**Introduction**

More than two-thirds of United States (U.S.) adults meet criteria for overweight or obesity (Flegal et al., 2016), and elevated body mass index (BMI) is suggested to be the second leading behavioral risk factor to disability adjusted life years in the U.S. (Forouzanfar et al., 2016). The health burden posed by obesity may be especially elevated when accounting for possible interactions with other prevalent health and behavioral risk factors such as depression, cigarette smoking, and risky drug or alcohol use (Forouzanfar et al., 2016; Kassebaum et al., 2016). However, evidence of associations between obesity and these risk factors is mixed. For instance, smoking cessation is associated with weight gain and many current smokers express hesitation about quitting due to fear of bodyweight changes (Jain et al., 2016; Twyman et al., 2014).

smokers with obesity have significantly lower HDL cholesterol and higher levels of current depression than either smokers without obesity or non-smokers with obesity (Vurbic et al., 2015)

10% experience depression each year (Hasin et al., 2018), 14% smoke cigarettes, and 5.3% engage in risky alcohol use (Sauer et al., 2019). Correspondingly, depression is the fifth leading contributor to disability adjusted life years (DALYs) in the U.S. (Kassebaum et al., 2016), while smoking, high body mass index (BMI), drug use, and alcohol use are the first, second, sixth, and seventh leading behavioral risk factors for DALYs, respectively (Forouzanfar et al., 2016).

In making progress towards reducing the prevalence of these risk factors, it is crucial to consider if and how they intersect. For instance, Associations between depression and obesity have also been studied extensively

individuals may be hesitant to quit smoking for fear of gaining weight (refs), or Some research on the cooccurrence of these risk factors suggests positive associations between depression or smoking and obesity (REFs), although findings are mixed (REFs).

-Obesity and depression; obesity and smoking = associations are fairly weak at best

Stigma, body image seem to play mediating role especially for girls (Howe 2017)

The objectives of this study were to 1) determine whether weight perception and current weight-related behaviors are associated with other health behaviors and outcomes (depression, smoking, cannabis use, and binge drinking) independent of obesity and 2) determine whether patterns of association between weight perception and health behaviors or health outcomes differ by how weight perception is assessed.

**Methods**

*Study Sample*

We used data from the 2005 – 2006, 2007 – 2008, 2009 – 2010, 2011-2012, and 2013- 2014 waves of the National Health and Nutrition Examination Survey (NHANES) for this analysis. NHANES is an ongoing cross-sectional survey conducted by the National Center for Health Statistics designed to monitor trends in common health behaviors and outcomes in the noninstitutionalized United States population. We restricted analyses to participants age 18 and older due to differences substance use and bodyweight perception questionnaires for adolescent versus adult respondents. For these waves of data collection. response rates ranged from 72 to 79%.

**Measures**

*Weight Perceptions and Behaviors*

We used responses to the questions “Do you consider yourself now to be overweight, underweight, or about the right weight?” and “Would you like to weigh more, less, or about the same?” to assess participants’ self-perception of and desired weight, respectively. Additionally, participants self-reported their current weight and weight a year prior to the interview. Individuals reporting a current weight more than 10 pounds lower than their previous weight were then asked if they intentionally changed their weight. Individuals who did not report weight loss were then asked if they had tried to lose weight or tried to not gain weight. We coded past year weight action as a five-level dummy variable from responses to these questions: intentional weight loss, unintentional weight loss, attempted (but unsuccessful) weight loss, attempted weight gain prevention, or no attempted weight control.

*Depression*

Current depressive symptoms were assessed using the nine item Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001). Respondents were asked how often, in the two weeks prior to interview, they experienced symptoms of depression such as anhedonia, restlessness, and irritability. Each symptom was scored on a 0 – 3 scale, corresponding to “not at all,” “several days,” “more than half of days,” or “nearly every day.” After summing symptom scores, depression was operationalized as a total PHQ-9 score of 11 or greater, which roughly corresponds to moderate or severe depression.

*Cannabis Use*

We operationalized cannabis use as a four-level ordinal variable, representing never users, individuals who currently used or formerly used cannabis at a frequency of monthly or less, those who used cannabis more than monthly but less than 25 times per month, and daily users (> 25 times per month). These cutoffs were chosen to facilitate compatibility between different survey waves, as former cannabis users were only asked to select from different categories of frequency rather than reporting an exact number of days of use.

