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Internalizing Weight Stigma: Prevalence and Sociodemographic Considerations in US Adults

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Objective: This study aimed to conduct a comprehensive assessment of the presence, severity, and sociodemographic correlates of weight bias internalization (WBI) across three distinct samples of US adults.

Methods: Levels of WBI were compared in (1) a sample of adults with obesity and heightened risk of weight stigma ($N = 456$), (2) an online community sample ($N = 519$), and (3) a national online panel ($N = 2,529$). Samples 2 and 3 comprised adults with and without obesity. Participants completed identical self-report measures, including demographic variables and weight-related factors, to determine their relationship with low, mean, and high levels of WBI.

Results: At least 44% of adults across samples endorsed mean levels of WBI (as determined by sample 3). The highest levels of WBI were endorsed by approximately one in five adults in the general population samples and by 52% in the sample of adults with obesity. Individuals with the highest WBI were white, had less education and income, were currently trying to lose weight, and had higher BMIs, higher self-perceived weight, and previous experiences of weight stigma (especially teasing).

Conclusions: Internalized weight bias is prevalent among women and men and across body weight categories. Findings provide a foundation to better understand characteristics of individuals who are at risk for internalizing weight bias.

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Introduction

As many as 40% of US adults have been a target of weight-based teasing, unfair treatment, or discrimination (1,2). These experiences, commonly referred to as "weight stigma," are associated with numerous health consequences. Weight stigma induces physiological stress, increased caloric consumption, and depleted dietary self-efficacy, and it is associated with increased emotional distress (depression, low self-esteem, and body dissatisfaction) as well as disordered eating and lower physical activity (3,4). Prospective associations link weight stigma with long-term declines in self-reported health, increased maladaptive eating behaviors, and weight gain (5-7). These associations remain independent of sociodemographic characteristics and body mass index (BMI), highlighting weight stigma as a unique contributor to poor health and a barrier to effective obesity prevention and treatment.

Distinct from stigmatizing experiences, many individuals internalize negative societal stigma directed toward them (8,9). Internalized stigma occurs when a person is aware that he or she has a stigmatized identity and applies negative societal stereotypes to oneself (10). Emerging evidence indicates that this is also true of individuals who are stigmatized because of their weight (11). This form of self-stigma, or "weight bias internalization" (WBI), involves applying negative weight-based stereotypes to oneself and engaging in self-blame for one's weight status (11,12).

WBI is a significant and independent contributor to poor emotional and physical health (including depression, anxiety, stress, clinical eating pathology, binge eating, health-related quality of life, poor weight loss maintenance, and metabolic syndrome) beyond the effect of BMI (13-20) and, in some cases, independent of experienced weight stigma (12,21,22). Some studies have pointed to WBI as a mechanism through which experienced weight stigma exacerbates adverse health behaviors (23), potentially through low self-esteem and basing one's self-evaluation on body weight (24,25). While longitudinal research in this area has been limited, existing evidence has documented poorer weight loss outcomes in individuals with high baseline levels of WBI (26,27). Despite increasing evidence of WBI as a contributor to health, there is not yet a comprehensive understanding of factors that characterize individuals who internalize weight bias. Most studies have relied on homogeneous samples

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(19,21,27-29) composed primarily of white women, making it unclear how WBI occurs in different segments of the population. An exception to this literature is a recent systematic examination of WBI in a national sample of US adults ($N = 956$), which found that WBI, but not experienced stigma, varied across race and gender; women reported higher WBI than men, and black participants reported less WBI than white participants (2). Thus, determining the extent of WBI across different sociodemographic characteristics in larger, diverse samples is an important next step to clarify who is at heightened risk and may benefit from supportive clinical intervention.

In addition, we need to obtain a clearer picture of how levels of WBI differ among people with heightened vulnerability to weight stigma compared with the general population. Some studies have documented higher WBI in people with high BMI versus low BMI (15,16,19,21) and among individuals with binge eating symptoms compared with those without (17,30). However, less is known about other weight-related variables that may affect WBI, such as self-perceived weight status, different types of experienced weight stigma, or weight loss efforts. Examining these variables in the context of WBI can advance our understanding of potential risks that WBI may pose for weight management, obesity, and related health behaviors.

To begin to address these gaps in the field, we conducted a comprehensive systematic assessment of the presence, severity, and sociodemographic correlates of internalized weight bias in three distinct samples of adults. Levels of WBI were compared in (1) a sample of adults with obesity, (2) an online community sample, and (3) a national online panel. To identify characteristics that describe individuals who internalize weight bias, we assessed the predictive value of key demographic variables and weight-related factors in relation to different levels of WBI.

Methods

Participants and procedure

Across three samples, 3,504 adults (56.4% women) completed online self-report surveys. Online survey software (Qualtrics, Provo, Utah) prevented participants from completing the survey more than once. Participation was anonymous and voluntary. All procedures were approved by the appropriate institutional review board. Table 1 shows characteristics of the full sample and each subsample.

