



## Impacts of stigma and discrimination on people with obesity who smoke cigarettes

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### ABSTRACT

Stigma is the state of social devaluation due to a trait or group identity; weight and smoking-based self-, felt-, and enacted stigma may have detrimental health effects and pose barriers to smoking cessation. This study examined associations between stigma, discrimination, and health for people with overweight or obesity (body mass index [BMI]  $\geq 25$ ) who smoke cigarettes (cigarettes smoked/day  $\geq 5$ ) who reported interest in quitting smoking and minimizing weight gain. Participants ( $N = 63$ ; predominantly women (81.0 %), White (63.5 %) or Black/African American (31.7 %), and heterosexual (85.7 %) with 50 % having a yearly income below \$50,000) completed the measures of stigma (i.e., Weight Bias Internalization Scale and Internalized Stigma of Smoking Inventory), discrimination (i.e., Everyday Discrimination Scale), and symptoms of depression, weight, smoking, nicotine dependence, and concerns about gaining weight while quitting smoking were measured. Those who reported more internalization of weight bias and more everyday discrimination reported greater depressive symptomatology and greater concern about gaining weight while quitting smoking, with depressive symptomatology fully mediating both internalization of weight bias and everyday discrimination's relation with concern about gaining weight while quitting smoking. There was also an association of smoking felt-stigma, but not self- or enacted-stigma, with symptoms of depression. Stigma's associations with symptoms of depression and post-cessation weight concern suggest barriers to effective behavior change, and interventions may consider targeting processes for coping with stigma experienced by this population.

*Stigma*, or the state of social devaluation due to a trait or group identity (Goffman, 1963; Pescosolido & Martin, 2015), predicts morbidity and mortality and is a fundamental cause of population-level health inequities (Hatzenbuehler et al., 2013). Stigmatization creates an “us vs them” dynamic by assigning individuals with certain characteristics to labeled, negatively stereotyped groups, which are then deemed socially inferior, resulting in unjust outcomes (Link & Phelan, 2001).

People with overweight (OW, BMI  $\geq 25$  kg/m<sup>2</sup>) or obesity (OB, BMI  $\geq 30$  kg/m<sup>2</sup>) are often labeled with negative stereotypes and experience more enacted stigma, such as weight-based discrimination and unequal treatment due to their weight (Abu-Odeh, 2014; Prunty et al., 2020; Puhl & Heuer, 2009; Spahlholz et al., 2016) across settings (Hollmann et al., 2024; Prunty et al., 2020). Weight-related self-, felt-, and enacted-stigma and discrimination—and, in particular, stigma against OW/OB—can prevent individuals from getting appropriate healthcare (Carels et al., 2024; Mensinger et al., 2018; Phelan et al., 2015; Puhl

et al., 2021; Ryan et al., 2023; Wetzel & Himmelstein, 2023). People who experience more self-, felt-, public, and structural stigma due to OW/OB face more adverse psychological outcomes, including eating disturbances, depression, anxiety, and body image dissatisfaction (Alimoradi et al., 2020; Emmer et al., 2020; Hayward et al., 2018; Mooney & El-Sayed, 2016; Papadopoulos & Brennan, 2015; Sutin & Terracciano, 2017; Wang et al., 2021; Wu & Berry, 2018). In addition, stigma and discrimination related to OW/OB may contribute to or underlie some of the adverse physical health outcomes classically associated with OW/OB (Daly et al., 2019; Hunger & Major, 2015; Prunty et al., 2023; Tomiyama et al., 2014).

Smoking stigma, like stigma related to OW/OB, is associated with detrimental consequences for mental and physical health. Individuals who smoke cigarettes are often assigned to a distinct category of people (“smokers”) with associated negative stereotypes, and report experiences of enacted stigma (i.e., discrimination) in a variety of domains

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such as at work, healthcare, and relationships (Graham, 2012; Murphy et al., 2024; Triandafilidis et al., 2016). Smoking-related self-, felt-, and enacted-stigma is reported by both those who smoke and the general population (Draucker et al., 2020; Peretti-Watel et al., 2014). Although some research shows that stigmatization of smoking (i.e., increasing felt stigma) encourages quit attempts (Bayer, 2008; Helweg-Larsen et al., 2020; Helweg-Larsen & Tjitra, 2024; Schoenaker et al., 2018), it also is associated with negative outcomes like medical treatment avoidance, decreased self-esteem, increased smoking as a defensive or coping response to stigma (Antin et al., 2017; Cortland et al., 2019; Evans-Polce et al., 2015), shame, decreased intention to quit (Kim et al., 2018), withdrawing from people who do not smoke, and secrecy about smoking status (David et al., 2024).

Smoking and weight have synergistic effects on health and interact in complex ways. Smoking cessation is associated with weight gain (Alruwaili et al., 2024), and people with OW/OB gain more weight after quitting than do people without OW (Lycett et al., 2011). As a result, people with OW/OB who smoke cigarettes may endorse substantial weight concern, which can interfere with quit attempts (Levine et al., 2013; Murphy et al., 2024). Existing research, has demonstrated that there is an interaction effect between anti-fat attitudes and BMI in its impact on smoking frequency, with endorsing anti-fat attitudes associated with greater smoking frequency in individuals with average or lower BMIs, but not in people with OB/OW, indicating that the experiences of people with OW/OB in particular may be unique (Tran et al., 2023). Despite significant interactions between smoking and weight and stigmatization of both, there is limited research exploring the experiences of self-, felt-, or enacted stigma and discrimination among those with OW/OB who smoke cigarettes.

The current study sought to elucidate the impacts of stigma and discrimination on measured and self-reported factors associated with smoking and weight in this population. We aimed to determine the relationships between self-, felt-, and enacted stigma and everyday discrimination experiences with 1) symptoms of depression, 2) smoking-related factors (i.e., self-reported number of cigarettes smoked per day

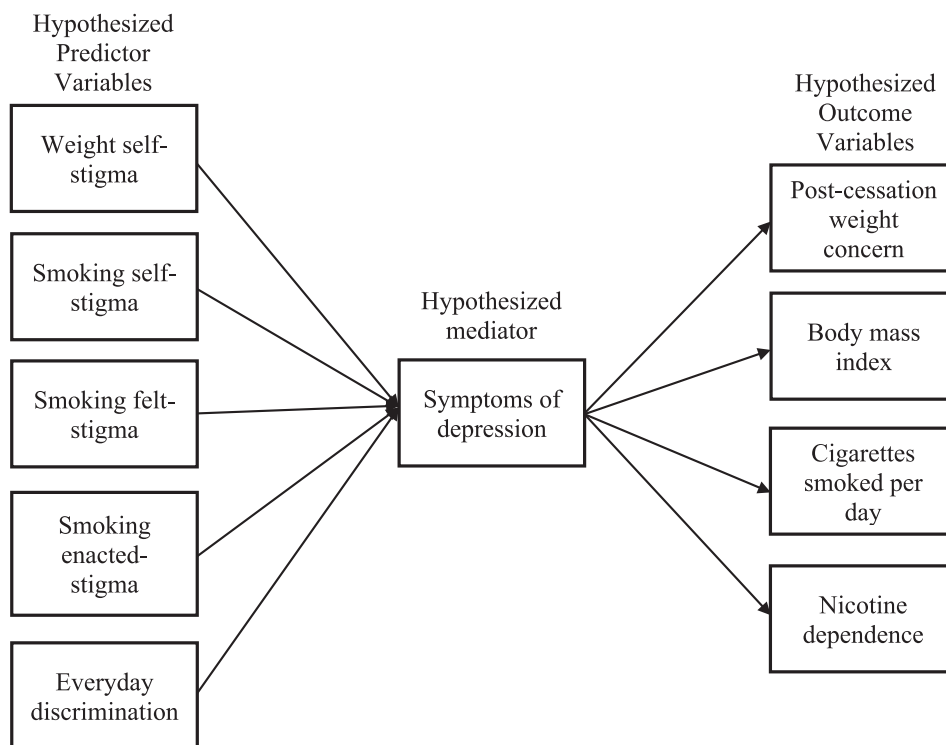
and calculated level of nicotine dependence), and 3) weight-related factors (i.e., measured BMI and subjective, self-reported concerns about smoking cessation-related weight gain). We hypothesized that experiencing more weight self-stigma, smoking self-, felt-, and enacted stigma, or everyday discrimination would be associated with greater number of cigarettes smoked per day, nicotine dependence, BMI, and concern about gaining weight after quitting smoking, and that symptoms of depression would mediate these relationships (see Fig. 1). A better understanding of the impacts of co-occurring weight-based and smoking-based stigma and discrimination can inform public policy and intervention development.

