortisol slopes than White men. More Black men than White men smoked and reported atypical sleep schedules, but fewer used medications.

Table 2 (middle columns) compares frequency of coping strategies used by race. Men of both races reported more frequent use of planning, positive reinterpretation, active coping, and religious and spiritual coping, but less frequent use of behavioral disengagement, denial, and stress eating. Black men were more likely than White men to report positive reinterpretation, denial, drug use, and smoking, but less likely to be physically active.

Table 2 (right columns) summarizes relationships between different coping strategies and men's diurnal cortisol slopes. In the main effects models, religious/spiritual coping was the

Table 1 Participant characteristics, by race

Characteristic	Black Men M (SD) or %	White Men M (SD) or %	<i>p</i>
Age, in years	54.3 (10.00)	57.2 (12.10)	0.036
Married/cohabitating	62.7	82.8	< 0.001
Educational attainment			
No HS degree/GED	13.6	4.8	0.012
HS degree/GED	66.1	47.0	0.006
BA/BS degree	10.2	30.6	< 0.001
Graduate/professional degree	10.2	17.6	0.203
Employed	57.6	68.3	0.110
Supervisory role, current/last job	31.6	51.7	0.004
Decision autonomy, current/last job ^a	19.4 (6.27)	23.0 (4.85)	0.001
Annual household income, median	\$39,000	\$65,250	< 0.001
Stressor Exposure			
Stressful life events ^b	5.4 (3.11)	3.4 (2.27)	< 0.001
Everyday discrimination ^c	16.6 (7.37)	12.4 (4.42)	< 0.001
Lifetime discrimination ^d	2.8 (2.52)	0.6 (1.29)	< 0.001
Diurnal cortisol slopes	− 0.15 (0.15)	− 0.21 (0.11)	0.004
Smoker	32.2	15.3	0.003
Atypical sleep schedule	28.8	8.7	< 0.001
Medication affecting cortisol	11.9	27.8	0.008
Protocol non-adherent	6.8	4.8	0.526
Total <i>N</i>	59 (8.4%)	641 (91.6%)	

^a Decision Authority Subscale [39] in which scores range from 5 (none) to 30 (a great deal)

^b Stressful Life Events Inventory, created for MIDUS, indicates number of events experienced, out of 27

^c Everyday Discrimination Scale [40] in which reverse-coded frequency scores for up to 9 endorsed items are summed and range from 9 (no daily discrimination) to 36 (often experience all forms assessed)

^d Major lifetime discrimination [40] indicates number of forms experienced, out of 11

only strategy associated with men's diurnal cortisol slopes. In the interaction models, only four coping strategies met the Benjamini-Hochberg multiple comparisons criteria for additional exploratory analyses: religious/spiritual coping, drug use, physically active, and smoking. *Religious/spiritual coping* marginally interacted with race to predict men's diurnal cortisol slopes; however, further investigation using simple slopes tests (reported in Fig. 1a) indicated that higher levels of religious/spiritual coping were associated with steeper (i.e., more robust) diurnal cortisol slopes among White men. The figure depicts the opposite relationship for Black men; although this relationship did not achieve statistical significance, this may reflect power limitations, as the slope for Black men is farther from 0 than the slope for White men. Post hoc analyses indicated that Black men reported more private religious practices such as praying, meditating, or reading religious literature ($t(687) = -2.49, p = 0.013$) and more mindfulness due to religious/spiritual beliefs ($t(684) = -4.27, p < 0.001$). Religious congregation affiliation, Christian identification, and religious service attendance rates were comparable. *Drug use* in the past 12 months interacted with race to predict men's diurnal cortisol slopes. Black men who reported

drug use had steeper diurnal cortisol slopes than Black men who abstained, while diurnal cortisol slopes were comparable regardless of White men's drug use (Fig. 1b). Post hoc analyses indicated that more Black men than White men reported using marijuana (19.0% vs. 5.3%, $\chi^2 = 16.39, p = 0.001$), cocaine/crack (10.2% vs. 0.5%, $\chi^2 = 39.93, p < 0.001$), and LSD/hallucinogenics (5.1% vs. 0%, $\chi^2 = 32.62, p = 0.001$); the groups had comparable rates of sedative, tranquilizer, stimulant, painkiller, antidepressant, inhalant, and heroin use. Assessing the drug types or use characteristics that drove the findings was infeasible due to the small number of Black men in the sample who reported drug use. Additional post hoc analyses of *physically active* and *smoking*, both of which marginally interacted with race, indicated these coping strategies were not associated with either Black or White men's diurnal cortisol slopes (physically active: Black men $b = 0.073, t = 1.93, p = 0.054$; White men $b = 0.003, t = 0.32, p = 0.750$; smoking: Black men $b = -0.044, t = -1.40, p = 0.161$; White men $b = 0.021, t = 1.66, p = 0.097$). *In summary*, with the exceptions of religious/spiritual coping and drug use, the coping strategies examined were either unrelated to Black and White men's diurnal cortisol slopes or too weakly related for

