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Weight Discrimination and Risk of Mortality

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Abstract

Discrimination based on weight is a stressful social experience linked to declines in physical and mental health. We examine whether this harmful association extends to risk of mortality. Participants in the Health and Retirement Study (HRS; *N*=13,692) and the Midlife in the United States Study (MIDUS; *N*=5,079) reported on discriminatory experiences and attributed those experiences to personal characteristics, including weight. Weight discrimination was associated with a nearly 60% increased mortality risk in both HRS (HR=1.57, 95% CI=1.34-1.84) and MIDUS (HR=1.59, 95% CI=1.09-2.31) that was not accounted for by common physical and psychological risk factors. The association between weight discrimination and mortality was generally stronger than for other attributions for discrimination. In addition to poor health outcomes, weight discrimination may shorten life expectancy.

Unfair treatment on the basis of body weight is stressful (Schvey, Puhl, & Brownell, 2014). A growing literature indicates that perceived weight discrimination is associated with the common psychological and physiological correlates of stressful social experiences. Those who experience weightism, for example, report more psychological distress, lower well-being, and greater loneliness (Lewis et al., 2011). Such experiences also take a toll on physical health: Weight discrimination increases risk for obesity (Hunger & Tomiyama, 2014; Sutin & Terracciano, 2013), chronic inflammation (Sutin, Stephan, Luchetti, & Terracciano, 2014), and disease burden (Sutin, Stephan, Carretta, & Terracciano, 2015) and is associated with health-risk behaviors, including avoiding physical activity (Vartanian & Novak, 2011). Many of the diseases associated with obesity (e.g., hypertension, diabetes) are stress-related diseases that may develop, in part, from the stress of discrimination (Muennig, 2008). Indeed, experimental evidence suggests that the experience of weight-based stigma increases blood pressure, reduces cognitive control, and increases food consumption (Major, Eliezer, & Rieck, 2012; Major, Hunger, Bunyan, & Miller, 2014). As such, there are significant health correlates to experiencing bias based on body weight, a process that plays out over time (Tomiyama, 2014).

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The ultimate cumulative effect of these hostile social interactions may be lower life expectancy. The present research examines whether the harmful effect of weight discrimination reaches beyond morbidity to mortality and whether common comorbidities and health-risk behaviors account for this association. We also compare its association with mortality risk to other forms of discrimination (e.g., age, race, sex) to examine whether the association with mortality is unique to weight discrimination or common to all attributions. Finally, we examine whether the association between discrimination and mortality varies by sex, ethnicity, age, or body mass index (BMI). We test these associations in two large longitudinal studies.

Methods

Participants

HRS: Participants were drawn from the Health and Retirement Study (HRS), a nationally representative longitudinal study of Americans ages 50 and older (Health and Retirement Study). HRS participants are re-interviewed every two years. In 2004, HRS instituted an enhanced face-to-face interview that included a psychosocial questionnaire that participants completed at home after the face-to-face interview and returned by mail to the University of Michigan. Starting in 2006, this questionnaire included items about the experience of everyday discrimination (see below). Half of the participants completed the discrimination measure in 2006; the other half completed it in 2008. These two assessments were combined into baseline. A total of 13,692 participants (59% female) completed the discrimination measure and had known vital status as of 2012. All participants with relevant data were included in the analysis (i.e., discrimination, vital status, and demographic covariates). At baseline, these participants were, on average, 68.33 (*SD* = 10.48) years old, had an average of 12.58 (*SD*=3.11) years of education, and were 84% white, 13.0% African-American, and 3% other ethnicities. Human subjects approval for HRS was obtained from the University of Michigan's Institutional Review Board (IRB); the analyses were also approved by the IRB at Florida State University. HRS data are publically available at http://hrsonline.isr.umich.edu/.

