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The association between obesity, depression, and educational attainment in women: The mediating role of body image dissatisfaction

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Abstract

Objective—We examine the mediating role of body image dissatisfaction (BID) on the association between obesity and depression and the variation of this association as a function of years of education among a population-based sample of women aged 40–65 years.

Methods—A series of sample-weighted logistic regression models were used to estimate the associations between obesity, BID, and depression, stratified by educational attainment. Data were obtained from a structured telephone interview of 4543 female health plan enrollees, including self-reported height and weight, the Patient Health Questionnaire assessment of depression, and a single-item measure of BID.

Results—Among those with <16 years of education, in both the unadjusted and adjusted models, obesity and BID were significantly associated with depression. Similarly, among those with ≥16 years of education, obesity and BID were significantly associated with depression in the unadjusted models. However, in the adjusted model, only BID was associated with depression. A formal test for mediation suggests that the association between obesity and depression was mediated by BID regardless of level of education.

Conclusions—Our data suggest that BID-mediated the obesity-depression association. In addition, obesity and BID may be salient risk factors for depression among middle-aged women as a function of the level of education.

Keywords

Body dissatisfaction; Depression; Educational attainment; Obesity; Women

Introduction

Obesity is a major public health concern in the United States with its overall prevalence in the adult population increasing over the past decade [1]. While obesity is a serious health issue by itself, it is also associated with other health problems including psychiatric illnesses. The literature on the association between obesity and depression has been inconsistent with some, but not all [2,3], studies suggesting a positive association [4–14]. According to Friedman and Brownell [15], an explanation for the mixed findings may be

that obese individuals do not constitute a homogenous population with a consistent association to depression. They suggest that, in order to improve our understanding of depression among obese individuals, it is important to identify who among the obese population is likely to experience depression and ultimately, to identify the mechanisms that link obesity and depression. In light of the Friedman and Brownell publication, a number of studies have identified potential risk factors for comorbid obesity and depression, including severe obesity [7,13] female gender [8,10,12,14], and high socioeconomic status (SES) [10,16–18].

Despite our growing knowledge of the potential moderators that may place subgroups within the obese population at increased risk for depression, our understanding is limited regarding the potential mediators that may link the causal effect of obesity on depression [19,20].

In their theoretical review of the obesity–depression association, Markowitz et al. [19] suggested three potential mechanisms, including (1) behavioral (e.g., functional impairment and repeated dieting), (2) cognitive [e.g., body image dissatisfaction (BID), poor self-rated health], and (3) social (e.g., weight-based stigma) mechanisms that may mediate the association between obesity and depression. From these potential causal mechanisms, the authors proposed two pathways to explain the increased comorbidity observed in obese individuals. In the present study, we examined one potential mechanism, “appearance concern,” which suggests that women and especially those of high SES may experience depression through a pathway involving BID [5,19].

It has been posited that obesity may increase the risk of depression through a pathway involving BID [5,19]. However, the relationship between body size and BID varies. Previous studies have found a positive relationship between body mass index (BMI) and BID among obese individuals compared to the non-obese [21–23]. Yet, BID has been found to increase as the severity of obesity increased [24]. Moreover, BID among women has been linked to adverse psychological outcomes including depression [5,25–27]. Empirical evidence exists that provides initial support for the BID pathway. Body image dissatisfaction was found to be related to depressive symptoms, self-esteem, and degree of obesity among a treatment-seeking sample of 110 men and women. The findings also suggest that BID partially mediated the association between BMI and depressive symptoms and self-esteem [28]. Although this study suggests that BID is a mediator of the association between obesity and depression, aspects of the study design (e.g., treatment-seeking sample) limit the generalizability of the findings.

Another area in the obesity–depression literature that is poorly understood involves the role of SES. A small number of studies have examined the obesity–depression association in association to SES. In sum, the findings from these studies are unclear regarding the direction of the association between obesity, depression, and SES. While the greater prevalence of obese individuals among those reporting low SES [29–31] has led some researchers to suggest that low SES may increase the risk of depression among the obese population [32,33] a past study suggests that higher SES may instead increase the risk of lifetime mood disorders among obese individuals [10]. Despite these inconsistent findings, potential explanations for the socioeconomic variation in the obesity–depression association are lacking. One proposed pathway that warrants examination is whether BID plays a role in the socioeconomic variation of the obesity–depression association. Research has demonstrated that higher SES individuals, particularly women, are more dissatisfied with their bodies than lower-SES individuals [34,35]. Some posit that this is due to the role of thinness as an indicator for social status, which makes it more likely to be socially valued by individuals in higher socioeconomic strata [34]. Given the association between BID and

obesity, it may be plausible that among those who are obese, experiencing BID may increase the risk of depression among high SES individuals.

