Title: Is Exposure Enough? Race Differences in Chronic Stress Exposure, Appraisal & Mental Health among Older Adults

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Abstract

Exposure to stressors is differentially distributed by race/ethnicity with minority groups reporting higher stress burdens than their white counterparts. Prior research and theory have suggested that exposure to objectively stressful events contributes to race/ethnic mental health disparities in older adulthood. Yet, in order to understand the extent to which some groups bear a disproportionate stress and mental health burden we need to consider race/ethnic differences in stress appraisal, specifically how upsetting they may be, in addition to stress exposure. We examine racial/ethnic differences in the number of reported chronic stressors across 5 domains (health, financial, residential, relationship and caregiving), their appraised stressfulness and their varying association with anxiety and depression among a diverse sample of older adults. Data come from 6,019 adults ages 52+ from the 2006 Health and Retirement Study. Fully adjusted OLS models show that greater stress exposure and appraisal significantly and independently predicted more anxiety and depressive symptoms. Race and stress exposure interactions show that as exposure to stressors increase, blacks report a greater number of anxiety symptoms relative to whites. Moreover, when blacks consider stress not upsetting they report similar number of depressive and anxiety symptoms as whites. Comparatively, when blacks consider their stress exposure as either somewhat or very upsetting they report significantly more depressive symptoms relative to whites. These findings suggest stress appraisal measures a different and independent construct from stress exposure and both have varying consequences for the mental health of whites and blacks. The distinction between exposure and appraisal based measures of stress shed light on important pathways in which stress differentially contributes to race/ethnic mental health disparities.

Introduction

Stress theories have positioned stress exposure as a foundational component in the manufacturing of social inequalities in health. The differential exposure hypothesis posits that racial and ethnic minorities, and blacks in particular, look worse on major health outcomes since they are exposed to greater levels of stress (G. W. Brown & Harris, 1978; Kessler, 1979b). Similarly, the stress process model suggests social and economic stratification result in varying exposure to stressors, which explain population differences in health (L. I. Pearlin, 1989). National surveys have embedded theories centering on differential stress exposure into how we measure stress in populations with the bulk of empirical evidence demonstrating that race/ethnic differences in health are determined by the degree to which individuals are exposed to a set of objective life stressors. However, this work entirely overlooks the stress appraisal process or an individual's evaluation of how upsetting a given stress exposure is. In contrast, psychological stress models emphasize that experiencing the same event can be stressful for some individuals but not for others (Cohen, Kessler, & Gordon, 1995; Cohen, Gianaros, & Manuck, 2016). In psychological models of stress, the appraisal process is a primary mechanism through which stress exposure operates to impact more distal health outcomes (McEwen, 1998). Further evidence suggests blacks may respond to stressors differently than whites, suggesting the stress experience depends on culture, individual meaning, and the context in which the stressor exposure occurs (Brown, Mitchell, & Ailshire, 2018). Importantly, there is a lack of research in the health disparities literature that has examined whether both race/ethnic variability in stress exposure and appraisal differently impact health and wellbeing in old age.

A persistent quandary among stress researchers is that racial/ethnic minorities tend to report more exposure to stressors compared to whites, but don't exhibit the expected increase in

psychological distress. For instance, researchers have found seemingly paradoxical evidence showing lower rates of stress-related psychopathology, such as depressive and anxiety disorders, among blacks relative to non-Hispanic whites, despite large disparities in stress exposure and physical health in mid and late life (Mezuk et al., 2013). Although it may seem counterintuitive for groups experiencing more stressors to have similar, or better, mental health these patterns may reflect important differences between experiences of acute and chronic stressors and between exposure and appraisal that have yet to be fully examined in the stress disparities literature. The limitations in the stress literature, and with stress measurement focused primarily on exposure, maybe why prior work has been unable to explain the mental/physical health paradox in blacks relative to whites (Williams, Yan, Jackson, & Anderson, 1997). This paper will examine how race differences in chronic stress exposure and stress appraisal are differentially related to anxiety and depressive symptoms in older whites and blacks. Importantly, this work will use a more comprehensive measurement of chronic stress while also examining exposure and appraisal across five life domains: health, financial, residential, relationship and caregiving strain to determine the impact of these stressors on black and white older adults mental health.

Background

Much of the empirical work examining race/ethnic differences in stress in nationally representative surveys only focus on objectively verifiable exposures and life situations such as the death of a spouse or living in poverty (Lazarus & Folkman, 1984; Park & Folkman, 1997; Pearlin, 1989; Thoits, 1995). For example, the focus of prior research examining the relationship between race, stress and mental health in older adults has used check lists of negative life events (see Kraaij, Arensman, & Spinhoven, 2002 for a review). These studies rely on the assumption

that standardized lists of events that researchers have conceptualized as stress are perceived similarly by individuals or members of different groups. Yet, even the earliest definitions of stress by Lazarus and Folkman (1984) indicate that the degree to which a situation is perceived as threatening and elicits stress is a psychological process that is a function of the individuals appraisals of the stress experience. All major subsequent conceptualizations of the stress process also acknowledge that responses to stressors depend on their meanings to the person which is linked to an individual's personal and social history (Cohen, Kamarck, & Mermelstein, 1983; Williams et al., 1997). Individuals experience stress in the context of different personal and environmental resources that shape the stressfulness of a life experience. Yet, the empirical work examining the stress process has embedded potentially shallow or incorrect relationships between stress exposure and health, suggesting stress is experienced uniformly across race/ethnic groups. Incorporating context and appraisal in stress measurement are critical for a full appreciation of life stressors on health and wellbeing.

If stress exposure is hypothesized to be a major contributor to race/ethnic differences in health in older adulthood, it would follow that stress appraisal measures may contribute to our understanding of the manufacturing of health inequity. Stress exposure, theoretically, should lead to endorsement that that exposure is stressful, or an imbalance between the demands of a stressor and the resources of the individual to deal with the stressor. Therefore, stress has at least two components: 1) exposure to the stressor and 2) the perceived demands of the stressor or ability to cope, leading to a corresponding appraisal of whether or not the stressor is distressing. In light of this understudied appraisal processes, the differential vulnerability hypothesis aims to incorporate race/ethnicity and perceived stressfulness into health disparities literature. The differential vulnerability hypothesis posits that, where there are equal levels of stress exposure,

minority groups and blacks in particular, react more strongly to stressors since more vulnerable groups have fewer social and personal resources to buffer the negative effects of stress on health (Brown & Harris, 1978; Kessler, 1979a). Individuals with the dual burden of socioeconomic disadvantage and race-related stressors may be at even greater risk since they have limited access to psychosocial and material coping mechanisms (Myers, 2009). For example, two studies examining race differences in exposure and vulnerability to stressful life events found both greater exposure and psychological distress among low SES nonwhites (Kessler, 1979; Ulbrich, Warheit, & Zimmerman, 1989). These theories and a handful of prior studies would suggest that racial/ethnic minorities are disproportionately exposed to various social stressors (e.g.,poverty, discrimination) that place them at higher risk of poor mental health.

