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Perceived racism in relation to telomere length among African-American women in the Black Women's Health Study

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Abstract

Purpose: Telomere length is considered a biomarker of human aging and premature morbidity and mortality which has been associated with chronic stress.

Methods: We assessed the relation between perceived racism and telomere length in the Black Women's Health Study, a follow-up study of US black women begun in 1995. Participants were asked about frequency of "everyday racism" (e.g., "people act as if they think you are not intelligent") and "institutional racism" (e.g., "ever treated unfairly due to race by police"). Using quantitative real-time polymerase chain reaction assay, relative telomere lengths (RTL) were measured as the copy number ratio of telomere repeat to a single control gene in 997 participants. Associations of racism variables with log-RTL were estimated by multivariable linear regression, with adjustment for age at blood draw and potential confounders.

Results: Participants were aged 40-70 years (mean=55.6 years), and mean telomere length was 0.77 (range 0.21-1.38). In stratified analyses, there was an inverse association between everyday racism and log-RTL among women who did not discuss their experiences of racism with others (β = −0.1104; 95% CI= −0.2140 to −0.0067; p=0.045).

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Conclusions: Everyday racism was associated with shorter telomere length among women who reported not discussing those experiences with others.

Introduction

Telomeres are repetitive sequences of DNA at the ends of chromosomes, which protect against DNA degradation during cell division. At each division, telomeres become shorter until the Hayflick limit [1] is reached, at which point the cell arrests and becomes senescent [2]. In the past decade, increasing epidemiological research suggests that telomere length is a useful predictor of age-related diseases and mortality [3].

Previous studies have found that psychosocial stress, such as stress experienced during childhood [4] or due to mental health disorders [5], is a contributing factor to the degradation of telomeres [6] [7]. In African Americans, perceived racism is a major source of chronic stress [8, 9]. There have been only two studies of the relation of racial discrimination to telomere length in African Americans. A small study of San Francisco Bay area of African American men found that racial discrimination was associated with shorter telomere length only among those with an internalized negative racial bias [10]. In a sample of 550 older African American adults, everyday discrimination was not significantly associated with telomere length in standard multivariable analyses, but in one of three possible models that matched on socioeconomic factors, everyday discrimination was associated with shorter telomeres [11].

In the US, Black women have the lowest life expectancy compared to other groups[12], with the highest mortality rates being from cancer and cardiovascular disease, irrespective of socioeconomic status[13–15]. In the Black Women's Health Study (BWHS), a large follow-up study of African American women, perceived racism has been associated with a range of adverse health effects, including increased risk of type-2 diabetes [16], asthma [17], obesity [18, 19], and uterine leiomyomata [20]. We sought to assess the relationship between perceived racism and telomere length among women in the BWHS. We hypothesized an inverse association between measures of perceived racism and TL.

Methods

Source of Study Subjects

The BWHS began in 1995, when approximately 59,000 African American women, aged 21-69 years, from across the continental United States enrolled by completing postal health questionnaires which were sent mainly to subscribers of Essence magazine, members of selected Black women's professional organizations, and friends and relatives of early respondents. The questionnaires ascertained data on medical history, use of medications, demographic and lifestyle factors, reproductive history and behaviors [21, 22]. Participants have been followed by biennial postal and web questionnaires and the National Death Index with successful follow-up on >85% of potential person-years through 2015. The study protocol was approved by the Institutional Review Board of Boston University School of Medicine. Participants indicated consent to use their questionnaire data by completing and

returning questionnaires. Participants who provided blood samples provided written informed consent to use the samples for health-related research.

Blood specimen collection and measurement of telomere length

Collection of blood specimens from BWHS participants was conducted from 2013 through 2018, during which time all living study participants in regions of the continental U.S. serviced by Quest Diagnostics Patient Service Centers [23] were extended the opportunity to provide a blood sample. Recruitment was rolled out by geographic region, beginning with the Southeastern U.S. in 2013 and ending with the rollout in the Northeastern region in 2017. Sample collection in all regions of the U.S. was completed in 2018. Of participants approached, 27% gave a blood sample and a signed consent form. Blood specimens were collected at Quest Diagnostics Patient Service Centers and processed by Quest Diagnostics regional laboratories. Quest Diagnostics (Madison, NJ, USA) is an accredited national clinical laboratory [23]. Frozen aliquoted samples were shipped to the Boston University Core Genetics facility for long-term storage at −80C.

