

**The Negative and Bi-Directional Effects of Weight Stigma
on Health**

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In Major, B., Dovidio, J. & Link, B. G. (in press) Oxford Handbook of Stigma, Discrimination and Health. Oxford University Press.

Author note: Preparation of this chapter was supported by NIH Grant 5R01HL112818-02 to Brenda Major

Abstract

Weight stigma, or the social devaluation and denigration of people who are perceived to carry excess weight, is severe, pervasive, and has negative consequences for health. This chapter introduces a model describing the mechanisms by which weight stigma can lead to poorer health outcomes among people who are or who perceive themselves to be overweight. It is proposed that enacted weight stigma (discrimination) directly impairs the health of heavier weight individuals by changing the social and material aspects of their lives in ways that are detrimental to health, including fostering social isolation, compromising the quality of health care, decreasing socio-economic status, and increasing stress and negative emotions. Further, it is proposed that perceived weight stigma can lead to social identity threat, which in turn can indirectly impair health by increasing stress and negative emotions, physiological reactivity, calorie intake, and stigma-avoidance behaviors. Finally, it is proposed that weight stigma is bi-directional, in that experiencing weight stigma leads to weight gain or inhibits weight loss through increased eating and other biobehavioral mechanisms, which in turn leads to further stigmatization. Implications for health and recommendations for future research are discussed.

The Negative and Bi-directional Effects of Weight Stigma on Health

When introducing the Obesity Prevention Act of 2008, U. S. Senator Christopher Dodd described obesity as “a medical emergency of hurricane like proportions” that is wreaking havoc “on our families, on our society, and on our health care system” (New York Times, October 5, 2008). Senator Dodd’s alarmist words were based on two established facts. First, the prevalence of obesity in industrialized nations has increased dramatically over the last several decades. More than two-thirds (68.8 percent) of adults in the U.S. are now considered to be overweight (Body Mass Index or BMI between 25 and 29.99) or obese (BMI 30+), and more than one-third (35.7 percent) are considered obese. Among young people (ages 6 to 19), almost one in three are considered to be overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014). Second, significant health disparities exist between overweight/obese individuals and those who are of so-called “normal” or “average” weight. People who are obese have a lifespan that is, on average, two years shorter than that of average weight individuals. Heavier body weight individuals are more likely than those of average weight to experience Type II diabetes, hypertension, sleep apnea, liver disease, asthma, gallbladder disease, osteoarthritis, chronic back pain, coronary heart disease, a variety of cancers, and a host of other ailments (see Guh et al., 2009 for a review).

Alarms about the dangers of obesity reflect the widely held assumption that metabolic, hormonal, and other physiological changes associated with adiposity *cause* the negative health conditions with which they are associated. Evidence to support this assumption, however, is much weaker than assumed (Muennig, 2008). In fact, there is evidence of an “obesity paradox” whereby obesity conveys a significant health

advantage in the context of some diseases (see Clark, Fonarow, & Horwich, 2014). Such findings suggest that some factors other than adiposity may also contribute to the poorer health of heavier people. Although biological factors are surely important, evidence is accumulating that *weight stigma* is one such factor.

Weight stigma refers to the pervasive social devaluation and denigration of people who are perceived to carry excess weight. In Goffman’s (1963) terms, people who are overweight or obese have a “spoiled identity” that engulfs perceptions of them as a person and disqualifies them from full social acceptance. In this chapter, we present evidence that weight stigma negatively affects the health of individuals who are or who perceive themselves to be overweight, and we discuss several mechanisms through which it does so (see also Hunger, Major, Blodorn & Miller, 2015; Muennig, 2008; Puhl & Heuer, 2010; Puhl & Suh, 2015a; Tomiyama, 2014). In addition, we present evidence that stigmatization of overweight individuals creates a vicious cycle that perpetuates stigma (see also Brewis, 2015; Tomiyama, 2014).

Not all, however, share our perspective that stigmatizing individuals with excess weight has negative health effects and sets into motion processes that promote further stigma. Prominent health policy scholars have explicitly lobbied for the use of weight stigma as a health promotion tool. For example, Callahan (2013) argued for the use of “stigmatization lite” to create social pressure to take obesity seriously and to increase heavier individuals’ motivation for weight loss. As we will illustrate, however, the available evidence argues against these contentions.

In the following sections, we first briefly review evidence that weight stigma is severe, pervasive, and has negative consequences for individuals across a broad array of

life domains. We then introduce a model describing the mechanisms by which weight stigma can lead to poorer health outcomes among individuals who are or perceive themselves to be overweight. We propose that weight stigma has bidirectional effects and review research showing that perceived weight stigmatization can create a positive feedback loop in which experiencing weight stigma leads to weight gain or inhibits weight loss through increased eating and other biobehavioral mechanisms. We close by discussing the implications of research on the effects of weight stigma for the design of weight loss interventions and with recommendations for future research.

The Stigma of Overweight/Obesity

In his classic treatise on social stigma, Goffman (1963) identified three major types of stigma: *tribal stigma* (i.e., stigmas such as race or religion passed down through lineage and shared with others), *abominations of the body* (i.e., physical deformities of the body), and *blemishes of individual character* (i.e., negative character traits such as a weak will, unnatural passions, or dishonesty). In Western countries that prioritize personal responsibility, obesity is viewed as both an abomination of the body and a blemish of character (Crandall, 1994). Individuals who are overweight or obese have been shown to elicit disgust, the same emotion displayed toward people with physical deformities (Vartanian, 2010). Furthermore, overweight and obese individuals are morally discredited and negatively stereotyped as lazy, weak-willed, unsuccessful, unmotivated, sloppy, undisciplined and unconcerned with their own health (e.g., Brochu & Esses, 2011). Consistent with the idea that obesity is regarded as a moral flaw or character blemish, even when obese individuals have lost weight residual stigma persists. People judge a lean target described as having formerly been obese more

negatively than the same target described as always lean (e.g., Latner, Ebner & O'Brien, 2012).

Negative stereotypes (i.e., overgeneralized beliefs) about, prejudice (i.e., negative attitudes) toward and discrimination (i.e., unfair treatment) against people who are overweight and obese have been extensively documented and reviewed in the literature (see Puhl & Brownell, 2006; Puhl & Heuer, 2009 for reviews). These forms of bias occur among employers, coworkers, teachers, peers, and family members, and are prevalent among health care practitioners, including physicians, nurses, medical students, and psychologists (Phelan et al., 2015). A survey of over 620 primary care physicians, for example, found that a third viewed obese patients as weak-willed, sloppy and lazy, and more than half viewed them as awkward, unattractive and noncompliant (Foster et al., 2003). Even health professionals specializing in obesity show profound weight bias (Tomiyama et al., 2015). Negative bias toward overweight people has been documented in children as young as three years of age (Cramer & Steinwert, 1998). Although all individuals who are overweight or obese are subject to some devaluation, stigmatization is more severe for women, for younger individuals, and Whites than it is for men, older individuals, and non-White individuals (Meunnig, 2008; Puhl & Heuer, 2009).

