Received: 30 May 2024 | Revised: 3 September 2024 | Accepted: 3 October 2024

DOI: 10.1002/osp4.70015

SHORT COMMUNICATION

Obesity Science and Practice Open Access WILEY

The impact of weight self-stigma on weight-loss treatment engagement and outcome

Samantha J. Schram[1] | KayLoni L. Olson[1,2] | Emily Panza[1,2] | Jason Lillis[1,2,3]

[1]The Weight Control and Diabetes Research Center, The Miriam Hospital, Providence, Rhode Island, USA

[2]The Department of Psychiatry and Human Behavior, Warren Alpert Medical School of Brown University, Providence, Rhode Island, USA

[3]College of Psychology, California Northstate University, Rancho Cordova, California, USA

Correspondence

Samantha J. Schram, The Weight Control and Diabetes Research Center, 196 Richmond Street, Providence, RI 02903, USA.
Email: samanthaschram0@gmail.com

Funding information

National Institute of Diabetes and Digestive and Kidney Diseases, Grant/Award Numbers: K23DK124578, R01DK120731; National Institute on Minority Health and Health Disparities, Grant/Award Number: K23MD015092

Abstract

Background: Individuals with overweight or obesity often endure significant weight-based prejudice and discrimination in various settings. Experiencing weight-related stigma is linked to many adverse psychosocial outcomes. Weight self-stigma is when an individual internalizes and identifies with negative attributes ascribed to people with larger bodies and has self-devaluing thoughts because of their weight and is associated with poorer health outcomes.

Aims: This study explored how weight self-stigma may impact weight management efforts and outcomes for adults participating in an onlight weight-loss intervention.

Materials and Methods: 508 adults (86.2% female, 84.6% White) with overweight or obesity participated in an asynchronous 12-week online weight-loss intervention with computer-generated feedback. Weight and weight self-stigma were measured at baseline and 3 months later.

Results: Thirty-one point five percent of the sample reported high levels of stigma, which was associated with greater program dropout than those who did not report high stigma (32.5% vs. 21.6%). Program completers reporting high self-stigma showed better treatment engagement (77.0% vs. 69.7% lessons viewed) and weight loss (M = −6.31% vs. −5.08%); these differences were not observed when using intent-to-treat assumptions. When analyzed as a continuous variable, weight self-stigma showed no association with treatment engagement and outcome.

Discussion: These findings highlight the complexity of understanding how self-stigma affects treatment engagement and outcome in behavioral weight loss and the need for more targeted research in this understudied area.

Conclusion: Results suggest that weight self-stigma plays a role in weight management during an online weight-loss intervention, affecting engagement and outcomes.

KEYWORDS

obesity, stigma, weight, weight loss

1 | INTRODUCTION

Individuals with overweight or obesity often endure significant weight-based prejudice and discrimination.[1–4] Weight stigma is pervasive, affecting individuals in various settings (e.g., work, healthcare).[5–8] Media often endorse and perpetuate negative stereotypes surrounding overweight and obesity, portraying individuals of higher weight as lazy, less competent, and unattractive.[9] Weight-based stigma has been linked to many adverse psychosocial outcomes, including increased stress, binge eating, depression, avoidance of healthcare settings,[10–13] and increased weight gain.[14] Evidence suggests that weight stigma's adverse effects are exacerbated by its internalization (also referred to as 'weight self-stigma'), a widespread phenomenon[15,16] that occurs when an individual identifies with negative attributes ascribed to people with larger bodies and has self-devaluing thoughts because of their weight.[17]

More than half of the individuals with overweight and obesity in the United States pursue weight loss,[18] and many of these individuals report high levels of weight self-stigma.[19] Indeed, systemic anti-fat bias contributes to a culture where weight loss is desirable, and concerns have been raised that behavioral weight loss treatments may perpetuate weight stigma by reinforcing weight loss as a path to improved health.[20,21] At the same time, behavioral weight loss treatment is an evidence-based strategy associated with potent cardiometabolic health benefits,[22,23] and many individuals desire weight loss.[24] Given the incidence of weight self-stigma among people initiating behavioral weight loss treatment, it is critical to examine how self-stigma functions in the context of treatment and to distinguish evidence-based treatments from the harmful world of diet culture.[25] Few studies have examined the role of weight self-stigma in the context of weight loss intervention delivery, and the findings have been inconsistent.

