

REVIEW

Clinical Trials and Investigations

Weight bias among health care professionals: A systematic review and meta-analysis

Blake J. Lawrence^{1,2}  | Deborah Kerr¹ | Christina M. Pollard¹ | Mary Theophilus³ |
Elise Alexander^{1,2} | Darren Haywood^{1,2}  | Moira O'Connor^{1,2}

¹School of Population Health, Curtin University, Perth, Western Australia, Australia

²Western Australia Cancer Prevention Research Unit, Curtin University, Perth, Western Australia, Australia

³St John of God Hospital, Perth, Western Australia, Australia

Correspondence

Blake J. Lawrence, School of Population Health, Curtin University, 6102, Perth, Western Australia, Australia.
Email: blake.lawrence@curtin.edu.au

Abstract

Objective: Weight-biased attitudes and views held by health care professionals can have a negative impact on the patient-provider relationship and the provision of care, but studies have found mixed results about the extent and nature of bias, which warrants a review of the evidence.

Methods: A systematic review and random-effects meta-analysis were conducted by including studies up to January 12, 2021.

Results: A total of 41 studies met inclusion criteria, with 17 studies providing sufficient data to be meta-analyzed. A moderate pooled effect (standardized mean difference = 0.66; 95% CI: 0.37-0.96) showed that health care professionals demonstrate implicit weight bias. Health care professionals also report explicit weight bias on the Fat Phobia Scale, Antifat Attitudes Scale, and Attitudes Towards Obese Persons Scale. Findings show that medical doctors, nurses, dietitians, psychologists, physiotherapists, occupational therapists, speech pathologists, podiatrists, and exercise physiologists hold implicit and/or explicit weight-biased attitudes toward people with obesity. A total of 27 different outcomes were used to measure weight bias, and the overall quality of evidence was rated as very low.

Conclusions: Future research needs to adopt more robust research methods to improve the assessment of weight bias and to inform future interventions to address weight bias among health care professionals.

INTRODUCTION

Almost 65% of Australian adults are now living with overweight or obesity (1), and projections suggest almost 80% of adults in Western nations will be living with overweight or obesity by 2030 (2). Overweight and obesity are associated with increased risk of cardiovascular disease (3), type II diabetes mellitus (4), and colorectal, ovarian, renal cell, postmenopausal breast, gallbladder, and thyroid cancers (5). In addition to pathophysiological effects, many individuals living with overweight or obesity experience feelings of weight stigmatization (6), which are associated with increased

depression, anxiety, stress, suicidality, and substance use, as well as low self-esteem (7-9). For people with overweight and obesity, negative psychosocial experiences frequently precipitate maladaptive coping mechanisms (e.g., comfort and binge eating), which lead to greater weight gain and reinforce feelings of stigma (10,11). Research (12) suggests that people with overweight or obesity may also feel stigmatized about their weight by individuals who hold negative weight-based stereotypes, known as weight stigma (13), and these stereotypes may influence an individual's behavior toward a person living with overweight or obesity, known as weight bias (14).

Weight biases include assumptions that people living with overweight or obesity are lazy, incompetent, lacking willpower and self-discipline, and not motivated to improve their health (12). Evidence shows that up to 42% of adults living with overweight or obesity experience weight bias, which leads to internalized feelings of weight stigmatization (15). Weight bias associated with overweight and obesity may also pose a greater threat to an individual's health than increasing BMI (6). Longitudinal evidence shows that irrespective of baseline BMI, adults who experienced weight discrimination have a 60% increased risk of death (16). The pervasive nature of weight bias also increases long-term risks of cardiometabolic health issues for people living with overweight and obesity (17), with a biomarker study showing a 207% increase in risk of high levels of allostatic load, associated with chronic life stressors, among individuals who had experienced ongoing weight discrimination during their life (18). Substantial evidence now shows that weight bias and stigma are psychosocial contributors to the obesity pandemic (12), with health care professionals (HCPs) and health care settings identified as sources of weight bias that require urgent attention.

People living with overweight and obesity rely on HCPs when seeking advice to improve their health, and a supportive client-provider relationship is of the utmost importance for successful long-term weight loss and improvements in health (19). Most HCPs demonstrate a commitment to providing care and do not intentionally discriminate against their clients. However, increasingly research shows that a proportion of HCPs hold biased attitudes about people living with overweight or obesity. Weight bias has been reported in physicians (20), nurses (21), dietitians (22), physiotherapists (23), and psychologists (24), as well as nutritionists and exercise professionals (25), and it is as pervasive among medical professionals as it is within the general population (20). Weight-biased attitudes may have a profoundly negative effect on the sensitive and personal nature of the client-provider relationship, which is often compounded by the power imbalance in most health care settings (26).

For people living with overweight or obesity, experiences of weight bias from HCPs are associated with less engagement and use of health care services and consequently delaying or forgoing medical intervention. A scoping review (27) found that weight bias was often expressed by HCPs through contemptuous, patronizing, and disrespectful treatment, as well as attributing all of a patient's health issues to excess weight, which directly contributes to feelings of weight stigmatization and which is associated with avoidance, delay, or cancellation of health care appointments. Up to 55% of women living with obesity report delaying or canceling an appointment if they anticipated needing to be weighed during the consultation (28), and evidence shows that women with overweight or obesity admit to delaying or avoiding pelvic and breast examinations because of fears of judgment when needing to expose their bodies (29). Therefore, weight bias in HCPs may prevent active participation in the health care system by individuals with obesity who are likely most at risk of comorbidities associated with their weight. However, when people with obesity do participate in the health care system, weight bias may also adversely affect a HCP's provision of care.

Study Importance

What is already known?

- ▶ People living with overweight or obesity report experiencing weight-biased attitudes from health care professionals.
- ▶ Implicit and explicit weight bias has been identified within specific health care disciplines, but results vary across studies, which warrants the need for a review of the evidence.

What does this study add?

- ▶ From 41 studies, medical doctors, nurses, dietitians, psychologists, physiotherapists, occupational therapists, speech pathologists, podiatrists, and exercise physiologists demonstrate implicit and/or explicit weight bias toward people living with overweight or obesity.
- ▶ Studies use heterogeneous methods to measure weight bias in health care professionals, which undermines the reliability of the extant literature.

How might these results change the direction of research?

- ▶ These results show that future research needs to develop a psychometrically validated and reliable measure of weight bias that is tailored to health care professionals and health care settings.
- ▶ Future research must also begin to examine the potential of obesity education programs and virtual reality applications as professional development activities for reducing weight bias in health care professionals.