*Smoking Status*

Respondents who had smoked fewer than 100 cigarettes in their lifetime were categorized as never smokers. Those who had smoked at least 100 cigarettes in their lifetime were asked whether they now smoked cigarettes; those who responded “not at all” were considered former smokers and all others were considered current smokers.

*Binge Drinking*

Binge drinking was operationalized as ever drinking four or more (for females) or five or more (for males) alcoholic beverages in a single day at any time in the year prior to interview. Because we were primarily interested in contrasting binge drinking with lower-risk alcohol use, we excluded individuals who reported drinking fewer than 12 drinks in their lifetime from analyses where binge drinking was the primary outcome. Due to the structure of the NHANES questionnaire, it was not possible to assess other categorizations of alcohol use (e.g. females were only asked if they had consumed four- but not five- or more drinks in one day, and the lowest amount of alcohol consumption possible to classify never-drinkers was fewer than 12 drinks lifetime).

*Covariates*

In addition to self-reported weight and height, participants had weight and height measured by NHANES staff at mobile clinics. We calculated body mass index (BMI) using the latter measurements as weight in kilograms divided by height in meters squared, and categorized BMI as underweight (BMI < 18.5), normal weight (18.5 - < 25), overweight (25 - < 30), obesity class I (30 - < 35), obesity class II (35 - < 40), and obesity class III (40 +). Due to sample size considerations, we operationalized race/ethnicity as Hispanic, non-Hispanic white, non-Hispanic Black, and other. We categorized educational attainment as less than high school degree, high school degree, and some college or more, age into approximate 10-year spans: 18 – 29, 30 – 39, 40 – 49, 50 – 59, and 60 years or higher, and sex as male or female.

*Statistical Analyses*

We computed prevalence estimates for BMI category, sex, race/ethnicity, educational attainment, and age category, as well as primary exposures (desired weight, weight consideration, and weight behavior), and outcomes (current depression, cannabis use frequency, smoking status, and lifetime binge drinking). We then computed odds ratios (for binary and ordinal outcomes; i.e. depression, cannabis use frequency, and binge drinking) or relative risk ratios (for categorical outcomes; i.e. smoking status) and corresponding 95% confidence intervals to assess the strength of association between each exposure/outcome pair using binary logistic, ordinal logistic, and multinomial logistic regressions. Model 1 was unadjusted, while Model 2 was adjusted for age category, sex, race, and education. For models predicting depression, Model 3 was further adjusted for BMI category whereas for all other outcomes, Model 3 was further adjusted for both BMI category and current depression. All analyses were weighted for survey design using a Taylor series linearization to compute variance.

**Results**

*Descriptive Statistics*

The final analytic sample size was 22,764. Most participants in the sample were non-Hispanic White (65.8%) and had weights in the overweight (32.5%) or obese (25.6%) range. Similarly, the most frequently endorsed category of weight perception was overweight (56.1%), with most participants wanting to weigh less (66.4%) and either trying to lose weight (36.7%), doing nothing about their weight (34.1%), or having lost weight successfully in the past year (15.7%). In terms of health behaviors, the majority of participants were never smokers and only 7.4% reported PHQ-9 scores greater than the cut off for clinical depression, but more than half endorsed lifetime binge drinking or cannabis use (Table 1).

*Depression*

In unadjusted models, all levels of desired weight, weight consideration, and weight action were significantly associated with depression. The strongest predictors of depression were self-perception of underweight, compared to self-perception of “about right” (OR = 2.57, 95% CI = 1.99 – 3.30), and having lost weight unintentionally (OR = 3.08, 95% CI = 2.43 – 3.91) or trying not to gain weight (OR = 0.49, 95% CI = 0.34 – 0.72) compared to not doing anything about weight (Table 2). With the exception of the coefficient for wanting to weigh less, adjustment for sociodemographic characteristics and measured bodyweight category did not substantially change the magnitude of associations. Overall, wanting to weigh more, perceiving oneself as underweight or as overweight, and having lost weight intentionally or unintentionally were positively associated with depression whereas trying to not gain weight was inversely associated with depression (Table 2).

