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Body Critique or Body Acceptance: Overweight Diagnosis and Weight Cycling Among Adults with a History of Overweight/Obesity in the United States 2017-2020

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An abstract of
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Abstract

Body Critique or Body Acceptance: Overweight Diagnosis and Weight Cycling Among Adults with a History of Overweight/Obesity in the United States 2017-2020

By Kjersti Kleine

Background: Weight cycling, or repeated episodes of intentional weight loss, is related to negative cardiovascular health outcomes. Clinical diagnosis of overweight by healthcare providers is an important component of weight loss counseling, but such diagnoses may inadvertently promote weight cycling. We assessed the association between clinical diagnosis of overweight and history of weight cycling among adults in the United States with a history of being overweight.

Methods: Data from 5,512 adults aged 20 and older assessed in the nationally representative 2017-2020 National Health and Nutrition Examination Survey who reported ever having BMI≥25.0 kg/m^2 were analyzed. Participants who reported ever being told by a doctor or healthcare provider that they were overweight were considered to have a clinical diagnosis of overweight. Weight cycling was defined as an episode of intentional weight loss of 10 pounds or more. Participant weight cycling history was categorized as having no episodes (reference), low weight cycling (1-5 weight loss episodes), or high weight cycling (6 or more episodes). We conducted multinomial logistic regression analysis of the association between a clinical diagnosis of overweight and level of weight cycling (none, low, or high). Covariates included gender, age, race/ethnicity, family income to poverty ratio, and education.

Results: Among US adults who had ever been overweight, 50.7% reported clinical diagnosis of overweight, 49.7% reported low weight cycling and 16.8% reported high weight cycling. Adults with a clinical diagnosis of overweight had higher relative odds of both low and high weight cycling (OR=3.45; 95%CI: 2,83, 4.20 and OR=8.78; 95%CI: 5.73, 13.48, respectively), compared with no weight cycling. Non-Hispanic white adults and men had the highest odds ratios for high weight cycling history.

Conclusions: Clinical diagnosis of overweight was associated with substantially higher odds of weight cycling among adults who have ever been overweight. Approaches to tailor weight loss counseling by healthcare providers that prevent weight cycling should be explored to minimize the physiological and psychosocial implications of frequent episodic weight loss among overweight adults.

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Introduction

Healthcare providers (HCPs) have the potential to impact patient health behaviors. Currently, the National Institutes of Health (NIH) recommends that HCPs use BMI to determine which patients may benefit from weight loss (1). There are conflicting theories that consider the risks and benefits of weight loss counseling based on BMI. Between 2011-2018, approximately 40% of US adults with a BMI $\geq$25.0 kg/m^2 reported being counselled to control or lose weight by an HCP, and about half of those patients report making positive behavior changes (2). Some studies show that having an overweight or obesity diagnosis from an HCP increases a patient's likelihood of dieting, exercising, and/or both (3). However, people with high internalized weight bias are less likely to have success in weight loss attempts (4). Weight stigma in healthcare settings is prevalent and harmful (5). Internalized weight bias is associated with poor mental health outcomes, poorer body image, more stress, increased likelihood of eating as a coping strategy, and decreased likelihood of going to the gym (6). While there are positive benefits of eating a balanced diet and getting regular exercise, it is difficult to know when recommendations have gone too far.

"Weight cycling," also known as "yo-yo dieting" consists of repeated bouts of weight loss and weight re-gain (7). For people in larger bodies, losing weight and maintaining a normal-weight BMI has not proven to be sustainable, as "one to two thirds of the weight is regained within 1 year, and almost all is regained within 5 years" (8). There is conflicting evidence of the cardiovascular effects of weight cycling. Among people who lose weight, it is common for cardiovascular measurements, such as "blood pressure, heart rate, sympathetic activity, glomerular filtration rate, blood glucose and lipids" to "overshoot" normal values during periods of weight regain (9). These overshoots can put serious stress on the cardiovascular system. In

another study, weight cycling was found to be associated with poorer cardiovascular health indicators in premenopausal women with no pregnancy history (10). Weight cycling, however, has not been shown to lead to greater weight regain (11). A large prospective cohort study in the U.S. found that there is not an increased risk of mortality with weight cycling (12).

While there is a growing literature on the implications of weight cycling for health, no studies assess the relationship between an HCP diagnosis of overweight or obesity and weight cycling patterns. The aim of this study is to quantify the role of clinical diagnosis of overweight in shaping the weight cycling behaviors of adults with a history of overweight. The analysis draws on nationally representative data on US adults assessed in 2017-2020.

Extended Literature Review

History of Obesity Prevention

The Centers for Disease Control and Prevention (CDC) defines healthy weight range as BMI between 18.50 and 24.99 kg/m^2, overweight as a BMI between 25 and 29.99 kg/m^2, and obesity BMI greater than or equal to 30 kg/m^2 (13). The BMI measurement originated in 1842 with data from European participants as a tool to evaluate statistical associations and create predictions (14) and started to be utilized widely in population and public health research in 1972 (15). The measure was not developed with the intent to diagnose overweight and obesity, although it has become a widely used diagnostic tool.