In the present study, we seek to contribute to the study of obesity and depression by investigating the following research questions: (1) is there an association between obesity and depression among a population-based sample of middle-aged women? and (2) is BID a mediator of the obesity-depression association and does this association vary as a function of years of education?

Methods

Sampling design

This was a population-based, prospective cohort study conducted among middle-aged women enrolled in Group Health Cooperative, a group-model prepaid health plan serving approximately 500,000 members in Washington and northern Idaho. Group Health members are representative of the underlying demographic characteristics of the area [36]. The cohort was originally assembled to examine risk factors for breast cancer among female group members. The Group Health Breast Cancer Screening Program invites all female members aged 40 and older to fill out periodic questionnaires regarding breast cancer risk factors, including self-reported height and weight. Approximately 85% participated in these periodic screenings [37]. In order to increase the efficiency of the survey, computerized medical records were used to over-sample women with a recorded BMI ≥ 30 during the last 5 years. Study participants were recruited from eight group health primary care clinics selected for higher rates of racial-ethnic minority enrollment.

Procedures

Originally, 8000 potential participants were mailed an invitation letter that included detailed information regarding informed consent, a gift card incentive for participation, and a phone number to call in order to decline participation. However, 442 of them were found to be ineligible (had since died, moved away, or disenrolled from the health plan). Of the remaining 7558 eligible participants, 865 could not be reached via telephone and 2033 declined to participate, resulting in 4660 women (62% of those eligible) who completed the telephone survey. Those who did not decline to participate were contacted by trained interviewers who conducted telephone interviews to screen respondents for participation in a weight loss and depression treatment study conducted by the same research team. Each interviewer received at least 8 h of general interview training and 4 h of project-specific training. Contact protocols required a minimum of nine contact attempts, including attempts during evening and weekend times. Surveys were conducted between November 2003 and February 2005. Written informed consent was obtained for all participants and study procedures and protocols were approved by Group Health Institutional Review Board. In the present study, the final sample included 4543 participants with 117 women excluded due to missing data on one or more key variables.

Depression

The outcome of interest in the present study was depression assessed by the nine-item Patient Health Questionnaire (PHQ) [38]. The PHQ is a self-report measure of depression symptoms based on *DSM-IV* criteria for diagnosis of major depressive disorders [39]. Previous validation studies in a representative community sample [40] and medical and outpatient sample [38,41] demonstrate strong agreement between the PHQ and a clinical structured interview. A dimensional score was obtained as the total of all nine items (range=0–27). A score of 10 or more on the scale represents a moderate level of depressive symptoms [41].

Obesity

Obesity was determined from self-reports of height and weight. In the present study, respondents were classified as either obese (BMI ≥ 30) or normal-weight/overweight (BMI 18.5–29.9) [6]. Individuals with BMI less than 18.5 ($N=15$) were excluded from the analyses since research has shown a u-shaped association between BMI and the prevalence of mood disorders [14].

Body image dissatisfaction

A BID score was generated for each respondent based on a single item (“I feel satisfied with the shape of my body”)[5,42,43]. Responses ranged from 0 (always) to 5 (never). In the present study, BID was treated as a continuous score with high scores reflecting a higher degree of BID.

Demographic measures

Potential covariates included race, age, marital status, educational attainment, and smoking status and were selected based on previous studies [10,14,44]. In the present study, age (measured in years) was assessed as a continuous variable based on the date of the interview and self-reported date of birth. Marital status was analyzed as a dichotomous variable (married/cohabiting versus not married). Educational attainment (measured in years) was treated as a dichotomized variable based on self-reported number of years of education (≥ 16 versus <16 years) [10,45]. Educational attainment was selected as a measure of SES because it may indicate the extent to which individuals from higher economic strata are attuned to and accepting of cultural and social norms of physical beauty as well as health messages regarding diet and exercise. A recent study provided support for the role of educational attainment as a better measure of SES as it has greater relevance for women’s weight and height [46]. Finally, smoking status was dichotomized: current smoker versus non-smoker.

