The mixed impact of medical school on medical students' implicit and explicit weight bias

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CONTEXT Health care trainees demonstrate implicit (automatic, unconscious) and explicit (conscious) bias against people from stigmatised and marginalised social groups, which can negatively influence communication and decision making. Medical schools are well positioned to intervene and reduce bias in new physicians.

OBJECTIVES This study was designed to assess medical school factors that influence change in implicit and explicit bias against individuals from one stigmatised group: people with obesity.

METHODS This was a prospective cohort study of medical students enrolled at 49 US medical schools randomly selected from all US medical schools within the strata of public and private schools and region. Participants were 1795 medical students surveyed at the beginning of their first year and end of their fourth year. Web-based surveys included measures of weight bias, and medical school experiences and climate. Bias change was compared with changes in bias in the general public over the same period. Linear mixed models were used to assess the impact of curriculum, contact with people with obesity, and faculty role modelling on weight bias change.

RESULTS Increased implicit and explicit biases were associated with less positive contact with patients with obesity and more exposure to faculty role modelling of discriminatory behaviour or negative comments about patients with obesity. Increased implicit bias was associated with training in how to deal with difficult patients. On average, implicit weight bias decreased and explicit bias increased during medical school, over a period of time in which implicit weight bias in the general public increased and explicit bias remained stable.

CONCLUSIONS Medical schools may reduce students' weight biases by increasing positive contact between students and patients with obesity, eliminating unprofessional role modelling by faculty members and residents, and altering curricula focused on treating difficult patients.

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INTRODUCTION

Health care provider implicit (automatic, unconscious) biases and attitudes about stigmatised groups have been shown to impact interpersonal care processes with members of those groups. These biases are caused, in part, by exposure to societal stigma and shared stereotypes about these groups. Medical school is a time of rapid socialisation into the field of medicine and hence the medical school climate and specific observed behaviours are likely to influence students' implicit, as well as explicit, biases. In this paper, we measure these processes and how they influence changes in attitudes about one highly stigmatised group: people with obesity. Health care providers and trainees, like the general public, hold negative attitudes about people with obesity, including beliefs that they are lazy, non-compliant and unintelligent.[1–5] These attitudes, although they represent only a fraction of the stigma experienced by individuals with obesity, can impact communication and decision making in ways that impede patients' attempts to make lifestyle changes,[6,7] prevent them from seeking follow-up care,[8] and lead to suboptimal quality of care.[9–11]

Weight bias consists of at least two cognitive processes[12]: implicit bias, or an unconscious preference for thin over fat people, and explicit bias, a conscious preference. These processes are largely independent of each other[12] and independently predict less patient-centred communication and decision making.[13–16] High prevalences of obesity and overweight mean that approximately two-thirds of patients may be struggling with weight. Thus, weight bias is an important clinical concern that should be addressed in training.

Medical students have high levels of implicit and explicit weight bias at the start of medical school[1] and thus medical schools are well positioned to intervene to reduce bias prior to students' practising medicine. Several key elements of medical education, including curriculum content, instructor role-modelling and student interactions with individuals who have obesity, may affect students' weight bias. A better understanding of these factors is needed to guide interventions to reduce bias in emerging generations of physicians.

Curriculum

Few medical schools provide curriculum content on obesity prevention and treatment, let alone instruction to reduce weight bias.[17] However, most schools offer instruction in health disparities and provider bias broadly (usually in the context of racial bias),[18] as well as skill building in empathic responses to patients, interpersonal communication and regulation of emotions.[19] These experiences may impact implicit or explicit biases. Coursework to develop skills in treating patients with obesity that does not include a consideration of weight bias may increase bias by defining patients with obesity as different and more challenging patients, a process called 'othering'.[20,21]

Modelling

A powerful hidden curriculum[22] is conveyed through faculty staff and instructor modelling of behaviours and attitudes.[23,24] Role models who demonstrate prejudice, disrespect, poor treatment or low expectations of patients with obesity may establish norms that negative attitudes about these patients are expected and even desirable. In a recent study of medical students, 40% reported witnessing instructors make jokes and negative comments toward patients with obesity, and 65% witnessed the making of such comments by other health care providers.[25] Alternatively, exposure to role models who demonstrate positive attitudes about treating patients who have obesity may improve students' attitudes about these patients.