## 1. Methods

### 1.1. Participants

Participants were adults with OW/OB (BMI  $\geq 25$  kg/m<sup>2</sup>) who smoked cigarettes ( $\geq 5$  cigarettes per day) and were interested in quitting smoking and preventing or minimizing associated weight gain during smoking cessation. Participants needed access to a smartphone or tablet and to be able to understand and provide informed consent.

Participants were excluded if they reported currently being in smoking cessation or weight loss treatment including medication; using other forms of tobacco or nicotine more than weekly (other than e-cigarettes); had a current alcohol or other substance use disorder, severe depression or suicidal ideation, an eating disorder, or severe psychiatric disorder (e.g., schizophrenia or bipolar disorder); were not stabilized on psychotropic medications; were currently using medications known to interact with smoking cessation; or had a clinically significant medical condition for which participation would not be recommended (e.g., pregnancy, untreated hypertension). Exclusion criteria were developed to ensure that participants could safely participate in the intervention being tested in the larger parent study K23DA045078.



**Fig. 1.** Potential hypothesized mediation models. *Note:* Figure depicts all hypothesized predictor variables, the hypothesized mediator, and hypothesized outcome variables. tests of hypothesized relationships were only conducted for predictors evidencing a statistically significant relationship in bivariate analyses.

## 1.2. Procedure

Data for this project were derived from the baseline assessment of the parent study K23DA045078 with procedures approved by the Brown University Institutional Review Board. Participants were recruited between 2021 and 2023 via advertisements posted on social media (Facebook, Instagram) for a study for people with OW/OB who smoked cigarettes and wanted to quit smoking and minimize associated weight gain. Individuals were screened, provided informed consent, completed baseline assessment, and were compensated \$30 for their time.

## 1.3. Measures

### 1.3.1. Demographic characteristics

Participants reported their age, education, gender identity, sexual orientation, ethnicity, race, marital status, employment status, and income.

### 1.3.2. Stigma & discrimination

**Weight Stigma.** The 11-item Weight Bias Internalization Scale (Durso & Latner, 2008) assessed the extent to which individuals applied negative stereotypes about people with OW/OB to themselves (i.e., self-stigma), with higher scores (1–7) on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*) indicating more stigma (i.e., bias internalization) with statements such as “I hate myself for my weight.” The scale has demonstrated construct validity and convergent validity (Durso & Latner, 2008), as well as excellent internal consistency within our sample ( $\alpha = 0.91$ ).

**Smoking Stigma.** The 8-item Internalized Stigma of Smoking Inventory (Brown-Johnson et al., 2015) assessed levels of smoking-related stigma on a 4-point Likert scale (1 = *strongly disagree* to 4 = *strongly agree*) with three sub-scales calculated: Self-stigma (internalization of stigma of smoking impacting views of one’s worth; “I am embarrassed or ashamed that I am a smoker”); felt stigma (awareness of the judgment and devaluation from others including fear of being stigmatized due to smoking; “Others think that I can’t achieve much in life because I am a smoker”); and enacted stigma (discriminatory experiences due to smoking; “People often treat me disrespectfully just because I am a smoker”). On all subscales, scores are calculated as means, with higher scores (1–4) indicating more stigma. The ISSI has demonstrated construct validity (Brown-Johnson et al., 2015) and had good internal consistency in our sample (sub-scale  $\alpha$ s = 0.76–0.84).

**Everyday Discrimination.** The 9-item Everyday Discrimination Scale (EDS) (Krieger et al., 2005; Williams et al., 1997) assessed levels of everyday discrimination participants experienced, with higher scores (6–54) indicating greater discrimination. Participants indicated the frequency of discriminatory experiences (e.g., “You are treated with less courtesy than other people are”) on a 6-point scale (1 = *never* to 6 = *almost every day*). A follow-up question assesses the aspects of their identity (e.g., smoking, weight, race, gender) they attributed these experiences resulting from, with instructions to select all that applied. The scale has demonstrated construct validity and test-re-test reliability (Krieger et al., 2005), and had excellent internal consistency in our sample ( $\alpha = 0.94$ ).

### 1.3.3. Smoking-related factors

**Cigarettes Per Day.** Participants’ average number of cigarettes smoked per day over the past 28 days was calculated based on self-reported information from the Timeline Followback (TLFB) interview, which has demonstrated convergent validity and high test-retest reliability (Brown et al., 1998; Robinson et al., 2014; Sobell et al., 1996).

**Nicotine Dependence.** The 6-item Fagerström Test for Nicotine Dependence (FTND) (Heatherton et al., 1991) with questions such as “How soon after you wake up do you smoke your first cigarette?” was used, with higher scores (0–10) indicating greater levels of dependence. The FTND has demonstrated convergent validity (Heatherton et al.,

1991) and had acceptable internal consistency in our sample ( $\alpha = 0.64$ ).

### 1.3.4. Weight-related factors

**Body Mass Index (BMI).** BMI was calculated (weight (lb) / [height (in)]<sup>2</sup> x 703) based on measured weight and self-reported height.

**Weight concern.** The 6-item Post-Cessation Weight Concern Scale (Borrelli & Mermelstein, 1998) assessed concern about gaining weight as a result of quitting smoking, with higher scores (1–10) indicating greater concern. Participants rated their agreement with statements such as “How concerned are you about gaining weight as a result of quitting smoking?” on a 10-point Likert scale (1 = *not at all* to 10 = *very*). The scale has demonstrated convergent validity (Borrelli & Mermelstein, 1998) and had good internal consistency in our sample ( $\alpha = 0.77$ ).

### 1.3.5. Depressive symptomatology

The Patient Health Questionnaire (PHQ-9) (Kroenke et al., 2001) assessed symptoms of depression on a 4-point Likert scale (0 = *not at all* to 3 = *nearly every day*), with higher scores (0–27) indicating greater frequency of symptoms endorsed within the past two weeks. The scale has demonstrated construct validity and criterion validity (Kroenke et al., 2001), and had good internal reliability in our sample ( $\alpha = 0.85$ ).

## 1.4. Statistical analyses

T-test were used to test for group differences among participants in stigma and discrimination experienced, with individuals with minoritized races grouped as people of color, lesbian/gay and bisexual participants grouped as sexual minority individuals, and income divided above and below the federal poverty line (i.e., < \$20,000 and  $\geq$  \$20,000 (Office of the Assistant Secretary for Planning and Evaluation, 2024)).

Bivariate analyses were conducted using Pearson correlations to determine zero-order relationships between hypothesized predictor variables, including the hypothesized mediator, with hypothesized outcome variables (see Fig. 1 and Table 2). All hypothesized predictor and sociodemographic variables evidencing a statistically significant relationship with a hypothesized outcome were included together in subsequent multivariate testing to examine the unique variance accounted for by each variable associated (Table 4).

When the hypothesized mediator (depressive symptomatology) was associated with both a hypothesized predictor and a hypothesized outcome variable, simple mediation analyses using ordinary least squares regression were conducted to examine potential indirect effects of stigma or discrimination on these outcomes through symptoms of depression (Table 5). All analyses were conducted using SPSS 18.0 with a Type I error rate ( $\alpha$ ) set at  $p \leq 0.05$ . Simple mediation analyses were conducted using Hayes’ PROCESS Macros (Model 4) in SPSS using 10,000 bootstrapped samples (Hayes, 2022).