MIDUS: Participants were also drawn from the Midlife in the United States (MIDUS) study. The first wave of the MIDUS collected survey data from a total of 7,108 English-speaking adults in the United States aged 20–74 years. At the baseline assessment, collected in 1995–1996, participants completed a 30-minute telephone interview and a self-administered questionnaire, which included the discrimination measure. A total of 5,079 participants (53% female) completed the discrimination measure and either completed the MIDUS II assessment in 2004-2005 or were confirmed deceased as of 2007. As with HRS, all participants with relevant data were included in the analysis (i.e., discrimination, vital status, and demographic covariates). At baseline, these participants were, on average, 47.86 (*SD* = 12.91) years old, had an average of 14.15 (*SD*=2.57) years of education, and were 91% white, 4% African-American, and 5% other ethnicities. Human subjects approval for the MIDUS data collection was obtained from the IRB at the University of Wisconsin Madison, University of California Los Angeles, and Georgetown University; the analyses were also approved by the IRB at Florida State University. MIDUS data are publically available at http://www.midus.wisc.edu/.

Measures

Everyday discrimination: Participants rated their experiences with everyday discrimination (Williams, Yu, Jackson, & Anderson, 1997) and then attributed those experiences to a number of personal characteristics (Kessler, Mickelson, & Williams, 1999). Specifically, participants were asked, "In your day-to-day life, how often have any of the following things happened to you?" In the HRS, participants rated five items (e.g., "You are treated with less courtesy or respect than other people.") on a scale from 1 (*never*) to 6 (*almost everyday*). In the MIDUS, participants answered these same five items plus four additional items on a scale from 1 (*never*) to 4 (*often*). After making these ratings, participants were then asked, "what do you think were the reasons why these experiences happened to you?" In HRS, participants could attribute unfair treatment (yes/no) to ancestry or national origin, sex, race, age, weight, a physical disability, appearance, and/or sexual orientation. The attributions were similar in MIDUS, with the exception that one option was height or weight rather than weight and one option was ethnicity or nationality rather than ancestry or national origin. Participants could endorse as many or as few attributions as necessary. This measure has been used successfully to examine the effect of race (Purnell et al., 2012) and sex (Borrell et al., 2010) discrimination on smoking, to track trends in weight discrimination over time (Andreyeva, Puhl, & Brownell, 2008), and to document the correlates of weight bias (Krukowski et al., 2009).

Mortality: The National Death Index and/or a household proxy report of target participant's vital status confirmed mortality within a month's accuracy. In HRS, updated vital status was available through 2012. Through personal communication between family members and HRS staff, some participants were also confirmed deceased in 2013. Survival time was computed from the month of the baseline (i.e., 2006/2008) interview to the month of the last interview or death. In MIDUS, updated vital status was available through 2007. Survival time was computed from the day of the baseline interview to the month of the last interview or death.

Covariates: We included a number of covariates in the analyses to examine whether poor physical and psychological health could explain part of the association between discrimination and mortality: Body mass index (BMI) was derived as kg/m^2. Because of its curvilinear association with mortality (Flegal, Kit, & Graubard, 2014), BMI was dummy coded into categories, a standard approach in epidemiology (Flegal, Kit, Orpana, & Graubard, 2013): underweight (BMI<18.50), overweight (BMI between 25 and <30), obese (BMI between 30 and <40), and morbidly obese (BMI ≥40) with normal weight (BMI between 18.50 and <25) as the reference group. Subjective health was measured with a single item, "Would you say your health is excellent, very good, good, fair, or poor?" Responses ranged from 1 (*excellent*) to 5 (*poor*). From a detailed medical history, disease burden was calculated as the sum of eight diagnoses in HRS and 30 chronic conditions in MIDUS. Depressive symptoms in HRS were measured with an 8-item version of the Centers for Epidemiological Studies Depression Scale (CES-D) and with a 7-item scale in MIDUS. Smoking was history of ever smoking (yes/no). Moderate physical activity in HRS was measured with the item, "And how often do you take part in sports or activities that are moderately energetic?" Moderate physical activity in MIDUS was the mean of two items on

the frequency of moderate physical activity in a month. These covariates were measured at the same time as the everyday discrimination scale at baseline in both studies. See the Table 1 for descriptive statistics for these variables in HRS and MIDUS, respectively.

