Perceived Discrimination is Associated with Health Behaviors among African Americans in the Jackson Heart Study[*]

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Abstract

Background—Using Jackson Heart Study data, we examined associations of multiple measures of perceived discrimination with health behaviors among African Americans (AA).

Methods—The cross-sectional associations of everyday, lifetime, and burden of discrimination with odds of smoking and mean differences in physical activity, dietary fat, and sleep were

examined among 4,939 35–84 year old participants after adjustment for age and socioeconomic status (SES).

Results—Men reported slightly higher levels of everyday and lifetime discrimination than women and similar levels of burden of discrimination as women. After adjustment for age and SES, everyday discrimination was associated with more smoking and a greater percentage of dietary fat in men and women (OR for smoking: 1.13, 95%CI 1.00,1.28 and 1.19, 95%CI 1.05,1.34; mean difference in dietary fat: 0.37, p<.05 and 0.43, p<.01, in men and women, respectively). Everyday and lifetime discrimination were associated with fewer hours of sleep in men and women (mean difference for everyday discrimination: −0.08, p<.05 and −0.18, p<.001, respectively; and mean difference for lifetime discrimination: −0.08, p<.05, and −0.24, p<.001, respectively). Burden of discrimination was associated with more smoking and fewer hours of sleep in women only.

Conclusions—Higher levels of perceived discrimination were associated with select health behaviors among men and women. Health behaviors offer a potential mechanism through which perceived discrimination affects health in AA.

INTRODUCTION

Perceived discrimination is associated with poor health[1] including cardiovascular disease (CVD).[2–5] Research has explored the pathways through which discrimination affects health. As a stressor, discrimination has a direct impact on physiologic processes which affects health.[1,4] Discrimination may also operate indirectly through unhealthy behaviors, which may occur as a coping response to stress resulting from discrimination.[6]

This is also referred to as avoidant coping strategies which result in behaviors such as substance abuse, poor eating, physical inactivity, and smoking.[7] Studies show that African American (AA) women use avoidance as a means of coping with discrimination.[8,9] Studies also report that AA cope with stressful situations by engaging in unhealthy behaviors (e.g., poor eating, smoking), which indirectly may alleviate the symptoms of stress (i.e., depression, anxiety), but directly contribute to physical health disparities by race/ethnicity.[6] The extent to which AA men and women cope with discrimination differently also suggests that the association of discrimination with unhealthy behaviors varies by sex[5,10]

Unhealthy behaviors are more prevalent among AA. Although the national prevalence of smoking is similar among AA and Whites (21%), the social environments in which AA live contribute to a greater health burden from smoking cigarettes.[11] AA also engage in less physical activity and more unhealthy dietary habits than Whites.[12,13] Physical inactivity and poor nutrition are associated with weight gain, diabetes, and hypertension.[14,15] Research shows that AA have an increased risk of short sleep and chronic insomnia relative to Whites,[16–19] which are related to increased morbidity and chronic stress burden.[20]

Researchers have reported associations of discrimination with weight gain, smoking, and alcohol consumption.[10,21] However, most studies have focused on a single measure of discrimination, and few have examined how attribution of discrimination, or coping with discrimination modifies the association of discrimination with behaviors. In light of this gap, we used data from the Jackson Heart Study (JHS), a prospective study of CVD in AA, to examine associations of multiple measures of discrimination (everyday, lifetime, and burden) with behaviors. We also investigated the extent to which attribution of discrimination and coping with discrimination would modify the association between discrimination and behaviors. We hypothesized that measures of discrimination would be associated with behaviors, associations would vary by sex, and associations would be modified by coping responses to discrimination.

METHODS

Data

The JHS is a study of CVD among non-institutionalized AA 35–84 years old (1,941 men, 3,360 women) in Jackson, Mississippi. Between 2000 and 2004, participants were recruited from Hinds, Madison and Rankin counties in the Jackson Mississippi metropolitan area. They were enrolled from four sources: random-17%; volunteer-22%; the Atherosclerosis Risk in Communities (ARIC) Study-30%; and family members-31%. Details of the study design were published elsewhere.[22,23] The study was approved by the institutional review boards of University of Mississippi Medical Center, Jackson State University, and Tougaloo College. All participants provided informed consent.

Measures

The JHS Discrimination Instrument (JHSDIS) was administered during exam 1, which measured everyday and lifetime discrimination. Everyday discrimination, adapted from Williams' scale,[24] had good internal reliability (α=.88).[25] Participants were asked "How often on a day-to-day basis do you have the following experiences?:" "…treated with less courtesy and… less respect…, People act as if …you are dishonest…, you are threatened." Responses ranged from 1 ("never") to 7 ("several times a day"). The mean of the 9 items was used as a continuous score.

Lifetime discrimination was based on the Krieger scale[8] (α=.78). Participants were asked about the occurrence of unfair treatment over the lifetime (yes/no) across such domains as: at school, getting a job, at work. The count of the domains for which unfair treatment was reported (0–9) was the lifetime discrimination score.