Sample 1. Sample 1 comprised 456 members of the Obesity Action Coalition (OAC). The OAC is a national nonprofit organization of 54,000 + adults who support individuals affected by obesity through education and advocacy. Participants who reported struggling with their weight on OAC's internal membership survey ($N = 2,663$) were invited to participate in a survey about their experiences related to body weight and opinions about weight stigma, advertised via emails and announcements from the OAC's membership newsletter or website in September and October 2015. Upon survey completion, participants could choose to be entered into a random drawing for a one-in-ten chance of winning a $25 gift certificate to a national online retailer. Details about this sample and recruitment were reported previously (31).

Sample 2. Sample 2 comprised 519 individuals from Mechanical Turk (MTurk), a reliable and psychometrically sound online data source shown to be similar in diversity relative to other panels and adequate for measuring attitudes related to body weight and shape (32,33). Participants responded to a posting for a survey on attitudes about body weight. Data were collected in September and October 2016. Participants were compensated $0.75 (credited to their MTurk account), which is consistent with compensation practices for short survey research with MTurk (32). A total of 618 individuals entered the survey, but 99 were excluded for missing demographic or anthropometric questions (e.g., sex, height, weight).

Sample 3. Sample 3 comprised 2,529 adults drawn from a national online survey panel administered by Survey Sampling International LLC (SSI) (Shelton, Connecticut). SSI's panel includes more than 2 million active research respondents derived from 3,400 + sources. SSI provides a variety of incentives for participation, including research feedback, charitable donations, and monetary and points rewards. Quotas were established for sex, income groups, and race to approximate US Census characteristics. Data collection occurred in July 2015 as part of a larger online study on weight and health (advertised to participants as a survey on attitudes related to body weight and health behaviors) reported elsewhere (20).

Measures

In all three samples, participants completed self-report measures to assess demographic characteristics, weight status, dieting behavior, history of experienced weight stigma, and internalization of weight bias. These measures are described below.

WBI. WBI was measured by using the Modified Weight Bias Internalization Scale (WBIS-M) (11,12,29), which assessed the extent to which participants blame themselves for stigma, apply negative weight-based stereotypes to themselves, and judge themselves negatively because of their body weight (combined sample $\alpha = 0.89$; sample 1 $\alpha = 0.85$; sample 2 $\alpha = 0.88$; sample 3 $\alpha = 0.90$). Participants responded to 10 items on a scale of one (strongly disagree) to seven (strongly agree). To examine differences in WBI, we constructed a variable to identify participants who scored (1) 1 standard deviation (SD) below the mean on internalization, (2) at the mean on internalization, and (3) 1 SD above the mean on internalization. We used the mean and SD from sample 3 ($M = 3.36$; SD = 1.51) to construct this variable given that this sample was a large, diverse national sample of the general population of US adults. Low internalization (1 SD below the mean) corresponded to WBIS-M scores ≤ 1.85, and high internalization (1 SD above the mean) corresponded to WBIS-M scores ≥ 4.87.

Demographics. Participants in all samples answered questions regarding their age, sex, race, education, income, and marital status.

Anthropometrics. Participants self-reported their height, weight, and highest-ever weight (excluding pregnancy). BMI was calculated from self-reported height and weight. For subjective weight status, participants indicated how they would describe themselves

TABLE 1 Sample characteristics

	Full Sample N = 3504		Sample 1 n= 456		Sample 2 n=519		Sample 3 n = 2529				
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*df*	*F*	*p*
Age	44.01	15.81	51.00	11.08	37.71	11.38	44.05	16.77	2, 3485	89.91	0.000
BMI	28.11	7.33	36.41	9.01	27.62	7.47	26.64	5.74	2, 3386	428.29	0.000
Highest BMI	32.51	11.08	46.66	10.95	31.64	9.15	30.01	9.36	2, 3268	563.52	0.000
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*df*	X^2	*p*
Sex									2	283.29	0.000
Male	1527	43.6	34	7.5	231	44.5	1262	49.9			
Female	1977	56.4	422	92.5	288	55.5	1267	50.1			
Race/ethnicity									8	161.47	0.000
White, non-Hispanic, non-Latino	2438	69.6	393	86.2	425	81.9	1620	64.1			
Latino, Hispanic, or Mexican-American	436	12.4	19	4.2	20	3.9	397	15.7			
Black or African American	375	10.7	24	5.3	35	6.7	316	12.5			
Asian or Pacific Islander	175	5.0	6	1.3	25	4.8	144	5.7			
Other	72	2.1	11	2.4	12	2.3	49	1.9			
Education									6	62.29	0.000
Less than high school or high school	500	14.3	40	8.8	43	8.3	417	16.6			
Some college	1114	31.9	137	30.1	188	36.4	789	31.3			
College graduate	1273	36.5	171	37.6	223	43.2	879	34.9			
Postgraduate degree or higher	602	17.3	107	23.5	62	12.0	433	17.2			
Income									8	45.37	0.000
Under $25,000	536	15.4	63	14.0	96	18.5	377	15.0			
$25,000-$49,999	873	25.1	100	22.3	145	28.0	628	24.9			
$50,000-$74,999	746	21.4	85	18.9	138	26.6	523	20.8			
$75,000-$99,999	615	17.6	83	18.5	78	15.1	454	18.0			
$100,000 or more	715	20.5	118	26.3	61	11.8	536	21.3			
Current BMI Category									6	450.35	0.000
Underweight	188	5.4	1	.2	10	1.9	177	7.0			
Normal Weight	1160	33.1	33	7.2	217	41.8	910	36.0			
Overweight	1018	29.1	86	18.9	151	29.1	781	30.9			
Obese	1138	32.5	336	73.7	141	27.2	661	26.1			
Highest Ever BMI Category									6	417.86	0.000
Underweight	70	2.0	0	0	6	1.2	64	2.5			
Normal Weight	684	19.5	5	1.1	111	21.4	568	22.5			
Overweight	865	24.7	17	3.7	146	28.1	702	27.8			
Obese	1645	46.9	418	91.7	256	49.3	971	38.4			