## 2. Results

### 2.1. Sample demographics

Participants ( $N = 63$ ) included individuals who met inclusion criteria and completed all baseline assessments. Participant sociodemographic characteristics are in Table 1. Participants were, on average, 49.8 years old ( $SD = 11.7$ ) and had 14.2 years of education ( $SD = 2.4$ ). Average BMI was 35.7 ( $SD = 8.2$ ), consistent with a categorization of obesity, and average cigarettes smoked per day was 15 ( $SD = 6.1$ ). The most commonly endorsed reasons for discrimination on the EDS were smoking (39.7%), weight (28.6%), and race (9.5%).

### 2.2. Zero-order associations and differences based on demographic characteristics

Correlations are summarized in Table 2. Between-group differences in variables associated with sociodemographic characteristics are

**Table 1**  
Sociodemographic characteristics of participants (N = 63).

Sample Characteristics	N	%
Gender Identity		
Female	51	81.0
Male	12	19.0
Sexual Orientation		
Straight (heterosexual)	54	85.7
Lesbian, Gay	1	1.6
Bisexual	8	12.7
Ethnicity		
Hispanic/Latino	2	3.2
Not Hispanic/Latino	61	96.8
Race		
American Indian or Alaska Native	3	4.8
Black or African American	20	31.7
White	40	63.5
Marital Status		
Married	20	31.7
Partnered/Living together	14	22.2
Separated	6	9.5
Divorced	7	11.1
Widowed	5	7.9
Never married	11	17.5
Employment		
Full Time	29	46
Part Time	6	9.5
Retired	10	15.9
Unable to work due to a disability	10	15.9
Unemployed	8	12.7
Household Yearly Income		
\$0 to \$9,999	5	7.9
\$10,000 to \$19,999	8	12.7
\$20,000 to \$29,000	6	9.5
\$30,000 to \$39,999	4	6.3
\$40,000 to \$49,999	9	14.3
\$50,000 to \$59,999	7	11.1
\$60,000 to \$69,999	6	9.5
\$70,000 to \$79,999	5	7.9
\$80,000 to \$89,999	4	6.3
\$90,000 to \$99,999	3	4.8
Greater than \$99,999	6	9.5

summarized in Table 3. Smoking stigma, stigma related to OW/OB, and discrimination were all positively associated. Stigma associated with OW/OB and everyday discrimination were also significantly positively correlated with symptoms of depression and post-cessation weight concerns, but not significantly associated with BMI. BMI had a significant negative association with age and years of education completed. White participants reported significantly higher stigma associated with OW/OB than people of color.

Smoking felt-stigma was significantly associated with symptoms of depression. There were significant positive associations between number of cigarettes smoked daily and nicotine dependence with smoking enacted-stigma. Sexual minority participants reported significantly

more enacted stigma due to smoking than those who identified as heterosexual/straight. Women reported significantly more smoking self-stigma than men, and participants with household incomes above the federal poverty level reported significantly more smoking self-stigma than those below it. There were no group differences in levels of nicotine dependence but number of cigarettes smoked per day varied by race, with white participants reporting smoking significantly more cigarettes daily than people of color.

2.2.1. Multivariate analyses and mediation

Table 4 shows follow-up analyses conducted to determine unique variance associated with the three outcome variables that evidenced significant bivariate relationships with hypothesized predictors and/or sociodemographic characteristics: 1) weight concern, 2) cigarettes smoked per day, and 3) nicotine dependence.

**Weight concern.** When depressive symptomatology, stigma associated with OW/OB, and discrimination were included together in a multivariate model, symptoms of depression remained significantly related to post-cessation weight concern, but stigma associated with OW/OB and everyday discrimination were not statistically significant. Given significant bivariate relationships between symptoms of depression with stigma associated with OW/OB, everyday discrimination, and post-cessation weight concern, separate mediational analyses were conducted testing putative mediational pathways between stigma associated with OW/OB and everyday discrimination with weight concern via symptoms of depression (Table 5). Mediation analysis indicated that internalized self-stigma from OW/OB indirectly influenced post-cessation weight concern through its effect on symptoms of depression. Participants with greater internalization of weight stigma had more symptoms of depression and depressive symptomatology was associated with greater post-cessation weight concern (Fig. 2). There was no evidence that internalization of weight stigma influenced post-cessation weight concern independent of its effect on depressive symptomatology ( $c' = 0.27, p = 0.11$ ). The association between discrimination and weight concern demonstrated the same pattern, with no evidence that everyday discrimination influenced post-cessation weight concern independent of its effect on symptoms of depression ( $c' = 0.04, p = 0.10$ ).

**Cigarette Smoking & Nicotine Dependence.** Number of cigarettes smoked per day was regressed on enacted smoking stigma based on significant zero-order correlations, with race, also a significant predictor of number of cigarettes smoked per day, also included in the model. Enacted smoking stigma accounted for a significant proportion of the variance associated with number of cigarettes smoked per day. Enacted smoking stigma was the predictor or sociodemographic variable found to be associated with nicotine dependence, and, therefore nicotine dependence score was regressed on enacted smoking, also demonstrating a significant relationship (Table 4).

**Table 2**  
Descriptive statistics and correlations for study variables.

Variable	n	M	SD	1	2	3	4	5	6	7	8	9	10
1. weight self-stigma	63	3.30	3.44	—									
2. smoking felt-stigma	63	2.05	0.80	0.43**	—								
3. smoking self-stigma	63	2.75	0.83	0.28*	0.53**	—							
4. smoking enacted-stigma	62	2.26	0.84	0.28*	0.72**	0.56**	—						
5. everyday discrimination	63	17.49	9.29	0.46**	0.58**	0.36**	0.45**	—					
6. symptoms of depression	63	3.38	3.44	0.50**	0.44**	0.24	0.25	0.36**	—				
7. post-cessation weight concern	63	6.29	1.64	0.37**	0.22	0.16	0.14	0.32**	0.41**	—			
8. body mass index	59	35.67	8.25	-0.06	-0.09	-0.10	-0.13	-0.17	0.02	-0.01	—		
9. cigarettes smoked per day	59	14.99	6.14	0.19	0.05	0.06	0.39**	-0.03	0.02	0.15	0.02	—	
10. nicotine dependence	63	5.57	2.01	-0.00	0.04	-0.02	0.33**	-0.18	-0.22	0.02	0.01	0.58**	—
11. age	63	49.25	11.68	-0.09	-0.07	-0.03	-0.04	-0.15	-0.21	-0.13	-0.35**	-0.06	0.08
12. years of education	63	14.21	2.37	0.03	-0.09	0.18	0.06	-0.08	-0.05	-0.06	-0.36**	-0.04	-0.24

Note. Frequencies, means, and standard deviations for each study variable, as well as Pearson correlations between study variables, are reported. \*  $p < 0.05$ . \*\*  $p < 0.01$ .



**Table 3**  
Means, standard deviations, and subgroup *t*-test results for sociodemographic sub-groups of participants.

	Race			Gender			Sexual Orientation			Income		
	White	Minoritized races	<i>p</i>	Men	Women	<i>p</i>	Straight/heterosexual	Sexual minority	<i>p</i>	above poverty line	below poverty line	<i>p</i>
weight self-stigma	3.64 (1.21)	2.72 (1.23)	0.005*	2.83 (1.18)	3.40 (1.30)	0.19	3.20 (1.26)	3.93 (1.37)	0.06	3.39 (1.24)	2.98 (1.47)	0.31
smoking felt-stigma	2.12 (0.84)	1.93 (0.72)	0.37	1.76 (0.62)	2.11 (0.83)	0.19	1.93 (0.80)	2.48 (0.71)	0.08	2.03 (0.83)	2.10 (0.70)	0.78
smoking self-stigma	2.83 (0.81)	2.61 (0.87)	0.31	2.30 (0.91)	2.85 (0.79)	0.048*	2.70 (0.86)	3.04 (0.63)	0.27	2.87 (0.81)	2.28 (0.76)	0.02*
smoking enacted-stigma	2.36 (0.82)	2.07 (0.88)	0.19	1.95 (0.85)	2.32 (0.84)	0.19	2.17 (0.80)	2.78 (0.94)	0.045*	2.32 (0.86)	2.04 (0.75)	0.30
everyday discrimination	19.23 (9.55)	14.48 (8.16)	0.05	15.45 (8.41)	17.92 (9.49)	0.43	16.59 (9.18)	22.89 (8.49)	0.06	18.66 (9.82)	13.00 (4.95)	0.05
symptoms of depression	3.52 (0.52)	3.13 (3.77)	0.67	2.64 (3.44)	3.54 (3.45)	0.43	3.39 (3.60)	3.33 (2.40)	0.97	3.24 (2.99)	3.92 (4.92)	0.53
post-cessation weight concern	6.54 (1.50)	5.85 (1.80)	0.11	5.80 (1.76)	6.39 (1.61)	0.28	6.42 (1.59)	5.52 (1.86)	0.13	6.41 (1.54)	5.81 (1.98)	0.24
body mass index	35.62 (8.74)	35.77 (7.54)	0.95	33.78 (4.51)	35.60 (1.10)	0.47	34.88 (7.23)	37.70 (8.88)	0.30	34.63 (7.07)	39.78 (11.25)	0.05
cigarettes smoked per day	16.35 (5.73)	12.53 (6.23)	0.02*	13.43 (4.63)	15.31 (6.40)	0.38	14.71 (5.87)	16.58 (7.68)	0.40	15.37 (6.00)	13.65 (6.71)	0.38
nicotine dependence	5.65 (2.09)	5.43 (1.90)	0.69	5.64 (1.29)	5.56 (2.15)	0.45	5.46 (2.03)	6.22 (1.92)	0.30	5.54 (2.16)	5.69 (1.38)	0.81