However, minority status, despite being related to experiences of prejudice, discrimination, greater stress exposure and lower SES, is also a source of psychosocial resources, such as a collective racial identity (Sellers & Shelton, 2003) and larger and more supportive religious and social networks (Mouzon, 2017; Thoits, 1995) that can protect against the effects of chronic stressors (Kessler & Neighbors, 1986). Thus, it may be that racial/ethnic minorities are more prone to stress exposure, have less access to resources related to SES, but have adapted better coping mechanisms and have access to other psychosocial resources that leave them better able to manage both the emotional and physical consequences of adversity in later life relative to their white peers. Prior empirical evidence has shown that older blacks appraise stress less upsetting (Brown et al., 2018) and report less general and domain specific distress. For example, the caregiving literature suggests there is racial/ethnic variation in perceptions of caregiving as a stressor. The emotional effects of ongoing caregiving strain will undoubtedly differ depending on the availability of financial resources to cope with the responsibilities, the ability to take time off work to care for

that person, and the meaning of caregiving for that individual. African Americans have been shown to view caregiving as less burdensome than their white counterparts, largely due to differences in culture (Roth, Dilworth-Anderson, Huang, Gross, & Gitlin, 2015). Status based characteristics, including race, affect the psychological and behavioral responses to stress. Blacks facing chronic adversity may be driven to reorganize their outlook on life (Epel, 2009). In the course of coping with chronic stress, people often develop cognitive shifts or changes in their mental filter that promote a more beneficial stress appraisal process. Consequently, attributions related to the stress exposure should be distinguished from those relevant to the individual's perceptions of stress since stress exposure may not manifest uniformly across groups (Amirkhan, 1994; Harrell, 2000). More stress exposure but lower stress appraisal may result in minorities and blacks in particular exhibiting less stress related psychopathology, a potential explanation for the white-black paradox in mental health. Stress exposure and appraisal measure different constructs particularly in minority older adults who have adapted to stress exposure differently.

Appraising acute events as stressful is a common reaction to environmental adversity and illicit a stress response that subsides in a relatively short amount of time that are unlikely to pose long-term risk. Chronic stressors, or ongoing strains that are persistent and enduring, are less understood since these strains may put older adults in a constant state of arousal that is built into the social environment, often preventing them from ever biologically or psychologically habituating (Herbert & Cohen, 1993; Lepore, 1995; L. I. Pearlin, 2010). Chronic stress may be a particularly important kind of stress for capturing the prolonged experience of stress exposure that, if unaddressed, may result in anxiety and depression. Since chronic stressors tend to surface within major social and role domains such as financial stability, employment and family, they can elicit a prolonged stress response, leading to psychiatric illnesses such as depression and

anxiety disorders. Prior work has suggested chronic stressors rather than life events were found to be of primary importance in explaining the social distribution of psychopathology (Turner, Wheaton and Lloyd 1995), making them central to investigating race/ethnic differences in anxiety and depression. Further, chronic stress exposure and appraisal may have unique relationships with anxiety and depression since not all individuals exposed to stress will develop anxiety or depressive symptoms. Perhaps because those who appraise their stress as not distressing or successfully cope with chronic stress do not end up developing psychopathology, which may also vary by race/ethnicity.

Unlike other physical comorbidities, both anxiety and depression are based on subjective reactions or appraisals to an individuals' conditions that they interpret as threatening or distressing. Therefore, anxiety and depressive symptoms are often influenced by factors that shape both an individuals' stress exposure and appraisal, chief among them perceptions and interpretations of their reality. Anxiety and depression are related conditions that the social stress literature often treats as interchange outcomes. Still anxiety and depression are very different experiences with different relationships to both stress exposure and race/ethnicity. Work by Anhensel (1992) demonstrates how studies that use a single outcome can misrepresent the extent of group differences in mental health when different groups have distinct reactions to stress. While the literature suggests that depression may be the result of long-term anxiety (among other factors), a threat appraisal without the belief that effective coping responses are available is experienced as stress which engenders emotional responses including worry, fear and anxiety (Cohen et al., 2016). The degree to which stressors are depressing, on the other hand, are that they erode an individual's self concept, diminishing self esteem and mastery. People typically endorse depressive symptomology since they have diminished resources in the face of chronic

strains, precisely when they need it the most (Pearlin, Lieberman, Menaghan, & Mullan, 1981). There is a potential for reverse causation since depression and anxiety in and of themselves are sources of chronic stress. Yet, prior longitudinal work has maintained a pathway that starts with chronic stress exposure rather than anxiety and depressive symptoms. Thus, examining race differences in chronic stress exposure, appraisal and anxiety and depressive symptoms can help us understand how chronic stress exposure and appraisal are differently linked to mental health, and potentially inform the ways in which whites and blacks experience stress and how these stressors differently manifest in mental health disparities in older adulthood.

Despite the well-documented association between stress exposure and health, prior work has yet to connect appraisal measures to mental health in diverse nationally representative samples of older adults. No comprehensive body of research examines the role of chronic stress exposure and appraisal as independent mechanisms in producing population differences in depression and anxiety symptoms. Thus, we examine whether stress exposure and appraisal have independent effects on anxiety and depressive symptoms among black and white older adults. We also examine the domains of chronic stress that are associated with more anxiety and depressive symptoms for blacks and whites. We are testing how stressors exert their inimical effects on mental health and why these effects are stronger for some people than others, with the possibility that stress appraisal may exert a protective influence on mental health if an individual's perceives stress as not upsetting in the presence of general and specific chronic stressors. This work may help us understand the mechanisms that link chronic stress exposure and appraisal to anxiety and depressive symptomology but may also inform efforts to improve or understand resilience in the face of chronic strain among older adults

Methods

Data come from the nationally representative Health and Retirement Study (HRS), an ongoing biennial study of U.S. adults age 51 and older that began in 1992 with the aim of improving our understanding of the social, economic, environmental, and behavioral factors associated with aging and the health of older adults. In 2006, the HRS began collecting data on chronic stress using a self-administered questionnaire (SAQ) given to a random half-sample of non-institutionalized respondents who were selected for a face-to-face interview. The SAQ had a 90% completion rate, leaving 7,168 cohort eligible SAQ respondents (Smith et al., 2013). We excluded 665 respondents who did not identify as white or black. Finally, 484 respondents (7.4%) were excluded who were missing on stress measures resulting in a final analytic sample of 6,019 adults with complete data on all measures assessed.