Since 1999, the prevalence of obesity has been increasing in the US (16). There are significant disparities in prevalence of obesity and overweight across race, gender, and geographic region (16). It is important to note that these data utilize the CDC BMI cut points for the definitions of overweight and obesity (16). Projections estimate that 78% of people in the U.S. will be overweight or obese by 2030 (16). Obesity has been shown to have associations with many cardiovascular diseases including hypertension, stroke, atrial fibrillation, and heart failure (17). However, attempts to reverse effects of the high prevalence of overweight and obesity in the U.S. have not proven to be effective (18).

The American Medical Association (AMA) declared obesity a disease in 2013 on the grounds that obesity has characteristic symptoms, impairs normal function, and causes harm or morbidity (19). In the same addendum, it was noted that “even after weight loss in obese patients there are hormonal and metabolic abnormalities not reversible by lifestyle interventions that will likely require multiple different risk stratified interventions for patients” (19). While lifestyle

factors may influence obesity, there are other factors contributing to this complex disease including genetic factors and environmental influences (20). Public recognition of the multi-faceted influences of obesity has the potential to reduce stigma and discrimination (20). It has been less than a decade since obesity has been declared a disease, and there is still a lot of be learned about how to approach the complex topic.

Weight Cycling, Mental Health, & Disordered Eating

There is evidence demonstrating negative mental health impacts with behavioral weight loss programs. In a randomized-control trial, depressive symptoms and anxiety and stress levels increased following a behavioral weight loss program (4). Additionally, there is an increase in odds of substance abuse disorder among those with perceived weight discrimination (21). However, a systematic review found that there was no difference at end of intervention between anxiety levels, self-esteem, or stress among people who participated in behavioral weight loss interventions and those who did not, although there was insufficient evidence to evaluate effects of behavioral weight loss interventions on "anxiety, binge-eating, body image, emotional eating" 12 months post baseline (22). Repeated bouts of weight loss and regain are associated with depressive symptoms among adults in the US (23). Although there is conflicting evidence, practices that contribute to weight stigma demonstrate risks to mental health. Given these potential impacts on mental health, disordered eating, body image, dieting behaviors, exercise behaviors, and stress levels, the behavioral implications of HCP communication around BMI should be investigated further.

In discussions of obesity, dieting, and weight loss promotion, eating disorders and disordered eating must be acknowledged. Eating disorders are defined by "a severe and persistent disturbance in eating behavior that causes psychosocial and, sometimes, physical

impairment" (24). Disordered eating, however, is a term used to classify individuals who do not meet definitions for a diagnosed eating disorder but who have other forms of disrupted dietary patterns such as "binge eating, restraint, emotional eating, disinhibition, strict dieting, and controlling body weight and shape through inappropriate compensatory behaviors" (25). There is a fine line between healthy eating habits and unhealthy disordered eating behaviors indicating the need for clearer definitions and understanding of risks. In a study at universities across the U.S., it was found that women with both eating disorders and obesity had a higher concern for weight/shape, perceived benefit of thinness, and more depressive symptoms compared to women with eating disorders who were not overweight or obese (26). Elevated weight and shape concerns are a risk factor for eating disorders (27). Given the delicate balance between eating disorders, disordered eating, and obesity, HCPs must take great care in discussing dieting behaviors with patients.

Internalized Weight Bias & Stigma

Individuals with a normal BMI have lower risk of cardiovascular disease and higher risk of morbidity and mortality (17). However, weight loss attempts among people with excess weight do not guarantee improved health. In a multinational study, it was found that high levels of internalized weight bias can negatively affect dieting and exercise behaviors, demonstrating correlations with avoiding going to the gym and using food as a coping strategy, both counterproductive to maintaining a balanced diet and regular physical activity (6). In a study of college students, it was found that overweight students were more likely to have preoccupation with food, a desire to be thinner, and engage in dieting behaviors when compared to normal-weight students (28). While diet and exercise can be useful tools for health promotion, there is inconclusive evidence that using these tools as a means for weight loss is helpful or sustainable.

Striking a balance between promoting health without contributing to internalized weight bias is a challenge for healthcare providers and public health professionals.

Perceived weight discrimination has a negative impact on mental health and is closely connected to patients' experiences in healthcare settings. Among people with a BMI greater than or equal to 25 kg/m^2, the odds of experiencing a mood or anxiety disorder with perceived weight discrimination is approximately 2.5 times the odds of a mood or anxiety disorder without perceived weight discrimination (21). Studies exploring weight stigma, typically measured as the frequency of experiences of stigmatizing situations due to weight or body size, have demonstrated that weight stigma is correlated with lower feelings of motivation to diet or adopt healthy eating behaviors (29). Weight stigma is often not considered when developing public health approaches to obesity prevention (30). When obesity prevention programs have underlying messages contributing to weight stigma and discrimination, there is risk of contradictory outcomes. Considering the role HCPs and public health professional have in health promotion, it's essential that weight stigma in healthcare settings not offset efforts to promote healthy behaviors.