("underweight," "about the right weight," "overweight," or "obese"). While continuous BMI was used in regression analyses, BMI status was stratified into weight categories by using clinical guidelines from the Centers for Disease Control and Prevention (Tables 1 and 3) (34).

Weight stigma. The history of experienced weight stigma was measured by using three (yes/no) questions in which participants indicated whether they had ever been teased, treated unfairly, or discriminated against because of their weight (35). Participants were coded as having experienced weight stigma if they answered "yes" to any of these questions.

Dieting behavior. Participants indicated whether they had tried to intentionally lose weight by dieting in the past year (yes/no) and what their current weight goals were ("lose weight," "gain weight," "stay the same weight," and "I am not trying to do anything about my weight") (36).

Statistical analysis

All analyses were performed using SPSS Statistics version 22.0 (IBM Corp., Armonk, New York). One-way analyses of variance (ANOVAs) and χ^2 tests compared sample characteristics (Table 1) and weight variables (Table 2) across the three samples. One-way ANOVAs compared these variables at low versus high levels of WBI (Table 3). Linear regression was used to assess predictors of WBI (Table 4).

TABLE 2 Sample comparisons on self-perceived weight, stigma, and dieting

	Full sample, $N = 3,504$		Sample 1, $n = 456$		Sample 2, $n = 519$		Sample 3, $n = 2,529$				
	M	SD	M	SD	M	SD	M	SD	*df*	*F*	*P*
Weight bias internalization (WBI)	3.53	1.59	4.72	1.45	3.31	1.66	3.36	1.51	2, 3,501	160.46	0.000
	n	%	*n*	%	*n*	%	*n*	%	*df*	X^2	*P*
Subjective weight status									6	666.6	0.000
Underweight	156	4.5	1	.2	24	4.6	131	5.2			
About the right weight	1,338	38.2	53	11.6	215	41.4	1,070	42.3			
Overweight	1,513	43.2	165	36.2	215	41.4	1,133	44.8			
Obesity	487	13.9	235	51.5	62	11.9	190	7.5			
Experienced weight stigma									2	362.51	0.000
Any	1,735	49.5	410	89.9	270	52.0	1,055	41.7			
None	1,767	50.4	45	9.9	249	48.0	1,473	58.2			
Teased about weight									2	392.02	0.000
Yes	1,592	45.4	397	87.1	255	49.1	940	37.2			
No	1,906	54.4	58	12.7	264	50.9	1,584	62.6			
Treated unfairly because of weight									2	476.15	0.000
Yes	1,151	32.8	351	77.0	167	32.2	633	25.0			
No	2,348	67.0	103	22.6	352	67.8	1,893	74.9			
Discrimination because of weight									2	422.66	0.000
Yes	923	26.3	298	65.4	136	26.2	489	19.3			
No	2,577	73.5	157	34.4	383	73.8	2,037	80.5			
Tried to lose weight in last year									2	224.87	0.000
Yes	2,514	71.7	434	95.2	350	67.4	1,730	68.4			
No	377	10.8	17	3.7	169	32.6	191	7.6			
Current weight goals									6	363.41	0.000
Lose weight	2,087	59.6	409	89.7	277	53.4	1,401	55.4			
Gain weight	560	16.0	3	.7	37	7.1	520	20.6			
Stay the same weight	610	17.4	25	5.5	113	21.8	472	18.7			
I am not trying to do anything about my weight	228	6.5	11	2.4	89	17.1	128	5.1			
	BMI										
	Underweight		Normal weight		Overweight		Obesity				
	n	%	*n*	%	*n*	%	*n*	%	*df*	X^2	*P*
BMI & subjective weight status concordance									9	2,292.31	0.000
Underweight	56	29.9	80	6.9	9	0.9	11	1.0			
About the right weight	97	51.9	855	73.9	344	33.8	42	3.7			
Overweight	32	17.1	220	19.0	645	63.4	616	54.4			
Obesity	2	1.1	2	0.2	19	1.9	464	41.0			

TABLE 3 Socio-demographic differences according to level of weight bias internalization