Analysis

All analyses used STATA software (version 10). We accounted for the complex survey design using the Taylor series linearization method of variable estimation [47]. The STATA survey LOGISTIC command incorporates weights reflecting stratified sampling procedures and differential response rates across sampling strata. Weighted cross-tabulations were used to describe characteristics of the Group Health data. We conducted bivariate tests of association between our predictors and depression using Wald chi-square tests for categorical variables and t-tests for continuous variables. Because prior studies have shown educational differences in the association between obesity and depression [10], all models were stratified a priori by level of educational attainment (<16 versus ≥ 16 years). Logistic regression models were first specified to examine the main effects of obesity and BID score unadjusted, adjusted for each other, and then adjusted for sociodemographic covariates.

To test whether the association between obesity and depression was mediated by BID scores, a series of linear regression models was specified based on procedures outlined by Baron and Kenny [48]. The first equation regressed the mediator (BID) on the independent variable (depression). The second equation regressed the dependent variable (obesity) on the independent variable (depression). The third equation regressed the dependent variable (obesity) on both the independent (depression) and mediator variable (BID). According to Baron and Kenny [48], the following criteria must be met to establish mediation: (1) the independent variable (obesity) must be significantly related to the mediator (BID); (2) the independent variable (obesity) must be significantly related to the dependent variable (depression); (3) the mediator (BID) must be significantly related to the dependent variable (depression); and (4) the association between the independent and dependent variables must

be attenuated when the mediator is included in the regression model. In addition to this informal procedure, we performed a formal test of mediation using steps outlined by Sobel [49]. First, we estimated the attenuation or indirect effect. The indirect effect is the effect of the independent variable on the mediator from the first regression model multiplied by the effect of the mediator on the dependent variable obtained from the third regression model. Second, we divided the indirect effect by its standard error and performed a Z test of the null hypothesis that the indirect effect is equal to zero. All significance tests were evaluated at the .05 level.

Results

Sample characteristics

Table 1 shows the sociodemographic characteristics of the sample and the prevalence of depression and obesity stratified by level of education. Overall, the weighted prevalence of obesity was 33.9% and 12.8% of the sample had a PHQ score ≥ 10 , suggesting current depression. The sample weight mean BID score was 3.47, the majority of respondents were white (84.8%), mean age was 52.3 years, 65.8% were married, and 58.1% reported ≥ 16 years of education.

When we examined whether respondents with <16 years of education differed from those with ≥ 16 years, there were significant differences. Those who reported <16 years of education had a significantly higher mean BMI, were more likely to be obese, were more likely to experience depression, and have a higher mean BID score compared to those with ≥ 16 years of education.

Table 2 shows obesity rates, BID scores, sociodemographic characteristics, and tobacco use for respondents with PHQ scores <10 compared to those with PHQ scores ≥ 10 . Women with depression were significantly more likely to be obese, have a higher mean BID score, and have <16 years of education compared to those without depression.

Informal procedure testing for mediation effects of body image dissatisfaction

Table 3 presents results from models examining the association between obesity and depression stratified by level of education. The top portion of Table 3 presents logistic regression models examining the obesity-depression association among those with <16 years of education. We found obesity and BID were independently associated with depression. In order to examine whether differences in depression could be accounted for by BID, we examined the association between obesity and depression including BID (Model 3). We found BID was positively and significantly associated with depression. In addition, although obesity was still significantly associated with depression, the odds ratio was attenuated from Model 1–1.81 (95% CI: 1.15–2.86). We ran parallel models testing mediation of the obesity-depression association by BID controlling for sociodemographic characteristics. Results remained substantively similar. Among those with <16 years of education, despite the inclusion of BID in the model, obesity remained a significant predictor of depression.

The lower portion of Table 3 presents a series of models examining the obesity-depression association for those with ≥ 16 years of education. Similar to the previous results, those who were obese or reported BID were at increased risk for depression. In order to examine whether differences in depression could be accounted for by BID, we examined the association between obesity and depression including BID (Model 3). We found that BID was positively and significantly associated with depression. However, with the inclusion of BID in the model, obesity was no longer significantly associated with depression. In the final model (Model 4), adjusted for potential covariates, results were similar to those in the

unadjusted models. Among those with ≥ 16 years of education, adjusting for BID in the model, obesity was no longer a significant predictor of depression.

