Self-Reported Instances of Major Discrimination, Race/Ethnicity, and Inflammation Among Older Adults: Evidence from the Health and Retirement Study

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BACKGROUND. This study examines the relationship between self-reported instances of major discrimination and inflammation among older adults, and explores whether this relationship varies in accordance with race/ethnicity. We hypothesized that self-reported instances of major discrimination would be associated with higher levels of high-risk inflammation, and that this relationship would be stronger for racial/ethnic minorities than Whites.

METHODS. Data from the 2006/2008 Health and Retirement Study (HRS), an ongoing biennial nationally representative sample of older adults in the United States, was used to collect measures of self-reported instances of major discrimination and high-risk C-reactive protein (CRP), which was assayed from blood samples. Modified Poisson regression with robust standard errors was applied to estimate the prevalence ratios of self-reported instances of major discrimination, as it relates to high-risk CRP (CRP≥ 22 kg/m2), and test whether this relationship varies by race/ethnicity.

RESULTS. Respondents who experienced any instances of major discrimination had a higher likelihood of high-risk CRP (prevalence ratio [PR]: 1.14, 95% confidence interval [CI] = 1.07–1.22) than those who did not report experiencing any instances of major discrimination. This association was independent of differences in newly diagnosed health conditions and socioeconomic status. The relationship between any self-reported instance of major discrimination and high-risk CRP was weaker for Blacks than Whites (PR: 0.81, 95% CI = 0.69–0.95).

CONCLUSIONS. Our study confirms that self-reported instances of major lifetime discrimination is a psychosocial factor that is adversely associated with high-risk CRP among older adults; this association is especially pronounced among older Whites. Future studies among this population are required to examine whether the relationship between self-reported instances of major discrimination and high-risk CRP changes over time.

KEYWORDS: Discrimination, Inflammation, and Older adults

Understanding how psychosocial stressors such as perceived discrimination relate to inflammation levels is important in relation to health disparities research among older adults for several reasons. First, research has long shown that persistent inflammation contributes to accumulative damage in tissues that border sites of chronic infection and is a risk factor for a range of cardiometabolic diseases (e.g., heart disease, stroke, and end-stage renal disease). [1,2] Second, though prior work in this area suggests that self-reported instances of everyday discrimination (i.e., relatively minor or even trivial day-to-day hassles) is associated with higher levels of inflammation among older adults,[3] it remains unclear whether self-reported instances of major discrimination (i.e., singular discrete incidents of unfair treatment in the labor market and other macro levels in society) are associated with disparities in inflammation. Given that levels of self-reported instances of major discrimination and inflammation are higher among non-Latino Blacks (hereafter Blacks) and Latinos than their non-Latino White (hereafter White) counterparts,[4] understanding the interplay between self-reported instances of major discrimination, race/ethnicity, and CRP may provide us with further insight into the racial/ethnic health disparities in late life.

The idea that self-reported instances of discrimination is a risk factor for elevated levels of inflammation [5] is consistent with the stress process model.[6] This model contends that experiences with psychosocial stressors (e.g., perceived discrimination) creates a sense of threat, elicits negative emotional states, and initiates the fight or flight processes that prepare the body for action.[7] Over time, repeated stressors overtax individuals' ability to adapt, which in turn, leaves individuals more vulnerable to disease risk. To date, most studies in this area focus on the relationship between self-reported instances of everyday discrimination and inflammation C-Reactive Protein (CRP),[8,9] an acute-phase protein produced by the liver in

response to increasing levels of circulating inflammatory factors. Findings from this body of research suggests that self-reported instances of everyday discrimination can get under the skin to influence levels of CRP.[10,11]