	−1SD, WBI ≤ 1.85		M, WBI: 1.86-4.87		+1SD. WBI ≥ 4.88				
	M	*SD*	*M*	*SD*	*M*	*SD*	*df*	*F*	*p*
Age	48.12[a]	17.19	43.73[b]	15.97	41.47[c]	13.47	2, 3483	32.73	0.000
BMI	24.27[a]	3.92	27.73[b]	6.47	32.34[c]	9.36	2, 3384	243.60	0.000
Highest BMI	27.11[a]	6.09	31.69[b]	9.64	39.08[c]	14.21	2, 3268	238.27	0.000
	N	*%*	*N*	*%*	*N*	*%*	*df*	χ^2	*p*
Sex									
Male	336	52.6	968	46.9	223	27.9	2	110.44	0.000
Female	303	47.4	1097	53.1	577	72.1			
Race							8	38.37	0.000
White	409	64.1	1408	68.3	621	77.8			
Black	87	13.6	224	10.9	64	8.0			
Asian	35	5.5	114	5.5	26	3.3			
Latino	90	14.1	270	13.1	76	9.5			
Other	17	2.7	44	2.1	11	1.4			
Education							6	14.56	0.024
Less than high school or high school	99	15.6	290	14.1	111	13.9			
Some college	182	28.6	652	31.7	280	35.1			
College graduate	221	34.7	763	37.1	289	36.2			
Postgraduate degree or higher	134	21.1	350	17.0	118	14.8			
Income							8	26.88	0.001
Under $25,000	74	11.7	312	15.2	150	18.8			
$25,000-$49,999	163	25.7	488	23.8	222	27.9			
$50,000-$74,999	139	21.9	453	22.1	154	19.3			
$75,000-$99,999	114	18.0	361	17.6	140	17.6			
$125,000 or more	145	22.8	439	21.4	131	16.4			
Current BMI Category							6	449.45	0.000
Underweight	37	5.8	110	5.3	41	5.1			
Normal Weight	351	54.9	670	32.4	139	17.4			
Overweight	205	32.1	647	31.3	166	20.8			
Obese	46	7.2	638	30.9	454	56.8			
Highest BMI Category							6	403.18	0.000
Underweight	10	1.6	42	2.2	18	2.4			
Normal Weight	234	38.4	385	20.1	65	8.8			
Highest BMI Category									
Overweight	225	36.9	543	28.4	97	13.1			
Obese	141	23.1	945	49.3	559	75.6			
Subjective Weight							6	872.67	0.000
Underweight	30	4.7	107	5.2	19	2.4			
About the right weight	474	74.3	750	36.4	114	14.3			
Overweight	126	19.7	1020	49.5	367	46.0			
Obese	8	1.3	182	8.8	297	37.3			
Experienced Weight Stigma							2	635.1	0.000
Any	119	18.6	945	45.8	671	84.0			
None	520	81.4	1119	54.2	128	16.0			
Teased about weight							2	558.74	0.000
Yes	112	17.6	855	41.5	625	78.2			
No	525	82.4	1207	58.5	174	21.8			
Treated unfairly about weight							2	683.95	0.000
Yes	44	6.9	560	27.2	547	68.5			
No	594	93.1	1502	72.8	252	31.5			

TABLE 3. (continued).

	N	%	*N*	%	*N*	%	*df*	χ^2	*p*
Discrimination due to weight							2	611.92	0.000
Yes	28	4.4	429	20.8	466	58.3			
No	610	95.6	1634	79.2	333	41.7			
Tried to Lose Weight in Last Year							2	126.54	0.000
Yes	297	71.7	1496	87.1	721	94.9			
No	117	28.3	221	12.9	39	5.1			
Current Weight Goals							6	646.99	0.000
Lose weight	132	20.7	1272	62.0	683	85.7			
Gain weight	201	31.5	316	15.4	43	5.4			
Stay the same weight	240	37.6	319	15.6	51	6.4			
I am not trying to do anything about my weight	65	10.2	143	7.0	20	2.5			

Results

Sample characteristics

Tables 1 and 2 display characteristics for the full sample and differences by sample for demographics, anthropometrics, WBIS-M scores, experienced weight stigma, and dieting behavior. On average, participants were 44.01 (SD = 15.81) years old. The mean BMI was 36.41 in sample 1 (73.7% with obesity), 27.62 in sample 2 (27.2% with obesity), and 26.64 in sample 3 (26.1% with obesity). Participants identified as white (69.6%), Hispanic or Latino (12.4%), black (10.7%), Asian (5.0%), or other (2.1%). More than 80% of participants reported educational attainment of some college or higher. In total, 49.5% of participants reported that they had experienced weight stigma.

Age, BMI, and highest BMI were significantly higher in the OAC sample (sample 1) compared with sample 2 (MTurk) and sample 3 (SSI). Experienced weight stigma was higher in sample 1 (89.9% experienced stigma) relative to samples 2 (52%) and 3 (41.7%). Similarly, more participants in sample 1 endorsed high WBIS-M scores (52.2%; $M = 4.72$) compared with sample 2 (20%; $M = 3.31$) and sample 3 (18%; $M = 3.36$). No differences in WBIS-M scores emerged between samples 2 and 3; approximately 60% of participants in these samples endorsed the mean level of internalization. We compared subjective weight status with BMI categories to examine concordance rates (Table 2). Participants with an underweight or normal-weight BMI were more likely to perceive their subjective weight status as "about right." Participants with a BMI in the

TABLE 4 Predictors of weight bias internalization

	B	*β*	*P*	R^2	*F*	*df*	*P*
				0.38	113.24	14, 2,555	0.000
Sample (ref sample 3)							
Sample 1	0.30	0.07	0.001				
Sample 2	−0.31	−0.08	0.000				
Age	−0.02	−0.19	0.000				
Female	0.10	0.03	0.062				
Race (ref white)							
Asian	−0.01	0.00	0.928				
Black	−0.29	−0.05	0.001				
Latino	−0.20	−0.04	0.015				
Income	−0.06	−0.05	0.003				
Education	−0.07	−0.04	0.019				
BMI	0.02	0.09	0.003				
Highest BMI	−0.01	−0.04	0.250				
Subjective weight status	0.63	0.29	0.000				
Experienced stigma	0.94	0.30	0.000				
Tried to lose weight in the past year	0.38	0.08	0.000				

overweight or obesity range were likely to perceive their subjective weight as overweight or obesity.