Stereotypes and prejudice can differ in the extent to which individuals are able or willing to report on them. *Explicit* biases are consciously held beliefs and attitudes that individuals can deliberately (and strategically) control. In contrast, *implicit* biases are automatically activated by situational cues (e.g., the presence of an overweight person) and commonly operate outside of conscious awareness or control. Measures of explicit bias typically rely on self-report, such as the Anti-Fat Attitudes questionnaire (Crandall, 1994),

whereas implicit anti-fat bias is commonly measured using reaction-time measures like the Implicit Association Task (e.g., Nosek et al., 2007). Individuals evince strong explicit and implicit anti-fat biases (Puhl & Heuer, 2009). Moreover, discrimination can differ in the extent to which it is subtle (e.g., greater social distance in a public setting) versus blatant (e.g., calling someone a derogatory name). Unlike many forms of contemporary bias, such as that against racial minorities, bias against people who are overweight or obese is often explicit, overt, and rarely challenged. Indeed, weight stigma is often called the last “acceptable” form of bias (Brochu & Esses, 2011). As an example, one of the most popular forums on Reddit, a social networking site, is devoted to mocking and shaming fat people. When the CEO of Reddit tried in July 2015 to shut down the site (which had more than 150,000 subscribers), subscribers revolted, precipitating her resignation.

A key factor underlying the perceived social acceptability of weight bias is the widely shared belief that weight is controllable (Crandall, 1994). This belief locates the cause of obesity within individuals and holds those who are heavier responsible both for causing their stigmatizing condition as well as for solving it. Obese individuals viewed as not exerting effort to reduce their weight are more negatively stereotyped and evoke more disgust than do those who are seen as exerting effort to control their weight (Black, Sokol & Vartanian, 2014). The belief that overweight individuals are personally responsible for their condition is used to justify shaming and ridiculing them. The assumption that weight is under individual control motivates the many weight-loss programs and interventions that focus on changing individual behavior rather than altering obesogenic environments, despite the well-documented failure of the former (Mann et al., 2007). It also underlies anti-obesity campaigns that embrace weight stigma

as a public health strategy to motivate obese individuals to lose weight (Vartanian & Smyth, 2013).

Enacted Stigma (Discrimination)

Weight bias translates into negative treatment of individuals who are overweight or obese. Despite the fact that the majority of Americans are overweight or obese, rates of weight-based mistreatment are pervasive and increasing (Puhl, Andreyeva, & Brownell, 2008). *Enacted stigma* refers to behaviors or policies that emanate from bias toward stigmatized groups. Enacted stigma can include behaviors such as social exclusion, rejection, teasing, bullying, harassment, and interpersonal discrimination. It can also include institutional forms of discrimination such as policies and programs that unfairly disadvantage overweight people relative to others, such as charging overweight individuals higher healthcare premiums.

Extensive evidence indicates that children and adults who are overweight and/or obese are victims of enacted stigma across multiple life domains (see Puhl & Heuer, 2009). Overweight children and adolescents are frequent targets of bullying, social exclusion, and weight-related teasing (Puhl & Latner, 2007). Employers discriminate against overweight and obese adults at virtually every stage of the employment cycle, including selection, placement, compensation, promotion, and discharge (Roehling, Roehling, & Pichler, 2007). Individuals who are obese or overweight also face discrimination in education (Puhl & Heuer, 2009). Even family members discriminate against overweight children. Parents, for example, are less likely to pay for the college education of their daughters (but not their sons) if they are overweight (Crandall, 1995).

Perceived Stigma (Stigma Awareness)

As a result of exposure to portrayals of overweight and

obese individuals in the larger culture, negative comments made about fat people by others, and observation of discrimination against children and adults who are overweight, people who live in weight-stigmatizing cultures become well aware that being overweight is socially devalued and associated with negative stereotypes. That is, as a part of cultural socialization, people develop relatively early in life the conception that “fat is bad” (Cramer & Steinwert, 1998). This awareness that “most people” look down on people who are overweight and think poorly of people who are fat is *perceived stigma* (Link, 1982). Perceived weight stigma is widespread in the U.S. and exists among those who are overweight as well as those who are not (Puhl et al., 2008). People who are overweight typically perceive stigma against the overweight to exist long before they themselves gain excess weight.

Self-stigma (Internalized Stigma)

One of the most pernicious effects of enacted and perceived weight stigma is that it is often internalized by those who are themselves overweight, thus becoming *self-stigma*. People who are obese often endorse the same negative stereotypes of obese individuals as do those who are thinner; they also display high levels of explicit and implicit anti-fat prejudice (Brochu & Esses, 2011; Schwartz, Vartanian, Nosek & Brownell, 2006.). The more that people who are overweight endorse the belief that weight is controllable and that people are personally responsible for their weight the more anti-fat bias they display (Crandall, 1994). Internalized stigma is measured with scales such as the Weight Bias Internalization Scale (WBIS; Durso & Latner, 2008) and the Weight Self-Stigma Questionnaire (WSSQ; Lillis, Luoma, Levin, & Hayes, 2010). Scoring highly on measures of internalized weight stigma is correlated with poorer psychological well-being and disordered eating symptomology (e.g., Durso & Latner, 2008).

For example, among adults enrolled in a weight-loss intervention, greater internalized weight bias was associated with greater depression, poorer body image, and increased binge eating (Carels, Wott, Young, Gumble, Koball, & Oehlhof, 2010). Another study found that scores on an implicit measure of internalized weight bias were independently predictive of binge eating disorder over and above BMI and experiences of weight stigma (Rudolph & Hilbert, 2015). Self-stigma can also exacerbate the negative effects of social identity threat on health, a point we address below.

Social Identity Threat

Perceived weight stigma makes overweight individuals vulnerable to experiencing *weight-based social identity threat* (Major & O’Brien, 2005; Major, Eliezer & Rieck, 2012; Hunger et al., 2015). Weight-based social identity threat is a situationally-triggered psychological state in which individuals are concerned that they will be devalued, rejected, negatively stereotyped or discriminated against because of their social identity as an “overweight person.” A social identity is the portion of an individual’s self-concept derived from perceived membership in a social category or social group. When people categorize themselves as being an overweight or fat person, or believe that others categorize them as such, it becomes a social identity that is shared with others also perceived to be overweight. Importantly, people who categorize themselves as overweight may experience the negative effects of weight-based social identity threat even though they do not personally endorse negative stereotypes of people who are overweight. That is, weight-based identity threat can exist in the absence of self-stigma.

Weight-based social identity threat can be activated in situations in which discrimination is directly *experienced*, such as being told by others that one should lose weight; *suspected*,

such as wondering whether a job rejection was due to one's weight; or *anticipated*, such as when one first meets a potential dating partner. Weight-based social identity threat can also be activated by messages and behaviors that explicitly or implicitly devalue or justify devaluation of overweight people, such as "fat jokes" or media coverage about the costs to society of obesity, both of which are ubiquitous. The source of threat in these situations stems from perceived stigma -- the individual's awareness of bias against people who are overweight -- paired with awareness that he or she may be categorized as overweight. Weight-based social identity threat is thus a *psychological* threat. Weight based social identity threat induces vigilance for and concerns about rejection based on one's weight.

Importantly, people must believe they are overweight or believe others see them as overweight to experience weight-based identity threat. Even though individuals who categorize themselves as overweight may not regard their weight as a central part of their self-concept or endorse negative stereotypes about overweight people, they may still be concerned that they will be viewed through a stereotypical lens and thus devalued, mistreated, or negatively judged by others because of their weight (Steele, Spencer, & Aronson, 2002). To the extent that it is experienced repeatedly in a number of domains, weight-based social identity threat can become a chronic concern that shapes individuals' reactions across a variety of domains. People who chronically expect and are concerned about being rejected because of their weight, i.e., are weight-based rejection sensitive (Brenchley & Quinn, 2016), report higher psychological distress (e.g., anxiety), as well as greater bulimic tendencies, lower health-related quality of life, and greater symptoms of physical illness over time. Furthermore, both acute and chronic weight-based identity

threat can have a negative effect on health independent of enacted weight stigma. The fear of being treated negatively because of one's weight shapes how people perceive, feel about, and interact with their social world (Crocker, Major, & Steele, 1998; Puhl, Moss-Racusin, Schwartz, & Brownell, 2008). These perceptions, feelings, and behaviors can exert effects on health even in the absence of directly experienced discrimination or enacted stigma.