Contact

Positive contact with members of stigmatised groups has been shown to reduce prejudice.[26] Positive contact with patients may challenge students' expectations and stereotypes and increase understanding of causes of obesity or difficulty in losing weight. Working with a peer with obesity or appreciating the accomplishments of a faculty member with obesity may help develop positive emotions about people with obesity.

The objective of this study is to assess changes in implicit and explicit weight biases during medical school, and the medical school factors that influence such changes.

METHODS

Sample

The Medical Student Cognitive Habits and Growth Evaluation Study (CHANGES) is a longitudinal study of medical students who matriculated in US

medical schools in the fall of 2010. We randomly selected 50 medical schools from strata of public and private schools in six regions of the country, using sample proportional to strata size methodology. One sampled school with highly unique characteristics (a military school) was excluded, leaving a sample of 49 schools. From those schools, we ascertained and invited 5823 Year 1 students (68% of all Year 1 students attending sampled schools) to participate in the web-based survey during their first semester of medical school. Recruitment was conducted in three stages: firstly, the Association of American Medical Colleges (AAMC) added an item to its Matriculation Questionnaire asking students to provide an e-mail address if they wished to learn more about participating in the study. Secondly, a publicly available (but incomplete) list was purchased from the American Medical Association (AMA). Thirdly, survey completers were sent an e-mail with study contact information that they could forward to classmates. Students who contacted us were screened for eligibility and sent a link to complete the survey.[1] The sample (n = 4732) consisted of 81% of those sent an invitation and 55% of all Year 1 medical students at the study schools. To reduce overall respondent burden, 50% (n = 2370) were randomly assigned to complete a Weight Implicit Association Test (Weight IAT), a measure of implicit bias. In spring 2014, during the students' final semester, we e-mailed a follow-up survey to students who completed the Weight IAT. Using a response rate maximisation strategy, including a US $50 incentive, we achieved the return of completed surveys from 1890 students (80%). Students who were not in their third or fourth year of medical school for any reason (e.g. delaying attendance, pursuing another degree) were excluded (n = 95), which left complete longitudinal data for 1795 students. This study was approved by the Mayo Clinic Institutional Review Board.

Measures

Common survey questions were used to measure age, sex, race, Hispanic/Latino ethnicity, height and weight at baseline. Students reported their household income during high school (age 15–18 years) to allow us to assess family socio-economic status. Family income was dichotomised into < US $100 000 per year and ≥ US$100 000 per year. Because previous research showed that Black medical students have, on average, more pro-fat implicit attitudes than members of other race groups,[1] race was dichotomised into Black versus all other races. Body mass index (BMI) was calculated.

Implicit weight bias was measured with the Weight IAT, an extensively validated measure of automatic, unconscious attitudes that predicts behaviour independently of explicit attitudes. The Weight IAT is a computer-based measure that compares the time it takes to categorise silhouettes of people with large body sizes with negative words (e.g. awful, horrible) and silhouettes of thin people with positive words (e.g. wonderful, joy) to the opposite (fat/positive, thin/negative).[27,28] Difference scores are calculated and range from −2 (strong pro-fat bias) to 2 (strong anti-fat bias). Change in implicit bias was calculated by subtracting Year 1 scores from Year 4 scores; thus a negative change in score represented a reduction in implicit bias.