More participants in sample 1 reported dieting in the past year (95.2%) relative to samples 2 (67.4%) and 3 (68.4%), and participants in sample 1 were more likely to be currently trying to lose weight (89.7%) relative to samples 2 (53.4%) and 3 (55.4%). These results suggest that participants in sample 1 had elevated characteristics relevant to WBI (higher BMI, more dieting, and more weight stigma) compared with samples 2 and 3.

Differences in WBI across sociodemographic characteristics

Table 3 shows differences in sample demographics, anthropometrics, experienced stigma, and dieting behavior among individuals scoring 1 SD below the mean (low internalization), at the mean, or 1 SD above the mean (high internalization) on WBIS-M. Age differed linearly across internalization categories with younger adults ($M = 41.47$ years) endorsing high internalization and older participants ($M = 48.12$ years) endorsing low internalization. Men and women were similarly distributed in both the low internalization (52.6% men, 47.4% women) and mean internalization categories (46.9% men, 53.1% women), but among individuals with the highest WBIS-M scores, 72.1% were women. Regarding racial differences, fewer black (8%) and Latino (9.5%) participants endorsed high internalization relative to low internalization (black = 13.6%, Latino = 14.1%) or the mean level of internalization (black = 10.9%, Latino = 13.1%). The proportion of white participants increased at each level of internalization (low WBIS-M = 64.1%, mean WBIS-M = 68.3%, high WBIS-M = 77.8%).

BMI and highest-ever BMI differed linearly across levels of WBI; individuals with higher BMIs endorsed high internalization on the WBIS-M (BMI: $M = 32.34$; highest-ever BMI: $M = 39.08$), and individuals with lower BMIs endorsed low internalization (BMI: $M = 24.27$; highest-ever BMI: $M = 27.11$). Among individuals with the highest WBIS-M scores, 56.8% had a BMI in the obesity range, 20.8% had an overweight BMI, and 17.4% had a normal BMI. Subjective weight status followed a similar trajectory; individuals with low internalization were primarily those who felt they were "about the right weight" (74.3%), while participants endorsing high internalization primarily perceived themselves as having overweight (46%) or obesity (37.3%). While most participants indicated they had dieted in the past year, this percentage increased linearly across WBI levels; 71.7% of individuals with low WBIS-M scores reported dieting in the past year relative to 94.9% who endorsed high WBI. Similarly, nearly all participants with high internalization (85.7%) indicated they were currently trying to lose weight versus 20.7% with low internalization.

Experienced weight stigma followed a linear pattern; 18.6% of participants reported experienced weight stigma at the low level of internalization, 45.8% experienced stigma at the mean for internalization, and 84% at the high level of internalization. Teasing was the most common type of experienced stigma, followed by unfair treatment and discrimination. Among individuals who endorsed low internalization, 17.6% reported experiencing weight-based teasing, compared with 78.2% of individuals who reported teasing in the high internalization category. A similar pattern emerged for unfair treatment (6.9% of the low internalization category vs. 68.5% of the high internalization category) and discrimination (4.4% vs. 58.3%).

Predicting WBI

By using a linear regression, we predicted WBI by sample, demographics, anthropometrics, and dieting behavior. Sample 3 was used as the reference group for samples 1 and 2 because it was a large and diverse national sample. Men were the reference group for women, and white was the reference group for race/ethnicity. Table 4 displays the coefficients for each predictor of WBI for the combined samples. Accounting for sample, age, sex, race, income, education, BMI, highest-ever BMI, subjective weight status, experienced stigma, and dieting behavior in the past year explained 38% of the variance in WBIS-M: $F\ (14,\ 2{,}555) = 113.24$; $P < 0.001$. Results showed that being in sample 1 (relative to sample 3) predicted WBIS-M scores ($B = 0.30$; $P = 0.001$), with higher scores present in the OAC sample versus the national SSI sample. Internalization was lower in the MTurk sample relative to the SSI sample ($B = -0.31$; $P < 0.001$).

Gender was not associated with WBIS-M scores ($B = 0.10$; $P = 0.062$). Being black or Latino (relative to white) was negatively associated with internalization ($B = -0.29$; $P = 0.001$; $B = -0.20$; $P = 0.015$), suggesting that black participants and Latino participants had lower internalization than white participants. Income ($B = -0.06$; $P = 0.003$) and education ($B = -0.07$; $P = 0.019$) were negatively associated with internalization. BMI ($B = 0.02$; $P = 0.003$) and subjective weight status ($B = 0.63$; $P < 0.001$) were both positively predictive of higher internalization, although highest-ever BMI did not predict WBIS-M scores. Experienced stigma ($B = 0.94$; $P < 0.001$) and dieting behavior in the past year ($B = 0.38$; $P < 0.001$) predicted higher WBIS-M scores. Collectively, these results indicate increased vulnerability to high WBI among white adults with lower education or income, high BMI and self-perceived high body weight, active engagement in weight loss efforts, and a significant history of experienced weight stigma. By using the standardized regression weight (beta) as a measure of comparative effect size, subjective weight status ($\beta = 0.29$) and experienced stigma ($\beta = 0.30$) were the strongest predictors of WBI (Table 4).

