

ORIGINAL ARTICLE

Signaling hostility: The relationship between witnessing weight-based discrimination in medical school and medical student well-being

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Abstract

Environments that are hostile to one or more marginalized groups are known to have a negative effect on the mental health and well-being of both targets and observers. Anti-fat attitudes have been well documented in medical education, including the use of derogatory humor and discriminatory treatment toward higher-weight patients. However, to date, it is not known what effect observing weight stigma and discrimination during medical school has on medical students' psychological health and well-being, sense of belonging, and medical school burnout. The present study surveyed a total of 3994 students enrolled across 49 US medical schools at the start of their first year and at the end of their fourth year. Participants reported the frequency with which they had observed stigmatizing and discriminatory behaviors targeted at both higher-weight patients and higher-weight students during their four years of medical school. Observed weight stigma was prevalent, and was associated with worse psychological and general health, reduced medical school belonging and increased medical school burnout. The indirect effects of observed weight stigma on medical school burnout, via belonging, psychological health, and general health, were statistically significant in the sample as a whole, but were more pronounced in higher-weight students. This effect may be explained, in part, by the relationship between observed stigma and medical school belonging. Higher levels of observed stigma were associated with reduced feelings of belonging in higher-weight but not normative-weight students. Top-down institutional culture change is needed to rectify this situation, which is detrimental to both students and patients.

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1 | INTRODUCTION

Weight stigma can be broadly defined as negative attitudes, beliefs, and behaviors toward higher-weight individuals because of their weight or size.¹ Negative beliefs and attitudes include endorsement of stereotypes of higher-weight people, for example, that they are greedy, lazy, or unintelligent (Allon, 1982). Stigmatizing behaviors can range from social exclusion to rude or presumptuous comments, from staring or pointing to overt discrimination, or even verbal and physical attacks (Myers & Rosen, 1999). Many forms of behavioral stigma take the form of microaggressions – apparently ‘minor’ slights that may be overlooked by many observers and are frequently not recognized as stigma at all, but that cumulatively communicate a hostile environment to members of the target group (Sue et al., 2007). The prevalence of both more major stigmatizing experiences and the relatively commonplace, but pervasive, indicators of hostility toward higher-weight individuals is associated with a wide range of negative outcomes, including poor mental and physical health, reduced quality of life, and disparities in educational and employment opportunities and outcomes (Munro, 2017; Puhl & King, 2013; Rogge et al., 2004).

One domain in which weight stigma has been particularly well-documented is that of healthcare (for reviews see Pausé, 2014; Puhl & Heuer, 2009). Explicit and implicit weight-related biases are displayed by a wide range of healthcare providers, including general practitioners (Ferrante et al., 2009; Foster et al., 2003; Sabin et al., 2012), internal medicine specialists (Davis et al., 2008), gynecologists and obstetricians (Bombak et al., 2016; Vireday, 2015), pediatricians (Halvorson et al., 2019; Tanas et al., 2017), and providers specializing in the care of higher-weight patients (Schwartz et al., 2003; Tomiyama et al., 2015). Similarly, weight stigma is also prevalent among medical, nursing, and other healthcare students (Brochu, 2019; George et al., 2019; Miller et al., 2013; Pantenburg et al., 2012; Phelan et al., 2014; Swift et al., 2013), and some evidence suggests that anti-fat attitudes tend to worsen over the course of their training (Davis et al., 2008; Ip et al., 2013; Phelan, Puhl, et al., 2015).

Negative anti-fat messaging starts early during medical education, with disdain and disgust of higher-weight bodies heard from both peers and professors during gross anatomy classes at the start of medical school (Goss et al., 2020). The pattern continues into clinical training. Medical students, residents, and attendings report that “obese” patients are a common target of derogatory humor, disrespectful remarks, and other forms of disparate treatment among providers and instructors (Glaser et al., 2019; Puhl et al., 2014; Wear et al., 2006, 2009). Thus, while the formal medical curriculum teaches best practice and patient-centered competencies, the

institutional and professional norms and values that are conveyed, whether explicitly or tacitly, by the day-to-day workings and culture of an organization may supersede those intended lessons – a phenomenon widely known as the ‘hidden curriculum’ (Hafferty et al., 2015), albeit that given the prevalence and blatant expression of weight bias, this may be something of a misnomer.

In addition to witnessing negative comments and interactions directed at patients, medical students may themselves be targets of weight stigma. Numerous studies have described the hostile environment faced by students from other marginalized groups, in particular, racial and ethnic minorities, during medical school, and the negative impact on their well-being and academic performance (Ackerman-Barger et al., 2020; Hardeman et al., 2016; Hurtado et al., 1999; Phelan, Burgess, et al., 2015). However, little is known about the impact on medical students of an environment where weight stigma is pervasive. The present study seeks to explore the impact on medical students of witnessing weight-related stigma and discrimination during medical school.

1.1 | Medical students’ well-being

It is well documented that medical students tend to have worse mental health and higher levels of anxiety and depression, lower quality of life, and greater rates of suicidal ideation than age-matched peers, and that prevalence tends to increase over the course of medical school (Schwenk et al., 2010; Tyssen et al., 2001; for a review see Dyrbye, Thomas, & Shanafelt, 2006). There is also evidence that these poor health outcomes are particularly pronounced in under-represented or otherwise marginalized groups, including racial and ethnic minorities, women (compared with men), sexual minority students (compared with heterosexual students), and first-generation college students (Association of American Medical Colleges, 2014; Dyrbye, Thomas, Huschka, et al., 2006; Hardeman et al., 2015; Przedworski et al., 2015). Poorer psychological outcomes in these groups are at least partially explained by direct and indirect experiences of stigma, social isolation, and insufficient social support (Association of American Medical Colleges, 2014; Hardeman et al., 2016; Przedworski et al., 2015). Additionally, simple numerical under-representation may serve as a contextual cue that people with certain identities do not belong (Purdie-Vaughns et al., 2008; Schmader & Sedikides, 2018; Schwarz & Zetkovic, 2019), and students’ experiences with discrimination may further signal that they are not valued or accepted in a particular institution (Clark et al., 2012; Hagerty & Patusky, 1995). Importantly, lack of belonging has been linked to poorer physical and mental wellbeing in a range of academic contexts (Hale et al., 2005; Layous et al., 2017; Miller & Orsillo, 2020; Sowell et al., 2015), as well as with poorer academic outcomes (Clark et al., 2012; Layous et al., 2017; Walton & Cohen, 2007).