Table 2 Racial differences in men's coping strategies and associations between coping and diurnal cortisol slopes

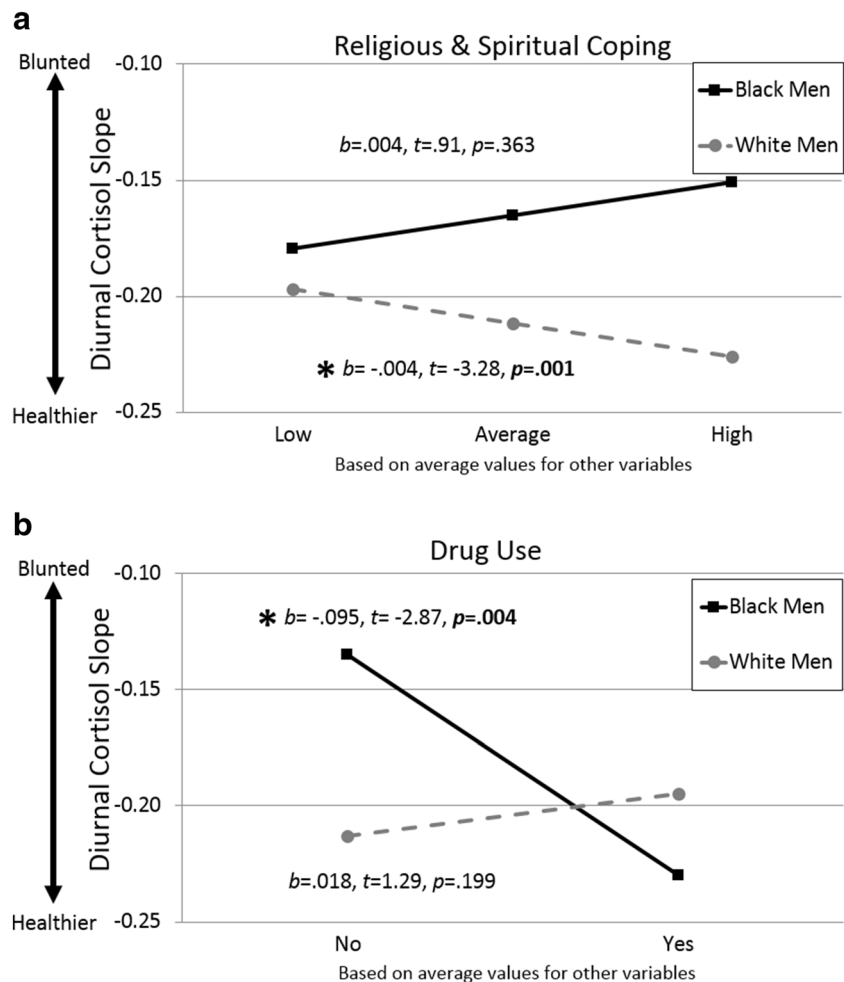
Coping strategy	<i>n</i>	Frequencies			Relationship with diurnal cortisol slopes ^b	
		Black men M (SD) or %	White men M (SD) or %	<i>p</i>	Main effects <i>b</i> (SE), <i>p</i>	Interaction w/ race <i>b</i> (SE), <i>p</i>
Positive reinterpretation	692	12.98 (2.07)	12.13 (2.37)	0.007	− 0.001 (0.002), <i>p</i> = 0.738	0.002(0.007), <i>p</i> = 0.760
Active coping	691	12.53 (2.05)	12.57 (2.13)	0.911	− 0.001 (0.002), <i>p</i> = 0.604	0.002(0.007), <i>p</i> = 0.782
Planning	692	13.32 (2.27)	13.05 (2.32)	0.398	− 0.001 (0.002), <i>p</i> = 0.486	0.002(0.007), <i>p</i> = 0.811
Venting of emotions	691	8.72 (2.78)	8.43 (2.56)	0.411	− 0.001 (0.002), <i>p</i> = 0.506	− 0.005(0.006), <i>p</i> = 0.423
Denial	691	6.75 (2.26)	5.75 (1.89)	0.001	0.001 (0.002), <i>p</i> = 0.540	− 0.001(0.007), <i>p</i> = 0.909
Behavioral disengagement	691	6.64 (2.48)	6.55 (2.17)	0.761	0.002 (0.002), <i>p</i> = 0.324	0.002(0.006), <i>p</i> = 0.740
Stress eating	691	6.87 (3.09)	6.46 (3.07)	0.328	0.001 (0.001), <i>p</i> = 0.444	− 0.005(0.005), <i>p</i> = 0.347
Religious/spiritual coping	694	11.24 (3.37)	10.49 (3.65)	0.128	− 0.003 (0.001), <i>p</i> = 0.012	0.008(0.005), <i>p</i> = 0.074
Alcohol abuse	693	5.1	5.2	1.000	− 0.017 (0.020), <i>p</i> = 0.382	0.048(0.069), <i>p</i> = 0.492
Drug use	698	26.7	11.4	0.002	0.001 (0.013), <i>p</i> = 0.954	− 0.113(0.036), <i>p</i> = 0.002
Physically active	695	19.3	37.5	0.006	0.007 (0.009), <i>p</i> = 0.432	0.070(0.039), <i>p</i> = 0.073
Smoking	700	32.2	15.3	0.003	0.012 (0.012), <i>p</i> = 0.297	− 0.065(0.034), <i>p</i> = 0.055

