

Racial and Ethnic Differences in the Association Between Obesity and Depression in Women

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Abstract

Background: It is generally accepted that obesity and depression are positively related in women. Very little prior research, however, has examined potential variation in this relationship across different racial/ethnic groups. This paper examines the association between obesity and depression in non-Hispanic White, non-Hispanic Black, and Mexican American women.

Methods: The sample included women aged 20 years and older in the 2005–2008 National Health and Nutrition Examination Surveys ($n=3666$). Logistic regression was used to assess the relationship between obesity and depression syndrome (assessed using the Patient Health Questionnaire-9), after adjusting for covariates. We then investigated whether this association varied by race/ethnicity.

Results: Overall, obese women showed a 73% greater odds of depression (odds ratio [OR]=1.73; 95% confidence interval [CI]=1.19, 2.53) compared with normal weight women. This association varied significantly, however, by race/ethnicity. The obesity-depression associations for both Black and Mexican American women were different from the positive association found for White women ($OR_{\text{Black*obese}}=0.24$; 95% CI=0.10,0.54; $OR_{\text{Mexican American*obese}}=0.42$; 95% CI=1.04). Among White women, obesity was associated with significantly greater likelihood of depression (OR=2.37; 95% CI=1.41, 4.00) compared to normal weight. Among Black women, although not statistically significant, results are suggestive that obesity was inversely associated with depression (OR=0.56; 95% CI=0.28, 1.12) relative to normal weight. Among Mexican American women, obesity was not associated with depression (OR=1.01; 95% CI=0.59, 1.72).

Conclusions: The results reveal that the association between obesity and depression varies by racial/ethnic categorization. White, but not Black or Mexican American women showed a positive association. Next research steps could include examination of factors that vary by race/ethnicity that may link obesity to depression.

Introduction

OBESITY AND DEPRESSION are major public health concerns that, together may disproportionately affect women. Recent estimates reveal that approximately 36% of U.S. adult women are obese (i.e., have a body mass index [BMI] ≥ 30 kg/m²).^{1,2} Obesity is an important risk factor for numerous medical conditions, including cardiovascular diseases, diabetes, and various cancers.³ Researchers report that the prevalence of depression among women has increased in recent decades,⁴ with roughly 17% of adult women experiencing depression at some point in their life.⁵ In addition to being highly comorbid with obesity-related

health conditions such as type 2 diabetes,⁶ depression is the second leading cause of disability-adjusted life-years lost for women in the United States.⁷

It is widely accepted that obesity and depression are positively associated among women; many studies—including longitudinal studies—have found this association.^{8–11} However, there is also evidence supporting a bi-directional association.⁹ Furthermore, other studies have shown no association between obesity and depression.¹²

One possible explanation for these divergent findings is that these relationships may not be consistent across social groups. For example, recent data reveal that Black and Hispanic women have higher prevalence of obesity relative to

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White women (59%, 45%, and 33%, respectively).¹³ However, studies have also found that Black and Hispanic women have lower prevalence rates of major depression relative to Whites.⁵ There are a handful of studies that have investigated racial/ethnic variation in the associations between obesity and depression, outlined in Table 1, with mixed results. It is important to note that inconsistencies in the measurement of depression and obesity across these studies likely also contributed to the mixed findings. In this study, we examined whether the association between obesity and depression varied across racial/ethnic groups. We incorporated several methodological advances over previous research: First, we estimated BMI based on objectively measured height and weight, which diminishes confounding by either depression status (e.g., persons with depression may have a more negative view of their body size) or sociocultural factors influencing self-reports. For example, previous research has suggested measurement bias, specifically underestimating the prevalence of obesity for Hispanic women, when using self-reports.¹⁴ Second, we use a scale of depression validated for clinical screening of major depressive episode (MDE) according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria. The use of a diagnostic measure of depression is critical because a large body of research shows that while Blacks score higher than Whites on measures of non-specific psychological distress, such as the Centers for Epidemiologic Studies - Depression Scale (CESD),¹⁵ Black adults have the same, or in most cases, lower prevalence of depression as assessed by instruments that correspond to DSM criteria.^{16,17}

