THE ASSOCIATION BETWEEN RACIAL AND GENDER DISCRIMINATION AND BODY MASS INDEX AMONG RESIDENTS LIVING IN LOWER-INCOME HOUSING

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Background: Research on the association between self-reported racial or gender discrimination and body mass index (BMI) has been limited and inconclusive to date, particularly among lower-income populations.

Objectives: The aim of the current study was to examine the association between self-reported racial and gender discrimination and BMI among a sample of adult residents living in 12 urban lower-income housing sites in Boston, Masschusetts (USA).

Methods: Baseline survey data were collected among 1,307 (weighted $N=1907$) study participants. For analyses, linear regression models with a cluster design were conducted using SUDAAN and SAS statistical software.

Results: Our sample was predominately Black (weighted $n=956$) and Hispanic (weighted $n=857$), and female (weighted $n=1420$), with a mean age of 49.3 (SE: .40) and mean BMI of 30.2 kg m^{-2} (SE: .19). Nearly 47% of participants reported ever experiencing racial discrimination, and 24.8% reported ever experiencing gender discrimination. In bivariate and multivariable linear regression models, no main effect association was found between either racial or gender discrimination and BMI.

Conclusions: While our findings suggest that self-reported discrimination is not a key determinant of BMI among lower-income housing residents, these results should be considered in light of study limitations. Future researchers may want to investigate this association among other relevant samples, and other social contextual and cultural factors should be explored to understand how they contribute to disparities. (*Ethn Dis*. 2009;19:251–257)

Key Words: Discrimination, Body Mass Index, Obesity, Health Disparities, Gender

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INTRODUCTION

Obesity and overweight, defined as a body mass index (BMI) of ≥ 30 or 25–29.9, respectively, is one of the most pressing public health concerns in the United States. About one third of adults are classified as obese and 34% as overweight.[1,2] These rates are alarming considering their harmful social, psychological, and economic consequences and substantial resulting implications for morbidity and mortality.[3,4] Racial/ethnic minorities are disproportionately affected by overweight and obesity, with prevalence rates particularly striking among African American and Mexican American women.[2,5]

Racial discrimination has been identified as a race-related stressor that may contribute to racial/ethnic disparities in health.[6,7] Perceived racial discrimination has been found to have harmful health consequences for a number of mental and physical health outcomes, including potentially stress-related conditions like high blood pressure and low-birthweight deliveries.[7–9]

Research on self-reported racial discrimination and BMI has been somewhat limited and has produced mixed findings. A study among a sample of Black women aged 35 to 49 years found that high levels of perceived racism were associated with lower waist-to-hip ratio.[10] In contrast, a study among Asian Americans found that everyday racial discrimination was associated with obesity and increased BMI.[11] Furthermore, a recent study among a multi-ethnic population-based sample of US adults found an association between perceived chronic discrimination and high-risk waist circumference among a sample of Irish, Jewish, Polish, and Italian Whites, but not among Blacks, Hispanics, or other Whites.[12] The association between self-reported racial discrimination and BMI has not been thoroughly examined among a racially/ethnically diverse, lower-income sample – a group that carries a large proportion of the population burden in obesity and overweight.

Gender-based discrimination is another psychosocial stressor that may have negative health consequences, and is a potentially important area of investigation for health conditions in which gender disparities are notable, including obesity and overweight. To our knowledge, no prior studies have specifically examined the association between gender discrimination and BMI among a racially/ethnically diverse and low-income sample.

There are several potential mechanisms through which perceived racial and/or gender discrimination could be associated with increased BMI. In accordance with the stress and coping framework,[13,14] discrimination may act as a stressor by negatively impacting psychological health.[7,14] Psychological distress may encourage the adoption of harmful coping responses (eg, overeating, physical inactivity, alcohol use),[15–17] increasing the risk for overweight and obesity over

time. The stress of discrimination may also activate the hypothalamic-pituitary-adrenal axis, resulting in abnormally high or imbalanced insulin and glucocortoid levels (eg, cortisol) that stimulate the appetite and promote body fat deposition.[18,19] In fact, some research suggests that stress-induced increases in cortisol may contribute to overeating and ultimately obesity.[20,21] Prolonged physiological response to the stress of discrimination may also cause 'wear and tear' to organ systems (allostatic load) and contribute to overweight or obesity.[19]

Despite the plausibility of this association and the mechanisms through which it operates, the potential impact of discrimination on BMI has been understudied, particularly among lower-income, racial/ethnic minorities. In light of some of the limitations of prior research and the inconclusive research findings, we felt these associations warranted further investigation among a large, randomly selected, racially/ethnically diverse and low-income sample. The primary aim of the study was to examine the association between racial and gender-based discrimination (alone and in combination) and BMI among a sample of residents living in lower-income housing. Based on the pathogenic effects of racism and sexism,[6] we hypothesized that residents who reported experiencing gender and/or racial discrimination would have a higher BMI than residents who reported never experiencing discrimination.