Anxiety

The HRS used five items from the widely used Beck Anxiety Inventory (BAI) in the SAQ (Brenes, et al; 2005). The Beck Inventory has been shown to distinguish symptoms of anxiety from depression and to be valid for use in older populations. Respondents were asked how often did they feel this way during the past week: fear of the worst happening, nervous, hands trembling, fear of dying, felt faint. Respondents could choose 1= *never*, 2= *hardly ever*, 3= *some of the time*, or 4= *most of the time* and respondents were told "The best answer is usually the one that comes to your mind first." Responses to the items are averaged to form an index of anxiety (range= 1 to 4) and respondents were considered missing if more than two of the four items had missing values.

Depression

The HRS uses the abbreviated version of the Center for Epidemiologic Studies – Depression Scale (CES-D; Radloff, 1977) with eight yes/no items from the original 20-item CES-D and has been validated for use with older adults (Beekman et al., 1997). Respondents were asked if they had experienced the following items in the past week: depressed, everything was an effort, restless sleep, happy, lonely, enjoyed life, sad, and could not get "going." Two items (happy, enjoyed life) are reverse-scored and responses were summed (range= 1 to 8).

Ongoing Chronic Stress

We measure total chronic stress exposure (Aldwin, Sutton, Chiara, & Spiro, 1996; Troxel, Matthews, Bromberger, & Sutton-Tyrrell, 2003) using a count of the number of chronic stressors respondents reported experiencing (range: 0-7) during the last twelve months or longer. We include the following stressors based on respondents self reports (yes/no): ongoing health problems (in yourself), physical or emotional problems (in spouse or child), problems with alcohol or drug use in family member, financial strain, housing problems, problems in a close relationship, and helping at least on sick/limited/frail family member or friend on a regular basis. An item about assessing ongoing problems in the workplace was excluded from our analysis since more than 60% of respondent are retired or out of the labor force.

We also created a stress appraisal scale by averaging across responses of how upsetting each of the seven stressors was among respondents who experienced at least one stressor (range: 1-3; α=0.75). Respondents who reported exposure to a chronic stressor could rate that stressor as 1= *not upsetting*, *2= somewhat upsetting*, or *3= very upsetting*. Stress appraisal was dichotomized as somewhat or very upsetting versus not upsetting when examined by domain.

Sociodemographic variables

Race/ethnicity was self reported and respondents were classified as non-Hispanic white, and non-Hispanic black. We include sociodemographic and socioeconomic factors that might be related to race/ethnic differences in stress exposure and appraisal. Age is measured as a continuous variable in years. Gender was dichotomized as male or female. Educational attainment was measured using number of years of completed schooling. Employment status was categorized as currently employed either full or part time, unemployed/not in the labor force, and retired. Total household income is log transformed and wealth (assets minus debts) is quartiled because these variables were highly skewed. Marital status was categorized as married/partnered, divorced/separated, widowed, and never married.

Analytic Strategy

We used OLS regression models to examine 1) race differences in anxiety symptoms, 2) the predictive capacity of chronic stress exposure and appraisals on anxiety symptoms, and 3) whether chronic stress exposure or appraisal interacts with race differently effecting anxiety and depressive symptoms. In the same three model progression, we then examine race, stress exposure and appraisal on depressive symptoms. Finally, using OLS regression models, we predict mean anxiety and depressive symptoms by each domain of chronic stress exposure and their corresponding stress appraisals (health, financial, housing, relationship, caregiving) for whites and blacks separately. All analyses are weighted using the self-administered questionnaire sample weights, which adjust for differential probability of selection and response rates and produce estimates representative of the older U.S population. We account for the complex sample design using the SVY suite of commands in Stata 13.1.

Results

Table 1 presents weighted demographic and socioeconomic characteristics for the full sample and by race. The mean age in the sample was 65.4 (range: 52-102). Women make up about 54% of the sample, 91% were white and the mean level of education was 13.2 years (range: 0-17). The mean logged household income for the sample was 10.7 and the wealth distribution of the sample is similar to and reflects its majority white composition. Nearly 53% were retired and 69% were married or partnered. When looking at the sample characteristics by race/ethnicity, whites on average were older, more educated, and had higher incomes and wealth than their black counterparts. On average, blacks had a higher level of ongoing chronic stress exposure (2.7) relative to whites (2.1), but they also had a lower average stress appraisal (1.6) or considered their stress as less upsetting than their white peers (1.7). Blacks, report slighter higher anxiety symptomology but similar depressive symptomology relative to their white peers.

To determine race/ethnic, stress exposure, and appraisal differences in anxiety symptoms, Table 2 shows results from OLS regression models. Model 1 shows race and chronic stress exposure are positively associated with anxiety after adjusting for age and gender. Anxiety symptoms increase with the number of chronic stress exposures (Model 1: β =0.14, SE=0.01; $p<0.001$) and blacks report more anxiety symptoms compared to whites (Model 1: β =0.12, SE=0.03; $p<0.001$). To determine if SES or demographic measures account for race differences or the association between stress exposure on anxiety, Model 2 adds education, income, wealth, employment and marital status. After adjusting for SES and demographic measures, results remain stable for chronic stress exposure (Model 2: β =0.13, SE=0.00; $p<0.001$) while black-white differences in anxiety are attenuated (Model 2: β =0.04, SE=0.03; $p>0.05$). Race and stress exposure interactions in Model 3 show differences in anxiety symptoms vary by the number of stress exposures reported for whites and blacks in fully adjusted models (Model 3: β =0.04,

SE=0.01; p<0.01). Figure 1 graphs the interaction from model 3 showing that if blacks report no stress exposure or only report exposure to one chronic strain they report similar anxiety symptom relative to whites. Yet, when blacks report being exposed to two or more stressors they report more anxiety symptoms relative to their white peers who are exposed to the same number of chronic strains.

Table 2 shows the same three model progression in predicting anxiety symptoms, except now we examine stress appraisal, adjusting for total chronic stress exposure. Results show that, on average, stress appraisal is positively associated with anxiety symptoms (Model 1: β =0.19, SE=0.02; p<0.001) such that as stress appraisal increases so do anxiety symptoms net of chronic stress exposure. Results were robust after adjusting for sociodemographic measures in model 2 (Model 2: β =0.18, SE=0.02; p<0.001). However, Model 3 shows that the race by stress appraisal interaction was not significant suggesting increases in anxiety symptoms with higher levels of stress appraisal are not different for whites and blacks. Figure 2 graphs the interactions, showing race/ethnic differences in anxiety by stress appraisal or considering stress not upsetting, somewhat or very upsetting. As stress appraisal increases, the black-white differences in anxiety symptoms increase but these differences were not significant.