*Smoking Status*

In the multinomial logistic models predicting smoking status from weight perception, both wanting to weigh less and wanting to weigh more were associated with greater odds of being a former smoker compared to a never smoker. While wanting to weigh more was also positively associated with being a current smoker compared to a never smoker, wanting to weigh less was inversely associated with current smoking (Table 3). Both former and current smoking were positively predicted by considering oneself overweight or underweight although the association between overweight perception and current smoking was nonsignificant and weaker than that for former smoking (RRR = 1.09, 95% CI = 0.90 – 1.13). Compared to individuals who were doing nothing about their weight, those who lost weight unintentionally had a higher relative risk of being a former or current smoker compared to being a never smoker. Those who were trying to lose weight had a higher relative risk of former smoking and lower relative risk of current smoking, ang those who were trying to not gain weight had a lower relative risk of current smoking only (Table 3).

*Cannabis Use*

Table 4 depicts estimated associations between weight perception and weight behavior and cannabis use. As in unadjusted models predicting depression, wanting to weigh more, considering oneself as underweight, and having lost weight unintentionally were the strongest positive predictors of cannabis use. Having tried to lose weight unsuccessfully was inversely associated with cannabis use in both unadjusted models, but was no longer associated after adjustment for sociodemographic characteristics and depression. Both having lost weight intentionally and unintentionally were positively associated with cannabis use category after full adjustment for confounders (Table 4).

*Binge Drinking*

Associations between weight perception variables and binge drinking were more sensitive to adjustment (Table 5). Prior to adjustment for confounders, wanting to weigh more was significantly positively associated with past year binge drinking while having lost weight or attempting to lose weight were inversely associated. In adjusted models, wanting to weigh more and having tried to lose weight were no longer significantly associated with odds of lifetime binge drinking while wanting to weigh less (OR = 1.68, 95% CI = 1.38 – 2.05), self-perception of overweight (OR = 1.50, 95% CI = 1.26 – 1.79), and intentional weight loss (OR = 0.75, 95% CI = 0.58 – 0.99) were.

**Discussion**

Overall, what individuals would like to weigh and how they considered their weight were the most robust predictors across all outcomes of interest. Conceptually similar levels of weight perception, desired weight, and weight action (such as wanting to weigh more, perceiving oneself as underweight, and having lost weight unintentionally) generally showed parallel patterns of association across outcomes. Binge drinking and current smoking showed a few exceptions to this, with binge drinking being positively predicted by wanting to weight less and self-perception of overweight but negatively predicted by intentional weight loss and current smoking being inversely associated with the desire to weigh less and positively (but not significantly) associated with considering oneself overweight. It is also notable that, aside from trying not to gain weight, all levels of weight perception and weight action were associated with higher odds of at least one harmful outcome.

These results suggest that both underweight and overweight perception may be harmful, albeit for different outcomes. The majority of body dissatisfaction literature has focused on weight overperception and desire for weight loss as predictors of risky behaviors and adverse outcomes, including depression and suicidality (REFs), cigarette smoking and initiation (REFs), and drug or alcohol use (REF). Although there is recognition that body dissatisfaction can take many forms, the predominant focus of previous literature, particularly in the eating disorders field, has been on weight overperception and desire for weight loss. For instance \_\_\_\_. Better understanding of the ways in which perceptions and desires concerning weight do or do not differ from those concerning other aspects of appearance is still needed to elucidate the mechanisms by which self-perception may impact behavioral outcomes.

(Paragraph here about the inverse associations for the non-successful or non-weight loss dieting behaviors actually being protective against these other outcomes. Talk about emphasis in public health ab

The consistent inverse associations observed between trying (unsuccessfully) to lose weight, trying to not gain weight, and not actively attempting to change weight and depression or smoking are also notable. For decades, As body positive movements such as ‘Health at Every Size’