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METHODS

This study used baseline data from *Open Doors to Health*, a cluster randomized controlled trial of a colorectal cancer (CRC) prevention intervention that targeted CRC screening, physical activity, and multi-vitamin use among residents living in lower-income housing. Lower-income housing is an interesting setting in which to investigate these associations since a large proportion of residents are racial/ethnic minorities and female. Twelve urban lower-income housing communities in Boston, Massachusetts (USA) agreed to participate in the study and served as the primary sampling units, with individuals within housing sites as secondary sampling units. Initially, housing site representatives sent letters informing potentially eligible residents about the study, including information about how to opt out of the study. Due to the varying size of housing communities, unequal probability sampling was used to create a sample of potential participants: a random sample was drawn in larger sites to obtain a 35% sample with a minimum of 250 participants per site, and all residents were sampled in the remaining six smaller sites. Potential participants were then contacted by telephone or visited at home to inquire about their interest in participating in the study. To be eligible, participants had to: 1) reside within the housing sites; 2) be at least 18 years old; 3) be fluent in English or Spanish; and 4) be not currently undergoing treatment for cancer. The study protocol was approved by the Human Subjects Committee at the Harvard School of Public Health.

The overall response rate for the survey was 53%, ranging from 34% to 92% across housing sites. These analyses were conducted among a sub-sample of those who: 1) completed the baseline survey; and 2) provided complete height/weight data. Residents missing data on important study variables were excluded: 44 residents missing BMI data and 56 residents missing race/ethnicity data or were in the 'Other' race/ethnicity category were excluded. A total of 147 residents were also excluded because they were missing discrimination data. The majority of residents missing discrimination data were given a shorter version of the survey (due to factors such as scheduling or limited time availability) that did not include the discrimination questions. The final sample for this article consisted of 1307 residents (weighted N=1907).

Data Collection

After providing informed consent, all participants completed an interviewer-administered survey in English or Spanish. Upon completion of data collection, a $25 grocery store gift card was given to participants.

Body mass index (BMI) is a measure of body fat that is commonly used to indicate obesity and overweight.[1] Thirty-three percent of participants were measured and weighed at the time of the interview, when participants were able to come to a central location for data collection in which we had a stadiometer and standard scale. For the remainder of the sample (67%), self-reported weight and height were taken in participants' home due to lack of stadiometer and scale. BMI was defined as weight in kilograms divided by height in meters squared and was calculated from height and weight. The distribution of BMI for individuals with self-reported BMI was nearly identical to that for individuals with measured BMI (mean=29.9, SE mean=.37, median=28.7; and mean=30.3, SE mean=.38 median=28.7, respectively). This is consistent with other literature that demonstrates the validity of self-reported BMI.[22,23]

Racial discrimination was assessed using an adapted version of Krieger's Experiences of Discrimination measure,[24–26] which assesses self-reported experiences of lifetime racial discrimination. The full measure has been validated among a sample of racially/

ethnically diverse working class adults in Greater Boston, with a Cronbach's alpha of .74 or higher.[26] In our study, the measure was shortened given limited survey space and efforts to minimize survey response burden. Using five items, participants were asked: 'Have you ever felt discriminated against, been kept from doing something, been hassled, or been made to feel inferior in these situations because of your race, ethnicity or color: 1) getting a job; 2) at work; 3) getting housing; 4) getting medical care; 5) on the street or in a public setting?' Participants chose from the following response options for each item: *Never*; *Once*; *2–3 times*; or *4 or more times*. The same approach was taken to measure gender discrimination (with 'race, ethnicity, or color' substituted with 'gender' in the questions above). Data were dichotomized separately into 'ever' vs 'never' experienced: a) racial discrimination; or b) gender discrimination. This approach was taken because the data were not normally distributed (even after transformation), and broader categories had limited variability and small cell sizes. We also created a combined variable that indicated whether people had ever experienced *either* racial or gender discrimination ('ever' vs 'never').

