



Published in final edited form as:

Int J Clin Pract. 2016 December ; 70(12): 1003–1011. doi:10.1111/ijcp.12902.

Perceived Weight Discrimination and Chronic Medical Conditions in Adults with Overweight and Obesity

Tomoko Udo, Ph.D.¹, Katherine Purcell, B.A.¹, and Carlos M. Grilo, Ph.D.^{2,3}

¹Department of Health Policy, Management, and Behavior, School of Public Health, University at Albany, State University of New York, 12144, USA

²Department of Psychiatry, Yale University School of Medicine, New Haven, CT 06510

³National Center on Addiction and Substance Abuse (at Yale), New Haven, CT. 06510

Abstract

Aim—This study investigated whether perceived weight discrimination is associated with increased risk for major chronic medical conditions and whether the associations persist after adjusting for other stressful life events in addition to BMI, physical activity, and sociodemographic variables.

Methods—The study included 21,357 overweight/obese adults (52.9% women) from the 2001-2002 and 2004-2005 National Survey of Alcohol and Related Conditions (NESARC).

Results—Perceived weight discrimination was significantly associated with risk for arteriosclerosis, diabetes, high cholesterol, myocardial infarction, minor heart conditions, and stomach ulcers. Perceived weight discrimination was associated with reporting more stressful life events. After adjusting additionally for stressful life events in the final multiple logistic regression, associations with arteriosclerosis, diabetes, and minor cardiac conditions remained significant. Gender-stratified analyses revealed that perceived weight discrimination was associated with different medical conditions in women than men, and many associations became non-significant when adjusting for stressful life events, particularly for women.

Conclusions—Among overweight/obese adults, perceived weight discrimination is associated with significantly increased risk for obesity-related chronic medical conditions even after adjusting for BMI, physical activity, and sociodemographic variables. Accounting for other acute stressful life events may also be important in understanding the health effects of perceived weight discrimination. Such added health risk of overweight/obesity posed by perceived weight discrimination warrants public health and policy interventions against weight discrimination to reduce the socioeconomic burden of obesity.

Corresponding Author: Tomoko Udo, Ph.D.; 1 University Place, Rensselaer, NY 12144; Phone: 518-486-5572; Fax: 518-402-0414; tschaller@albany.edu.

The authors report no conflicts of interest or any competing interests.

Author Contributions: TU performed the analyses and led conception of the study and the writing of the manuscript. KP also performed the analyses. CMG contributed to conception of the study and the writing of the manuscript. All authors had final approval of the submitted manuscript.

Introduction

Recent epidemiological studies estimate that 34.9% of adults over 20 years old are obese in the United States (1). As the prevalence of obesity has dramatically increased over the past few decades, weight-related discrimination (i.e., unfair treatment in various settings due to weight), has received increasing empirical attention. Much like racial and gender discrimination, perceived weight discrimination has been found to be a significant psychosocial stressor with potentially profound negative impacts on health behaviors and psychosocial functioning of individuals with overweight/obesity. Weight discrimination, for example, has been shown to increase food consumption and reduce physical activity in individuals with obesity (2). Treatment-seeking individuals with obesity who report weight stigmatization have increased depressive symptoms, greater body image dissatisfaction, and lower self-esteem than those who do not report weight stigmatization (3). Epidemiological studies have reported significant associations between perceived weight discrimination and increased risk of meeting diagnostic criteria for various psychiatric and substance use disorders in the past year (4), lower life satisfaction and quality of life (5), poorer subjective health and greater disease burden (6). Perceived weight discrimination has also been linked with increased all-cause mortality in midlife even after adjusting for other known risk factors such as smoking history and disease burden (7).

The negative impact of perceived discrimination - based on various reasons such as race/ethnicity, gender, and sexual orientations – on mental and physical health may be due partly by psychological and physiological stress responses (8). Self-reported experiences with weight stigmatization have been associated with elevated cortisol levels (9). Experimentally manipulated weight discrimination experiences have also shown to induce elevation in arterial blood pressure (10) and heightened cortisol response (11, 12). Collectively, such findings suggest that experiences with weight discrimination may acutely elevate activity of the stress response system. Repeated, chronic exposure to stress, such as frequent experience with discrimination, may lead to difficulties regulating stress, which in turn may increase sensitivity to stress in general and to the development of various health problems (13, 14).

Perceived weight discrimination may affect or increase overall physical health and mortality burdens in individuals with obesity who already suffer high burdens (15, 16). Less is known, however, regarding the relationship of weight discrimination with specific chronic medical conditions. Research has found that perceived racial and gender discrimination are associated with increased risk for cardiovascular disease (17, 18) and hypertension (19), but whether perceived weight discrimination is associated with such specific chronic medical and metabolic conditions associated with obesity is largely unknown. One study has reported that perceived weight discrimination enhanced the relationship between measures of adiposity and glycemic control (HbA1C) in a nondiabetic subsample of 938 adults in the MIDUS II survey (20), but we are not aware of other studies investigating the relationship between perceived weight discrimination and chronic medical conditions in large epidemiological studies.