Phelan and colleagues (30) proposed a model to explain the potential associations between a patient living with obesity and future health outcomes and how this relationship may be partially mediated by HCPs' biased attitudes and stereotypes about obesity. Despite increasing evidence that obesity is a complex condition associated with biological (31,32), socioeconomic (33), and psychological (34) risk factors that frequently operate in a cyclic model of reinforcement predisposing many people to lifelong obesity, many HCPs continue to view obesity as the consequence of an individual's poor lifestyle choices and an avoidable risk factor for many diseases (13). Therefore, HCPs may inadvertently allow this simplistic view of obesity to influence their perceptions of patients with weight gain, leading to less respect for patients with obesity (35), less time educating them about their health (36), and potentially worse health outcomes.

Despite research showing the existence of weight bias within many health care settings, the heterogeneous methods used to assess weight bias have been identified as a primary limitation of

the extant literature. A 2017 systematic review (37) of the characteristics and psychometric properties of explicit weight bias questionnaires showed that 40 different outcome measures had been developed. Whereas most questionnaires demonstrated adequate internal consistency (i.e., items measuring a similar construct), most studies developing these outcome measures did not use a theoretical framework to inform item structure nor did they report all relevant psychometric properties (e.g., test-retest reliability, sensitivity to change, discriminant or structural validity) to support their dissemination and use within research and clinical settings (37). The use of many different questionnaires to assess weight bias in HCPs may have contributed to variable findings in the literature, with some studies reporting a presence of weight bias (38,39) and others reporting neutral (40,41) or even favorable (42,43) views toward people living with obesity. Therefore, it is not clear whether these variable findings represent methodological differences between studies or provide evidence of differences in the extent of weight bias in HCPs.

In summary, weight bias in HCPs can directly contribute to the growing obesity pandemic (6) and it is associated with worse mental health outcomes (7-9), increased risk of long-term cardiometabolic health issues (17,18), and early mortality (16) in people living with overweight and obesity. Weight bias in HCPs also negatively influences the client-provider relationship and the provision of care (30), which consequently reduces participation in the health care system (27) for individuals living with significant weight gain. Previous literature reviews (25,44) examined weight bias in specific health care disciplines, and only one early review (45) examined attitudes toward obesity across multiple health care settings. However, this study was an integrative review rather than a systematic review or meta-analysis. Many more weight bias studies have been published over the past decade, hence the need for an updated review of the literature. It is not clear what extent of weight bias exists across all health care disciplines, and no previous review, to our knowledge, has attempted to meta-analyze the results to provide pooled estimates of the extent of weight bias in HCPs. Therefore, the current systematic review and meta-analysis will answer the following question: what is the extent of weight bias in HCPs?

METHODS

The Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA) statement (46) (Supporting Information Table S1) was followed for this systematic review and meta-analysis, and the protocol was prospectively registered with PROSPERO (ID: CRD42020209406).

Search strategy

Electronic databases were searched (e.g., MEDLINE, Embase, Web of Science, PsycInfo) using relevant search terms (e.g., weight bias,

stigma, obesity) to identify published articles reporting weight bias in HCPs (Supporting Information Table S2). Gray literature and preprint databases were also searched (e.g., OpenGrey, biorxiv, psyxiv) to identify unpublished manuscripts relevant to this topic. Reference lists of previous systematic reviews were also searched for relevant articles, and studies were included from first date of journal publication to January 12, 2021. Searches were limited to English language and adult participants.

Study selection

Studies were included if they involved participants currently working as HCPs (e.g., physician, nurse, surgeon, dietitian, physiotherapist, occupational therapist, psychologist) and included an implicit and/or explicit measure of weight bias. Cross-sectional, cohort, and baseline results from intervention studies were considered for inclusion in this review. The lead author (BJL), who is experienced in systematic reviews and meta-analyses, screened all article titles and abstracts in-line with selection criteria to identify articles for inclusion. Co-authors (DK, EA, and DH) then independently screened full text articles in-line with selection criteria and provided recommendation for the final articles for inclusion. Any disagreements were resolved through discussion.

Data extraction

Participants, study characteristics, weight bias outcomes, and findings were extracted from each study. Only the most recent studies were included in this review when data were reported from the same participants but in separate studies. Corresponding authors were contacted when study information and sufficient data for meta-analysis were not reported in published articles.

Statistical analysis

For studies reporting Cohen's *d* for performance on the Implicit Association Test, a standardized mean difference (SMD) was used to represent the pooled effect size. Effect sizes were pooled using a random-effects model with 95% confidence intervals (CI) (47). Egger's regression asymmetry test and Rosenthal's Fail-Safe *N* were used to assess publication bias within this effect. Cochrane *Q* and *I*² statistics were used to examine heterogeneity. If *Q* was statistically significant ($p < 0.10$), the *I*² statistic estimated the percentage of variation across the samples due to heterogeneity. *I*² values of 0% to 40% (low), 41% to 60% (medium), and 61% to 100% (high) were used to categorize levels of heterogeneity (46).

For studies reporting means and standard deviations on explicit weight bias outcomes (e.g., Fat Phobia Scale), pooled means and standard deviations were used to represent the extent of weight bias on those outcomes. Means and standard deviations were

pooled only when two or more studies reported performance on the same outcome measure and when sufficient data was available to compute the pooled estimate. Pooled means and standard deviations for studies reporting performance from one group of participants could only be interpreted for each outcome independently; therefore, no standardized pooled effect and associated publication bias and heterogeneity statistics could be computed for these outcomes. Instead, the extent of weight bias of the pooled means was reported in relation to the scoring method for each outcome. When studies did not report sufficient data to compute pooled means or SMDs, values were computed using available data following recommendations by Borenstein et al. (47). All statistical analysis was completed using Comprehensive Meta-Analysis (CMA) version 3.3.070.

Study quality assessment

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) system was used to assess the quality of evidence (48). The GRADE system evaluates the quality of evidence across studies for each pooled effect size included in a systematic review, summarized by an overall “certainty of evidence” grading. Gradings range from “very low” to “high” and represent the extent of certainty in an outcome result as a reliable estimate of an effect (48).

RESULTS

Search results

A total of 5,908 article titles and abstracts were systematically screened from online databases (Figure 1). A total of 41 studies including 12,818 participants met inclusion criteria for this systematic review, and 17 of those studies provided sufficient data to be meta-analyzed.