For participants who reported at least 1 instance of lifetime discrimination, burden of discrimination was examined by asking "When you had experiences like these, have they been - not stressful, moderately stressful, or very stressful?" "…has discrimination interfered with… life," and "how much harder has life been…?... not at all, a little, some, or a lot?" Responses were summed to create a continuous score ranging from 1 (low burden) to 4 (greater burden). Internal reliability (α=0.63) was moderate.[25–27] Everyday, lifetime and

burden of discrimination scores were transformed into standard deviation (SD) units for ease of interpretation.

After each set of discrimination questions, participants reported the reason for discrimination (age, sex, race, height/weight). Responses were combined with discrimination scores to create 5 categories: (1) no discrimination (referent); (2) low discrimination (below the median) attributed to race; (3) low discrimination attributed to nonracial factors; (4) high discrimination (at or above the median) attributed to race; and (5) high discrimination attributed to nonracial factors. These categories were created for everyday, lifetime and burden discrimination.

We examined the extent to which coping with discrimination modified the association with behaviors.[8,28] After responding to questions about everyday discrimination, participants were asked: "And when you receive unfair treatment…, do you…: Speak up, Accept it, Ignore it, etc." Participants were asked to select *one* response from 12 options, which resulted in a value of one for the selected coping method and 0 for others. For lifetime discrimination, participants were allowed to select multiple coping responses.[25] When they selected a response, they were asked a follow-up question: "…did you do that a little (=1), some (=2), or a lot (=3)?" To create a measure that incorporated coping and frequency, we multiplied the coping (0/1) and frequency (1–3) scores together for each of the 12 options. The final score ranged from 0 (did not use coping response) to 3 (frequently used coping response).

We further categorized items into emotion-focused and problem-focused coping.[29] Emotion-focused coping included ignoring, forgetting, avoiding, or accepting the situation; praying; keeping it to yourself; and blaming yourself. Problem-focused coping included speaking up, violence, trying to change things, and working harder to prove them wrong. For everyday discrimination, participants chose one of the 11 responses, so each participant was assigned either a 1 or 0 for emotion-focused and problem-focused coping, and the dichotomous indicators were used in the analyses. For lifetime discrimination, a mean problem- and emotion-focused score was created by dividing summed scores for each type of coping by the number of items for each category.

Outcomes included cigarette smoking, calories from fat, physical activity, and sleep duration. Cigarette smoking was measured as current smoker vs. not current smoker. Diet was measured as the percent daily calories from fat. Physical activity was measured as a summed score of four indices (Active Living, Work/Occupational, Home Life, and Sport) from the JHS physical activity instrument (JPAC).[30] We also estimated associations of discrimination with each sub-scale of physical activity (supplementary analysis). Self-report sleep duration was measured as the number of hours of sleep per night participants report.

Socioeconomic status (SES) included education, income, and occupation. Educational attainment included less than high school; high school graduate or GED; some college (1–3 years), vocational school, or associate degree; and college graduate or higher (4+ years). Income was classified as poor, lower-middle, upper-middle, and affluent, based on family size, US Census poverty levels, and year of baseline clinic visit (2000–2004). Occupation,

coded according to the 2000 US standard occupational codes (US Bureau of the Census, 2000), was classified as follows: production/ construction/extract, sales/office, service, and managerial/professional. Additional covariates included sex, age, and body mass index (BMI) calculated as weight in kilograms divided by height in meters squared.

Analysis

Of the 5,301 participants who completed the baseline clinic examination, 765 were excluded because of missing data on discrimination measures (n = 294), education (n=20), occupation (n=7), outcomes and covariates (n=444). In addition, we excluded 53 participants with occupation records of farming, military, unemployed, retired, student, sick and homemaker because of smaller sample size. Missing data for income was coded as a separate category in order to retain participants in the analysis. The final sample sizes for regression analyses were restricted to 4,452 for measures of everyday and lifetime discrimination and 3,942 for burden of lifetime discrimination.

Baseline characteristics were examined by sex and tested for differences using Chi-squared test or t tests. Multivariable regression models examined the associations of everyday, lifetime, and burden of discrimination with behaviors before and after adjustment for covariates. Logistic regression estimated odds ratios for current smoking (yes/no), and linear regression estimated mean differences for continuous outcomes of physical activity, percent calories from fat, and hours of sleep. Because prior work suggested that the association of discrimination with behaviors varies by sex,[5,31] we stratified by sex. Model 1 adjusted for age only, and model 2 added SES and BMI (in physical activity models).

Global interaction tests were performed between emotion- and problem-focused coping and the three discrimination measures. Interactions with everyday coping were investigated by including the product of the dichotomous emotion- and problem-focused coping variable with the continuous everyday discrimination score. Interactions with lifetime and burden coping were investigated by including the product of the continuous emotion- and problem-focused variable with the continuous lifetime score. A total of 48 sex-stratified models were run to test whether coping modified associations of discrimination with behaviors. For each discrimination measure, the first model adjusted for age, SES, discrimination, emotion-focused coping, and the interaction between discrimination and coping. The second model adjusted for age, SES, discrimination, problem-focused coping, and the interaction between discrimination and coping. For each behavior, this produced 16 models for each discrimination measure. All tests were two-tailed and a probability value of <.05 was considered statistically significant. All analyses were performed using SAS version 9.1 (SAS Institute Inc,Cary, NC).