Next we examined race, stress exposure and appraisal differences in depressive symptoms in Table 3 using the same model progression. Model 1 shows that chronic stress exposure is positively associated with depressive symptoms (Model 1: β=0.36, SE=0.02; p<0.001) and blacks report higher levels of depressive symptoms compared to whites (Model 1: β=0.53, SE=0.10; p<0.001). After adjusting for our demographic and SES measures, chronic stress exposure remains robust (Model 2: β=0.32, SE=0.02; p<0.001) and race differences were attenuated (Model 2: β=0.11, SE=0.09). Different from our findings on anxiety symptoms,

Model 3 show the interaction between race and stress exposure is not significant (Model 3: β=0.05, SE=0.06) and Figure 3 graphs the interaction term suggesting depressive symptoms increase similarly with number of stress exposures for blacks and whites.

Table 3 also shows the same model progression focusing on stress appraisals. Model 1 shows stress appraisal is a significant predictor of depressive symptoms (Model 1: β=0.85, SE=0.05; p<0.001). After adjusting for covariates, appraisal remains a robust predictor of depressive symptoms (Model 2: β =0.81, SE=0.05; p<0.001). Unlike anxiety, Model 3 shows that the race by stress appraisal interaction is significant (Model 3: β =0.32, SE=0.15; p<0.05). Figure 4 graphs the interaction from model 3 showing black-white differences in depressive symptoms increases with higher stress appraisal or considering stress exposure very upsetting. The biggest black-white disparity was among whites who reported chronic stress exposure as 'very upsetting' reported an average of about 2.5 depressive symptoms while blacks who consider their stress exposure 'very upsetting' reported an average of 3.1 depressive symptoms.

Finally, we show predicted means for both anxiety and depressive symptoms by chronic stress domain for whites and blacks separately to determine what types of stressors are associated with high levels of anxiety and/or depression for each race group. We present mean anxiety and depressive symptoms for those who report being exposed to the stress domain and for those who also reported that stress domain as somewhat or very upsetting (versus considering it not upsetting). Overall, blacks report more anxiety and depressive symptoms across stress exposure and appraisal domains. The stress domain that induced the highest reports of anxiety and depression among older adults was residential strain. Residential strain was also the only domain in which blacks and whites who reported being exposed and upset by this stressor reported similar levels anxiety and depressive symptoms.

Discussion

This study is the first to examine race differences in chronic stress exposure and appraisal as principal but independent mechanisms contributing to mental health disparities in a diverse sample of older adults. Most empirical evidence at the population level only focuses on race differences in stress exposure and its connection to mental health. However, this paper is innovative in that it provides a more nuanced understanding of how race differences in the appraisal of ongoing chronic stressors uniquely contribute to national differences in anxiety and depressive symptoms among older adults. It is also the first study to disentangle the type or domain of chronic stressor(s) that are most consequential for mental health outcomes. Consistent with prior research, we found that stress exposure is an important predictor of both anxiety and depressive symptoms for older adults. This seemed to be a dose response effect, demonstrating that as stress exposure increased so did anxiety and depressive symptoms for older blacks and whites even after adjusting for SES and demographic characteristics. In general, blacks report more chronic stress exposure and, as a result, report more anxiety and depressive symptoms. However, interactions between race and stress exposure suggest higher levels of stress exposure among blacks result in greater endorsement of anxiety symptoms relative to whites. Thus, occupying social positions that expose individuals to a greater number chronic stressors is one mechanism contributing to race differences in anxiety and depressive symptoms in older adulthood.

Exposure to stressors is enough to elicit race based differences in mental health among older adults, even without considering appraisal processes. But appraisal is an important independent predictor of mental health in older adulthood, even when controlling for chronic stress exposure. Chronic stress appraisal significantly predicts anxiety and depressive symptoms

for both blacks and whites after controlling for SES, demographic characteristics, and stress exposure such that endorsement of anxiety and depressive symptoms increase when older adults consider stress exposure more upsetting. While blacks in this sample appraise their stress as less upsetting compared to whites (Brown, Mitchell, & Ailshire, 2018), race and stress appraisal interactions show that stress appraisal does not operate differently for whites and blacks in predicting anxiety symptoms. However, findings show that stress appraisal may operate more strongly among blacks in its impact on depressive symptoms. Race and stress appraisal interactions show that when blacks and whites rate their stress exposure as not upsetting both groups report and average of about one depressive symptom. Comparatively, when blacks consider their stress exposure as very upsetting they report significantly more depressive symptoms relative to whites. At the largest gap, if stress exposure is considered very upsetting, blacks report an average of about 3 depressive symptoms while whites reported an average of 2.5 depressive symptoms, after adjusting for SES and demographic measures. Thus, older blacks may be protected from the negative mental health effects of greater exposure to chronic strain when they consider it less upsetting relative to whites, but may be more vulnerable when they consider their strain either somewhat or very upsetting relative to whites.

When examining exposure and appraisal by chronic stress domain, we found that, in general, blacks and whites who consider stress exposure as very upsetting report higher average anxiety and depressive symptomology relative to those who report just experiencing stress exposure across any domain. Stress appraisals, therefore, are important in the manufacturing of mental health disparities. Additionally, there were important black-white differences in depressive and anxiety symptomology. First, blacks exposed to health, financial, relationship or caregiving strain report significantly higher depressive symptomology ($p<0.05$) than whites who

report the same stress exposures. The only exception was residential strain where both blacks and whites report similar levels of anxiety and depressive symptoms. The same was true in considering appraisal, blacks who considered stress exposure somewhat or very upsetting reported both more anxiety and depressive symptoms than whites who considered it upsetting across every stress domain except residential strain. This potentially reflects the fact that older blacks who report exposure to health, financial, relationship, and caregiving strain are experiencing this strain at a greater severity, resulting, in worse mental health outcomes. It may also reflect the fact that when blacks are exposed to stressors and consider their stress upsetting it has greater implications for their mental health outcomes. The vulnerability hypothesis suggests blacks may be more susceptible to the effects of stress since they have few resources to buffer the negative effects of stress on health. Thus, this evidence seems to support the hypotheses that blacks are more vulnerable to the deleterious mental health effects of financial, residential, and caregiving strain, especially so when they consider their stress exposure upsetting.

This paper is novel in building a case for stress appraisal as an understudied but important predictor of mental health in addition to chronic stress exposure. When blacks report their stress exposure as not upsetting, they tend to report similar anxiety and depressive symptoms relative to whites. However, older blacks whom consider chronic stress exposure as somewhat or very upsetting they report higher depressive and anxiety symptoms relative to whites regardless of age, gender, SES, or marital status. These findings suggest chronic stress exposure and appraisal processes independently contribute to mental health outcomes in blacks and whites and they may also have implications for the black-white mental health paradox. The paradox, or the finding that, in general, blacks tend to have similar or better mental health than whites, may be the result of blacks appraising their stress as less upsetting to reduce the chronic

stressors impact on mental health. Blacks maybe actively coping with stress exposure, resulting in generally lower stress appraisal (Brown et al., 2018) and as a result, fewer anxiety and depressive symptoms comparted to whites.