Explicit weight bias was measured using a validated 'feeling thermometer' strategy in which participants indicated their feelings toward 'obese people' by moving a slider along a thermometer.[29] Numbers along the thermometer ranged from 0 to 100 degrees, in 10 s, and the ends were labelled, respectively, 'very cold or unfavourable' and 'very warm or favourable'. Change in explicit bias was calculated by subtracting Year 4 scores from Year 1 scores, and thus a negative difference in score represented a reduction in explicit bias. For comparison with bias in the general public, we obtained data from Project Implicit, which collects implicit and explicit data from individuals who visit its website (www.projectimplicit.org).[2,9] These data included Weight IAT and feeling thermometer scores from 397 600 visits during 2010–2013.

Formal curriculum was assessed by calculating the average number of hours the student reported that he or she spent training in each of four domains. The health disparities curriculum is often focused on race disparities, and these classes are most likely to cover the concepts of implicit bias and stigmatised populations. Thus, *hours of training related to disparities* (Cronbach's α = 0.88) was an average of self-reported hours of training devoted to: (i) racial disparities in health care; (ii) identifying cultural customs that might affect clinical care, and (iii) the potential effect of unintended racial bias on care. *Hours of training related to emotion regulation* (α = 0.85) was an average of self-reported hours of training devoted to: (i) managing emotions, and (ii) managing or reducing stress. *Hours of training related to interpersonal skills* (α = 0.81) was an average of self-reported hours of training devoted to: (i) communication skills; (ii) partnership-building skills; (iii) seeing things from the patient's perspective, and (iv) working effectively in interprofessional

teams. Students also reported *hours of training devoted to working with difficult patients*, a term used to describe patients who are non-compliant, medically complex or difficult to communicate with. We categorised this variable into quartiles because it showed a highly skewed distribution. We also assessed student self-reported *skill in providing weight loss counselling* to patients with obesity as a proxy for training in the provision of such counselling.

Role modelling was assessed using two sets of items. *Observed weight stigma* was an average of two items measured on a 5-point scale: (i) 'How often have you heard professors or residents make negative comments about obese patients?' (ii) 'While in medical school, how often have you witnessed discriminatory treatment of an obese patient?' ($\alpha = 0.60$). Each participant also reported whether he or she had observed another student being: (i) given lower grades for unfair reasons; (ii) treated in an unfriendly way as if not welcome; (iii) subjected to offensive remarks or names; (iv) treated with less respect than other students; (v) publicly humiliated, and (vi) ignored by residents or attending physicians. For each of these observations, participants reported the extent to which they attributed the incident to the recipient student's body size, race or ethnicity, gender or sexual orientation. We created a two-category variable whereby one category was assigned to participants who had either witnessed none of these incidents or had witnessed these incidents but said that they were not at all likely to have occurred because of the recipient student's body size. Students who had witnessed any of these incidents and attributed the occurrence to the recipient student's body size were placed in the second category.

Contact with people with obesity was measured by six items. Students reported on a 4-point scale *how much interaction* they had with: (i) obese medical students; (ii) obese faculty staff, attending physicians or residents, and (iii) obese patients. Students also reported on a 4-point scale *how favourable their interactions were* with: (i) obese medical students; (ii) obese faculty staff, attending physicians or residents, and (iii) obese patients.

Analysis

We calculated implicit and explicit weight biases in our sample and compared them with those in the general public during the same period of time. We then developed six preliminary linear mixed models, one for each domain of medical school environment (curriculum, contact and role modelling) predicting change in, respectively, implicit or explicit bias. Each model included a random intercept for school, all independent variables from the given domain and the respective baseline implicit or explicit weight bias score. Model fit was evaluated using R^2 adjusted for mixed models, measuring the variation explained by adding the fixed effects to the random intercept model. We examined β-coefficients and corresponding p-values to assess associations. We examined variance inflation factors, but found no evidence of excessive multicollinearity. We then tested the interactions between amount and favourability of contact with students, faculty staff and patients. The two final linear mixed models included a random intercept for school, the respective baseline implicit or explicit bias score, socio-demographic covariates, and the independent variables and interactions that achieved a p-value of < 0.15 in the three preliminary models.