Statistical Analysis—Cox proportional hazards regression analysis was used to test whether discrimination was associated with mortality risk. Time to event was defined as time (in years) from the discrimination assessment to death or censoring date. We test three progressively restrictive models. Model 1 controlled for age, sex, race, and education to show the association between discrimination and mortality only controlling for basic demographic factors. Model 2 controlled for these demographic characteristics and BMI category. The purpose of Model 2 is to test whether the association between weight discrimination and mortality is independent of BMI. Model 3 included the covariates from Model 2 plus the clinical and behavioral risk factors: subjective health, disease burden, depressive symptoms, smoking history, and physical activity. The purpose of Model 3 is to test whether the association between discrimination and mortality is net of common comorbidities that also increase risk of morality. We tested weight discrimination and the other attributions for discrimination to examine whether the effects of discrimination were limited to specific attributions or increased risk broadly. The attributions were entered separately into the model. We also tested sex (1=female and 0=male), race (1=African-American and 0=white; due to the small sample size and complexity of interpreting the category, participants classified as other or unknown race were not included in the moderation analysis), age, and BMI as moderators of the discrimination-mortality relation. The analyses were conducted using SPSS, and we meta-analytically combined the HR from the two studies (weighted by sample size) using the software Comprehensive Meta-Analysis.

Results

In HRS, across the median follow-up of 4.42 years (range 1 to 84 months) totaling 65,513 person-years, 15% of the sample died (*n*=2003). In MIDUS, across the median follow-up of 8.97 years (range 2 to 145 months) totaling 44,078 person-years, 9% of the sample died (*n*=476). Controlling for the demographic characteristics, discrimination based on weight was associated with an almost 60% increased risk of mortality in both HRS (Table 2) and MIDUS (Table 3). The combined meta-analytic HR was 1.57 (95% CI=1.36-1.82). In the both samples, BMI, subjective health, disease burden, depressive symptoms, smoking history, and physical activity reduced this association but did not eliminate it. Although the association in MIDUS was reduced to non-significance (*p*=.15), the strength of the association was nearly identical to the association in HRS, and the combined meta-analytic HR was similar and significant (HR=1.32, 95% CI=1.12-1.55).

Demographic Moderators—The risk associated with weight discrimination was slightly stronger for African American participants (HR=1.91, 95% CI=1.35-2.71 and HR=2.46, 95% CI=.92-6.54 for HRS and MIDUS, respectively) than white participants (HR=1.50, 95% CI=1.25-1.80 and HR=1.52, 95% CI=1.00-2.31 for HRS and MIDUS, respectively), but the interaction was not significant ($HR_{race \times weight\ discrimination}$ =1.46, 95% CI=.99-2.14

and $HRr_{ace \times weight\ discrimination}$=1.72, 95% CI=.60-4.91, respectively for HRS and MIDUS). The interaction with age was not significant in either HRS ($HR_{age \times weight\ discrimination}$ =.85, 95% CI=.73-1.00) or MIDUS ($HR_{age \times weight\ discrimination}$ =.98, 95% CI=.73-1.34) nor was the interaction with sex ($HR_{sex \times weight\ discrimination}$ =1.07, 95% CI=.78-1.47 and $HR_{sex \times weight\ discrimination}$ =1.15, 95% CI=.54-2.45 for HRS and MIDUS, respectively). Finally, there was an interaction with BMI in the MIDUS that indicated the risk of mortality increased at higher BMI ($HR_{BMI \times weight\ discrimination}$ =1.08, 95% CI=1.02-1.14); this interaction was not apparent in HRS ($HR_{BMI \times weight\ discrimination}$=1.02, 95% CI=.99-1.04). These results suggested that weight discrimination conferred similar risk, regardless of age or sex, but may be slightly stronger for African-American participants and participants at a higher BMI.

Discrimination based on characteristics other than weight—We next examined whether the other attributions for discrimination were associated with mortality risk. Of these attributions, discrimination based on a physical disability had the strongest association with risk of mortality (Model 1), which was stronger among relatively younger than relatively older participants in HRS ($HR_{age \times physical\ disability\ discrimination}$ =.70, 95% CI=.63-.79), an interaction that did not replicate in MIDUS ($HR_{age \times physical\ disability\ discrimination}$ =.94, 95% CI=.56-1.58). Sex, race and BMI did not moderate this association in either sample. The mortality risk was still apparent after controlling for the clinical and behavioral risk factors (Model 3).