One study of 188 treatment-seeking adults with overweight and obesity examined weight self-stigma's role in the context of a 3-month online weight loss intervention.[26] Results were mixed in that weight self-stigma was not associated with program engagement metrics or weight loss. However, individuals who reported high levels of fearing stigmatization from others due to weight (considered a subcomponent of weight self-stigma) had less weight loss at the end of the intervention. On the other hand, another study of 72 adults participating in a 3-month behavioral weight loss program found that higher internalized weight bias was associated with greater adherence to weight self-monitoring.[27]

Pearl and colleagues[28] found that higher internalized stigma at baseline did not predict overall weight change for 133 adult participants enrolled in a 14-week lifestyle intervention and randomized to a weight loss maintenance condition; however, it did reduce the odds of achieving a ≥5 and ≥10% weight loss at the midpoint (week 24) of the RCT. Another RCT comparing internalized weight stigma levels in 106 adult participants with overweight or obesity found that participants who reported the lowest levels of internalized stigma lost nearly twice as much weight as those with the highest.[29]

These inconsistent findings, as well as the lack of studies examining weight self-stigma in the context of an online weight loss program, highlight the need to further explore the role of weight self-stigma in the context of weight loss intervention delivery. Therefore, the current study explores how weight self-stigma may impact short-term weight control efforts and outcomes during a 3-month online weight-loss intervention. The first aim was to examine the overall relationship between baseline weight self-stigma, baseline depression, program engagement, and weight loss outcome. The second aim explored how reporting high levels of self-stigma at the beginning of treatment could influence weight loss intervention engagement and outcome. Prior studies have examined weight self-stigma as both a continuous variable as well as utilizing a clinical cutoff for analyses. For example, reporting high levels of weight self-stigma, defined as greater than 1 standard deviation above published non-treatment-seeking norms, was related to greater psychological symptoms,[30] associated with lower short-term weight loss,[27] and served as a useful clinical cutoff to identify individuals who would benefit from a weight self-stigma focused intervention,[31] thus suggesting the utility of a collapsed categorical analysis of weight self-stigma. In the current study, weight self-stigma was characterized as both a continuous and cutoff variable, and it was hypothesized that high weight self-stigma would be associated with poorer weight loss outcomes and decreased program engagement.

2 | METHODS

2.1 | Design

This study was part of a larger randomized clinical trial in which all participants were enrolled in the same 3-month online weight loss program and were later randomized to one of two maintenance interventions in phase two of the study. The data analyzed for this study are from the initial single-arm phase of the trial. The Lifespan Institutional Review Board (IRB) approved all study procedures, and all participants provided written informed consent.

2.2 | Participants

2.2.1 | Inclusion criteria

Participants were 25–70 years of age and had a baseline body mass index (BMI) between 27.5 and 45 kg/m^2. Participants were fluent in English and literate at the sixth-grade level and could walk two city blocks without stopping.

2.2.2 | Exclusion criteria

Participants were excluded if they reported current participation in another weight loss program, weight-loss medication use, loss of ≥5%

of body weight in the past 6 months, pregnancy or plans to become pregnant, or any medical or psychiatric condition that would preclude safe participation in the study or ability to follow study procedures.

2.3 | Recruitment and screening

Participants were self-referred (i.e., not referred by a health professional) and completed a phone screen that assessed height and weight to calculate BMI and health status information, such as conditions prohibiting physical activity, pregnancy or planned pregnancy, and prior history of metabolic and bariatric surgery. Eligible participants attended an orientation via remote conferencing (Zoom), where the study was described in detail, and informed consent was obtained.

2.4 | Intervention

Participants completed Rx Weight Loss, a 12-week online behavioral weight loss intervention based on the Diabetes Prevention Program.[32] The treatment was delivered via 12, 10- to 15-min weekly interactive multimedia audio/visual presentations presented by experts on topics including energy balance, exercise goals, problem-solving, and restaurant eating.

To accomplish losing 1-2 pounds per week, participants received a target daily calorie goal between 1200 and 1800 kcal per day (with 25% of caloric intake from fat) based on individual starting weight. Participants were instructed to have gradually increased their exercise to 200 min per week by the end of the program. Participants entered their daily calories, exercise minutes, and weight into the study website and received computer-generated feedback weekly to encourage adherence to calorie, weight, and exercise goals.