One hypothesis that has emerged in the literature to explain the black-white paradox in mental health is access to racially salient positive resources (i.e. religiosity, social support, racial identity) that may buffer the effects of stress on health. Although recent studies suggest that neither religious involvement nor family relationships (Mouzon, 2017) nor relationships of choice (Mouzon, 2010) appear to serve as positive coping mechanisms to explain the black–white paradox in mental health, it is highly plausible that given a prolonged history of marginalization, blacks have developed other positive coping mechanisms that may account for their apparent emotional resilience. That is, when blacks do not consider things stressful that we have generally thought to be stressful, they may be using positive coping resources and as a result show less mental health symptomology. Someone who was able to cope with a stressor may report perceiving it as less severe upon reflection even if it was an intense stressor at the time of the experience. Importantly, these hypotheses engage race specific stress coping mechanisms that are important to consider when trying to better understand the black-white paradox in health.

This study has a few limitations in the way we measure and conceptualize stress exposure and appraisal. First, while we use a measure of appraisal that has been utilized in other studies (Aldwin et al., 1996), the retrospective timing in which the questions are asked require respondents to report the stressfulness of these ongoing chronic situations, even if it isn't impacting them in that moment. Individuals may be reporting stress exposure from the past 12 months but at the point of the interview maybe feeling less bothered by the stressor. Thus, respondents are relying on memory to report their stress response. Additionally, selective

mortality among blacks and foreign born Hispanics may mean we have a select group of individuals who cope well or who respond well to stressors and may be more likely to survive to old age. Importantly, we are measuring chronic stress cross-sectionally when the relationship between race/ethnicity, stress exposure and appraisal and mental health may vary over time. Finally, in measuring the "stress universe," it would be appropriate to note the importance of including a wider array of race based or related stressors (e.g., vicarious discrimination, incarceration, intersectional stressors) in future research on race/ethnic differences in the stress processes.

Conclusion

This paper addresses key methodological limitations in stress and health disparities literature by developing a stress and health model that more accurately depicts the stress experience for minority groups. Importantly, this paper considers both chronic stress exposure and appraisal as principal mechanisms that may independently impact race-based mental health disparities. This work uses a multidisciplinary framework and builds on the stress process model (McLeod, 2012; Pearlin et al., 1981; Thoits, 2010), to more carefully map social stress mechanisms that link race/ethnicity to mental health disparities. Whether a person perceives a situation as a threat is crucial in determining the mental health consequences of stress. The ability to adjust, habituate, or cope to repeated stress may also be determined by the way one perceives a situation (McEwen, 1998). Social determinants of mental health are interconnected systems of stratification by race/ethnicity that often also shape stress exposure and appraisals, yet appraisal processes can mitigate or exaggerate the mental health impacts of chronic stress exposure.

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Table 1. Weighted descriptive statistics for the full sample and by race, Health and Retirement Study, 2006

	Full Sample (n=6,019)	Whites (n=5,219)	Blacks (n=800)	Chi2
	%	%	%	
Age [mean(SE)]	65.4(0.3)	65.6(0.3)	63.8(0.5)	88.9***
Female	54.1	53.5	60.0	7.8**
Education [mean(SE)]	13.2(0.0)	13.4(0.1)	11.8(0.2)	2.7
HH Income [mean(SE)]	10.7(0.0)	10.8(0.0)	10.0(0.1)	3.4+
HH Wealth				106.2***
1st quartile	22.6	19.2	56.1	
2nd quartile	25.3	25.2	25.9	
3rd quartile	25.6	27.1	11.7	
4th quartile	26.5	28.6	6.4	
Employment Status				6.6**
Currently Employed	37.9	38.3	33.9	
Retired	52.5	52.6	52.0	
Not in the Labor Force	9.5	9.1	14.1	
Marital Status				37.0***
Married	69.2	71.3	48.9	
Divorced/Separated	12.0	10.9	22.6	
Widowed	15.33	14.7	21.2	
Never Married	3.5	3.1	7.3	
Stress Exposure [mean(SE)]	2.2(0.0)	2.1(0.0)	2.7(0.1)	1.9
Stress Appraisal [mean(SE)]a	1.7(0.0)	1.7(0.0)	1.6(0.0)	31.8***
Anxiety Symptoms [mean(SE)]	1.6(0.0)	1.5(0.0)	1.7(0.0)	3.0+
Depressive Symptoms [mean(SE)]	1.4(0.0)	1.3(0.0)	2.0(0.1)	1.1

+p<0.10 *p<0.05 **p<0.01 ***p<0.001

Note: HH income is logged

a Among those who reported any stress exposure (n= 5,069)

Table 2. OLS Regression models predicting anxiety symptoms, Health and Retirement Study, 2006

	Stress Exposure (n=6,019)									Stress Appraisal (n=5,069)								
Independent Variables	Model 1			Model 2			Model 3 (+interaction)			Model 1			Model 2			Model 3 (+interaction)		
	β	SE		β	SE		β	SE		β	SE		β	SE		β	SE	
Black (ref = white)	0.12	0.03	***	0.04	0.03		-0.06	0.05		0.16	0.03	***	0.08	0.03	*	-0.05	0.09	
Chronic stress exposure (0-7)	0.14	0.01	***	0.13	0.00	***	0.13	0.01	***	0.13	0.01	***	0.12	0.01	***	0.12	0.01	***
Race/Ethnicity X exposure																		
Black X exposure							0.04	0.01	**									
Stress Appraisal (1-3)										0.19	0.02	***	0.18	0.02	***	0.18	0.02	***
Race/Ethnicity X appraisal																		
Black X appraisal																0.08	0.06	
Age	0.00	0.00	***	0.00	0.00		0.00	0.00		0.00	0.00	***	0.00	0.00		0.00	0.00	
Female	0.06	0.01	***	0.03	0.02	*	0.03	0.02	*	0.04	0.02	*	0.02	0.02		0.02	0.02	
Education				-0.02	0.00	***	-0.02	0.00	***				-0.02	0.00	***	-0.02	0.00	***
HH Income				-0.01	0.01		-0.01	0.01					-0.01	0.01		-0.01	0.01	
HH Wealth (ref=1st quartile)																		
2nd quartile				-0.04	0.02	+	-0.04	0.02	+				-0.04	0.03		-0.04	0.03	
3rd quartile				-0.06	0.02	*	-0.06	0.02	*				-0.06	0.03	*	-0.06	0.03	*
4th quartile				-0.07	0.03	*	-0.07	0.03	*				-0.07	0.03	**	-0.07	0.03	*
Employment Status (ref=employed)																		
Retired				0.10	0.03	**	0.09	0.03	**				0.10	0.03	**	0.09	0.03	**
Not in labor force				0.06	0.02	**	0.06	0.02	**				0.06	0.02	*	0.06	0.02	*
Marital Status (ref=married)																		
Divorced/Separated				0.00	0.03		0.00	0.03					-0.02	0.03		-0.02	0.03	
Widowed				0.04	0.02	+	0.05	0.02	+				0.03	0.03		0.03	0.03	
Never Married				0.06	0.06		0.06	0.06					0.08	0.06		0.08	0.06	
Intercept	0.97	0.04	***	1.69	0.11	***	1.71	0.11	***	0.60	0.06	***	1.34	0.12	***	1.35	0.12	***