Limitations of Weight Loss Studies

Many studies assessing efficacy of weight loss recommendations do not follow participants for extended periods of time and therefore miss the complex patterns of weight regain and weight loss that many adults experience throughout a lifetime. Weight loss is complex and multi-faceted and is impacted by factors more complicated and less transformable than diet and exercise alone. HCPs have a unique role to play in supporting patients' cardiovascular health. Ample studies have evaluated the effects of various weight loss and obesity prevention programs, but few studies follow patients for a lifetime. Patients are sometimes referred to

commercial weight loss programs, many of which have led to short-term changes in weight, waist circumference, and blood pressure as demonstrated by a randomized clinical trial (31). In a systemic review and meta-analysis, it was found that over half of the people who started commercial weight loss program lost less than 5% body fat, indicating that commercial weight loss programs do not achieve desired results for over half of the clients who pay for services, and minimal results for the remaining participants (32). The role clinicians play in referring clients to commercial weight loss programs should be questioned given the lack of sustainable results. Another popular strategy for weight loss includes fad diets such as intermittent fasting, the paleo diet, and juicing or detoxification diets (33). These diets often include consistent patterns restricting certain foods. While fad diets often show short-term weight loss results given the extreme changes in caloric intake, they are rarely sustainable and often lead to weight gain after the diet has ended (33). Given the lack of sustainability and risk of weight cycling, clinicians should discourage fad diets as a tool for sustainable weight management. Additional longitudinal studies of weight fluctuations throughout lifetime are needed to better quantify the true experiences of weight loss.

New Approaches to Health

There are several new approaches to health that focus less on weight loss and more on overall health. Gaesser and Angadi propose a weight-neutral strategy to encourage increased physical activity rather than weight loss itself (34). Given the health risks of weight cycling and the positive health benefits of physical activity, regardless of weight, taking a weight-neutral approach to health can promote sustainable health behaviors without risk of contributing to harmful weight stigma. The “Health at Every Size” (HAES) approach, founded by Lindo Bacon, focuses on weight-neutral health and questions the promotion of dieting and weight loss as

means for improved health (35). In a randomized control trial with a 2 year follow-up period for white females with chronic dieting patterns, people assigned to the HAES intervention demonstrated maintained weight, better self-esteem, sustained improvements in systolic blood pressure, and higher rates of attrition when compared to the traditional diet intervention, where participants showed initial weight loss followed by weight regain at the 2-year mark resulting in non-statistically significant weight loss (36). A key component of the HAES approach is reducing restraint, enabling participants to become more aware of internal cues and ignore external cues (36). There are promising results to new approaches of health promotion. The medical and public health community has a responsibility to consider weight-neutral approaches to health promotion to support healthy communities, protect mental and emotional health, and decrease stigma and discrimination.

Study Justification

The lack of successful weight loss in population health indicators implies a need to change the current approach (18). Healthcare providers may be triggering a cascade of unhealthy behaviors when they diagnose a patient with overweight. This study will further explore the correlation of a healthcare provider diagnosis of overweight/obesity and weight cycling behaviors. Additionally, the agreement between weight perception and actual weight will be considered as an important component of physical and emotional health in the context of weight loss and healthcare provider interactions.

Methods

Data

Data from the National Health and Nutrition Examination Survey (NHANES) 2017-2020 (pre-pandemic data) were used for the cross-sectional analysis. NHANES is a complex, multistage, probability sample survey conducted by the CDC to create a nationally representative sample of the noninstitutionalized civilian resident population of the U.S. The present analysis was conducted among US adults aged 20 years and older who had ever been overweight, defined as maximum lifetime BMI≥25.0 computed based on self-reported greatest ever weight and current adult height from the medical exam. We further restricted the analytic sample to individuals with valid data for clinical diagnosis of overweight, weight cycling, and confounding variables. The final analytic sample included 5,512 participants. The impact of eligibility criteria and analytic exclusions on the final analytic sample is shown in Figure 1.

Data collection

Study measures were derived from participant interviews and anthropometric assessments. Data were collected by trained interviewers using a Computer-Assisted Personal Interview (CAPI) program for the interview questions or trained health technologist for the medical examination variables including anthropomorphic measurements. Interview teams included bilingual Spanish/English speakers, and interview materials were available in English, Spanish, Mandarin Chinese, Korean, and Vietnamese.

Weight cycling

The study outcome was weight cycling, defined as no weight cycling, low weight cycling or high weight cycling. The outcome was derived from the participants' response to "how many times

have you lost 10 pounds or more because you were trying to lose weight?" and participants could respond "1 to 2," "3 to 5," "6 to 10," "11 times or more," "never," "refuse to answer," or "I don't know." Because there is no universally accepted definition of the phenomenon, we relied on an empirical definition of "high weight cycling" as 6 or more episodes of weight loss, based on the median of "6 to 10" episodes. Participants reporting 1 to 5 attempts were defined as "low weight cycling." Participants who have never had weight loss episodes of at least 10 pounds were defined as having no weight cycling. Participants who responded "refuse to answer" or "I don't know" were excluded from the analytic sample.