The feedback system compared self-monitoring data to the weight, calorie, and exercise goals created by the program at the start of the intervention. Each weekly message began with a comment on the week's weight loss and cumulative weight loss. Additional feedback depended on the participant's caloric intake and physical activity Rx Weight Loss has demonstrated strong efficacy and effectiveness outcomes in numerous randomized controlled trials, producing clinically significant and safe 12-week weight losses of approximately 5%.[32]

2.5 | Measures

All measures were collected at baseline and 3 months later from 2020 to 2022. Questionnaire data were collected remotely via online surveys, while study staff collected anthropometric data in person.

2.5.1 | Anthropometric

To calculate BMI (kg/m^2), a digital scale measured weight to the nearest 0.1 kg, and height was measured to the nearest millimeter with a stadiometer using standardized procedures.

2.5.2 | Weight self-stigma questionnaire

The Weight Self-Stigma Questionnaire (WSSQ) is a 12-item measure that evaluates weight self-stigma in individuals with overweight or obesity.[30] The items are rated on a 5-point Likert scale ranging from "completely disagree" to "completely agree." The questionnaire assesses aspects of weight self-stigma, including self-devaluation and fear of being stigmatized by others. Scores ranged from 12 to 60, with higher scores indicating higher weight self-stigma. A cutoff of ≥36 indicates high levels of weight stigma that are related to greater psychological symptoms, lower quality of life, less successful weight management, and suitability for a weight self-stigma-focused intervention.[26,30,31] The WSSQ has demonstrated good internal consistency and construct validity.[30]

2.5.3 | Patient reported outcomes measurement information system initiative depression-short form

Depression was measured using standardized measures from the National Institute of Health (NIH) Patient Reported Outcomes Measurement Information System (PROMIS) initiative Depression-Short Form.[33] The questionnaire comprises four self-reported Likert scale items, with higher scores indicating higher levels of depression, and demonstrates good reliability and validity.[33]

2.5.4 | Treatment engagement and program completion

Treatment engagement was measured by the number of weeks a participant entered their self-monitored weight into the system and the number of lessons viewed (out of 12). The post-treatment assessment marked the end of phase 1 of a two-phase study. All participants who attended the post-treatment assessment were considered "completers" and those who did not were considered "dropouts." Practically, no data were available for "dropout" participants to compare to baseline, which is addressed in the analysis section. It should be noted that 7 of 129 participants characterized as "dropouts" viewed all 12 treatment lessons.

2.5.5 | Statistical analysis

All analyses were performed using IBM SPSS Statistics software version 29 for PC in 2023. Baseline means and standard deviations were calculated for BMI, weight self-stigma, and depression for the full sample and males and females.

Given the exploratory nature of this study, data analyses were performed in two ways when possible. The first approach was intent-to-treat and included all participants, regardless of whether they completed the intervention and attended their 3-month assessment. A last observation carried forward method was used to impute missing data. The second approach was a completers-only analysis

and displayed data only for the portion of the sample that attended the 3-month post-intervention assessment.

Given the precedent for weight self-stigma to be analyzed both as a continuous and a categorical cutoff variable, analyses were performed both ways. For continuous score analyses, correlations and logistic regression were performed. To examine the impact of high levels of weight self-stigma, participants were categorized as "High Stigma" (≥36) or "Not-High Stigma" (<36) on baseline weight self-stigma based on the suggested WSSQ clinical cutoff score (Lillis et al., 2010). Mean comparisons (chi-square and independent samples *t*-test) were conducted on the High Stigma versus Not-High Stigma groups for percent dropout, percent weight loss, number of lessons viewed, and number of weeks of self-monitored weight.

After observing the potential impact of higher levels of stigma, a series of post hoc analyses were performed. A sensitivity analysis examined the robustness of the findings when considering the effect of potential covariates. For each significant finding, an ANCOVA was run with baseline BMI, gender, and depression as covariates.

3 | RESULTS

A total of 508 participants entered the study and started the 12-week online weight loss program. The sample was 86.2% female, 84.6% white, with an average age of 54.6 ± 10.7 years, and a mean baseline BMI of 34.74 (*SD* = 4.65). Table 1 shows the means and standard deviations for BMI, weight self-stigma scores, and depression scores at baseline. Sex was associated with weight self-stigma, with females having higher baseline levels.