Note: Mean values for each study variable are shown by sociodemographic subgroups, as well as the results of statistical significance testing of differences between group means (subgroup *t*-tests). \**p* < 0.05.

**Table 4**  
Multiple linear regression models.

Variable	<i>B</i>	<i>SE</i>	$\beta$	<i>t</i>	<i>p</i>	95 % CI	
						<i>LL</i>	<i>UL</i>
Model Testing Predictors Significantly Associated with Post-Cessation Weight Concern							
(Constant)	4.71	0.54		8.67	0<.01	3.63	5.80
Symptoms of depression	0.14	0.06	0.28	2.11	0.04	0.01	0.26
Weight self-stigma	0.20	0.18	0.16	1.10	0.28	-0.16	0.56
Everyday discrimination	0.03	0.02	0.15	1.16	0.25	-0.02	0.07
Model Fit: $R^2 = 0.22$ ; Adjusted $R^2 = 0.18$							
Model Testing Predictors Significantly Associated with Number of Cigarettes Smoked Per Day							
(Constant)	4.35	3.11		1.40	0.17	-1.88	10.58
Enacted smoking stigma	2.64	0.88	0.37	3.02	0<.01	0.89	4.40
Race	2.87	1.53	0.23	1.88	0.07	-0.19	5.94
Model Fit: $R^2 = 0.21$ ; Adjusted $R^2 = 0.18$							
Model Testing Predictors Significantly Associated with Nicotine Dependence							
(Constant)	3.83	0.70		5.50	0<.01	2.44	5.23
Enacted smoking stigma	0.79	0.29	0.33	2.73	0<.01	0.21	1.37
Model Fit: $R^2 = 0.11$ ; Adjusted $R^2 = 0.10$							

### 3. Discussion

As hypothesized, people who experienced more overweight self-stigma, smoking felt-stigma, and discrimination also experienced greater depressive symptomatology. People who experienced more internalization of weight stigma and more everyday discrimination also had more concern about gaining weight from quitting smoking, and this association was fully mediated by depressive symptomatology. Those who experienced more enacted stigma related to their smoking reported smoking more cigarettes per day and being more dependent on nicotine. Contrary to hypotheses, no significant associations were found between any forms of stigma and BMI, and smoking self- and enacted- stigma were not associated with symptoms of depression.

The co-occurrence of stigma associated with OB/OW and smoking

and discrimination in this population is consistent with previous research showing that people who experience one of these types of stigma tend to be additionally impacted by numerous other systems of oppression (Brown-Johnson et al., 2015; Himmelstein et al., 2017). As such, our findings underscore the complex interplay between smoking stigma, stigma associated with OW/OB, and other stigmas (e.g., racism, sexism) and the effects on people who are impacted by the overlaps of these experiences. In addition, these findings highlight the need to focus on people with OW/OB who smoke cigarettes as a potential population of risk when developing smoking or weight interventions.

In line with past literature on smoking stigma, higher income was associated with greater smoking self-stigma (Graham, 2012; Kim et al., 2018). This aligns with stereotypes linking smoking to being lower class as part of the stigmatization process (Graham, 2012). In addition, white people reported significantly higher internalized weight stigma than did people of color. This is in line with prior literature, which shows that cultural attitudes privileging thinness tend to be more pervasive for white people—and in particular white women—than for people of color (Himmelstein et al., 2017; Reece, 2018).

The finding that weight self-stigma and experiences of everyday discrimination are associated with more symptoms of depression is consistent with literature that highlights the detrimental effects of experiences of stigma on mental health (Savoy et al., 2012; Stevens et al., 2018; Wott & Carels, 2010; Wu & Berry, 2018). Weight-based discrimination and stigma has also been shown to mediate relations between OW/OB and depression (Robinson et al., 2017). Our findings are in line with work that suggests that weight stigma presents a stronger association with symptoms of depression than does BMI (Mooney & El-Sayed, 2016; Ross, 1994; Stevens et al., 2018). Stress responses are activated in response to weight-stigmatizing experiences (Major et al., 2012), so people exposed to greater weight stigma are subjected to greater stress that contributes to negative mental health outcomes including symptoms of depression. In this way, weight stigma functions similarly to other forms of stigma and discrimination conceptualized as social determinants of health in the social-ecological model of health (Puhl et al., 2020).

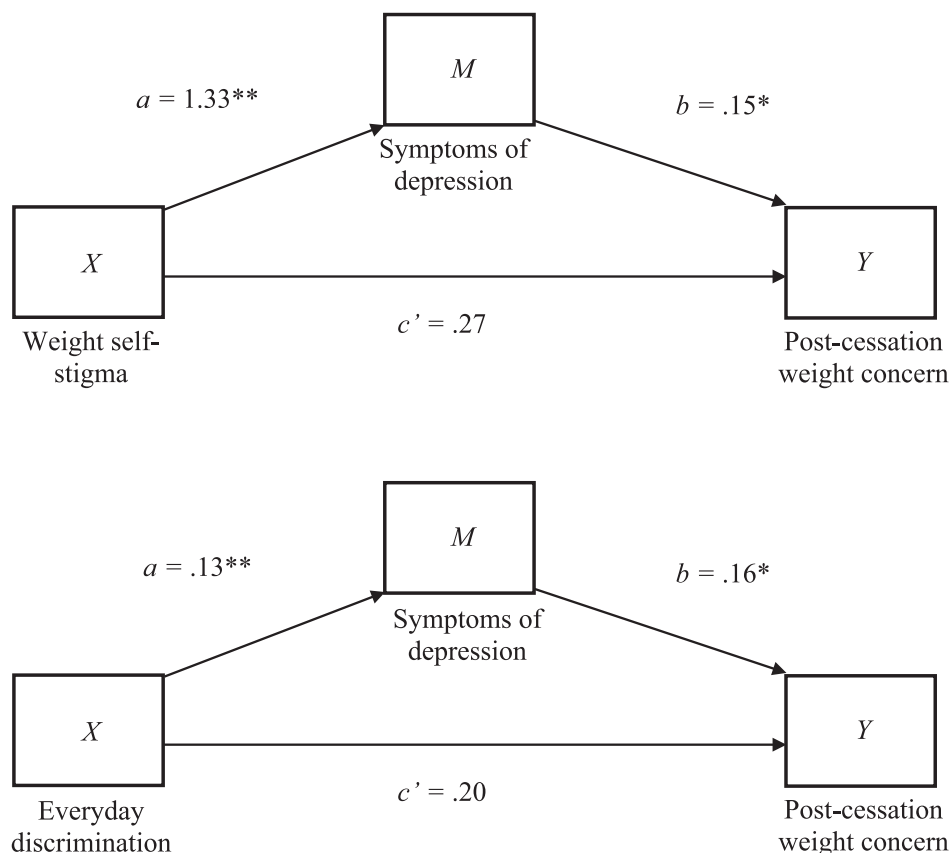
Weight stigma and everyday discrimination were also found to be significantly associated with post-cessation weight concern. To our knowledge, no past literature has investigated either of these associations. While past research has found an association between BMI and

**Table 5**

Model coefficients for simple mediation models with associations between weight self-stigma and post-cessation weight concern and everyday discrimination and post-cessation weight concern mediated by symptoms of depression.