Clinical diagnosis of overweight

The exposure of interest was clinical diagnosis of overweight, which was derived from a question that asked participants "has a doctor or healthcare professional ever said you were overweight?" Participants could answer "yes," "no," "refuse to answer," or "I don't know." Participants were only included in the analytic sample if they answered "yes" or "no" to this question.

Weight perception

A measure of current weight perception and weight status was created to examine whether weight perception played a role in weight cycling. This variable was based on participants' perception of current weight status based on self-reported height and weight and weight status based on objectively measured BMI at the time of survey. The final composite variable had 4 levels (normal weight, overweight based on perceived weight x normal weight, overweight based on measured weight).

Demographic covariates

Demographic variables including age, race/ethnicity, family income to poverty ratio, and highest level of education were collected through in-home interviews. The ratio of family income to poverty is a measure of the total family income divided by the poverty guidelines for a given year and used for federal assistance eligibility determinations. The income to poverty ratio ranges from 1-5 in NHANES (where 5 includes values $\geq$ 5). For this analysis, 0-1 is considered low, 1.01-3.99 is considered middle, and 4.0 or greater is considered high. Only participants with valid demographic data responses were included in the sample.

Female participants were asked if they have ever been pregnant and how many pregnancies they have had. Possible responses included a range of values 1-10, and 11 pregnancies or more. The number of pregnancies was included in the model to control for weight loss and weight gain associated with a pregnancy.

Statistical Analysis

Descriptive analyses were conducted to estimate the prevalence of clinical diagnosis of overweight as well as weight cycling in the US population with a history of overweight. Multinomial logistic regression models were estimated to assess the relationship between having an overweight diagnosis and a low or high number of weight loss episodes. Both the unadjusted association as well as the adjusted association controlling for age, race/ethnicity, income to poverty ratio, highest level of education, and number of pregnancies were estimated. Demographic variables include gender, race/ethnicity, education, and income to poverty ratio were assessed as effect measure modifiers. Interaction terms were created with each demographic variable and the primary outcome, and stratified associations were reported along with p-values for interaction. Associations between overweight diagnosis and history of weight cycling were assessed in strata of actual BMI and perception of weight.

Survey weights, clusters, and stratum variables were applied to all analysis to account for the complex multistage survey design. Analyses were conducted using SAS Studio 3.81 statistical software (Cary, NC).

Results

There were 15,560 participants assessed for eligibility as seen in Figure 1. The final analytic sample included 5,512 participants. Table 1 shows the demographic characteristics, weight cycling history, and weight perception of US adults reporting ever having BMI≥25. Of adults with a history of overweight, 43.4% were women, 56.7% were men, and the mean age was 50.56 years. 65.4% was non-Hispanic white, 11.0% were non-Hispanic Black, 15.3% was Hispanic, 4.0% was non-Hispanic Asian, and 4.3% identified as another race or multiple races. The mean greatest ever BMI in the sample was 34.36 kg/m^2 which is classified as obesity. Of the sample, 50.7% reported having been told by a healthcare provider they are overweight, while 49.3% report not having had an overweight diagnosis. 33.47% report never having lost 10 pounds or more for the purpose of weight loss, while 49.8% report having low weight cycling history and 16.8% report having high weight cycling history.

Figure 2 shows the distribution of weight loss episodes by clinical diagnosis of overweight/obesity. We found that having an overweight diagnosis was more common than not in all numbers of weight loss episode categories except for those that never lost 10 pounds or more for weight loss. Among people who low and high weight cycling, an overweight diagnosis is more common than not having an overweight diagnosis. People with an overweight diagnosis were most likely to attempt weight loss 1-5 times compared to any other category of weight loss episodes.

There was a strong association between having an overweight diagnosis and level of weight cycling (Table 2). People with an overweight diagnosis are more likely to have low weight cycling (OR=3.45; 95%CI: 2,83) 4.20) and have high weight cycling (OR=8.78; 95%CI: 5.73, 13.48) compared to those without an overweight diagnosis. We observed no statistical evidence of effect modification except for weight cycling by gender. The association between clinical diagnosis and weight cycling was stronger in men (low weight cycling OR=5.15; 95%CI: 4.02, 6.59, high weight cycling OR=9.65; 95%CI: 5.88, 15.85) compared with women (low weight cycling OR=2.00; 95%CI: 1.53, 2.62, high weight cycling OR=7.48; 95%CI: 4.72, 11.86). Weight cycling was most common among non-Hispanic whites and men compared to all other strata.

Table 3 shows the association between clinical diagnosis of overweight/obesity and weight cycling stratified by combinations of current weight perception and weight status. We found positive and statistically significant associations in all weight perception x weight status groups, with the exception of perceived overweight x normal BMI. Tables for all unadjusted models are listed in the appendices.