3.1 | Weight-self stigma continuous score analyses

Weight self-stigma total score at baseline was not significantly correlated with percent weight change ($r = -0.029$, $p = 0.522$), number of intervention lessons viewed ($r = 0.041$, $p = 0.364$), and number of weeks self-monitored ($r = 0.029$, $p = 0.520$). Weight self-stigma total score as baseline did not significantly predict dropout ($X^2 = 1.53$, $r^2 = 0.01$, $p = 0.216$, $OR = 1.01$).

3.2 | High stigma versus not-high stigma

3.2.1 | Descriptive statistics

As shown in Table 1, 31.5% of all participants reported above the weight self-stigma cutoff. Table 2 presents mean comparisons of individuals who scored above ('High Stigma') versus below ('Not-High Stigma') the cutoff at baseline on weight outcomes and program engagement.

3.2.2 | Weight change outcomes

As shown in Table 2, of those who completed their 3-month assessment, the High Stigma group had a greater percent weight loss than the Not-High Stigma group ($M = -6.31$ vs. -5.08, $p = 0.007$). Significant differences were not observed when using the intent-to-treat approach.

3.2.3 | Treatment engagement and completion

Program completers reporting high stigma also viewed more lessons ($M = 9.24$ vs. 8.36, $p = 0.030$). Significant differences were not observed when using the intent-to-treat approach (see Table 2). A significantly higher percentage of individuals in the High Stigma group dropped out of the program than in the Not-High Stigma group (32.5% vs. 21.6%, $\chi^2 = 6.84$, $p = 0.009$).

3.2.4 | Sensitivity analyses

To test the robustness of the observed association between High Stigma versus Not-High Stigma and percent weight loss among program completers, ANCOVA showed that baseline stigma category was significantly associated with percent weight loss ($F = 11.66$, $p < 0.001$) when controlling for baseline BMI ($F = 4.99$, $p = 0.026$), gender ($F = 0.09$, $p = 0.992$), and baseline depression ($F = 3.24$, $p = 0.073$). Similarly, an ANCOVA showed that baseline stigma category was significantly associated with lessons viewed ($F = 9.37$,

TABLE 1 Baseline means, standard deviations, and comparison of males versus females.

	Full sample (*N* = 508)	Males (*N* = 63)	Females (*N* = 438)
Baseline BMI	34.74	34.14	34.83
SD	4.65	4.75	4.63
WSSQ (self-stigma)	30.64	28.05	31.00*
SD	9.04	7.62	9.17
Depression	6.34	5.85	6.41
SD	3.08	2.47	3.16
Clinical self-stigma (%)	31.5%	21%	33%

*$p < 0.05$ for independent *t*-test males versus females.

TABLE 2 Comparison of the above versus below clinical stigma cutoff at baseline on 3 month weight outcome and program engagement.

	Above	Below	*t*	*p*
Mean % weight loss				
Intent-to-treat	−4.29 (4.60)	−3.98 (3.96)	0.77	0.440
Completers	−6.31 (4.29)	−5.08 (3.79)	2.71	0.007
Mean # of lessons viewed				
Intent-to-treat	7.93 (3.87)	7.63 (3.80)	−0.81	0.415
Completers	9.24 (3.31)	8.36 (3.55)	−2.18	0.030
Mean # weeks self-monitored				
Intent-to-treat	8.79 (3.92)	8.78 (4.05)	−0.01	0.989
Completers	10.43 (2.70)	9.75 (3.52)	−1.80	0.072

*$p < 0.05$ for independent *t*-test above versus below.

$p = 0.002$) when controlling for baseline BMI ($F = 1.86$, $p = 0.174$), gender ($F = 9.63$, $p = 0.002$), and baseline depression ($F = 7.95$, $p = 0.005$).

4 | DISCUSSION

The current study explored the relationships between weight self-stigma, weight loss, and program engagement in the context of a weight loss intervention. About one-third of this treatment-seeking adult sample reported high levels of weight self-stigma. Consistent with previous literature, mean self-stigma levels were higher for individuals identifying their sex as female versus male,[30,34] and self-stigma was associated with higher BMI and depression. Of note, individuals reporting the highest levels of weight self-stigma dropped out of the study at a significantly higher rate. This finding underscores the need for future work to explore mechanisms between self-stigma and program attrition and completion and whether behavioral interventions can be improved to better meet the needs of people with high self-stigma.