Materials and methods

Dataset

Data from the 2005/2006 and 2007/2008 waves of the National Health and Nutrition Examination Survey (NHANES) were used in this study. The details of this nationally representative, cross-sectional survey are provided elsewhere.¹⁸ Briefly, NHANES is an annual survey and health exam of non-institutionalized Americans aged 1–85 years. The racial/ethnic groups included are non-Hispanic White, non-Hispanic Black, and Mexican American. Because of the NHANES sampling design, Mexican American is the only Hispanic group that can be examined separately.¹⁸ We included only those White, Black, and Mexican American women who are 20 years of age or older and not pregnant and participated in the depression questionnaire ($n=3971$). We further excluded those who were underweight ($BMI < 17.5 \text{ kg/m}^2$, $n=69$), as inclusion of this group may introduce confounding. Finally, we excluded those who were missing information on model variables, for a final sample size of 3,666. Most of those excluded were due to missing information on family poverty-to-income ratio (PIR) ($n=251$).

Key variables

Tentative depression diagnosis was assessed using the Patient Health Questionnaire (PHQ-9), a nine-item assessment tool with questions corresponding to the criteria for MDE in the DSM-IV.¹⁹ Consistent with DSM-IV criteria, depression was indicated if respondents endorsed five of the nine PHQ-9 symptoms for more than half the days in the

previous 2 weeks, with one of the requisite symptoms being either depressed mood or anhedonia; endorsing suicidal ideation counted toward depression criteria regardless of the frequency of this symptom.¹⁹ Furthermore, depression was indicated only if respondents then acknowledged that the endorsed symptoms had caused some difficulty in their lives.¹⁹ BMI was assessed using measured weight (in kilograms) and height (in meters). In focal analyses, we used a BMI variable in which BMI was divided into three categories (under and normal weight [reference group], $< 25.0 \text{ kg/m}^2$; overweight, $25.0\text{--}29.9 \text{ kg/m}^2$; and obese, $> 29.9 \text{ kg/m}^2$).

Analytic approach

First, we examined descriptive characteristics of the sample by race/ethnicity group using chi-squared tests for categorical variables and analysis of variance for continuous variables. Second, we examined the association between obesity and depression in the total sample by regressing depression on BMI categories in a series of logistic models: (A) unadjusted; (B) adjusted for age, race/ethnicity, education ($<$ high school [HS], =HS, $>$ HS), and family PIR; and (C) with additional adjustments for smoking status (never, former, current), current alcohol use (abstain, light-moderate, heavy), average daily caloric intake, and average daily minutes of moderate or vigorous physical activity. While we included these last four covariates because they may be confounders of the obesity-depression association, they may also mediate these associations; thus, this last model may represent over-control. Third, we examined racial/ethnic group variation in the association between obesity and depression by regressing depression on the interaction between BMI categories and race/ethnicity, plus adjustment for the variables listed above. All results are weighted using the appropriate weights (examination weights for models A and B; dietary weights for model C) for the two waves and account for the complex survey design of NHANES.

We conducted several sensitivity analyses to assess the robustness of results. Models were fit using different measures of weight status, including continuous BMI, and dichotomous obesity (not obese, obese). Because the inclusion of underweight women with those who are normal weight may confound the association between obesity and depression, we also ran models with underweight people removed ($n=69$) from the normal-weight category. Models were also fit using waist circumference as a measure of central obesity. Finally, we also used a BMI measure with six categories corresponding to the World Health Organization International Classification of adult weight based on BMI:²⁰ underweight ($< 18.5 \text{ kg/m}^2$), normal weight ($18.5\text{--}24.9 \text{ kg/m}^2$), overweight ($25.0\text{--}29.9 \text{ kg/m}^2$), obese class 1 ($30.034.9 \text{ kg/m}^2$), obese class 2 ($35.039.9 \text{ kg/m}^2$), and obese class 3 ($\geq 40.0 \text{ kg/m}^2$), because research suggests that the association with depression may be different at different levels of obesity²¹ and that there may be a stigmatizing effect of extreme obesity.²²

All analyses were conducted in STATA 11.0 (StataCorp).

Results

There were no racial/ethnic differences in the unadjusted prevalence of depression (Table 2). However, Black women had the highest unadjusted prevalence of obesity, followed by Mexican American and then White women ($p_{\text{White-Black}} < 0.001$; $p_{\text{White-Mexican American}} = 0.001$; $p_{\text{Black-Mexican American}} < 0.001$).