Medical training is also associated with high levels of burnout, a result of chronic work-related stress that is characterized by increased cynicism, physical and emotional exhaustion, detachment

¹In this manuscript, the words “obesity” “overweight” and “normal weight” are placed in inverted commas to indicate contestation of the medicalization of body weight and the social construction of a disease narrative. When not describing standard BMI category nomenclature, “normative weight” is used in the place of “normal weight” to represent societally approved weight/BMI levels, and this is contrasted with “higher-weight” to encompass individuals whose BMI would place them into one of the two higher BMI categories.

toward and depersonalization of patients, and feelings of futility and powerlessness (Dyrbye et al., 2014). Over half of US physicians experience burnout, with similar rates in medical students and even higher rates during residency (for a review see Reith, 2018). In addition to its severe negative impact on well-being, including higher rates of substance abuse and suicide (Dyrbye, Thomas, Huschka, et al., 2006; McCall, 2001; Schernhammer & Colditz, 2004), burnout is associated with increased risk of medical errors and poorer patient outcomes (Balch et al., 2011; Cimiotti et al., 2012; Halbesleben & Rathert, 2008; Shanafelt et al., 2010; Welp et al., 2015). Burnout in medical students has been linked with increases in serious consideration of dropping out of medical school, unprofessional and unethical behavior and decreases in altruism (Dyrbye, Massie, et al., 2010; Dyrbye, Thomas, et al., 2010).

For members of under-represented and marginalized groups, direct and indirect forms of stigma, including frequent microaggressions, create a hostile educational and working environment that acts as a constant stressor and requires additional cognitive and emotional coping resources not required of dominant social groups (Ackerman-Barger et al., 2020; Burgess et al., 2010; Erwin et al., 2002). Students may also feel the need to over-perform, to prove that they do indeed belong and to disprove negative assumptions about their capabilities, sometimes resulting in strong academic performance but at great personal cost (Ackerman-Barger et al., 2020; Odom et al., 2007).

Higher-weight medical students represent a group of individuals who are under-represented within medical school, but who are not generally considered in equality and diversity statistics (e.g., Association of American Medical Colleges, 2020; The King's Fund, 2020). Baseline data from the Medical Student Cognitive Habits and Growth Evaluation Study (CHANGES) cohort indicated that only 24.5% of 4687 matriculating students at 49 US medical schools had self-reported height and weight that would put them in the "overweight" or "obese" BMI categories (Phelan, Burgess, et al., 2015), considerably lower than U.S. population norms (CDC, 2020). It is unknown to what extent this disparity is due to self-selection for medicine versus barriers to acceptance (for barriers to tertiary and graduate education for higher-weight individuals, see for example, Burmeister et al., 2013; Crandall, 1995; Hill et al., 2019; Incollingo Rodriguez et al., 2019; MacCann & Roberts, 2013). Nevertheless, being a higher-weight medical student in a training and clinical environment where weight is often inherently associated with pathology, and higher-weight bodies othered and devalued, takes a toll on mental health and well-being, medical school belonging, and engagement with medical training (Lomax-Sawyers, 2017).

In addition to experiencing some of the same challenges faced by other marginalized groups, higher-weight medical students must contend with an additional layer of complexity in the stigma they face resulting from the perception that they are failing to "model" health. It is widely accepted that healthcare professionals should act as role models for healthy choices (Black et al., 2012; Davis et al., 2008). It is also widely accepted that fat bodies are inherently unhealthy, a belief that is erroneous and discounts the impact of

social determinants of health, including stigma and discrimination, on both weight status and health outcomes (Calogero et al., 2019). Thus, although high-weight status is neither a behavior nor a lifestyle choice, higher-weight healthcare professionals may be deemed to be poor role models and treated with less respect and reduced credibility by both patients and colleagues (McClure-Brenchley et al., 2020; Moller & Tischner, 2019; Puhl et al., 2013; Shaw & Meadows, 2021). It is likely that higher-weight medical students face similar challenges, although to our knowledge no studies have yet explored this phenomenon in medical students.

1.2 | Effects of hostile environments on targets and non-targets

Indirect forms of stigma, for example observing stigma or discrimination toward other members of one's group, is associated with worse health and well-being. For example, in a large meta-analysis, indirect racism was significantly associated with depression, stress, anxiety, overall mental health, physical health, self-esteem, and life satisfaction in members of non-White racial and ethnic groups (Paradies et al., 2015).

However, evidence also supports a negative impact of hostile environments on non-target group members. An experimental study conducted in White college students found that those high in internal motivation to suppress prejudice exhibited both a physiological stress response and increased negative affect on watching a video of two White men in an anti-diversity discussion in the company of a Black confederate (Schmader et al., 2012). In another study of college students, ambient heterosexist harassment was associated with anxiety, depression, and substance abuse, poorer perceived instructor relations and social acceptance, and greater school avoidance, irrespective of gender or sexual orientation, although, again, women and sexual minorities reported more frequent direct experiences of harassment (Silverschanz et al., 2008). Data from the CHANGES study support these findings in the medical school context – witnessing racial discrimination toward patients or other students was associated with worsening depressive symptoms in all students, although the effect was most pronounced in Asian students (Hardeman et al., 2016). A negative racial climate may be indicative of an overall hostile environment, or other mechanisms may be at play; it is also possible that the mechanisms differ for members of advantaged versus disadvantaged groups (Hardeman et al., 2016).

Compared with the extensive literature documenting the direct and indirect harms that experiences and expectancies of weight-related stigma have on the targets' health and well-being (e.g., Puhl & Suh, 2015; Sutin et al., 2015; Udo et al., 2016; Vadiveloo & Mattei, 2017), few studies have explored the impact of observing weight-related stigma directed at others. In one experimental study conducted in a weight-diverse sample of adult women, viewing a weight stigmatizing video induced a stress response with increased salivary cortisol levels in both 'normal weight' and 'overweight' women, compared with viewing a control video (Schvey et al., 2014).