Despite ongoing interest in the links between perceived discrimination and CRP, there are some limitations. First, as noted earlier, most studies in this area focus on self-reported instances of everyday discrimination, which reflect chronic exposure to mistreatment.[12] Although important, it remains unclear how acute psychosocial stressors, such as self-reported instances of major discrimination, relate to CRP. This neglect is curious, given that both everyday and major instances of discrimination were designed to capture related, but nonetheless dissimilar experiences of mistreatment.[13] This neglect also occurs despite conflicting evidence regarding how self-reported instances of major discrimination relate to CRP. Specifically, some studies suggest that self-reported instances of major discrimination is positively related to higher levels of CRP,[14] while other studies suggest there is no relationship between these two measures.[15]

Due to the paucity of research focusing on the relationship between self-reported instances of major discrimination and CRP among older adults, it is not surprising that limited evidence exists regarding whether this relationship varies in accordance with race/ethnicity. On one hand, scholarship in this area has long documented racial/ethnic disparities in both experiences of discrimination and health among older adults and health risks, with racial/ethnic minorities having an increased likelihood to both report higher levels of major discrimination, [4,16] and possess higher levels of inflammation than their White counterparts. [16] On the other hand, while the tenets of the Stress Process Model would support findings that self-reported instances of major discrimination are associated with elevated levels of CRP, evidence from empirical

studies remains mixed. For instance, one association between major discrimination and CRP suggests that self-reported instances of major discrimination are positively associated with CRP.[14] In contrast, Kershaw et al. [15] found no statistically significant relationship between self-reported instances of major discrimination and CRP levels among middle-aged and older respondents in her study. Moreover, to date, the authors of the study have not identified any published study drawn from a nationally representative sample of older adults to examine whether racial/ethnic differences exist in the relationship between self-reported instances of major discrimination and CRP.

The current study addresses this gap and provides further buttress to our understanding of how psychosocial factors relate to health disparities among older adults in, at least, two important ways. First, most prior studies on this topic were completed with younger populations or community-based samples. In contrast, our study draws on data from a nationally representative sample of adults above the age of 50 to examine how self-reported instances of major discrimination relate to CRP among older adults. Based on the Stress Process Model,[6] we hypothesize that self-reported instances of major discrimination would be positively associated with higher levels of CRP among older adults. Second, rather than focusing on the relationship between self-reported instances of major discrimination and CRP among one racial/ethnic group, the present study examines whether the hypothesized link between self-reported instances of major discrimination and CRP varies by race/ethnicity. Given the previously documented associations between self-reported instances of major discrimination, race/ethnicity, and health,[14–16] we also hypothesized that this relationship would be especially pronounced for older Blacks and Latinos in comparison to Whites.

Method

Data and Sample

Data for this study is derived from the Health and Retirement Study (HRS), an ongoing nationally representative, bi-annual, longitudinal study of adults above the age of 50 in the United States.[19] The HRS is designed to monitor age-related changes in the physical, functional, and cognitive health of older adults. Respondents were re-interviewed every two years since 1992. Beginning in 2006, the HRS collected biological and psychosocial information from a random half-sample of the non-institutionalized older adults in the survey. [20] Specifically, HRS interviewers administered the biomarker assessments during the in-person interview,[21] while the self-administered questionnaires were left with respondents upon completion of the in-person core interview and mailed back to the HRS.[20] The other half of the 2006 sample received the biomarker and psychosocial assessments in 2008. In this study, data from both waves were pooled, and the analytic sample used for this study included respondents with complete demographic information (e.g., age, sex, and education), biomarker measurements, and psychosocial data (n = 10,716) among self-identified Whites, Blacks, and Latinos. Due to low sample size issues, we excluded respondents of the "Other Race" racial group.

Measures

Systematic inflammation is measured CRP. After the face-to-face interviews, HRS interviewers collected blood samples using dried blood spots. The collection of blood samples involved interviewers cleansing the respondents' fingers with an alcohol swab, pricking the respondents' fingers with a sterile lancet, placing the blood droplets on specially treated filter paper, and sending the blood samples to the University of Vermont to be assayed for CRP. Due to the skewed distribution of this variable, we normalized the distribution transformed CRP

values using a natural log. Based on prior research,[21] we used a clinical cut-point for high-risk CRP (1 = high risk CRP [(≥3.0 mg/L], 0 = low-risk CRP).