TABLE 1. PUBLISHED STUDIES ON RACIAL/ETHNIC VARIATION IN THE ASSOCIATION BETWEEN OBESITY AND DEPRESSION IN WOMEN IN THE UNITED STATES

Source	Measurement		Age, mean (range)	n	Results
	Depression/depressive symptoms	Obesity			
Longitudinal design					
(Merten et al. 2008) ²⁴ Add Health	CESD	BMI: self-report	(12–18) at baseline	4102	• Obesity ^a →DS for Whites and Blacks
(Needham et al. 2010) ^{12,b} CARDIA	CESD	BMI, WC: objective	30 at baseline	4643	• No BMI→DS association for Whites or Blacks • No WC→DS association for Whites or Blacks
(Sachs-Ericsson et al. 2007) ^c EPESE	CESD	BMI: self-report	73 for Whites at baseline; 72 for Blacks at baseline	2406	• Obesity→DS for Blacks but not Whites
Cross-sectional design					
(BeLue et al. 2009) ^d NSCH	Depression/anxiety problem: parent-report ^e	BMI: parent-report	(12–17)	35,184	• Obesity associated with depression/anxiety for Whites and Hispanics but not Blacks
(Dong et al. 2004)	History of treatment for depression	BMI: objective	(14+)	1003	• BMI associated with depression for Whites and Blacks
(Heo et al. 2006) ²⁹ BRFSS	≥7, ≥14 days depressed mood in last 30 days	BMI: self-report	(18+)	19,997	• Obesity associated with ≥7-day depressed mood for Whites, Blacks, and Hispanics • Obesity associated with ≥14-day depressed mood for Whites but not Blacks or Hispanics
(Gavin et al. 2010) CPES	CIDI	BMI: self-report	44	8299	• Obesity associated with 12-month MDD for Whites, but not Blacks or Hispanics
(Carpenter et al. 2000) ³⁰ NLAES	AUDADIS	BMI: self-report	44 ^f	23,322	• Obesity associated with depression for Whites and Blacks
(Simon et al. 2006) ^{32,g} NCS-R	CIDI	BMI: self-report	45	9125	• Obesity associated with lifetime mood disorder in Whites but not Blacks or Hispanics
(Blazer et al. 2002) ^{23,h} EPESE	CESD	BMI: self-report	(65+)	4162	• Blacks and Whites showed similar high BMI/DS comorbidity

Note: If associations are reported, they are positive.

^aObesity in children and adolescents is determined to be a BMI≥95th percentile based on gender-specific percentiles developed by the Centers for Disease Control and Prevention.

^bAnalyses were not stratified/interacted with both race/ethnicity and gender, so there are no racial/ethnic comparisons in women only. Neither men nor women showed the BMI→DS or waist→DS association.

^cAnalyses were not stratified by gender; however, interactions with race and gender were not statistically significant. Interactions with race alone were statistically significant.

^dAnalyses were not stratified/interacted by gender. Results presented were stratified by race/ethnicity, adjusting for gender.

^eParents were asked the question: “Has a health professional ever told you that your child has a problem with depression or anxiety?”

^fMean age was reported only for the entire sample, which included both men and women. Mean age, stratified by BMI category, and gender was reported for women as: underweight, 40; normal 46; obese, 47.

^gResults were not reported stratified by race and gender, so results reported here are for men and women together.

^hResults were not reported stratified by gender, so results reported here are for men and women together.

→ is associated with “later”; Add Health, National Longitudinal Study of Adolescent Health; AUDADIS, Alcohol Use Disorders and Associated Disabilities Interview Schedule; BMI, body mass index; BRFSS, Behavioral Risk Factor Surveillance Survey; CARDIA, Coronary Artery Risk Development in Young Adults; CESD, Center for Epidemiology Studies—Depression; CIDI, Composite International Diagnostic Interview; CPES, Comprehensive Psychiatric Epidemiology Surveys; DS, depressive symptoms; EPESE, Established Populations for Epidemiologic Studies of the Elderly; MDD, major depressive disorder; NCS-R, National Comorbidity Survey Replication; NLAES, National Longitudinal Alcohol Epidemiologic Study; NSCH, National Study of Children’s Health; WC, waist circumference.