Notably, individuals who are objectively overweight or obese but who do *not* categorize themselves as such are unlikely to experience weight-based social identity threat. Nonetheless, they may still be vulnerable to the pernicious effects of enacted stigma. That is, because weight is a visible stigma, heavier weight individuals may be devalued, excluded, or discriminated against by others because of their weight. These forms of enacted weight stigma can have negative effects on health by diminishing people's access to social and material resources that foster health, even in the absence of targets' realization that weight was the cause.

Pathways from Weight Stigma to Poorer Health

A large body of research has demonstrated that enacted stigma and social identity threat based on race, ethnicity, gender, and sexual orientation can affect pathophysiological processes that put people at risk for poor mental and physical health. For example, prospective, longitudinal studies demonstrate that experiencing discrimination on the basis of race, ethnicity, gender or sexual orientation is associated with increased risk for depression, anxiety, high blood pressure, and mortality, among other negative health outcomes (see Major, Mendes, & Dovidio, 2013; Pascoe & Smart Richman, 2009; Williams & Mohammed, 2009 for reviews).

Accumulating evidence indicates that experiencing weight bias has similar detrimental effects on health (Puhl &

Heuer, 2009; Puhl & Suh, 2015a). A cross-sectional survey of 192 community-dwelling adults recruited on the internet-based site Mechanical Turk found that the more individuals reported experiencing weight-based discrimination and the more they reported they were concerned about being stigmatized because of their weight, the poorer their self-reported physical health (Hunger & Major, 2015). Furthermore, consistent with the idea that stigma processes may explain the negative health implications of a higher body weight, perceived discrimination and weight stigma concerns fully accounted for the negative relationship between body mass index (BMI) and self-reported health in this study. A 10-year longitudinal study of 1,856 adults based on the Midlife in the United States Study (MIDUS) data set demonstrated that the negative effects of obesity on decline in functional mobility over time were significantly more severe for obese individuals who reported experiencing weight-based discrimination (Schafer & Ferraro, 2011). Experiences of weight discrimination are also positively related to systemic inflammation, a known risk factor for obesity-associated conditions such as cardiovascular disease and diabetes (Sutin, Stephan, Suchetti, & Terreciano, 2014). Waist circumference more strongly predicts poor blood sugar control among individuals who had experienced weight-based discrimination (Tsenkova, Carr, Schoeller, & Ryff, 2010).

Evidence of the negative health implications of perceived weight-based discrimination comes from a study examining the association between weight discrimination and mortality. Using data from the Health and Retirement Study (N=13,692) and the MIDUS Study (N=5,079), Sutin, Stephan and Terracciano (2015) found that in both samples men and women who had experienced weight-based discrimination had a nearly 60% increased mortality risk. This increased risk of mortality was not accounted for by common physical and

psychological risk factors, including BMI, depressive symptoms, self-reported health, smoking, and physical activity level. These findings suggest that experiencing weight discrimination not only contributes to poorer physical health outcomes, but also can shorten life expectancy.

In Figure 1 we present a model illustrating several pathways by which weight stigma can undermine mental and physical health. This model starts with the existence of societal weight stigma. The left side of the model illustrates that enacted weight stigma (discrimination) can directly impair the health of heavier individuals by changing the social and material aspects of their lives in ways that are detrimental to health. These pathways are numbered in the figure and include: (1) fostering social isolation, (2) compromising quality of health care, (3) decreasing socio-economic status (SES) by limiting opportunities and access to status and material realities that promote better health (e.g., adequate nutrition, safe environments and good health care), and (4) increasing stress and negative emotions. The right side of the model illustrates that even in the absence of enacted weight stigma, perceived stigma can lead to social identity threat (5), which in turn can indirectly impair health. Mechanisms by which social identity threat can impair health are also labeled in the figure and include: (6) increasing stress and negative emotions, which in turn lead to (7) increased physiological reactivity (e.g., elevated cortisol, cardiac reactivity); (8) impaired self-regulation and increased comfort eating to relieve stress, both of which can lead to increased calorie intake; and (9) increased engagement in stigma-avoidance behaviors that have negative health implications (e.g., avoiding exercising in public, visiting the doctor, social withdrawal). Furthermore, the model proposes that self-stigma can increase stress and negative emotions (10) and exacerbate the negative effects of social

identity threat on health (11). Figure 1 additionally illustrates that many of the mechanisms are bi-directional in that they can also contribute to weight gain and/or inhibit weight loss. Thus ironically, experiencing weight stigma can perpetuate the source of stigmatization – both that enacted by others (12) and social identity threat (13). In the following sections, we provide evidence consistent with each pathway in the model.

Enacted Weight Stigma and Health

As noted above, overweight and obese children, adolescents, and adults are vulnerable to experiencing various forms of enacted stigma, including interpersonal and institutional discrimination, bullying, social rejection, and harassment across a range of life domains (see Puhl & Heuer, 2009; Puhl & Latner, 2007 for reviews). Discrimination against overweight and obese individuals can have a direct detrimental effect on health through several pathways.

Social Isolation. Enacted stigma and discrimination against stigmatized individuals can negatively affect health by impairing both the quality and quantity of their social relationships (Link et al., 1989; Figure path 1). Social isolation and ostracism by others appear to have universally aversive and deleterious effects (Williams, 2007). Social relationships are a strong predictor of health (see Cohen, 2004 for a review). Individuals with strong social relationships have fewer physical health problems (Umberson & Montez, 2010) and live longer (Holt-Lunstad, Smith, & Layton, 2010) than poorly connected individuals. For example, people who are more socially integrated and who report higher levels of social support are less likely to have heart attacks, develop upper respiratory illness when exposed to the common cold, and are more likely to survive breast cancer. Social relationships exert both a “main effect” on health, and a “stress-buffering” effect, providing resources (informational, emotional, or tangible) that promote

adaptive behavioral or neuroendocrine responses to acute or chronic stressors (Cohen, 2004; see “Stress” section below). Social rejection and isolation can be considered major life stressors that produce negative affect, negative reactivity, and lowered feelings of self-worth, which in turn promote chronic elevations in stress responses (Hawkley & Cacioppo, 2010).

There is substantial evidence that children, adolescents, and adults avoid, exclude, and reject people who are overweight or obese, and do so irrespective of their own weight (Puhl & Heuer, 2009; Puhl & Latner, 2007). The desire by others to avoid the taint of “stigma by association” (i.e., a tendency for people who associate with stigmatized individuals to be negatively evaluated) may contribute to the social avoidance of overweight individuals (e.g., Hebl & Mannix, 2003). This avoidance can to greater social isolation and loneliness among overweight persons (Lewis et al., 2011). Overweight children experience bullying, ostracism, and mistreatment by their peers, all of which may undermine social relationships and constrict social networks (see Puhl & Heuer, 2009; Puhl & Latner, 2007 for reviews). Using a social network analysis approach, Strauss and Pollack (2003) found that overweight children were more likely to receive no friendship nominations, received fewer total friendship nominations, and were more peripheral in their social network compared to “average” weight children. Another study found that obese adolescents were less likely to spend time with friends than were thinner peers (Falkner et al., 2001). In fact, across four countries, weight was by far the most commonly reported reason for youth bullying (Puhl & Suh, 2015a). A longitudinal study of the friendship nominations of 20,502 adolescents and young adults over an 8-year period indicated that obesity causes social marginalization and not vice versa (Apolloni, Marathe, & Pan, 2011). Enacted weight stigma

appears to have an especially negative impact on the social relationships of obese women. Obese women are consistently evaluated more negatively as dating partners than thinner women. Adolescent girls and women who are overweight report having fewer close friends, dating less, and being more dissatisfied with their dating status and relationships than thinner women and girls (Puhl & Latner, 2007; but see Carr & Friedman, 2006).

