Associations Between Unhealthy Weight-Loss Strategies and Depressive Symptoms

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Introduction: There appears to be a link between weight loss and improved mental health, but less is known about how using unhealthy weight-loss strategies impacts the odds of reporting depression.

Methods: This study includes respondents from the National Health and Nutrition Examination Survey from 2005 to 2014 who attempted to lose weight over the past year. Analysis occurred in 2017. Multivariable logistic regression was used to describe associations between all weight-loss strategies, including those grouped as unhealthy (smoking, vomiting, laxatives, skipping meals, and using diet pills), and the adjusted odds of depression (Patient Health Questionnaire−9 score ≥10). The model was then stratified by BMI, sex, race, and antidepressant use to compare the effect of using at least one unhealthy weight-loss strategy and depression within certain populations.

Results: The sample included 6,765 respondents (weighted n=59.2 million, 95% CI=55.5, 62.9 million). Of these respondents, 18.0% (n=1,270) reported using at least one unhealthy weight-loss strategy. In unadjusted analysis, unhealthy weight-loss strategies were generally associated with higher incidence and odds of reporting depression. In multivariable analysis, using at least one unhealthy weight-loss strategy was significantly associated with odds of reporting depression (AOR=1.47, 95% CI=1.14, 1.91, p<0.01). When the model was stratified, this effect was statistically significant among respondents with class I or II obesity (AOR=2.20, 95% CI=1.56, 3.10, p<0.01); female respondents (AOR=1.46, 95% CI=1.06, 2.00, p=0.02); and respondents who did not use an antidepressant (AOR=1.57, 95% CI=1.14, 2.15, p=0.01).

Conclusions: Unhealthy weight-loss strategies are associated with increased odds of depression. This may inform screening practices and public health messaging.
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INTRODUCTION

Half of all Americans, including many within a non-overweight BMI range,[1−3] spend billions of dollars annually to lose weight.[4−6] To combat the obesity epidemic and improve population health, NIH endorsed guidelines that recommend reducing caloric intake and increasing physical activity for adults with a BMI of 25 or more.[7] However, many individuals attempting to lose weight do not follow these guidelines and use weight-loss strategies that are not sustainable or are medically unhealthy.[8−10]

In addition to their well-described relationships with physical health, there is evidence that weight-loss strategies are associated with mental health. For example, medically unhealthy approaches to weight loss, such as laxative use or smoking for meal replacement, have been shown to be associated with depression and other

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dysphonic moods in adolescent and young adult populations.[2,11−14] In adults, certain diets, such as the Mediterranean diet, have been associated with improving mental health status.[15−18] However, studies exploring the more general associations between multiple weight-loss strategies on mental health remain largely limited to samples that are composed of college-aged subjects[1,12−14,19,20] and usually include only individuals with a BMI of 25 or more.[5] These populations are narrow and do not encompass many U.S. adults attempting to lose weight.

Describing the association between weight-loss strategies and mental health in the general population is warranted given the high prevalence of weight-loss attempts among individuals of all ages and BMIs as well as the extent to which depression is underdiagnosed and undertreated in the U.S.[21,22] Furthermore, in a national sample, less than 5% of primary care offices were found to routinely screen patients for depression,[23] and better quantifying the association between weight-loss strategies and depression may lead to clinically useful information to cue physicians to ask patients about their mental health in addition to further characterizing the complex association between weight and mental health. Thus, the current study utilized data from a nationally representative sample of U.S. adults between 2005 and 2014 to characterize the association between weight-loss strategies and depressive symptoms.

METHODS

Study Population

The sample consisted of adults aged ≥18 years who took part in the National Health and Nutrition Examination Survey (NHANES). NHANES is a cross-sectional survey conducted by the Centers for Disease Control and Prevention. NHANES utilizes a complex, multistage, clustered probability method to sample non-institutionalized U.S. civilians to provide nationally representative estimates.[24] Responses of individuals sampled between 2005 and 2014 who completed both the weight-loss history and mental health screener and also reported attempting to lose weight in the past year were eligible for inclusion. Respondents were excluded if they reported trying to lose weight but had a BMI <18.5, felt that they were currently underweight, or had missing responses. This sample encompassed the 10 most recent years of NHANES data.