TABLE 2. UNADJUSTED SOCIODEMOGRAPHIC AND HEALTH CHARACTERISTICS IN WOMEN BY RACE/ETHNICITY

	Non-Hispanic White n=2029 % or $\bar{x} \pm SD$	Non-Hispanic Black n=914 % or $\bar{x} \pm SD$	Mexican American n=723 % or $\bar{x} \pm SD$	W-B ^b	W-M	B-M
Depression syndrome ^a	5	7	9			
BMI						
Normal (<25.0 kg/m ²)	39	21	26	***	***	
Overweight (25.0–29.9 kg/m ²)	28	27	32			*
Obese (≥ 40.0 kg/m ²)	33	51	42	***	***	**
Age, years	49.0 \pm 11.0	45.3 \pm 17.2	41.7 \pm 19.1	***	***	***
Education						
<High school	12	25	47	***	***	***
=High school	26	21	20	*	**	
>High school	62	55	34	*	***	***
Family PIR	3.3 \pm 1.0	2.4 \pm 1.7	2.0 \pm 1.9	***	***	***
Avg. daily caloric intake, kcal	1783 \pm 472	1784 \pm 999	1729 \pm 961			
Avg. daily physical activity, minutes/day	32.6 \pm 36.4	23.0 \pm 52.2	20.7 \pm 58.5	**	**	
Smoking status						
Never	54	66	76	***	***	*
Former	25	14	13	***	***	
Current	22	20	11		***	**
Alcohol use						
Abstain	29	44	41	***	***	
Light-moderate	61	50	46	**	***	
Heavy	10	6	13	**	*	***

Results reported are percentage for categorical variables and mean (\bar{x}) \pm standard deviation (SD) for continuous variables. Results are weighted to account for complex survey design.

^aDepression syndrome is measured by the Patient Health Questionnaire-9.

^bTests for group differences: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

PIR, poverty income ratio; avg., average; W, White; B, Black, M, Mexican American.

We first examined the association between BMI categories and depression in the entire sample (Table 3, Model 1) and found that, after controlling for age and race/ethnicity, overweight women had a 58% greater odds of depression compared to normal weight women (Table 3, Model 1; OR=1.58; 95% CI=1.05, 2.40). Obese women had a 73% greater odds of depression compared to normal weight women (OR=1.73; 95% CI=1.17, 2.56). In this model, we also found that, adjusting for BMI category, both Black and Mexican American women had higher odds of depression compared to White women. However, these higher odds were completely attenuated for Black women and substantially attenuated for Mexican American women after further controlling for family PIR, education, smoking status, alcohol use, physical activity, and caloric intake (results not shown).

We next examined the variation by race/ethnicity in the association between BMI categories and depression (Table 3, Models 2–5). Controlling for age (Model 2), both overweight and obese White women had higher odds of depression compared with normal weight; the odds for White women was only slightly attenuated in fully adjusted models (Model 5). For example, controlling for age, obese White women had more than twice the odds of depression compared to normal weight White women (OR=2.37; 95% CI=1.41, 4.00).

In the lower panel of Table 3, we present the parameter estimates for the race/ethnicity-specific association between BMI categories and depression, calculated from the parameter estimates for BMI categories and the interaction between race/ethnicity and BMI categories. Controlling for age

(Model 2), overweight and obese status, compared with normal weight status, was not associated with depression among Black women. Furthermore, the parameter estimates suggest that obese Black women may have a *lower* odds of depression compared to normal weight Black women (OR=0.56; 95% CI=0.28, 1.12; $p=0.095$). The interaction term indicates that this association between overweight and depression and, in particular, between obesity and depression was different for Black and White women, even in fully adjusted models. For example, controlling for age, the odds of depression for obese Black women was significantly lower compared with obese White women, as shown by the interaction term (OR_{Black*obese}=0.24; 95% CI=0.10, 0.54).

As shown in the lower panel of Table 3, the results for Mexican American women were slightly different. Controlling for age (Model 2), there were no associations between overweight and obese statuses and depression compared to normal weight. For example, controlling for age, obese Mexican American women showed no difference in the odds of depression compared with normal weight Mexican American women (OR=1.01; 95% CI=0.59, 1.72). The interaction term suggests that the lack of a obesity-depression association is different than the positive association seen in White women (OR_{Mexican American*obese}=0.42; 95% CI=0.17, 1.04; $p=0.059$).