Predictor	Outcome M (symptoms of depression)			Y (post-cessation weight concern)				
	Coeff.	SE	p	Coeff.	SE	p		
Weight self-stigma predicting post-cessation weight concern, mediated by symptoms of depression								
X (weight self-stigma)	<i>a</i>	1.33	0.29	0<.01	<i>c'</i>	0.27	0.17	0.12
M (symptoms of depression)	—	—	—	—	<i>b</i>	0.15	0.06	0.02
constant	<i>i<sub>M</sub></i>	-1.01	1.04	0.34	<i>i<sub>y</sub></i>	4.75	0.54	0<.01
$R^2 = 0.25$ $F(1, 61) = 20.36, p < 0.01$				$R^2 = 0.21$ $F(2, 60) = 20.36, p < 0.01$				
Everyday discrimination predicting post-cessation weight concern, mediated by symptoms of depression								
X (everyday discrimination)	<i>a</i>	0.13	0.04	0<.01	<i>c'</i>	0.04	0.02	0.10
M (symptoms of depression)	—	—	—	—	<i>b</i>	0.16	0.06	0.01
constant	<i>i<sub>M</sub></i>	1.08	0.88	0.22	<i>i<sub>y</sub></i>	5.11	0.41	0<.01
$R^2 = 0.13$ $F(1, 61) = 8.83, p < 0.01$				$R^2 = 0.21$ $F(2, 60) = 7.86, p < 0.01$				

Note: Model coefficients for paths in simple mediation models with everyday discrimination and weight self-stigma predicting post-cessation weight concern, mediated by symptoms of depression are presented above.



**Fig. 2.** Simple mediation models with associations between weight self-stigma and post-cessation weight concern and everyday discrimination and post-cessation weight concern mediated by symptoms of depression. Note: Simple mediation models show relationships between weight self-stigma and post-cessation weight concern as mediated by symptoms of depression (top) and between everyday discrimination and post-cessation weight concern as mediated by symptoms of depression (bottom).  $*p < .05$ ;  $**p < .001$ .

post-cessation weight concern (Levine et al., 2013; Pomerleau & Saules, 2007), this study did not find such a relation, and it is possible that stigma related to OW/OB would serve as a better predictor of weight concern than BMI. As suggested by the mediation models, stigma may impact cessation-related weight concern via its impact on symptoms of depression. Literature has shown mixed results on whether levels of weight concern predict smoking cessation outcomes or have an association with interest or motivation to quit smoking (Berg et al., 2008; Germeroth & Levine, 2018; Mukhopadhyay & Wendel, 2011; Perkins

et al., 2001; Tuovinen et al., 2015). Nevertheless, the significant association found in some studies warrants greater attention to weight self-stigma and discrimination as upstream factors of weight concern with a potential effect on smoking cessation attempts and outcomes. Additionally, the finding that experiences of everyday discrimination are associated with greater weight concern is in line with work that has found a relation between weight-based discrimination and poorer body satisfaction and greater concern about weight (Jung et al., 2017).

Notably, significantly less research has been conducted on the

relation between smoking stigma and symptoms of depression. The effects of smoking stigma on depression have only been considered as an adjunct to other more studied forms of stigma, such as lung cancer stigma, HIV stigma, and unemployment stigma, and have yielded mixed results. Some studies have found associations between smoking stigma and psychological distress (Fielding-Singh et al., 2020) and others have found no direct effect of smoking stigma on endorsed symptoms of depression, but rather an interaction effect of multiple types of stigma (Kim & DeMarco, 2022). Smoking felt-stigma's impact on mental health likely functions via similar mechanisms to other types of stigma: increased internalization of stigma contributes to increased stress, which leads to greater psychological burden and symptoms of depression (Hatzenbuehler et al., 2013; Major & O'Brien, 2005). Our finding that self-stigma and enacted-smoking stigma had a weaker, non-significant association with depressive symptomatology is also surprising and warrants further investigation.

Also significant was the association between smoking enacted stigma and number of cigarettes smoked per day and level of nicotine dependence. There may be a cyclical relation in which people who are more highly dependent on nicotine and smoke more cigarettes encounter more enacted stigma due to smoking. In turn, they may be more likely to smoke as a way of coping with experiences of discrimination, thus increasing their number of cigarettes smoked per day and dependence on nicotine. This is in line with research that suggests that smoking can serve as a coping mechanism for experiences of stigma and discrimination (Crockett et al., 2018; Lorenzo-Blanco & Unger, 2015; Parker et al., 2016). This reciprocal relation between amount smoked and experiences of discrimination points to the potential dangers of public health practices which may increase enacted smoking stigma, making it more difficult for some individuals to quit smoking. Nonetheless, the lack of association between amount smoked or nicotine dependence with other forms of smoking stigma (i.e., self- and felt- stigma) suggests that processes outside of heaviness of smoking are related to stigmatization for people who smoke at least five cigarettes per day. One potential explanation is that being assigned the identity category of someone who smokes, no matter how much, puts one at risk of encountering felt- and self-stigma, but that people who smoke more heavily are more likely to experience enacted stigma. The finding that people who smoke cigarettes may smoke more in response to (and potentially to cope with) experiences of smoking-related discrimination but appear not to do so in response to felt- or self-stigma is interesting and warrants further investigation.

### 3.1. Strengths and limitations

This study adds significantly to the limited research on the complex impacts of stigma and discrimination on people with OW/OB who smoke cigarettes. Measures captured numerous forms of stigma and discrimination and we were able to examine impacts on a number of weight- and smoking-related outcomes. By establishing an association between feeling/perceiving more smoking stigma and experiencing more symptoms of depression, this study also adds to the scant existing literature on the psychological effects of smoking stigma. Nevertheless, these data should be interpreted within the context of their limitations. Firstly, as this research is cross-sectional, we were unable to establish direct causal relations within these data. Although we suggest a possible directional or cyclical relation for many of our results, it is possible that an alternative directionality can be established. Future work examining the impacts of smoking- and weight-related stigma and discrimination on smoking cessation outcomes longitudinally is necessary. Additionally, the sample was not powered to detect the interaction effects of different forms of stigma and discrimination. As smoking stigma, weight self-stigma, and everyday discrimination were highly correlated, such an analysis with a larger sample could elucidate potential additional impacts on people who experience these multiple forms of stigma and discrimination. Participants in this sample also reported low overall

symptoms of depression, and people with severe depression and/or suicidality were excluded. Other psychologically distressing symptoms outside of depressive symptoms were not assessed. Future research should examine the associations between smoking/weight stigma and discrimination and depressive symptomatology among those with a broader range of depressive symptoms as well as consider a greater variety of forms of psychological distress that may be associated with weight- or smoking-related stigma or discrimination. While we were able to include a measure that assessed three different forms of smoking-related stigma (self-, felt-, and enacted-), our measure of weight bias internalization only covered weight self-stigma; thus, the role of weight felt- and enacted- stigma on these outcomes warrants further investigation. Additionally, as the most endorsed reason for discrimination was smoking, the measure of everyday discrimination may have overlapped with the measure of smoking enacted stigma, although the moderate correlation between the two suggests that they were not redundant. Nonetheless, future studies interested in examining the impacts of experiences of discrimination outside of smoking- or weight-related discrimination should consider including more specific measures of discrimination focused on other systems of oppression. This sample also has limited diversity, particularly in terms of race, ethnicity, and gender identity. Future work exploring the impacts of these phenomena in a greater diversity of populations may increase generalizability.

### 3.2. Implications & future directions

This study points to the importance of considering the roles of stigma and discrimination when examining health-related outcomes among people with overweight or obesity who smoke cigarettes. This is important within the context of the dearth of research examining the co-occurrence of multiple forms of stigma in this population. Examining stigma and discrimination can help elucidate some of the factors that contribute to poor health outcomes for this population as well as potential barriers to health behavior change.