Study characteristics

A total of 40 studies were cross-sectional designs, and 1 study (49) reported baseline results from a between-groups intervention (Supporting Information Table S3). Among studies that reported sample demographics, participants were middle-aged (mean age = 41.25 [5.59], $k = 25$) and more frequently female (67%, $k = 36$). Studies were published between 1989 and 2020, with one study (50) included from gray literature. Seven studies (39,51-56) examined the extent of weight bias in a multidisciplinary group of HCPs, twelve studies (21,42,49,50,57-64) examined weight bias in nurses, twelve studies (20,35,38,41,43,65-71) in physicians/medical doctors, five studies (22,40,72-74) in dietitians, three studies (23,75,76) in physiotherapists/physical therapists, and one study in psychologists (24) and physician assistants (77). Seven studies

(20,21,53,64,66,71,73) examined implicit weight bias measured by the Weight Implicit Association Test, and the remaining studies examined explicit weight bias using 26 different methods. Six studies (22,39,54,74,76,77) used the Fat Phobia Scale, four studies (42,49,51,62) used the Attitudes Towards Obese Persons Scale, four studies (21,23,64,76) used the Antifat Attitudes Questionnaire, three studies (50,55,61) used the Nurses' Attitudes Toward Obesity and Obese Patients scale, three studies (39,49,76) used the Beliefs About Obese People scale, three studies (41,59,72) used the Bray Attitude Toward Obesity Scale, two studies (57,60) used the Nurses' Attitudes Toward Obese Adult Patients scale, and two studies (66,71) used the same two-item questionnaire assessing explicit attitudes toward “thin” and “fat” people. Authors of the remaining 16 studies used different methods to measure explicit weight bias in HCPs (20,24,35,38,43,51,52,56,58,63,65,67-70,75).

Implicit weight bias

A moderate and statistically significant pooled effect (SMD = 0.66; 95% CI: 0.37-0.96) shows that HCPs demonstrate implicit weight bias (Table 1). Egger's regression was not significant ($p = 0.24$), suggesting no presence of publication bias in this pooled effect, and 1,126 studies with nonsignificant results would be needed to render this effect zero. There was a large degree of heterogeneity within the pooled effect ($Q = 114.99$, $p < 0.001$; $I^2 = 94.78$). However, the small number of studies included in this analysis ($k = 7$) did not allow for a meaningful subgroup examination of the variance within the pooled effect. In accordance with the GRADE criteria (48), the quality of evidence was classified as very low (Table 2).

Explicit weight bias

In accordance with each outcome's scoring methods (Table 3), HCPs reported explicit weight bias on the Fat Phobia Scale (mean = 3.48 [0.05]), the Antifat Attitudes Scale (2.85 [0.33]), and the Attitudes Towards Obese Persons Scale (69.30 [1.77]). Scores on the Nurses Attitudes Towards Overweight and Obese Patients Scale indicated no presence of weight bias for studies that used this outcome (50,61).

DISCUSSION

Findings from this systematic review and meta-analysis show that medical doctors, nurses, dietitians, psychologists, physiotherapists, physician assistants, physical therapists, occupational therapists, speech pathologists, podiatrists, and exercise physiologists hold implicit or explicit weight-biased attitudes toward people with overweight or obesity. Studies included in this review were published from 1989 to 2020, indicating that weight bias has been reported in the literature for more than three decades. Most HCPs provide the highest quality care for their patients; however, results from

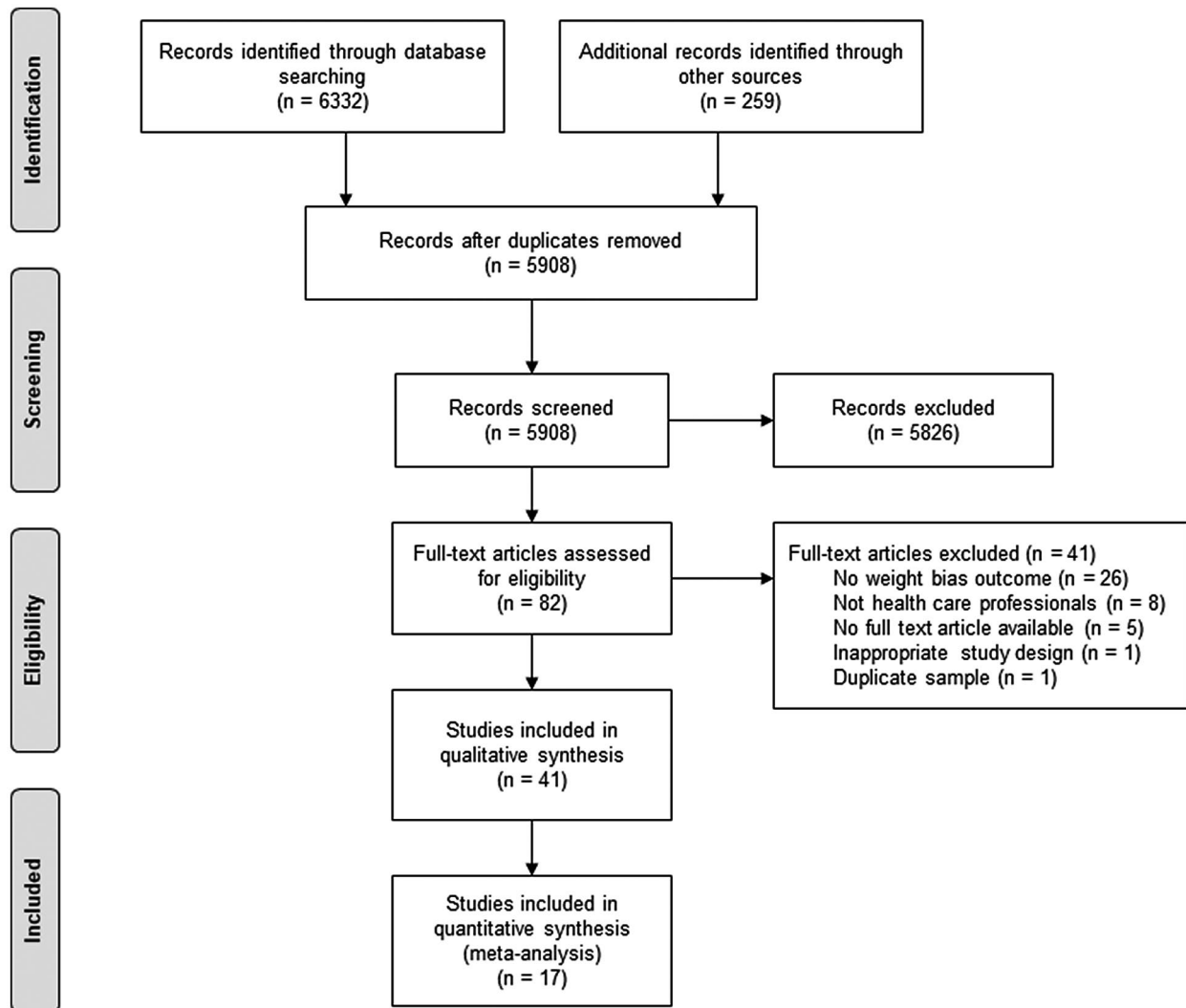


FIGURE 1 PRISMA flowchart of search results. PRISMA, Preferred Reporting Items of Systematic Reviews and Meta-Analyses