+p<0.10 *p<0.05 **p<0.01 ***p<0.001

Figure 1. Predicted means of anxiety symptoms by race and stress exposure from fully adjusted models

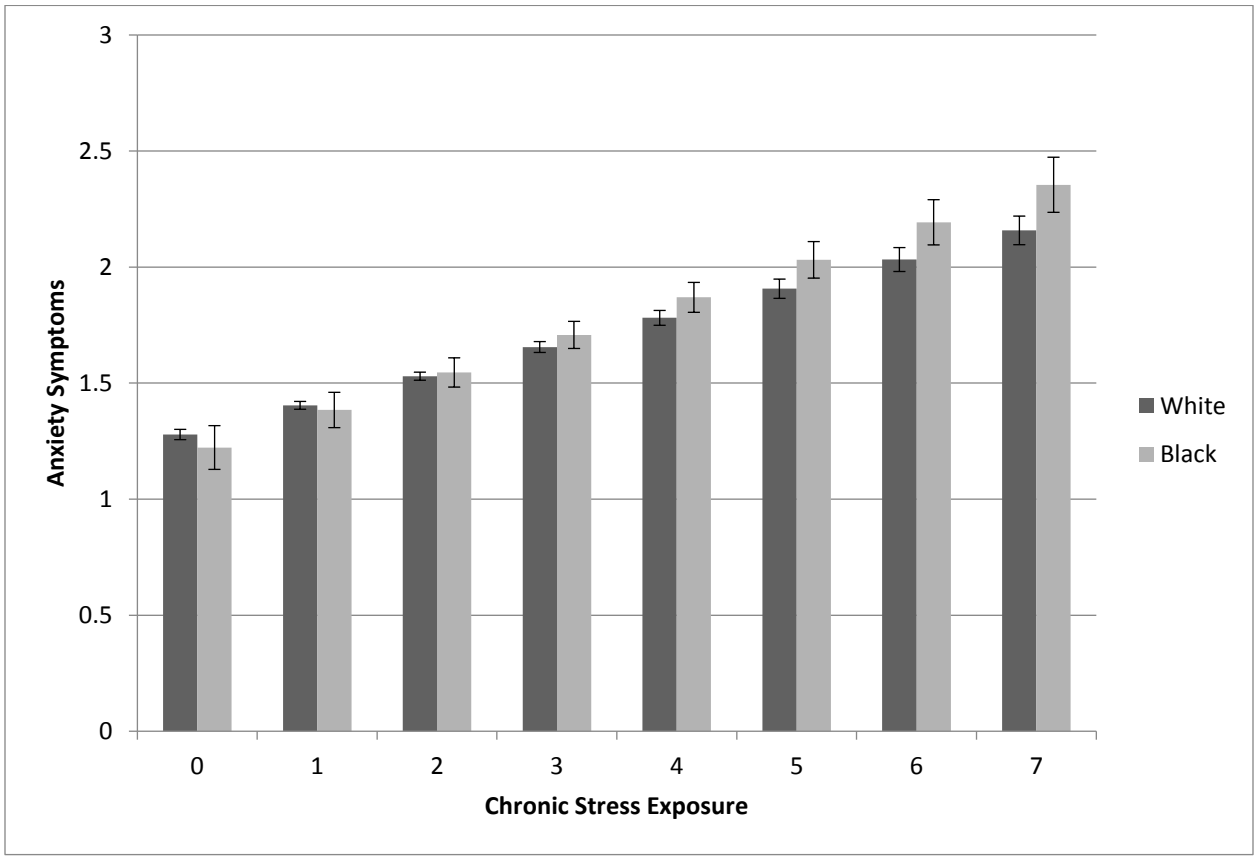

Figure 2. Predicted means of anxiety symptoms by race and stress appraisal from fully adjusted models