It is important to address stigma as a potential adverse effect of interventions seeking to promote positive health behavior change (McGregor et al., 2022). This may include helping people acknowledge and cope with smoking and weight-related stigma and discrimination in smoking cessation treatment on the individual level. Structural interventions are also needed to reduce weight-based stigma and discrimination (Meadows et al., 2021) along with public health avoiding stigmatizing language when promoting smoking cessation. These interventions may help reduce stigma and improve health and well-being.

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### Ethical approval and informed consent statements

Procedures for this study were approved by the Brown University Institutional Review Board, protocol number IRB000000554 on January 10, 2019. All participants provided written informed consent prior to enrollment in the study.

### CRediT authorship contribution statement

**Liza A. Kolbasov:** Writing – original draft, Writing – review & editing, Formal analysis. **Arryn A. Guy:** Writing – review & editing, Formal analysis. **Cara M. Murphy:** Conceptualization, Methodology, Investigation, Resources, Supervision, Project administration, Funding acquisition, Writing – review & editing, Formal analysis.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data will be made available on request.

## References

- Abu-Odeh, D. (2014). Fat stigma and public health: a theoretical framework and ethical analysis. *Kennedy Institute of Ethics Journal*, 24(3), 247–265. <https://www.proquest.com/scholarly-journals/fat-stigma-public-health-theoretical-framework/docview/1628558542/se-2?accountid=9758>.
- Alimoradi, Z., Golboni, F., Griffiths, M. D., Broström, A., Lin, C.-Y., & Pakpour, A. H. (2020). Weight-related stigma and psychological distress: A systematic review and meta-analysis. *Clinical Nutrition (Edinburgh, Scotland)*, 39(7), 2001–2013. <https://doi.org/10.1016/j.clnu.2019.10.016>
- Alruwaili, A., King, J. A., Deighton, K., Kelly, B. M., Liao, Z., Innes, A., Henson, J., Yates, T., Johnson, W., Thivel, D., Metz, L., Thackray, A. E., Tolfrey, K., Stensel, D. J., & Willis, S. A. (2024). The association of smoking with different eating and dietary behaviours: A cross-sectional analysis of 80 296 United Kingdom adults. *Addiction*, 119(10), 1737–1750. <https://doi.org/10.1111/add.16584>
- Antin, T. M. J., Annechino, R., Hunt, G., Lipperman-Kreda, S., & Young, M. (2017). The gendered experience of smoking stigma: Implications for tobacco control. *Critical Public Health*, 27(4), 443–454. <https://doi.org/10.1080/09581596.2016.1249825>
- Bayer, R. (2008). Stigma and the ethics of public health: Not can we but should we. *Social Science & Medicine*, 67(3), 463–472. <https://doi.org/10.1016/j.socscimed.2008.03.017>
- Berg, C. J., Park, E. R., Chang, Y., & Rigotti, N. A. (2008). Is concern about post-cessation weight gain a barrier to smoking cessation among pregnant women? *Nicotine & Tobacco Research*, 10(7), 1159–1163. <https://doi.org/10.1080/14622200802163068>
- Borrelli, B., & Mermelstein, R. (1998). The role of weight concern and self-efficacy in smoking cessation and weight gain among smokers in a clinic-based cessation program. *Addictive Behaviors*, 23(5), 609–622. [https://doi.org/10.1016/S0306-4603\(98\)00014-8](https://doi.org/10.1016/S0306-4603(98)00014-8)
- Brown, R. A., Burgess, E. S., Sales, S. D., Whiteley, J. A., Evans, D. M., & Miller, I. W. (1998). Reliability and validity of a smoking timeline follow-back interview. *Psychology of Addictive Behaviors*, 12(2), 101–112. <https://doi.org/10.1037/0893-164X.12.2.101>
- Brown-Johnson, C. G., Cataldo, J. K., Orozco, N., Lisha, N. E., Hickman Iii, N. J., & Prochaska, J. J. (2015). Validity and reliability of the internalized stigma of smoking inventory: An exploration of shame, isolation, and discrimination in smokers with mental health diagnoses. *The American Journal on Addictions*, 24(5), 410–418. <https://doi.org/10.1111/ajad.12215>
- Carels, R. A., Byrd, R., Mansour, L., Metzler, A. L., & Jansen, E. (2024). The role of weight stigma and internalized weight bias in health care avoidance and mistrust. *Stigma and Health*. <https://doi.org/10.1037/sah0000578>
- Cortland, C. I., Shapiro, J. R., Guzman, I. Y., & Ray, L. A. (2019). The ironic effects of stigmatizing smoking: Combining stereotype threat theory with behavioral pharmacology. *Addiction*, 114(10), 1842–1848. <https://doi.org/10.1111/add.14696>
- Crockett, K. B., Rice, W. S., & Turan, B. (2018). Associations between multiple forms of discrimination and tobacco use among people living with HIV: the mediating role of avoidance coping. *AIDS Journal of Acquired Immune Deficiency Syndromes*, 78(1). [https://journals.lww.com/jaids/fulltext/2018/05010/associations\\_between\\_multiple\\_forms\\_of.2.aspx](https://journals.lww.com/jaids/fulltext/2018/05010/associations_between_multiple_forms_of.2.aspx)
- Daly, M., Sutin, A. R., & Robinson, E. (2019). Perceived weight discrimination mediates the prospective association between obesity and physiological dysregulation: evidence from a population-based cohort. *Psychological Science*, 30(7), 1030–1039. <https://doi.org/10.1177/0956797619849440>
- David, J.-C., Fonte, D., Sutter-Dallay, A.-L., Auriacombe, M., Serre, F., Rasclé, N., & Loyal, D. (2024). The stigma of smoking among women: A systematic review. *Social Science & Medicine*, 340, Article 116491. <https://doi.org/10.1016/j.socscimed.2023.116491>
- Draucker, C. B., Rawl, S. M., Vode, E., Fields, M., Elkins, C., Morgan, O., Perez, S. R., Straber, L., & Carter-Harris, L. (2020). Smoking-related social interactions as experienced by persons who smoked long-term. *Clinical Nurse Specialist*, 34(6), 282–289. <https://doi.org/10.1097/NUR.0000000000000555>
- Durso, L. E., & Latner, J. D. (2008). Understanding self-directed stigma: development of the weight bias internalization scale. *Obesity*, 16(S2), S80–S86. <https://doi.org/10.1038/oby.2008.448>
- Emmer, C., Bosnjak, M., & Mata, J. (2020). The association between weight stigma and mental health: A meta-analysis. *Obesity Reviews*, 21(1), Article e12935. <https://doi.org/10.1111/obr.12935>