^b Controlling for age, educational attainment, race, smoking, atypical sleep schedule, medications, and protocol non-adherent

their relationships to be detected in our analyses. *Sensitivity analyses* were generally consistent with presented findings,

though some lacked power to detect relationships at the $\alpha < 0.05$ level. Although smoking was correlated with several

Fig. 1 Relationships between diurnal cortisol slopes and religious/spiritual coping (a) and drug use (b) for Black and White men



coping strategies, removing the smoking control variable from the models did not meaningfully alter results. Differential stressor exposure did not account for or reduce the magnitude of the racial differences detected in relationships between coping and men's diurnal cortisol slopes.

Discussion

This exploratory study provides evidence that the coping strategies and behaviors of midlife and older Black and White US men, with some notable exceptions, may be largely unrelated or negligibly related to men's diurnal cortisol slopes. Diurnal cortisol slopes are an important health outcome, as they provide an objective indicator suggestive of biological stress response system dysregulation that is associated with amplified risk for chronic disease and premature mortality [7, 12]. Accordingly, findings suggest that the coping strategies currently used by older Black and White men may not be important factors, as determinants or targets for intervention, in racial disparities in diurnal cortisol slopes among men in this age group.

Black and White men reported comparable use of most of the coping strategies and behaviors examined; therefore, hypothesized race-based differences in coping (H1) were generally unsupported. Compared with White men, Black men reported greater use of some “unhealthy” strategies accessible in disadvantaged communities (i.e., drug use, smoking), but not others (i.e., stress eating, alcohol abuse). Only one coping strategy that differed by race was also associated with men's diurnal cortisol slopes: drug use. Drug use was more frequently reported by Black men, but was also associated with steeper cortisol slopes, thereby potentially functioning to narrow racial disparities rather than contribute to them. In summary, differential reliance on the coping strategies examined in this study did not account for racial disparities in men's cortisol slopes.

All but two coping strategies were not associated with the diurnal cortisol slopes of either Black or White men, incompatible with study hypotheses (H2 and H3). Though this study examined only 12 coping strategies and behaviors, many of these feature prominently in literature on relationships between coping and health [26] and have been identified as commonly relied upon by men in this age range [19]. Findings were not consistent with (1) academic and popular categorization of some coping strategies as healthy and others as unhealthy; or (2) the idea that coping strategies affecting the body through more direct pathways would demonstrate stronger relationships with diurnal cortisol slopes than more cognitive-oriented strategies (H2). Although testing theoretical models linking coping to health disparities [20–24] was not the goal of this study, these ideas informed H3, which was not supported due to the predominantly null findings.

An important consideration in interpreting the findings is the sample's midlife and older age range. Given that, on average, Black men demonstrated more blunted diurnal cortisol slopes than their White counterparts, it seems plausible that Black men's HPA axis systems were deteriorated to the extent that their diurnal cortisol slopes were largely unaffected by coping [8, 41]. If this was the case, however, we would expect to detect more relationships between coping and White men's relatively steeper cortisol slopes than we did. Rather, study findings imply that this component of the biological stress response systems of both Black and White men in the latter half of the lifespan was not meaningfully affected by coping, either positively or negatively. This is consistent with the idea that racial health disparities are rooted in fundamental factors (e.g., social inequities), and more proximal factors (e.g., coping) have little effect on distributions of health within the population [42, 43]. An alternative, but not incompatible, perspective grounded within a stress and coping framework is that differential exposure to stressors, patterned by race, shapes adult health and resultant health disparities, including health indicators such as men's diurnal cortisol slopes [44]. Another plausible explanation for the null study findings is that early life experiences determine adult diurnal cortisol slopes [42]. Several of these processes may also function in conjunction. Testing temporal relationships between exposure to stressors, coping, and later life diurnal cortisol slopes was outside the scope of this study. Additional insight into how age influences relationships, or lack thereof, between coping and men's diurnal cortisol slopes may be gained by replicating this study with younger cohorts or using longitudinal data collected across the life course. Although the specific mechanisms underlying study findings cannot be determined, this study provides clear evidence that interventions prioritizing enhancing older men's coping skills and resources are unlikely to alter diurnal cortisol slopes or slope disparities within this population.