Measures

Primary predictor variables were the weight-loss strategies included in the NHANES survey. NHANES provides a list of 20 predefined weight-loss strategies and asks respondents to self-report if they used any while trying to lose weight in the past year. The strategies are listed in Table 1.[25] One strategy, "Had surgery to lose weight," was not described as a separate category because it was not included as an option until 2013−2014 (0.1%, *n*=5). One binary composite variable was constructed corresponding to the use of weight-loss strategies that were classified as unhealthy (used/did not use). Specifically, respondents who had reported

using at least one of the following weight-loss strategies were considered to have used an unhealthy method: skipping meals, vomiting/using laxatives, smoking to lose weight, taking prescription diet pills, or taking nonprescription diet pills. All other weight-loss strategies were considered healthy or neutral and coded together as not unhealthy, resulting in the final binary variable. This grouping was informed by the coding scheme from Project Eat III and the related literature.[11,26]

The primary outcome measure was depressive symptoms evaluated using the Patient Health Questionnaire−9 (PHQ-9), which is a validated measure of depression in adults.[27−29] The PHQ-9 consists of nine questions that ask respondents to rank on a scale of 0 (not at all) to 3 (nearly every day) how often they have experienced symptoms of depression in the past 2 weeks for a final score that ranges from 0 to 27. In order to maximize sensitivity and specificity, respondents were classified as depressed if they had a PHQ-9 score ≥10 (equivalent to moderate or greater symptoms).[30,31]

Potential confounder variables were selected based on their previously demonstrated associations with depression. These variable groups included demographic,[32] general health,[33] and measures as well as perceptions of weight status.[34] Demographic variables included age (continuous); sex (binary); race (nominal); family income-to-poverty ratio (continuous); education (nominal); and marital status (nominal). Health variables included Likert-type scale measured general health status (binary; excellent/very good/good versus fair/poor) and antidepressant medication use (yes versus no in the past 30 days). Weight variables included BMI (continuous); body-weight perception (binary; perceive self as normal weight versus overweight); and self-reported weight change over the past year (nominal; weight maintenance versus gained weight versus lost weight[35]).

Statistical Analysis

Chi-square tests were used to compare prevalence of depression among those who did and did not report attempting to lose weight in the past year. Student's *t*-tests (for continuous responses) and chi-square tests (for categorical responses) were used to compare the demographic characteristics of respondents across those who did and did not report using an unhealthy weight-loss strategy. Unadjusted counts were used to describe prevalence of each weight-loss strategy as well as the sum of unhealthy weight-loss strategies used by participants. Multivariable logistic regression models were used to assess both (1) the use of each weight-loss strategy and odds of depression, and (2) the composite variable of any unhealthy weight-loss strategy and odds of depression. All multivariable models adjusted for all confounder variables described in the Measures section. To examine the impact of effect modification on the association between the composite variable and depression, the final model was stratified by (1) BMI categories (non-overweight: 18.5−24.9, overweight: 25.0−29.9, class I or II obesity: 30.0−39.9, class III obesity: ≥40.0); (2) sex, (3) race (black, white, Hispanic, other); or (4) antidepressant use (yes, no) based on evidence that different demographic groups may be psychologically unique[36,37] and that antidepressants are widely used for non-depression diagnoses but may be associated with both reporting depression and weight change.[38,39] Finally, a sensitivity analysis was performed that removed prescription diet pills from the composite variable, because such a method does include

Table 1. Association Between Depressive Symptoms and Weight-Loss Strategies in Adults Trying to Lose Weight