Furthermore, the relationship between perceived weight discrimination and risk for chronic medical conditions may differ by gender. Women are more likely to report experiences with

weight discrimination than men (21, 22), and gender differences have been documented in the prevalence, onset, progression, and expression of chronic disease conditions (e.g., 23, 24). The few studies that have examined gender differences in weight discrimination and health reported no moderation by gender on risk for obesity (25) or mortality (7). While gender differences may not exist when looking at gross measures of health such as all-cause mortality, the relationship between perceived weight discrimination and specific or individual causes of mortality or morbidity might differ by gender. To our knowledge, however, this has not yet been studied. Using the data from the National Survey of Alcohol and Related Conditions (NESARC), the current study examined whether perceived discrimination increased risk of reporting new diagnosis of chronic medical conditions. Given that stressful life events may also increase risk for cardiovascular conditions (26), metabolic conditions (27), and arthritis (28), we additionally examined whether perceived weight discrimination confers an additional or unique contribution to observed associations with medical conditions. In addition to the analyses with a total sample, we completed gender-stratified analyses to explore whether the patterns of associations between perceived weight discrimination and chronic medical conditions differed by gender.

Methods

Study sample

The NESARC aimed to understand the pattern of alcohol consumption behaviors, and estimate the magnitude of alcohol use problems and their associated disabilities in the general U.S. adult population. The NESARC included two waves of data collection; the Wave 1 interview of the NESARC was conducted between 2001 and 2002, and the Wave 2 interview was completed between 2004 and 2005. Wave 1 interview of the NESARC included a total of 43,093 non-institutionalized civilians aged 18 and older who were randomly selected from a roster of individuals living in each house hold. All individuals completed computer-assisted personal interviews in face-to-face household settings (29). At Wave 2 interview, 34,653 out of all eligible individuals were re-interviewed (see, 29, 30, for the details about the NESARC Wave 1 and Wave 2 Studies). The final sample for the current study consisted of 21,357 men and women (mean age = 46.2 ± 16.4 at Wave 1) who participated in the Wave 1 and Wave 2 surveys of the NESARC study. Individuals were excluded if they had missing weight information in either Wave 1 or Wave 2 interview or missing height information in both Wave 1 and Wave 2 ($n = 1,228$). Individuals who were not overweight or obese (i.e., body-mass-index [BMI] < 25 ; self-reported weight [lb]/self-reported height [in^2] $\times 703$) at the time of Wave 2 interview were instructed to state that they were not overweight in the past 12 months and not to report frequency of experiences with weight-based discrimination. Therefore, these individuals were also excluded ($n = 11,968$). Individuals with overweight and obesity who did not answer any of the questions about perceived weight discrimination were also excluded from the analyses ($n = 100$).

Assessment and Measures

Perceived weight discrimination—Perceived weight discrimination questions in the NESARC Wave 2 interview asked individuals with overweight and obesity about the frequency of experiencing five types of discrimination because of his/her weight in the past

year (1= Never, 2 = Almost never, 3 = Sometimes, 4 = Fairly often, and 5 = Very often). The five types of perceived weight discrimination included: 1) Obtaining health care or health insurance; 2) How you were treated when you got care; 3) Public settings such as on streets, in restaurants, stores, and public transportation); 4) Obtaining a job, on the job, or getting admitted to school or training program; and 5) In any other situation such as in courts, by police, and obtaining housing. Based on preliminary analysis of response frequency, respondents were categorized as reporting perceived weight discrimination if they responded “Sometimes,” “Fairly often,” or “Very often.” This categorization approach is also consistent with previous studies (4, 31). Good test-retest reliability and internal consistency of these weight discrimination question items have been reported (inter-class-correlation = 0.79) (32). Internal consistency of the scale was also good and compatible with previous reports (Cronbach's alpha = 0.73).

Chronic medical condition—The NESARC Wave 1 and Wave 2 interview included questions about the doctor's diagnoses regarding 18 chronic medical conditions in the past 12 months. This study included the following medical conditions: arteriosclerosis, hypertension, diabetes (Wave 2 only), high cholesterol (Wave 2 only), liver diseases (cirrhosis and any other forms of liver diseases combined), myocardial infarction, all other minor heart conditions (angina pectoris, tachycardia, and other forms combined), stomach ulcer, stroke (Wave 2 only), gastritis, and arthritis. The current study excluded diagnosis of HIV, AIDS, and any other sexually transmitted diseases as it is unlikely that obesity or weight discrimination directly increases risk for these conditions. Incidence was calculated as a number of individuals who reported a diagnosis at Wave 2 over a number of individuals who reported absence of diagnosis at Wave 1. For diabetes, high cholesterol, and stroke, however, analyses were completed based on the prevalence (i.e., a number of individuals who reported a diagnosis at Wave 2 over a total number of the sample at Wave 2) because the NESARC Wave 1 interview did not include questions regarding these three conditions.¹

Stressful life events—The NESARC Wave 2 interview also included questions about 14 stressful events occurring in the past 12 months (1 = Yes, 0 = No): 1) Moved or anyone new came to live with the respondent; 2) Fired or laid off from a job; 3) Unemployed and looking for a job longer than a month; 4) Have had trouble with a boss or coworker; 5) Changed jobs, job responsibilities or work hours; 6) Got separated or divorced or broke off a steady relationship; 7) Have had serious problems with a neighbor, friend or relative; 8) Have experienced a major financial crisis, declared bankruptcy or more than once been unable to pay your bills on time; 9) Had serious trouble with the police or the law; 10) Something was stolen that the respondent was carrying or from inside or outside home; 11) Someone intentionally damaged or destroyed property owned by the respondent or someone else in the house; 12) Family members or close friends die; 13) Family members or close friends

¹We also performed multiple logistic regressions predicting prevalence for other medical conditions, and found very similar patterns of findings for the prediction of prevalence both for the total sample and by gender. However, in the model predicting prevalence, hypertension remained significant after adjusting for BMI, physical activity, and socioeconomic variables (in the total sample and among women), and after additionally adjusting for stressful life events (among men). Perceived weight discrimination was also significantly associated with prevalence of minor heart conditions after adjusting BMI, physical activity, and socioeconomic variables and additionally for stressful life events in women.

physically assaulted, attacked or mugged; 14) Family members or close friends have serious trouble with the police or the law. A total number of stressful life events were calculated.