this review suggest that weight-biased attitudes exist within many health care settings. Weight bias exhibited by HCPs negatively affects the provision of care (30) and it is associated with less use of health care services by clients with overweight or obesity (30), which consequently leads to treatment avoidance. Patients report avoiding treatment when they do not feel HCPs are attentive to their health concerns or spend sufficient time listening to them during a consultation (78). Considering that weight bias is often expressed by HCPs through patronizing and disrespectful language (27), patients living with overweight or obesity may be more likely to avoid treatment and participation in the health care system to reduce the risk of experiencing weight bias and stigmatization. Up to 80% of people in developed nations will be living with overweight or obesity by 2030 (2), which indicates that most people participating in the health care system will be living with overweight or obesity. Without intervention, weight bias may, therefore, contribute to the worsening obesity pandemic (6). Supported by the recent joint international consensus statement for ending stigma of obesity (13), it is clear that current and future research needs to first improve our understanding

of weight bias in HCPs and then develop interventions to address this psychosocial issue impacting people living with overweight and obesity.

This systematic review and meta-analysis found that HCPs demonstrate explicit weight bias on several frequently used weight bias outcomes (e.g., Fat Phobia Scale, Antifat Attitudes Scale). However, among the 41 studies included in this review, 26 different outcome measures were used to assess weight bias, and most studies that used or developed original outcomes did not report sufficient psychometric properties to determine their reliability or validity (20,24,35,38,43,51,52,56,58,63,65,67-70,75). Lacroix and colleagues (37) also identified significant heterogeneity in the use and development of weight bias outcomes, with 40 different questionnaires used to measure weight bias in the literature, and most of those studies did not report sufficient psychometric properties for their outcomes. Before we are able to develop interventions to address weight bias effectively in health care settings, we must first be able to measure weight bias with robust and psychometrically validated tools that are tailored to the perceptions and experiences

TABLE 1 Individual and pooled effect estimate of implicit weight bias outcomes

Weight bias outcome	Study	N	Discipline	Effect size			Heterogeneity			
				SMD	SE	95% CI		Q (df)	p	I ²
						Lower	Upper			
Implicit Association Test	Teachman et al. (2001)	84	Multidisciplinary	0.45	0.11	0.22	0.67	0.001*		
	Vallis et al. (2007)	78	Multidisciplinary	0.32	0.06	0.16	0.62	0.001		
	Edeistein et al. (2009)	128	Dietitians	0.18	0.09	0.00	0.35	0.05		
	Sabin et al. (2012)	2,284	Medical doctors	0.93	0.03	0.88	0.95	0.001*		
	Lund et al. (2018)	240	General practitioners	1.14	0.08	0.98	1.30	0.001*		
	Robstad et al. (2018)	30	Nurses	1.29	0.30	0.09	1.88	0.001*		
	Robstad et al. (2019)	159	Nurses	0.43	0.18	0.03	0.78	0.02		
	Total	3,003	Pooled effect estimate	0.66	0.15	0.37	0.96	0.001*	114.99 (6)	0.001*

Abbreviations: Q, Cochran Q; SMD, standardized mean difference.

*p < 0.001.

TABLE 2 GRADE summary of evidence for implicit weight bias in health care professionals

Population: health care professionals						
Setting: community samples						
Outcome, N ^o of participants (studies)	Risk of bias	Inconsistency	Indirectness	Imprecision	Overall certainty of evidence	Effect size SMD (95% CI) / What happens
Implicit weight bias, N ^o of participants: 3,003 (7 studies)	Serious	Serious	Not serious	Serious	⊕○○○ VERY LOW ¹⁻⁴	0.66 (0.37 to 0.96) / Health care professionals demonstrate a moderate degree of implicit weight bias

Abbreviation: SMD, standardized mean difference.

¹Risk of bias was downgraded one level because studies did not include an active control group.

²Inconsistency was downgraded one level because of a large degree of heterogeneity between a small number of studies within the pooled effect.

³Indirectness was not downgraded considering all studies used the same outcome measure within similar participant groups.

⁴Imprecision was downgraded one level because of a small number of studies and small N participants included in the pooled effect.

TABLE 3 Individual and pooled means of explicit weight bias outcomes

Weight bias outcome	Study	N	Discipline	Mean	SE
<i>Fat Phobia Scale</i>	Wolf et al. (2012)	122	Physician assistants	3.58	0.05
	Hellbardt et al. (2014)	49	Dietitians	3.50	0.06
	Wise et al. (2014)	221	Health care professionals	3.50	0.03
	Diversi et al. (2016)	201	Dietitians	3.37	0.03
	Elboim-Gabyzon et al. (2020)	285	Physical therapists	3.60	0.03
	Total	878	Pooled mean	3.48*	0.05
<i>Antifat Attitudes Scale</i>	Setchell et al. (2014)	256	Physiotherapists	3.20	0.07
	Robstad et al. (2018)	30	Nurses	2.88	0.32
	Robstad et al. (2019)	159	Nurses	2.03	0.11
	Elboim-Gabyzon et al. (2020)	114	Physical therapists	3.30	0.11
	Total	559	Pooled mean	2.85*	0.33
<i>Attitudes Towards Obese Persons Scale</i>	Wang et al. (2016)	297	Nurses	71.04	0.81
	Hyer et al. (2020)	312	Nurses	67.50	0.95
	Total	609	Pooled mean	69.30*	1.77
<i>Nurses Attitudes Towards Overweight and Obese Patients Scale¹</i>					
Response to patients	Watson et al. (2008)	604	Nurses	495.57	7.43
	Torrey et al. (2014)	106	Nurses	336.07	17.23
	Total	710	Pooled mean	416.57	79.75
Characteristics	Watson et al. (2008)	604	Nurses	564.05	7.43
	Torrey et al. (2014)	106	Nurses	276.14	11.61
	Total	710	Pooled mean	420.23	143.96
Lifestyle factors	Watson et al. (2008)	604	Nurses	522.52	14.05
	Torrey et al. (2014)	106	Nurses	254.52	5.57
	Total	710	Pooled mean	388.21	134
Stereotypes	Watson et al. (2008)	604	Nurses	85.05	4.45
	Torrey et al. (2014)	106	Nurses	83.99	4.44
	Total	710	Pooled mean	84.54	3.14
Caring for patients	Watson et al. (2008)	604	Nurses	123.73	3.59
	Torrey et al. (2014)	106	Nurses	126.40	5.48
	Total	710	Pooled mean	124.53	3

¹The Nurses Attitudes Towards Overweight and Obese Patients Scale produces five subscale estimates rather than an overall total score.