RESULTS

Women composed 63% of the sample and were older than men (Table 1). Men reported higher levels of everyday and lifetime discrimination than women and similar levels of burden of discrimination as women. Thirty eight percent of women and 47% of men attributed everyday discrimination to race, and 51% of women and 63% of men attributed lifetime discrimination to race. Men reported using more problem-focused strategies than

women (50.1% vs. 43%, respectively), while women reported more emotion-focused strategies than men (54.7% vs. 48.2%, respectively).

Table 2 presents odds ratios (OR) or mean differences for associations of discrimination with behaviors by sex. Among women, everyday discrimination was significantly associated with current smoking, physical activity, and calories from fat after adjustment for age and SES [OR of smoking per 1 SD increase in discrimination 1.19; 95% CI = 1.05, 1.34; mean differences in physical activity (0.11, p ≤05) and calories from fat (0.43, p ≤01)]. Everyday discrimination was negatively associated with sleep after adjustment for SES (−0.18, p ≤ 001). A similar pattern of associations with smoking, physical activity, and sleep was observed for lifetime discrimination [OR of smoking per 1 SD increase in discrimination 1.17; 95% CI = 1.03, 1.33; mean differences in physical activity (0.14, p ≤01) and sleep (−0.24, p ≤001)]. Burden of discrimination was associated only with smoking and sleep [OR of smoking per 1 SD increase in discrimination 1.20; 95% CI = 1.05, 1.36; mean difference in sleep (−0.19, p ≤001)]. Analyses for different types of physical activity among women showed that greater everyday and burden discrimination were associated with work physical activity [mean difference in work index per 1 SD in everyday discrimination (0.045, p ≤01) and burden discrimination (0.044; p ≤001)]. Greater lifetime (0.057; p ≤001) and burden discrimination (0.035, p ≤05) were associated with active living (supplementary table 1).

For men, everyday discrimination was positively associated with current smoking (OR 1.13; 95% CI = 1.00, 1.28) and fat intake (0.37, p ≤05) and negatively associated with sleep (−0.08, p ≤05) after adjustment for age and SES (Table 2). Lifetime discrimination was significantly associated with fat intake (0.46, p ≤01) and fewer hours of sleep (−0.08, p ≤05) in the full model, but not with smoking or physical activity. Burden of discrimination was not associated with any of the behaviors.

Table 3 presents the associations of discrimination with behaviors for racial and nonracial attribution, compared to participants who did not perceive discrimination (reference). All models adjusted for age and SES, and BMI in the physical activity model. Among women, associations of higher levels of everyday discrimination with greater odds of smoking, more physical activity, higher fat intake, and less sleep did not differ significantly by attributions (p value for difference: >.05). Similar patterns were observed for lifetime discrimination, with the exception of sleep: lifetime discrimination attributable to non-racial factors was more strongly associated with reduced sleep than discrimination attributable to race (p value for difference: ≤05). Burden of discrimination attributed to non-racial factors was more strongly associated with reduced sleep than discrimination attributed to race (p value for difference: ≤05). For men the associations of everyday and lifetime discrimination with behaviors did not differ significantly by attribution (p value for difference: >.05). Burden of discrimination attributable to race was more strongly associated with smoking than discrimination attributable to nonracial factors (p value for difference: ≤05).

Neither emotion- nor problem-focused coping modified the association of everyday discrimination or burden of discrimination with any of the behaviors (supplementary table 2). One interaction was significant for women, such that the association of lifetime

discrimination with more physical activity was stronger in women who used emotion-focused coping (b=0.20, p-value 0.03).

DISCUSSION

This study examined the associations of discrimination with behaviors in a large cohort of AA. We found that higher levels of everyday discrimination were associated with more smoking, higher fat consumption and less sleep in both men and women. Higher levels of lifetime discrimination were associated with more smoking in women, more fat consumption in men, and less sleep in both genders. Burden of discrimination was associated with more smoking and less sleep in women only. The association of discrimination with behavioral risk factors did not vary by racial or non-racial attribution, except lifetime discrimination and sleep among women and burden discrimination and sleep among men. An unexpected finding was that higher everyday and lifetime discrimination were associated with more physical activity in women.

Previous studies have reported associations of discrimination with behaviors. One multi-ethnic study found that lifetime discrimination was associated with greater smoking and consumption of alcohol among AA (n=1,839) 45–84 years old.[10] A study of Asian Americans also found that general (and racial) everyday discrimination was associated with smoking.[32] This is consistent with our findings for everyday discrimination and smoking in both genders, and lifetime discrimination and smoking among women. Research has suggested that individuals may cope with psychosocial stress by using nicotine to self-medicate, particularly among AA in poor environments.[33] Greater lifetime discrimination attributed to race has also been linked to less healthy diets among nonwhites (n=308).[34] Consistent with these findings, we found that higher lifetime discrimination was related to higher fat intake in men and higher everyday discrimination was related to higher fat intake in women. One study of stress and diet concluded that chronic stress exposure may promote reduced dietary restraint and consumption of foods containing more carbohydrates and saturated fat,[35] which is consistent with the finding that chronically stressed individuals often crave foods high in salt, sugar, and fat.