Major and colleagues[35] found that exposure to stigmatizing incidents was associated with a decreased perceived capacity to engage in weight loss-consistent behaviors. Additionally, technology-delivered weight loss interventions may unintentionally perpetuate weight stigma.[36] Anecdotally, a small number ($n = 7$) of participants in the current study reported dropping out because they disliked the automated feedback system, which delivers pre-programmed feedback based on participant data that is not sensitive to contextual factors when prescribed goals are not met. It is also worth noting that even with good intentions and carefully designed feedback, the process of being evaluated on weight, given the backdrop of systemic anti-fat bias in Western culture, has the potential to be shame-inducing. Future studies would benefit from ongoing data analysis of various potential factors contributing to program engagement and collecting data on weight loss motivations and stigmatizing experiences during the study.

Program completers reporting higher stigma also lost slightly more weight and viewed more intervention lessons. These findings contradict the preponderance of observational evidence suggesting that higher levels of experiential stigma and self-stigma contribute to myriad negative consequences, including unhealthy and disordered eating, lower physical activity, and significant mental and physical health symptoms.[14,37,38] One possible explanation is the short timeframe of the study. For example, lower body satisfaction has been linked to greater weight loss over 6 months,[39] while greater weight self-stigma has been shown to predict lower weight loss at 24 months.[29] Further research is needed to identify whether the trajectories of high self-stigma individuals differ over time compared to those without high self-stigma and the degree to which weight loss behaviors are undertaken in a healthy and sustainable manner.

A noteworthy finding is that no significant associations with treatment engagement or outcome were observed when weight self-stigma was treated as a continuous variable. This may, in small part, help explain prior seemingly inconsistent findings in the literature; the analyses based on cutoff in the current study showed associations with treatment engagement and outcome, similar to prior studies in which cutoffs for weight self-stigma were examined. Dichotomization of continuous variables is generally discouraged[40] even though, in some cases, dichotomous variables outperform continuous ones.[41] This practice is clearly unjustifiable when arbitrary cutoffs are established, for example, mean or median splits. However, clinically, meaningful clinical cutoffs to identify people who may benefit from services (i.e., any psychiatric diagnosis) when data support the use of such cutoffs, as is the case in the current study. Regardless, dichotomizing continuous variables can result in loss of power and increased chance of finding spurious effects, and thus caution is required for interpretation of the observed associations.

This study contributes to a vast literature suggesting that weight self-stigma is a relevant factor to consider when administering any form of health behavior change intervention, especially given the measurement overlap between weight self-stigma and body dissatisfaction,[42] which is a strong predictor of disordered eating behaviors.[43] For behavioral weight loss, findings showing that high weight self-stigma is linked to early dropout highlight the need for more research on why weight self-stigma is linked to dropout and how the treatment can be modified to improve acceptability for folks with high weight self-stigma. For example, engaging in behavioral weight loss intervention may also have the unintended consequence of reinforcing internalization of stereotypes about people with higher weight. The notion that self-stigma may contribute to discontinuation in weight loss intervention also aligns with growing interest in weight-neutral interventions and parallels a growing empirical basis for the efficacy of such interventions.[44,45] Furthermore, it is worth considering whether focusing on weight loss as an outcome, which may unintentionally perpetuate weight stigmatizing attitudes, as opposed to a more robust set of cardiometabolic health indicators, is warranted. Health behavior change interventions may also be improved by routinely evaluating personal reasons for enrollment. Despite the controversy surrounding the appropriateness of

behavioral weight loss treatment, many patients endorse desiring weight loss interventions for both health- and esthetic-related reasons, highlighting the importance of including individuals with lived experience in the research process.

The study strengths include the use of a validated weight loss intervention program, a large sample size, blind assessors, and standardized and objective weight measurement. It is limited by a homogenous sample of primarily white middle-aged women, and the use of self-reporting measures for all psychosocial variables could result in self-report bias. Additionally, this study did not capture data on experienced stigma, which may have clarified better links between stigma and weight. Finally, this study utilized BMI as the primary screening criteria, which is very limited as a tool for identifying cardiometabolic risk, and it is increasingly recognized that it should not be used in isolation to guide treatment planning.[46,47]

The study results suggest that weight self-stigma is important to assess among individuals seeking weight-loss treatments. While a significant change in how society views and treats individuals of high weight status is necessary, cultural transitions of this magnitude often require a large amount of effort, time, intervention, and resources from various health-promoting groups. In parallel, and assuming weight loss is an agreed-upon goal of both patient and provider, focusing efforts on curating weight loss interventions that are sensitive and responsive to individuals reporting high levels of weight self-stigma to encourage health-promoting behaviors and self-compassion should be a focus of treatment innovation.