Formal procedure testing for mediation effects of body image dissatisfaction

Results for testing the mediational role of BID among women with <16 years of education (see Fig. 1) indicated that in the first regression equation, obesity was positively associated with BID ($\beta=1.38, P<.001$). In the second equation, obesity was positively associated with depression ($\beta=2.17, P<.001$). In the third equation, obesity and BID were simultaneously included in the model, with both obesity ($\beta=1.15, P<.001$) and BID ($\beta=.58, P<.05$) being positively and significantly associated with depression. This suggests that the effect of obesity on depression was partially mediated by BID. The Sobel test ($z=11.19, P<.001$) indicated that the percentage of total effect mediated by BID was 73.3%. Results for testing the mediational role of BID among women with ≥ 16 years of education indicated that BID partially mediated the obesity–depression association. Specifically, obesity was positively associated with BID ($\beta=1.42, P<.001$). In the second equation, obesity was positively associated with depression ($\beta=1.65, P<.001$). In the third equation, only BID ($\beta=1.02, P<.001$) was positively associated with depression. Using Sobel's test of mediation, there was statistically significant evidence that the total effect mediated by BID was 88.7%, suggesting that BID partially mediated the association between obesity and depression (Sobel test: $z=14.23, P<.001$).

Discussion

In the present study, we examined two research questions: (1) is there an association between obesity and depression among a population-based sample of middle-aged women? and (2) is BID a mediator of the obesity-depression association and does this association vary as a function of years of education?

Regarding the first research question, in analyses stratified by educational attainment, our results revealed that obesity was positively and significantly associated with depression among women who reported <16 years of education. At higher levels of education, there was a positive but nonsignificant association between obesity and depression. Our findings are consistent with previous studies which suggest a positive association between obesity and depression among women [4–14]. However, our findings add to the literature and suggest that in this sample, obesity is a significant risk factor for depression only among women with lower levels of education after accounting for BID.

This finding is consistent with the notion of social patterning of disease [50]. A number of studies have found low SES persistently associated with obesity. Data from US population-based studies have revealed that lower educational levels were associated with higher prevalence of obesity [44,51]. A recent longitudinal study showed that weight gain over adulthood was more rapid for economically disadvantaged groups suggesting that socioeconomic inequalities in obesity become more pronounced over the adult life course [52]. Although it was evident that BMIs among economically advantaged groups had also increased over time, the linear increase in BMI trajectories among this group was largely a function of historical changes in social, environmental and cultural conditions that influence caloric balance [52–56]. From this perspective, low SES is a fundamental cause of obesity [50,57]. This implies that individuals who possess limited resources (e.g., knowledge, money, power, prestige, beneficial social connections) have fewer opportunities to engage in activities related to the reduced prevalence of obesity. For example, individuals who lived in neighborhoods with limited healthy food choices reported a higher prevalence of obesity [58–60]. Similarly, those who resided in communities with limited, or the lack of environmental factors that are conducive to physical activity had higher BMIs [61].

Consequently, availability of healthy food choices in local food environments and opportunities for physical activity is ‘socially patterned’ [62–64]. Based on this argument, low SES may confer risk on obesity resulting in depression as a function of comorbid physical health conditions. There is strong evidence relating determinants of obesity (e.g., dietary factors and physical activity levels) to many disorders that are associated with high mortality and morbidity, including diabetes, coronary heart disease, certain malignancies, hypertension, osteoarthritis, stroke, and gallbladder disease [65,66]. To address the “social patterning” in the obesity–depression association, prevention strategies should be designed from a “fundamental cause” multilevel perspective. At the micro level, marketing strategies regarding health-promotion behaviors should be targeted towards low SES groups. At the macro level, in addition to income redistribution policies, interventions to reduce socioeconomic disparities in obesity must include proactive urban planning policies that reduce barriers related to supermarket access, places to exercise, safety, living wage employment opportunities, and public transportation.