Genomic DNA was extracted from peripheral blood leukocytes using the QiAmp (Qiagen) 96-spin blood protocol. Leukocyte telomere length assays were performed in the laboratory of Dr. Immaculata De Vivo at the Dana Farber Cancer Institute/Harvard Cancer Center Genotyping and Population Studies. Laboratory technicians masked to participant characteristics assayed each sample in triplicate. Quality control samples were interspersed on each plate to assess variability. Relative telomere length (RTL) was based on quantitative real-time polymerase chain reaction (Q-PCR). Average RTL was calculated as the exponentiated ratio of telomere repeat copy number to single-copy-gene (36B4) copy number (T/S) corrected for a reference sample [24]. RTL is reported as the exponentiated T/S ratio. The coefficient of variation (CV) for the exponentiated T/S ratio of quality control samples was 9%.

Exposures

The 1997 follow-up questionnaire included questions on experiences of racism adapted from an instrument developed by Williams et al. [25]. Five questions about everyday interpersonal racism asked about the frequency in daily life of the following experiences: “You receive poorer service than other people in restaurants or stores,” “People act as if they think you are not intelligent,” “People act as if they are afraid of you,” “People act as if they think you are dishonest,” and “People act as if they are better than you.” Response options were “never,” “a few times a year,” “once a month,” “once a week,” and “almost every day,” coded as 1 through 5. An everyday racism score was created by averaging subjects’ responses to the five questions. The Cronbach-α for the five everyday racism items was 0.80, indicating high internal consistency[26]. Three questions ascertained exposure to “institutional racism” over one’s lifetime by asking whether the participant was ever “treated unfairly due to your race” on the job, in housing, and by the police. Response categories were “yes” and “no.” An institutional racism score summed the positive responses to 0, 1, 2, or 3. Additionally, we considered a binary version of the institutional racism score, “no to all” versus “yes to at least one.” The racism questions were asked again on the 2009 questionnaire and scored in the same way.

Principal components factor analysis showed two factor patterns which confirmed the predetermined domains of everyday and institutional racism[27]. We assessed the reproducibility over time of the racism questions among 1,172 women who returned a duplicate questionnaire in 1997. Weighted κ-values indicated good reproducibility of responses (range 0.54-0.73), and the level of agreement did not vary by the length of the interval between the 2 questionnaires[27].

Covariates

In addition to age at blood draw, we considered a number of variables potentially associated with racism or and RTL. We selected factors that have been shown to be related to telomere length in other studies, including body mass index (BMI) (kg/m^2; <25, 25-29, 30-34, ≥35), geographic region of residence (Northeast, South, Midwest, West), alcohol use (never, past, current: 1-3, ≥4 drinks/week), cigarette smoking (packyears), vigorous physical activity (hours/week), neighborhood socioeconomic status [17] (quintiles), and depression diagnosis with medication (yes/no). These items were measured on the baseline (1995) and most follow-up questionnaires; the data on these variables were taken from the biennial questionnaire most proximal to the date of blood collection. Additional variables measured at different time-points over follow-up include maternal age at participant's birth (years) [28, 29] measured in 1997; household income ($) measured in 2003; education (years) measured in 1995 and 2003; and childhood physical abuse (no, low, intermediate, high), childhood sexual abuse (no, 1-3, ≥4 incidents) and depressive symptoms (CES-D score (<16, 16-23, ≥24)[30], were each measured in 2005. The 2013 questionnaire asked women whether they experienced financial hardship during childhood (yes/no), and whether they received emotional support during childhood (yes/no).

Participants in the present study

Potential participants **for** the present analyses were **the 2,463** BWHS participants who had completed a supplemental questionnaire as part of the Psychosocial Stress, Spirituality and Health Study (PI: Shields), responded to the racism questions on both the 1997 and 2009 questionnaires, and had provided a blood sample between November 2013 and December 2017. A random sample of 1,000 women were selected for the RTL assays of which three had missing RTL due to failed Q-PCR, resulting in a total analytic sample of 997.

Statistical methods

The natural log of RTL (log-RTL) was used to improve normality. Associations of everyday or institutional racism were assessed as categorical predictors, with four quartiles of everyday racism score and values of 0,1,2,3 on institutional racism. Linear trend tests were conducted by treating those variables as ordinal variables.

To assess potential for confounding, we separately examined age-adjusted associations of the previously described covariates with racism (everyday or institutional) and log-RTL using linear regression. The final multivariate model included only those variables that were associated both with telomere length and with one or both of the racism variables: age at blood draw (years), alcohol consumption (never, past, current: 1-3 drinks per week, current: 4+ drinks per week), current region of residence (Northeast, Midwest, West, South) and

diagnosis of depression with anti-depressant use (yes/no). Indicator variables were used for missing values.