Our results for physical activity are unexpected in that in women, higher lifetime and everyday discrimination were associated with greater physical activity. In the case of everyday discrimination this was primarily due to work activity which suggests that residual confounding by occupation could play a role. In the case of lifetime discrimination, it was primarily observed for active living (i.e., daily walking and biking, and watching television and sweating from physical exertion). A previous study found no association between general lifetime discrimination and physical activity (steps taken) in race-stratified models.[36] It has been suggested that physical activity (specifically exercise) relieves stress, anxiety and depression.[37,38] More work, however, is needed to explore this pathway.

No studies of which we are aware have examined the association of multiple measures of discrimination with sleep in a large cohort of AA. We found that greater everyday and lifetime discrimination were associated with fewer hours of sleep among men and women, and that higher burden of discrimination was associated with reduced sleep among women.

These results suggest that stress linked to discrimination could contribute to sleep deprivation among AA,[20,39] which may contribute to CVD risk.[40]

An important strength of our study was the availability of multiple measures of discrimination. In general, we observed similar patterns for lifetime and everyday discrimination across behaviors and genders, but reports of burden of discrimination were associated with behaviors (smoking and sleep) only in women. Burden captures the stressfulness of discrimination, how it has interfered with life, and whether it made life harder. Research has suggested that the consequences or stressfulness of life events is important for predicting health outcomes.[1,41] Notably, our findings suggest that stress associated with discrimination may be more important in the health of women in this sample. In fact, the component of the burden index that asked if lifetime discrimination made your life very stressful, women reported higher levels than men (27% vs. 20%, p<.001, respectively).[5]

Another novel feature of this study included examining the attribution of discrimination. Previous studies have investigated the extent to which race vs. nonracial attributions modify the association of discrimination with behaviors, but they have not examined attribution of multiple measures of discrimination in a single study. Two studies with large AA samples (n >1,000) found that racial (vs. nonracial) lifetime discrimination was associated with greater tobacco use.[10,42] Chae et al.[32] found that everyday discrimination, attributed to racial/ethnic status, was associated with smoking among Asian Americans. In general, we found no consistent evidence that the associations of discrimination with behaviors differed by attribution. Most associations were similar whether discrimination was attributed to race or non-racial factors. There was some evidence that lifetime and burden discrimination attributable to nonracial factors was more strongly associated with reduced sleep in women, suggesting that weight could be a residual confounder.

The availability of detailed coping data also allowed us to examine the manner in which individuals cope with discrimination modifies its impact on behaviors. Kreiger and Sydney[8] found that AA, who reported high levels of racial lifetime discrimination and coped with it by accepting this treatment, had higher blood pressure than individuals who challenged the discrimination they perceived. We found a positive association of discrimination with physical activity for women who chose emotion-focused coping. This suggests that women who passively cope with lifetime discrimination also engage in high levels of physical activity. To our knowledge, no study has examined how coping behaviors modified the associations of measures of discrimination with behaviors in a large sample of AA.

This study is not without limitations. The JHS was restricted to a single site, which limits its generalizability. We used a cross-sectional design, which limited our ability to draw causal inferences about the exposure to discrimination and behaviors. Additionally, coping was asked as a global response after all everyday and lifetime discrimination items were asked. Our measure of diet (calories from fat) was limited in that it did not capture a full array of dietary measures that may be associated with perceived discrimination as well as CVD risk. There are also strengths of this study. The JHS is the largest study of CVD in AA, which enabled us to measure multiple dimensions of discrimination (everyday, lifetime and burden)

and to examine the attributions of each dimension. Another important strength was the simultaneous investigation of multiple behaviors, including sleep duration.

In summary, we found that measures of discrimination were related to behaviors, possibly contributing to the clustering of behaviors in discriminated groups. Given the established relationship between behaviors and health outcomes, our results suggest that discrimination may contribute to adverse health outcomes in AA.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

References

1. Williams DR, Mohammed SA. Discrimination and racial disparities in health: evidence and needed research. J Behav Med. 2009; 32(1):20–47. [PubMed: 19030981]

2. Wyatt SB, Williams DR, Calvin R, Henderson FC, Walker ER, Winters K. Racism and cardiovascular disease in African Americans. Am J Med Sci. 2003; 325(6):315–331. [PubMed: 12811228]

3. Lewis TT, Everson-Rose SA, Powell LH, et al. Chronic exposure to everyday discrimination and coronary artery calcification in African-American women: the SWAN Heart Study. Psychosom Med. 2006; 68(3):362–368. [PubMed: 16738065]

4. Brondolo E, Gallo LC, Myers HF. Race, racism and health: disparities, mechanisms, and interventions. J Behav Med. 2009; 32(1):1–8. [PubMed: 19089605]

5. Sims M, Diez-Roux AV, Dudley A, et al. Perceived discrimination and hypertension among African Americans in the Jackson Heart Study. Am J Public Health. 2012; 102(Suppl 2):S258–265. [PubMed: 22401510]