Discussion

Our findings show that internalized weight bias is prevalent among US adults. At least 44% of adults across all three samples endorsed the mean level of WBI. High levels of WBI (corresponding to 1 SD above the WBIS-M mean) were endorsed by approximately one in five adults in the general population samples and by 52% in the OAC sample, suggesting that a considerable portion of the population may be at risk for internalization, especially if they share characteristics with the OAC sample, such as high BMI, considerable exposure to weight stigma, and trying to lose weight.

Compared with previous research, the mean level of WBI in sample 1 ($M = 4.72$) was similar to treatment-seeking samples of adults with obesity ($M = 4.6$) (37), binge eating disorder ($M = 4.75$) (30), and bariatric surgery candidates ($M = 4.54$) (27) but higher than the mean level of WBI observed in a recent study of adults with obesity enrolled in a weight loss trial ($M = 3.6$) (18). Because of the lack of previous research assessing WBI in general population samples, it is difficult to compare the mean WBIS-M scores observed in samples 2 ($M = 3.31$) and 3 ($M = 3.36$) with similarly diverse populations.

As expected, these means were lower than levels of WBI in treatment-seeking samples of individuals with obesity noted earlier. However, comparisons with previously published community samples are less clear; WBIS-M means in our samples were slightly lower compared with levels of WBI reported in a community sample of 198 adults with obesity ($M = 3.95$) (11), slightly higher than mean scores in an MTurk sample of 148 adults ($M = 3.27$) (12), and identical to mean levels of WBI in a community sample of 81 women with obesity ($M = 3.31$) (21). As these studies reflect smaller, more homogeneous samples, it will be important for additional research to assess levels of WBI in larger, diverse populations comparable with the present study.

Our findings highlight a pattern of sociodemographic characteristics among individuals who internalize weight bias. Similar to some previous research (11), women and men in our samples were similarly distributed at low and mean levels of internalization. However, among adults with the highest levels of internalization, 72% were women, supporting other studies that have shown an increased vulnerability to WBI among women compared with men (15,38). Women's vulnerability to higher WBI may be attributed to a potentially increased risk of exposure to weight stigmatization relative to men (7,39). Compared with gender, little work has examined WBI in relation to socioeconomic status or race/ethnicity. In our study, income and education were negatively associated with internalization, similar to sociodemographic correlates of WBI documented in a national German sample (15). Regarding race, black participants and Latino participants had lower WBI than white participants. As few studies have systematically compared exposure to weight stigma in white participants compared with racial minorities (40), more research is needed to examine WBI across different racial/ethnic groups.

Similar to previous research (15,16,41), our study found BMI and subjective views about body weight to be positively associated with WBI. Most individuals with high WBIS-M scores had a BMI in the obesity range (56.8%). However, it is noteworthy that among individuals reporting high WBI, 20.8% had an overweight BMI and 17.4% had a normal BMI. Thus, people across body weight categories may be vulnerable to high WBI. These findings support recent evidence of WBI observed among women with normal weight and underweight (16,41) and highlight the importance of studying WBI in populations with diverse body weights.

Finally, our study provides new insights about links between experienced and internalized weight stigma. Our findings show that 84% of adults with high WBIS-M scores reported a history of experienced weight stigma. While previous work has observed positive associations between experienced and internalized stigma (16), our findings point to the importance of considering different types of experienced stigma. Specifically, severe forms of weight stigma were experienced by a considerable percentage of individuals with high WBI (e.g., 68.5% reported unfair treatment because of their weight, 58.3% reported weight discrimination); however, weight-based teasing was the most commonly reported form of experienced stigma (78.2%) among individuals with high levels of internalization. This finding suggests that seemingly less severe forms of experienced stigma (e.g., teasing vs. discrimination) are pronounced in people who internalize weight bias. It may be that individuals who are teased about their weight from peers or family members have a heightened risk for blaming themselves compared with those who face weight discrimination in less personal scenarios (e.g., employment). Alternatively, individuals high in WBI may have heightened awareness of stigma and, in turn, be more likely to perceive weight stigma from others. Given that subjective weight status and experienced stigma were the strongest predictors of WBI, it will be important for future research to examine these relationships and determine whether WBI incurs different health consequences depending on personal views about weight as well as the type, severity, or frequency of experienced stigma.

Several limitations of this study should be noted. First, all measures were self-reported, including weight and height. However, research has demonstrated good concordance rates between online self-reported weight and measured weight (42). Second, although the identical measure of internalized weight bias (WBIS-M) was used across samples, it will be important for future work to compare different measures of this construct. As research on WBI is relatively new, very few measures have been developed or validated. Preliminary comparisons of the WBIS to another measure, the Weight Self-Stigma Questionnaire (43), are favorable, but longitudinal studies on their stability and predictive validity are needed (44). Third, our samples are not nationally representative and are limited to individuals who use the internet. The OAC sample, while similar in demographic composition to previous research on WBI with treatment-seeking samples, lacks generalizability to more diverse groups who may be at heightened risk for WBI. Finally, the three samples completed the survey at different time points from 2015 to 2016, introducing possible cohort effects.