A secondary analysis included only women who reported similar levels of exposure to everyday racism (n=393) or institutional racism (n=468) on the 1997 and 2009 questionnaires (i.e., in the same quartile of everyday racism or in the same institutional racism category); these women may have had more consistent experiences of racism over time than women who, over time, changed categories. We also assessed possible effect modification by health- or coping-related covariates using multiplicative interaction terms to determine if associations of racism with log-RTL differed by BMI (<25 kg/m^2, ≥25 kg/m^2), smoking (ever, never), maternal age at participant's birth (<35 years, ≥35+ years), age at blood draw (<60, ≥60)[29], or geographic region. Additionally, we stratified according to two variables measuring coping[31] from the 2009 questionnaire which asked women whether they talked about their experiences of racism with others (yes/no), and whether they tried to do something about racism (yes, no).

All statistical analyses were done in SAS version 9.3 (SAS Institute Inc, Cary, NC). Two-sided hypothesis testing was conducted with α=0.05.

Results

Table 1 shows the relation of various characteristics of participants at or near the time of blood draw to measures of everyday and institutional racism. At the time of selection for the Psychosocial Stress, Spirituality and Health Study, blood sample collection in the Northeastern US had only recently begun, resulting in under-representation from that region. Older women had lower mean everyday racism scores compared to younger women, but higher institutional racism scores. Higher everyday racism scores were associated with higher BMI, greater pack-years of smoking, depression, childhood abuse and financial hardship, and lack of emotional support in childhood. In addition to age, higher institutional racism scores were associated with higher BMI, smoking, depression, and childhood abuse and financial hardship. Both racism scores were lowest in the South.

Table 1 also presents associations of participant characteristics with log-RTL. Older age, maternal age <35, and depression treated by medication were associated with shorter telomere length. Additionally, women residing in the Midwest had longer telomere lengths than women residing in the South or West.

As shown in Table 2, values of log-RTL were similar across categories of everyday racism score in both age-adjusted and multivariable analyses. Results for institutional racism also suggested little relationship between institutional racism and log-RTL. In an analysis confined to women who reported the same levels of everyday racism and institutional racism in 1997 and 2009, there also was no evidence of a trend of decreasing RTL with higher frequency of everyday racism.

Table 3 presents results on everyday and institutional racism stratified by age at blood draw, region, BMI, smoking, maternal birth age, and two possible reactions to racism—discussing it with others versus keeping it to oneself and doing something about it versus accepting it as

a fact of life. Log-RTL decreased with increasing quartile of everyday racism among women who kept experiences of racism to themselves (p_{trend}=0.05) and there was no statistically significant association (p=0.53) among those who reacted to experiences of racism by discussing it with others ($p_{interaction}$ = 0.06). Among women who kept experiences of racism to themselves, the difference in log-RTL between highest quartile of everyday racism and lowest quartile was −0.1104, 95% CI −0.2140 to −0.0067. For institutional racism, the decrease in log-RTL was greater among women who kept the racism experience to themselves (−0.06) than among women who discussed it (−0.01), but the p for interaction was not significant (p=0.39). Associations of everyday racism with shorter telomere length appeared to be somewhat stronger among smokers (p_{trend} = 0.11) than among nonsmokers and among women with maternal age at birth ≥35 than among those with a younger maternal age at birth, although the interactions did not reach statistical significance at the 0.05 level ($p_{interactions}$ = 0.08 and 0.06, respectively). There were no notable associations of institutional racism with log-RTL.

Discussion

In the present study of African American women, there was no evidence of a main effect of everyday racism or institutional racism on telomere length in the full sample of 997 African American women included in this analysis. However, higher levels of everyday discrimination were associated with shorter telomeres among the women who reported that they kept experiences of racism to themselves. There was no association among women who discussed their experiences of racism with others. Taken together, these results are somewhat parallel to a study of 92 African American men aged 30-50 years, in which there was not a main effect of racial discrimination on telomere length. Instead, a statistically significant association was observed among men classified as having an internalized negative racial bias (i.e. prejudice against blacks or greater negative interactions with black experimenters) [10]. That same study of African American men also found a significant association of racism with telomere length among men with fewer depressive symptoms [32], which was not the case in the present study. Results of a more recent study of racism or discrimination in relation to telomere length [11] are somewhat unclear. An everyday discrimination measure similar to that used in the present study was utilized. Based on data from the 550 African Americans included in the study, there was little evidence of an association of experiences of everyday discrimination with decreased telomere length; there was a statistically significant lower mean telomere length in those who perceived everyday discrimination in a single coarsened exact matching (CEM) model, but not in two similar CEM models that included slightly different variables, and not in three multivariable linear regression models. In the present study, no significant main-effect was found in the overall sample.