Age, gender, income, having a regular health care provider, and language were assessed using standard demographic questions. Participants were asked to report their race or ethnicity as Black, White, Hispanic, Asian, American Indian, Native Hawaiian or Pacific Islander, or Other. Participants were permitted to select more than one option; those who selected Hispanic were coded as such, regardless of other options selected. Participants choosing more than one of the other options were assigned to a ''mixed race or ethnicity'' category. Nativity was assessed by asking people to report where they were born. Due to the large number of Puerto Rican participants, responses were categorized into 'born in the United States,' 'born in Puerto Rico,' or 'born outside US/Puerto Rico.'

Participants were asked about their current work situation, including whether work was full or part-time. Due to small cell sizes, this was categorized into 'Disabled/Not working' and 'Working Full or Part-time' for these analyses. For education, participants were asked the highest level of school they had completed, categorized here as: 'Less than High School Education'; 'Completed High-school/Vocational School'; and 'At Least Some College or More.' We assessed whether individuals were at/below or above poverty level by combining yearly household income and the number of people supported by that income based on the 2005 Federal Poverty Guidelines.[27] Financial status was also determined by asking: 'How would you describe the money situation in your household right now?'; to conserve degrees of freedom in our models, response options were dichotomized into 'Comfortable'/'Enough' and 'Have to cut back'/'Can't make ends meet.' As an indicator of health status, participants were asked if they had ''any health problems that make it hard for you to exercise'' (Yes; No).

Statistical Analyses

Analyses used resident-level data, accounting for the cluster design. Data were weighted up to the population size within each housing site (weighted n= 1907). Since the data for BMI were not normally distributed, all models were examined using both transformed and non-transformed data for BMI. Non-transformed data are reported here to aid with interpretability of results, since all results were in the same direction and had comparable levels of statistical significance. For a small subgroup of participants (n=96), BMI data were imputed using a single stage linear regression model with independent variables weight, gender, age, and nativity, due to missing height data.

Linear regression models with a cluster design were used for all analyses. We first fit age-adjusted bivariate models predicting BMI; these were created separately for each covariate and primary exposure. In separate models, we then developed multivariable linear regression models to explore the main effect relationship between racial and/or gender discrimination and BMI, including theoretically-relevant covariates that were significant at the .15 level in bivariate age-adjusted analyses. All analyses used SUDAAN Version 9.01 and SAS Version 9.1 statistical software for clustered data.

RESULTS

Participants in the study were predominately female (74.5%), with a mean age of 49.3 (SE: .40). The sample was comprised largely of racial/ethnic minorities, with 50% identifying as Black and nearly 45% as Hispanic (see Table 1). Almost 40% of the sample had less than a high school education, and 40% were not currently employed. Nearly 47% reported ever experiencing racial discrimination and nearly 25% reported ever experiencing gender discrimination, with a total of 49.6% ever experiencing either racial or gender discrimination. The average BMI of participants was 30.2 kg m^{-2} (SE: .19), with a median of 28.9 kg m^{-2} (range = 14.4 to 78.3 kg m^{-2}). Upon further inspection of the minimum and maximum data points, we determined these were not outliers but part of the distribution of BMI data for this sample. There were differences in mean BMI by gender (28.0 [SE: .27] kg·m^{-2} among men and 30.9 [SE: .23] kg m^{-2} among women), but no differences by race/ethnicity. The distributions of other potential predictors of BMI are provided in Table 1.

Significant predictors of BMI in separate age-adjusted bivariate models included: gender, financial status, nativity, health problems, and having a regular

health provider (Table 2). There was a non-significant bivariate association between racial discrimination and BMI (P=.53); this association remained non-significant in multivariable models (P=.46). In exploratory analyses, we examined the association between racial discrimination and BMI among a subsample of Black and Hispanic participants only. Here we also found a non-significant multivariable association when discrimination was measured either dichotomously (P=.38) or categorically (0 situations; 1–2 situations; 3+ situations) (P =.62) (data not shown). We also examined multivariable models stratified by race/ethnicity, and found that discrimination remained non-significant (P=.97 for Hispanics and P=.27 for Blacks). All multivariable analyses controlled for gender, age, financial status, nativity, health problems, and regular provider.

We found non-significant bivariate (P=.79) and multivariable (P=.68) associations between gender discrimination and BMI, the latter controlling for age, financial status, nativity, health problems, and regular provider (Table 2). This finding remained when we examined this association among the full sample of men and women, and when we examined these associations in separate models by gender.