Strengths of our study include the comparison of identical measures across three large and distinct samples, allowing for novel comparisons of WBI that are currently absent in research. The diverse national panel in sample 3 approximates US estimates for characteristics such as race, sex, and body weight distributions, allowing for a comprehensive analysis of WBI with improved generalizability to broader groups. The inclusion of weight-related variables, such as type of experienced stigma, provide novel insights on factors relevant to WBI that have previously been unstudied.

Conclusion

This study provides a comprehensive analysis and comparison of internalized weight bias in US adults. Findings indicate that internalized weight bias is prevalent in the general population, present in both women and men, and occurs across diverse body weight categories. Individuals with high levels of WBI are more likely to be white, have a higher BMI and self-perceived higher body weight, have previous experiences of weight stigma (especially teasing), and be actively engaged in efforts to lose weight. This evidence provides an initial foundation to better understand characteristics of individuals with high WBI. Given recent calls for efforts to address weight stigma in weight loss treatment (31,45), our findings have implications for interventions targeting obesity and weight management. Efforts to improve weight-related health are likely to be more successful with a clearer understanding of who is at risk for high WBI and who may benefit most from clinical support to prevent internalization from contributing to emotional distress or interfering with healthy behaviors. O

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References

1. Puhl RM, Latner JL, O'Brien K, Luedicke JL, Danielstottir S, Forhan M. A multinational examination of weight bias: predictors of anti-fat attitudes across four countries. *Int J Obes (Lond)* 2015;39:1166-1173.
2. Himmelstein MS, Puhl RM, Quinn DM. Intersectionality: an understudied framework for addressing weight-stigma. *Am J Prev Med* 2017;53:421–431.
3. Puhl RM, Suh Y. Health consequences of weight stigma: implications for obesity prevention and treatment. *Curr Obes Rep* 2015;4:182-190.
4. Vartanian LR, Porter AM. Weight stigma and eating behavior: a review of the literature. *Appetite* 2016;102:3-14.
5. Sutin AR, Terracciano A. Perceived weight discrimination and obesity. *PLoS One* 2013;8:e70048. doi:10.1371/journal.pone.0070048
6. Sutin AR, Stephan Y, Carretta H, Terracciano A. Perceived discrimination and physical, cognitive, and emotional health in older adulthood. *Am J Geriatr Psychiatry* 2015;23:171-179.
7. Puhl RM, Wall MB, Chen C, Austin SB, Eisenberg ME, Neumark-Sztainer D. Early experiences of weight teasing and weight-related outcomes in adulthood: a 15-year longitudinal study. *Prev Med* 2017;100:173-179.
8. Livingston JD, Boyd JE. Correlates and consequences of internalized stigma for people living with mental illness: a systematic review and meta-analysis. *Soc Sci Med* 2010:71:2150-2161.
9. Quinn DM, Williams MK, Quintana F, et al. Examining effects of anticipated stigma, centrality, salience, internalization, and outness on psychological distress for people with concealable stigmatized identities. *PLoS One* 2014;9:e96977. doi: 10.1371/journal.pone.0096977
10. Corrigan PW, Larson JE, Rüsch N. Self-stigma and the "why try" effect: impact on life goals and evidence-based practices. *World Psychiatry* 2009;8:75-81.
11. Durso LE, Latner JD. Understanding self-directed stigma: development of the weight bias internalization scale. *Obesity (Silver Spring)* 2008;16:S80-S86.
12. Pearl RL, Puhl RM. Measuring internalized weight attitudes across body weight categories: validation of the modified weight bias internalization scale. *Body Image* 2014;11:89-92.
13. Carels RA, Burmeister J, Oehlhof MW, et al. Internalized weight bias: ratings of the self, normal weight, and obese individuals and psychological adjustment. *J Behav Med* 2013;36:86-94.
14. Durso LE, Latner JD, Ciao AC. Weight bias internalization in treatment-seeking overweight adults: psychometric validation and associations with self-esteem, body image, and mood symptoms. *Eat Behav* 2016;21:104-108.
15. Hilbert A, Baldofski S, Zenger M, et al. Weight bias internalization scale: psychometric properties and population norms. *PLoS One* 2014;9:e86303. doi: 10.1371/journal.pone.0086303
16. O'Brien KS, Latner JD, Puhl RM, et al. The relationship between weight stigma and eating behaviour is explained by weight bias internalization and psychological distress. *Appetite* 2016;102:70-76.
17. Palmeira L, Pinto-Gouveia J, Cunha M. The role of weight self-stigma on the quality of life of women with overweight and obesity: a multi-group comparison between binge eaters and non-binge eaters. *Appetite* 2016;105: 782-789.