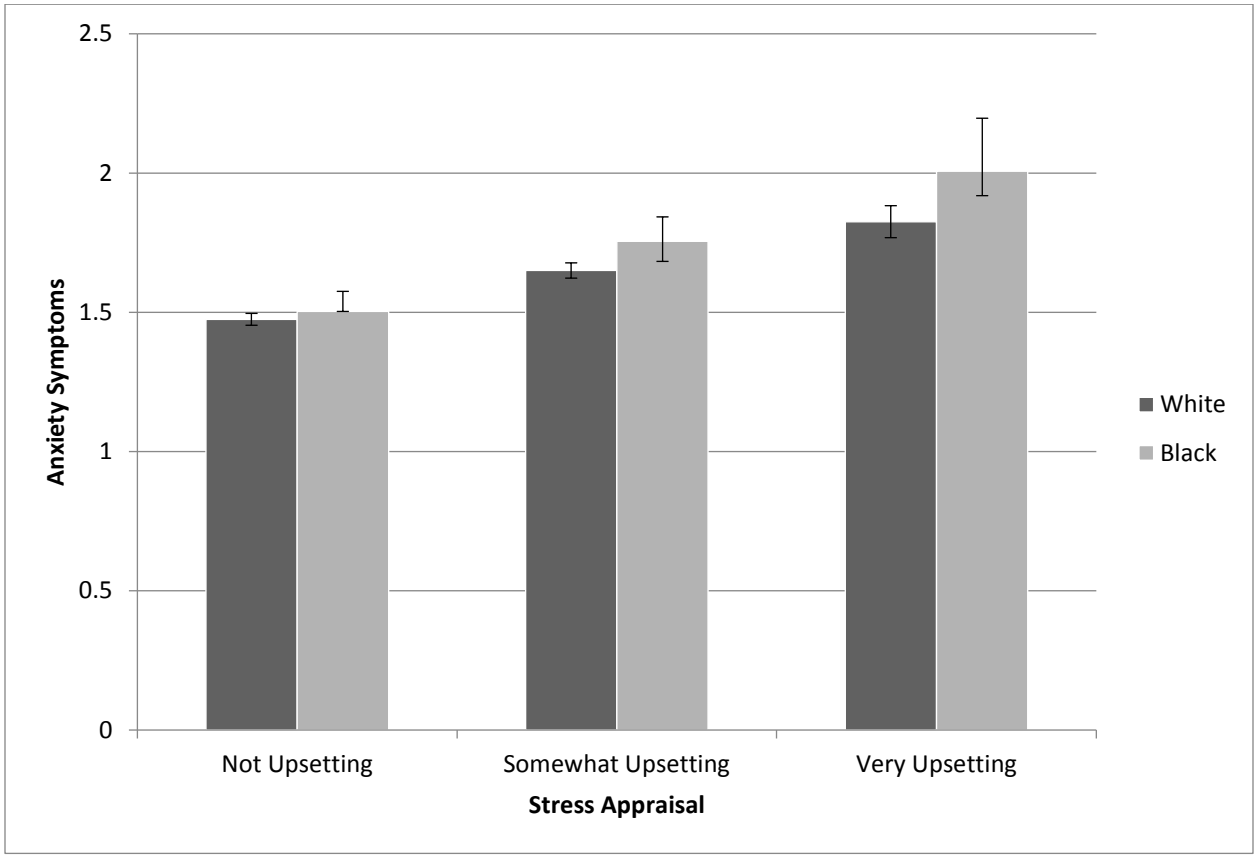

Table 3. OLS Regression models predicting depressive symptoms, Health and Retirement Study, 2006

Independent Variables	Stress Exposure (n=6,019)									Stress Appraisal (n=5,069)								
	Model 1			Model 2			Model 3			Model 1			Model 2			Model 3		
	β	SE		β	SE		β	SE		β	SE		β	SE		β	SE	
Black (ref=white)	0.51	0.10	***	0.09	0.09		0.04	0.15		0.57	0.10	***	0.16	0.09	+	-0.37	0.24	
Chronic stress exposure (0-7)	0.37	0.02	***	0.33	0.02	***	0.32	0.02	***	0.32	0.03	***	0.28	0.03	***	0.28	0.03	***
Race/Ethnicity X exposure																		
Black X exposure							0.02	0.06										
Stress Appraisal (1-3)										0.85	0.05	***	0.81	0.05	***	0.78	0.05	***
Race/Ethnicity X appraisal																		
Black X appraisal																0.32	0.15	*
Age	0.01	0.00	***	-0.01	0.00	*	-0.01	0.00	*	0.01	0.00	***	-0.01	0.00		-0.01	0.00	
Female	0.23	0.05	***	0.01	0.04		0.01	0.04		0.13	0.05	*	-0.06	0.05		-0.06	0.05	
Education				-0.08	0.01	***	-0.08	0.01	***				-0.08	0.01	***	-0.08	0.01	***
HH Income				-0.07	0.04	*	-0.07	0.04	+				-0.06	0.04		-0.06	0.04	
HH Wealth (ref=1st quartile)																		
2nd quartile				-0.21	0.11	+	-0.21	0.11	+				-0.19	0.11	+	-0.18	0.11	
3rd quartile				-0.19	0.09	+	-0.19	0.09	+				-0.18	0.10	+	-0.17	0.10	
4th quartile				-0.28	0.10	**	-0.28	0.10	**				-0.30	0.09	**	-0.30	0.09	**
Employment Status (ref=employed)																		
Retired				0.60	0.14	***	0.60	0.14	***				0.57	0.15	***	0.56	0.15	***
Not in labor force				0.28	0.08	***	0.28	0.08	***				0.26	0.08	**	0.26	0.08	**
Marital Status (ref=married)																		
Divorced/Separated				0.50	0.10	***	0.50	0.10	***				0.47	0.10	***	0.47	0.10	***
Widowed				0.61	0.09	***	0.61	0.09	***				0.56	0.09	***	0.57	0.09	***
Never Married				0.48	0.23	*	0.48	0.23	*				0.53	0.23	*	0.52	0.23	*
Intercept	-0.38	0.17	*	2.86	0.45	***	2.87	0.45	***	-1.80	0.17	***	1.39	0.43	*	1.43	0.43	**

+p<0.10 *p<0.05 **p<0.01 ***p<0.001

Figure 3. Predicted means of depressive symptoms by race and stress exposure from fully adjusted models

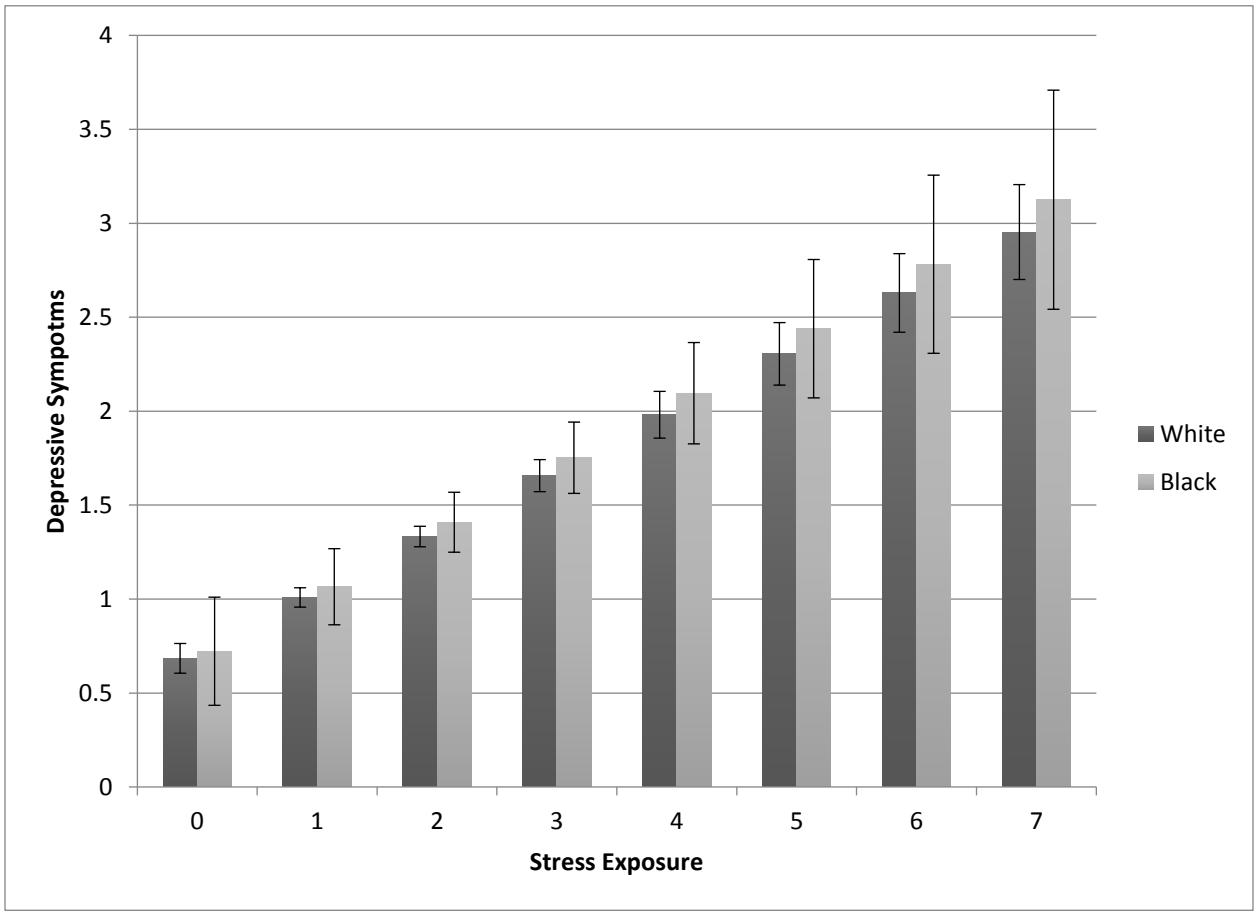

Figure 4. Predicted means of depressive symptoms by race and stress appraisal from fully adjusted models