- Evans-Polce, R. J., Castaldelli-Maia, J. M., Schomerus, G., & Evans-Lacko, S. E. (2015). The downside of tobacco control? Smoking and self-stigma: A systematic review. *Social Science & Medicine*, 145, 26–34. <https://doi.org/10.1016/j.socscimed.2015.09.026>
- Fielding-Singh, P., Vogel, E. A., & Prochaska, J. J. (2020). Occupying multiple stigmatized identities: Smoking and unemployment stigmas among the unemployed. *SSM - Population Health*, 11, Article 100598. <https://doi.org/10.1016/j.ssmph.2020.100598>
- Germeroth, L. J., & Levine, M. D. (2018). Postcessation weight gain concern as a barrier to smoking cessation: Assessment considerations and future directions. *Addictive Behaviors*, 76, 250–257. <https://doi.org/10.1016/j.addbeh.2017.08.022>
- Goffman, E. (1963). *Stigma: Notes on the management of spoiled identity*. Prentice Hall Inc.
- Graham, H. (2012). Smoking, stigma and social class. *Journal of Social Policy*, 41(1), 83–99. <https://doi.org/10.1017/S004727941100033X>
- Hatzenbuehler, M. L., Phelan, J. C., & Link, B. G. (2013). Stigma as a fundamental cause of population health inequalities. *Am J Public Health*, 103(5), 813–821. <https://doi.org/10.2105/ajph.2012.301069>
- Hayes, A. F. (2022). *Introduction to moderation, mediation, and conditional process analysis: a regression-based approach* (3 ed.). The Guilford Press.
- Hayward, L. E., Vartanian, L. R., & Pinkus, R. T. (2018). Weight stigma predicts poorer psychological well-being through internalized weight bias and maladaptive coping responses. *Obesity (Silver Spring, Md.)*, 26(4), 755–761. <https://doi.org/10.1002/oby.22126>
- Heatherington, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerström, K. O. (1991). The Fagerström test for nicotine dependence: a revision of the fagerström tolerance questionnaire. *Br J Addict*, 86(9), 1119–1127. <https://doi.org/10.1111/j.1360-0443.1991.tb01879.x>
- Helweg-Larsen, M., Pyakuryal, M., & Pisinger, C. (2020). Reminders of a stigmatized status might help smokers quit. *Stigma and Health*, 5(3), 273–283. DOI: 10.1037/sah000019710.1037/sah0000197.supp (Supplemental).
- Helweg-Larsen, M., & Tjitra, C. (2024). Does ostracism help smokers quit? *Stigma and Health*, 9(1), 30–38. <https://doi.org/10.1037/sah0000304>
- Himmelstein, M. S., Puhl, R. M., & Quinn, D. M. (2017). Intersectionality: An understudied framework for addressing weight stigma. *American Journal of Preventive Medicine*, 53(4), 421–431. <https://doi.org/10.1016/j.amepre.2017.04.003>
- Hollmann, E., Farrell, E., Le Roux, C., Nadgrowski, J., & McGillicuddy, D. (2024). "Treated as second class citizens" - the lived experience of obesity-related stigma: An IM2 SOPHIA study. *International Journal of Qualitative Studies on Health and Well-being*, 19(1), Article 2344232. <https://doi.org/10.1080/17482631.2024.2344232>
- Hunger, J. M., & Major, B. (2015). Weight stigma mediates the association between BMI and self-reported health. *Health Psychol*, 34(2), 172–175. <https://doi.org/10.1037/hea0000106>
- Jung, F., Spahlholz, J., Hilbert, A., Riedel-Heller, S. G., & Luck-Sikorski, C. (2017). Impact of weight-related discrimination, body dissatisfaction and self-stigma on the desire to weigh less. *Obesity Facts*, 10(2), 139–151. <https://doi.org/10.1159/000468154>
- Kim, J., Cao, X., & Meczowski, E. (2018). Does stigmatization motivate people to quit smoking? examining the effect of stigmatizing anti-smoking campaigns on cessation intention. *Health Communication*, 33(6), 681–689. <https://doi.org/10.1080/10410236.2017.1299275>
- Kim, S. S., & DeMarco, R. F. (2022). The intersectionality of HIV-related stigma and tobacco smoking stigma with depressive and anxiety symptoms among women living with HIV in the United States: A cross-sectional study. *The Journal of the Association of Nurses in AIDS Care*, 33(5), 523–533. <https://doi.org/10.1097/JNC.0000000000000323>
- Krieger, N., Smith, K., Naishadham, D., Hartman, C., & Barbeau, E. M. (2005). Experiences of discrimination: Validity and reliability of a self-report measure for population health research on racism and health. *Soc Sci Med*, 61(7), 1576–1596. <https://doi.org/10.1016/j.socscimed.2005.03.006>
- Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: Validity of a brief depression severity measure. *J Gen Intern Med*, 16(9), 606–613. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>
- Levine, M. D., Bush, T., Magnusson, B., Cheng, Y., & Chen, X. (2013). Smoking-related weight concerns and obesity: differences among normal weight, overweight, and obese smokers using a telephone tobacco quitline. *Nicotine & tobacco research*, 15(6), 1136–1140. <https://doi.org/10.1093/ntn/nts226>
- Link, B. G., & Phelan, J. C. (2001). Conceptualizing stigma. *Annual Review of Sociology*, 27, 363–385. <https://doi.org/10.1146/annurev.soc.27.1.363>
- Lorenzo-Blanco, E. I., & Unger, J. B. (2015). Ethnic discrimination, acculturative stress, and family conflict as predictors of depressive symptoms and cigarette smoking among latina/o youth: the mediating role of perceived stress. *Journal of Youth and Adolescence*, 44(10), 1984–1997. <https://doi.org/10.1007/s10964-015-0339-4>
- Lycett, D., Munafò, M., Johnstone, E., Murphy, M., & Aveyard, P. (2011). Associations between weight change over 8 years and baseline body mass index in a cohort of continuing and quitting smokers. *Addiction*, 106(1), 188–196. <https://doi.org/10.1111/j.1360-0443.2010.03136.x>
- Major, B., Eliezer, D., & Rieck, H. (2012). The psychological weight of weight stigma. *Social Psychological and Personality Science*, 3(6), 651–658. <https://doi.org/10.1177/1948550611434400>
- Major, B., & O'Brien, L. T. (2005). The social psychology of stigma. *Annual review of psychology*, 56(1), 393–421. <https://doi.org/10.1146/annurev.psych.56.091103.070137>
- McGregor, S., Roberts, S., Grant, S. L., & O'Loughlin, E. (2022). Weight-normative versus weight-inclusive narratives in weight-related public health campaigns: effects on anti-fat attitudes, stigma, motivation, and self-efficacy. *Obesities*, 2(1), 76–93. <https://www.mdpi.com/2673-4168/2/1/8>
- Meadows, A., Danielsdóttir, S., Goldberg, D., & Mercedes, M. (2021). Fighting for a (wide enough) seat at the table: Weight stigma in law and policy. *Fat Studies*, 10(2), 101–124. <https://doi.org/10.1080/21604851.2020.1835295>