Tables and Figures

Figure 1. Participant diagram

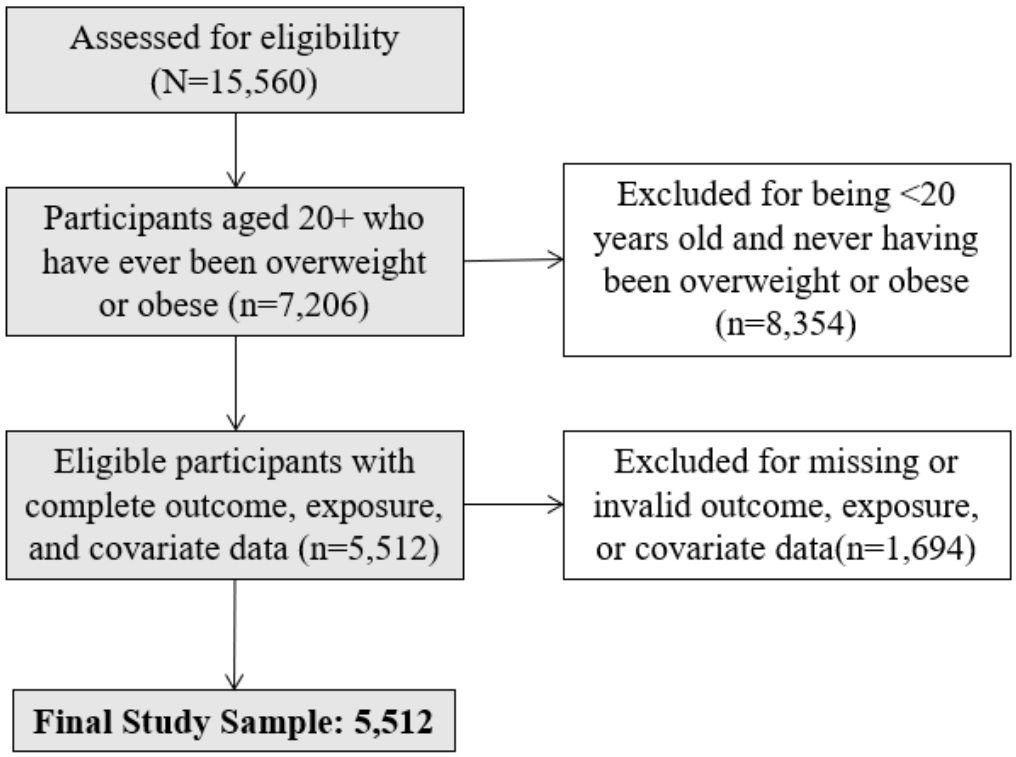

Figure 2. Distribution of weight loss episodes by clinical diagnosis of overweight/obesity