Results from the sensitivity analyses using different measures of weight status yielded qualitatively similar results, with the exception of analyses using six BMI categories. Results from these latter sensitivity analyses are shown in Supplementary Table 1 (Supplementary Data are available online

TABLE 3. ODDS RATIOS FOR THE ASSOCIATION BETWEEN BMI CATEGORIES AND DEPRESSION IN WOMEN BY RACE/ETHNICITY

	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)	Model 5 OR (95% CI)
Race/ethnicity					
White	ref	ref	ref	ref	ref
Black	1.58 (1.01, 2.47)	3.68 (1.70, 7.99)	2.48 (1.15, 5.37)	2.75 (1.24, 6.06)	2.32 (1.09, 4.95)
Mexican American	2.16 (1.38, 3.40)	2.96 (1.28, 6.87)	1.74 (0.75, 4.04)	2.43 (1.01, 5.86)	2.82 (1.17, 6.78)
BMI category					
Normal	ref	ref	ref	ref	ref
Overweight	1.58 (1.05, 2.40)	1.85 (1.09, 3.14)	1.79 (1.02, 3.12)	1.94 (1.13, 3.35)	1.79 (1.04, 3.06)
Obese	1.73 (1.17, 2.56)	2.37 (1.41, 4.00)	2.07 (1.19, 3.61)	2.38 (1.37, 4.15)	2.34 (1.34, 4.10)
Race/ethnicity*BMI category					
Black*Overweight		0.38 (0.16, 0.92)	0.42 (0.17, 1.06)	0.39 (0.15, 0.99)	0.61 (0.20, 1.84)
Black*Obese		0.24 (0.10, 0.54)	0.26 (0.11, 0.62)	0.25 (0.10, 0.62)	0.32 (0.12, 0.86)
Mexican American*Overweight		0.75 (0.28, 2.00)	0.70 (0.26, 1.93)	0.68 (0.23, 2.00)	0.86 (0.25, 2.99)
Mexican American*Obese		0.42 (0.17, 1.04)	0.44 (0.17, 1.11)	0.39 (0.15, 0.99)	0.37 (0.13, 1.08)
Post-estimation products of logistic regression coefficients (odds ratios) of depression syndrome as a function of BMI category within race/ethnicity ^a					
White					
Overweight versus normal		1.85 (1.09, 3.14)	1.79 (1.02, 3.12)	1.94 (1.13, 3.35)	1.79 (1.04, 3.06)
Obese versus normal		2.37 (1.41, 4.00)	2.07 (1.19, 3.61)	2.38 (1.37, 4.15)	2.34 (1.34, 4.10)
Black					
Overweight versus normal		0.71 (0.35, 1.40)	0.75 (0.37, 1.56)	0.75 (0.36, 1.57)	1.09 (0.39, 2.99)
Obese versus normal		0.56 (0.28, 1.12)	0.54 (0.27, 1.07)	0.60 (0.30, 1.22)	0.76 (0.36, 1.58)
Mexican American					
Overweight versus normal		1.38 (0.71, 2.71)	1.26 (0.63, 2.49)	1.32 (0.62, 2.83)	1.53 (0.59, 3.93)
Obese versus normal		1.01 (0.59, 1.72)	0.91 (0.53, 1.58)	0.93 (0.54, 1.60)	0.87 (0.41, 1.84)

^aOdds ratios of depression syndrome calculated post-estimation as the product of the parameter estimates for BMI category and race-BMI category interaction as follows:

$$\begin{aligned} \text{Depression syndrome} = & \beta_0 + \beta_1\text{Black} + \beta_2\text{Mexican American} \\ & + \beta_3\text{overweight} + \beta_4\text{obese} \\ & + \beta_5\text{Black*overweight} + \beta_6\text{Black*obese} \\ & + \beta_7\text{Mexican American*overweight} + \beta_8\text{Mexican American*obese} \\ & + \beta_{9-n}\text{covariates} + \epsilon \end{aligned}$$

Depression syndrome in:

$$\begin{aligned} \text{Overweight versus normal weight Blacks} &= \beta_3*\beta_5 \\ \text{Obese versus normal weight Blacks} &= \beta_4*\beta_6 \\ \text{Overweight versus normal weight Mexican Americans} &= \beta_3*\beta_7 \\ \text{Obese versus normal weight Mexican Americans} &= \beta_4*\beta_8 \end{aligned}$$

Models are adjusted for:

- (1) age (years),
- (2) age (years),
- (3) covariates in Model 2 and education (<high school (HS), = HS, >HS) and family poverty-income ratio (PIR),
- (4) covariates in Model 3 and smoking status (never, former, current) and alcohol use (abstinence, light-moderate, heavy), and
- (5) covariates in Model 4 and physical activity (average number of daily minutes of moderate or vigorous recreational physical activity) and caloric intake (average number of daily kilocalorie intake).