The seemingly protective nature of religious/spiritual coping for White men's diurnal cortisol slopes and suggested inverse relationship for Black men was unanticipated. This runs counter to previous literature documenting (1) the importance of religion for Black Americans' health [45] and (2) positive relationships typically found between religion and health outcomes [46, 47]. Scant research, however, has examined these relationships at the intersection of race and male sex. Perhaps religious/spiritual coping is more effective than the other coping strategies we examined, but the HPA axis systems of the older Black men in this study were too impaired to benefit. Alternatively, findings may reflect the different types of stressors White and Black men face: religious/spiritual coping may effectively buffer against transient and resolvable stressors, experienced by both groups of men, but not chronic, intractable stressors rooted in social inequities, disproportionately experienced by Black men [13].

Drug use was linked to steeper diurnal cortisol slopes among Black men. This contradicts commonly held beliefs about the dangers of drug use, which is typically considered an “unhealthy” coping strategy. Biological systems involved in the stress response are affected differently depending on the frequency and types of drugs used [48]. Exploring what drug use characteristics may have driven our findings related to the HPA axis was infeasible and outside the scope of the current study. For this reason and others, more in-depth research is needed before the findings can be translated into recommendations. In the meantime, a harm reduction approach to drug use is advised for healthcare providers serving Black men, as this study indicates that the relationship between drug use and Black men’s health may be more complex and poorly understood than previously recognized.

Findings should be interpreted in light of limitations. First, responses to coping items may have been biased by social desirability or discordance between how men believed they coped versus how they actually coped. Measures also may not have captured subtle race-based differences in men’s interpretation of certain coping strategies. For example, the nature of venting may differ by race, because venting has more negative consequences for Black men than White men [49]. More nuanced alternatives to the dichotomous measures may also provide additional insight (e.g., distinguishing between regular and occasional drug users). Second, lifestyle and measurement factors can bias diurnal cortisol slopes, which demonstrate only moderate stability [30, 50]. To mitigate these shortcomings, we controlled for confounding factors including several measures of stressor exposure, averaged slopes over 4 days, and conducted a series of sensitivity analyses. Finally, sample size and characteristics constrained our analyses and the generalizability of the findings. We were unable to include comparisons with men of other races/ethnicities because of insufficient subsample sizes in the dataset. The modest subsample of Black men may have prevented us from identifying coping strategies with weak relationships to Black men’s cortisol slopes (e.g., possibly smoking or being physically active). On the other hand, this also meant that any statistically significant parameters in our analyses represented sizable racial differences or effect sizes. Overall, the absence of detectable relationships in most of the main effect and race moderation models suggests that current coping strategies were unrelated, or so weakly related as to evade statistical detection, to older men’s cortisol slopes. Findings were not weighted to be nationally representative given the variety of sampling strategies used for the MIDUS II core, Milwaukee oversampling of Blacks, and NSDE II. The generalizability of the findings is further limited by the disproportionate number of Black and low-income men excluded from the analytic sample due to missing data; it is unknown whether and how these men may have differed from those included in the study. For all of these reasons, collecting data for assessing relationships

between coping and diurnal cortisol patterns among larger subsamples of Black men and nationally representative samples is essential to confirm and build on the findings from the current study.

In summary, this exploratory study enriches the literature on relationships between coping and stress-related biological mechanisms underlying racial health disparities among older Black and White men and alludes to the potential advances in understanding men’s health and health disparities that may result from expanded biomarker research, particularly with larger, nationally representative samples. With some notable and unanticipated exceptions, men’s reported coping strategies were not associated with their diurnal cortisol slopes. This provides further evidence that factors other than how midlife and older men currently cope warrant additional investigation and prioritization in efforts to understand and reduce Black-White disparities in diurnal cortisol slopes and associated health outcomes among men.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Research Involving Human Participants and/or Animals The present study was Internal Review Board exempt, because it involved secondary analysis of publicly available, deidentified data.

The MIDUS study, from which the data used in the present study were drawn, performed all study procedures involving human participants in accordance with the ethical standards of the University of Wisconsin Institutional Review Board and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the MIDUS study.

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