The present study found a suggestion of a modifying effect of advanced maternal age at the birth of the participant for everyday racism in relation to telomere length. A stronger association was also observed among ever-smokers, which is consistent with studies suggesting that tobacco products contribute to the progression of aging-related diseases resulting in shorter telomeres [33]. An analysis of a different psychosocial factor than what we assessed, phobic anxiety, in the predominantly white (European ancestry) Nurses' Health Study, also observed effect modification by these factors [29]. Our finding that higher levels

of perceived racism were associated with shorter telomere length among women who did not discuss the racism with others, but not among those who did, is compatible with the literature suggesting that healthy coping behaviors may decrease the adverse effect of stress on mental and physical health. However, the literature on the effects of coping behaviors is inconsistent Mezuk and colleagues, utilizing the Environmental Affordances model, hypothesized that unhealthy, self-regulatory coping behaviors (e.g., smoking, alcohol consumption, high fat diet) employed by disadvantaged groups may protect against psychopathological conditions (e.g., major depressive disorder) by mitigating neuroendocrine processes (e.g., stress response system, reward/reinforcement system)[34]. Against this hypothesis, engagement in unhealthy behaviors did not alleviate the effects of chronic stress on incident depressive symptoms in the Health and Retirement Study[35]. It is unclear whether the Environmental Affordances model extends to telomere length. Our results emphasize 'positive coping' behaviors, as discussing experiences of racism rather than keeping quiet may help to relieve the associated stress and provide a buffer against adverse biologic effects. Complicating the issue of how coping behaviors affect outcomes is the fact that coping responses to stress may be gendered[36] with men being less likely to talk with others about their stress experiences than women[37].

Strengths and limitations

The present study is the largest to date to investigate associations between racism and telomere length in African Americans. The study used information on numerous risk factors that might confound or modify an association of racism with telomere length. The racism measures have been related to adverse health outcomes in the expected direction in previous BWHS studies [16–20]. The sample of participants assessed in the present study was selected from among the 27% of living BWHS participants who provided a blood sample in 2013-2018. There was a further selection of subjects from that group—specifically from a random sample of 2,463 participants who had completed a supplemental questionnaire focused on religious practices and spirituality. Thus, the sample size for the present analysis of telomere length was considerably smaller than the much larger sample size in previous BWHS analyses based on the entire BWHS population. Those who provided blood samples did not differ from those who did in terms of reported perceived racism, completed education, or neighborhood SES (data not shown). Nevertheless, we cannot rule out that selection of participants resulted in bias.

We examined possible interactions by several factors, including responses to perceived racist events. The observed differences in association of everyday racism and telomere length between those who discussed racism and those who did not may have been due to chance, introduced through stratification on coping style (collider-stratification bias)[38], or due the limited analytic sample size (Type I error).

Although the observed differences in log-RTL were modest, they were in accord with prior studies investigating effects of psychosocial stressors on telomeres. [10, 29] Thus, while the present research provides some evidence that frequent experiences of interpersonal racism may contribute to the premature aging observed in African Americans, [39, 40] further research is clearly needed.