Analysis

For basic sample characteristics, chi-square tests were used to analyze categorical variables, and t-tests were used to analyze continuous variables. For the main analysis, two separate multiple logistic regression analyses were performed to calculate odds ratios (ORs) and 95% confidence intervals (CIs) of reporting diagnosis of each medical condition at Wave 2 interview by those who reported perceived weight discrimination, relative to those who did not report perceived weight discrimination. The first model adjusted for sociodemographic variables including age, gender (coded 1 = male, 2 = female), income (coded 1 = < \$10,000, 2 = \$10,000-\$24,999, 3 = \$25,000-49,999, 4 = \$50,000), education (coded 1 = less than high school, 2 = high school or GED, 3 = more than high school), and race/ethnicity (coded Caucasian [1 = Yes, 0 = No], African American [1 = Yes, 0 = No]), as well as BMI and frequency of rigorous or moderate physical activity (coded 0 = less than twice per year, 1 = 3 to 12 times per year, 2 = 2 to 4 times per months, 3 = 2 to 4 times per week, 4 = every day or nearly every day). The second model additionally adjusted for stressful life events in the past 12 months to further examine whether the effect of perceived weight discrimination on chronic disease risks is above and beyond the effects of other significant stressful life events.

All analyses were completed with a total sample and by gender, using the Statistical Analysis System (SAS) (release 9.4, 2002-2012, SAS Institute, Cary, NC). Because the selection of the sample based on BMI and perceived weight discrimination is not consistent with the original NESARC survey design that focused on alcohol use patterns in U.S. adults, we did not adjust for the complex survey design of the NESARC in our analyses. In all analyses, a *p*-value of less than 0.05 was considered statistically significant.

Results

Differences in sample characteristics

A significantly greater proportion of individuals who reported perceived weight discrimination were women, compared with those without perceived weight discrimination (Table 1). Compared with individuals who reported no perceived weight discrimination, individuals who reported perceived weight discrimination were significantly younger, significantly less likely to be married, reported significantly greater BMI, and reported a significantly greater number of stressful life events in the past 12 months across the analyses with the total sample, with women, and with men. Compared with those without perceived weight discrimination, those who reported perceived discrimination reported less income (total sample), more frequent physical activity (total sample and women), and more educated (women).

Likelihood of diagnosis for chronic conditions

Total sample—After adjusting for sociodemographic variables, BMI, and physical activity, perceived weight discrimination was associated with significantly higher odds of the diagnoses of arteriosclerosis, diabetes, high cholesterol, myocardial infarction, other minor

heart conditions, and stomach ulcer (Table 2). In a second multiple logistic regression analysis that adjusted additionally for stressful life events (in addition to sociodemographic variables, BMI, and physical activity), the odds ratios remained significantly higher only for arteriosclerosis, diabetes, and minor heart conditions.

Gender-stratified analysis—For women, after adjusting for sociodemographic variables, BMI, and physical activity, perceived weight discrimination was associated with significantly higher odds of the diagnoses of arteriosclerosis, diabetes, myocardial infarction, minor heart conditions, and stomach ulcer (Table 3). In a second multiple logistic regression analysis that adjusted additionally for stressful life events (in addition to sociodemographic variables, BMI, and physical activity), the association remained significant only for arteriosclerosis.

For men, after adjusting for sociodemographic variables, BMI, and physical activity, perceived weight discrimination was associated with significantly higher odds ratios of the diagnoses of hypertension, minor heart conditions, and arthritis (Table 3). In a second multiple logistic regression analysis that adjusted additionally for stressful life events (in addition to sociodemographic variables, BMI, and physical activity), the odds ratios remained significant only for minor heart conditions and arthritis.

Discussion

This study examined perceived weight discrimination and its associations with chronic medical conditions in a large national sample of US men and women with overweight/obesity. This approach builds on previous work documenting the negative health sequelae associated with other forms of discrimination (e.g., gender and racial), emerging work suggesting weight discrimination has broad negative psychosocial sequelae (4-6), and preliminary findings suggesting increased mortality (7). Consistent with previous findings that weight discrimination increases with BMI (33, 34), this study found that those who reported perceived weight discrimination had significantly higher BMI than those who did not. Perceived weight discrimination remained significantly associated with increased incidence of cardiovascular conditions (i.e., arteriosclerosis, myocardial infarction, and other minor heart conditions) and stomach ulcer, as well as prevalence of diabetes and high cholesterol after adjusting for sociodemographic characteristics, BMI, and physical activity. Thus, similar to previous findings for perceived racial and gender discriminations (17, 18), our findings suggest that perceived weight discrimination is associated with significantly heightened risk for developing cardiovascular conditions in persons with overweight/obesity even after adjusting further for BMI, sociodemographic variables, and physical activity. Therefore, it appears that weight-based discrimination adds to the medical burden associated with obesity.