*Pooled mean suggests presence of weight bias as measured by corresponding outcome.

of clients and practitioners. Any future attempts at assessing the extent of weight bias in HCPs must either administer an existing outcome measure with sufficient psychometric properties (e.g., Nurses' Attitudes Toward Obesity and Obese Patients Scale (61)) or use a theoretical framework to develop a global measure (including context specific subscales) to assess weight bias across all health care disciplines and follow established psychometric conventions for questionnaire development (79).

Development of a universal tool to accurately assess weight bias in HCPs will need to follow the following protocol: 1) item development; 2) questionnaire development; and 3) questionnaire

evaluation (79). Item development (determining the first set of items to be included in the questionnaire) involves identification of the domain (i.e., weight bias) and associated items relevant to that domain. Questionnaire development involves pretesting questions, preliminary survey administration, reducing questionnaire items, and identifying the latent (i.e., underlying) factors assessed by the questionnaire. Questionnaire evaluation involves statistical analysis of questionnaire dimensionality, reliability, and validity (79). A new tool to assess stigma associated with type 2 diabetes (80,81) provides an example of questionnaire development that could be followed to develop a new universal tool to assess weight bias in HCPs.

First, development of the Type 2 Diabetes Stigma Assessment Scale (DSAS-2) involved semi-structured qualitative interviews with adults living with type 2 diabetes to understand their perceptions and experiences of diabetes stigma (i.e., identification of the domain) (80). From the qualitative interviews, 57 questionnaire items relevant to diabetes stigma were developed into a preliminary questionnaire and administered to a new group of participants with lived experience of diabetes stigma (81). Following feedback from this group of participants, the DSAS-2 items were reduced to 48 items and administered to a large ($N = 1,064$) sample of participants to identify latent constructs and assess the questionnaire's dimensionality, reliability, and validity (81). The final version of the DSAS-2 included 19 questionnaire items assessing three latent constructs associated with diabetes stigma (i.e., treated differently, blame and judgment, and self-stigma). Each construct, as well as the overall factor structure of the questionnaire, demonstrated high internal consistency ($\alpha > 0.80$) and sufficient concurrent validity (scores correlated with a similar established questionnaire), convergent validity (scores correlated with a questionnaire assessing a construct related to diabetes stigma), and discriminant validity (scores did not correlate with a construct unrelated to diabetes stigma). Any future examination of weight bias in HCPs will, therefore, benefit from first developing and validating a new universal tool, and we recommend following these established conventions of questionnaire development (79-81).

Following development of a tool to accurately assess weight bias in HCPs, future research also needs to explore potential interventions to reduce weight bias in health care settings. Preliminary evidence shows that some interventions may be efficacious for ameliorating weight bias in HCPs (82,83). Many HCPs view obesity as the consequence of an individual's poor lifestyle behaviors rather than a disease, which incorrectly informs their weight-biased attitudes (13). However, a randomized controlled trial of an "obesity as a disease" video teaching intervention showed that HCPs (when compared with the general population) were more likely to rate the burden of obesity as a disease higher following completion of the teaching intervention (83). These results suggest that improving HCPs' knowledge of obesity as a disease (rather than a lifestyle choice) may begin to change their attitudes toward people living with obesity and, therefore, reduce weight bias in health care settings. Evidence also suggests that adopting more weight-neutral terminology during consultations may reduce weight bias and feelings of weight stigmatization in health care settings (82). Patients with overweight or obesity report preferring terms such as "unhealthy weight" rather than "obese" when discussing their weight with HCPs (84), which indicates that the relatively simple approach of changing weight-based language may decrease weight bias and improve patient-provider relationships. Virtual reality interventions may also prove to be a novel approach to addressing weight bias in HCPs. Quigley and colleagues (85) are currently developing a virtual reality training tool to improve sensitive weight-related communication skills in HCPs, and results from a pilot trial are expected in the near future. The above interventions for addressing weight bias in HCPs are promising; however, it must be noted that implicit biases may be more resistant to change


over time when compared with explicit biases, with evidence showing an increase in implicit weight bias in the general population (86). That being said, preliminary studies show that medical students may demonstrate a decrease in implicit weight bias over time (87,88), which provides evidence to support future interventions to address weight bias among the next generation of HCPs. Future research will also need to examine the potential of these interventions for addressing both implicit and explicit weight biases independently and consider whether an integrated approach of obesity education, sensitive communication training, and virtual reality applications is most efficacious for addressing implicit weight biases likely resistant to intervention. However, it is important to emphasize that evidence supporting interventions to address weight bias in HCPs is currently limited and requires further research to determine specifically which type of intervention (or which combination of interventions) will be most efficacious in this population.

Compared with older HCPs, one study found that younger HCPs exhibited greater weight bias toward patients with obesity (89). Weight-biased attitudes have also been identified in university students studying health science disciplines (90,91). Therefore, the most effective way to reduce weight bias in HCPs may be to increase education of obesity as a disease (92), as well as increasing sensitive communication training (93) and use of virtual reality applications (85) during tertiary education, to ensure that future HCPs develop greater awareness and understanding of the potential influence of weight bias on their provision of care and how weight bias may negatively influence the patient-provider relationship.

The primary strength of this systematic review and meta-analysis is the inclusion of all published studies examining weight bias across health care disciplines, which showed that implicit and explicit weight biases are exhibited by many HCPs. Most studies examined weight bias in nurses and medical doctors, with few studies examining weight bias in allied health fields (i.e., dietitians, psychologists, physiotherapists). Therefore, we recommend future studies with these populations to improve our understanding of weight bias across all health care settings and to ensure that future interventions are tailored to the context of weight bias within each domain. The current study was also the first to meta-analyze pooled estimates of implicit and explicit weight biases across health care disciplines, and there was no presence of publication bias within the implicit bias pooled effect. There was a large degree of heterogeneity within the pooled effect for implicit weight bias, but because of the small number of studies included in the pooled effect, we were not able to explore the heterogeneity with subgroup analyses. As noted above, the heterogeneous use of different, and often psychometrically flawed, outcome measures to assess weight bias is the primary limitation of existing studies. This heterogeneity also did not permit a greater proportion of studies to be pooled within the implicit and explicit weight bias effect estimates. In addition, the quality of the evidence supporting the pooled effect for implicit weight bias was rated as very low because of weaknesses in study designs (i.e., case study, cross-sectional) and significant heterogeneity within the pooled effect. Although it was not possible to evaluate

the quality of evidence using the GRADE criteria (48), for the pooled mean scores of explicit weight bias outcomes the studies examining explicit weight bias used similar research designs that also provided low quality evidence. Therefore, future studies must examine the extent of weight bias and potential interventions to address weight bias using robust research designs in order to improve our understanding of this psychosocial issue that is directly contributing to the global obesity pandemic.