BMI categories: normal (<25.0 kg/m²), overweight (25.0–29.9 kg/m²), obese (>29.9 kg/m²).

at www.liebertpub.com/jwh). While the sample sizes within BMI/depression categories by racial/ethnic group are small, the results suggest that for Black women there were lower odds of depression with increasing levels of obesity, with the exception of extreme obesity (obese class 3). For example, in age-adjusted models, the odds of depression compared with normal weight Black women was 0.74 for overweight (95% CI=0.36, 1.50), 0.52 for obesity class 1 (95% CI=0.22, 1.25), and 0.35 for obesity class 2 (95% CI=0.13, 0.97). Contrary to these lower odds of depression, Black women in obesity class 3 showed no difference in the odds of depression compared with normal weight Black women (OR=0.93; 95% CI=0.39,2.24). For Mexican American women, there is no association between obesity and depression; the odds of depression are similar at each BMI category. The results from

models run excluding those who were underweight (*n*=69) yielded nearly identical results to those shown in Table 3 (results not shown).

Discussion

The main finding of this study is that the relationship between obesity and depression varied by racial/ethnic group. We found that obesity and depression were positively related only among non-Hispanic White women. Among non-Hispanic Black and Mexican American women we found that there were either no associations or the suggestion of an inverse association for Black women. To our knowledge, this is the first study to examine racial/ethnic group variation in the association between obesity and depression using a measure

of BMI that was objectively obtained and a measure of depression that corresponds to the DSM diagnostic criteria for MDE in a population-representative national sample.

It is worth noting that, while studies that use non-diagnostic measures of distress (e.g., CESD) tend to show positive associations between depressive symptoms and obesity, studies that use measures that more closely aligned with DSM-IV criteria (such as the PHQ-9 used in this report) do not tend to show a consistent association. Furthermore, when using the CESD, researchers generally report no racial/ethnic differences in the association between obesity and depressive symptoms.^{12,23,24} This may be because the CESD has not been thoroughly validated for use in multiethnic samples.²⁵ Furthermore, it may be that the CESD assesses stress-related symptoms²⁶ of both depression and anxiety,²⁷ rather than clinical dimensions of major depressive disorder (MDD) specifically.²⁸ For example, the CESD does not require a presence of either depressed mood or anhedonia; it also does not require a specific number of other symptoms in order to qualify for clinical depression.

One other way that the CESD does not correspond to MDD is in the temporal requirement of depressed mood or anhedonia for at least 2 weeks. In fact, researchers who used measures of depressed mood for ≥ 7 and ≥ 14 days found that there were no racial/ethnic differences in the association between obesity and depressed mood when using the 7-day measure.²⁹ On the other hand, they found that White but not Black or Hispanic women showed a positive association when using the 14-day measure.²⁹ The temporal criterion for an episode of MDD is depressed mood (or anhedonia) for at least 2 weeks.

Two other studies have examined racial/ethnic group variation in this association, using self-reported height and weight and a measure of depression that corresponds to DSM-IV diagnostic criteria for MDD.^{30,31} In one, researchers reported that both Black and White women showed a positive association,³⁰ while in the other, White but not Black or Hispanic women showed a positive association.³¹ In one additional study, researchers examined mood disorders rather than MDD alone; they found that White, but not Black or Hispanic women, showed a positive association between obesity and mood disorders.³²

A major implication from this study is that obesity and depression are not universally positively related; rather, the relation between the two depends on social context. Prior research suggests that there are other circumstances under which obesity and depression are not positively related. For example, several report that men show either no association or an inverse association,⁸⁻¹¹ the latter of which some term the "jolly fat hypothesis."³³ Furthermore, others report an inverse association in non-U.S. samples, particularly Asian samples.³³⁻³⁶ Results from a recent meta-analysis suggest that, in general, studies with non-U.S. samples fail to show a positive association between obesity and depression.¹¹ Theories on the mechanistic links between obesity and lower risk of depression include the notion that obesogenic foods (e.g., high carbohydrates) result in biochemical changes that improve mood.^{37,38} Researchers posit that, for women, obesity and depression are positively related due to the mitigating influence of the psychologically stigmatizing effect of obesity in societies that have lean ideal body types.^{39,40} In other words, while obesogenic foods may have mood-enhancing properties, the stigma associated with

obesity for women may negate these properties and result in increased risk of depression.