In the present study, individuals who reported perceived weight discrimination reported a significantly greater number of stressful life events than those without perceived weight discrimination. This finding is consistent with those reported by Meyer and colleagues (35) that reported prejudice-related acute stress was associated with more general stressful life events and that racial/ethnic and sexual minority groups reported higher levels than their less

socially disadvantaged counterparts. In addition to being linked with chronic medical conditions (26-28), stressful life events have also been linked with increases in weight, BMI, and waist circumference (36, 37). Our analyses revealed that after adjusting for stressful life events (in addition to BMI, sociodemographic variables, and physical activity), perceived weight discrimination was no longer significantly associated with significantly elevated prevalence risk of high cholesterol and incidence of myocardial infarction. Collectively, these findings might suggest that experiencing more stressful life events may increase sensitivity to discrimination in individuals, and that stressful life events mediate the relationship between perceived weight discrimination and chronic medical conditions. Unfortunately, the cross-sectional nature of components of this study precluded analyses testing such clinical speculations which should be examined by future longitudinal studies.

Gender-stratified analyses also revealed gender differences in the patterns of associations between perceived weight discrimination and incidence of certain chronic medical conditions. In women, after adjusting for sociodemographic characteristics, BMI, and physical activity, perceived weight discrimination was associated significantly with arteriosclerosis, diabetes, myocardial infarction, minor heart conditions, and stomach ulcer. In men, perceived weight discrimination was associated significantly with hypertension, minor heart conditions, and arthritis. After adjusting further for the number of stressful life events reported in the past year, only arteriosclerosis in women and minor heart conditions and arthritis in men remained significantly associated with perceived weight discrimination.

Despite known gender differences in prevalence, onset, progression, and expression of chronic disease conditions (e.g., 23, 24), the emerging literature on gender differences in the relationship between individual health conditions and various forms of perceived discrimination remains limited and in need of further work. A previous study reported no gender differences in the relationship between perceived weight discrimination and all-cause mortality (7). While further research is needed to replicate and extend our findings; for example, the observed non-significant findings regarding diabetes and myocardial infarction in men in our first model could potentially reflect limited power given the smaller number of men who reported perceived weight discrimination relative to women. Nonetheless, our study suggests that perceived weight discrimination may be associated with overall or gross indicators of population health similarly in men and women, but the association between perceived weight discrimination and specific medical conditions may differ by gender. Furthermore, particularly for women, the relationship between perceived weight discrimination and chronic medical conditions may be partly accounted for by greater experiences of other forms of acute stressful life events. Differences in stress responses, such as the hypothalamic-pituitary-adrenal axis response, have been hypothesized to explain gender differences in the risk for developing stress-related disorders (e.g., 38). Future study should investigate potential biological mechanisms underlying observed gender differences in the patterns of association between perceived weight discrimination, chronic medical conditions, and stressful life events.

The strengths of the study included investigation of incidence (rather than prevalence) in a large socioeconomically, geographically, and ethnically sample of U.S. adults that allowed for statistical adjustment of BMI, sociodemographic factors, and physical activity (i.e., an

important lifestyle factor associated with physical health). However, the study findings should also be interpreted with some caution due to potential limitations. For example, in addition to physical activity, other lifestyle factors such as dietary intake might have accounted for the relationship between perceived weight discrimination and chronic medical conditions. Perceived weight discrimination and stressful life events were assessed only with respect to the 12 months prior to the Wave 2 interview. Thus, longer-term prospective studies and experimental paradigms are needed to investigate further questions about the potential causal role of perceived weight discrimination in chronic disease conditions as well as potential mediational or mechanistic factors. Future studies should also investigate whether the risk for chronic disease conditions differ by forms of weight discrimination, and whether a dose-response relationship exists between a frequency of experience with weight discrimination or a total number of forms of weight discrimination. The current study also did not account for individual differences in the degree of internalizing experiences with weight discrimination or the level of emotional or physical stress response to weight discrimination, which may also mediate the relationship between perceived weight discrimination and chronic disease conditions. While the NESARC data included a wide range of disease conditions associated with obesity, it did not include certain additional major causes of mortality and morbidity, such as cancer and cognitive disorders (e.g., dementia and Alzheimer's disease). In addition, the NESARC relied on participants' self-report regarding whether they had been officially diagnosed with each of the medical conditions by a physician; no objective information was available nor were data available regarding current medication use and treatment history. Thus, it is possible that the incidence of chronic medical condition may be under- or overestimated. Due to lack of data in Wave 1, we were not able to include the incidence rate of high cholesterol and diabetes, which are indicators of metabolic abnormalities strongly associated with obesity. BMI was calculated based on self-reported height and weight in the NESARC. The prevalence of perceived weight discrimination might have been underestimated because the questions regarding perceived weight discrimination only applied for individuals who were ever overweight or obese in the NESARC. However, use of self-reported weight and height is common in such a large epidemiological study for feasibility, and studies have reported high correlation between self-reported and measured height and weight (39, 40). Some participants, particularly those with morbid obesity, might have also felt embarrassed and reluctant to discuss weight-related issues given that the survey was administered in person.