Poorer Healthcare. Enacted weight stigma and discrimination can also directly undermine health by compromising the quality of healthcare they receive from practitioners (see Phelan et al. 2015; Puhl & Heuer, 2009 for reviews; Figure path 2). Audio-recordings of primary care physicians' interactions with their patients, for example, revealed that physicians displayed less warmth and emotional rapport when interacting with higher body weight patients (Gudzune, Beach, Roter & Cooper, 2013). Primary care providers randomly assigned to evaluate the records of a patient portrayed as obese were more likely to rate the encounter as a waste of time and indicate that they would spend less time with the patient compared to providers who evaluated the same patient portrayed as thinner (Hebl & Xu, 2001). Medical students randomly assigned to interact with a virtual patient who was visibly obese directed less visual contact toward the patient compared to students assigned to interact with the same patient who was not obese (Persky & Eccleston, 2011). These studies suggest that enacted weight stigma can reduce the quality of care that overweight and obese individuals receive.

Lower Socio-Economic Status. Enacted stigma and discrimination against people who are stigmatized can also negatively affect their health by lowering their socio-economic status (SES; e.g., Link, 1982; Figure path 3). Whether assessed

by actual (e.g., income, education, occupation), or perceived social position, lower SES is associated with poorer health, and this is true across the SES gradient (see Adler & Snibbe, 2003 for a review). Poor people have higher rates of morbidity and mortality than middle-income people, who in turn have higher rates than wealthy people. People who have not completed high school have worse health than college graduates, who in turn have worse health than those with graduate degrees. Higher SES is associated with access to resources such as greater knowledge and better housing, nutrition, and health care, all of which have implications for health.

Discrimination against overweight people negatively affects all objective indicators of SES. On the educational front, heavier young women are less likely to enter college or obtain a college degree (for a review, see Cohen, Rai, Rehkopf, & Abrams, 2013). They are also less likely to receive offers to attend graduate school after an in-person interview than those who are average weight, despite similar or better credentials (Burmeister, Kiefner, Carels, & Musher-Eizenman, 2013). With respect to occupation, overweight and obese people are discriminated against in all aspects of the employment process (Roehling et al., 2007) and receive fewer training, work, and career opportunities than their non-obese peers (Puhl & Heuer, 2009).

Weight bias also negatively affects income. A number of studies have shown that people who are obese (especially women) experience a wage penalty; they are paid less than their non-obese peers even once socio-economic factors, familial variables, health limitations, and job performance are controlled (Puhl & Heuer, 2009). A study using the National Longitudinal Survey of Youth data (N = 25,843) for example, found that among White women, an increase of 64 pounds above average weight was associated with a 9% decrease in

wages (Baum & Ford, 2004). Notably, many studies show that the employment, educational, and income costs of weight stigma are borne primarily by overweight girls and women, not boys and men.

In short, enacted weight stigma can lead to a spiral of downward social mobility for obese and overweight individuals, resulting in lower SES than they might have otherwise had (Brewis, 2011). Individuals with lower SES, in turn, are exposed to more minor and major stressors than individuals with higher SES and are more psychologically reactive to stress, both of which can increase their vulnerability to disease (Adler & Snibbe, 2003). Thus weight stigma contributes to lower SES among overweight and obese individuals, and lower SES, in turn, contributes to impaired health. Importantly, lower income also restricts people's access to healthy food and safe and affordable exercise options, which in turn can increase their likelihood of weight gain and thus increase their vulnerability to further stigmatization on the basis of weight (Carroll-Scott et al., 2013). This bi-directional path is illustrated in the Figure (path 12).

Stress and Negative Emotion. Many models of the discrimination-health linkage posit that increased stress exposure is a central pathway by which discrimination affects physical health (Figure path 4). Experiencing enacted stigma (e.g., discrimination, harassment, teasing, bullying) can elicit negative emotions and psychological stress that trigger biological responses that can damage over time (Figure path 7). Allostatic load refers to this cumulative wear and tear on the body caused by repeated adaptations to stressors (McEwen, 1998). Allostatic load is thought to be the underlying biological pathway leading from stress to multiple health outcomes often linked to obesity, including cardiovascular disease, diabetes, strokes, ulcers, decreased immune functioning, and cancers

(McEwen, 1998). Over time, greater exposure to weight-stigma related stress can diminish an individual's capacity for responding to environmental challenges and make them more vulnerable to disease (Gallo & Matthews, 2003).

The proposition that weight stigma-related stress contributes to allostatic load is consistent with evidence that diseases associated with obesity (e.g., hypertension, heart disease) are stress-related diseases as well as with evidence that weight-related diseases are most prevalent among groups most stigmatized for being overweight (i.e., younger individuals, Whites, and women; Muennig, 2008). Overweight individuals reporting weight-based discrimination are three times more likely to be in the highest quartile of perceived stress compared to individuals not reporting discrimination, above and beyond BMI and demographic variables (Hatzenbuehler et al., 2009). These findings converge with research using the Midlife in the United States (MIDUS) dataset, which has shown that the heightened psychological distress and stress often associated with excess weight is driven by perceptions of weight-based mistreatment (Carr & Friedman, 2005).

In sum, enacted forms of weight stigma, such as discrimination, social avoidance, harassment, and exclusion can directly affect the health of overweight and obese individuals by increasing social isolation, compromising health care, decreasing access to status and material resources associated with higher SES, and increasing stress exposure, all of which are associated with poorer health. Notably, these forms of enacted stigma can compromise the health of individuals who are objectively overweight or obese but who do not perceive themselves as such. Furthermore, they can have negative effects on health even in the absence of their targets' awareness that weight was an issue or that they were targets of discrimination.

Weight-based Social Identity Threat and Health

As noted above, perceived weight stigma (stigma awareness) is widespread. Heavy as well as thin individuals are keenly aware that being overweight is culturally devalued and of the pervasive negative stereotypes that accompany this stigmatized social identity (Puhl et al., 2008). For individuals who categorize themselves as overweight (or who believe others do), perceived stigma increases vulnerability to experiencing weight based social identity threat (Figure path 5). Weight based social identity threat, in turn, can negatively affect health independent of objective experiences of discrimination. We propose that it does so primarily by elevating negative emotions and stress (Figure path 6), which in turn leads to: increased physiological reactivity (Figure path 7), increased calorie consumption due to impaired self-regulation and comfort eating to relieve stress (Figure path 8), stigma-avoidance behaviors that have negative health consequences (Figure path 9). Each of these processes not only has negative implications for health, but also can exacerbate weight stigma by leading to further weight gain. This bi-directional path is illustrated in Figure 1, path 13.