RESULTS

Sample demographic characteristics are presented in Table 1. Figure 1 shows the mean Weight IAT score at each year between 2010 and 2013 for the Project Implicit (public) sample, and the mean scores in 2010 and 2014 for the CHANGES sample. In 2010, the scores in each sample are approximately equal (0.42 and 0.43). Over the next 2 years, public Weight IAT scores increased (indicating a stronger implicit preference for thin people), before decreasing slightly between 2012 and 2013. By contrast, between 2010 and 2014, the average medical student IAT score in the CHANGES sample decreased substantially (by 0.11), representing a steep reduction in implicit weight bias. Of the 49 sample schools, implicit weight bias increased in five schools and decreased in 44 schools. Figure 2 shows the mean feeling thermometer score by year in the public and CHANGES samples. Absolute differences between the samples are difficult to interpret because of differences in the wording used in the public (fat people) and CHANGES (obese people) samples. The CHANGES sample shows a small but significant increase in explicit bias between 2010 and 2014 (from 30.4 to 35.6; $p < 0.001$), whereas the mean score in the public sample changes little.

In the domain-specific models (Table 2), greater increase in implicit weight bias was associated with more hours of training in dealing with difficult patients ($\beta = 0.032$; $p = 0.027$), and more observation of discrimination or negative comments about patients with obesity by faculty staff ($\beta = 0.025$; $p = 0.029$). Greater decrease in implicit weight bias

Table 1 Sample characteristics of 1795 Year 4 medical students

Characteristic	*n* (%)
Students	1795 (100)
Age, years	
19–22	575 (32.0)
23	456 (25.4)
24–25	473 (26.4)
≥ 26	281 (15.7)
Missing data	10 (0.6)
Sex	
Female	917 (51.1)
Male	878 (48.9)
Body mass index (kg m^{-2})	
< 18.5	50 (2.8)
18.5–24.9	1211 (67.5)
25.0–29.9	430 (24.0)
≥ 30.0	100 (5.6)
Missing data	4 (0.2)
Family income	
< US$100 000	774 (43.1)
≥ US100 000	989 (55.1)
Missing data	32 (1.8)
Race/Ethnicity (multiple categories allowed)	
American Indian/Alaskan Native	25 (1.4)
Black	93 (5.2)
Hispanic	83 (4.6)
East Asian	257 (14.3)
Native Hawaiian/Pacific Islander	24 (1.3)
South Asian	176 (9.8)
White	1281 (71.4)
Unknown	57 (3.2)

was associated with more favourable interactions with patients with obesity ($\beta = -0.047$; $p = 0.014$) and marginally associated with more interaction with medical students with obesity ($\beta = -0.034$; $p = 0.052$) and patients with obesity ($\beta = -0.031$; $p = 0.098$). Greater increase in explicit bias was associated with more observations of discrimination or negative comments about patients with obesity by faculty staff ($\beta = 2.104$; $p < 0.001$). Greater reduction in explicit bias was associated with more skill in providing weight loss counselling to patients with obesity ($\beta = -1.631$; $p = 0.005$), and more favourable interactions with patients with obesity ($\beta = -9.051$; $p < 0.001$). None of the interactions between amount and favourability of contact reached significance.

The final adjusted models explained 41% and 32% of the variance in implicit bias change and explicit bias change, respectively (Table 3). In these models, greater increase in implicit weight bias was associated with more hours of training in dealing with difficult patients ($\beta = 0.028$; $p = 0.034$), and discrimination or negative comments about patients with obesity by faculty members or residents ($\beta = 0.026$; $p = 0.022$). Greater decrease in implicit weight bias was associated with more favourable interactions with patients with obesity ($\beta = -0.033$; $p = 0.023$) and family income of > US$100 000 ($\beta = -0.001$; $p = 0.008$) and marginally associated with more interaction with medical students with obesity ($\beta = -0.026$; $p = 0.057$) and Black race ($\beta = -0.086$; $p = 0.058$). Greater increase in explicit weight bias was associated with observing faculty member and resident discrimination or negative comments about patients with obesity ($\beta = 1.212$; $p = 0.032$) and male gender ($\beta = 3.936$; $p < 0.001$). Greater decrease in explicit weight bias was associated with more favourable interactions with patients with obesity ($\beta = -8.599$; $p < 0.001$).