Weight-loss strategies	n (%)[a]	AOR of depression[b,c] (95% CI)	p-value
Not unhealthy strategies			
Ate diet foods or products	719 (12)	1.20 (0.84, 1.72)	0.31
Ate fewer carbohydrates	1,718 (26)	0.87 (0.66, 1.14)	0.31
Ate less candy and sweets	1,236 (18)	0.92 (0.65, 1.29)	0.62
Ate less fat to lose weight	2,381 (34)	1.01 (0.79, 1.29)	0.96
Ate less to lose weight	4,202 (63)	1.30 (1.05, 1.60)	**0.02***
Ate more fruits, vegetables, and salads	1,654 (24)	1.00 (0.78, 1.29)	0.99
Changed eating habits	1,192 (18)	0.95 (0.71, 1.27)	0.71
Drank a lot of water	2,662 (40)	0.84 (0.70, 1.04)	0.11
Drank liquid diet formula	343 (5)	1.91 (1.19, 3.07)	**0.01***
Exercised to lose weight	4,148 (63)	0.78 (0.60, 1.01)	0.05
Followed a special diet	439 (8)	0.75 (0.45, 1.26)	0.23
Joined a weight-loss program	368 (7)	0.76 (0.40, 1.45)	0.40
Other	71 (1)	3.25 (1.47, 7.19)	**<0.01****
Switched to foods with lower calories	2,182 (34)	1.11 (0.89, 1.38)	0.40
Unhealthy strategies			
Skipped meals	1,136 (16)	1.48 (1.11, 1.98)	**0.01***
Started to smoke or began smoking again	55 (1)	0.90 (0.31, 2.61)	0.84
Took laxatives or vomited	67 (1)	3.31 (1.47, 7.50)	**0.01***
Took non-prescription diet pills/supplements	470 (7)	1.99 (1.32, 2.98)	**<0.01****
Took prescription diet pills	161 (2)	1.69 (0.97, 2.95)	0.06

Note: Boldface indicates statistical significance (**p*<0.05, ***p*<0.01).
[a]Weighted percentage.
[b]Adjusted for age, sex, race, education, marital status, family income-to-poverty ratio, BMI, self-reported weight change in the past year, self-reported health status, body weight perception, and antidepressant use.
[c]Depression defined as PHQ-9 ≥10.
PHQ-9, Patient Health Questionnaire−9.

medical oversight. All confounder variables included in the conceptual models used to build multivariable regression models were informed by the literature and interrogated using logistic regression and found to be significantly associated with both depression and use of an unhealthy weight-loss strategy at an α level of 0.20.[40,41]

Appropriate weights were applied to take into account the complex, multistage sampling methodology of NHANES, and all statistics except for table counts represent weighted estimates.[42] Specifically, the Complex Sample Analysis module within SPSS, version 24 (www.ibm.com/analytics/us/en/technology/spss/), which enables proper weighting of NHANES data, was used for all analysis.[43] Data analysis occurred in 2017.

RESULTS

From 2005 to 2014, there were 50,965 respondents to NHANES. Of these, a total of 28,551 and 26,213 respondents were sampled to complete the weight history and mental health screener section of the NHANES survey, respectively, whereas 22,925 completed both sections. Approximately 37% (*n*=9,498, 95% CI=35.7%, 37.3%) reported attempting to lose weight in the past year, and of these individuals 7,947 also completed the

mental health screener module. After excluding respondents with missing data (*n*=1,118); a BMI <18.5 (*n*=10); or respondents who considered themselves underweight (*n*=54), the final sample size was 6,765 respondents (85.1% of respondents meeting inclusion criteria). This represents a weighted estimate of 59.2 million U.S. adults (95% CI=55.5, 62.9 million).

Those who reported attempting to lose weight had a higher prevalence of depressive symptoms than those who did not report attempting to lose weight (7.7% vs 6.5%, *p*<0.01). The plurality of respondents had class I or II obesity (37.7%, *n*=2,781), though a significant percentage were individuals with a BMI <25 (18.7%, *n*=1,051). The majority of the sample were female (62.8%, *n*=4,326); white (71.5%, *n*=3,259); and not depressed (92.3%, *n*=6,148) or on an antidepressant (85.6%, *n*=5,945). Those who used an unhealthy weight-loss strategy tended to be younger, to have a higher BMI, to have been more likely to have lost weight in the past year, to be non-white, to report fair/poor health, to have less education, and to be non-married (Table 2).