In addition to weight and a physical disability, discrimination based on ancestry/national origin was also associated with increased mortality risk in HRS, but the similar attribution in MIDUS (ethnicity/nationality) was unrelated to mortality risk. Although there was not a main effect of race discrimination on mortality, there was an interaction with race in HRS: Discrimination based on race was associated with mortality among white participants (HR=1.37, 95% CI=1.10-1.71) but not African American participants (HR=.80, 95% CI=.62-1.02; $HR_{race \times race\ discrimination}$ =.62, 95% CI=.44-.86). This interaction was not significant in MIDUS ($HR_{race \times raace\ discrimination}$ =.50, 95% CI=.21-1.18), but there was a similar pattern across white (HR=1.51, 95% CI=.98-2.34) and African American (HR=.77, 95% CI=.33-1.79) participants. Although surprising, a previous study reported a similar finding (Barnes et al., 2008).

There was less evidence for the remaining attributions. Discrimination based on appearance in HRS was associated with mortality in the model controlling for basic demographic covariates but not in the fully adjusted model; it was unrelated to mortality in MIDUS. Discrimination based on sex, age, or sexual orientation was unrelated to mortality risk in either sample. And, other than the moderators described above, none of the associations differed by sex, race, or age.

Discussion

The present findings indicate that the harmful effect of unfair treatment because of body weight is not limited to psychological distress and morbidity, but extends to risk of mortality. This association was apparent in two independent samples that covered different

periods of the lifespan and persisted after accounting for behavioral and clinical risk factors. The effect of weight discrimination on mortality was generally stronger than other forms of discrimination and was comparable to other established risk factors, such as history of smoking and disease burden. Moreover, the association between weight discrimination and mortality risk is in sharp contrast to the protective relation between some of the BMI categories and mortality risk. These findings suggest the possibility that the stigma associated with weight is more harmful than actual overweight or obesity itself.

The exact mechanisms through which weight discrimination contributes to mortality remain to be determined. A growing literature indicates that weight discrimination is associated with behavioral risk factors such as a sedentary lifestyle, as well as comorbidities that partly explain the association with mortality risk. But the psychological and physiological costs of unfair treatment are not fully captured by common comorbidity measures (e.g., depressive symptoms, disease burden). Other consequences of weight discrimination, such as social isolation (Lewis et al., 2011), economic losses (Puhl & Heuer, 2009), and reduced quality of healthcare (Phelan et al., 2015), are also likely to play a role.

It was somewhat surprising that, with one exception, none of the other attributions for discrimination was associated with mortality consistently across the samples. There may be unique aspects to the experience of weight discrimination that increase mortality risk that are not shared with other attributions. For example, the perpetrators of weight discrimination are sometimes loved ones who would typically provide social support in stressful situations (Boyes & Latner, 2009). That is, instead of the support that would buffer stress, close others may be the source of it. In addition, given that weight is largely perceived to be controllable, unfair treatment because of body weight may lead to feelings of shame because of the perception that individuals should do something about their weight. These feelings may be compounded by the ambivalence many individuals feel about their desire to lose weight (for aesthetics and/or health reasons) and the messages from health care providers aimed at weight loss (Brown & McClimens, 2012). These mechanisms, however, are speculative, and need to be tested in future research.

Discrimination based on a physical disability was the only other attribution associated with mortality risk across both samples. Individuals with a physical disability may be both more ill and more vulnerable to discrimination than adults without such disabilities. We could not, however, identify who considered themselves disabled. Supplementary analysis on common markers of disability in HRS (i.e., limitations in activities of daily living, limitations in instrumental activities of daily living, and identifying as not working due to a disability) reduced the association between discrimination based on a disability and mortality but did not eliminate it (HR=1.36, 95% CI=1.18-1.57, $p<.01$). It is possible that the discrimination measure conflated disability-related morbidity with the stigma of disability. The relation between discrimination and mortality may thus reflect the effect of the disability more than discriminatory experiences being particularly harmful. In light of this limitation, this association should be interpreted with caution.