DISCUSSION

We found evidence that medical school factors influence changes in attitudes about stigmatised patient groups. Implicit weight bias declined considerably and explicit weight bias increased slightly but significantly during medical school. An increase in explicit bias, but not a decrease in implicit bias, is consistent with evidence of declines in empathy as students progress through medical school.[30,31] During the same period, implicit weight bias increased in the general public and explicit bias remained stable, suggesting that changes during medical school do not reflect a secular change in the broader population but may be attributable in some part to the medical school experience. Previous research suggests that implicit weight bias among physicians is similar to that of the population average[2] and thus these findings suggest that either recent changes in medical schools are causing positive change that was not seen historically, or the change is relatively temporary and proximal to medical school completion. Importantly, although implicit bias was reduced overall, the average IAT score at Year 4 still shows slight bias against people with obesity.[32] The implications of these changes for the delivery of care require additional study. Given evidence that decisions (deliberative behaviour) are powerfully influenced by explicit cognitions,[15,33] worsening explicit weight bias over medical school

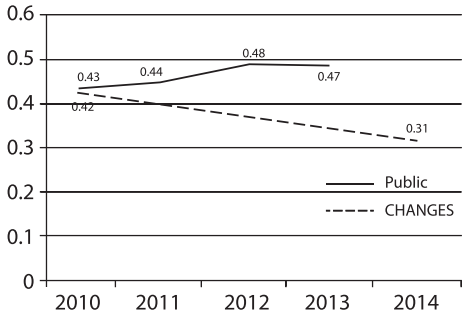

Figure 1 Change in implicit weight bias in medical students in the CHANGES study (2010–2014; $n = 1795$) and in visitors to www.projectimplicit.org (2010–2013; $n = 397\ 600$). Implicit weight bias was measured with the Weight Implicit Association Test, a measure of the difference in the amount of time participants take to categorise images of people with positive or negative words. The CHANGES survey was administered to students in Years 1 and 4 of medical school. Project Implicit data were available for each year between 2010 and 2013

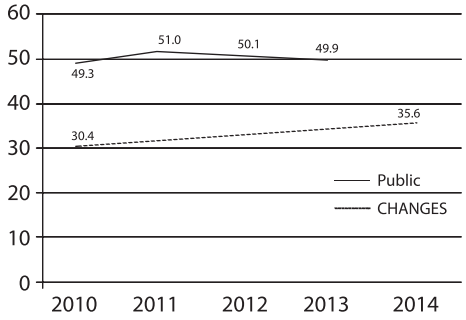

Figure 2 Change in explicit weight bias in medical students in the CHANGES study (2010–2014; $n = 1795$; bias against 'obese people') and in visitors to www.projectimplicit.org (2010–2013; $n = 397\ 600$; bias against 'fat people'). Scores were recorded on a feeling thermometer using a sliding scale ranging from 0 (very cold) to 100 (very warm), on which participants indicate their warmth toward people who are obese. The CHANGES survey was administered to students in Years 1 and 4 of medical school. Project Implicit data were available for each year between 2010 and 2013

might be expected to decrease the likelihood that a provider will utilise face-to-face weight loss counselling. This is consistent with evidence that most providers choose not to initiate weight loss discussions with patients,[34–36] despite clinical guidelines and reimbursement provision in the Affordable Care Act that encourage them to do so.[37,38] Improved implicit bias, which has been shown to exert more influence on subtle non-verbal communication (spontaneous behaviour) and improve patient satisfaction,[15,33] may lead to communication that is more respectful and patient-centred, perhaps improving the patient's experience and outcomes when these actions are taken.