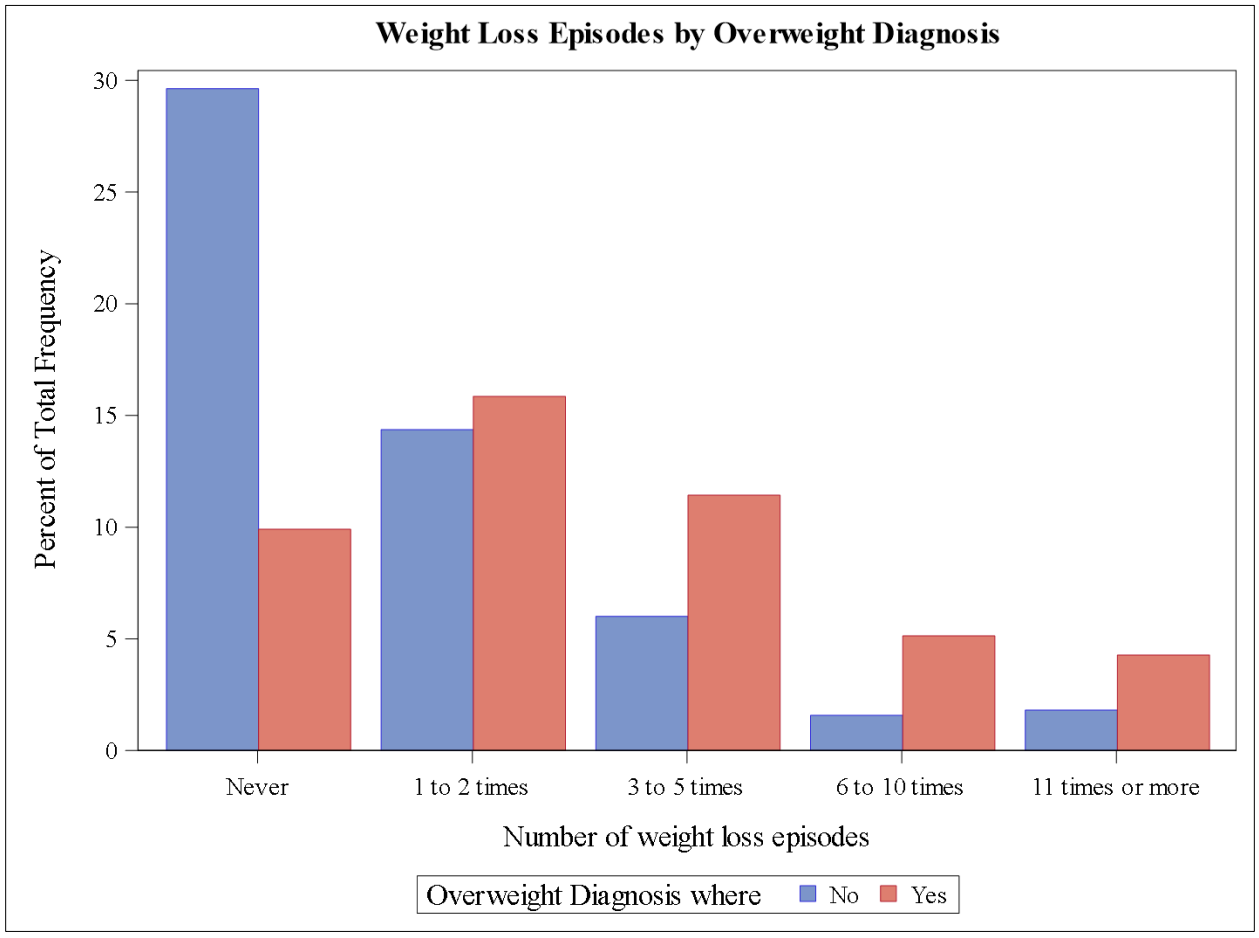

Table 1. Characteristics of US adults with history of overweight, 2017-2020

	n	Prevalence / mean	95% CI
Total Sample (N)	5512	n/a	n/a
Gender, %			
Men	3061	56.7%	[54.64, 58.76]
Women	2451	43.4%	[41.24, 45.36]
Age (years, **mean**)	5512	50.56	[49.22, 51.89]
Race/Ethnicity, %			
NH White	2070	65.4%	[59.92, 70.96]
NH Black	1494	11.0%	[7.89, 14.20]
Hispanic	1200	15.3%	[12.07, 18.42]
NH Asian	470	4.0%	[2.53, 5.36]
Other Race	278	4.3%	[3.41, 5.24]
Income to Poverty Ratio, %			
0-1	1030	11.9%	[10.34, 13.53]
1.01-3.99	3010	48.1%	[43.76, 52.38]
4.0+	1472	40,0%	[35.82, 44.17]
Education Level, %			
Less than high school	992	10.7%	[9.70, 11.77]
High School diploma and/or some college	3268	60.6%	[56.65, 64.61]
College graduate or above	1252	28.6%	[24.38, 32.90]
Greatest Ever BMI (kg/m^2, mean)	5512	34.36	[33.97, 34.76]
Current BMI			
Underweight (BMI<18.5 kg/m^2)	12	0.1%	[0.03, 0.19]
Normal weight (18.5 kg/m^2≤BMI<25 kg/m^2)	741	13.0%	[11.28, 14.62]
Overweight/Obese (BMI>25 kg/m^2)	4759	86.9%	[85.28, 88.61]
Overweight Diagnosis, %			
Yes	2943	50.7%	[48.65, 52.82]
No	2569	49.3%	[47.18, 51.35]
Weight Cycling			
None	2179	33.5%	[31.25, 35.69]
Low weight cycling (1-5 episodes)	2627	49.8%	[47.44, 52.11]
High weight cycling (6+ episodes)	706	16.8%	[14.25, 19.25]
Weight Perception			
Underweight	189	2.8%	[2.10, 3.58]
Normal weight	2026	32.1%	[30.45, 33.82]
Overweight	3297	65.0%	[62.90, 67.15]

Abbreviations: BMI, body mass index; NH, non-Hispanic; OR, odds ratios; CI, confidence interval

Notes: The prevalence and 95% confidence intervals are weighted measures that account for complex survey design with survey weights, clusters, and stratums. Current BMI is based on objectively measured height and weight at the NHANES medical examination. Weight perception is based on questionnaire data of weight perception at time of survey. Other race category includes multiple races. Family income to poverty ratio are calculated using the Department of Health and Human Services poverty guidelines that determine eligibility for federal assistance which consists of dividing total annual family (or individual) income by poverty guidelines for that year.

Table 2. Association between clinical diagnosis of overweight/obesity and weight cycling

	Low weight cycling OR** [95% CI]	**High weight cycling** OR [95% CI]	**p-value**
All adults	3.45 [2.83, 4.20]	8.78 [5.73, 13.48]	
Gender			<0.0001
Men	5.15 [4.02, 6.59]	9.65 [5.88, 15.85]	
Women	2.00 [1.53, 2.62]	7.48 [4.72, 11.86]	
Race/Ethnicity			0.577
NH white	3.37 [2,44, 4.65]	9.48 [5.43, 16.56]	
NH Black	3.89 [3.02, 5.00]	7.87 [4.41, 14.05]	
Hispanic	3.75 [2.72, 5.18]	5.40 [3.40, 8.56]	
NH Asian	3.61 [2.47, 5.30]	7.44 [2.11, 26.16]	
Other Race	2.54 [1.36, 4.73]	6.60 [2.01, 21.65]	
Education			0.270
Less than high school	2.86 [1.66, 4.92]	2.70 [0.93, 7.80]	
High school or some college	3.45 [2.83, 4.21]	11.63 [7.27, 18.60]	
College graduate or above	4.01 [2.50, 6.43]	7.25 [4.00, 13.15]	
Income to Poverty Ratio, %			0.660
0-1	2.46 [1.58, 3.85]	5.07 [2.25, 11.43]	
1.01-3.99	4.13 [3.37, 5.05]	10.51 [6.70, 16.49]	
4.0+	3.23 [2.23, 4.68]	8.36 [4.62, 15.14]	