The major strengths of our study include the large sample size and use of a representative population, the reliance on measured BMI rather than self-report in adjusting for confounders, and the incorporation of multiple measures of bodyweight perception in analyses. Even so, our results should be interpreted given several limitations. First, this study was based on cross-sectional data, so we cannot establish the temporal orders of associations between body dissatisfaction and health behaviors. In several instances, it is plausible that outcomes preceded weight behaviors and perceptions, such as depression or cannabis use and unintentional weight loss. Weight loss itself is a symptom of depression (REF) while cannabis use has been shown to reduce weight in observational studies (Alshaarawy & Anthony, 2019; Le Strat & Le Foll, 2011) and randomized trials (REF), so reverse causality is likely. Given that NHANES does not ask respondents about attempts to gain weight, we were also unable to investigate associations between attempted weight gain and health outcomes. Similarly, the weight action category of “doing nothing” subsumed both individuals not actively trying to change their weight and those who were trying to gain weight, which may have reduced the precision of our estimates if there was uncaptured heterogeneity in the weight action reference group. Finally, while expressed desire for weight loss/gain and weight manipulation practices are conceptually related to body dissatisfaction (Fallon et al., 2014; Kruger et al., 2004), individuals may be dissatisfied with their bodies without necessarily wanting to change weight or vice versa. Depending on the degree of misclassification, observed associations between our proxy measures and outcomes, versus weight dissatisfaction and outcomes, may be biased in either direction. Future studies directly contrasting the predictive validity of weight perception versus body dissatisfaction in relation to health behaviors may better elucidate if there are meaningful differences in the two constructs with respect to other behavioral endpoints.

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**Table 1.** Sample characteristics of 22,764 participants from 2005 – 2013 NHANES participants. All numbers indicated survey-weighted percentages.

|  |  |
| --- | --- |
| BMI Category |  |
| Underweight | 1.8 |
| Normal | 30.2 |
| Overweight | 32.5 |
| Obese (Class I) | 19.9 |
| Obese (Class II) | 9.0 |
| Obese (Class III) | 6.7 |
| Male | 49.1 |
| Race/Ethnicity |  |
| White | 65.8 |
| Black | 12.0 |
| Hispanic | 14.8 |
| Other | 7.4 |
| Education |  |
| High School Degree or Less | 16.5 |
| Some College | 22.3 |
| College Degree or Higher | 61.2 |
| Age Category |  |
| 18 - 29 | 23.4 |
| 30 - 39 | 20.7 |
| 40 - 49 | 22.7 |
| 50 - 59 | 21.1 |
| 60 or more | 12.2 |
| Current Depression | 7.4 |
| Smoking |  |
| Never | 55.6 |
| Former | 21.2 |
| Current | 23.3 |
| Ever Binge Drank | 64.6 |
| Ever Used Cannabis | 59.7 |
| Weight Consideration |  |
| About Right | 39.3 |
| Overweight | 56.1 |
| Underweight | 4.6 |
| Desired Weight |  |
| Same | 26.6 |
| Less | 66.4 |
| More | 7.0 |
| Weight Action |  |
| Lost Weight Intentionally | 15.7 |
| Lost Weight Unintentionally | 5.0 |
| Tried to Lose Weight | 36.7 |
| Tried to Not Gain Weight | 8.5 |
| Not Doing Anything | 34.1 |

**Table 2.** Associations between weight perception or weight control behavior and current depressive symptoms (PHQ9 score ≥ 11) in 2005 – 2013 NHANES participants. Odds ratios (ORs) and 95% confidence intervals (CIs) are estimated using binary logistic regression weighted for survey design and sampling procedure.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Model 1 | Model 2 | Model 3 |
|  | OR (95% CI) | OR (95% CI) | OR (95% CI) |
| Like to Weigh |  |  |  |
| Same | REF | REF | REF |
| Less | **1.33 (1.21 - 1.71)** | **1.33 (1.11 - 1.60)** | 0.99 (0.79 - 1.24) |
| More | **1.90 (1.46 - 2.47)** | **2.06 (1.58 - 2.69)** | **2.36 (1.82 - 3.07)** |
| Consider Weight |  |  |  |
| About Right | REF | REF | REF |
| Overweight | **1.80 (1.56 - 2.08)** | **1.66 (1.43 - 1.93)** | **1.38 (1.15 - 1.66)** |
| Underweight | **2.57 (1.99 - 3.30)** | **2.54 (1.94 - 3.32)** | **2.75 (2.08 - 3.65)** |
| Doing About Weight |  |  |  |
| Did Nothing | REF | REF | REF |
| Lost Intentionally | **1.48 (1.24 - 1.75)** | **1.51 (1.26 - 1.81)** | **1.34 (1.13 - 1.58)** |
| Lost Unintentionally | **3.08 (2.43 - 3.91)** | **2.86 (2.26 - 3.62)** | **2.93 (2.29 - 3.73)** |
| Tried to Lose | 1.15 (0.97 - 1.35) | 1.15 (0.97 - 1.37) | 1.02 (0.87 - 1.21) |
| Tried to Not Gain | **0.49 (0.34 - 0.72)** | **0.57 (0.39 - 0.83)** | **0.57 (0.39 - 0.83)** |