One explanation for the divergent trends in implicit and explicit bias refers to the influence of mediating variables. Positive contact has been found to influence explicit bias partially through decreased anxiety about contact.[39] Thus, if students remain anxious about providing care for patients with obesity, perhaps in part as a result of increased knowledge or emphasis of the health risks of obesity, the potential benefits of contact in medical school may be negated. By contrast, evidence shows that the impact of contact on implicit bias is direct,[39] and thus, this effect was not contingent on intermediary experiences. Further study is necessary to elucidate these complex processes.

Self-reported hours of curriculum spent on training in health disparities, emotion regulation or interpersonal skills did not predict bias change. Emotion regulation and interpersonal skills are more likely to affect the probability that bias influences care, and thus it is unsurprising that they did not predict change in bias itself. It is more surprising, given the reduction in implicit bias overall, that hours of training in health disparities did not predict reduced implicit or explicit bias. This may be

Table 2 Hierarchical linear regression models predicting change in implicit and explicit weight biases for three aspects of the medical school environment: curriculum, contact and role modelling

	Implicit bias change		Explicit bias change	
	Coefficient	**p-value**	**Coefficient**	**p-value**
Curriculum				
Hours of training related to health disparities	−0.002	0.135	−0.094	0.218
Hours of training related to emotion regulation	−0.001	0.683	−0.018	0.788
Hours of training related to interpersonal skills	0.001	0.457	−0.048	0.442
Hours of training in dealing with difficult patients	0.034	0.027	1.132	0.162
Skill providing weight loss counselling to patients with obesity	−0.014	0.200	−1.631	0.005
Baseline bias (implicit or explicit)	−0.700	< 0.001	0.490	< 0.001
Contact				
Amount of interaction with medical students with obesity	−0.034	0.052	−0.326	0.712
Amount of interaction with faculty staff with obesity	0.017	0.337	−0.039	0.966
Amount of interaction with patients with obesity	−0.031	0.098	−0.358	0.708
Favourability of interaction with medical students with obesity	−0.031	0.293	1.451	0.340
Favourability of interaction with faculty staff with obesity	0.041	0.174	−3.066	0.046
Favourability of interaction with patients with obesity	−0.047	0.014	−9.051	< 0.001
Baseline bias (implicit or explicit)	−0.721	< 0.001	0.565	< 0.001
Role modelling				
Observed discrimination/negative comments about patients with obesity	0.021	0.060	2.104	< 0.001
Witnessed micro-aggression against a medical student attributed to his or her body size	0.026	0.224	−0.998	0.387
Baseline bias (implicit or explicit)	−0.716	< 0.001	0.486	< 0.001
Contact interactions*				
Amount × favourability of interaction with medical students with obesity	−0.007	0.731	−0.131	0.910
Amount × favourability of interaction with faculty staff with obesity	−0.027	0.190	1.178	0.327
Amount × favourability of interaction with patients with obesity	−0.036	0.166	−0.697	0.606

* Interaction effects tested in separate models; main effects for the interaction being modelled and baseline bias were included in each model, but are not shown in the table

because curricula on disparities are often focused on race bias. Medical schools should consider including discussions about caring for members of stigmatised populations such as patients with obesity in curricula on disparities. With the exception of favourable interactions with obese patients, the amount and favourability of interaction with obese people were inconsistently associated with bias change. Consistent with the contact hypothesis, independent of favourable interactions with obese patients, amount of contact did not predict attitude change, which suggests the usefulness of a smaller number of meaningful positive experiences.