The authors hypothesized that this might have been due to a shared identity as women, or because slimmer women also have body image concerns. Alternatively, witnessing unfair treatment may simply be distressing in and of itself, at least to individuals who hold egalitarian values (Schmader et al., 2012). Again, the mechanism of these effects remains to be determined.

1.3 | Present study

To date, no studies have explored the relationship between the weight stigma climate in medical schools and student health, medical school belonging, and burnout. The present study utilizes secondary analysis of the CHANGES cohort data to explore these relationships. We propose that observing weight stigma directed toward patients and other medical students during four years of medical school will be associated with poorer psychological and general health, and in turn with higher levels of burnout. We predict that, consistent with prior findings that indicate non-inclusive climates are harmful to all observers, this effect will be seen across the student population, irrespective of their weight. However, while environments that are hostile to particular groups of individuals may result in distress both to targets and to non-group members, the expectation that health professionals should “model” health may result in the harms associated with a weight stigmatizing environment in medical school being exacerbated in higher-weight medical students. We propose that for larger students, weight stigmatizing experiences are likely to signal that individuals with higher-weight bodies are not valued and do not belong in medical school. Thus, we predict that in higher-weight, but not normative-weight, students, downstream effects of observed stigma on psychological and general health and medical school burnout will be mediated in part by reduced sense of belonging in medical school (Figure 1). Note, in the present context, ‘normative’ is used in the sense of ‘socially acceptable’ and is contrasted with ‘higher weight’ – these terms are chosen in lieu of more medicalized language. For more on choice of terminology, see footnote 1.

We make the following formal hypotheses:

Hypothesis 1 *Observed weight stigma will be associated with lower perceived medical school belonging; worse psychological well-being (higher rates of depression and anxiety and lower levels of mastery) and general health, and higher levels of medical school burnout.*

Hypothesis 2 *The relationship between observed weight stigma and medical school burnout will be mediated by medical school belonging, psychological well-being, and general health.*

Hypothesis 3 *The relationship between observed weight stigma and medical school belonging will be moderated by participants’ own BMI, such that observed weight stigma will be associated with reduced medical school belonging in higher-weight but not normative-weight students.*

Hypothesis 4 *Observed weight stigma will be associated with increased medical school burnout in all students; however, the relationship will be more pronounced in higher-weight compared with normative-weight students.*

2 | METHODS

2.1 | Sample

The sample was part of the longitudinal Medical Student Cognitive Habits and Growth Evaluation Study (CHANGES) (NHLBI R01HL085631, PI van Ryn), a national longitudinal study of medical students who matriculated in US medical schools in 2010 (Phelan, Burgess, et al., 2015), and who have been followed up over the course of their clinical training and residence programs. Details of the cohort and data collection methods have been described previously (van Ryn et al., 2014). Briefly, a variety of methods were used to contact students at a random selection of 50 medical schools from strata of public and private schools in six regions of the United States. One of the sampled schools, a military school, was atypical

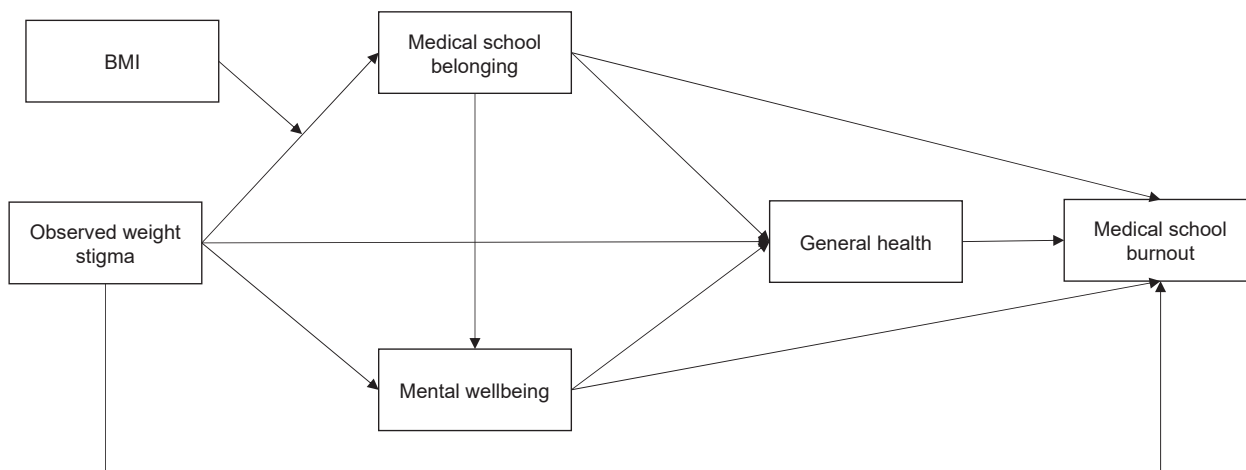


FIGURE 1 Hypothesized moderated mediation model

compared with the rest of the sample and data were not collected from this institution after the baseline survey. Eligible students were invited to complete an online survey during their first semester of their first year of medical school in the fall of 2010. The purpose of the study was described as examining “changes in medical students' quality of life, social relationships, attitudes, and beliefs over the course of medical school.” No deception was used, and participants were allowed to skip questions without penalty.

Responses were examined for indications of inattentive responding (e.g., implausibly short completion times, systematic repetition of identical scoring choices). After removal of invalid and duplicate surveys ($n = 32$), a total of 4732 students from 49 schools provided completed questionnaires at this time. Respondents completing surveys at baseline were invited to complete a second online questionnaire during their final semester in the spring of 2014, with 3994 (84.4%) completing the follow-up survey. This study was approved by the Institutional Review Boards of the Mayo Clinic and the University of Minnesota. Additionally, external collaborators must sign a data use agreement and work under the sponsorship of a core team member. At both time points, respondents gave informed consent and received a \$50.00 incentive.

2.2 | Measures

Students' age, gender, race, annual family income – as a proxy for socioeconomic status – and sexual orientation were measured with standard survey questions at baseline. Students self-reported height and weight at both baseline (Year 1) and at follow-up (Year 4), which were used to calculate body mass index (BMI). For the present analysis, Year 4 BMI was used to be contemporaneous with questionnaire measures.