References

1. Shay JW and Wright WE, Hayflick, his limit, and cellular ageing. Nature Reviews Molecular Cell Biology, 2000 1: p. 72–76.
2. Calado RT and Dumitriu B, Telomere dynamics in mice and humans. Semin Hematol, 2013 50(2): p. 165–74. [PubMed: 23956466]
3. Sanders J and Newman A, Telomere Length in Epidemiology: A Biomarker of Aging, Age-Related Disease, Both, or Neither? Epidemiologic Reviews, 2013 35: p. 112–131. [PubMed: 23302541]
4. Shalev I, et al., Exposure to violence during childhood is associated with telomere erosion from 5 to 10 years of age: a longitudinal study. Mol Psychiatry, 2013 18(5): p. 576–81. [PubMed: 22525489]
5. Wolkowitz OM, et al., Resting leukocyte telomerase activity is elevated in major depression and predicts treatment response. Mol Psychiatry, 2012 17(2): p. 164–72. [PubMed: 21242992]
6. Mathur MB, et al., Perceived stress and telomere length: A systematic review, meta-analysis, and methodologic considerations for advancing the field. Brain Behav Immun, 2016 54: p. 158–169. [PubMed: 26853993]
7. Houben JM, et al., Telomere length assessment: biomarker of chronic oxidative stress? Free Radic Biol Med, 2008 44(3): p. 235–46. [PubMed: 18021748]
8. Clark R, et al., Racism as a Stressor for African Americans. American Pyshologist, 1999 54(10): p. 805–816.
9. Thompson VL, Perceived experiences of racism as stressful life events. Community Ment Health J, 1996 32(3): p. 223–33. [PubMed: 8790965]
10. Chae DH, et al., Discrimination, racial bias, and telomere length in African-American men. Am J Prev Med, 2014 46(2): p. 103–11. [PubMed: 24439343]
11. Liu SY and Kawachi I, Discrimination and Telomere Length Among Older Adults in the United States. Public Health Rep, 2017 132(2): p. 220–230. [PubMed: 28147207]
12. Xu J, et al., Deaths: Final Data for 2016. Natl Vital Stat Rep, 2018 67(5): p. 1–76.
13. Ho JE, Paultre F, and Mosca L, The gender gap in coronary heart disease mortality: is there a difference between blacks and whites? J Womens Health (Larchmt), 2005 14(2): p. 117–27. [PubMed: 15775729]
14. Mensah GA, et al., State of disparities in cardiovascular health in the United States. Circulation, 2005 111(10): p. 1233–41. [PubMed: 15769763]
15. Cancer Facts & Figures. 2018, American Cancer Society: Atlanta, GA.
16. Bacon KL, et al., Perceived racism and incident diabetes in the Black Women's Health Study. Diabetologia, 2017 60(11): p. 2221–2225. [PubMed: 28812096]
17. Coogan PF, et al., Experiences of racism and the incidence of adult-onset asthma in the Black Women's Health Study. Chest, 2014 145(3): p. 480–485. [PubMed: 23887828]
18. Cozier YC, et al., Perceived racism in relation to weight change in the Black Women's Health Study. Ann Epidemiol, 2009 19(6): p. 379–87. [PubMed: 19364665]
19. Cozier YC, et al., Racism, segregation, and risk of obesity in the Black Women's Health Study. Am J Epidemiol, 2014 179(7): p. 875–83. [PubMed: 24585257]
20. Wise LA, et al., Perceived racial discrimination and risk of uterine leiomyomata. Epidemiology, 2007 18(6): p. 747–57. [PubMed: 17917606]
21. Russell C, et al., Follow-up of a Large Cohort of Black Women. American Journal of Epidemiology, 2001 154(9).
22. Rosenberg L, et al., A Prospective Study of Female Hormone Use and Breast Cancer Among Black Women. Arch Intern Med, 2006 166: p. 760–765. [PubMed: 16606813]
23. Department of Health and Human Services, Center for Medicare and Medicaid Services. Regulation and Guidance. Available at: http://www.cms.hhs.gov/CLIA/ (Accessed January 7, 2013).
24. Cawthon RM, Telomere measurement by quantitative PCR. Nucleic Acids Research, 2002 30(10).
25. Williams DR, et al., Racial Differences in Physical and Mental Health: Socio-economic Status, Stress and Discrimination. Journal of Health Psychology, 1997 2(3): p. 335–351. [PubMed: 22013026]

26. Cortina JM, What is coefficient alpha? An examination of theory and applications. Journal of Applied Psychology, 1993 78(1): p. 98–104.
27. Cozier Y, et al., Racial discrimination and the incidence of hypertension in US black women. Ann Epidemiol, 2006 16(9): p. 681–7. [PubMed: 16458539]
28. Liu K, et al., Advanced Reproductive Age and Fertility. Journal of Obstetrics and Gynaecology Canada, 2011 33(11): p. 1165–1175. [PubMed: 22082792]
29. Okereke OI, et al., High phobic anxiety is related to lower leukocyte telomere length in women. PLoS One, 2012 7(7): p. e40516. [PubMed: 22808180]
30. Kohout FJ, et al., Two shorter forms of the CES-D (Center for Epidemiological Studies Depression) depression symptoms index. J Aging Health, 1993 5(2): p. 179–93. [PubMed: 10125443]
31. Krieger N, et al., Experiences of discrimination: validity and reliability of a self-report measure for population health research on racism and health. Soc Sci Med, 2005 61(7): p. 1576–96. [PubMed: 16005789]
32. Chae DH, et al., Discrimination, mental health, and leukocyte telomere length among African American men. Psychoneuroendocrinology, 2016 63: p. 10–6. [PubMed: 26398001]
33. Astuti Y, et al., Cigarette smoking and telomere length: A systematic review of 84 studies and meta-analysis. Environ Res, 2017 158: p. 480–489. [PubMed: 28704792]
34. Mezuk B, et al., “White Box” Epidemiology and the Social Neuroscience of Health Behaviors: The Environmental Affordances Model. Soc Ment Health, 2013 3(2).
35. Rodriquez EJ, et al., Coping With Chronic Stress by Unhealthy Behaviors: A Re-Evaluation Among Older Adults by Race/Ethnicity. J Aging Health, 2017 29(5): p. 805–825. [PubMed: 27178298]
36. Courtenay WH, Constructions of masculinity and their influence on men’s well-being: a theory of gender and health. Soc Sci Med, 2000 50(10): p. 1385–401. [PubMed: 10741575]
37. Ellis KR, et al., “If you do nothing about stress, the next thing you know, you’re shattered”: Perspectives on African American men’s stress, coping and health from African American men and key women in their lives. Soc Sci Med, 2015 139: p. 107–14. [PubMed: 26183018]
38. Cole SR, et al., Illustrating bias due to conditioning on a collider. Int J Epidemiol, 2010 39(2): p. 417–20. [PubMed: 19926667]
39. Geronimus AT, Understanding and eliminating racial inequalities in women’s health in the United States: the role of the weathering conceptual framework. Journal of the American Medical Women’s Association (1972), 2001 56(4): p. 133–6, 149–50.
40. Geronimus AT, The weathering hypothesis and the health of African-American women and infants: evidence and speculations. Ethnicity & disease, 1992 2(3): p. 207–221. [PubMed: 1467758]