The number of hours of training in dealing with difficult patients was associated with increased bias. Patients who have obesity tend to have more comorbidities[40] and are often thought of as unable or unwilling to make behaviour changes,[41] and thus they may be more likely to be considered difficult patients. This finding underscores both the importance of addressing students' negative perceptions about treating patients with obesity and the need for strategies and appropriate and accessible examination and care tools to reduce the physical difficulties associated with providing care for this population. Further research is needed to determine the impact of various approaches. For example, schools that emphasise that obese patients represent a special population that requires more resources and time may communicate to students that these patients are a 'problem' and increase students' anxiety and

Table 3 Final adjusted mixed models predicting change in implicit and explicit weight bias during medical school

	Implicit bias change		Explicit bias change	
	Coefficient	**p-value**	**Coefficient**	**p-value**
Fully adjusted models				
Hours of training related to health disparities	−0.001	0.513		
Hours of training in dealing with difficult patients	0.028	0.034		
Skill providing weight loss counselling to patients with obesity			−0.811	0.117
Amount of interaction with medical students with obesity	−0.026	0.057		
Amount of interaction with patients with obesity	−0.031	0.100		
Favourability of interaction with faculty staff with obesity			−1.539	0.176
Favourability of interaction with patients with obesity	−0.033	0.023	−8.599	< 0.001
Faculty/residents discriminate against/make negative comments about patients with obesity	0.026	0.022	1.212	0.032
Baseline body mass index	−0.005	0.074	−0.105	0.494
Black race	−0.086	0.058	0.255	0.910
Male sex	0.020	0.345	3.936	< 0.001
Family income > US$100 000	−0.001	0.008	0.008	0.138
Baseline implicit bias	−0.717	< 0.001		
Baseline explicit bias			0.567	< 0.001

negative attitudes about treating them. This hypothesis should be directly tested in future research. Alternatively, in-depth training on care for challenging patients may help reduce trainees' feelings of failure when these patients are not able to be cured.

The contact hypothesis[42] states that prejudice between groups can be reduced when group members interact with one another in positive ways and find shared characteristics and experiences. Extensive study has supported this hypothesis[26] and found that the effects of inter-group interactions are mediated by increased empathy and reduced anxiety, and most robust when there are shared goals and equal status between group members.[43,44] Interaction with other students, such as during team-based learning, may involve participants of equal status and activity directed toward a common goal (academic success). Thus, the positive association between amount of interaction with obese students and implicit bias reduction is consistent with contact hypothesis. Favourable contact with patients with obesity may reduce anxiety about providing care for these patients and help students see them as individuals, which may increase empathy and reduce bias, although there is some evidence to the contrary.[45] Further research should clarify whether inter-group contact reduces bias and improves the quality of care.

Role modelling is an important part of medical education and socialisation,[24] and is a primary vehicle for learning professionalism.[23] It is thus not surprising that observations of role models making negative comments about or discriminating against patients with obesity are associated with increased bias. The frequency and normalisation of derogatory humour and comments are pervasive problems in medical education,[25,46] and their reduction or banishment may lead to greater improvements in students' attitudes.

This study used a robust longitudinal design to assess change in implicit weight bias and benefited from a large national sample of medical students. It provides vital information to guide medical school interventions to reduce bias and improve patient care. However, several additional elements of medical education remain unmeasured and may influence weight bias. Thus, more research is needed to elucidate the elements of medical school that are reducing implicit weight bias in students, and future studies should expand upon the school factors measured in this study. Furthermore, research is needed to test whether the associations found here are consistent for other stigmatised groups, including people of racial and ethnic minorities, and sexual minorities, and people from lower socio-economic backgrounds, and

whether attitudes about individuals with membership of multiple stigmatised groups are similarly affected.

CONCLUSIONS

The findings of this study point to a number of potential interventions to improve the attitudes of new physicians. Providing positive learning experiences with patients who have obesity may reduce bias. Promoting a school climate that communicates respect for patients of all sizes, and adopting a zero-tolerance policy toward discriminatory behaviour or derogatory comments may instil in students a professional and caring attitude toward patients who are obese. Finally, eliminating the message that certain patients are 'difficult' may avoid future adversarial encounters with patients who are so labelled and help students develop empathy and understanding of each patient's individual needs.

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