As this study was part of a larger survey, a number of steps were taken to minimize participant burden. First, constructs were tested using a reduced number of items from validated scales, with included items selected on the basis of construct and face validity, and with input from scale authors where possible. The following measures were all completed at Year 4.

2.2.1 | Observed weight stigma

Frequency of observed weight stigma during medical school was assessed at Year 4. All questions were scored from 1 (*never*) to 5 (*very often*), with higher scores indicating more frequently observed weight stigma. Two items captured observed stigma toward patients: “During medical school, how often have you heard/witnessed professors, instructors, attendings and/or residents make negative comments, disparaging remarks, or jokes about obese patients?” and “How often have you witnessed discriminatory treatment of an obese patient?” Eight items assessed how often participants had witnessed or heard about microaggressions toward another student. Examples included being treated with less respect, being subjected

to offensive remarks or names, and unfairly receiving lower marks or grades. For any item answered in the affirmative, follow up questions probed for the reason and frequency of this unequal treatment based on a number of possible marginalized identities, specifically, race or ethnicity, gender, sexual orientation, weight, socioeconomic status, and disability. The present study includes a weight-related microaggression score for those students who reported witnessing this type of unfair or unequal treatment and attributed the reason to the target's body size. Students who did not report witnessing a particular weight-related microaggressions were excluded from analysis for that item; that is, sample numbers differ for each item depending upon how many respondents endorsed that form of microaggression and attributed it to the target's weight. The eight items relating to microaggressions based on weight were averaged to create a total weight microaggressions score (Cronbach's $\alpha = .929$).

2.2.2 | Health and psychological well-being

Participants rated their overall health at Year 4 with a single item from the Medical Outcomes Study Short Form Health Survey (Ware et al., 1996): “How is your overall health right now?” Responses ranged from 1 (*Poor*) to 5 (*Excellent*). Note, in the standard scoring of this item, “Excellent” is scored as 1 and “Poor” as 5. Scoring was reversed in the present analysis such that higher scores indicated better self-rated general health.

Anxiety was measured with four items from the PROMIS Anxiety scale (Pilkonis et al., 2011). Participants indicated how frequently in the previous seven days they had felt: anxious, worried, nervous, or uneasy (Cronbach's $\alpha = .915$). Depression was measured with six items from the PROMIS Depression scale (Pilkonis et al., 2011). Participants indicated how frequently in the previous seven days they had felt: worthless, helpless, like a failure, depressed, unhappy, or hopeless (Cronbach's $\alpha = .937$). Response options for both scales ranged from 1 (*Never*) to 5 (*Very often*). For both scales, items were summed to produce a total score, with higher scores indicating worse psychological well-being. Mastery, a sense of control or agency over one's own life, was measured with five items from the Pearlin Mastery scale (Pearlin & Schooler, 1978) (Cronbach's $\alpha = .807$). Sample items included: “What happens to me in the future mostly depends on me,” and “There is little I can do to change many of the important things in my life” (reverse scored). Participants rated their agreement on a 7-point scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*), such that higher scores indicated greater sense of mastery.

2.2.3 | Medical school variables

Sense of belonging in medical school was measured with five items (Cronbach's $\alpha = .859$). Three items were adapted from Murphy and Dweck (2010), and two additional items were created for the present study. Sample items were: “How much do you feel like you belong in

medical school?" and "How accepted do you feel in medical school?" Responses were scored from 1 (*Not at all*) to 5 (*Extremely*). Items were averaged to give a total score, with higher scores indicating greater perceived belonging.

Medical school burnout was measured with three items (Cronbach's $\alpha = .662$). Two items were adapted from the Maslach Burnout Inventory (Maslach et al., 1997): "I feel burned out by medical school," and "I have become more callous toward people since beginning medical school." A third item was added: "I am as idealistic as I was when I started medical school" (reverse scored). Responses were scored from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Items were averaged to give a total score, with higher scores indicating more burnout.

2.3 | Data analysis

Descriptive statistics were calculated for sample characteristics. Bivariate and partial correlations (controlling for participant BMI) were calculated between weight stigma, health and well-being, and medical school variables. Analyses were conducted using SPSS for Mac v25.0.

Structural equation modeling with maximum likelihood estimation was used to test the hypothesized model. The serial mediation model (without the moderator) was tested first. Observed weight stigma was the predictor variable, medical school belonging, psychological well-being, and general health were serial mediators, and medical school burnout was the dependent variable. Participant BMI was entered as a moderator of the observed stigma–belonging pathway.

Latent variables were constructed for observed weight stigma and psychological well-being. The latent variable for observed weight stigma was estimated with three items – negative comments toward higher-weight patients, discriminatory treatment of higher-weight patients, and the total scale score for microaggressions toward higher-weight students. The latent variable for psychological well-being was also estimated with three items – namely the total scale scores for anxiety, depression, and mastery. Confirmatory factor analysis was conducted for the two latent variables; however, the models had zero degrees of freedom and as such, fit statistics were unavailable. Scale scores for all other model components (general health, medical school belonging and burnout) were treated as manifest variables in the model. Age, gender, race (dichotomized as White/another racial identity), sexual orientation (dichotomized as heterosexual/another sexual identity), family income, and BMI were entered as covariates for all steps in the mediation pathway. Non-categorical covariates (age, BMI) were grand mean-centered. The variance of the two latent variables was fixed at unity to facilitate estimation.

A bootstrapping resampling procedure (DiCiccio & Efron, 1996; Fritz & MacKinnon, 2007) with 1000 bootstrap samples was used to construct bias-corrected 95% confidence intervals for the path estimates and indirect effects. An effect was considered statistically

significant if the 95% confidence intervals did not include zero. Adequacy of model fit was determined using the comparative fit index (CFI), the root-mean-square error of approximation (RMSEA), and the standardized root-mean-square residual (SRMR). CFI values $\geq .95$, RMSEA $\leq .06$, and SRMR $\leq .08$ indicate good fit to the data (Hu & Bentler, 1999).