Stress and Negative Emotions. Weight-based social identity threat is psychologically distressing (Figure path 6). Schvey, Puhl, and Brownell (2014) found that women who watched a weight-stigmatizing versus neutral video exhibited stronger negative emotions (e.g., anxiety). Other studies have shown similar increases in negative emotions following exposure to situations that arouse concerns about weight stigmatization (Blodorn, Major, Hunger, & Miller, 2016a; Major et al., 2012). Using nationally representative data from 22,231 individuals with an overweight or obese BMI, Hatzenbuehler, Keyes, and Hasin (2009) found that individuals who perceived any weight discrimination during the previous

12 months were 2.48 times more likely to have a mood disorder (e.g., depression) and 2.62 times more likely to have an anxiety disorder (e.g., social phobia). Importantly, these effects held when controlling for BMI, suggesting that the social aspects of weight drive these effects. The emotional consequences of weight-based social identity threat have important implications for physical health. Indeed, negative emotions can trigger inflammatory processes that are implicated in a host of other obesity-associated diseases such as cardiovascular disease and Type 2 diabetes (Slavich, 2015).

Shame as a specific emotion may be particularly important, given that higher body weight individuals often report high levels of shame (Conradt et al., 2007). Dickerson, Gruenewald, and Kemeny (2004) highlight the role of shame as a fundamental emotional response to socially threatening stressors that has particular health relevance. Compared to other negative emotions, shame more effectively engages the HPA stress axis (see below) and reliably results in increases in cortisol secretion (Dickerson et al., 2004). Shame also elicits inflammation in experimental settings (Dickerson, Kemeny, Aziz, Kim, & Fahey, 2004).

Experiencing weight-based social identity threat is also stressful (Hunger et al., 2015). For example, when asked to give a speech on camera about their positive dating qualities, a domain in which overweight women are harshly stigmatized, higher BMI women reported greater stress-relevant emotions than their lower BMI counterparts (Major, Eliezer, & Rieck, 2012). The psychological stress associated with social identity threat is driven by concern for and expectation of weight-based rejection. Blodorn et al. (2016a) had participants give a dating speech while their weight was visible or not to a potential dating partner ostensibly evaluating the speech. Compared to when weight was unseen, when weight was seen, higher body

weight women expressed greater expectations of rejection, and this in turn was associated with greater psychological stress. Women who are chronically concerned about weight stigma also evince greater perceived stress (Tomiya et al., 2014).

Physiological Stress Reactivity. Experiencing weight-based social identity threat and the negative emotions and psychological stress it elicits can trigger biological responses that over time can damage systems than regulate the body's stress response (Figure path 7). Major et al. (2012) found that overweight women asked to speak about their dating qualities while being videotaped evidenced greater increases in blood pressure than overweight women delivering a similar audiotaped speech and thinner women in either condition. Blodorn, Major, Hunger and Miller (2016b) demonstrated similar effects among women anticipating a non-dating interaction with a same-gender peer who expressed weight bias, and showed that concerns about social rejection mediated this increase in blood pressure. Cardiovascular reactivity to stress – such as increases in heart rate and blood pressure – can contribute to the development of cardiovascular disease when experienced chronically (Chida & Steptoe, 2010). Moreover, exaggerated cardiovascular reactivity in response to psychological stress predicts cardiovascular mortality (Carroll et al., 2012). Chronic exposure to stress stemming from weight-based identity threat can increase allostatic load, diminish an individual's capacity for responding to environmental challenges and increase vulnerability to disease (Gallo & Matthews, 2003).

Weight-based social identity threat also increases hypothalamic-pituitary-adrenal (HPA) axis activation, one of the body's stress-responsive systems whose primary output is the hormone cortisol (Dickerson & Kemeny, 2004). Tomiyama and colleagues (2014) found a correlation between the

frequency of experiencing weight-stigma and both morning serum cortisol levels and the cortisol awakening response. Furthermore, they found that weight-stigma consciousness (chronic concerns about weight stigma) was also positively associated with the cortisol awakening response, and that perceived stress mediated this relationship. These findings were paralleled in an experiment by Himmelstein, Incollingo Belsky, and Tomiyama (2015) which showed that self-perceived overweight women who were rejected from participating in a shopping task based on their weight exhibited elevated cortisol levels compared to self-perceived overweight women not exposed to such rejection and women who did not perceive themselves as overweight. Schvey, Puhl, and Brownell (2014) found that women who merely watched a weight-stigmatizing video exhibited elevated cortisol levels compared to those who watched a neutral video. Interestingly, this effect emerged regardless of participants' weight. Their manipulation involved extended exposure to a weight-stigmatizing video and thus may have led thinner women to worry about the *possibility* of being stigmatized if they gained weight, thus initiating similar emotional and psychobiological processes. Weight-based social identity threat can also affect more basic biological processes related to physical health. For example, Tomiyama and colleagues (2014) found an association between weight-stigma consciousness and oxidative stress, a pathogenic cellular aging process that contributes to the development of obesity-related diseases such as hypertension and insulin resistance (Basu, 2008).

Increased Calorie Intake. Social identity threat can also lead to increased calorie intake (and hence weight gain) through two interrelated processes (Figure path 8). First, there is considerable evidence that coping with social identity threat is effortful and may impair subsequent self-regulation

(Schmader, Johns, & Forbes, 2008; Major et al., 2012). Specifically, social identity threat increases vigilance for cues to belongingness and threat, leads individuals to (automatically) suppress negative stereotypes and emotions that are elicited, and may lead individuals to engage in behavioral compensation in social interactions (Schmader et al., 2008). Vigilance, suppression, and compensation responses rely on (and tax) executive resources vital for successful self-regulation, such as avoiding eating when one is trying to control one's diet.

Indeed, several experimental manipulations of weight based social identity threat have been shown to increase calorie consumption (Major et al., 2014; Schvey, Puhl, & Brownell, 2011).

In one study, for example, women randomly assigned to read and give a speech on an ostensible article titled, "Lose Weight or Lose Your Job," ate more snack foods (e.g., M&Ms) than those assigned to read one titled, "Quit Smoking or Lose Your Job" (Major et al., 2014). Moreover, women exposed to the weight-stigmatizing article showed less self-efficacy for subsequent dietary control. Importantly, this effect emerged *only* for those who perceived themselves as overweight (Major et al., 2014). In another experimental study, women categorized as normal BMI and overweight BMI watched either a weight-stigmatizing or neutral series of video clips. Those in the weight stigma condition consumed more snack foods than the neutral condition (Schvey et al., 2011). Although this effect emerged in both overweight and average BMI women, the magnitude of the effect was much larger in the overweight participants (on average 214 versus 26 calorie difference between stigma conditions). A third set of experiments (Brochu & Dovidio, 2014) showed that reading an article designed to increase weight-based social identity threat

(vs. a control article) significantly increased the number of calories overweight women and men ordered on a menu selection task but did not influence those not overweight. Providing menus with calorie information eliminated this effect, suggesting that menu labeling may help to increase self-regulation.

Second, the psychological experience of stress induced by weight-based identity threat can stimulate a drive for unhealthy foods (Adam & Epel, 2007) – a behavior colloquially known as "comfort eating." There appears to be a physiological drive toward high-sugar, high-fat, and high-calorie food in particular in times of stress (Adam & Epel, 2007), because these types of food actually serve to dampen down physiological stress responses such as those of the HPA axis. Many types of stressors can trigger increased eating, such as laboratory-induced acute psychological stressors, naturally-occurring stressful events, and daily hassles (see Tomiyama, Finch, & Cummings, 2015). Weight-based social identity threat is a stressor that has been shown to affect an individual in all of these contexts (Himmelstein et al., 2015; Vartanian, Pinkus, & Smyth, 2014), and therefore comfort eating represents a plausible pathway through which weight stigma begets weight gain. Importantly, the stress-responsive hormone cortisol itself can also stimulate a drive toward high fat and high sugar foods (Adam & Epel, 2007).