Table 1.

Mean racism scores and log-RTL according to participant characteristics.

		Everyday racism		Institutional racism		Log-RTL	
	No. of Women	Mean score (SE)	p[1]	Mean score (SE)	p[1]	Mean (SE)	p[1]
Age at blood draw (years)[2]							
<45	87	1.89 (0.06)	0.33	0.97 (0.11)	<0.001	−0.24 (0.02)	<0.001
45-50	152	1.94 (0.05)		1.11 (0.08)		−0.25 (0.01)	
50-54	192	1.86 (0.05)		0.96 (0.06)		−0.24 (0.01)	
55-59	227	1.93 (0.05)		1.37 (0.07)		−0.25 (0.01)	
60-64	199	1.83 (0.05)		1.30 (0.07)		−0.33 (0.02)	
65+	140	1.81 (0.05)		1.45 0.09)		−0.34 (0.02)	
Region of residence							
North-East	18	1.90(0.15)	0.01	1.62(0.24)	<.01	0.79(0.03)	<0.01
South	450	1.80(0.03)		1.09(0.05)		0.76(0.01)	
Mid-West	306	1.94(0.04)		1.32(0.06)		0.82(0.01)	
West	223	1.96(0.04)		1.28(0.07)		0.75(0.01)	
Advanced Maternal Age							
<35 years	827	1.88(0.02)	0.68	1.21(0.04)	0.53	0.77(0.01)	0.04
≥35 years	119	1.85(0.06)		1.15(0.09)		0.80(0.01)	
Body Mass Index (Kg/m^2)							
<25	206	1.83(0.04)	<0.001	1.12(0.07)	0.09	0.77(0.01)	0.58
25-29	322	1.79(0.04)		1.15(0.06)		0.78(0.01)	
30-34	232	1.95(0.04)		1.33(0.07)		0.77(0.01)	
≥35	232	1.98(0.04)		1.26(0.07)		0.77(0.01)	
Alcohol use							
Never	491	1.85(0.03)	0.06	1.17(0.05)	0.54	0.77(0.01)	0.09
Past	71	2.00(0.08)		1.30(0.12)		0.76(0.02)	
Current, 1-3 drinks/week	304	1.85(0.04)		1.24(0.06)		0.78(0.01)	
Current, 4+ drinks/week	131	1.98(0.06)		1.28(0.09)		0.79(0.01)	
Pack-years							
Never	721	1.85(0.02)	0.03	1.20(0.04)	0.35	0.77(0.01)	0.71
<10	163	1.88(0.05)		1.20(0.08)		0.78(0.01)	
≥10	113	2.03(0.06)		1.35(0.10)		0.78(0.01)	
Depression diagnosis with medication use							
No	706	1.81(0.02)	<.001	1.15(0.04)	<.001	0.78(0.01)	0.02
Yes	291	2.14(0.04)		1.44(0.07)		0.76(0.01)	
CES-D score							
<16	772	1.82(0.02)	<.001	1.15(0.04)	<0.01	0.78(0.01)	0.40
≥16	216	2.02(0.04)		1.38(0.06)		0.77(0.01)	
Childhood physical Abuse							
No abuse of any kind	366	1.77(0.03)	<0.01	1.01(0.05)	<0.01	0.78(0.01)	0.25