- Mensingher, J. L., Tylka, T. L., & Calamari, M. E. (2018). Mechanisms underlying weight status and healthcare avoidance in women: A study of weight stigma, body-related shame and guilt, and healthcare stress. *Body Image*, 25, 139–147. <https://doi.org/10.1016/j.bodyim.2018.03.001>
- Mooney, S. J., & El-Sayed, A. M. (2016). Stigma and the etiology of depression among the obese: An agent-based exploration. *Social Science & Medicine*, 1982(148), 1–7. <https://doi.org/10.1016/j.socscimed.2015.11.020>
- Mukhopadhyay, S., & Wendel, J. (2011). Is post-smoking-cessation weight-gain a significant trigger for relapse? *Applied Economics*, 43(24), 3449–3457. <https://doi.org/10.1080/00036841003652430>
- Murphy, C. M., Scott, K., Colby, S. M., Yermash, J., Evans, E. W., Wing, R. R., Kolbasov, L. A., & Rohsenow, D. J. (2024). “Healthier health in more ways than one”: Perspectives on a program for changing both smoking and obesity-related health behaviors. *Eat Behav*, 53, Article 101883. <https://doi.org/10.1016/j.eatbeh.2024.101883>
- Office of the Assistant Secretary for Planning and Evaluation. (2024). HHS Poverty Guidelines for 2024. <https://aspe.hhs.gov/topics/poverty-economic-mobility/poverty-guidelines>.
- Papadopoulos, S., & Brennan, L. (2015). Correlates of weight stigma in adults with overweight and obesity: A systematic literature review. *Obesity*, 23(9), 1743–1760. <https://doi.org/10.1002/oby.21187>
- Parker, L. J., Kinlock, B. L., Chisolm, D., Furr-Holden, D., & Thorpe, R. J., Jr (2016). Association between any major discrimination and current cigarette smoking among adult african american men. *Substance Use & Misuse*, 51(12), 1593–1599. <https://doi.org/10.1080/10826084.2016.1188957>
- Peretti-Watel, P., Legleye, S., Guignard, R., & Beck, F. (2014). Cigarette smoking as a stigma: Evidence from France. *International Journal of Drug Policy*, 25(2), 282–290. <https://doi.org/10.1016/j.drugpo.2013.08.009>
- Perkins, K. A., Marcus, M. D., Levine, M. D., D’Amico, D., Miller, A., Broge, M., Ashcom, J., & Shiffman, S. (2001). Cognitive-behavioral therapy to reduce weight concerns improves smoking cessation outcome in weight-concerned women. *Journal of consulting and clinical psychology*, 69(4), 604–613. <https://doi.org/10.1037/0022-006X.69.4.604>
- Pescosolido, B. A., & Martin, J. K. (2015). The stigma complex. *Annual Review of Sociology*, 41(1), 87–116. <https://doi.org/10.1146/annurev-soc-071312-145702>
- Phelan, S. M., Burgess, D. J., Yeazel, M. W., Hellerstedt, W. L., Griffin, J. M., & van Ryn, M. (2015). Impact of weight bias and stigma on quality of care and outcomes for patients with obesity. *Obes Rev*, 16(4), 319–326. <https://doi.org/10.1111/obr.12266>
- Pomerleau, C. S., & Saules, K. (2007). Body image, body satisfaction, and eating patterns in normal-weight and overweight/obese women current smokers and never-smokers. *Addictive Behaviors*, 32(10), 2329–2334. <https://doi.org/10.1016/j.addbeh.2007.01.027>
- Prunty, A., Clark, M. K., Hahn, A., Edmonds, S., & O’Shea, A. (2020). Enacted weight stigma and weight self stigma prevalence among 3821 adults. *Obesity Research & Clinical Practice*, 14(5), 421–427. <https://doi.org/10.1016/j.orcp.2020.09.003>
- Prunty, A., Hahn, A., O’Shea, A., Edmonds, S., & Clark, M. K. (2023). Associations among enacted weight stigma, weight self-stigma, and multiple physical health outcomes, healthcare utilization, and selected health behaviors. *International Journal of Obesity*, 47(1), 33–38. <https://doi.org/10.1038/s41366-022-01233-w>
- Puhl, R. M., & Heuer, C. A. (2009). The stigma of obesity: a review and update. *Obesity*, 17(5), 941–964. <https://doi.org/10.1038/oby.2008.636>
- Puhl, R. M., Himmelstein, M. S., & Pearl, R. L. (2020). Weight stigma as a psychosocial contributor to obesity. *American Psychologist*, 75(2), 274–289. <https://doi.org/10.1037/amp0000538>
- Puhl, R. M., Lessard, L. M., Himmelstein, M. S., & Foster, G. D. (2021). The roles of experienced and internalized weight stigma in healthcare experiences: Perspectives of adults engaged in weight management across six countries. *PLoS ONE*, 16(6), Article e0251566. <https://doi.org/10.1371/journal.pone.0251566>
- Reece, R. L. (2018). Coloring weight stigma: on race, colorism, weight stigma, and the failure of additive intersectionality. *Sociology of Race and Ethnicity*, 5(3), 388–400. <https://doi.org/10.1177/2332649218795185>
- Robinson, E., Sutin, A., & Daly, M. (2017). Perceived weight discrimination mediates the prospective relation between obesity and depressive symptoms in U.S. and U.K. adults. *Health Psychol*, 36(2), 112–121. <https://doi.org/10.1037/hea0000426>
- Robinson, S. M., Sobell, L. C., Sobell, M. B., & Leo, G. I. (2014). Reliability of the timeline Followback for cocaine, cannabis, and cigarette use. *Psychol Addict Behav*, 28(1), 154–162. <https://doi.org/10.1037/a0030992>
- Ross, C. E. (1994). Overweight and depression. *Journal of Health and Social Behavior*, 63–79.
- Ryan, L., Coyne, R., Heary, C., Birney, S., Crotty, M., Dunne, R., Conlan, O., & Walsh, J. C. (2023). Weight stigma experienced by patients with obesity in healthcare settings: A qualitative evidence synthesis. *Obesity Reviews*, 24(10), Article e13606. <https://doi.org/10.1111/obr.13606>
- Savoy, S., Almeida, L., & Boxer, P. (2012). The relation of weight stigmatization to psychological adjustment1. *Journal of Applied Social Psychology*, 42(9), 2285–2308. <https://doi.org/10.1111/j.1559-1816.2012.00940.x>
- Schoenaker, D. A. J. M., Brennan, E., Wakefield, M. A., Durkin, S. J., & Moccia, M. (2018). Anti-smoking social norms are associated with increased cessation behaviours among lower and higher socioeconomic status smokers: A population-based cohort study. *PLoS ONE*, 13(12), e0208950–e. <https://doi.org/10.1371/journal.pone.0208950>
- Sobell, L., Sobell, M., Buchan, G., Cleland, P., Fedoroff, I., & Leo, G. (1996). Timeline followback method (drugs, cigarettes, and marijuana). *30th Annual Meeting of the Association for Advancement of Behavior Therapy*.
- Spahholz, J., Baer, N., König, H. H., Riedel-Heller, S. G., & Luck-Sikorski, C. (2016). Obesity and discrimination - a systematic review and meta-analysis of observational studies. *Obes Rev*, 17(1), 43–55. <https://doi.org/10.1111/obr.12343>
- Stevens, S. D., Herbozo, S., & Martinez, S. N. (2018). Weight stigma, depression, and negative appearance commentary: exploring BMI as a moderator. *Stigma and Health (Washington, D.C.)*, 3(2), 108–115. <https://doi.org/10.1037/sah0000081>
- Sutin, A. R., & Terracciano, A. (2017). Perceived weight discrimination and high-risk health-related behaviors. *Obesity*, 25(7), 1183–1186. <https://doi.org/10.1002/oby.21845>
- Tomiyama, A. J., Epel, E. S., McClatchey, T. M., Poelke, G., Kemeny, M. E., McCoy, S. K., & Daubennier, J. (2014). Associations of weight stigma with cortisol and oxidative stress independent of adiposity. *Health Psychol*, 33(8), 862–867. <https://doi.org/10.1037/hea0000107>
- Tran, D. D., Herbozo, S., Stevens, S. D., Lee, H. J., Martinez, S. N., & Morrell, H. E. R. (2023). BMI as a moderator of the relationship between stigmatizing attitudes and smoking: An exploratory study. *Journal of Substance Use*, 28(5), 678–684. <https://doi.org/10.1080/14659891.2022.2082333>
- Triandafyllidis, Z., Ussher, J. M., Perz, J., & Huppertz, K. (2016). An intersectional analysis of women’s experiences of smoking-related stigma. *Qualitative Health Research*, 27(10), 1445–1460. <https://doi.org/10.1177/1049732316672645>
- Tuovinen, E.-L., Saarni, S. E., Kinnunen, T. H., Haukкала, A., Jousilahti, P., Patja, K., Kaprio, J., & Korhonen, T. (2015). Associations of weight concerns with self-efficacy and motivation to quit smoking: a population-based study among finnish daily smokers. *Nicotine & Tobacco Research*, 17(9), 1134–1141. <https://doi.org/10.1093/ntr/ntu277>
- Wang, Z., Dang, J., Zhang, X., Moore, J. B., & Li, R. (2021). Assessing the relationship between weight stigma, stress, depression, and sleep in Chinese adolescents. *Quality of Life Research*, 30(1), 229–238. <https://doi.org/10.1007/s11136-020-02620-4>
- Wetzel, K. E., & Himmelstein, M. S. (2023). Health care avoidance as vigilance: A model of maladaptive eating behaviors due to weight stigma in health care, avoidance, and internalization among women. *Stigma and Health*. <https://doi.org/10.1037/sah0000470>
- Williams, D. R., Yan, Y., Jackson, J. S., & Anderson, N. B. (1997). Racial differences in physical and mental health: socio-economic status, stress and discrimination. *Journal of health psychology*, 2(3), 335–351. <https://doi.org/10.1177/135910539700200305>
- Wott, C. B., & Carels, R. A. (2010). Overt weight stigma, psychological distress and weight loss treatment outcomes. *Journal of Health Psychology*, 15(4), 608–614. <https://doi.org/10.1177/1359105309355339>
- Wu, Y. K., & Berry, D. C. (2018). Impact of weight stigma on physiological and psychological health outcomes for overweight and obese adults: A systematic review. *Journal of Advanced Nursing*, 74(5), 1030–1042. <https://doi.org/10.1111/jan.13511>