Despite these limitations, this was the first study to evaluate the relationship between perceived weight discrimination and specific chronic medical conditions in a large sample of U.S. adults with overweight/obesity. The findings suggest that perceived weight discrimination is associated with heightened health risk in persons with overweight/obesity even after adjusting for BMI, sociodemographic factors, and physical activity. Significant findings were observed for arteriosclerosis, minor cardiovascular conditions, and diabetes. Such findings, considered within the context of our study's strengths and weaknesses, add further support to previous calls for action to empower patients with obesity and to increase efforts to reduce weight stigma by health care and public health professionals (2). Researchers have long advocated for legislation to prohibit weight discrimination, and public health support for such policies has been increasing (41). Our findings should serve

as further evidence to support the importance of these public health interventions to combat weight discrimination at both individual and societal levels to reduce the socioeconomic burden of obesity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding: This research was supported, in part, by grants from the National Institutes of Health (K24 DK070052). The funding agency (NIH) had no role in the preparation or the content of this paper.

References

1. Flegal KM, Carroll MD, Kit BK, Ogden CL. Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. *JAMA*. 2012; 307:491–497. [PubMed: 22253363]
2. Puhl R, Suh Y. Health consequences of weight stigma: Implications for obesity prevention and treatment. *Curr Obes Rep*. 2015; 4:182–190. [PubMed: 26627213]
3. Myers A, Rosen JC. Obesity stigmatization and coping: Relation to mental health symptoms, body image, and self-esteem. *Int J Obes Relat Metab Disord*. 1999; 23:221–230. [PubMed: 10193866]
4. Hatzenbuehler ML, Keyes KM, Hasin DS. Associations between perceived weight discrimination and the prevalence of psychiatric disorders in the general population. *Obesity*. 2009; 17:2033–2039. [PubMed: 19390520]
5. Jackson SE, Beeken RJ, Wardle J. Obesity, perceived weight discrimination, and psychological well-being in older adults in England. *Obesity*. 2015; 23:1105–1111. [PubMed: 25809860]
6. Sutin AR, Stephan Y, Carretta H, Terracciano A. Perceived discrimination and physical, cognitive, and emotional health in older adulthood. *Am J Geriatr Psychiatry*. 2015; 23:171–179. [PubMed: 24745563]
7. Sutin AR, Stephan Y, Terracciano A. Weight discrimination and risk of mortality. *Psychol Sci*. 2015; 26:1803–1811. [PubMed: 26420442]
8. Pascoe EA, Smart Richman L. Perceived discrimination and health: A meta-analytic review. *Psychol Bull*. 2009; 135:531–554. [PubMed: 19586161]
9. Tomiyama AJ, Epel ES, McClatchey TM, Poelke G, Kemeny ME, McCoy SK, et al. Associations of weight stigma with cortisol and oxidative stress independent of adiposity. *Health Psychol*. 2014; 33:862–867. [PubMed: 25068456]
10. Major B, Eliezer D, Rieck H. The psychological weight of weight stigma. *Soc Psychol Personal Sci*. 2012; 3:651–658.
11. Himmelstein MS, Incollingo Belsky AC, Tomiyama AJ. The weight of stigma: Cortisol reactivity to manipulated weight stigma. *Obesity*. 2015; 23:368–374. [PubMed: 25522347]
12. Schvey NA, Puhl RM, Brownell KD. The stress of stigma: Exploring the effect of weight stigma on cortisol reactivity. *Psychosom Med*. 2014; 76:156–162. [PubMed: 24434951]
13. McEwen BS. Stress, adaptation, and disease. Allostasis and allostatic load. *Ann N Y Acad Sci*. 1998; 840:33–44. [PubMed: 9629234]
14. McEwen BS, Stellar E. Stress and the individual. Mechanisms leading to disease. *Arch Intern Med*. 1993; 153:2093–2101. [PubMed: 8379800]
15. Guh DP, Zhang W, Bansback N, Amarsi Z, Birmingham CL, Anis AH. The incidence of comorbidities related to obesity and overweight: A systematic review and meta-analysis. *BMC Public Health*. 2009; 9:1–20. [PubMed: 19121216]
16. Ogden CL, Yanovski SZ, Carroll MD, Flegal KM. The epidemiology of obesity. *Gastroenterology*. 2007; 132:2087–2102. [PubMed: 17498505]