		Everyday racism		Institutional racism		Log-RTL	
	No. of Women	Mean score (SE)	P[1]	Mean score (SE)	P[1]	Mean (SE)	P[1]
Low	179	1.87(0.05)		1.15(0.07)		0.76(0.01)	
Intermediate	96	1.91(0.06)		1.43(0.10)		0.75(0.02)	
High	263	2.04(0.04)		1.52(0.06)		0.78(0.01)	
Childhood Sexual Abuse							
No abuse of any kind	366	1.77(0.03)	<.001	1.01(0.05)	<.001	0.78(0.01)	0.27
1-3 incidents	146	1.86(0.05)		1.29(0.08)		0.79(0.01)	
≥4 incidents	121	2.09(0.06)		1.47(0.09)		0.77(0.01)	
Financial hardship as a child							
No	627	1.84(0.03)	<.01	1.17(0.04)	0.04	0.77(0.01)	0.37
Yes	314	1.97(0.04)		1.32(0.06)		0.78(0.01)	
Emotional support as a child							
No	338	1.96(0.03)	<.01	1.30(0.05)	0.04	0.77(0.01)	0.69
Yes	647	1.83(0.03)		1.17(0.04)		0.78(0.01)	

[1] P-value from a test of equal mean racism score or log-RTL over all levels of the categorical predictor, adjusted for age at blood draw

[2] Not adjusted for age at blood draw

Table 2.

Experiences of everyday and institutional racism in relation to log-RTL in 997 black women from BWHS.

Exposure	N	Age-adjusted mean difference in log-RTL (95% CI)	Multivariable-adjusted[1] mean difference in log-RTL (95% CI)	Racism responses consistent in 1997 and 2009	
				N	Multivariable-adjusted[1] mean difference in log-RTL (95% CI)
Everyday Racism					
Quartile 1	259	Reference	Reference	132	Reference
Quartile 2	179	−0.0088 (−0.0461, 0.0286)	−0.0107 (−0.0474, 0.0261)	74	0.0105 (−0.0471, 0.0681)
Quartile 3	330	0.0001 (−0.0317, 0.0319)	−0.0006 (−0.0319, 0.0306)	73	−0.0304 (−0.0877, 0.0270)
Quartile 4	229	−0.0066 (−0.0415, 0.0283)	−0.0069 (−0.0417, 0.0278)	114	−0.0086 (−0.0603, 0.0430)
p-value[2]		0.84	0.99		0.96
Institutional Racism					
No to all	299	Reference	Reference	168	Reference
Yes to 1	319	−0.0152 (−0.0544,0.0240)	−0.0179 (−0.0484, 0.0125)	144	−0.0218 (−0.0659, 0.0224)
Yes to 2	245	−0.0130 (−0.0522, 0.0262)	−0.0137 (−0.0466, 0.0191)	113	0.0052 (−0.0430, 0.0533)
Yes to all 3	134	−0.0097 (−0.0489, 0.0295)	−0.0164 (−0.0560, 0.0233)	43	−0.0365 (−0.1050, 0.0319)
p-value[2]		0.55	0.97		0.58
Institutional Racism					
No to all	299	Reference	Reference	168	Reference
Yes to at least 1	698	−0.0134 (−0.0399, 0.0131)	−0.0162 (−0.0425, 0.0101)	300	−0.0137 (−0.0517, 0.0243)

[1]Adjusted for age at blood draw (continuous), alcohol consumption (never/past/current:1-3, 4+ drinks per week), depression with anti-depressant use (Yes/No) and current region of residence (Northeast, South, Midwest, West).

[2]Reported p-value for trend, which was obtained by treating the racism exposure as an ordinal predictor.

Table 3.

Experiences of everyday and institutional racism in relation to log-RTL stratified by selected covariates in multivariate[1] models for 997 black women from BWHS.

		Everyday Racism					Institutional Racism			
Stratifying Factor	**Strata Level**	**Racism Level**	**N**	**Difference (95% CI)**	**P_{trend}**	**P INT[2]**	**Racism Level**	**N**	**Difference (95% CI)**	**P INT[2]**
Age at blood draw	<60 years	Q1	163	Reference	0.98	0.48	No to All	208	Reference	0.79
		Q2	115	0.0064 (−0.0375, 0.0503)			Yes to ≥1	450	−0.0182 (−0.0485, 0.0121)	
		Q3	211	0.0056 (−0.0316, 0.0429)						
		Q4	169	−0.0007 (−0.0404, 0.0390)						
	≥60 years	Q1	96	Reference	0.59		No to All	91	Reference	
		Q2	64	−0.0278 (−0.0946, 0.0390)			Yes to ≥1	248	−0.0178 (−0.0684, 0.0329)	
		Q3	119	−0.0109 (−0.0668, 0.0451)						
		Q4	60	−0.0245 (−0.0931, 0.0440)						
BMI	<25 kg/m^2	Q1	51	Reference	0.22	0.10	No to All	71	Reference	0.41
		Q2	55	0.0284 (−0.0524, 0.1091)			Yes to ≥1	135	−0.0449 (−0.1056, 0.0158)	
		Q3	61	−0.0125 (−0.0881, 0.0631)						
		Q4	39	−0.0435 (−0.1301, 0.0430)						
	≥25 kg/m^2	Q1	207	Reference	0.61		No to All	227	Reference	
		Q2	121	−0.0213 (−0.0636, 0.0210)			Yes to ≥1	559	−0.0098 (−0.0392, 0.0196)	
		Q3	268	0.0065 (−0.0278, 0.0408)						
		Q4	190	0.0029 (−0.0350, 0.0407)						
Smoking	Non-Smoker	Q1	196	Reference	0.42	0.08	No to All	234	Reference	0.95
		Q2	137	−0.0075 (−0.0476, 0.0326)			Yes to ≥1	487	−0.0166 (−0.0455, 0.0122)	
		Q3	222	0.0187 (−0.0165, 0.0539)						
		Q4	166	0.0071 (−0.0317, 0.0459)						