Finally, the full moderated-mediation model depicted in Figure 1 was tested by adding BMI as a potential moderator of the relationship between observed weight stigma and medical school belonging. BMI remained a covariate for other steps in the mediation pathway. All structural equation modeling analyses were conducted using Mplus v.8 (Muthén & Muthén, 1998–2017).

3 | RESULTS

Participant characteristics are shown in Table 1. The baseline demographic characteristics of the sample are similar to those of all students matriculating at U.S. medical schools in the same year (Association of American Medical Colleges, 2011). Socioeconomic data are consistent with prior data on parental income in medical students (Association of American Medical Colleges, 2008). Two-thirds (66.4%) of participants had a BMI in the "normal-weight" category, 23.4% were in the "overweight" BMI category, 6.3% in the "obese" category, and 2.8% in the "underweight" category.

More students reported having observed weight stigma toward patients than reported having observed weight-related microaggressions toward other students (Table 2). Nearly 90% of students had witnessed clinical or teaching faculty make negative comments, disparaging remarks, or jokes about higher-weight patients, and over 50% had observed discriminatory treatment toward higher-weight patients. Students with BMI in the "obese" BMI category reported observing verbal mistreatment, Welch's $F(3, 377.6) = 2.86, p = .037$, and discrimination, Welch's $F(3, 374.8) = 4.04, p = .008$, toward higher-weight patients more frequently than students with BMIs in the "overweight," "normal weight," and "underweight" categories.

Approximately one in four students ($n = 916, 23.7\%$) reported observing weight-related microaggressions against other students. While reported by fewer students than negative comments or discriminatory treatment toward patients, all forms of weight-related microaggressions directed at students, including unfair evaluations, offensive remarks and names, and even public humiliation, were observed by approximately 10% to 20% of all participants. Again, more students whose weight placed them in the "obese" BMI category reported having witnessed microaggressions directed toward other students than did students in the other BMI categories, 29.6% versus 22.8%, respectively, $\chi^2(1) = 6.14, p = .013$, Cramer's $V = .039$. Of students who reported witnessing weight-related microaggression toward other students, the frequency of observing such occurrences did not differ across student BMI categories, Welch's $F(3, 103.3) = .43, p = .736$. Observed weight stigma was associated with worse psychological and overall health, lower medical school belonging, and more burnout, with only minor differences in the magnitude of

TABLE 1 Sample characteristics

	<i>n</i>	%	<i>N</i>
Gender			3984
Male	1995	49.9	
Female	1983	49.6	
Another gender identity	6	0.2	
Race			3867
White	2629	65.8	
East Asian	485	12.2	
South Asian	366	9.2	
Multi-racial	193	4.8	
Black	185	4.6	
Native Hawaiian/Pacific Islander	7	0.2	
Family income			3845
Less than \$20,000	99	2.5	
\$20,00–49,000	473	11.9	
\$50,000–99,000	1159	51.5	
\$100,000–249,000	1400	35.1	
\$250,000 or more	714	17.9	
Sexual orientation			3890
Heterosexual	3643	91.2	
Gay, lesbian, bisexual, or another non-heterosexual identity	195	4.9	
	<i>M</i>	<i>SD</i>	<i>Range</i>
Age	23.9	2.6	19–49
BMI	23.83	3.91	14.3–73.3

Note: Age, sexual orientation and BMI as reported at Year 4. Other demographic data collected at Year 1. Total *N* = 3994. Sample sizes differ due to missing data.

these correlations when controlling for participant BMI (Table 3). Thus, Hypothesis 1 was supported.

We first tested the hypothesized serial mediation model, without the moderator. The model was an excellent fit to the data, CFI = .954, RMSEA = .045 (90% CI .041, .049), SRMR = .027, $\chi^2(50) = 434.4$, $p < .001$. Thus, Hypothesis 2 was supported. With the exception of the direct path between observed weight stigma and self-reported general health, all paths were statistically significant (all $p < .001$; Figure 2), with the full model explaining 24.1% of the variance in medical school burnout.² The direct effect and all indirect effects were statistically significant with the exception of the indirect effect of observed weight stigma on burnout via self-reported general health (Table 4).

Next, we tested whether participants' own BMI moderated the relationship between observed weight stigma and medical school

burnout, via reduced sense of medical school belonging. We first tested a simple moderation model with observed weight stigma as the predictor variable, BMI as the moderator, and medical school belonging as the dependent variable. This analysis confirmed that BMI was a moderator of this relationship, standardized estimate = $-.070$, $SE = .020$, $Z = -3.49$, $p < .001$.³ Moderation effects were tested with simple slopes analysis. The high-BMI effect was taken at one standard deviation above (27.7 kg/m^2) and the low-BMI effect at one standard deviation below (19.9 kg/m^2) the mean, corresponding with values in the "overweight" and "normal-weight" BMI categories, respectively. At high BMI, observed stigma was associated with reduced medical school belonging, slope estimate = $-.146$, $SE = .024$, $Z = -6.124$, $p < .001$. No statistically significant relationship was observed at low BMI, slope estimate = $-.031$, $SE = .025$, $Z = -1.214$, $p = .225$. Thus, Hypothesis 3 was supported.

Finally, we ran the full moderated mediation model proposed in Figure 1. The model explained 24.9% of the variance in medical school burnout. The total indirect effect of observed weight stigma

²Of the covariates, age and family income were significant independent predictors of belonging but of no other study variables. Gender was not a significant predictor of general health or medical school belonging. Sexual orientation was not a significant independent predictor of psychological well-being or general health. BMI was not a significant independent predictor of medical school belonging. A trimmed model was run with non-significant pathways removed. While still a good fit to the data, this model was a statistically worse fit than the full model with all covariates included at each mediation step, CFI = .950, RMSEA = .042, SRMR = .029, $\chi^2(61) = 472.0$, $p < .001$; $\chi^2 = 37.6$, $df = 11$, critical value = 19.7. Thus, the full model was retained.

³Because it is also possible that participant BMI may moderate the relationship between observed weight stigma and psychological well-being through mechanisms besides via reduced medical school belonging, we also conducted exploratory analysis of this pathway. The interaction between observed weight stigma and participant BMI was not a significant predictor of psychological well-being ($p = .241$).