Abbreviations: BMI, body mass index; NH, non-Hispanic; OR, odds ratios; CI, confidence interval

Notes: Odds Ratios are estimated from multinomial logistic regression models of a three-level weight cycling variable (none [referent]; low; high). The models are adjusted for age, number of pregnancies (for women only) and all other variables in the table. Other race includes multi-racial. Family income to poverty ratio are calculated using the Department of Health and Human Services poverty guidelines that determine eligibility for federal assistance which consists of dividing total annual family (or individual) income by poverty guidelines for that year.

Table 3. Association between clinical diagnosis of overweight/obesity and weight cycling stratified by current weight perception and current weight status

	Low Weight Cycling OR [95% CI]	**High Weight Cycling OR** [95% CI]	**p-value**
Weight perception and Weight Status Stratum			0.102
Normal Perception, Normal BMI (n=540)	2.53 [0.66, 9.67]	8.07 [1.70, 38.31]	
Normal Perception, Overweight (n=1484)	3.49 [2.39, 5.09]	8.35 [3.99, 17.48]	
Overweight Perception, Overweight (n=3227)	2.16 [1.66, 2.81]	5.08 [2.77, 9.30]	
Overweight Perception, Normal BMI (n=70)	0.53 [0.05, 6.01]	4.02 [0.23, 69.16]	

Note: individuals with underweight or perceived underweight were excluded from this analysis (n=191)

Discussion

One in six US adults with a history of overweight report 6 or more episodes of intentionally losing >10 pounds. Among all US adults with a history of overweight, we observed that a clinical diagnosis of overweight was associated with higher relative odds of frequent weight cycling behavior. Notably, this association was consistent across gender, race, income, and education. Given the potential negative physiological and psychosocial impacts of weight cycling, the findings indicate the importance of revisiting the way healthcare providers discuss weight with their patients. Healthcare providers and public health professionals must strive to better understand weight cycling, weight neutral approaches to health, and how to support people in larger bodies to avoid the potential harmful unintended consequences of overweight diagnoses on weight loss behaviors.

The results of this study confirm the hypothesis that those with an overweight diagnosis are more likely to have a history of weight cycling. The mechanism by which this occurs, whether through internalized weight bias, disordered eating, mental health challenges, stigma, or other pathways, should be further explored. In a 2020 study, an estimated 74.6% of adults in the US have attempted weight loss with an average of 7.8 weight loss episodes (23). The results of this study estimate that among adults with a history of being overweight, 66.6% have lost 10 pounds through attempted weight loss at least once. The median number of weight loss episodes of 10 pounds or more was between 6 and 10 times, consistent with other studies. A study from 2008 noted that 75% of overweight individuals and 29% of obese individuals did not have an overweight diagnosis by a healthcare provider (3). This is consistent with our study findings, as 49.3% of people with a history of being overweight or obese report never having had an overweight diagnosis. The literature noted that the desire to lose weight was more common

among women than men, so we predicted that women would have a higher odds of weight cycling associated with an overweight diagnosis (3). However, the study results demonstrate that men were more likely to have low weight cycling and high weight cycling with an overweight diagnosis when compared to women.

There are several limitations of the study. First, temporality cannot be established in this cross-sectional study. More studies are needed to establish causality and explore how healthcare provider interactions impact weight cycling behaviors. The questionnaire was conducted in household interview by trained interviewers, but there is risk for social desirability bias and recall bias. When participants are recalling 6 or more episodes of weight loss, recalling the details can be difficult. If participants overestimated the number of weight loss episodes in their lifetimes, the results would be biased away from the null. Additionally, discussions of weight can be sensitive and stigmatizing, leading to potential inaccuracies in answers reported by participants. Participants may overestimate experiences with overweight diagnoses, which could bias the results. Additionally, although the outcome variable asks about intentional weight loss, there may be confounding factors leading to weight loss that participants included when answering the question.

There are also several strengths of the study. NHANES is a nationally representative survey with participants representing many demographic categories. The study had a relatively large sample size, with 5,512 participants included in the final analysis. The comprehensiveness of NHANES provided many variables for which to adjust, including pregnancies, a factor that will affect the weight gain and weight loss of many participants.

Although there are still many factors to study, this study highlights the idea that overweight diagnoses are highly correlated with potentially harmful weight cycling behaviors. In

recent years, social movements have created a demand to change the way we perceive body size and health. It is time for the public health and medical community to respond with research, policy, and action. Several health researchers have explored new theories to approach health without contributing to weight stigma, including weight-neutral approaches and the Health at Every Size movement (34,35). Additional commitment to studying these phenomena is necessary to ensure that current recommendations are not exacerbating unintended consequences. The results of this study support three key recommendations to the public health and medical communities.