Although, the “social patterning” of the obesity–depression association is highlighted as a potential explanation, a direction for the causal relationship has not been established. Our analysis reflects the cross-sectional association between obesity and depression and precludes us from examining this causal pathway of the possibility that unmeasured confounders induced the association. Longitudinal data analysis has shown that social causation, rather than social selection, in part, explains why obese individuals may be at increased risk for depression. However, additional longitudinal studies are needed because of the diversity in results from cross-sectional studies [45].

With regard to our second research question, we found evidence in support of BID as a mediator of the obesity–depression association, and the degree to which BID significantly mediated the obesity–depression association varied according to level of education. This finding is consistent with a previous study that found body image evaluation partially mediated the association between body weight and depression in a treatment-seeking sample of obese individuals [28]. In addition, this finding is in contrast to a previous report that found the association between obesity and *DSM-IV* lifetime mood disorder appeared stronger in respondents with higher educational attainment [10]. Although findings from this study suggest that higher SES may confer risk for depression among the obese population, this study did not assess BID in the examination of the obesity–depression association. This may be relevant because BID has been associated with both obesity and depression [5,27]. Specifically, high-SES women report more dissatisfaction or concern with their bodies than low-SES women [34,35,67]. One potential explanation involves the prevailing societal acceptance of a ‘thin’ body as the ideal physical body type. In a recent review article examining the association between SES and obesity, McLaren [68] reported that among women from highly developed countries, negative evaluations of higher body weight were especially common among those in higher SES groups. Based on the work of Bordieu and his relational model of class [69,70] as interpreted by others [71], she posited that the negative perception of excess body weight may be a prevalent attitude among higher socioeconomic groups because the social status ascribed to the physical body (inclusive of appearance, style, and behavioral affinities) is a social metaphor for an individual’s status [68]. From this perspective, a “thin” body may be socially valued to a greater extent for those women in higher socioeconomic strata. Some posit that high SES women in highly developed countries are more likely to value a “thin” body, to engage in behaviors related to a healthy diet and physical exercise, and to have the resources to pursue these behaviors [46]. In turn, these values could help maintain class differences for women for whom thinness continues to be accepted as an ideal beauty standard [68].

Another potential explanation for our findings includes stigma. Based on research developments in the field of stigma research, it has been suggested that individuals characterized by excessive weight face anti-fat bias. As such, bias associated with excessive weight may result in stigma and discrimination [22,72–74]. Some posit that weight bias begets stigma because, in the case of obesity, individuals are thought to be responsible for their condition [25]. In addition, being obese brings real economic and social disadvantages in education, employment, and health care settings [74,75].

There is evidence supporting a positive association between weight-based stigmatization and mental health outcomes [22,26,72,76,77]. Carr and Friedman [78] state that obese individuals who report stigma related to their weight perceive they are the target of multiple forms of discrimination related to their weight, resulting in lower psychological well-being. A recent study examined the association between perceived weight and discrimination and *DSM-IV* 12-month major depressive disorder (MDD) among a nationally representative sample of obese individuals. Perceived weight discrimination was found to be significantly associated with MDD [76].

The findings from this study should be interpreted in light of the following limitations. First, previous methodological research suggests that self-reported height and weight are highly correlated with direct physical measurements [79–81], but self-reported measurements tend to consistently underestimate weight and overestimate height [80]. To our knowledge, there is no evidence to suggest that underestimation of weight would affect the association between obesity and depression [82]. Earlier studies that suggest an association between obesity and depression have included both self-report [5,7,8,10,11,13,14] and actual measurements of height and weight [13,83,84]. Second, our analyses did not consider the potential influence of previous depressive episodes on weight. Depression can be a chronic disease with remission, relapse, and reoccurrence [85,86]. However, misclassification of depression would be expected to lessen or obscure the association between obesity and depression [5]. Third, our analysis did not include assessments of psychotropic medication use. Medication used to manage depressive or anxiety disorders may result in weight gain [87]. However, there is evidence that accounting for psychotropic medication use may not have any effect on the association between obesity and depression in this sample of women [5]. Fourth, the survey response rate, the restricted geographic setting of the study, and the racially homogenous nature of the sample may limit the generalizability of the findings. Finally, body image dissatisfaction was assessed using a single-item measure, rather than a fully validated instrument.