TABLE 2 Frequency of observed weight stigma

	Never	Once/occasionally	Often/very often
Weight stigma directed at higher-weight patients			
Negative comments, disparaging remarks, jokes	364 (9.1%)	1994 (50.0%)	1520 (38.0%)
Discriminatory treatment	1913 (47.9%)	1708 (42.7%)	254 (6.4%)
Weight-related microaggressions toward another student because of their body size			
Given lower evaluation or grades for unfair or unjust reasons – rather than performance	1388 (34.8%)	334 (8.4%)	94 (2.4%)
Treated in an unfriendly way, as if they were not welcome	1773 (44.4%)	746 (18.6%)	127 (3.2%)
Having their abilities over-estimated	1538 (38.5%)	411 (10.3%)	78 (2.0%)
Subjected to offensive remarks/names	1328 (33.2%)	580 (14.5%)	149 (3.8%)
Treated with less respect than other medical students?	1472 (37.1%)	674 (16.8%)	164 (4.2%)
Getting unfair advantages	1563 (39.1%)	433 (10.9%)	129 (3.3%)
Publicly humiliated	1520 (38.1%)	399 (10.0%)	87 (2.2%)
Ignored by resident or attending physician	2167 (54.3%)	483 (12.1%)	78 (2.0%)

Note: Items relating to weight stigma toward patients were asked to all participants. Numbers do not add up to 100% due to missing data. Items relating to microaggressions on the basis of student body size were asked only to participants who indicated being aware of that type of microaggression; reasons for the microaggression were then prompted in follow-up questions.

TABLE 3 Bivariate and partial correlations between study variables

	1	2	3	4	5	6	7	8	9	10
1. BMI										
2. Negative comments	.03*									
3. Discrimination	.04*	.44***								
4. Microaggressions	.09**	.19***	.40***							
5. Anxiety	-.00	.10***	.13***	.09**						
6. Depression	.09***	.05**	.15***	.13***	.62***					
7. Mastery	-.03	-.08**	-.14***	-.17***	-.45***	-.59***				
8. General health	-.28***	-.03	-.06***	-.10**	-.24***	-.35**	.28***			
9. Belonging	-.04**	-.03	-.10***	-.08**	-.36***	-.51***	.45***	.30***		
10. Burnout	.026	.15***	.14***	.12***	.33***	.36***	-.34***	-.25***	-.40***	

Note: Numbers above the diagonal show partial correlations between observed stigma variables and health and well-being outcomes, controlling for participants' BMI.

* $p < .05$; ** $p < .01$; *** $p < .001$.

on medical school burnout was significant in both lower- (slope estimate = .092, $SE = .015$) and higher-weight students (slope estimate = .145, $SE = .024$), both $p < .001$, but was more pronounced in higher-weight students (Figure 3), slope difference = .053, $SE = .012$, $Z = 4.33$, $p < .001$. Thus, Hypothesis 4 was supported.

4 | DISCUSSION

The present study is the first to examine the relationship between observed weight stigma and well-being outcomes in medical students. Consistent with findings from smaller-scale studies of observed weight stigma prevalence (Glaser et al., 2019), stigmatizing treatment of higher-weight patients was common, with almost all students having observed some form of negative treatment. Weight-related microaggressions toward students were also not rare. It is

worth noting that microaggressions, by their nature, often go unnoticed, particularly by members outside of the target group, or may not be attributed to stigma because of their ambiguous nature (Sue et al., 2007). It should be noted that unwillingness or inability to conclusively attribute a negative experience to stigma does not negate the real impact that such experiences have on members of the target group (Barreto & Ellemers, 2015). Environments in which such "minor" hostilities are pervasive exact a toll on members of the target group, who must expend cognitive and emotional resources to evaluating and addressing these potential threats to their identity (Meyer, 2003; Sue et al., 2007).

As predicted, students who reported observing more weight-related stigma also reported worse psychological and general health, lower medical school belonging, and higher medical school burnout. The indirect effects of observing weight-related stigma on medical school burnout, via belonging, psychological health and

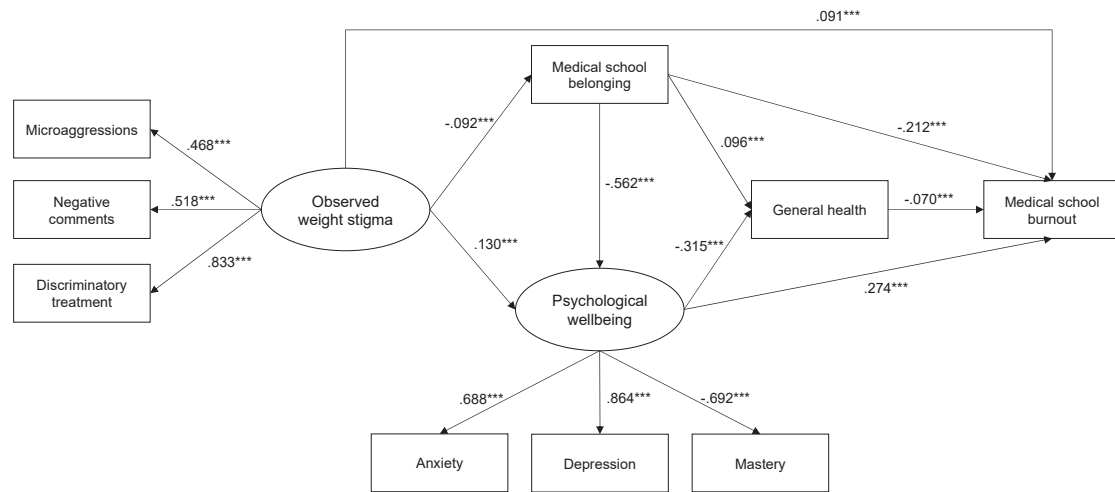


FIGURE 2 Mediation model showing relationship between observed weight stigma, medical school belonging, psychological well-being, general health, and medical school burnout. Age, gender, family income, race, sexual orientation, and BMI are included as covariates (paths not shown). Standardized beta coefficients are presented on figure paths. Non-significant pathways not displayed. *** $p < .001$