6. Jackson JS, Knight KM, Rafferty JA. Race and unhealthy behaviors: chronic stress, the HPA axis, and physical and mental health disparities over the life course. Am J Public Health. 2010; 100(5): 933–939. [PubMed: 19846689]

7. Guthrie BJ, Young AM, Williams DR, Boyd CJ, Kintner EK. African American girls' smoking habits and day-to-day experiences with racial discrimination. Nurs Res. 2002; 51(3):183–190. [PubMed: 12063417]

8. Krieger N, Sidney S. Racial discrimination and blood pressure: the CARDIA Study of young black and white adults. Am J Public Health. 1996; 86(10):1370–1378. [PubMed: 8876504]

9. Utsey SO, Ponterotto JG, Reynolds AL, Cancelli A. Racial discrimination, coping, life satisfaction, and self-esteem among African Americans. Journal of counseling and development. 2000; 78(1): 72–80.

10. Borrell LN, Diez Roux AV, Jacobs DR Jr, et al. Perceived racial/ethnic discrimination, smoking and alcohol consumption in the Multi-Ethnic Study of Atherosclerosis (MESA). Prev Med. 2010; 51(3–4):307–312. [PubMed: 20609433]

11. CDC. Vital signs: current cigarette smoking among adults aged >= 18years --United States, 2005–2010. Morbidity and Mortality Weekly Report. 2011; 60:1207–1212. [PubMed: 21900875]

12. Crespo CJ, Smit E, Andersen RE, Carter-Pokras O, Ainsworth BE. Race/ethnicity, social class and their relation to physical inactivity during leisure time: results from the Third National Health and Nutrition Examination Survey, 1988–1994. Am J Prev Med. 2000; 18(1):46–53. [PubMed: 10808982]

13. Carithers T, Dubbert PM, Crook E, et al. Dietary assessment in African Americans: methods used in the Jackson Heart Study. Ethn Dis. 2005; 15(4 Suppl 6):S6-49–55.

14. Dubbert PM, Robinson JC, Sung JH, et al. Physical activity and obesity in African Americans: the Jackson Heart Study. Ethn Dis. 2010; 20(4):383–389. [PubMed: 21305826]

15. Wagner EH, LaCroix AZ, Buchner DM, Larson EB. Effects of physical activity on health status in older adults. I: Observational studies. Annu Rev Public Health. 1992; 13:451–468. [PubMed: 1534661]

16. Hicken MT, Lee H, Ailshire J, Burgard SA, Williams DR. "Every shut eye, ain't sleep": The role of racism-related vigilance in racial/ethnic disparities in sleep difficulty. Race Soc Probl. 2013; 5(2):100–112. [PubMed: 23894254]

17. Hale L, Do DP. Racial differences in self-reports of sleep duration in a population-based study. Sleep. 2007; 30(9):1096–1103. [PubMed: 17910381]

18. Lauderdale DS, Knutson KL, Yan LL, et al. Objectively measured sleep characteristics among early-middle-aged adults: the CARDIA study. Am J Epidemiol. 2006; 164(1):5–16. [PubMed: 16740591]

19. Bixler EO, Vgontzas AN, Lin HM, Vela-Bueno A, Kales A. Insomnia in central Pennsylvania. J Psychosom Res. 2002; 53(1):589–592. [PubMed: 12127176]

20. Akerstedt T. Psychosocial stress and impaired sleep. Scand J Work Environ Health. 2006; 32(6): 493–501. [PubMed: 17173205]

21. Bennett GG, Wolin KY, Robinson EL, Fowler S, Edwards CL. Perceived racial/ethnic harassment and tobacco use among African American young adults. Am J Public Health. 2005; 95(2):238–240. [PubMed: 15671457]

22. Payne TJ, Wyatt SB, Mosley TH, et al. Sociocultural methods in the Jackson Heart Study: conceptual and descriptive overview. Ethn Dis. 2005; 15(4 Suppl 6):S6-38–48. [PubMed: 16317984]

23. Taylor HA Jr, Wilson JG, Jones DW, et al. Toward resolution of cardiovascular health disparities in African Americans: design and methods of the Jackson Heart Study. Ethn Dis. 2005; 15(4 Suppl 6):S6-4–17.

24. Williams DR, Yu Y, Jackson JS, Anderson N. Racial differences in physical and mental health: socio-economic status, stress and discrimination. J Health Psych. 1997; 2:335–351.