		Everyday Racism					Institutional Racism			
Stratifying Factor	**Strata Level**	**Racism Level**	**N**	**Difference (95% CI)**	**P_{trend}**	**P INT^2**	**Racism Level**	**N**	**Difference (95% CI)**	**P INT^2**
	Current/Past	Q1	63	Reference	0.11		No to All	65	Reference	
		Q2	42	−0.0307 (−0.1156, 0.0541)			Yes to ≥1	211	−0.0197 (−0.0802, 0.0408)	
		Q3	108	−0.0524 (−0.1188, 0.0141)						
		Q4	63	−0.0552 (−0.1310, 0.0207)						
Maternal Birth Age	<35 years	Q1	215	Reference	0.44	0.06	No to All	251	Reference	0.87
		Q2	152	−0.0062 (−0.0466, 0.0342)			Yes to ≥1	576	−0.0037 (−0.0748, 0.0674)	
		Q3	264	0.0030 (−0.0318, 0.0377)						
		Q4	196	0.0137 (−0.0242, 0.0516)						
	≥35 years	Q1	30	Reference	0.14		No to All	38	Reference	
		Q2	19	−0.0372 (−0.1412, 0.0667)			Yes to ≥1	81	−0.0166 (−0.0456, 0.0125)	
		Q3	48	−0.0397 (−0.1224, 0.0431)						
		Q4	22	−0.0820 (−0.1841, 0.0201)						
Discuss Racism	Discuss It	Q1	234	Reference	0.53	0.06	No to All	266	Reference	0.39
		Q2	158	−0.0049 (−0.0441, 0.0343)			Yes to ≥1	618	−0.0097 (−0.0377, 0.0184)	
		Q3	305	0.0076 (−0.0253, 0.0406)						
		Q4	187	0.0087 (−0.0290, 0.0464)						
	Keep it to yourself	Q1	20	Reference	0.05		No to All	24	Reference	
		Q2	18	−0.0675 (−0.1974, 0.0624)			Yes to ≥1	78	−0.0600 (−0.1501, 0.0302)	
		Q3	23	−0.0682 (−0.1808, 0.0445)						
		Q4	41	−0.1104 (−0.2140, −0.0067)[s]						
Accept Racism	Do something about it	Q1	64	Reference	0.62	0.58	No to All	101	Reference	0.57

		Everyday Racism					Institutional Racism			
Stratifying Factor	**Strata Level**	**Racism Level**	**N**	**Difference (95% CI)**	**P_{trend}**	**P INT[2]**	**Racism Level**	**N**	**Difference (95% CI)**	**P INT[2]**
		Q2	78	−0.0044 (−0.0636, 0.0547)			Yes to ≥1	273	−0.0034 (−0.0443, 0.0374)	
		Q3	125	−0.0238 (−0.0768, 0.0292)						
		Q4	107	−0.0089 (−0.0651, 0.0473)						
	Accept it as a fact of life	Q1	189	Reference	0.83		No to All	188	Reference	
		Q2	99	−0.0164 (−0.0658, 0.0330)			Yes to ≥1	422	−0.0219 (−0.0571, 0.0133)	
		Q3	202	0.0141 (−0.0261, 0.0543)						
		Q4	120	−0.0063 (−0.0531, 0.0406)						

[1] Adjusted for age at blood draw (continuous), alcohol category (never/past/current:1-3, 4+ drinks per week), depression diagnosis with medication use (Yes/No), and current region of residence (Northeast, Midwest, West, South).

[2] An interaction p-value (P INT) between the strata variable and everyday/institutional racism was assessed by creating a multiplicative interaction term and including it in the linear regression model.

[s] P-value < 0.05; Q1: Quartile 1; Q2: Quartile 2; Q3: Quartile 3; Q4: Quartile 4;