The majority of participants did not report any unhealthy weight-loss strategies (69.6%, *n*=4,702). Of

Table 2. Comparison of Adults That Used an Unhealthy Weight-Loss Method to Adults That Did Not

Characteristics	Did not use an unhealthy weight-loss method (*n*=5,214)	Used an unhealthy weight-loss method[a] (*n*=1,551)	*p*-value[b]
Age in years, M ± SD	47 ± 16	42 ± 14	**<0.01****
Female,[c] *n* (%)	3,202 (62)	1,004 (64)	0.16
Race,[c] *n* (%)			**<0.01****
White	2,559 (73)	643 (65)	
Black	938 (9)	421 (15)	
Hispanic	1,258 (12)	367 (13)	
Other	459 (6)	120 (7)	
Marital status,[c] *n* (%)			**<0.01****
Married	2,957 (61)	774 (53)	
Living with partner	346 (7)	136 (10)	
Widowed	294 (4)	57 (3)	
Divorced/separated	746 (13)	267 (15)	
Never married	871 (15)	317 (19)	
Education level,[c] *n* (%)			**<0.01****
College graduate	1,570 (37)	325 (25)	
Some college	1,633 (32)	561 (36)	
Completed high school or equivalent	1,067 (19)	408 (27)	
Did not complete high school	944 (12)	257 (12)	
Family income-to-poverty ratio,[d] M ± SD	3.3 ± 1.6	3.0 ± 1.6	**<0.01****
BMI,[c] *n* (%)			**<0.01****
Non-overweight, 18.5−24.9	857 (19)	194 (16)	
Overweight, 25.0−29.9	1,749 (35)	446 (30)	
Class I or II obesity, 30.0−39.9	2,100 (37)	681 (40)	
Class III obesity, ≥40	508 (9)	230 (14)	
Self-reported weight change in past year,[c] *n* (%)			**<0.01****
Weight maintenance, ±1 kg	1,932 (40)	453 (32)	
Weight gain, >1 kg	1,031 (18)	257 (16)	
Weight loss, >1 kg	2,251 (42)	841 (52)	
Self-reported health status,[c] *n* (%)			**<0.01****
Good or better	4,117 (85)	1,161 (80)	
Fair or poor	1,097 (15)	390 (20)	
Body weight perception,[c] *n* (%)			**<0.01****
Normal weight	1,032 (21)	236 (15)	
Overweight	4,182 (79)	1,315 (85)	
Depressive symptoms,[c] *n* (%)			**<0.01****
None to mild, PHQ-9 <10	4,796 (93)	1,352 (88)	
Moderate to severe, PHQ-9 ≥10	418 (7)	199 (12)	
Antidepressant use,[c] *n* (%)			0.11
No	4,601 (86)	1,344 (84)	
Yes	613 (14)	207 (16)	

Note: Boldface indicates statistical significance (*p<0.05, **p<0.01).
[a]Unhealthy weight-loss methods included skipping meals, vomiting/using laxatives, smoking to lose weight, taking prescription diet pills, and taking non-prescription diet pills/supplements.
[b]*p*-values were calculated with Student's *t*-test for continuous variables and Pearson's χ^2 test for categorical variables.
[c]Weighted percentage.
[d]Family income-to-poverty ratio was calculated by dividing the annual family income by the survey-year specific HHS poverty guidelines.
PHQ-9, Patient Health Questionnaire−9.

those that did report an unhealthy weight-loss strategy, the majority (68.5%, *n*=1,429) reported using only one unhealthy weight-loss strategy, of whom the plurality reported skipping meals (44.3%, *n*=687). In

multivariable analysis of the association between weight-loss strategies and adjusted odds of depressive symptoms (Table 1), adjusting for demographic characteristics, measures as well as perception of weight, and general

Table 3. Multivariable Model of Factors Associated With Depressive Symptoms in Adults Trying to Lose Weight