17. Everson-Rose SA, Lutsey PL, Roetker NS, Lewis TT, Kershaw KN, Alonso A, et al. Perceived discrimination and incident cardiovascular events: The Multi-Ethnic Study of Atherosclerosis. *Am J Epidemiol.* 2015; 182:225–234. [PubMed: 26085044]
18. Lewis TT, Williams DR, Tamene M, Clark CR. Self-reported experiences of discrimination and cardiovascular disease. *Curr Cardiovasc Risk Rep.* 2014; 8:365. [PubMed: 24729825]
19. Sims M, Diez-Roux AV, Dudley A, Gebreab S, Wyatt SB, Bruce MA, et al. Perceived discrimination and hypertension among African Americans in the Jackson Heart Study. *Am J Public Health.* 2012; 102 Suppl 2:S258–265. [PubMed: 22401510]
20. Tsenkova VK, Carr D, Schoeller DA, Ryff CD. Perceived weight discrimination amplifies the link between central adiposity and nondiabetic glycemic control (HbA1c). *Ann Behav Med.* 2011; 41:243–251. [PubMed: 21136227]
21. Dutton GR, Lewis TT, Durant N, Halanych J, Kiefe CI, Sidney S, et al. Perceived weight discrimination in the CARDIA study: Differences by race, sex, and weight status. *Obesity.* 2014; 22:530–536. [PubMed: 23512948]
22. Andreyeva T, Puhl RM, Brownell KD. Changes in perceived weight discrimination among Americans, 1995–1996 through 2004–2006. *Obesity.* 2008; 16:1129–1134. [PubMed: 18356847]
23. Appelman Y, van Rijn BB, Ten Haaf ME, Boersma E, Peters SA. Sex differences in cardiovascular risk factors and disease prevention. *Atherosclerosis.* 2015
24. Razzouk L, Muntner P. Ethnic, gender, and age-related differences in patients with the metabolic syndrome. *Current Hypertension Reports.* 2009; 11:127–132. [PubMed: 19278602]
25. Sutin AR, Terracciano A. Perceived weight discrimination and obesity. *PLoS One.* 2013; 8:e70048. [PubMed: 23894586]
26. Kershaw KN, Brenes GA, Charles LE, Coday M, Daviglius ML, Denburg NL, et al. Associations of stressful life events and social strain with incident cardiovascular disease in the Women's Health Initiative. *J Am Heart Assoc.* 2014; 3:e000687. [PubMed: 24973226]
27. Rutters F, Pilz S, Koopman AD, Rauh SP, Pouwer F, Stehouwer CD, et al. Stressful life events and incident metabolic syndrome: The Hoorn study. *Stress.* 2015; 18:507–513. [PubMed: 26186032]
28. Neufeld KM, Karunanayake CP, Maenz LY, Rosenberg AM. Stressful life events antedating chronic childhood arthritis. *J Rheumatol.* 2013; 40:1756–1765. [PubMed: 23950190]
29. Grant, BF.; Moore, TC.; Shepard, J.; Kaplan, K. Source and Accuracy Statement: Wave 1 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). National Institute on Alcohol Abuse and Alcoholism; Bethesda, MD: 2003.
30. Grant, BF.; Kaplan, K.; Moore, T.; Kimball, J. 2004–2005 Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions: Source and Accuracy Statement. National Institute on Alcohol Abuse and Alcoholism; Bethesda, MD: 2007.
31. Udo T, Grilo CM. Perceived weight discrimination, childhood maltreatment, and weight gain in U.S. adults with overweight/obesity. *Obesity.* 2016; 24:1366–1372. [PubMed: 27112217]
32. Ruan WJ, Goldstein RB, Chou SP, Smith SM, Saha TD, Pickering RP, et al. The alcohol use disorder and associated disabilities interview schedule-IV (AUDADIS-IV): Reliability of new psychiatric diagnostic modules and risk factors in a general population sample. *Drug Alcohol Depend.* 2008; 92:27–36. [PubMed: 17706375]
33. Hansson LM, Naslund E, Rasmussen F. Perceived discrimination among men and women with normal weight and obesity. A population-based study from Sweden. *Scand J Public Health.* 2010; 38:587–596. [PubMed: 20529966]
34. Puhl RM, Andreyeva T, Brownell KD. Perceptions of weight discrimination: Prevalence and comparison to race and gender discrimination in America. *Int J Obes.* 2008; 32:992–1000.
35. Meyer IH, Schwartz S, Frost DM. Social patterning of stress and coping: Does disadvantaged social statuses confer more stress and fewer coping resources? *Soc Sci Med.* 2008; 67:368–379. [PubMed: 18433961]
36. Wardle J, Chida Y, Gibson EL, Whitaker KL, Steptoe A. Stress and adiposity: A meta-analysis of longitudinal studies. *Obesity.* 2011; 19:771–778. [PubMed: 20948519]
37. Udo T, Grilo CM, McKee SA. Gender differences in the impact of stressful life events on changes in body mass index. *Prev Med.* 2014; 69:49–53. [PubMed: 25204986]

38. Stephens MA, Mahon PB, McCaul ME, Wand GS. Hypothalamic-pituitary-adrenal axis response to acute psychosocial stress: Effects of biological sex and circulating sex hormones. *Psychoneuroendocrinology*. 2016; 66:47–55. [PubMed: 26773400]
39. Kuczmarski MF, Kuczmarski RJ, Najjar M. Effects of age on validity of self-reported height, weight, and body mass index: findings from the Third National Health and Nutrition Examination Survey, 1988-1994. *J Am Diet Assoc*. 2001; 101:28–34. [PubMed: 11209581]
40. Spencer EA, Appleby PN, Davey GK, Key TJ. Validity of self-reported height and weight in 4808 EPIC-Oxford participants. *Public Health Nutr*. 2002; 5:561–565. [PubMed: 12186665]
41. Puhl RM, Suh Y, Li X. Legislating for weight-based equality: National trends in public support for laws to prohibit weight discrimination. *Int J Obes*. 2016

What's known?

Discrimination, which can take various forms, is a psychosocial stressor that has significant impact on mental and physical health. Along with increases in the prevalence of obesity, perceived weight discrimination has received increased empirical attention. Perceived weight discrimination is associated with all-cause mortality, poor subjective health, and disease burden, but little is known about its associations with specific disease conditions.

What's new?

Perceived weight discrimination may increase risk for developing obesity-related chronic medical conditions, although other stressful life events may also have significant contributions to the development of medical conditions. Perceived weight discrimination was associated with different medical conditions in men and women. Perceived weight discrimination may contribute to the socioeconomic burden of obesity, particularly for women, and indicates the importance of addressing it as a public health and societal issue.