Relatedly, weight based social identity threat also contributes to binge eating, which can have negative health effects. In treatment seeking and community adult populations (e.g., Durso, Latner, & Hayashi, 2012; Wott & Carels, 2010) as well as adolescent populations (e.g., Neumark-Sztainer et al., 2002), experiences with weight stigma predict increased binge eating behaviors. Importantly, experiences with weight stigma emerge as a significant contributor to bingeing behavior above

and beyond well-established risk factors such as depression and (low) social support (Almeida, Savoy, & Boxer, 2011).

Stigma Avoidance. In an effort to avoid stress and distressing emotions, weight-based social identity threat may lead individuals to avoid situations (Figure path 9) in which they have experienced or anticipate they will encounter stigma. Two domains in which weight is highly stigmatized, however, are also vital for promoting physical health – medicine and fitness. Experiences with weight-based discrimination are associated with greater motivation to avoid exercising in public (Vartanian & Shaprow, 2008). A qualitative study of the experiences of obese adults found that 46% stated that they were unwilling to participate in exercise because they expected that people would “laugh at,” “ridicule,” “stare at,” or “abuse” them (Lewis et al., 2011). Seacat and Mickelson (2009) found that priming overweight women with weight-related stereotypes led to diminished dietary health and exercise intentions.

Social identity threat can also lead heavier individuals to underutilize or avoid health care. Overweight and obese individuals frequently cite health care professionals as a source of weight stigma (Puhl & Brownell, 2006) and report feeling disrespected, criticized, and blamed by physicians for their health problems (Anderson & Wadden, 2004; but see Chang, Asch, & Werner, 2010). As a result, heavier individuals may be less likely to engage in age-appropriate preventative care compared to their thinner peers (e.g., cancer screening; Amy, Aalborg, Lyons, & Keranen, 2006) putting them at additional risk for poor health.

Anticipating weight-based mistreatment may also lead to social withdrawal in an effort to avoid further stigmatization, leading to social isolation. Experimental evidence shows that weight-based social identity threat leads to expectations of

rejection. Heavier women (but not men) who had to deliver a speech about why they would make a good dating partner reported greater expectations of social rejection than did thinner women, but only when they believed that potential evaluators would see them (Blodorn et al., 2016a). A second study showed that overweight women who anticipated interacting with a same-sex peer reported greater expectations of rejection if the peer had expressed anti-fat bias vs. no bias (Blodorn et al., 2016b). Coping with weight-based rejection concerns may lead overweight and obese individuals to avoid forming new social bonds, limiting the quality of their social network (but see Carr & Friedman, 2006). Although this may serve a psychological benefit, insofar as it reduces exposure to enacted stigma, social withdrawal can exert a physical toll. As discussed above, strong social relationships are paramount for protecting and promoting physical health. Thus, independent of enacted stigma, anticipating stigma can lead to social isolation and decrements in health.

The Role of Self-Stigma. As shown in the Figure, we propose that internalized weight bias can increase negative emotions and stress (path 10) and exacerbate the negative effects of weight-based social identity threat (path 11). Although evidence is sparse, several findings are consistent with these predictions. For example, one study found that the relationship between experiences with weight-based discrimination and a reduced desire to avoid exercising in public was particularly pronounced among individuals who internalized weight bias (Vartanian & Novak, 2011). Another study found that among a community sample, individuals with higher internalized weight bias were more likely to report binge eating in response to weight-based discrimination (Durso et al., 2012). A third demonstrated that overweight and obese participants who believed that weight-based stereotypes were

true reported more frequent binge eating and refusal to diet in response to stigma experiences compared with those who reported stereotypes to be false (Puhl, Ross-Macusan & Schwartz, 2012). Internalized weight bias can also interfere with the effectiveness of health interventions. Indeed, among higher BMI women, weight bias internalization moderated the effectiveness of a healthy living program, such that individuals with higher internalized bias failed to improve their eating patterns over time (Mensing, Calogero, & Tylka, 2016). Further research is clearly needed to understand why self-stigma might modulate responses to weight-based social identity threat. Internalized stigma may shape the attributions made for weight-based mistreatment or it may increase the degree to which individuals actually see weight-based discriminatory treatment as justified and fair.

Bi-directional effects of Weight Stigma:

Effects on Weight Gain, Obesity and Weight Loss

Several theoretical models describe the bi-directional effects of weight stigma (Figure paths 12 and 13), capturing the idea that the processes elicited by weight stigma themselves contribute to weight gain, which may, in turn, feedback to create more vulnerability to weight stigma (Brewis, 2014; Puhl & Suh, 2015a; Hunger et al., 2015). For example, the Cyclic Obesity/Weight-based Stigma model (COBWEBS; Tomiyama, 2014) highlights the role of stress pathways in triggering the bi-directional effect of weight stigma. As described above, enacted weight stigma and weight-based social identity threat are experienced as stressful, which in turn causes increases in cortisol, a hormone that triggers fat deposition and stimulates appetite and comfort eating. Weight gain results over time, putting individuals at ever more risk for experiencing weight stigma – a vicious cycle.

Brewis (2014) posits a broader sociological bi-directional model that includes pathways discussed above such as behavioral pathways of comfort eating, unhealthy weight control behaviors, and healthcare avoidance; physiological pathways, namely activation of the HPA axis; and structural effects of discrimination such as low SES. To these, Brewis adds two additional pathways. The first is a social network pathway, building on the finding that BMI and obesity tend to spread through social networks (Christakis & Fowler, 2007; but see VanderWeele, 2011 for a critique), potentially due to the “contagion” of social norms surrounding eating and exercise (Hruschka, Brewis, Wutich, & Morin, 2011; Pachucki, Jacques, & Christakis, 2011). The second is an intergenerational pathway, wherein the stress of weight stigma is transmitted to offspring via maternal hormones interacting with the placenta (Entringer, Kumsta, Hellhammer, Wadhwa, & Wüst, 2009) or via epigenetic effects (McEwen, 2008).

In a systematic review, Puhl and Suh (2015a) also noted the bi-directional consequences of weight stigma, identifying the major pathways described above of increased eating (including binge eating), physiological stress responses, and decreased physical activity. They also concluded that obesity-related media campaigns that contain stigmatizing messages do not increase motivation for healthy behaviors, but may decrease self-efficacy for behavior change and thus interfere with weight loss (see also below).

What is the evidence that weight stigma leads to weight gain? Studies in this area generally use large, population-based studies, and find supportive evidence in both adult and child/adolescent samples. In the nationally representative Health and Retirement Study, Sutin and Terraciano (2013) found that non-obese adults who reported experiencing discrimination on the basis of their weight were 2.54 times

more likely to become obese four years later. Those who were obese at baseline were 3.20 more times likely to remain obese. Similarly, participants in the English Longitudinal Study of Ageing who reported weight discrimination were 6.67 times more likely to become obese four years later, although in this study weight discrimination did not change the odds of remaining obese (Jackson, Beeken & Wardle, 2014).

In 2,516 adolescent boys and girls sampled from Minnesota metropolitan schools in the Project EAT study, those who experienced weight-teasing by family members and peers were 2.00 and 1.55 times more likely, respectively, to have an overweight BMI five years later (Haines, Neumark-Sztainer, Eisenberg, & Hannan, 2006). In the 10-year follow-up of Project EAT (N = 2,134), weight-related teasing remained a significant predictor of overweight status, with females 2.43 times and males 1.67 times more likely to be overweight if they had experienced teasing (Quick, Wall, Larson, Haines, & Neumark-Sztainer, 2013). Similarly, in the Growing Up Today Study (GUTS) of 10,054 adolescents throughout the US, those who experienced weight-related teasing were 1.64 times more likely to become overweight or obese one to three years later (Haines, Kleinman Rifas-Shiman, Field, & Austin, 2010). Finally, in the NHLBI Growth and Health study of 2062 Black and White girls from three US sites, those were called “too fat” by friends or family at age 10 were 1.62 and 1.40 times more likely, respectively, to have an obese BMI at age 19, regardless of their race (Hunger & Tomiyama, 2014). In sum, a number of studies suggest that experiencing weight-stigma may lead to weight gain.