Self-reported instances of major discrimination were assessed using the modified five item Williams' Major Experiences of Discrimination Scale.[13] Study respondents were asked to indicate whether they were ever treated unfairly (yes/no) in five domains: (i) "Have you ever been unfairly dismissed from a job?" (ii) "For unfair reasons, have you ever not been hired for a job?" (iii) "Have you ever been unfairly denied a promotion?" (iv) "Have you ever been unfairly prevented from moving into a neighborhood because the landlord or a realtor refused to sell or rent you a house or apartment?" and (v) "Have you ever been unfairly denied a bank loan?" A scale was created by summing across the five items, with scores ranging from zero to five. Higher scores signify additional self-reported instances of major discrimination. An exploratory analysis revealed the distribution of self-reported instances of major discrimination among respondents in our sample was non-normal. Following prior research,[22] we created a binary variable to identify respondents who reported one or more self-reported instances of major discrimination relative to respondents who did not report any self-reported instances of major discrimination (1 = yes, 0 = no).

An a priori decision was made to control for factors that could be associated with self-reported instances of major discrimination or CRP among older adults. These covariates include race/ethnicity, sex, marital status, years of education, logged household income, employment status, and newly diagnosed health conditions. We included the following three racial/ethnic categories: White, Black, and Latinos. Age is a continuous variable of respondents' reported age at the time of the interview. Sex (1 = men, 0 = women) and marital status (1 = married, 0 = not married) are dummy variables. Education is a continuous variable measured in years of

completed schooling. We also included a measure of logged household income; employment status is a binary variable (1 = currently employed, 0 = not employed). HRS interviewers asked if a doctor diagnosed them with heart problems or diabetes. Respondents who indicated "yes" to any of the questions were considered to have undergone a disease diagnosis for the corresponding disease.

Statistical Analyses

Sample characteristics were summarized for the entire sample and by self-reported instances of major discrimination in Table 1. Since the outcome, CRP, was common (>10%), Modified Poisson regression with robust standard errors was used to estimate prevalence ratios and corresponding 95% confidence intervals for the relationship between self-reported instances of major discrimination and CRP.[23] In Table 2, four models were specified to determine the association between self-reported instances of major discrimination and high-risk CRP. Model 1 examined the association between self-reported instances of major discrimination and high-risk CRP. Model 2 examined the relationship between self-reported instances of major discrimination and high-risk CRP, adjusting for race/ethnicity, age, sex, and marital status. The next three models examined the association between self-reported instances of major discrimination and high-risk CRP, including the covariates in Model 2, as well as self-reported diagnoses of diabetes (Model 3) and heart conditions (Model 4) separately. In Model 5, we included both self-reported diagnoses of diabetes and heart conditions in the model. Following this, we examined whether the relationship between self-reported instances of major discrimination and high-risk CRP holds after controlling for years of education, logged income, employment status, and the other covariates listed in Model 6. Given prior studies suggest that the relationship between self-reported instances of major discrimination and inflammation differed by race/ethnicity,[6] we also

tested an interaction between major discrimination and race/ethnicity in the final model (Model 7). Sampling weights and design factors were used to account for non-response to the psychosocial and biomarker assessments and for the complex study design of the HRS. All analyses were conducted using STATA 13.

Results

Results

The distribution of the select characteristics of respondents in the HRS for the total sample and by self-reported instances of major discrimination status is displayed in Table 1. Of the respondents, 38% of our sample had high-risk CRP, while nearly a third of the older adults reported experiencing one or more instances of major discrimination. In terms of race/ethnicity, 84% of our sample comprised Whites, while Blacks and Latinos accounted for 9% and 7% respectively. A little less than half of the sample (46%) comprised men. On average, respondents were 66 years of age $\pm$ 10.1, and 37% of the sample was married. The mean years of education in the sample was about 13 years $\pm$ 3.0, and the mean household income (logged) was 10.6 $\pm$ 1.4. Thirty-five percent of our sample was currently employed at the time of the initial interview. Nearly three percent of our sample reported experiencing a new diagnosis of heart problems, while 21% of older adults in our sample reported a new diabetes diagnosis since the last wave.