CONCLUSION

This systematic review and meta-analysis included 41 studies examining weight bias in 12,818 HCPs. Although most HCPs endeavor to provide the highest quality of care for their patients, implicit and explicit weight bias was identified within many health care settings. For people living with overweight or obesity, experiencing weight bias during consultations with HCPs often leads to feelings of internalized weight stigma, which is associated with increased depression, anxiety, stress, and suicidality. These mental health issues often elicit maladaptive coping mechanisms such as comfort and binge eating, which may lead to greater weight gain. Future studies must employ high quality research designs to improve our measurement of weight bias in HCPs and to inform future interventions to address this psychosocial contributor to obesity as a global health crisis. 

CONFLICT OF INTEREST

The authors declared no conflict of interest.

ORCID

Blake J. Lawrence  <https://orcid.org/0000-0002-8772-8226>

Darren Haywood  <https://orcid.org/0000-0002-9317-4135>

REFERENCES

- Huse O, Hettiarachchi J, Gearon E, Nichols M, Allender S, Peeters A. Obesity in Australia. *Obes Res Clin Pract*. 2018;12(1):29-39.
- Ward ZJ, Bleich SN, Craddock AL, et al. Projected US state-level prevalence of adult obesity and severe obesity. *N Engl J Med*. 2019;381(25):2440-2450.
- Khan SS, Ning H, Wilkins JT, et al. Association of body mass index with lifetime risk of cardiovascular disease and compression of morbidity. *JAMA Cardiol*. 2018;3(4):280-287.
- Hinnouho G-M, Czernichow S, Dugravot A, et al. Metabolically healthy obesity and the risk of cardiovascular disease and type 2 diabetes: the Whitehall II cohort study. *Eur Heart J*. 2015;36(9):551-559.
- Avgerinos KI, Spyrou N, Mantzoros CS, Dalamaga M. Obesity and cancer risk: emerging biological mechanisms and perspectives. *Metabolism*. 2019;92:121-135.
- Tomiya AJ, Carr D, Granberg EM, et al. How and why weight stigma drives the obesity 'epidemic' and harms health. *BMC Med*. 2018;16(1):123. doi:10.1186/s12916-018-1116-5
- Wu YK, Berry DC. Impact of weight stigma on physiological and psychological health outcomes for overweight and obese adults: a systematic review. *J Adv Nurs*. 2018;74(5):1030-1042.
- Papadopoulos S, Brennan L. Correlates of weight stigma in adults with overweight and obesity: a systematic literature review. *Obesity (Silver Spring)*. 2015;23(9):1743-1760.
- Brochu PM. Weight stigma as a risk factor for suicidality. *Int J Obes (Lond)*. 2020;44:1979-1980.
- Schvey NA, Puhl RM, Brownell KD. The impact of weight stigma on caloric consumption. *Obesity (Silver Spring)*. 2011;19(10):1957-1962.
- Sutin AR, Terracciano A. Perceived weight discrimination and obesity. *PLoS One*. 2013;8(7):e70048. doi:10.1371/journal.pone.0070048
- Puhl RM, Himmelstein MS, Pearl RL. Weight stigma as a psychosocial contributor to obesity. *Am Psychol*. 2020;75(2):274-289.
- Rubino F, Puhl RM, Cummings DE, et al. Joint international consensus statement for ending stigma of obesity. *Nat Med*. 2020;26:485-497.
- Brownell KD, Puhl RM, Schwartz MB, Rudd LE. *Weight Bias: Nature, Consequences, and Remedies*. Guilford Publications; 2005.
- Spahlholz J, Baer N, König H-H, Riedel-Heller SG, Luck-Sikorski C. Obesity and discrimination—a systematic review and meta-analysis of observational studies. *Obes Rev*. 2016;17(1):43-55.
- Sutin AR, Stephan Y, Terracciano A. Weight discrimination and risk of mortality. *Psychol Sci*. 2015;26(11):1803-1811.
- Takizawa R, Danese A, Maughan B, Arseneault L. Bullying victimization in childhood predicts inflammation and obesity at mid-life: a five-decade birth cohort study. *Psychol Med*. 2015;45(13):2705-2715.
- Vadiveloo M, Mattei J. Perceived weight discrimination and 10-year risk of allostatic load among US adults. *Ann Behav Med*. 2017;51(1):94-104.
- Gray CM, Hunt K, Lorimer K, Anderson AS, Benzeval M, Wyke S. Words matter: a qualitative investigation of which weight status terms are acceptable and motivate weight loss when used by health professionals. *BMC Public Health*. 2011;11(1):513. doi:10.1186/1471-2458-11-513.
- Sabin JA, Marini M, Nosek BA. Implicit and explicit anti-fat bias among a large sample of medical doctors by BMI, race/ethnicity and gender. *PLoS One*. 2012;7(11):e48448. doi:10.1371/journal.pone.0048448
- Robstad N, Westergren T, Siebler F, Söderhamn U, Fegran L. Intensive care nurses' implicit and explicit attitudes and their behavioural intentions towards obese intensive care patients. *J Adv Nurs*. 2019;75(12):3631-3642.
- Diversi T, Hughes R, Burke K. The prevalence and practice impact of weight bias amongst Australian dietitians. *Obes Sci Pract*. 2016;2(4):456-465.
- Setchell J, Watson B, Jones L, Gard M, Briffa K. Physiotherapists demonstrate weight stigma: a cross-sectional survey of Australian physiotherapists. *J Physiother*. 2014;60(3):157-162.
- Agell G, Rothblum ED. Effects of clients' obesity and gender on the therapy judgments of psychologists. *Prof Psychol Res Pr*. 1991;22(3):223-229.
- Panza GA, Armstrong LE, Taylor BA, Puhl RM, Livingston J, Pescatello LS. Weight bias among exercise and nutrition professionals: a systematic review. *Obes Rev*. 2018;19(11):1492-1503.
- Joseph-Williams N, Edwards A, Elwyn G. Power imbalance prevents shared decision making. *BMJ*. 2014;348:g3178. doi:10.1136/bmj.g3178
- Alberga AS, Edache IY, Forhan M, Russell-Mayhew S. Weight bias and health care utilization: a scoping review. *Prim Health Care Res*. 2019;20:e116. doi:10.1017/S1463423619000227
- Olson CL, Schumaker HD, Yawn BP. Overweight women delay medical care. *Arch Fam Med*. 1994;3(10):888-892.
- Cohen SS, Palmieri RT, Nyante SJ, et al. A review: obesity and screening for breast, cervical, and colorectal cancer in women. *Cancer*. 2008;112(9):1892-1904.
- Phelan SM, Burgess DJ, Yeazel MW, Hellerstedt WL, Griffin JM, Ryn M. Impact of weight bias and stigma on quality of care and outcomes for patients with obesity. *Obes Rev*. 2015;16(4):319-326.
- Rohde K, Keller M, la Cour Poulsen L, Blüher M, Kovacs P, Böttcher Y. Genetics and epigenetics in obesity. *Metabolism*. 2019;92:37-50.