ACKNOWLEDGMENTS

Samantha J. Schram led data curation and formal analysis. KayLoni L. Olson and Emily Panza supported formal analysis. Jason Lillis acquired funding, led investigation and methodology, and supported data curation and formal analysis. All authors were involved in writing the paper and had final approval of the submitted and published versions. The Lifespan Institutional Review Board approved all study procedures (Protocol 1472639), and all participants provided written informed consent. This study was pre-registered with clinicaltrials.gov (NCT04256850). All analyses are part of a secondary analysis plan and are not a part of the pre-registered analysis plan for this clinical trial, which is ongoing at the time this manuscript is being written. The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the National Institute of Diabetes and Digestive and Kidney Diseases [R01DK120731]. This work was supported by training grants from the National Institute on Minority Health and Health Disparities (K23MD015092) and the National Institute of Diabetes and Digestive and Kidney Diseases (K23DK124578).

CONFLICT OF INTEREST STATEMENT

Samantha J. Schram declares no conflicts of interest. KayLoni L. Olson serves as the Vice Chair of the Health Research Council for the Society of Health Psychology. Emily Panza was an invited speaker and received support for attending The Obesity Society's annual meeting in 2023. Jason Lillis received hourly consulting fees from Abacus Health Solutions for about 25 h of work to advise on integrating Acceptance and Commitment Therapy strategies into weight management products that they are developing.

ORCID

KayLoni L. Olson https://orcid.org/0000-0001-7946-9570

REFERENCES

1. Karnehed N, Rasmussen F, Hemmingsson T, Tynelius P. Obesity and attained education: cohort study of more than 700,000 Swedish men. *Obesity*. 2006;14(8):1421-1428. https://doi.org/10.1038/oby.2006.161
2. Puhl RM, Himmelstein MS, Pearl RL. Weight stigma as a psychosocial contributor to obesity. *Am Psychol*. 2020;75(2):274-289. https://doi.org/10.1037/amp0000538
3. Sarlio-Lahteenkorva S, Lahelma E. The association of body mass index with social and economic disadvantage in women and men. *Int J Epidemiol*. 1999;28(3):445-449. https://doi.org/10.1093/ije/28.3.445
4. Sobal J. Obesity and socioeconomic status: a framework for examining relationships between physical and social variables. *Med Anthropol*. 1991;13(3):231-247. https://doi.org/10.1080/01459740.1991.9966050
5. Andreyeva T, Puhl RM, Brownell KD. Changes in perceived weight discrimination among Americans, 1995-1996 through 2004-2006. *Obesity*. 2008;16(5):1129-1134. https://doi.org/10.1038/oby.2008.35
6. Lee KM, Hunger JM, Tomiyama AJ. Weight stigma and health behaviors: evidence from the Eating in America Study. *Int J Obes*. 2021;45(7):1499-1509. https://doi.org/10.1038/s41366-021-00814-5
7. Puhl R, Brownell KD. Bias, discrimination, and obesity. *Obes Res*. 2001;9(12):788-805. https://doi.org/10.1038/oby.2001.108
8. Puhl RM, Lessard LM, Himmelstein MS, Foster GD. The roles of experienced and internalized weight stigma in healthcare experiences: perspectives of adults engaged in weight management across six countries. Jackson SE, editor. *PLoS One*. 2021;16(6):e0251566. https://doi.org/10.1371/journal.pone.0251566
9. Heuer CA, McClure KJ, Puhl RM. Obesity stigma in online news: a visual content analysis. *J Health Commun*. 2011;16(9):976-987. https://doi.org/10.1080/10810730.2011.561915
10. Ashmore JA, Friedman KE, Reichmann SK, Musante GJ. Weight-based stigmatization, psychological distress, and binge eating behavior among obese treatment-seeking adults. *Eat Behav*. 2008;9(2):203-209. https://doi.org/10.1016/j.eatbeh.2007.09.006
11. Puhl RM, Heuer CA. Obesity stigma: important considerations for public health. *Am J Public Health*. 2010;100(6):1019-1028. https://doi.org/10.2105/ajph.2009.159491
12. Schvey NA, Roberto CA, White MA. Clinical correlates of the Weight Bias Internalization Scale in overweight adults with binge and purge behaviours. *Advances in Eating Disorders*. 2013;1(3):213-223. https://doi.org/10.1080/21662630.2013.794523
13. Wott CB, Carels RA. Overt weight stigma, psychological distress and weight loss treatment outcomes. *J Health Psychol*. 2010;15(4):608-614. https://doi.org/10.1177/1359105309355339
14. Tomiyama 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. https://doi.org/10.1186/s12916-018-1116-5
15. Friedman KE, Reichmann SK, Costanzo PR, Zelli A, Ashmore JA, Musante GJ. Weight stigmatization and ideological beliefs: relation