*Note:* Boldface denotes statistical significance. Model 1 represents unadjusted associations. Model 2 is adjusted for age category, race, sex, and education. Model 3 includes all covariates in Model 2 plus BMI category.

**Table 3.**  Associations between weight perception or weight control behavior and smoking status in 2005 – 2013 NHANES participants. Odds ratios (ORs) and 95% confidence intervals (CIs) are estimated by multinomial logistic regression weighted for survey design and sampling procedure.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Model 1 | Model 2 | Model 3 |
|  | RRR (95% CI) | RRR (95% CI) | RRR (95% CI) |
| **Former Smoker** |  |  |  |
| Like to Weigh |  |  |  |
| Same | REF | REF | REF |
| Less | **1.35 (1.20 - 1.52)** | **1.33 (1.17 - 1.51)** | **1.28 (1.10 - 1.50)** |
| More | 1.12 (0.91 - 1.38) | **1.31 (1.05 - 1.64)** | **1.36 (1.09 - 1.69)** |
| Consider Weight |  |  |  |
| About Right | REF | REF | REF |
| Overweight | **1.41 (1.27 - 1.57)** | **1.31 (1.18 - 1.45)** | **1.31 (1.15 - 1.50)** |
| Underweight | **1.32 (1.02 - 1.70)** | **1.35 (1.03 - 1.79)** | **1.41 (1.06 - 1.88)** |
| Doing About Weight |  |  |  |
| Did Nothing | REF | REF | REF |
| Lost Intentionally | 1.12 (0.97 - 1.30) | **1.19 (1.01 - 1.40)** | 1.16 (0.97 - 1.37) |
| Lost Unintentionally | 1.26 (1.00 - 1.59) | **1.28 (1.02 - 1.62)** | **1.26 (1.01 - 1.61)** |
| Tried to Lose | 1.06 (0.93 - 1.20) | **1.17 (1.03 - 1.33)** | **1.14 (1.00 - 1.30)** |
| Tried to Not Gain | 0.93 (0.77 - 1.12) | 0.91 (0.76 - 1.10) | 0.91 (0.75 - 1.09) |
| **Current Smoker** |  |  |  |
| Like to Weigh |  |  |  |
| Same | REF | REF | REF |
| Less | **0.72 (0.65 - 0.79)** | **0.77 (0.69 - 0.86)** | **0.84 (0.74 - 0.96)** |
| More | **2.12 (1.84 - 2.43)** | **2.01 (1.74 - 2.32)** | **1.80 (1.56 - 2.07)** |
| Consider Weight |  |  |  |
| About Right | REF | REF | REF |
| Overweight | **0.82 (0.75 - 0.89)** | **0.85 (0.78 - 0.93)** | 1.09 (0.90 - 1.13) |
| Underweight | **2.49 (2.10 - 2.95)** | **2.27 (1.89 - 2.72)** | **1.94 (1.59 - 2.37)** |
| Doing About Weight |  |  |  |
| Did Nothing | REF | REF | REF |
| Lost Intentionally | **0.69 (0.60 - 0.78)** | **0.81 (0.71 - 0.92)** | 0.89 (0.77 - 1.03) |
| Lost Unintentionally | **1.83 (1.51 - 2.22)** | **1.86 (1.53 - 2.28)** | **1.70 (1.39 - 2.09)** |
| Tried to Lose | **0.44 (0.40 - 0.49)** | **0.54 (0.49 - 0.60)** | **0.59 (0.53 - 0.67)** |
| Tried to Not Gain | **0.46 (0.38 - 0.55)** | **0.55 (0.46 - 0.65)** | **0.57 (0.48 - 0.69)** |

*Note:* Boldface denotes statistical significance. Model 1 represents unadjusted associations. Model 2 is adjusted for age category, race, sex, and education. Model 3 includes all covariates in Model 2 plus BMI category and current depression (PHQ9 score ≥ 11).