32. Llewellyn CH, Trzaskowski M, van Jaarsveld CHM, Plomin R, Wardle J. Satiety mechanisms in genetic risk of obesity. *JAMA Pediatr.* 2014;168(4):338-344.
33. Vazquez CE, Cubbin C. Socioeconomic status and childhood obesity: a review of literature from the past decade to inform intervention research. *Curr Obes Rep.* 2020;9(4):562-570.
34. Hemmingsson E. A new model of the role of psychological and emotional distress in promoting obesity: conceptual review with implications for treatment and prevention. *Obes Rev.* 2014;15(9):769-779.
35. Huizinga MM, Cooper LA, Bleich SN, Clark JM, Beach MC. Physician respect for patients with obesity. *J Gen Intern Med.* 2009;24(11):1236-1239.
36. Bertakis KD, Azari R. The impact of obesity on primary care visits. *Obes Res.* 2005;13(9):1615-1623.
37. Lacroix E, Alberga A, Russell-Matthew S, McLaren L, von Ranson K. Weight bias: a systematic review of characteristics and psychometric properties of self-report questionnaires. *Obes Facts.* 2017;10(3):223-237.
38. Al-Muraikhi AE, Al-Kuwari MG. Primary care physicians' knowledge, attitude, and practice toward obesity management in Qatar. *Middle East Journal of Family Medicine.* 2008;6(10):3-7.
39. O'Keefe M, Flint SW, Watts K, Rubino F. Knowledge gaps and weight stigma shape attitudes toward obesity. *Lancet Diabetes Endocrinol.* 2020;8(5):363-365.
40. McArthur LH, Ross JK. Attitudes of registered dietitians toward personal overweight and overweight clients. *J Acad Nutr Diet.* 1997;97(1):63-66.
41. Brandsma LL. Physician and patient attitudes toward obesity. *Eat Disord.* 2005;13:201-211.
42. Hyer S, Edwards J. Weight management practices among Florida nurse practitioners: a cross-sectional study. *J Nurse Pract.* 2020;16(2):131-135.
43. Nair SC, Sheikh SM, Ibrahim H. Higher physician body mass index is associated with increased weight bias in an Arab country with high prevalence of obesity. *Int J Prev Med.* 2019;10(1):1-5.
44. Cavaleri R, Short T, Karunaratne S, Chipchase LS. Weight stigmatisation in physiotherapy: a systematic review. *Phys Ther Rev.* 2016;21(1):1-9.
45. Budd GM, Mariotti M, Graff D, Falkenstein K. Health care professionals' attitudes about obesity: an integrative review. *Appl Nurs Res.* 2011;24(3):127-137.
46. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med.* 2009;6(7):e1000097. doi:10.1371/journal.pmed.1000097
47. Borenstein M, Hedges LV, Higgins JPT, Rothstein HR. *Introduction to Meta-Analysis.* 1st ed. John Wiley & Sons; 2009.
48. Schunemann H, Brozek J, Guyatt G, Oxman A, eds. *GRADE Handbook.* Updated October 2013. <https://gdt.gradepro.org/app/handbook/handbook.html>.
49. Gujral H, Tea C, Sheridan M. Evaluation of nurse's attitudes toward adult patients of size. *Surg Obes Relat Dis.* 2011;7(4):536-540.
50. Torrey A. Registered nurses' attitudes toward obese patients: do nurses' self-image influence their professional approach? *Dissertation Abstracts International: Section B.* 2014;74.
51. Harvey EL, Hill AJ. Health professionals' views of overweight people and smokers. *Int J Obes Relat Metab Disord.* 2001;25(8):1253-1261.
52. Brown I, Stride C, Psarou A, Brewins L, Thompson J. Management of obesity in primary care: nurses' practices, beliefs and attitudes. *J Adv Nurs.* 2007;59(4):329-341.
53. Vallis TM, Currie B, Lawlor D, Ransom T. Healthcare professional bias against the obese: how do we know if we have a problem? *Can J Diabetes.* 2007;31(4):365-370.
54. Wise FM, Harris DW, Olver JH. Attitudes to obesity among rehabilitation health professionals in Australia. *J Allied Health.* 2014;43(3):162-168.
55. Garcia JT, Amankwah EK, Hernandez RG. Assessment of weight bias among pediatric nurses and clinical support staff toward obese patients and their caregivers. *J Pediatr Nurs.* 2016;31(4):e244-e251.
56. Akman M, Kivrakoglu E, Cifcili S, Unalan PC. Weight bias among primary care health professionals: personal attitude matters. *Obesity and Metabolism.* 2010;6(2-3):63-68.
57. Bagley CR, Conklin DN, Isherwood RT, Pechiulis DR, Watson LA. Attitudes of nurses toward obesity and obese patients. *Percept Mot Skills.* 1989;68(3 Pt 1):954.
58. Maroney D, Golub S. Nurses' attitudes toward obese persons and certain ethnic groups. *Percept Mot Skills.* 1992;75(2):387-391.
59. Garner C, Nicol G. Comparison of male and female nurses' attitudes toward obesity. *Percept Mot Skills.* 1998;86(3 Pt 2):1442.
60. Zuzelo PR, Seminara P. Influence of registered nurses' attitudes toward bariatric patients on educational programming effectiveness. *J Contin Educ Nurs.* 2006;37(2):65-73.
61. Watson L, Oberle K, Deutscher D. Development and psychometric testing of the Nurses' Attitudes Toward Obesity and Obese Patients (NATOOPS) Scale. *Res Nurs Health.* 2008;31(6):586-593.
62. Wang Y, Ding YE, Song D, Zhu D, Wang J. Attitudes toward obese persons and weight locus of control in Chinese Nurses: a cross-sectional survey. *Nurs Res.* 2016;65(2):126-131.
63. Ward-Smith P, Peterson JA. Development of an instrument to assess nurse practitioner attitudes and beliefs about obesity. *J Am Assoc Nurse Pract.* 2016;28(3):125-129.
64. Robstad N, Siebler F, Söderhamn U, Westergren T, Fegran L. Design and psychometric testing of instruments to measure qualified intensive care nurses' attitudes toward obese intensive care patients. *Res Nurs Health.* 2018;41(6):525-534.
65. Loomis GA, Connolly KP, Clinch CR, Djuric DA. Attitudes and practices of military family physicians regarding obesity. *Mil Med.* 2001;166:121-125.
66. Teachman BA, Brownell KD. Implicit anti-fat bias among health professionals: is anyone immune? *Int J Obes Relat Metab Disord.* 2001;25(10):1525-1531.
67. Foster GD, Wadden TA, Makris AP, et al. Primary care physicians' attitudes about obesity and its treatment. *Obes Res.* 2003;11(10):1168-1177.
68. Warner CH, Warner CM, Morganstein J, Appenzeller GN, Rachal J, Grieger T. Military family physician attitudes toward treating obesity. *Mil Med.* 2008;173(10):978-984.
69. Ferrante JM, Piasecki AK, Ohman-Strickland PA, Crabtree BF. Family physicians' practices and attitudes regarding care of extremely obese patients. *Obesity (Silver Spring).* 2009;17(9):1710-1716.
70. Jay M, Kalet A, Ark T, et al. Physicians' attitudes about obesity and their associations with competency and specialty: a cross-sectional study. *BMC Health Serv Res.* 2009;9:106. doi:10.1186/1472-6963-9-106
71. Lund TB, Brodersen J, Sandoe P. A study of anti-fat bias among Danish general practitioners and whether this bias and general practitioners' lifestyle can affect treatment of tension headache in patients with obesity. *Obes Facts.* 2018;11:501-513.
72. Oberrieder H, Walker R, Monroe D, Adeyanju M. Attitude of dietetics students and registered dietitians toward obesity. *J Acad Nutr Diet.* 1995;95:914-916.
73. Edelstein S, Silva N, Mancini L. Obesity bias among dietitians by using the fat people-thin people implicit association test. *Top Clin Nutr.* 2009;24(1):67-72.
74. Hellbardt M, Riedel-Heller S, Sikorski C. Dieticians' attitudes towards obese patients. *Ernahrungs Umschau.* 2014;61(5):78-81.
75. Sack S, Radler DR, Mairella KK, Touger-Decker R, Khan H. Physical therapists' attitudes, knowledge, and practice approaches regarding people who are obese. *Phys Ther.* 2009;89(8):804-815.
76. Elboim-Gabyzon M, Attar K, Peleg S. Weight stigmatization among physical therapy students and registered physical therapists. *Obes Facts.* 2020;13(2):104-116.