to psychological functioning in obese adults. *Obes Res*. 2005;13(5):907-916. https://doi.org/10.1038/oby.2005.105
16. O'Brien KS, Latner JD, Puhl RM, et al. The relationship between weight stigma and eating behavior is explained by weight bias internalization and psychological distress. *Appetite*. 2016;102:70-76. https://doi.org/10.1016/j.appet.2016.02.032
17. Durso LE, Latner JD. Understanding self-directed stigma: development of the weight bias internalization scale. *Obesity*. 2008;16(S2):S80-S86. https://doi.org/10.1038/oby.2008.448
18. Martin CB, Herrick KA, Sarafrazi N, Ogden CL. *Attempts to Lose Weight Among Adults in the United States, 2013-2016*. Vol 313. NCHS Data Brief; 2018:1-8.
19. Pearl RL, Himmelstein MS, Puhl RM, Wadden TA, Wojtanowski AC, Foster GD. Weight bias internalization in a commercial weight management sample: prevalence and correlates. *Obes Sci Pract*. 2019;5(4):342-353. https://doi.org/10.1002/osp4.354
20. Becker C, Fitterman-Harris H, Levinson CA. The Unintentional Harms of Weight Management Treatment: Time for a Change; 2023. [cited 2024 Aug 20]; https://osf.io/su6zk/
21. Katherine MF. Use and misuse of BMI categories. *AMA Journal of Ethics*. 2023;25(7):E550-E558.
22. Reduction in the incidence of type 2 Diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346(6):393-403.
23. Look AHEAD Research Group. Eight-year weight losses with an intensive lifestyle intervention: the look AHEAD study. *Obesity*. 2014;22(1):5-13. https://doi.org/10.1002/oby.20662
24. Molarius A, Lindén-Boström M, Karlsson J. Desire to lose weight and need of weight loss support in the adult population—results from a cross-sectional study in Sweden. *Obesity Science & Practice*. 2020;6(4):373-381. https://doi.org/10.1002/osp4.412
25. Cardel MI, Newsome FA, Pearl RL, et al. Patient-centered care for obesity: how health care providers can treat obesity while actively addressing weight stigma and eating disorder risk. *J Acad Nutr Diet*. 2022;122(6):1089-1098. https://doi.org/10.1016/j.jand.2022.01.004
26. Lillis J, Thomas JG, Levin ME, Wing RR. Self-stigma and weight loss: the impact of fear of being stigmatized. *J Health Psychol*. 2020;25(7):922-930. https://doi.org/10.1177/1359105317739101
27. Crane N, Hagerman C, Horgan O, Butryn M. Patterns and predictors of engagement with digital self-monitoring during the maintenance phase of a behavioral weight loss program: quantitative study. *JMIR Mhealth Uhealth*. 2023;11:e45057. https://doi.org/10.2196/45057
28. Pearl RL, Wadden TA, Chao AM, et al. Weight bias internalization and long-term weight loss in patients with obesity. *Ann Behav Med*. 2019;53(8):782-787. https://doi.org/10.1093/abm/kay084
29. Marshall RD, O'Brien KS, Latner JD. The relationship of internalized weight bias to weight change in treatment-seeking overweight adults. *Obesities*. 2022;2(1):21-34. https://doi.org/10.3390/obesities2010003
30. Lillis J, Luoma JB, Levin ME, Hayes SC. Measuring weight self-stigma: the weight self-stigma questionnaire. *Obesity*. 2010;18(5):971-976. https://doi.org/10.1038/oby.2009.353
31. Levin ME, Potts S, Haeger J, Lillis J. Delivering acceptance and commitment Therapy for weight self-stigma through guided self-help: results from an open pilot trial. *Cognit Behav Pract*. 2018;25(1):87-104. https://doi.org/10.1016/j.cbpra.2017.02.002
32. Thomas JG, Leahey TM, Wing RR. An automated internet behavioral weight-loss program by physician referral: a randomized controlled trial. *Diabetes Care*. 2015;38(1):9-15. https://doi.org/10.2337/dc14-1474