The relationship between these characteristics was examined by experiences of any self-reported instances of major discrimination. A larger proportion of older adults, who were Black ($p < .001$), male ($p < .001$), younger ($p < .001$), married ($p < .001$), greater education ($p < .001$), greater household income ($p < .001$), and currently employed ($p < .001$), received a new diagnoses of heart problems ($p < .001$) or diabetes ($p < .001$) and reported any instances of self-reported instances of major discrimination.

[Insert Table One Here]

The association between self-reported instances of major discrimination and CRP among older adults is shown in Table 2. In the fully unadjusted model, older adults who reported one or more instances of major discrimination had a greater likelihood of high-risk CRP (Prevalence ratio [PR]: 1.14, 95% Confidence interval [CI]: 1.07–1.22) than respondents who did not have self-reported instances of major discrimination. In Model 2, the relationship between self-reported instances of major discrimination and high-risk CRP remained after adjusting for race/ethnicity, age, sex, and marital status (PR: 1.14, 95% CI: 1.07-1.22). Results from thus model also suggest that the likelihood of high-risk CRP is higher for Blacks (PR: 1.36, 95% CI: 1.25 - 1.47) and Latinos (PR: 1.16, 95% CI: 1.04 - 1.28) than Whites.

Model 3 includes adjustments for newly diagnosed heart conditions, and we observed that older adults who reported experiencing one or more instances of major discrimination (PR: 1.14, 95% CI: 1.07–1.22) had a higher likelihood of high-risk CRP than those who did not. Adjusting for newly diagnosed heart conditions separately (Model 4) did little to change this association, as older adults who reported experiencing one or more instances of major discrimination (PR: 1.13, 95% CI: 1.07–1.21) had a higher likelihood of high-risk CRP than those who did not. Model 5 includes the covariates listed in Model 4, and adjusts for recent self-reported diagnosis of diabetes. Results from this model suggests that older adults who reported experiencing one or more instances of major discrimination had a higher likelihood of high-risk CRP than those who did not (PR: 1.13, 95% CI: 1.07 - 1.21). Results from Model 6 also indicates that older adults who self-reported one or more instances of major discrimination still had a higher likelihood of high-risk CRP (PR: 1.15, 95% CI: 1.08 - 1.23) relative to older adults

who did not self-report any instances of major discrimination after adjusting for years of education and household income.

Model 7 included an interaction term for self-reported instances of major discrimination and race/ethnicity to examine if the relationship between self-reported instances of major discrimination and high-risk CRP is moderated by race/ethnicity. Results from this model suggest that the relationship between self-reported instances of major discrimination and high-risk CRP differed significantly by race/ethnicity, as self-reported instances of major discrimination was associated with a lower likelihood of high-risk CRP for Black but not White respondents (PR: 0.81, 95% CI: 0.69–0.95).

[Insert Table Two Here]

Discussion

A long tradition of research has shown that self-reported instances of major discrimination tends to disfavor the health of older adults.[10] Although this body of work is extensive, scholarship in this area has only begun to explore how self-reported instances of major discrimination relates to CRP among older adults. Our findings suggest that the self-reported instances of major discrimination is positively associated with high-risk CRP among older adults, and this association was independent of differences in newly diagnosed health conditions and socioeconomic status. In contrast to our hypothesis, however, the relationship appeared weaker among older Blacks relative to older Whites, even though older Blacks reported greater exposure to major instances of discrimination than their White counterparts. To date, we are unaware of any published study that has drawn on large and representative sample of older adults to examine whether the relationship between self-reported instances of major discrimination and CRP varied by race/ethnicity, thereby addressing the limitations in prior research on this topic.