We found some evidence that discrimination based on race was associated with mortality for white but not African American participants. These counterintuitive findings are consistent

with other studies (Albert et al., 2010; Barnes et al., 2008) but need to be interpreted within a broader context that may obscure the relation between race discrimination and mortality. First, there may be a survival effect, such that African Americans who survive to old age are particularly resilient against the harmful effects of discrimination (Jackson et al., 2011). There are also SES differences in who reports discrimination based on race: Higher SES African Americans tend to report more discrimination, whereas it tends to be the opposite for white Americans (Purrell et al., 2007). The association between race discrimination and mortality may thus reflect class in addition to the perceived experiences. Most important, systemic racism, rather than individual experiences with discrimination, may be more harmful for health. Structural racism, for example, increases risk of morbidity (Lukachko, Hatzenbuehler, & Keyes, 2014) and mortality (Chae et al., 2015) and such inequities (e.g., residential segregation, access to care) likely pose greater mortality risk than the individual's perceived experiences with discrimination. The complexity of race discrimination also may not be captured by a brief measure of discrimination, as was used here, and individuals from different racial background may not respond to such measures in similar ways (Lewis, Yang, Jacobs, & Fitchett, 2012).

No significant associations were found for the remaining attributions across both samples. The lack of association was particularly surprising for age discrimination, since it was previously linked with increases in disease burden across old age (Sutin et al., 2015). There may be buffering factors that protect against diseases progressing toward ultimate mortality. Alternatively, perhaps not enough time elapsed from the development of disease associated with age discrimination to culminate in mortality risk. It was likewise surprising that discrimination based on gender or sexual orientation was unrelated to mortality. Women tend to live longer and lead healthier lifestyles, which may be protective against the stress of discrimination. The low prevalence of discrimination based on sexual orientation may limit the power to detect an effect, and structural stigma may pose greater risk for mortality than individual experiences with discrimination (Hatzenbuehler et al., 2014). Longer follow-up intervals and more diverse samples are needed to adequately address how these attributions contribute to mortality risk.

It is important to note that our measure of discrimination was brief and did not assess the frequency, intensity, or timing of the unfair treatment. In addition, the measure in MIDUS included height in the item in addition to weight, which participants may have interpreted differently than in HRS. Even with such a brief measure that was slightly different across the studies, however, weight discrimination was associated with increased mortality risk in two independent samples. This finding points to the importance of weight as a source of social stress with significant consequences for health. From this initial evidence, future research needs to better delineate how the timing and course of how weight discrimination contributes to mortality risk. Future research also needs to use alternative measures of adiposity, given the inherent limitations of BMI.

Overall, this research suggests that unfair treatment on the basis of body weight increases mortality risk. There is a pervasive belief that shaming individuals because of their weight motivates weight loss. The consequences of this mistaken belief are now clear: growing

evidence suggests that weight bias does not work (Sutin & Terracciano, 2013), it leads to greater morbidity (Sutin et al., 2015), and now mortality.

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References

Albert MA, Cozier Y, Ridker PM, Palmer JR, Glynn RJ, Rose L, Rosenberg L, et al. Perceptions of race/ethnic discrimination in relation to mortality among Black women: results from the Black Women's Health Study. Archives of Internal Medicine. 2010; 170:896–904.10.1001/archinternmed.2010.116 [PubMed: 20498418]

Andreyeva T, Puhl RM, Brownell KD. Changes in perceived weight discrimination among Americans, 1995-1996 through 2004-2006. Obesity. 2008; 16:1129–1134.10.1038/oby.2008.35 [PubMed: 18356847]

Barnes LL, de Leon CF, Lewis TT, Bienias JL, Wilson RS, Evans DA. Perceived discrimination and mortality in a population-based study of older adults. American Journal of Public Health. 2008; 98:1241–1247.10.2105/AJPH.2007.114397 [PubMed: 18511732]

Borrell C, Artazcoz L, Gil-González D, Pérez G, Rohlfs I, Pérez K. Perceived sexism as a health determinant in Spain. Journal of Womens Health (Larchmt). 2010:741–750.10.1089/jwh.2009.1594

Boyes AD, Latner JD. Weight stigma in existing romantic relationships. Journal of Sex and Marital Therapy. 2009; 35:282–293.10.1080/00926230902851280 [PubMed: 19466667]

Brown I, McClimens A. Ambivalence and obesity stigma in decisions about weight management: A qualitative study. Health. 2012; 4:1562–1569.10.4236/health.2012.412A224

Chae DH, Clouston S, Hatzenbuehler ML, Kramer MR, Cooper HL, Wilson SM, Link BG, et al. Association between an Internet-Based Measure of Area Racism and Black Mortality. PLoS One. 2015; 10:e0122963.10.1371/journal.pone.0122963 [PubMed: 25909964]