Table 1

Sample characteristics

	Reported discrimination	Reported no discrimination	Chi-square/t-test
Total sample			
Sample size (%)	694 (3.2)	20,663 (96.8)	
Age in years (SD)	42.2 (12.6)	49.4 (16.4)	$\chi^2(774.51) = -14.68, p < .01$
% women	78.4	52.0	$\chi^2(1) = 187.39, p < .01$
% race/ethnicity			$\chi^2(2) = 3.92, ns$
Caucasian	55.6	54.9	
African American	23.8	21.6	
Other	20.6	23.5	
% education			$\chi^2(2) = 4.87, ns$
<High school	15.4	17.0	
High school or GED	25.9	28.6	
>High school	58.7	54.4	
% income			$\chi^2(3) = 24.58, p < .01$
<\$10,000	11.2	7.9	
\$10,000-\$24,999	25.8	21.7	
\$25,000-\$49,999	29.7	29.2	
\$50,000	33.3	41.2	
% married	38.4	53.5	$\chi^2(1) = 60.40, p < .01$
Stressful life events (SD)	3.0 (2.3)	1.5 (1.7)	$\chi^2(718.93) = 17.74, p < .01$
BMI (SD)	38.3 (8.0)	30.5 (4.9)	$\chi^2(710.9) = 25.52, p < .01$
Physical activity			$\chi^2(4) = 22.93, p < .01$
< twice per year	7.1	12.4	
3-12 times per year	6.2	5.4	
2 to 4 times per month	9.2	12.8	
2 to 4 times per week	29.7	29.4	
Every day or nearly every day	47.8	42.1	
Women			
Sample size (%)	544 (5.1)	10,748 (94.9)	

	Reported discrimination	Reported no discrimination	Chi-square/t-test
Age in years (SD)	41.8 (12.5)	50.2 (16.9)	$t(646.54) = -15.03, p < .01$
% race/ethnicity			$\chi^2(2) = 4.93, ns$
Caucasian	54.6	49.8	
African American	25.0	26.8	
Other	20.4	23.4	
% education			$\chi^2(2) = 8.86, p < .05$
<High school	14.9	18.6	
High school or GED	27.0	29.6	
>High school	58.1	51.8	
% income			$\chi^2(3) = 3.78, ns$
<\$10,000	12.5	10.7	
\$10,000-\$24,999	26.3	26.4	
\$25,000-\$49,999	31.1	29.4	
\$50,000	30.2	33.5	
% married	36.6	46.9	$\chi^2(11) = 22.14, p < .01$
Stressful life events (SD)	3.1 (2.3)	1.5 (1.7)	$t(573.39) = 15.39, p < .01$
BMI (SD)	38.4 (8.2)	31.1 (5.3)	$t(566.57) = 2.56, p < .01$
Physical activity			$\chi^2(4) = 45.10, p < .01$
< twice per year	6.6	15.4	
3-12 times per year	6.1	6.1	
2 to 4 times per month	9.8	11.7	
2 to 4 times per week	28.7	29.2	
Every day or nearly every day	48.8	37.7	
Men			
Sample size (%)	150 (1.5)	9,915 (98.5)	
Age in years (SD)	43.9 (12.6)	48.6 (15.9)	$t(156.26) = -4.54, p < .01$
% race/ethnicity			$\chi^2(2) = 1.40, ns$
Caucasian	59.3	60.4	
African American	19.3	16.0	
Other	21.3	23.6	
% education			$\chi^2(2) = 2.45, ns$

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

	Reported discrimination	Reported no discrimination	Chi-square/t-test
<High school	17.3	15.2	
High school or GED	22.0	27.6	
>High school	60.7	57.2	$\chi^2 (3) = 4.59, ns$
% income			
<\$10,000	6.8	4.9	
\$10,000-\$24,999	24.0	16.5	
\$25,000-\$49,999	24.7	29.1	
\$50,000	44.7	49.5	
% married	45.3	60.6	$\chi^2 (1) = 14.30, p < .01$
Stressful life events (SD)	2.6 (1.9)	1.5 (1.6)	$t(152.12) = 6.92, p < .01$
BMI (SD)	37.9 (7.0)	29.9 (4.3)	$t(150.71) = 13.86, p < .01$
Physical activity			$\chi^2 (4) = 3.26, ns$
< twice per year	8.7	9.1	
3-12 times per year	6.7	4.6	
2 to 4 times per month	7.3	9.8	
2 to 4 times per week	33.3	29.6	
Every day or nearly every day	44.0	46.9	

Notes: The analyses were based on Wave 2 interviews.

* = significantly different from individuals reporting no perceived weight discrimination at $p < .01$.

Table 2
Odds ratios (95% confidence intervals [CIs]) for reporting new diagnosis for each medical condition at Wave 2 by perceived weight discrimination in a total sample (N = 21,357)

	Model 1	Model 2
Arteriosclerosis	2.13 (1.08-4.19) †	2.08 (1.05-4.12) †
Hypertension	1.11 (0.85-1.45)	1.05 (0.80-1.36)
Diabetes ^a	1.37 (1.10-1.71) ‡	1.29 (1.03-1.61) †
High cholesterol ^a	1.24 (1.02-1.50) †	1.18 (0.98-1.43)
Myocardial infarction	2.35 (1.12-4.92) †	2.06 (0.98-4.34)
Minor heart conditions ¹	1.64 (1.21-2.21) ‡	1.44 (1.07-1.95) †
Stomach ulcer	1.71 (1.06-2.76) †	1.45 (0.90-2.36)
Gastritis	1.42 (0.99-2.02)	1.28 (0.90-1.83)
Arthritis	1.10 (0.84-1.45)	0.98 (0.74-1.30)
Liver disease ²	1.46 (0.67-3.19)	1.24 (0.57-2.72)
Stroke ^a	0.72 (0.22-2.35)	0.63 (0.20-2.07)

Notes. Model 1 adjusted for sociodemographic variables (age, gender, income, education, and race/ethnicity all reported at Wave 2), BMI, and physical activity. Model 2 additionally adjusted for stressful life events.