25. Sims M, Wyatt SB, Gutierrez ML, Taylor HA, Williams DR. Development and psychometric testing of a multidimensional instrument of perceived discrimination among African Americans in the Jackson Heart Study. Ethn Dis. 2009; 19(1):56–64. [PubMed: 19341164]

26. Williams DR, Neighbors HW, Jackson JS. Racial/ethnic discrimination and health: findings from community studies. Am J Public Health. 2003; 93(2):200–208. [PubMed: 12554570]

27. Kessler RC. The effects of stressful life events on depression. Annu Rev Psychol. 1997; 48:191–214. [PubMed: 9046559]

28. Vines AI, McNeilly MD, Stevens J, Hertz-Picciotto I, Baird M, Baird DD. Development and reliability of a Telephone-Administered Perceived Racism Scale (TPRS): a tool for epidemiological use. Ethn Dis. 2001; 11(2):251–262. [PubMed: 11456000]

29. Brondolo E, Brady Ver Halen N, Pencille M, Beatty D, Contrada RJ. Coping with racism: a selective review of the literature and a theoretical and methodological critique. J Behav Med. 2009; 32(1):64–88. [PubMed: 19127420]

30. Dubbert PM, Carithers T, Ainsworth BE, Taylor HA Jr, Wilson G, Wyatt SB. Physical activity assessment methods in the Jackson Heart Study. Ethn Dis. 2005; 15(4 Suppl 6):S6-56–61.

31. Borrell C, Muntaner C, Gil-Gonzalez D, et al. Perceived discrimination and health by gender, social class, and country of birth in a Southern European country. Prev Med. 2010; 50(1–2):86–92. [PubMed: 19891984]

32. Chae DH, Takeuchi DT, Barbeau EM, Bennett GG, Lindsey J, Krieger N. Unfair treatment, racial/ethnic discrimination, ethnic identification, and smoking among Asian Americans in the National Latino and Asian American Study. Am J Public Health. 2008; 98(3):485–492. [PubMed: 18235073]

33. Slopen N, Dutra LM, Williams DR, et al. Psychosocial stressors and cigarette smoking among African American adults in midlife. Nicotine Tob Res. 2012; 14(10):1161–1169. [PubMed: 22367977]

34. Manuel RC. Perceived race discrimination moderates dietary beliefs' effects on dietary intake. Ethn Dis. 2004; 14(3):405–416. [PubMed: 15328943]

35. Koob GF, Nestler EJ. The neurobiology of drug addiction. J Neuropsychiatry Clin Neurosci. 1997; 9(3):482–497. [PubMed: 9276849]

36. Shelton RC, Puleo E, Bennett GG, McNeill LH, Goldman RE, Emmons KM. Racial discrimination and physical activity among low-income-housing residents. Am J Prev Med. 2009; 37(6):541–545. [PubMed: 19944922]

37. Salmon P. Effects of physical exercise on anxiety, depression, and sensitivity to stress: a unifying theory. Clin Psychol Rev. 2001; 21(1):33–61. [PubMed: 11148895]

38. Sime, WE. Exercise Therapy for Stress Management. In: Lehrer, PM.; Woolfolk, RL.; Sime, WE.; Barlow, DH., editors. Principles and Practice of Stress Management. 3. New York, NY: The Guilford Press; 2007. p. 333-362.

39. Kerstedt T, Orsini N, Petersen H, Axelsson J, Lekander M, Kecklund G. Predicting sleep quality from stress and prior sleep - A study of day-to-day covariation across sixweeks. Sleep Med. 2012; 13(6):674–679. [PubMed: 22621983]

40. Hairston KG, Bryer-Ash M, Norris JM, Haffner S, Bowden DW, Wagenknecht LE. Sleep duration and five-year abdominal fat accumulation in a minority cohort: the IRAS family study. Sleep. 2010; 33(3):289–295. [PubMed: 20337186]

41. Dohrenwend BP. Inventorying stressful life events as risk factors for psychopathology: Toward resolution of the problem of intracategory variability. Psychol Bull. 2006; 132(3):477–495. [PubMed: 16719570]

42. Borrell LN, Jacobs DR Jr, Williams DR, Pletcher MJ, Houston TK, Kiefe CI. Self-reported racial discrimination and substance use in the Coronary Artery Risk Development in Adults Study. Am J Epidemiol. 2007; 166(9):1068–1079. [PubMed: 17698506]

What is already known on this subject

Prior research has established an association between perceived discrimination and behaviors. One multi-ethnic study found that lifetime discrimination was associated with greater smoking and consumption of alcohol among African Americans, while another study found that general (and racial) everyday discrimination was associated with smoking among Asian Americans. Few studies, however, have examined everyday and lifetime discrimination in a single study in order to determine their joint and independent effects on behaviors as the current study.

What this study adds

We evaluated multiple dimensions of (general and racial/nonracial) discrimination (everyday, lifetime and burden) as key predictors of behaviors in a large cohort of African Americans and found that each measure is related to behaviors among African Americans. No study, to our knowledge, has assessed a measure of burden of discrimination, as well as included multiple measures of discrimination in a single study. Unlike previous studies, we also included sleep as an outcome, and found that discrimination was associated with reduced hours of sleep. Our findings suggest that modifying behaviors in a highly discriminated group may help to mitigate the negative affects behaviors have on chronic diseases.