Variables	OR of depression[a] (95% CI)	p-value
Predictor variable		
Used an unhealthy weight-loss strategy[b]		**<0.01****
No (ref)	1.00 (—)	
Yes	1.47 (1.14, 1.91)	
Confounder variables		
Age in years[c]	0.99 (0.98, 1.00)	**0.02***
Sex		**0.03***
Male (ref)	1.00 (—)	
Female	1.37 (1.03, 1.82)	
Race		0.30
White (ref)	1.00 (—)	
Black	0.85 (0.63, 1.15)	
Hispanic	0.88 (0.65, 1.18)	
Other	1.26 (0.82, 1.93)	
Marital status		**<0.01****
Married (ref)	1.00 (—)	
Living with partner	1.27 (0.92, 1.76)	
Widowed	1.24 (0.66, 2.33)	
Divorced/separated	2.02 (1.50, 2.72)	
Never married	1.21 (0.84, 1.76)	
Education level		**0.04***
College graduate or above (ref)	1.00 (—)	
Some college	1.37 (0.92, 2.10)	
Completed high school or equivalent	1.59 (1.04, 2.44)	
Did not complete high school	1.85 (1.19, 2.87)	
Family income-to-poverty ratio	0.82 (0.74, 0.91)	**<0.01****
Self-reported health status		**<0.01****
Good or better (ref)	1.00 (—)	
Fair or poor	4.80 (3.74, 6.17)	
BMI	1.00 (0.99, 1.02)	0.62
Body weight perception		**<0.01****
Normal weight (ref)	1.00 (—)	
Overweight	1.87 (1.25, 2.81)	
Self-reported weight change in past year		0.26
Weight maintenance, ±1 kg (ref)	1.00 (—)	
Weight gain, >1 kg	1.31 (0.94, 1.81)	
Weight loss, >1 kg	1.16 (0.89, 1.50)	
Antidepressant use		**<0.01****
No (ref)	1.00 (—)	
Yes	4.02 (3.01, 5.37)	

Note: Boldface indicates statistical significance (*p<0.05, **p<0.01).
[a]Depression defined as PHQ-9 ≥10.
[b]Unhealthy weight-loss methods included skipping meals, vomiting/using laxatives, smoking to lose weight, taking prescription diet pills, and taking non-prescription diet pills/supplements.
[c]Per 1-year increase in age.
PHQ-9, Patient Health Questionnaire−9.

health information, a total of six weight-loss strategies were significantly associated with the odds of reporting depression. Specifically, compared with individuals not using the strategy, prevalence of scoring depressed on the PHQ-9 was significantly higher in those who ate less (AOR=1.30, 95% CI=1.05, 1.60, *p*=0.02); who skipped meals (AOR=1.48, 95% CI=1.11, 1.98, *p*<0.01); who took laxatives or vomited (AOR=3.31, 95% CI=1.47, 7.50, *p*=0.01); who took nonprescription supplements for weight loss (AOR=1.99, 95% CI=1.32, 2.98, *p*<0.01);

Table 4. Multivariable Analyses of the Association Between Use of an Unhealthy Weight Loss Method and Depression Stratified by BMI, Sex, Race, or Antidepressant Use

Used an unhealthy weight-loss method (yes versus no)[a]	AOR of depression[b,c] (95% CI)	*p*-value
BMI[d]		
Non-overweight, 18.5−24.9	1.37 (0.59, 3.14)	0.46
Overweight, 25.0−29.9	0.99 (0.55, 1.78)	0.96
Class I or II obesity, 30.0−39.9	2.20 (1.56, 3.10)	**<0.01****
Class III obesity, ≥40	1.14 (0.63, 2.04)	0.67
Sex[e]		
Male	1.53 (0.94, 2.47)	0.08
Female	1.46 (1.06, 2.00)	**0.02***
Race[f]		
White	1.46 (0.97, 2.19)	0.07
Black	1.16 (0.75, 1.81)	0.50
Hispanic	1.25 (0.89, 1.76)	0.20
Other	2.27 (0.90, 5.71)	0.08
Antidepressant use[g]		
No	1.57 (1.14, 2.15)	**0.01***
Yes	1.24 (0.77, 2.01)	0.38