33. DeWalt DA, Rothrock N, Yount S, Stone AA. Evaluation of item candidates: the PROMIS qualitative item Review. *Med Care*. 2007;45(5):S12-S21. https://doi.org/10.1097/01.mlr.0000254567.79743.e2
34. Sattler KM, Deane FP, Tapsell L, Kelly PJ. Gender differences in the relationship of weight-based stigmatisation with motivation to exercise and physical activity in overweight individuals. *Health Psychol Open*. 2018;5(1):205510291875969. https://doi.org/10.1177/2055102918759691
35. Major B, Rathbone JA, Blodorn A, Hunger JM. The countervailing effects of weight stigma on weight-loss motivation and perceived capacity for weight control. *Pers Soc Psychol Bull*. 2020;46(9):1331-1343. https://doi.org/10.1177/0146167220903184
36. Olson KL, Goldstein SP, Lillis J, Panza E. Weight stigma is overlooked in commercial-grade mobile applications for weight loss and weight-related behaviors. *Obesity Science & Practice*. 2021;7(2):244-248. https://doi.org/10.1002/osp4.457
37. Zhu X, Smith RA, Buteau E. A meta-analysis of weight stigma and health behaviors. *Stigma and Health*. 2022;7(1):1-13. https://doi.org/10.1037/sah0000352
38. Puhl RM, Moss-Racusin CA, Schwartz MB. Internalization of weight bias: implications for binge eating and emotional well-being. *Obesity*. 2007;15(1):19-23. https://doi.org/10.1038/oby.2007.521
39. Annesi JJ, Whitaker AC. Psychological factors discriminating between successful and unsuccessful weight loss in a behavioral exercise and nutrition education treatment. *Int J Behav Med*. 2010;17(3):168-175. https://doi.org/10.1007/s12529-009-9056-2
40. MacCallum RC, Zhang S, Preacher KJ, Rucker DD. On the practice of dichotomization of quantitative variables. *Psychol Methods*. 2002;7(1):19-40. https://doi.org/10.1037/1082-989x.7.1.19
41. DeCoster J, Iselin AMR, Gallucci M. A conceptual and empirical examination of justifications for dichotomization. *Psychol Methods*. 2009;14(4):349-366. https://doi.org/10.1037/a0016956
42. Saunders JF, Nutter S, Russell-Mayhew S. Examining the conceptual and measurement overlap of body dissatisfaction and internalized weight stigma in predominantly female samples: a meta-analysis and measurement refinement study. *Front Glob Womens Health*. 2022;3:877554. https://doi.org/10.3389/fgwh.2022.877554
43. Brechan I, Kvalem IL. Relationship between body dissatisfaction and disordered eating: mediating role of self-esteem and depression. *Eat Behav*. 2015;17:49-58. https://doi.org/10.1016/j.eatbeh.2014.12.008
44. Dimitrov UM, Pinto AJ, De Morais Sato P, et al. Effects of a new intervention based on the Health at Every Size approach for the management of obesity: the "Health and Wellness in Obesity" study. Ngo DTM, editor. *PLoS One*. 2018;13(7):e0198401. https://doi.org/10.1371/journal.pone.0198401
45. Mensinger JL, Calogero RM, Stranges S, Tylka TL. A weight-neutral versus weight-loss approach for health promotion in women with high BMI: a randomized-controlled trial. *Appetite*. 2016;105:364-374. https://doi.org/10.1016/j.appet.2016.06.006
46. De Morais NDS, Azevedo FM, De Freitas Rocha AR, et al. Body fat is superior to body mass index in predicting cardiometabolic risk factors in adolescents. *IJERPH*. 2023;20(3):2074. https://doi.org/10.3390/ijerph20032074
47. Gómez-Ambrosi J, Silva C, Galofré JC, et al. Body mass index classification misses subjects with increased cardiometabolic risk factors related to elevated adiposity. *Int J Obes*. 2012;36(2):286-294. https://doi.org/10.1038/ijo.2011.100

How to cite this article: Schram SJ, Olson K., Panza E, Lillis J. The impact of weight self-stigma on weight-loss treatment engagement and outcome. *Obes Sci Pract*. 2024;e70015. https://doi.org/10.1002/osp4.70015