1. **More research on the effects of weight cycling and qualitative experiences with weight loss attempts.** There is significant evidence to demonstrate harmful effects of weight cycling and approaches to weight loss that contribute to stigma and discrimination. However, additional research is needed. The cardiovascular and mental health effects of high weight cycling must be further studied to know more about the extent of risks and/or benefits. Additionally, qualitative studies are needed to understand the experiences and attitudes of people with a history of being overweight with HCPs. Exploring how an overweight diagnosis and obesity reduction messaging impacts emotions and behaviors in people in larger bodies will help HCPs and public health professionals adapt approaches to meet the needs of this vulnerable population.
2. **Revisiting standard recommendations for clinicians on weight loss identification and counseling.** Patients with healthy cardiovascular indicators (blood pressure, cholesterol, blood glucose) may not require weight loss recommendations due to BMI alone. HCPs should shift the focus towards measurable cardiovascular indicators, health behaviors, and genetic factors rather than body size alone. In addition, standard recommendations

should allow for bodily autonomy in sharing anthropomorphic measures at primary care visits. Weight should be taken only after consent and options should be provided for patients who are uncomfortable with knowing their weight. Clinical recommendations should reflect these considerations.

3. **Comprehensive, inclusive, patient-centered training.** Given strong evidence that weight loss discussions and overweight diagnoses are associated with negative outcomes, it's important to approach training of HCPs with care. Rather than focusing on weight loss counseling alone, HCPs should focus on behaviors, genetics, and lifestyle factors that may lead to poor cardiovascular indicators. Discussing health status with patients in a comprehensive way will reduce stigma and empower patients.

There has been great public health concern following the consistent rise in prevalence of obesity in the U.S., yet our solutions have yet to be successful and overlook important unintended consequences. Public health practitioners and the medical community have a responsibility to examine unintended consequences and respond to community demands to create more inclusive and less stigmatizing solutions to health risks. Revisiting how we discuss body size and weight in health science communities is a necessary component of promoting holistic health. This study supports the idea that people are struggling with repeated weight loss attempts, as 16.8% of people have a history of high weight cycling and 49.8% have a history of low weight cycling. The health science community must respond with compassion, humility, and comprehensive evaluation of current approaches.

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Appendices

Appendix A. Association between clinical diagnosis of overweight/obesity and Weight Cycling (unadjusted)

	Low weight cycling OR [95% CI]	**High weight cycling** OR [95% CI]	**P-value**
All adults	3.61 [3.02, 4.31]	9.17 [6.09, 13.80]	
Gender			<0.0001
Men	5.02 [3.93, 6.41]	9.40 [5.84, 15.12]	
Women	2.06 [1.61, 2.65]	7.11 [4.63, 10.94]	
Race/Ethnicity			0.572
NH white	3.49 [2.62, 4.65]	9.87 [5.84, 16.66]	
NH Black	4.27 [3.35, 5.43]	8.72 [5.14, 14.78]	
Hispanic	4.00 [2.89, 5.54]	5.78 [3.47, 9.63]	
NH Asian	3.59 [2.43, 5.30}	7.45 [2.22, 24.29]	
Other Race	2.57 [1.48, 4.47]	6.75 [1.98, 23.02]	
Education			0.318
Less than HS	3.01 [1.80, 5.03]	2.87 [1.03, 8.01]	
HS or some college	3.66 [3.02, 4.42]	12.24 [7.90, 18.86]	
College graduate or above	4.22 [2.63, 6.76]	7.77 [4.25, 14.21]	
Income to Poverty Ratio, %			0.027
0-1	2.66 [1.75, 4.04]	4.96 [2.16, 11.40]	
1.01-3.99	4.46 [3.70, 5.37]	11.12 [3.70, 5.37]	
4.0+	3.16 [2.20, 4.54]	8.66 [4.74, 15.83]	

Abbreviations: BMI, body mass index; NH, non-Hispanic; OR, odds ratios; CI, confidence interval

Notes: Odds Ratios are estimated from multinomial logistic regression models of a three-level weight cycling variable (none [referent]; low; high). Other race includes multiple races. Family income to poverty ratios are calculated using the Department of Health and Human Services poverty guidelines that determine eligibility for federal assistance which consists of dividing total annual family (or individual) income by poverty guidelines for that year.

Appendix B. Association between clinical diagnosis of overweight/obesity and weight cycling stratified by current weight perception and current weight status (unadjusted)

	Low Weight Cycling [95% CI]	**High Weight Cycling** [95% CI]	**p-value**
Weight perception and Weight Status Stratum			0.481
Normal Perception, Normal BMI (n=540)	3.62 [1.32, 9.90]	7.89 [2.17, 28.70]	
Normal Perception, Overweight (n=1484)	3.44 [2.40, 4.92]	7.49 [3.83, 14.66]	
Overweight Perception, Overweight (n=3227)	2.11 [1.62, 2.75]	5.08 [2.79, 9.23]	
Overweight Perception, Normal BMI (n=70)	0.66 [0.07, 6.53}	4.27 [0.34, 53.87]	

Note: individuals with underweight or perceived underweight were excluded from this analysis (n=191)