It may also be that obesity and depression are related only through a third factor, namely, psychosocial stress. Research indicates that both obesity and depression are related to the intersection of stress and coping.^{26,37,38,41} Stress has been shown to be associated with both obesity and depression. However, coping behaviors within social context may be an important modifier of both of these outcomes.⁴² Disadvantaged social contexts, such as resource-poor neighborhoods, are not only the source of psychosocial stress (e.g., neighborhood disorder, violence) but also the source of coping resources (e.g., full-service grocers vs. fast-food restaurants, abandoned lots versus well-kept parks with green space).⁴³

Other facets of social context relevant to the intersection of stress, coping, obesity, and depression are the social norms regarding ideal body shapes. For example, while many posit that obesity has psychological effects in women through "anti-fat" stigma, several lines of evidence suggests that there is racial/ethnic group variation in body ideals. For example, research has shown that Black women, do not share body shape norms with White women.⁴⁴⁻⁴⁶ Similarly, studies indicate that obese Black women report and experience less weight-related discrimination, including in the labor market, compared with obese White and Hispanic women.^{22,47-50} There has been less research on attitudes and perceptions of body weight among Hispanics, but evidence suggests that Hispanic women view larger body sizes as ideal as compared with White women and view larger body sizes as a sign of good health.^{51,52}

Researchers posit that the contextual differences between Blacks and Whites, both in coping resources and constraints and in social norms regarding body shape, result in differential stress-related coping that, for Blacks, may preserve mental health (i.e., depression) at the expense of physical health (i.e., obesity).^{42,53} It may be that in socially disadvantaged contexts, in which Blacks are overrepresented compared to Whites, available coping resources result in greater consumption of obesogenic foods (e.g., fast foods) and lower engagement in physical activity. Furthermore, the greater psychosocial stress experienced by Black compared to Whites may result in altered metabolism that results in greater weight gain, independent of energy intake/output balance.³⁷ Finally, social norms regarding body shape do not stigmatize Black (and possibly Hispanic) women for larger body types that are thought to link obesity to depression for White women.⁴⁷ Together, this would result in an inverse association between obesity and depression for Black (and perhaps Hispanic) women, as they are able to reap the mood-enhancing benefits of certain health behaviors (e.g., obesogenic food consumption) without the similar severity in stigma that may result from obesity.

There have been a handful of studies in which researchers have examined racial variation in the interrelation among stress, health behaviors, and depression. For example, researchers reported that, for Whites, those who engaged in the most unhealthy behaviors (i.e., smoking, alcohol use) and behavior-related proxies (i.e., obesity) showed the strongest stress-depression association compared with those who engaged in none of these unhealthy behaviors.⁴² Contrary to this, for Blacks, those who engaged in no unhealthy behaviors

showed the strongest association between stress and depression compared to those who engaged in the largest number of unhealthy behaviors. Using a different sample, researchers reported similar results whereby Whites showed the strongest stress-depression association in the presence of unhealthy behaviors, while Blacks showed the strongest stress-depression association in the absence of unhealthy behaviors.¹⁶ Future research is needed to examine the modifying effect of race/ethnicity specifically and social contextual factors more broadly, on the associations among stress, coping, obesity, and depression.

Our research supports a shift in the assumptions about the association between obesity and depression. If social context—and stress and coping more specifically—do, in fact, link obesity and depression, then interventions that directly target either of these conditions will have little consistent effect on the other condition. This is an important consideration given the fact that both obesity and depression create substantial health care and other economic costs.^{54,55} More broadly, this research contributes to the growing body of literature indicating that mental and physical health are related through complex mechanisms.

Conclusions

We found that White, Black, and Mexican American women all showed different associations between obesity and depression in a nationally representative sample. The variation in the obesity-depression association across racial/ethnic groups implies that this association is not, in fact, universal, but varies by social context. As both obesity and depression are related to stress, it may be more effective to target stress and socio-contextual factors associated with increased stress in an effort to address negative consequences of both obesity and depression.

Disclosure Statement

The authors declare no conflicts of interest.

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