Conclusions

Our results highlight the significant role that obesity and BID play in the association between obesity and depression among certain segments of the population. Future studies are needed to examine additional factors that might link obesity and depression among at-risk populations.

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Fig. 1.

Results of testing the body image dissatisfaction mediation model among women with <16 years of education (values outlined in red) and women with ≥16 years (values outlined in blue). * $P < .05$, ** $P < .01$, *** $P < .001$. Age, race, marital status, and smoking status were controlled in all equations in the designs.

Table 1

Distribution of demographic and clinical characteristics of survey respondents according to level of educational attainment, Group Health Cooperative data

	Total (N=4543)	<16 years education (n=1902)	≥16 years education (n=2641)	
% Obese (BMI≥30)	33.9%	46.9%	27.4%	$F_{(1)}=97.04$ ***
% PHQ score ≥10	12.8%	17.1%	10.7%	
% PHQ score <10	87.1%	82.8%	89.2%	$F_{(1)}=19.27$ ***
Mean body image dissatisfaction score (S.D.)	3.47 (1.44)	3.68 (1.39)	3.32 (1.46)	$t=8.10$ ***
% Nonwhite	15.1%	18.6%	13.4%	
% White	84.8%	81.3%	86.5%	$F_{(1)}=10.00$ **
Mean age (S.D.)	52.36 (6.56)	52.65 (6.72)	52.15 (6.44)	$t=2.54$ *
% Married/cohabitating	65.8%	63.3%	67.1%	$F_{(1)}=3.12$
% Current smoker	9.6%	14.9%	7.0%	$F_{(1)}=33.03$ ***

Sample size numbers reflect actual number of respondents; all percentages are weighted and incorporate sampling weights. F-statistic results reflect design-based effects.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

Table 2

Distribution of demographic and clinical characteristics of survey respondents according to PHQ-9 score, group health cooperative data

	PHQ Score <10 (n=3818)	PHQ Score ≥10 (n=725)	
% Obese (BMI≥30)	30.6%	55.8%	$F_{(1)}=69.94$ ***
Mean body image dissatisfaction score (S.D.)	3.33 (1.45)	4.24 (1.12)	$t=-15.96$ ***
% <16 years of education	31.7%	44.6%	
% ≥16 years of education	68.2%	55.3%	$F_{(1)}=19.27$ ***
% Nonwhite	15.2%	15.3%	
% White	84.7%	84.6%	$F_{(1)}=.00$
Mean age (S.D.)	52.46 (6.58)	51.82 (6.44)	$t=2.42$ **
% Married/cohabitating	67.7%	53.6%	$F_{(1)}=22.24$ ***
% Current smoker	8.9%	14.3%	$F_{(1)}=8.33$ *

Sample size numbers reflect actual number of respondents; all percentages are weighted and incorporate sampling weights. F-statistic results reflect design-based effects.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

Table 3

Logistic regression models of depression stratified by level of education

	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)
<16 years of education				
Obese	2.89 (1.89–4.41)		1.81 (1.15–2.86)	1.75 (1.11–2.77)
BID		1.52 (1.28–1.81)	1.38 (1.15–1.66)	1.39 (1.16–1.68)
Age				0.99 (0.96–1.02)
Race (white)				1.03 (0.64–1.67)
Married/cohabitating				0.67 (0.45–0.99)
Current smoker				1.49 (0.89–2.48)
≥16 years of education				
Obese	2.53 (1.82–3.52)		1.25 (0.85–1.85)	1.15 (0.77–1.72)
Body image dissatisfaction		1.70 (1.45–1.99)	1.64 (1.37–1.96)	1.64 (1.37–1.96)
Age				0.99 (0.96–1.01)
Race (white)				1.02 (0.61–1.71)
Married/cohabitating				0.57 (0.40–0.82)
Current smoker				1.83 (1.00–3.37)

ORs and 95% CIs are presented for each independent variable; for obesity, the normal-weight/overweight group (BMI, 18.5–29.9) was the reference category.

Model 1: logistic regression model of the association between obesity and depression.

Model 2: logistic regression model of the association between body image dissatisfaction and depression.

Model 3: logistic regression model of the association between obesity and depression adjusting for body image dissatisfaction.

Model 4: logistic regression model of the association between obesity and depression adjusting for all covariates.