Table 1

Baseline characteristics by sex, The Jackson Heart Study, 2000–2004

Variables	Women (n=2811)	Men (n=1641)	P value[*]
Age, mean (SD)	54.78 (12.59)	53.61 (12.69)	0.0029
Socioeconomic Status			
Education (%)			0.4182
Less than high school	16.29	18.04	
High school graduate	20.14	18.83	
Some college	29.63	29.68	
Bachelor degree or more	33.94	33.46	
Income (%)			<0.0001
Poor	14.8	8.35	
Lower-middle	22.41	18.04	
Upper-middle	25.86	25.96	
Affluent	21.56	32.48	
Others	15.37	15.17	
Occupation (%)			<0.0001
Production/construction/extract	10.53	39	
Sales/Office	20.46	12.8	
Service	29.78	15.97	
Management/Professional	39.24	32.24	
Measures of Discrimination, mean (SD)[†]			
Everyday Discrimination	2.08 (0.99)	2.18 (1.06)	0.0028
Lifetime Discrimination	2.98 (2.05)	3.25 (2.12)	<0.0001
Burden of Discrimination [**]	2.34 (0.79)	2.37 (0.77)	0.2619
Attribution of everyday discrimination (%)			
No discrimination	15.46	15.15	<0.0001
Race/low	18.28	19.62	
Nonracial/low	25.16	18.93	
Race/high	19.26	27.81	
Nonracial/high	21.83	18.50	
Attribution of lifetime discrimination (%)			
No discrimination	12.02	11.55	<0.0001
Race/low	16.22	17.26	
Nonracial/low	16.18	10.30	
Race/high	34.47	46.00	
Nonracial/high	21.11	14.90	
Attribution of Burden (%)			
Race/low	27.32	32.29	<0.0001
Nonracial/low	23.00	15.28	
Race/high	30.10	39.38	
Nonracial/high	19.58	13.06	

Variables	Women (n=2811)	Men (n=1641)	P value[*]
Coping responses[‡]			
Everyday coping (%)			
Problem-focused	43.01	50.08	<0.0001
Emotion-focused	54.73	48.19	0.0003
Lifetime coping, mean (SD)			
Problem-focused	1.12 (0.75)	1.15 (0.79)	0.3959
Emotion-focused	1.03 (0.62)	0.93 (0.61)	<.0001
Health Behaviors			
Current cigarette smoking (%)	10.07	17.79	<0.0001
Fat, mean (SD)	35.02 (7.17)	35.02 (6.53)	0.9962
Physical activity, mean (SD)	8.24 (2.55)	8.70 (2.60)	<0.0001
Sleep, mean (SD)	6.45 (1.48)	6.36 (1.50)	0.0407

Abbreviations: ANOVA, analysis of variance, SD, standard deviation

[†]Sample sizes for everyday and lifetime discrimination (N= 4452), and burden of discrimination (N= 3942)

[‡]Sample sizes for coping responses (N= 3334)

Problem-focused coping included speaking up and trying to change the situation.

Emotion-focused coping included accepting, ignoring or keeping things to yourself, avoiding or forgetting the situation.

[*]ANOVA test was used for continuous variables and Chi-squared test was used for categorical variables. Wilcoxon-Mann-Whitney test was used for variables with non-normal distribution

[**]Burden of discrimination is restricted to persons who reported at least 1 instance of lifetime discrimination.

Table 2

Odds Ratio (OR, 95% CIs) or Mean Differences (SE) of Behaviors associated with Measures of Discrimination by Sex, The Jackson Heart Study, 2000–2004

Women

Predictors[†]	Current Smoker (OR, 95%CI)		Physical Activity (SE) [‡]		Fat (SE)		Sleep (SE)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Everyday Discrimination	1.21 (1.07, 1.36)	1.19 (1.05, 1.34)	0.10 (0.05) *	0.11 (0.05) *	0.41 (0.14) **	0.43 (0.14) **	−0.18 (0.03) ***	−0.18 (0.03) ***
Lifetime Discrimination	1.06 (0.94, 1.12)	1.17 (1.03, 1.33)	0.24 (0.05) ***	0.14 (0.05) **	0.36 (0.14) **	0.23 (0.14)	−0.22(0.03) ***	−0.24 (0.03) ***
Burden of Discrimination	1.19 (1.05, 1.36)	1.20 (1.05, 1.36)	0.01 (0.05)	−0.001 (0.05)	0.11 (0.14)	0.11 (0.14)	−0.19 (0.03) ***	−0.19 (0.03) ***

Men

	Current Smoker (OR, 95%CI)		Physical Activity (SE) [‡]		Fat (SE)		Sleep (SE)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Everyday Discrimination	1.16 (1.03, 1.30)	1.13 (1.00, 1.28)	0.02 (0.06)	0.03 (0.06)	0.36 (0.16) *	0.37 (0.16) *	−0.08 (0.04) *	−0.08 (0.04) *
Lifetime Discrimination	0.90 (0.80, 1.03)	0.98 (0.86, 1.12)	0.21 (0.06) ***	0.10 (0.06)	0.48 (0.16) **	0.46 (0.16) **	−0.08 (0.04) *	−0.08 (0.04) *
Burden of Discrimination	1.06 (0.92, 1.22)	1.07 (0.93, 1.23)	0.09 (0.06)	0.09 (0.06)	0.02 (0.17)	0.02 (0.18)	−0.03 (0.04)	−0.03 (0.04)

Abbreviations: OR, odds ratio, CI, confidence interval, SE, standard error

Model 1: age adjusted only ; Model 2 adjusted for age, and socioeconomic status (Education, Income, and Occupation)

[‡] Model 2 for the Physical Activity model was also adjusted for BMI

[†] Everyday discrimination, lifetime discrimination, and burden of lifetime discrimination were based on standard deviation units. Sample sizes for everyday and lifetime discrimination were 4452, and 3942 for burden of discrimination. Burden of discrimination is restricted to persons who reported at least 1 instance of lifetime discrimination.