Also, no significant bivariate (P=.32) or multivariable (P=.26) association was found between experiencing either gender or racial discrimination and BMI, the latter adjusting for gender, financial status, health problems, having a regular

We found no significant association between either racial or gender discrimination (alone or in combination) and BMI in the present investigation

Table 1. Sociodemographic characteristics of the sample (*N*=1307 unweighted; 1907 weighted)

	Total weighted *n*	%
Racial/ethnic discrimination		
Ever	889	46.6%
Never	1017	53.4%
Gender discrimination		
Ever	471	24.8%
Never	1432	75.2%
Gender		
Male	486	25.5%
Female	1420	74.5%
Employment		
Work full-time	446	23.4%
Work part-time	280	14.7%
Disabled	418	21.9%
Not working	762	40.0%
Poverty		
Below poverty	941	54.4%
Above poverty	790	45.6%
Education		
<High school	760	39.9%
Completed HS/Vocational	517	27.2%
At least some college +	628	32.9%
Financial status		
Comfortable/enough	1071	56.7%
Have to cut back/Can't make ends meet	817	43.3%
Nativity		
Born in US	1029	54.0%
Born in Puerto Rico	484	25.4%
Born outside US/PR	394	20.6%
English 1st Language		
Yes	1033	54.2%
No	873	45.8%
Race/Ethnicity		
Hispanic	857	44.9%
Black	956	50.1%
White	94	5.0%
Age		
<35	427	22.5%
35–49	506	26.5%
50–64	614	32.2%
65+	359	18.8%
Current health problems		
Yes	829	43.5%
No	1076	56.5%
Regular provider		
Yes	1897	87.0%
No	246	13.0%
Obese		
Yes	820	43.0%
No	1086	57.0%

Note: Sample sizes are all weighted unless otherwise noted and may differ slightly due to missing data.

Table 2. Bivariate and multivariable association between discrimination, sociodemographic variables, and BMI (*N*=1307 unweighted; 1907 weighted)

	Bivariate Model Age-adjusted β(SE)	Multivariable Model* Racial Discrimination β (SE)	Multivariable Model* Gender Discrimination β (SE)
Financial Status	*P* value: .009	*P* value: .020	*P* value: .02
Comfortable/enough	−1.24 (0.39)	−1.04 (0.37)	−1.10 (0.38)
Have to cut back/Can't make ends meet	REF	REF	REF
Nativity	*P* value: .004	*P* value: .008	*P* value: .005
Born in US	1.82 (0.46)	1.77 (0.47)	1.90 (0.47)
Born in Puerto Rico	2.01 (0.52)	1.76 (0.54)	1.69 (0.55)
Born outside US/PR	REF	REF	REF
Current health problems	*P* value: .0001	*P* value: .0008	*P* value: .0004
No	REF	REF	REF
Yes	2.50 (0.41)	1.91 (0.42)	2.11 (0.42)
Regular provider	*P* value: .004	*P* value: .07	*P* value: .01
Yes	1.82 (0.51)	1.03 (0.51)	1.56 (0.51)
No	REF	REF	REF
Racial discrimination	*P* value: .53	*P* value: .46	
Never	REF	REF	
Ever	−0.25 (0.38)	−0.29 (0.38)	
Gender discrimination			*P* value: .68
Never			REF
Ever			0.19 (0.46)
Gender	*P* value: <.0001	*P* value: <.0001	
Male	REF	REF	
Female	2.99 (0.36)	2.58 (0.37)	
Race/ethnicity	*P* value: .29		
White	REF		
Black	.87 (0.90)		
Hispanic	1.31 (0.90)		
Employment status	*P* value: .25		
Work FT/PT	REF		
Disabled/Not working	0.53 (0.43)		
Education	*P* value: .12		
At least some college+	REF		
Completed HS or Vocational	0.51 (0.49)		
< High School	1.12 (0.49)		

* Multivariable models control for age, measured continuously.

provider, and nativity. Across all of our analyses, we examined all of the above associations using obesity (defined as BMI of ≥30 kg m^{-2}; coded as yes/no)[1] as the outcome. Our results were consistent and in the same direction as those for BMI.