^a = prevalence at Wave 2 interview, instead of three-year incidence.

¹ = other minor heart conditions include angina pectoris, tachycardia, and other forms.

² = liver diseases includes cirrhosis and other liver diseases. Odds ratios (ORs) were calculated as no perceived weight discrimination as a reference group.

†, ‡ = significant ORs at $p < .05$ and $p < .01$.

Table 3
Odds ratios (95% confidence intervals [CIs]) for reporting new diagnosis for each medical condition at Wave 2 by perceived weight discrimination by gender

	Men (n = 10,065)		Women (n = 11,292)	
	B (SE)	ORs (95% CIs)	B (SE)	ORs (95% CIs)
Model 1				
Arteriosclerosis	-0.39 (1.03)	0.68 (0.09-5.06)	1.10 (0.39)	3.00 (1.41-6.38) ‡
Hypertension	0.50 (0.25)	1.64 (1.00-2.69) †	0.04 (0.16)	1.04 (0.76-1.43)
Diabetes ^a	0.30 (0.23)	1.35 (0.86-2.12)	0.30 (0.13)	1.35 (1.04-1.74) †
High cholesterol ^a	0.34 (0.19)	1.41 (0.97-2.05)	0.21 (0.11)	1.23 (0.98-1.54)
Myocardial infarction	0.45 (0.76)	1.57 (0.34-6.89)	0.98 (0.45)	2.66 (1.11-6.37) †
Minor heart conditions ¹	0.87 (0.29)	2.39 (1.35-4.25) ‡	0.35 (0.18)	1.42 (1.00-2.02)
Stomach ulcer	-0.06 (0.74)	0.94 (0.22-3.99)	0.54 (0.26)	1.71 (1.02-2.86) †
Gastritis	0.55 (0.44)	1.74 (0.73-4.13)	0.26 (0.20)	1.29 (0.88-1.91)
Arthritis	0.62 (0.26)	1.86 (1.11-3.10) †	-0.07 (0.17)	0.94 (0.68-1.30)
Liver disease ²	0.47 (0.63)	1.60 (0.46-5.54)	0.29 (0.51)	1.34 (0.49-3.66)
Stroke ^a	0.92 (0.76)	2.53 (0.57-11.33)	-1.38 (1.02)	0.25 (0.03-1.86)
Model 2				
Arteriosclerosis	-0.44 (1.03)	0.64 (0.09-4.81)	1.06 (0.39)	2.90 (1.36-6.20) ‡
Hypertension	0.42 (0.25)	1.53 (0.93-2.51)	-0.01 (0.16)	0.99 (0.72-1.36)
Diabetes ^a	0.25 (0.23)	1.29 (0.82-2.03)	0.22 (0.13)	1.25 (0.97-1.26)
High cholesterol ^a	0.30 (0.19)	1.35 (0.93-1.96)	0.17 (0.11)	1.19 (0.94-1.48)
Myocardial infarction	0.33 (0.76)	1.39 (0.31-6.13)	0.87 (0.45)	2.39 (0.99-5.79)
Minor heart conditions ¹	0.76 (0.30)	2.13 (1.20-3.80) †	0.22 (0.18)	1.25 (0.88-1.78)
Stomach ulcer	-0.22 (0.74)	0.80 (0.19-3.40)	0.41 (0.27)	1.50 (0.89-2.53)
Gastritis	0.44 (0.44)	1.56 (0.65-3.70)	0.17 (0.20)	1.19 (0.80-1.76)
Arthritis	0.54 (0.26)	1.71 (1.02-2.87) †	-0.19 (0.17)	0.83 (0.59-1.15)
Liver disease ²	0.37 (0.64)	1.44 (0.41-5.03)	0.05 (0.52)	1.05 (0.38-2.90)

	Men (<i>n</i> = 10,065)		Women (<i>n</i> = 11,292)	
	<i>B</i> (SE)	ORs (95% CIs)	<i>B</i> (SE)	ORs (95% CIs)
Stroke ^{<i>d</i>}	0.77 (0.76)	2.16 (0.49-9.54)	-0.87 (0.67)	0.42 (0.11-1.57)

Notes. Model 1 adjusted for sociodemographic variables (age, income, education, and race/ethnicity all reported at Wave 2), BMI, and physical activity. Model 2 additionally adjusted for stressful life events.

^{*d*} = prevalence at Wave 2 interview, instead of three-year incidence.

^{*1*} = other minor heart conditions include angina pectoris, tachycardia, and other forms.

^{*2*} = liver diseases includes cirrhosis and other liver diseases. Odds ratios (ORs) were calculated as no perceived weight discrimination as a reference group.

^{*†, ‡*} = significant ORs at *p* < .05 and *p* < .01.