Note: Boldface indicates statistical significance (*p<0.05, **p<0.01).
[a]Unhealthy weight-loss methods included skipping meals, vomiting/using laxatives, smoking to lose weight, taking prescription diet pills, and taking non-prescription diet pills/supplements. "No" is the reference value.
[b]All models included age, education, marital status, family income-to-poverty ratio, self-reported weight change in the past year, self-reported health status and body weight perception as confounder variables.
[c]Depression defined as PHQ-9 ≥10.
[d]Model also includes sex, race, and antidepressant use as confounder variables.
[e]Model also includes BMI, race, and antidepressant use as confounder variables.
[f]Model also includes BMI, sex, and antidepressant use as confounder variables.
[g]Model also includes BMI, sex, and race as confounder variables.
PHQ-9, Patient Health Questionnaire−9.

who used a liquid diet formula (AOR=1.91, 95% CI=1.19, 3.07, *p*=0.01); and who selected the option of having used other weight-loss methods (AOR=3.25, 95% CI=1.47, 7.19, *p*<0.01). Alternatively, those who exercised to lose weight had reduced odds of reporting depression than those who did not report using this weight-loss strategy, though the association did not reach statistical significance (AOR=0.78, 95% CI=0.60, 1.01, *p*=0.05).

In multivariable analysis that assessed the relationship between the composite variable (i.e., using at least one unhealthy weight-loss strategy) and the odds of depression (Table 3), using at least one unhealthy weight-loss strategy versus not was significantly associated with odds of reporting depression (AOR=1.47, 95% CI=1.14, 1.91, *p*<0.01). Additionally, younger age; female sex; being divorced (compared with married); having less education; having a lower income-to-poverty ratio; being in poor health; self-perception of non-normal weight; and using antidepressants were associated with increased adjusted odds of reporting depression (Table 3). In the stratified analysis by BMI category, sex, antidepressant use, or race (Table 4), using at least one unhealthy weight-loss strategy was significantly associated with

increased odds of reporting depression only in respondents with class I or II obesity (AOR=2.20, 95% CI=1.56, 3.10, *p*<0.01); female respondents (AOR=1.46, 95% CI=1.06, 2.00, *p*=0.02); and respondents not using an antidepressant (AOR=1.57, 95% CI=1.14, 2.15, *p*=0.01).

The sensitivity analysis for respondents who used only prescription drug use as the unhealthy weight-loss strategy, which did not categorize 78 respondents (1.3%) as having used an unhealthy weight-loss strategy, reproduced the results presented above.

DISCUSSION

This study utilized 10 years of data from NHANES to describe associations between weight-loss strategies and odds of reporting depressive symptoms. Several weight-loss strategies were significantly associated with the odds of reporting depression. Specifically, using at least one unhealthy weight-loss strategy was associated with a 47% increased odds of reporting depression. From the stratified analysis, this association was present only for respondents who had a BMI between 30.0 and 39.9, who were female, or who did not report taking antidepressants.

Importantly, this study should be applied in the context of individuals who are attempting to lose weight. Respondents attempting to lose weight were already significantly more likely to have depression than those who were not. Previous studies have found that individuals who are attempting to lose weight have a lower health-related quality of life and decreased health, vitality, and physical functioning.[44,45] The results presented here suggest that choice of weight-loss strategy is associated with depression status, and future work should explore how healthcare professionals can support both healthy weight loss and mental health.

This study specifically adds to the large volume of literature supporting a complicated link between BMI, weight-loss behaviors, patient sex, and psychopathology. Individuals with depression can report decreased appetite; thus, individuals with undertreated depression may find skipping meals more achievable than attempting healthier weight-loss methods, such as exercise. Given these findings, weighed with the fact that some antidepressants increase risk of weight gain and type 2 diabetes, providers may counsel patients regarding these topics when considering the link between weight and mental health.[46,47]

The finding that unhealthy weight-loss behaviors are associated with depression in females mirrors the current literature, which suggests self-objectification behaviors reflecting societal pressures with respect to body image can moderate associations between weight-loss behaviors and depression in females.[48−50] Alternatively, it should be noted that the effect size was similar in males and females, and therefore the statistical difference may be a function of the larger sample size of females. However, given the totality of the research, females using unhealthy weight-loss strategies should be assessed for depression.