DISCUSSION

We set out to investigate the association between racial and gender-based discrimination and BMI in a large, random, multi-ethnic, and well-characterized sample to address some of the limitations of prior research in this area. This is an important area of inquiry given that the determinants of obesity are likely to vary across communities and contexts, and to our knowledge, no prior studies have investigated the association between self-reported discrimination and BMI among a sample of predominately Black and Hispanic, lower-income housing residents. We found no significant association between either racial or gender discrimination (alone or in combination) and BMI in the present investigation. To our knowledge, no prior studies have specifically reported on the association between gender discrimination and BMI. Previous studies examining the association between racial/ethnic discrimination and BMI or obesity have had mixed results,[10–12] though none have focused on this population and few have assessed self-reported experiences of racial discrimination. Other studies on racism and weight-related indicators have primarily been conducted among smaller samples outside of the United States (eg, Dominica). While several of these

studies have found an association between 'internalized racism' and elevated glucose levels, abdominal obesity, and waist circumference,[28–31] 'internalized racism' measures the extent to which people agree with racist stereotypes about their race,[32] and is a distinct construct from self-reported experiences of racial/ethnic discrimination, as measured here.

Differences in findings across these studies may relate to some of the methodological complexities that accompany this research, including differences in the selection of measures and composition of the sample. It has also been suggested that these seemingly inconsistent findings could also be explained by the hypothesis that those who perceive little or no racism may actually have higher internalized racism,[10,33] although this has yet to be substantiated. While our research among a large, predominately Black and Hispanic lower-income sample indicates that there is no association between self-reported experiences of discrimination and BMI, future research may want to investigate this association among other racial/ethnic groups and samples of varying socioeconomic position. Given that gender (and not race/ethnicity) was a strong predictor of BMI, it is possible that gendered social and cultural norms are more important determinants of BMI than racial discrimination among this population, and should be explored.

Several limitations of this study should be noted. The data used for these analyses were cross-sectional. Use of longitudinal data to investigate this association would make it possible to better establish temporality and to explore causation. Although our response rate was lower than ideal, it reflects the many challenges of conducting research in community settings, especially settings serving very low-income populations. Our response rate is also consistent with those from other community-based studies.[34,35] It was not possible to objectively measure height and weight for all participants, and self-reported weight and height have been used widely in population-based studies. Consistent with the literature,[22,23] average BMIs were similar among those who self-reported weight and those for whom we were able to measure weight objectively. Furthermore, we explored whether the association between discrimination and BMI differed when analyses were conducted among participants with self-reported BMI vs. measured BMI, and found no differences in this association for these two groups.

We used a self-report measure to understand the association between racial and gender discrimination and BMI, capturing one aspect of how experiences rooted in racism and sexism may negatively impact health. There are other pathways by which institutional discrimination and the resulting segregation of racial/ethnic minorities into economic disadvantage and poorer neighborhoods may also impact obesity.[8,36] Researchers should explore these pathways, which may include limited access to green-space and affordable, healthy food [37,38] and targeted marketing of unhealthy commodities (eg, junk food).[8] Finally, this research does not capture all forms of discrimination that may have health consequences, including weight discrimination.

Despite these limitations, this research has several important strengths. First, the characteristics of the sample are particularly notable, given that non-White, lower-income populations have been less represented in research on overweight and obesity. In addition, this study investigated the association between discrimination and BMI in a well-characterized study with a large sample size. Unlike much of the literature on discrimination and health, particularly related to BMI/obesity, this study used a random, population-based sample. Although we had limited degrees of freedom due to the cluster design, we controlled for a number of potentially confounding variables in our analyses.

In this article, we investigated the role of racial and gender-based discrimination as two dimensions of social context that may contribute to disparities in BMI, and ultimately overweight and obesity. While our findings did not provide evidence that self-reported discrimination is a key determinant of BMI among Black and Hispanic lower-income housing residents, social contextual and cultural factors should continue to be explored to understand the role they may play in shaping disparities. Since the determinants of overweight and obesity are strongly tied to the social and cultural contexts of communities,[39] addressing racial/ethnic disparities in overweight and obesity ultimately requires understanding and addressing social contextual factors.

ACKNOWLEDGMENTS

We gratefully acknowledge and appreciate the efforts of the *Open Doors to Health* research team, as well as the resident helpers and resident service coordinators at collaborating housing sites.

This research was supported by grants 5R01CA098864-02, 1K22CA126992-01, and K05CA124415 from the National Cancer Institute (NCI) and support to the Dana-Farber Cancer Institute by Liberty Mutual, National Grid, and the Patterson Fellowship. Funding support for the lead author (R.S.) was also provided through NCI by the Harvard Education Program in Cancer Prevention Control (5 R25-CA057711-14) and the Mount Sinai Program in Cancer Prevention and Control: Multidisciplinary Training (5R25-CA081137).

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