A competing hypothesis, however, is that experiencing weight stigma and its accompanying social identity threat may increase the motivation to escape the stigma via weight loss attempts, and hence lead to weight loss rather than weight gain.

One study showed that in the context of formal weight loss treatment, a greater history of weight stigma was associated with greater weight loss (Latner, Wilson, Jackson, & Stunkard, 2009; but see Wott & Carels, 2010). This study had a unique sample, however, in that participants were required to attend weekly meetings and were dropped from the treatment program if they did not lose a pre-determined amount of weight each month. Most evidence suggests that although temporary weight loss may be achieved, long-term maintenance of weight loss is unlikely (Mann et al., 2007; Tomiyama, Ahlstrom, & Mann, 2013). Moreover, heavy individuals are more likely to engage in unhealthy or disordered behaviors in an attempt to shed their stigma. Among teenagers, weight-related teasing is associated with disordered eating behaviors such as skipping meals or taking diet pills (Neumark-Sztainer et al., 2002). Weight teasing also predicts increased unhealthy weight control behaviors and dieting among girls (Haines et al., 2006).

Implications of Weight Stigma for Public Health Interventions to Reduce Obesity

The apparent success of stigma in anti-smoking efforts (Stuber, Galea & Link, 2008) has led some to call for a similar approach to public health campaigns aimed at reducing obesity. The Strong4Life anti-obesity campaign exemplifies such an approach. Strong4Life is a wellness campaign from Children’s Healthcare of Atlanta geared toward reducing the incidence of childhood obesity and obesity-related diseases. One particularly sensational Strong4Life public service announcement opens with a heavyset man on a gurney and then proceeds to “rewind” through a lifetime of sedentary behavior and unhealthy eating that lead him to this point. Such campaigns rely on stereotypical portrayals of the obese (e.g., lacking self-control) and distill the etiology of obesity down to individual choices, fostering simplistic ideas about weight and

exacerbating the blame directed at heavy individuals (Saguy, Frederick, & Gruys, 2014). The use of stigma as a public health tool hinges on the assumption that stigmatizing and shaming excess weight will in fact motivate healthier behavior among overweight individuals and thus is acceptable because it is “for their own good.” However, little evidence exists to indicate that stigmatizing experiences will lead to weight loss among overweight individuals (Vartanian & Smyth, 2013; but see Latner et al., 2009). Rather, as we have highlighted throughout this chapter, the stigma associated with weight operates at multiple levels and through multiple pathways to compromise the health and wellbeing of heavy individuals.

The weight-focused approach to health promotion has not only proven ineffective but has likely caused more harm than good by fostering poor body image, increasing eating pathology, and perpetuating the stigma associated with obesity (Hunger & Tomiyama, 2015). In light of this, we assert that efforts at public health promotion should eschew the dominant focus on weight and instead adopt a weight-neutral approach. The Health At Every Size (HAES) approach has shown particular promise for improving both health behaviors as well as physiological indicators of health (for a review, see Bacon & Aphramor, 2011). In one study of women with obesity, a HAES intervention that emphasized size acceptance and intuitive eating (i.e., eating in response to internal bodily cues) was tested against a traditional diet program. Compared to their baseline levels, the HAES participants had lower total cholesterol, reported fewer restrained eating behaviors, and had lower drive for thinness, body dissatisfaction and depression at the two-year follow-up. Importantly, these effects emerged even though participants showed no changes in weight. In contrast, the diet group participants not only failed to lose a significant amount of weight but also failed to improve on the

aforementioned measures (Bacon, Stern, Van Loan, & Keim, 2005). This study highlights the promise of adopting a weight neutral approach: individuals with obesity can see improvements on a host of physiological, behavioral, and psychological markers of health and wellbeing irrespective of weight loss.

Needed Research/Emerging Trends

A review by Puhl and Suh (2015a) identified key research questions ripe for future study (see Table 1 of Puhl & Suh, 2015a). Below, we expand on some of their recommendations and advance additional areas that we believe will move the field of weight stigma research forward.

Moderators of the Effects of Enacted Stigma and Social Identity Threat on Health

Our discussion has focused on weight stigma as a general phenomenon experienced by individuals who are or who perceive themselves to be overweight or obese and who live in cultures that disparage those who do not meet a thinner ideal. Relatively little research has investigated factors that moderate the perception of weight stigma or its impact on health. Researchers have statistically controlled for demographic factors such as BMI, age, and ethnicity rather than test for interactions. Research is needed to determine whether some people are more vulnerable than others to the effects of experienced weight-based discrimination and identity threat. Our model proposes that self-stigma is one potentially important moderator of the effects of weight stigma identity threat on health. Research demonstrating this, however, is as yet scarce. Prospective, longitudinal research examining whether people who internalize anti-fat bias, either implicitly or explicitly, show more severe health-related effects of weight stigma are needed. Several additional variables that may be important moderators of the health effects of experienced

weight stigma are sex, age of onset of obesity, and race/ethnicity.

Sex. As noted above, evidence suggest that weight stigmatization is more severe for women and girls than it is for men and boys (Puhl et al., 2008; Puhl & Heuer, 2009; Puhl & Latner, 2007 for reviews) and that overweight women, more so than overweight men, also are vulnerable to experiencing weight-based identity threat (Blodorn et al., 2016a). Muennig (2008) argues that the health effects of weight stigma are more pronounced for heavy women than heavy men because the former experience more weight-based mistreatment and also suffer from excess morbidity and mortality. Other research suggests, however, that once weight-based identity threat and/or discrimination is experienced, the effects on health appear to be similar for men and women. For example, Sutin et al. (2015) found that sex did not moderate the effects of perceived weight discrimination on mortality. More research is needed to determine when women are more vulnerable than men to weight stigma and why.

Age of Onset of Stigma. Some authors suggest that children may be especially vulnerable to weight stigmatization and its health effects (Puhl & Latner, 2007). However, it is unknown whether the effects of weight stigma on physical health are moderated by the age of onset of obesity and associated weight stigmatization. Several studies suggest that the negative impact of obesity stigma on the self-concept may be more severe for people who become obese in childhood or adolescence. For example, a longitudinal study of 2,206 girls based on data from the NHLBI Growth and Health Study found that White girls who were obese as children (9 to 10 years old) but who had shed the stigma of obesity and were in the normal weight range 10 years later, nonetheless had levels of self-esteem lower than girls who were always in the normal weight

range and comparable to the low self-esteem of chronically obese girls (Mustillo, Hendrix & Schafer, 2012). Using data from the MIDUS study, Carr and Friedman (2005) found that obesity predicted poorer perceived emotional support from family members only among obese adults who also had been overweight as adolescents. Research on weight stigma would benefit from prospective, longitudinal research examining the whether the physical health effects of weight stigma are moderated by age of onset of obesity.