Finally, the finding that use of an unhealthy weight-loss strategy is associated with depression only among individuals within certain BMI groupings is concordant with other studies that suggest individuals within different weight groups experience different sociocultural and psychological stresses.[36,51] However, it is notable that in the studied population, the link between unhealthy weight-loss behaviors and increased risk for depression was seen only in individuals with class I or II obesity but not in those with class III obesity. Additional research, perhaps qualitative in nature, is needed to more deeply describe this association, but it might be that respondents with class III obesity more often face significant health problems and challenges with activities of daily living because of their weight that influence risk of depression,[52] and the results presented here may suggest that such factors could be more closely associated with depressive status than weight-loss modality. These findings highlight the importance of recognizing the psychological uniqueness of different groups of individuals with different weights and the sometimes non-linear associations between weight and mental health.

This study may also have a role in assisting public health and clinical workers identify those at increased risk of mental health pathology. In addition to well-documented high-risk groups, such as patients with chronic diseases (e.g., cancer), individuals who are trying to lose weight, and especially those trying to do so by unhealthy tactic, may also be at higher risk for depression and may deserve special consideration of mental health needs during health care appointments.[53−55] Given discussions of BMI and weight have been reported to occur in as many as 70% of visits in a primary care setting, with the number of minutes devoted during the visit proportional to BMI,[56] these discussions may provide fruitful opportunities to also discuss mental health status, particularly if an effort is made to understand the approach a patient takes to weight loss.

Regardless of depressive status, nearly 20% of respondents endorsed use of at least one unhealthy weight-loss behavior, with individuals using these modalities significantly likely to be younger, black, with less education, and of lower income. Motivational interviewing and providing education about unhealthy weight-loss behaviors and associated risks to the cardiovascular, metabolic, skeletal, and intestinal systems, in addition to the associations with poor mental health reported here, are feasible in the primary care setting and may be opportunities to connect patients to programs that support healthy weight loss.[56−59] Given that many patients with obesity may be at higher risk of having multiple comorbid conditions, such as hypertension, diabetes, and osteoarthritis,[60] and that these issues may be compounded by unhealthy weight-loss use, providing evidence-based recommendations about healthy weight loss may help in the management of multiple problems, including mental health concerns. Finally, this study parallels other research suggesting endorsement of certain weight-loss behaviors may indicate lower risk of depressive status.[61,62] Endorsement of exercise reduced the odds of reporting depression by half, a borderline statistically significant finding, supporting previous evidence purporting its protective effect on mental health.[61]

Limitations

This study is not without limitations. First, this study is cross-sectional and cannot comment on causality between weight-loss strategies and depression. Further, the weight-loss strategies are self-reported over the entire previous year, which may be subject to recall bias. It is also possible

a respondent was no longer using a reported weight-loss method when the PHQ-9 was administered, which means it is possible that the effects of the weight-loss strategy on depression may occur after use of the weight-loss strategy. Additionally, the NHANES question concerning diet pill use asks respondents to report if they took diet pills prescribed by a doctor, which is vague and could include appropriately taken Food and Drug Administration−approved weight-loss medications that would not necessary qualify as an unhealthy weight-loss method. Weight-loss strategies were categorized based on accepted norms of the literature and expert input, the classification is limited by the NHANES questionnaire, and what is deemed sustainable or healthy may change with medical advancements and research. Finally, additional weight-loss strategies and the intensity with which one uses a given weight-loss method might also be associated with increased odds of depression. Thus, these results might serve as a guide, but not final recommendations, about how to intertwine weight loss and discussions regarding depression.

CONCLUSIONS

Despite these limitations, this study shows that weight-loss strategies, especially unhealthy ones, are associated with depression in certain groups of adults. Conversations about weight loss may therefore have an opportunity to impact both physical as well as mental health. Future research might further characterize this association and investigate how best to use discussions of weight loss to identify patients at risk of depression while limiting burden in an already over-extended provider population.[63]

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