18. Pearl RL, Wadden TA, Hopkins CM, et al. Association between weight bias internalization and metabolic syndrome among treatment-seeking individuals with obesity. *Obesity (Silver Spring)* 2017;25:317-322.
19. Schvey NA, Roberto CA, White MA. Clinical correlates of the Weight Bias Internalization Scale in overweight adults with binge and purge behaviours. *Adv Eat Disord* 2013;1:213-223.
20. Puhl RM, Quinn DM, Weisz BM, Suh YJ. The role of stigma in weight loss maintenance among U.S. adults [published online March 1, 2017] *Ann Behav Med*. doi:10.1007/s12160-017-9898-9
21. Latner JD, Barile JP, Durso LE. Weight and health-related quality of life: the moderating role of weight discrimination and internalized weight bias. *Eat Behav* 2014;15:586-590.
22. Pearl RL, Puhl RM. The distinct effects of internalizing weight bias: an experimental study. *Body Image* 2016;17:38-42.
23. Vartanian LR, Novak SA. Internalized societal attitudes moderate the impact of weight stigma on avoidance of exercise. *Obesity (Silver Spring)* 2011;19:757-762.
24. Pearl RL, White MA, Grilo CM. Overevaluation of shape and weight as a mediator between self-esteem and weight bias internalization among patients with binge eating disorder. *Eat Behav* 2014;15:259-261.
25. Hilbert A, Braehler E, Haeuser W, Zenger M. Weight bias internalization, core self-evaluation, and health in overweight and obese persons. *Obesity (Silver Spring)* 2014;22:79-85.
26. Mensinger JL, Calogero RM, Tylka TL. Internalized weight stigma moderates eating behavior outcomes in women with high BMI participating in a healthy living program. *Appetite* 2016;102:32-43.
27. Lent MR, Napolitano MA, Wood GC, et al. Internalized weight bias in weight-loss surgery patients: psychosocial correlates and weight loss outcomes. *Obes Surg* 2014;24:2195-2199.
28. Carels RA, Young KM, Wott CB, et al. Internalized weight stigma and its ideological correlates among weight loss treatment seeking adults. *Eating Weight Disord* 2009;14:e92-e97.
29. Lee MS, Dedrick RF. Weight bias internalization scale: psychometric properties using alternative weight status classification approaches. *Body Image* 2016;17:25-29.
30. Durso LE, Latner JD, Hayashi K. Perceived discrimination is associated with binge eating in a community sample of non-overweight, overweight, and obese adults. *Obes Facts* 2012;5:869-880.
31. Puhl RM, Himmelstein MS, Gorin AA, Suh YJ. Missing the target: including perspectives of women with overweight and obesity to inform stigma-reduction strategies. *Obes Sci Prac* 2017;3:25-35.
32. Buhrmester M, Kwang T, Gosling SD. Amazon's mechanical turk: a new source of inexpensive, yet high-quality, data? *Perspect Psychol Sci* 2011;6:3-5.
33. Gardner R, Brown D, Boice R. Using Amazon's Mechanical Turk website to measure accuracy of body size estimation and body dissatisfaction. *Body Image* 2012:9:532-534.
34. Centers for Disease Control and Prevention website. Defining adult overweight and obesity. http://www.cdc.gov/obesity/adult/defining.html. Updated June 16, 2016. Accessed July 15, 2017.
35. Puhl R, Heuer C, Sarda V. Framing messages about weight discrimination: impact on public support for legislation. *Int J Obes (Lond)* 2011;35:863-872.
36. Venditti EM, Wing RR, Jakicic JM, Butler BA, Marcus MD. Weight cycling, psychological health, and binge eating in obese women. *J Consult Clin Psychol* 1996;64:400-405.
37. Carels RA, Wott CB, Young KM, Gumble A, Koball A, Oehlhof MW. Implicit, explicit, and internalized weight bias and psychosocial maladjustment among treatment-seeking adults. *Eat Behav* 2010;11:180-185.
38. Boswell RG, White MA. Gender differences in weight bias internalization and eating pathology in overweight individuals. *Adv Eat Disord* 2015;3:259-268.
39. Han E, Norton EC, Powell LM. Direct and indirect effects of body weight on adult wages. *Econ Hum Biol* 2011;9:381-392.
40. Dutton GR, Lewis TT, Durant N, et al. Perceived weight discrimination in the CARDIA study: differences by race, sex, and weight status. *Obesity (Silver Spring)* 2014;22:530-536.
41. Schvey NA, White MA. The internalization of weight bias is associated with severe eating pathology among lean individuals. *Eat Behav* 2015;17:1-5.
42. Pursey K, Burrows TL, Stanwell P, Collins CE. How accurate is web-based self-reported height, weight, and body mass index in young adults? *J Med Internet Res* 2014;16:e4. doi:10.2196/jmir.2909
43. Lillis J, Luoma1 JB, Levin ME, Hayes SC. Measuring weight self-stigma: the weight self-stigma questionnaire. *Obesity (Silver Spring)* 2010;18:971-976.
44. Hubner C, Schmidt R, Selle J, et al. Comparing self-report measures of internalized weight stigma: the Weight Self-Stigma Questionnaire versus the Weight Bias Internalization Scale. *PloS One.* 2016;11:e0165566. doi:10.1371/journal.pone.0165566
45. Ratcliffe D, Ellison N. Obesity and internalized weight stigma: a formulation model for an emerging psychological problem. *Beh Cog Psychother* 2015;43:239-252.