Flegal KM, Kit BK, Graubard BI. Body mass index categories in observational studies of weight and risk of death. American Journal of Epidemiology. 2014; 180:288–296.10.1093/aje/kwu111 [PubMed: 24893710]

Flegal KM, Kit BK, Orpana H, Graubard BI. Assocaition of all-cause mortality with overweight and obesity using standard body mass index categories: A systematic review and meta-analysis. JAMA. 2013; 309:71–82.10.1001/jama.2012.113905 [PubMed: 23280227]

Hatzenbuehler ML, Bellatorre A, Lee Y, Finch BK, Muennig P, Fiscella K. Structural stigma and all-cause mortality in sexual minority populations. Social Science & Medicine. 2014; 103:33–41.10.1016/j.socscimed.2013.06.005 [PubMed: 23830012]

Health and Retirement Study: 2006-2012 core public use datasets. Ann Arbor, MI, Produced and distributed by the University of Michigan with funding from the National Institute on Aging (grant number NIA U01AG009740). 2012. Available at: http://hrsonline.isr.umich.edu/

Hunger JM, Tomiyama AJ. Weight labeling and obesity: a longitudinal study of girls aged 10 to 19 years. JAMA Pediatrics. 2014; 168(6):579–580.10.1001/jamapediatrics.2014.122 [PubMed: 24781349]

Jackson, JS.; Hudson, D.; Kershaw, K.; Mezuk, B.; Rafferty, J.; Knight Tuttle, K. Discrimination, chronic stress, and mortality among Black Americans: A life course framework. In: Rogers, RG.; Eileen M, C., editors. International Handbook of Adult Mortality. New York: Springer; 2011. p. 311-328.

Kessler RC, Mickelson KD, Williams DR. The prevalence, distribution, and mental health correlates of perceived discrimination in the United States. Journal of Health and Social Behavior. 1999; 40:208–230. [PubMed: 10513145]

Krukowski RA, West DS, Philyaw Perez A, Bursac Z, Phillips MM, Raczynski JM. Overweight children, weight-based teasing and academic performance. International Journal of Pediatric Obesity. 2009; 4:274–280.10.3109/17477160902846203 [PubMed: 19922042]

Lewis S, Thomas SL, Blood RW, Castle DJ, Hyde J, Komesaroff PA. How do obese individuals perceive and respond to the different types of obesity stigma that they encounter in their daily lives? A qualitative study. Social Sciences and Medicine. 2011; 73:1349–1356.10.1016/j.socscimed.2011.08.021

Lewis TT, Yang FM, Jacobs EA, Fitchett G. Racial/ethnic differences in responses to the everyday discrimination scale: a differential item functioning analysis. American Journal of Epidemiology. 2012; 175:391–401.10.1093/aje/kwr287 [PubMed: 22306556]

Lukachko A, Hatzenbuehler ML, Keyes KM. Structural racism and myocardial infarction in the United States. Social Science & Medicine. 2014; 103:42–50.10.1016/j.socscimed.2013.07.021 [PubMed: 24507909]

Major B, Eliezer D, Rieck H. The psychological weight of weight stigma. Social Psychological and Personality Science. 2012; 3:651–658.10.1177/1948550611434400

Major B, Hunger JM, Bunyan DP, Miller CT. The ironic effects of weight stigma. Journal of Experimental Social Psychology. 2014; 51:74–80.10.1016/j.jesp.2013.11.009

Muennig P. The body politic: The relationship between stigma and obesity-associated disease. BMC Public Health. 2008; 810.1186/1471-2458-8-128

Phelan SM, Burgess DJ, Yeazel MW, Hellerstedt WL, Griffin JM, van Ryn M. Impact of weight bias and stigma on quality of care and outcomes for patients with obesity. Obesity Reviews. 2015; 16:319–326.10.1111/obr.12266 [PubMed: 25752756]

Puhl RM, Heuer CA. The stigma of obesity: A review and update. Obesity. 2009; 17:941–964.10.1038/oby.2008.636 [PubMed: 19165161]

Purnell JQ, Peppone LJ, Alcaraz K, McQueen A, Guido JJ, Carroll JK, Morrow GR, et al. Perceived discrimination, psychological distress, and current smoking status: results from the Behavioral Risk Factor Surveillance System Reactions to Race module, 2004-2008. American Journal of Public Health. 2012; 102:844–851.10.2105/AJPH.2012.300694 [PubMed: 22420821]