**Table 4.** Associations between weight perception or weight control behavior and cannabis use category (never or not currently using, monthly, weekly, daily) in 2005 – 2013 NHANES participants. Odds ratios (ORs) and 95% confidence intervals (CIs) are estimated by ordinal logistic regression weighted for survey design and sampling procedure.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Model 1: OR (95% CI) | Model 2: OR (95% CI) | Model 3: OR (95% CI) |
| Like to Weigh |  |  |  |
| Same | REF | REF | REF |
| Less | **0.75 (0.65 - 0.86)** | **0.85 (0.73 - 0.98)** | 0.90 (0.75 - 1.09) |
| More | **2.07 (1.73 - 2.47)** | **1.69 (1.41 - 2.01)** | **1.67 (1.41 - 1.97)** |
| Consider Weight |  |  |  |
| About Right | REF | REF | REF |
| Too Big | **0.75 (0.67 - 0.85)** | **0.89 (0.79 - 0.99)** | 0.99 (0.86 - 1.15) |
| Too Thin | **2.01 (1.62 - 2.50)** | **1.82 (1.47 - 2.25)** | **1.82 (1.46 - 2.27)** |
| Doing About Weight |  |  |  |
| Did Nothing | REF | REF | REF |
| Lost Intentionally | 1.02 (0.86 - 1.21) | 1.13 (0.95 - 1.34) | **1.21 (1.01 - 1.46)** |
| Lost Unintentionally | **1.93 (1.55 - 2.38)** | **2.03 (1.63 - 2.52)** | **1.89 (1.51 - 2.35)** |
| Tried to Lose | **0.70 (0.61 - 0.80)** | **0.85 (0.74 - 0.99)** | 0.93 (0.80 - 1.09) |
| Tried to Not Gain | 0.88 (0.71 - 1.10) | 0.94 (0.77 - 1.17) | 0.97 (0.78 - 1.21) |

*Note:* Boldface denotes statistical significance. Model 1 represents unadjusted associations. Model 2 is adjusted for age category, race, sex, and education. Model 3 includes all covariates in Model 2 plus BMI category and current depression (PHQ9 score ≥ 11).

**Table 5.** Associations between weight perception or weight control behavior and past year binge drinking in 2005 – 2013 NHANES participants. Odds ratios (ORs) and 95% confidence intervals (CIs) are estimated with binary logistic regression weighted for survey design and sampling procedure.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Model 1: OR (95% CI) | Model 2: OR (95% CI) | Model 3: OR (95% CI) |
| Like to Weigh |  |  |  |
| Same | REF | REF | REF |
| Less | 1.02 (0.88 - 1.17) | **1.28 (1.08 - 1.51)** | **1.68 (1.38 - 2.05)** |
| More | **1.35 (1.06 - 1.73)** | 1.26 (0.93 - 1.71) | 1.22 (0.89 - 1.67) |
| Consider Weight |  |  |  |
| About Right | REF | REF | REF |
| Too Big | 0.92 (0.81 - 1.05) | 1.08 (0.93 - 1.25) | **1.50 (1.26 - 1.79)** |
| Too Thin | 0.90 (0.66 - 1.22) | 0.84 (0.59 - 1.21) | 0.81 (0.56 - 1.18) |
| Doing About Weight |  |  |  |
| Did Nothing | REF | REF | REF |
| Lost Intentionally | **0.68 (0.54 - 0.85)** | **0.72 (0.55 - 0.94)** | **0.75 (0.58 - 0.99)** |
| Lost Unintentionally | 0.86 (0.65 - 1.14) | 1.15 (0.84 - 1.61) | 1.09 (0.78 - 1.53) |
| Tried to Lose | **0.66 (0.53 - 0.81)** | 0.89 (0.70 - 1.13) | 0.94 (0.74 - 1.20) |
| Tried to Not Gain | 1.25 (0.88 - 1.77) | 1.14 (0.76 - 1.69) | 1.12 (0.75 - 1.69) |

*Note:* Boldface denotes statistical significance. Model 1 represents unadjusted associations. Model 2 is adjusted for age category, race, sex, and education. Model 3 includes all covariates in Model 2 plus BMI category and current depression (PHQ9 score ≥ 11).