77. Wolf C. Physician assistants' attitudes about obesity and obese individuals. *J Allied Health*. 2012;41(2):E45-E48.
78. Moore PJ, Sickel AE, Malat J, Williams D, Jackson J, Adler NE. Psychosocial factors in medical and psychological treatment avoidance: the role of the doctor-patient relationship. *Health Psychol*. 2004;9(3):421-433.
79. Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best practices for developing and validating scales for health, social, and behavioral research: a primer. *Front Public Health*. 2018;6:149. doi:10.3389/fpubh.2018.00149
80. Browne JL, Ventura A, Mosely K, Speight J. 'I call it the blame and shame disease': a qualitative study about perceptions of social stigma surrounding type 2 diabetes. *BMJ Open*. 2013;3(11):e003384. doi:10.1136/bmjopen-2013-003384
81. Browne JL, Ventura AD, Mosely K, Speight J. Measuring the stigma surrounding type 2 diabetes: development and validation of the Type 2 Diabetes Stigma Assessment Scale (DSAS-2). *Diabetes Care*. 2016;39(12):2141-2148.
82. Puhl RM. What words should we use to talk about weight? A systematic review of quantitative and qualitative studies examining preferences for weight-related terminology. *Obes Rev*. 2020;21:e13008. doi:10.1111/obr.13008
83. Nickel F, Tapking C, Benner L, et al. Video teaching leads to improved attitudes towards obesity—a randomized study with 949 participants. *Obes Surg*. 2019;29(7):2078-2086.
84. Hayward LE, Neang S, Ma S, Vartanian LR. Discussing weight with patients with overweight: supportive (not stigmatizing) conversations increase compliance intentions and health motivation. *Stigma Health*. 2020;5:53-68.
85. Quigley F, Moorhead A, Bond R, Zheng H, McAloon T. A virtual reality training tool to improve weight-related communication across healthcare settings. *Proceedings of the 31st European Conference on Cognitive Ergonomics*. Association for Computing Machinery; 2019:19-22.
86. Charlesworth TES, Banaji MR. Patterns of implicit and explicit attitudes: I. Long-term change and stability from 2007 to 2016. *Psychol Sci*. 2019;30(2):174-192.
87. Phelan SM, Puhl RM, Burke SE, et al. The mixed impact of medical school on medical students' implicit and explicit weight bias. *Med Educ*. 2015;49(10):983-992.
88. Baker TK, Smith GS, Jacobs NN, et al. A deeper look at implicit weight bias in medical students. *Adv Health Sci Educ Theory Pract*. 2017;22(4):889-900.
89. Schwartz MB, Chambliss HO, Brownell KD, Blair SN, Billington C. Weight bias among health professionals specializing in obesity. *Obes Res*. 2003;11(9):1033-1039.
90. Puhl R, Wharton C, Heuer C. Weight bias among dietetics students: Implications for treatment practices. *J Am Diet Assoc*. 2009;109(3):438-444.
91. Swift JA, Hanlon S, El-Redy L, Glazebrook C. Weight bias among UK trainee dietitians, doctors, nurses and nutritionists. *J Hum Nutr Diet*. 2013;26(4):395-402.
92. Poustchi Y, Saks NS, Piasecki AK, Hahn KA, Ferrante JM. Brief intervention effective in reducing weight bias in medical students. *Fam Med*. 2013;45(5):345-348.
93. Kushner RF, Zeiss DM, Feinglass JM, Yelen M. An obesity educational intervention for medical students addressing weight bias and communication skills using standardized patients. *BMC Med Educ*. 2014;14(1):53. doi:10.1186/1472-6920-14-53.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

How to cite this article: Lawrence BJ, Kerr D, Pollard CM, et al. Weight bias among health care professionals: A systematic review and meta-analysis. *Obesity (Silver Spring)*. 2021;29:1802– 1812. <https://doi.org/10.1002/oby.23266>