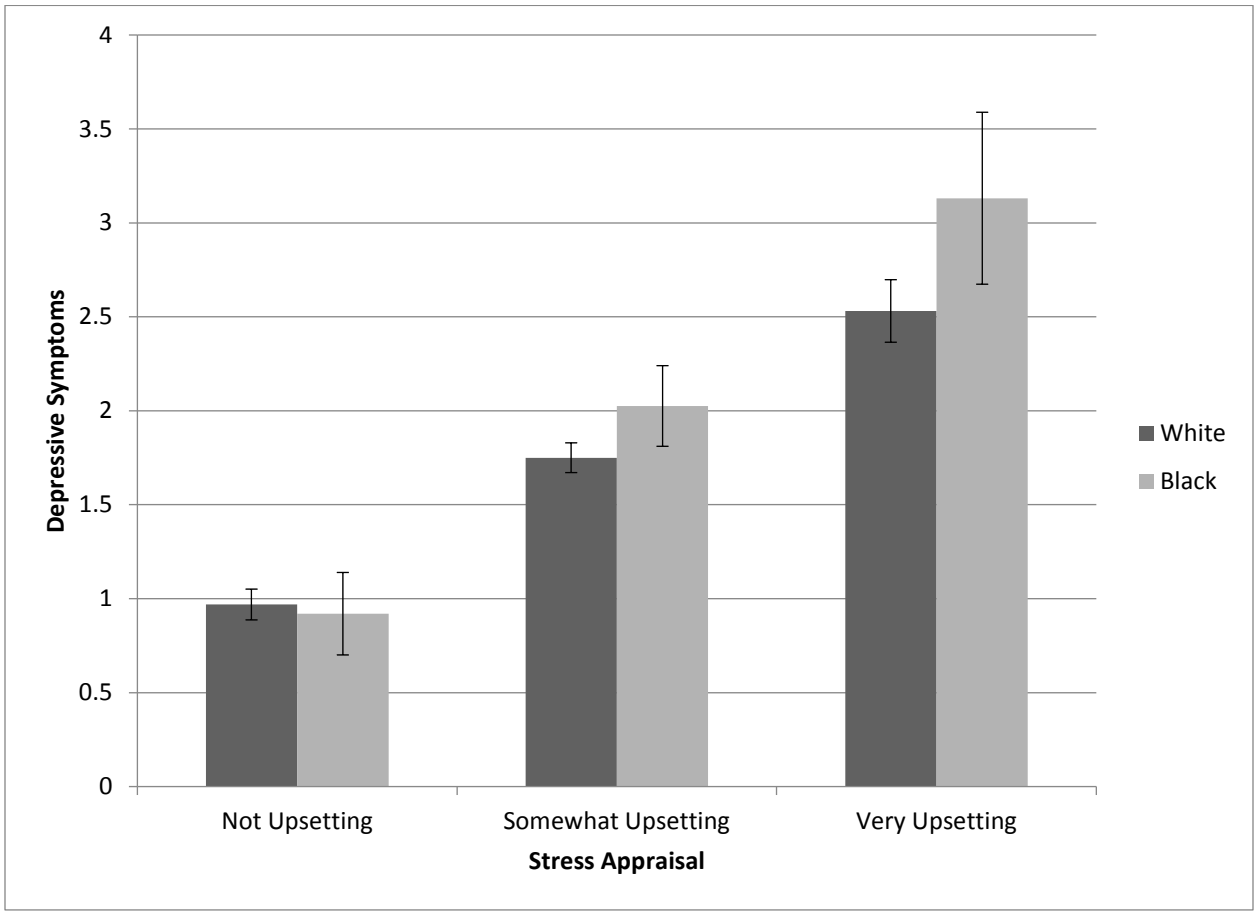

Table 4. Predicted mean anxiety and depressive syptoms by chronic stress exposure and stress appraisal for whites and blacks, Health and Retirement Study, 2006 (n=6,019)

	Anxiety Symptoms				Depressive Symptoms			
	White		Black		White		Black	
	mean	CI	mean	CI	mean	CI	mean	CI
Health								
Exposed	1.65	(1.62, 1.68)	1.82	(1.77 1.88)	1.68	(1.60, 1.76)	2.32	(2.13, 2.52)
Upseta	1.76	(1.72, 1.80)	1.99	(1.92 2.07)	2.12	(2.00, 2.25	2.92	(2.66, 3.18)
Financial								
Exposed	1.73	(1.7, 1.77)	1.87	(1.81 1.93)	1.87	(1.74 2.00)	2.41	(2.18, 2.63)
Upseta	1.85	(1.8, 1.90	2.04	(1.96 2.12)	2.35	(2.16, 2.54)	2.88	(2.56, 3.20)
Residential								
Exposed	1.97	(1.9 2.04)	2.10	(2.02, 2.17)	2.68	(2.38, 2.98)	3.18	(2.87, 3.49)
Upseta	2.11	(2.01 2.20)	2.29	(2.11, 2.46)	3.28	(2.83, 3.72)	3.53	(2.90, 4.17)
Relationship								
Exposed	1.68	(1.65 1.70)	1.86	(1.81, 1.92)	1.66	(1.56, 1.76)	2.35	(2.14, 2.55)
Upseta	1.71	(1.67 1.74)	1.95	(1.88 2.03)	1.83	(1.71, 1.95)	2.61	(2.34, 2.89)
Caregiving								
Exposed	1.62	(1.59 1.66)	1.82	(1.76, 1.88)	1.48	(1.37, 1.60)	2.19	(1.94, 2.45)
Upseta	1.71	(1.66 1.76)	2.01	(1.91 2.11)	1.80	(1.62, 1.98)	2.63	(2.21, 3.06)

+p<0.10 *p<0.05 **p<0.01 ***p<0.001

Upset = Somewhat/very upset vs. not upset

a Among those who reported any stress exposure (n= 5,069)

Adjusted for age and gender