Our first aim was to assess how self-reported instances of major discrimination relates to high-risk CPR among older adults, and we demonstrated that self-reported instances of major discrimination was inversely associated with high-risk CRP among older adults. This finding is somewhat consistent with the broader research on self-reported instances of discrimination and health among older adults.[8] For instance, prior research has uncovered a statistically significant relationship between self-reported instances of everyday discrimination and CRP [11,15] among older adults. Studies focusing on the link between self-reported instances of major discrimination and CRP, however, have reached different conclusions. Some studies[14] have found that self-reported instances of major discrimination were positively related to levels of inflammation, while others have not.[15] Sample restrictions may explain some of the differences in the conclusions reached in our study and prior examinations of this association. As highlighted earlier, our study relied on data from a nationally representative sample of older adults, while other studies drew on data from community-based surveys. Future research should examine whether the relationship between self-reported instances of major discrimination and high-risk CRP varies by the presence of cardiovascular diseases.

Our second aim was to examine whether the relationship between self-reported instances of major discrimination and high-risk CRP varied by race/ethnicity. In contrast to our hypothesis, we found that this relationship was stronger for older Whites than Blacks in this study. Although counterintuitive, these findings are consistent with other studies of perceived discrimination and mortality, depressive symptoms, psychological distress, and well-being among older adults.[2, 16] Scholars have offered several explanations for these findings. Some argue that there may be a survival effect, such as a Black who survived to old age and was particularly resilient against the

harmful effects of discrimination,[24] although studies of discrimination and mortality risk suggest that this relationship is less pronounced among older Blacks than Whites.[25,26]

Others contend that older racial/ethnic minorities have particularly resilient coping skills that help mitigate the harmful effects of discrimination.[27] Prior research has shown that older Blacks experience instances of major discrimination at younger ages than their White and Latino counterparts.[4] At the same time, research also suggests that racial/ethnic identity as a protective factor against poor health among adults.[27] This is consistent with the Stress Process Model,[6] which suggests that individuals are better equipped to counteract negative health consequences of exposure to discrimination if one's is socialized to believe that their racial/ethnic identity is a major component of their self-concept and/or is a source of pride.[27–30] Taken together, research suggests that our counterintuitive finding reported is not a general characteristic of the measure used in this study. Instead, older Blacks may have developed coping strategies at earlier stages in their life course than Whites, which may enable the former to overcome the harmful effects of self-reported instances of major discrimination.

The present study has important strengths, including the use of a large and representative sample and biopsychosocial measures in the dataset to address limitations in prior research on this topic. The measure of self-reported instances of major discrimination used in this study is derived from Williams et al. scale that was previously validated. [13] Other work using this scale has also found the link between self-reported instances of major discrimination and health in a predictable manner, as greater levels of self-reported instances of major discrimination is associated with increased depressive symptoms among older adults.[2,3] However, it is important to note its limitations, which include the use of cross-sectional data to examine this association. Although this work is important, future studies should examine how and why the relationship

between self-reported instances of major discrimination and CRP may by stages in the lifecourse. Second, our measure of self-reported instances of major discrimination was brief and did not examine the frequency, intensity, or timing of major discriminatory events. Moreover, the measure of self-reported instances of major discrimination used in this study was designed to capture self-reported instances of major discrimination in the general population. Though important, other studies have shown and there is some debate on the usefulness of this measure as capturing stress exposure among adults that came of age prior to the Civil Rights Movement. Given this, future work should investigate whether the relationship between self-reported instances of major discrimination and inflammation persists across different measurements of major discrimination.

The rapidly growing population of older adults in the United States will bring with it greater numbers of individuals with health challenges. The findings from this study suggest that self-reported instances of major discrimination were associated with a greater risk for high CRP. Our results highlight the need for creating policy-based interventions that focus on alleviating the stress associated with the life of older adults, to delay the health conditions that severely affect the quality of life among this group.