*
 $p \leq 05$;

**
 $p \leq 01$;

***
 $p \leq 001$

Table 3

Odds Ratio (OR, 95% CI) or Mean Differences (SE) of Health Behaviors associated with Attribution of Discrimination by Sex, The Jackson Heart Study, 2000–2004

Predictors†	Smoking (OR)		Physical Activity		Fat		Sleep	
	Women	Men	Women	Men	Women	Men	Women	Men
Attribution of Everyday								
No Discrimination	Referent	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Race/Low	1.21 (0.71, 2.04)	0.88 (0.55, 1.42)	**0.28 (0.16)** *	**0.65 (0.20)** **	**1.27 (0.47)** **	−0.25 (0.57)	**−0.37 (0.10)** ***	0.12 (0.13)
Nonracial/Low	**1.59 (1.00, 2.51)**	0.90 (0.57, 1.42)	0.09 (0.14)	0.35 (0.20)	0.44 (0.43)	−0.43 (0.56)	**−0.28 (0.09)** **	−0.04 (0.13)
Race/High	**1.68 (1.04, 2.74)**	0.99 (0.65, 1.53)	**0.38 (0.16)** *	**0.58 (0.19)** **	**1.76 (0.47)** ***	0.68 (0.54)	**−0.55 (0.10)** ***	−0.07 (0.12)
Nonracial/High	**2.20 (1.40, 3.45)**	1.21 (0.78, 1.89)	0.29 (0.15)	**0.46 (0.20)** *	**1.31 (0.45)** **	−0.09 (0.58)	**−0.46 (0.10)** ***	−0.16 (0.13)
P-difference£	0.1523	0.3056	0.5231	0.5082	0.2893	0.1146	0.3259	0.4636
Attribution of Lifetime								
No Discrimination	Referent	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Race/Low	0.98 (0.58, 1.66)	0.83 (0.51, 1.33)	0.08 (0.17)	0.06 (0.22)	0.81 (0.51)	1.16 (0.61)	−0.11 (0.11)	**−0.28 (0.14)** *
Nonracial/Low	1.23 (0.75, 2.01)	0.70 (0.41, 1.20)	0.11 (0.17)	0.06 (0.25)	0.35 (0.51)	−0.12 (0.69)	0.02 (0.11)	−0.12 (0.16)
Race/High	1.50 (0.96, 2.35)	0.85 (0.56, 1.29)	**0.35 (0.15)** *	**0.41 (0.19)** *	**0.97 (0.46)** *	**1.48 (0.54)** **	**−0.38 (0.10)** ***	**−0.31 (0.13)** *
Nonracial/High	**1.61 (1.01, 2.58)**	0.70 (0.42, 1.16)	**0.34 (0.16)** *	0.28 (0.23)	0.82 (0.49)	**1.36 (0.65)** *	**−0.57 (0.10)** ***	−0.26 (0.15)
P - difference £	0.6649	0.3220	0.8705	0.4418	0.6844	0.8111	**0.0152**	0.6481
Attribution of Burden *								
Race/Low	**1.61 (1.07, 2.43)**	1.01 (0.65, 1.57)	0.09 (0.14)	−0.16 (0.19)	−0.66 (0.40)	−0.77 (0.53)	0.11 (0.08)	0.22 (0.12)
Nonracial/Low	**2.07 (1.41, 3.05)**	1.38 (0.98, 1.94)	0.09 (0.12)	0.15 (0.14)	−0.27 (0.37)	0.11 (0.41)	**−0.19 (0.08)** **	−0.04 (0.09)
Race/High	**1.77 (1.16, 2.69)**	0.87 (0.54, 1.40)	−0.05 (0.14)	0.06 (0.20)	−0.14 (0.42)	−0.46 (0.56)	**−0.37 (0.90)** ***	−0.10 (0.13)
Nonracial/High								
P - difference £	0.3947	**0.0426**	0.3131	0.6680	0.7579	0.2975	**0.0264**	0.5974

Abbreviations: OR, odds ratio, CI, confidence interval, SE, standard error

All models are adjusted for age and socioeconomic status (education, income and occupation).

‡
Models for the Physical Activity outcome were adjusted for BMI

†
Everyday, lifetime, and burden of discrimination variables were based on standard deviation units. Sample sizes for everyday and lifetime attribution were 4373, and 3892 for burden attribution.

**
Burden of discrimination is restricted to persons who reported at least 1 instance of lifetime discrimination.

£
P – difference in coefficient between Race/High and Nonracial/High

*
$p \leq 05$;

**
$p \leq 01$;

***
$p \leq 001$