Schvey NA, Puhl RM, Brownell KD. The stress of stigma: exploring the effect of weight stigma on cortisol reactivity. Psychosomatic Medicine. 2014; 76:156–162.10.1097/PSY.0000000000000031 [PubMed: 24434951]

Sutin AR, Stephan Y, Carretta H, Terracciano A. Perceived discrimination and physical, cognitive, and emotional health in older adulthood. American Journal of Geriatric Psychiatry. 2015; 23:171–179.10.1016/j.jagp.2014.03.007 [PubMed: 24745563]

Sutin AR, Stephan Y, Luchetti M, Terracciano A. Perceived weight discrimination and C-reactive protein. Obesity (Silver Spring). 2014; 22:1959–1961.10.1002/oby.20789 [PubMed: 24828961]

Sutin AR, Terracciano A. Perceived weight discrimination and obesity. PLoS One. 2013; 8:e70048.10.1371/journal.pone.0070048 [PubMed: 23894586]

Tomiyama AJ. Weight stigma is stressful. A review of evidence for the Cyclic Obesity/Weight-Based Stigma model. Appetite. 2014; 82:8–15.10.1016/j.appet.2014.06.108 [PubMed: 24997407]

Vartanian LR, Novak SA. Internalized societal attitudes moderate the impact of weight stigma on avoidance of exercise. Obesity. 2011; 19:757–762.10.1038/oby.2010.234 [PubMed: 20948515]

Williams DR, Yu Y, Jackson JS, Anderson NB. Racial differences in physical and mental health. Socio-economic status, stress and discrimination. Journal of Health Psychology. 1997; 2:335–351.10.1177/135910539700200305 [PubMed: 22013026]

Table 1
Unweighted Descriptive Statistics for the HRS and MIDUS Samples

	HRS	MIDUS
Age (Years)	68.33 (10.48)	47.86 (12.91)
Sex (Female)	59%	53%
Ethnicity (Black)	13%	4%
Ethnicity (Other/unknown)	3%	5%
Education (Years)	12.58 (3.11)	14.15 (2.57)
BMI category		
Underweight	2%	2%
Overweight	38%	36%
Obesity	27%	18%
Morbid Obesity	4%	6%
Poor Subjective Health	2.84 (1.10)	2.45 (.98)
Disease Burden	2.02 (1.35)	2.44 (2.52)
Depressive Symptoms	1.87 (2.18)	.72 (1.84)
Smoking (Ever)	52%	52%
Moderate Physical Activity	3.17 (1.32)	9.22 (4.79)
Discrimination		
Weight	9%	7%
Ancestry	7%	3%
Race	10%	9%
Sex	12%	15%
Age	30%	10%
Physical Disability	8%	1%
Appearance	7%	4%
Sexual Orientation	2%	2%

Note. The columns report either the mean (standard deviation) or percentage. HRS=Health and Retirement Study. MIDUS=Midlife in the United States Study. BMI=Body Mass Index.