TABLE 4 Summary of results from mediation analyses

Mediation path	Point estimate	SE	Z	p	95% CI
Total effect	.164	.022	7.29	<.001	.120, .208
Total direct effect	.091	.021	4.41	<.001	.049, .130
Total indirect effect	.072	.010	6.92	<.001	.052, .093
Observed stigma → Belonging → Burnout	.020	.005	4.21	<.001	.011, .029
Observed stigma → Psychological wellbeing → Burnout	.036	.006	5.62	<.001	.025, .051
Observed stigma → Health → Burnout	-.002	.001	-1.19	.235	-.005, .000
Observed stigma → Belonging → Psychological wellbeing → Burnout	.014	.003	4.25	<.001	.008, .021
Observed stigma → Belonging → Health → Burnout	.001	.000	2.50	.013	.000, .001
Observed stigma → Psychological wellbeing → Health → Burnout	.003	.001	3.33	.001	.001, .005
Observed stigma → Belonging → Psychological wellbeing → Health → Burnout	.001	.000	2.95	.003	.001, .002

Note: Standardised point estimates are presented. All models include age, gender, race, family income, sexual orientation and BMI as covariates. Abbreviations: CI, confidence interval; SE, standard error.

general health were statistically significant in the sample as a whole. This is consistent with prior findings that hostile environments may have a negative impact on members of both the ingroup and of the outgroup (Chrobot-Mason et al., 2013; Gutierrez et al., 1994; Richman-Hirsch & Glomb, 2002; Silverschanz et al., 2008). Evidence suggests that these relationships are stronger in environments that are numerically skewed in favor of the dominant group (Miner-Rubino & Cortina, 2004), and the under-representation of higher-weight students in medical school would certainly produce such an environment.

With one exception, all indirect pathways in the model were statistically significant, indicating the highly interrelated nature of observed stigma and psychological well-being outcomes. The exception was the indirect path from observed stigma through general health to medical school burnout. The relationship between observed stigma and overall health appears to operate via psychological outcomes. Again, this is consistent with studies on other

types of social stigma (e.g., Glomb et al., 1997; Richman-Hirsch & Glomb, 2002).

Also as predicted, the inverse relationship between observed weight stigma and medical school belonging was more pronounced in higher-weight students. That is, as BMI increased, students who observed more weight-related stigma also reported lower medical school belonging, which was negatively associated with health and wellbeing. Given that the data are cross-sectional, further studies are required to establish causality and determine the mechanisms driving this effect. With regard to mechanism, a number of plausible explanations can be posited. Most obviously, the positioning of higher-weight bodies as inherently problematic in terms of health, coupled with the expectation of healthcare professionals to “model” health, could serve to constantly signal that the bodies of higher-weight students do not belong in a healthcare environment. Given widespread anti-fat attitudes and culpability discourses in healthcare and beyond, such signals may be accompanied by a sense of moral

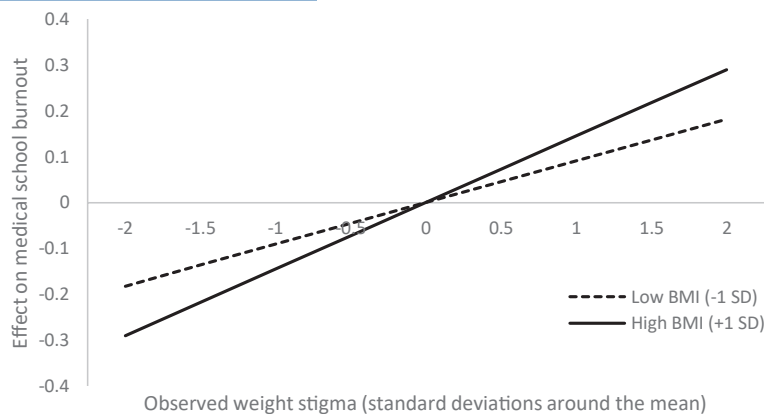


FIGURE 3 Total indirect effect of observed weight stigma on medical school burnout. Total indirect effect includes all indirect pathways between observed weight stigma and medical school burnout via one or more of the following mediators: medical school belonging, psychological well-being, and general health. The pathway between observed weight stigma and medical school belonging is moderated by participants' BMI. High and low BMI effects were calculated at 1 standard deviation above and below the sample mean, respectively. Age, gender, race, socioeconomic status, and sexual orientation are included in the model as covariates. BMI is included as a covariate in the non-moderated pathways

shame in higher-weight students over their apparent failings both as individuals (Crawford, 2006; Townend, 2009) and as "good" medics (McClure-Brenchley et al., 2020; Puhl et al., 2013). Shame was not assessed in the present study and future studies could explore this further. It would be interesting to examine whether students' own internalized weight stigma might moderate the relationship between observed stigma and psychological well-being.

Second, stereotype threat may also help to explain the relationship between observed weight stigma and negative psychological wellbeing in higher-weight students. Stereotype threat occurs when environmental cues make an individuals' membership of a stigmatized group salient, with concomitant psychological and physiological effects that may negatively impact performance (Schmader et al., 2008; Steele & Aronson, 1995). Medical students from under-represented minority groups tend to under-perform in medical school, doing less well than would be predicted by their Medical College Admission Test scores (Burgess et al., 2010; Koenig et al., 1998). Higher-weight students must contend with the stereotypes that fat people are lazy, unmotivated, and incompetent (Puhl & Heuer, 2009), and may perceive that they are constantly surveilled with such expectancies and feel compelled to pre-emptively over-compensate (Hunger et al., 2018; Neel et al., 2013). This additional cognitive and emotional labor may well have an effect on personal and medical school outcomes. While the Association of American Medical Colleges collects a large amount of demographic and background information about applicants, matriculants, and graduates of medical school, height and weight are not collected. It is therefore unknown how participant weight or BMI influences medical school success. As the evidence of systematic weight stigma in numerous domains, including healthcare, is now incontrovertible, it may be useful to collect anthropometric information in future surveys.