Intersections with Race/Ethnicity. Further attention to how race/ethnicity moderates the impact of weight stigma on health is also needed. Given the high prevalence of overweight and obesity in the US, a large number of individuals hold multiple disadvantaged statuses (Puhl et al., 2008). Particularly at the intersection of race/ethnicity and weight, two competing hypotheses can be advanced. The first is a double jeopardy or disadvantage hypothesis (Grollman, 2014), wherein individuals who hold multiple disadvantaged social identities experience cumulative health burdens, thus having worse health than those holding a single disadvantaged identity. Indeed, multiply disadvantaged individuals in the MIDUS study had worse self-reported health and greater functional limitations than those with no or single disadvantaged statuses (Grollman, 2014). Although this analysis examined racial, gender, sexual orientation, and obesity status, it did not separately examine the specific combination of obesity and race. This is important because a competing hypothesis to the double jeopardy/disadvantage hypothesis is that racial/ethnic minority status (specifically Black or Latino/a) would confer protection against weight stigma. For example, African-American women have larger body size ideals and are less likely to stigmatize obesity than White women (Gluck & Geliebter, 2002; Hebl, King & Perkins, 2009) and Black and Hispanic individuals are

less likely to (correctly or incorrectly) perceive themselves as overweight (Paeratakul, White, Williamson, Ryan, & Bray, 2002). This may lead heavy racial/ethnic minority individuals to be protected from social identity threat and internalization of weight stigma and its consequent health effects.

The Importance of Perceived versus Actual Weight

More research is needed to tease apart the health implications of perceived vs. actual weight. Although correlated, significant disparities exist. The negative effects of weight stigma on stress, health behaviors, and health have been shown to depend on perceived weight/BMI in some studies (Himmelstein et al., 2015; Major et al., 2014), on objective weight/BMI in others (Schvey et al., 2011), and not to depend on weight/BMI at all in other studies (Schvey et al., 2014). Furthermore, many studies documenting the negative effects of perceived weight-based discrimination on mental health (Hatzenbuehler et al., 2009), physical health (Hunger & Major, 2015), and mortality (Sutin et al., 2015) show these effects *controlling for BMI*.

One implication of this latter finding is that weight-based identity threat is more consequential for health than objective weight, a notion that echoes earlier theorizing by Muennig (2008). That is not to say that BMI is unimportant to the present model, however. Indeed, extra-individual processes, such as discrimination, exclusion and bullying likely depend on objective BMI more so than the target's own perceived BMI. BMI predicts both actual and perceived experiences of weight-based discrimination. Although perceiving oneself as heavy is considered a necessary condition to elicit social identity threat, relatively few studies measure both objective BMI and perceived weight. Future research should do so because the pernicious effects of weight stigma are unlikely to be limited to those who are objectively heavy.

Stigma Interventions

Compared to interventions targeted at changing bias against racial, gender, or sexual minorities, there are very few weight stigma interventions. Moreover, those that have been tried have not been successful (Dánielsdóttir, O'Brien, and Ciao, 2010). Prior approaches to eradicating weight stigma have been organized into four broad categories (Dánielsdóttir et al., 2010; Lee, Alta & Brannick, 2014): (1) changing the attribution of obesity from controllable to uncontrollable; (2) increasing empathy and likability of obese individuals; (3) manipulating the "social consensus" surrounding anti-fat attitudes; and (4) other/mixed approaches. Lee et al. (2014) conducted a meta-analysis of weight bias interventions and found a small effect size of $g = -0.33$ across 30 studies in terms of effectiveness in changing weight-biased attitudes and beliefs. The effects, however, were highly variable, and the credibility interval (a derivative of a confidence interval) included zero. While their meta-analysis found no significant differences among these four approaches, Lee et al. (2014) state the analysis was likely underpowered. Thus, we have no clear conclusion on what approach is most effective.

At least one study (Latner, Puhl, Murakami & O'Brien, 2014) examined the impact of a food-addiction model of obesity on reducing weight stigma directed at obese people. Participants in this study were randomly assigned to read either a food-addiction explanatory model of obesity or a nonaddiction model, and subsequently read a vignette describing a target person who met the characteristics of one of these models and was either obese or of average weight. The food-addiction model produced less stigma, less blame, and lower perceived psychopathology attributed to the target, regardless of the target's weight. The food-addiction model also produced less blame toward obese people in general and less

fear of fat. Results of this study suggest that presenting obesity as an addiction might have potential for reducing prejudice against obese people. There are many more strategies that have not been tested, and borrowing from the larger literatures of race, gender, and sexual minority may be fruitful in informing future interventions. One obvious intervention is changing policy. Making size discrimination illegal would be a clear first step that has the potential for large effects (see Hatzenbuehler, this volume). As Figure 1 shows, there are many pathways from weight stigma to health, both enacted and social identity threat-related, and interventions may need to target multiple pathways. Clearly, future research is needed to find ways to effectively eradicate weight stigma.

Weight Stigma and the Immune System

Existing research has focused on the autonomic and HPA axes when testing the health effects of weight stigma. While these are important mediators of negative health effects, future research should also examine the immune system. Chronic inflammation, a result of an overactive immune system, is related to eight out of the top 10 leading causes of death and implicated in many diseases such as cardiovascular disease, diabetes, and stroke (Slavich, 2015). At least one study suggests that weight discrimination may activate inflammatory processes (Sutin et al., 2014). Moreover, shame as a specific emotion (which we discuss above as a particularly relevant emotion in the context of overweight and obesity) is implicated in inflammation. Experimentally induced shame, for example, increases levels of the soluble receptor for the proinflammatory tumor necrosis factor-alpha (Dickerson et al., 2004).

Conclusions

This chapter reviews the accumulating evidence that weight stigma negatively affects the health of individuals who are or who perceive themselves to be overweight. We propose

that weight stigma negatively affects health through two primary processes: enacted stigma and weight-based social identity threat. Enacted forms of weight stigma, such as social avoidance, harassment, exclusion and discrimination can directly affect the health of overweight and obese individuals by increasing their exposure to acute and chronic stress, reducing the quality of their social relationships, compromising their health care, and decreasing their access to material resources associated with higher socio-economic status. Each of these, in turn, is predictive of poorer health. These forms of enacted stigma can compromise the health of individuals who are objectively overweight or obese but who do not perceive themselves as such and can have negative effects on health even in the absence of targets' awareness that weight was the cause.

Weight stigma also negatively affects health indirectly through its impact on weight-based social identity threat. Weight-based social identity threat is a situationally-triggered psychological state that occurs when an individual is concerned that they have been or will be devalued, discriminated against, rejected, or negatively stereotyped because of their social identity as an "overweight person." Weight based social identity threat elicits vigilance for potential rejection. It can be acute or chronic and can negatively affect health independent of objective experiences of discrimination. We presented evidence from a variety of methodologies indicating that weight based identity threat negatively affects health by elevating psychological distress and associated negative emotions, increasing physiological reactivity associated with stress, increasing calorie consumption, and fostering stigma-avoidance behaviors that have negative health implications. Further, we posit that internalization of weight bias (self-

stigma) exacerbates the effects of weight-based identity threat on these processes.

We also illustrated the bi-directional effects of weight stigma, reviewing research showing that perceived weight stigmatization can create a positive feedback loop in which experiencing weight stigma leads to weight gain or inhibits weight loss through increased eating and other biobehavioral mechanisms; weight gain, in turn, can increase vulnerability to stigmatization. Thus, stigmatization of overweight individuals creates a vicious cycle that perpetuates stigma. We conclude that stigmatizing people who are overweight is not only unsuccessful and likely to backfire, but is also harmful to the health of individuals who are, or who believe themselves to be, overweight.

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Figure 1. Model illustrating several pathways by which weight stigma and discrimination can undermine psychological and physical health.