Table 2
Mortality Risk Associated with Perceived Discrimination in HRS

	Model 1 HR (95% CI)	Model 2 HR (95% CI)	Model 3 HR (95% CI)
Age	2.36 (2.26-2.47)*	2.34 (2.23-2.45)*	2.20 (2.07-2.33)*
Sex (Female)	.70 (.64-.77)*	.65 (.60-.72)*	.66 (.60-.73)*
Ethnicity (Black)	1.21 (1.06-1.37)*	1.22 (1.08-1.39)*	1.04 (.90-1.19)
Ethnicity (Other/unknown)	.75 (.51-1.11)	.76 (.51-1.11)	.89 (.59-1.35)
Education (Years)	.95 (.94-.96)*	.95 (.94-.96)*	.99 (.98-1.01)
BMI category			
Underweight	--	2.55 (2.03-3.21)*	2.54 (1.98-3.21)*
Overweight	--	.77 (.69-.85)*	.73 (.65-.82)*
Obesity	--	.84 (.74-.96)*	.66 (.57-.75)*
Morbid Obesity	--	1.63 (1.29-2.06)*	.91 (.71-1.17)
Poor Subjective Health	--	--	1.37 (1.29-1.44)*
Disease Burden	--	--	1.18 (1.13-1.22)*
Depressive Symptoms	--	--	1.04 (1.01-1.06)*
Smoking (Ever)	--	--	1.41 (1.26-1.57)*
Moderate Physical Activity	--	--	.83 (.80-.86)*
Discrimination			
Weight	1.57 (1.34-1.84)*	1.48 (1.25-1.75)*	1.31 (1.10-1.57)*
Ancestry	1.26 (1.07-1.49)*	1.31 (1.11-1.56)*	1.44 (1.21-1.72)*
Race	1.06 (.90-1.26)	1.08 (.91-1.28)	1.11 (.93-1.33)
Sex	1.10 (.94-1.28)	1.08 (.92-1.26)	1.13 (.96-1.33)
Age	1.09 (.99-1.19)	1.08 (.98-1.19)	1.01 (.92-1.12)
Physical Disability	2.28 (2.01-2.57)*	2.21 (1.95-2.50)*	1.50 (1.30-1.72)*
Appearance	1.31 (1.11-1.55)*	1.27 (1.08-1.51)*	1.14 (.95-1.37)
Sexual Orientation	1.17 (.85-1.60)	1.13 (.81-1.56)	1.07 (.76-1.49)

Note. *N*=13,692 for Model 1. *N*=13,400 for Model 2 and *N*=12,307 for Model 3 due to missing data on some covariates. Coefficients are hazard ratios (95% Confidence Intervals). HRS=Health and Retirement Study. BMI=body mass index.

* $p<.01$.

Table 3
Mortality Risk Associated with Perceived Discrimination in MIDUS

	Model 1 HR (95% CI)	Model 2 HR (95% CI)	Model 3 HR (95% CI)
Age	2.26 (2.08-2.46)*	2.34 (2.14-2.55)*	2.24 (2.04-2.45)*
Sex (Female)	.75 (.63-.90)*	.68 (.56-.83)*	.75 (.61-.91)*
Ethnicity (Black)	1.74 (1.19-2.54)*	1.74 (1.18-2.58)*	1.70 (1.15-2.54)*
Ethnicity (Other/unknown)	1.58 (1.08-2.32)*	1.65 (1.11-2.46)*	1.30 (.87-1.95)
Education (Years)	.91 (.88-.95)*	.92 (.88-.95)*	.98 (.95-1.02)
BMI category			
Underweight	--	2.64 (1.55-4.50)*	2.36 (1.38-4.04)*
Overweight	--	.79 (.63-.98)*	.77 (.62-.96)*
Obesity	--	.86 (.67-1.12)	.70 (.53-.91)*
Morbid Obesity	--	1.53 (.86-2.70)	.92 (.52-1.64)
Poor Subjective Health	--	--	1.63 (1.46-1.81)*
Disease Burden	--	--	1.02 (.98-1.06)
Depressive Symptoms	--	--	1.01 (.96-1.07)
Smoking (Ever)	--	--	1.85 (1.50-2.30)*
Moderate Physical Activity	--	--	.97 (.95-.99)*
Discrimination			
Weight/height	1.59 (1.09-2.31)*	1.46 (.97-2.20)+	1.35 (.90-2.04)
Ethnicity/nationality	.61 (.31-1.20)	.68 (.35-1.33)	.64 (.33-1.27)
Race	1.15 (.79-1.67)	1.11 (.74-1.62)	1.03 (.70-1.52)
Sex	.92 (.64-1.31)	.86 (.60-1.25)	.81 (.56-1.18)
Age	1.18 (.88-1.58)	1.11 (.82-1.51)	1.03 (.76-1.41)
Physical Disability	3.51 (2.16-5.72)*	3.49 (2.14-5.70)*	2.10 (1.25-3.53)*
Appearance	.86 (.48-1.53)	.83 (.45-1.51)	.70 (.38-1.29)
Sexual Orientation	1.15 (.43-3.09)	1.13 (.42-3.05)	.96 (.35-2.62)

Note. N=5,079 for Model 1. N=4,883 for Model 2 and N=4,846 for Model 3 due to missing data on some covariates. Coefficients are hazard ratios (95% Confidence Intervals). MIDUS=Midlife in the United States Study. BMI=body mass index.

* p<.05.

+ p=.07.