To our knowledge, no studies are available on the impact of applicant body weight on medical school acceptance; however, a quick internet search finds numerous postings to discussion boards

of higher-weight individuals who are concerned that their weight may be a barrier to a successful application. Whether the under-representation of higher-weight individuals among medical students at US schools is due to bias during the application process or self-selection out of the applicant pool, and, in all likelihood, both may play a role, the fact remains that lack of representation may add to the sense that higher-weight bodies do not belong in medical school or in medicine. Under-representation may also increase the risk of stereotype threat by marking out the identity in question as non-normative and therefore more noteworthy (Cheryan et al., 2009; Murphy et al., 2007; Sekaquaptewa & Thompson, 2002, 2003). Role models from one's own ingroup also serve to influence goals and motivation, serving to inspire and increase the likelihood of engagement and persistence in a domain (Lockwood, 2006; Stout et al., 2011). Thus, the relative paucity of higher-weight peers and, consequently, residents and attendings, deprives higher-weight medical students of this facilitation pathway to their success, one which might have acted as a counterpoint to mitigate the effects of observed weight stigma (Dasgupta, 2011).

In addition, greater representation of currently under-represented groups would also increase the diversity of the student body, which may then translate into improved inter-group attitudes. For example, a recent study in US adults found that monoracial people of color and multiracial individuals who lived in more racially diverse climates reported lower rates of racial and ethnic microaggressions and discrimination compared with those living in more homogeneously White areas (Meyers et al., 2020). According to the contact hypothesis, more contact with an outgroup tends to be associated with reduced stigmatizing attitudes to that group (Allport, 1954; Pettigrew et al., 2011) via reduced anxiety and increased empathy toward group members (Pettigrew & Tropp, 2008). In medical students, more frequent favorable contact with higher-weight faculty and staff (and higher-weight patients) has been linked to reductions in explicit anti-fat attitudes over four years of medical

school (Phelan, Puhl, et al., 2015), and similar findings have been reported for contact with racial (Onyeador et al., 2020) and sexual minority (Wittlin et al., 2019) outgroups. Thus, achieving greater body diversity among medical students would increase the frequency of exposure of other students and faculty to higher-weight individuals outside the patient role and may aid in reducing anti-fat attitudes and behaviors. However, it should be noted that increasing diversity without addressing a stigmatizing cultural climate may worsen intergroup relations and individual well-being of members of the marginalized groups (Ahmed, 2006; Hurtado et al., 1999; Joshi, 2014).

The findings of the present study add to the very limited literature on the negative implications of observing weight stigma, but also contribute to the growing literature on how medical education is a site for the construction of oppressive and marginalizing subjectivities. Efforts to reduce anti-fat attitudes among medical students have been largely unsuccessful and may even have paradoxical effects (Alberga et al., 2016; Daniëlsdóttir et al., 2010; Meadows et al., 2017). Many such interventions have drawn on attribution theory to contest the controllability of body weight – highlighting the complex causality involved. However, while such interventions have been successful at changing beliefs about weight controllability, they have been less successful at reducing antipathy toward higher-weight individuals (Daniëlsdóttir et al., 2010). One reason for this lack of effectiveness may be that while the interventions addressed controllability of weight, they did nothing to counter the negative value that society attaches to high-weight status (Brochu, 2020). As long as both the formal and informal medical curriculum continue to message the discrediting of higher-weight bodies, it is unlikely that any form of intervention will achieve culture change.

Strengths of the present study include the large sample size and that the demographic characteristics are typical of all students matriculating to US medical schools in 2010 (Association of American Medical Colleges, 2008, 2011). Thus, the findings are likely to be representative of medical students across the US. However, a number of limitations should be noted. First, the data are cross-sectional and thus it is not possible to draw causal inferences. However, these findings are consistent with those of a study that experimentally manipulated the presence or absence of weight stigma, and which found that both higher-weight and normative-weight participants reported the observed stigma as distressing and exhibited increased physiological stress (Schvey et al., 2014). Second, as this was part of a larger study, impetus to reduce participant burden meant that only a limited number of questions could be asked for each construct of interest. The questions asked herein comprised only a small proportion of the many types of stigmatizing incidents that may have been observed. For example, we did not include items that captured the potentially stigmatizing nature of the formal medical school curriculum around body weight (Lomax-Sawyers, 2017). It is possible that this form of microaggression may be particularly frequent and may have magnified the negative effect on medical school belonging in higher-weight students.

Third, retrospective recall of weight stigmatizing events, especially the more “minor” types, is known to significantly underestimate

prevalence when compared with methodologies that use experience sampling techniques (Seacat et al., 2016; Vartanian et al., 2014). Finally, the data were all self-report measures and the extent to which participants may have engaged in social desirability responding is unknown. Although participants were not being asked about their own stigmatizing behaviors, it is possible that some students may have under-reported observed stigma as a form of reputation management for their profession as a whole. Certainly, evidence suggests that as students progress through medical school, they transition to an ingroup identity with their trainers and begin to normalize inappropriate humor and treatment disparities, attributing them to medics being under-resourced and overworked and an understandable means of dealing with stress (Glaser et al., 2019; Parsons et al., 2001; Wear et al., 2006). Other students struggle with the dissonance between the stigmatizing and non-empathic behaviors they observe in medical school and the values and ideals that led them to enter the profession (Glaser et al., 2019), which may also be linked with under-reporting of observed stigma, and again contributing to the emotional stress and reduced sense of belonging that increases the risk of burnout.

5 | CONCLUSION

The physical and psychological toll of medical school on students is well documented and contributes to the likelihood of burnout. These harms are even more pronounced in members of under-represented and/or stigmatized groups, including higher-weight students, and may be driven by observation of stigma and discrimination. Hostile environments combine individual acts of prejudice with structurally embedded forms of discrimination. As such, they cannot be altered by small-scale interventions delivered in individual bias-awareness seminars alone (Hurtado et al., 1999; Williams, 2019). In order to address the potential harms to both students and patients, comprehensive institutional culture change will be necessary. Diversity, whether by race, gender, socioeconomic status, body size, or any other domain under which some demographics are currently under-represented must be sought *and valued*. Microaggressions in both the formal and informal curriculum must be addressed, and medical education should focus more on an equity-based model in which the social determinants of health take precedence over neoliberal individualistic discourses.

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CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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