Table 1. Distribution of select characteristics by self-reported instances of major discrimination Status Among Whites, Blacks, and Latinos in the Health and Retirement Study

	Full Sample N=10,716	No Self-Reported Instances of Major Discrimination N=7,172	Any Self-Reported Instances of Major Discrimination N=3,544
High Risk CRP	38.0	36.0	41.0***
Major discrimination, %	32.0		
Race/Ethnicity, %			
White	84.0	87.0	82.0***
Black	9.0	6.0	12.0***
Latino	7.0	7.0	6.0***
Demographic Characteristics			
Male, %	45.7	41.7	52.9***
Age, M ± SD	66.1 + 10.1	67.5 +10.2	63.5 + 8.7***
Currently Married, %	37.0	34.0	38.0***
Socioeconomic Status			
Years of Education, M ± SD	12.9 + 3.0	12.8 +2.9	13.3 + 2.9***
Household Income (logged), M ± SD	10.6 + 1.4	10.6 + 1.3	10.6 + 1.4***
Currently Employed, %	35.0	31.0	42.0***
Health Problems, %			
New Diagnosis of Heart Problems	2.9	2.7	3.2***
New Diagnosis of Diabetes	21.0	20.4	23.0***

Note: *p < .05. **p < .01. ***p < .001

Table 2: The association between self-reported instances of major discrimination and high-risk CRP in 10,716 Older White, Black, and Latino Adults in the Health and Retirement Study

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Major Discrimination	1.14	1.14	1.14	1.13	1.13	1.15	1.19
	(1.07 - 1.22)	(1.07 - 1.22)	(1.07 - 1.22)	(1.07 - 1.21)	(1.06 - 1.21)	(1.08 - 1.23)	(1.11 - 1.28)
Demographics							
Black		1.36	1.35	1.33	1.33	1.22	1.35
		(1.25 - 1.47)	(1.25 - 1.46)	(1.23 - 1.44)	(1.23 - 1.44)	(1.13 - 1.32)	(1.22 - 1.48)
Latino		1.16	1.16	1.14	1.14	0.92	0.95
		(1.04 - 1.28)	(1.04 - 1.28)	(1.03 - 1.26)	(1.03 - 1.26)	(0.82 - 1.03)	(0.83 - 1.08)
Female		1.28	1.28	1.28	1.29	1.27	1.27
		(1.20 - 1.36)	(1.20 - 1.37)	(1.20 - 1.37)	(1.21 - 1.37)	(1.19 - 1.35)	(1.19 - 1.35)
Age		1.00	1.00	1.00	1.00	0.99	0.99
		(1.00 - 1.00)	(0.99 - 1.00)	(0.99 - 1.00)	(0.99 - 1.00)	(0.99 - 0.99)	(0.99 - 0.99)
Currently Married/Partnered		0.92	0.92	0.92	0.92	0.95	0.95
		(0.87 - 0.98)	(0.87 - 0.98)	(0.87 - 0.98)	(0.87 - 0.98)	(0.89 - 1.02)	(0.89 - 1.02)
Health Conditions							
Newly Diagnosed Heart Condition			1.07		1.05	1.04	1.04
			(0.91 - 1.25)		(0.89 - 1.24)	(0.89 - 1.22)	(0.89 - 1.23)
Newly Diagnosed Diabetes				1.16	1.16	1.13	1.13
				(1.11 - 1.21)	(1.11 - 1.21)	(1.09 - 1.18)	(1.08 - 1.18)
Socioeconomic Status							
Years of Education						0.96	0.96
						(0.95 - 0.97)	(0.95 - 0.97)
Household Income (logged)						0.98	0.98
						(0.96 - 1.00)	(0.96 - 1.01)
Unemployed						1.14	1.14
						(1.05 - 1.24)	(1.06 - 1.24)
Interactions							
Major Discrimination x Black							0.81
							(0.69 - 0.95)
Major Discrimination x Latino							0.91
							(0.73 - 1.13)

Notes. PR stands for prevalence ratios.

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