Racial/Ethnic Differences in the Association Between Obesity and Major Depressive Disorder: Findings from the Comprehensive Psychiatric Epidemiology Surveys

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SYNOPSIS

Objectives. This study examined whether the association between obesity and 12-month prevalence of major depressive disorder (MDD) varied according to racial/ethnic status and nativity in representative national samples of black, Latino, Asian, and non-Hispanic white people.

Methods. We used data from the Comprehensive Psychiatric Epidemiology Surveys.

Results. In analyses by gender, obesity was associated with an elevated risk of MDD among non-Hispanic white women (adjusted odds ratio [AOR] =1.73; 95% confidence interval [CI] 1.27, 2.35; p=0.001). Formal test for interaction revealed significant variation by race present between non-Hispanic white women and black, Latin, and Asian women. No significant differences were evident among men. In analyses by nativity, the association between obesity and MDD was significant among U.S.-born non-Hispanic white women (AOR=1.62; 95% CI 1.16, 2.27; p=0.001) and U.S.-born black women (AOR=1.29; 95% CI 1.01, 1.66; p=0.041). Significant interactions were present among U.S.-born white and black women, Latin women, and Asian women. No significant interactions were evident among foreign-born women. Similarly, no significant differences were present among native-born or foreign-born men.

Conclusions. The findings suggest that the association between obesity and MDD varies according to racial/ethnic status and nativity. Understanding the link between obesity and depression may be imperative to designing interventions to address body weight maintenance and reduction strategies among women.

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Obesity is a major public health concern in the United States, with its overall prevalence in the adult population increasing during the past decade.[1] While obesity is a serious health issue by itself, it is also associated with other health problems, including psychiatric illnesses. Previous studies suggest that obesity may be significantly associated with major depressive disorder (MDD).[2–10] A unique set of paradoxical findings arises when we examine how obesity and depression are associated with each other among different racial/ethnic groups.

The prevalence of obesity varies by race/ethnicity as well as gender. Specifically, the prevalence of obesity is highest (in order of prevalence) among black, Latino, white, and Asian populations.[11] Because some racial/ethnic groups have higher rates of obesity than white people and obesity may be a risk factor for psychiatric illnesses, we might expect that obese individuals within these groups, especially black and Latino minority groups, would have higher rates of depression than white people. However, this may not be the case. Research findings suggest that compared with non-Hispanic white people, black, Latino, and Asian minority groups have lower 12-month rates of MDD.[11–15] Despite the lower prevalence, black, Latino, and Asian minority populations affected by MDD are less likely to receive treatment and are more likely to be severely and chronically impaired by MDD than non-Hispanic white people.[13,15,16]

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 most, but not all,[17,18] studies suggesting a positive association.[2–10,19,20]

Despite the higher prevalence of obesity among some racial/ethnic groups, our understanding of the obesity-depression association among these groups is limited in the following ways. First, previous studies often have not specifically examined the association between obesity and depression among racial/ethnic groups.[2,3,5,8,9,19] This is largely a function of insufficient numbers of racial/ethnic group members in survey data that result in pooled sample methods by which all racial groups are examined together. Although pooled sample analyses estimate outcomes fairly well, they may not flesh out subtle and significant differences between racial/ethnic groups. This limits the conclusions that may be drawn based on race/ethnicity.[21]

Second, in studies that have examined whether the association between obesity and MDD varies by racial/ethnic status, the association remains inconclusive. Carpenter et al.[10] reported on data from a national survey of black and white adults and found that obesity was significantly associated with past-year *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (*DSM-IV*) major depression among women. The association between body weight and major depression was comparable for black and white women. Heo and colleagues[6] used data from a nationally representative sample of white, black, and Hispanic adults, and reported that among women, the prevalence of past month depressed mood increased in obese people regardless of race. However, using data from the National Comorbidity Survey Replication (NCS-R), Simon and colleagues[7] found the association between obesity and lifetime mood disorder was significant among non-Hispanic white compared with nonwhite people. Specifically, in a formal test for interaction, there was a borderline significant difference in the odds ratios between non-Hispanic white and nonwhite people. A possible explanation for the contradictory results could be that racial differences were difficult to detect because of insufficient numbers of racial/ethnic minorities compared with non-Hispanic white people. For example, non-Hispanic white people comprised between 73% and 88% of the sample in previously noted studies. Although studies were able to conduct analyses separately for African Americans and Hispanic people,[6,7,10] racial/ethnic groups that were included in these studies were underrepresented compared with their numbers in the U.S. population.[22]

Third, there is increasing recognition that nativity status is an important indicator of variation in body mass index (BMI) and mental health outcomes among racial/ethnic groups. Findings from the National Health Interview Surveys (NHISs) suggest that U.S.-born adults have a greater prevalence of obesity than foreign-born adults.[23,24] Furthermore, U.S.-born black women were twice as likely to be obese compared with U.S.-born white women.[23] Studies have also shown that among foreign-born samples of Asian and Latino populations, the number of years spent in the U.S. was directly related to an increased risk of being overweight or obese.[16,25] In addition, previous mental health research on black, Latino, and Asian populations suggests that aspects of nativity and the immigrant experience are associated with MDD.[26–31] For example, various aspects of nativity, such as family burden, cultural conflict, and perceived neighborhood safety, have been shown to be associated with 12-month MDD.[29] To our knowledge, there are no previous studies that have examined the role of nativity in the association between obesity and MDD.

In the present study, we used data from the Collaborative Psychiatric Epidemiology Studies (CPES) to investigate whether the association between obesity

and 12-month prevalence of MDD varies according to racial/ethnic status or nativity in nationally representative samples of black, Latino, Asian, and non-Hispanic white people.

METHODS

Sampling design

A detailed description of the CPES protocol and sampling design has been previously documented.[32] Briefly, three national surveys of Americans' mental health comprise the CPES: the NCS-R,[33] the National Study of American Life (NSAL),[34] and the National Latino and Asian American Study of Mental Health (NLAAS).[35] Participants were recruited using two sampling methods: (*1*) core sampling based on multistage stratified area probability designs, resulting in nationally representative household samples; and (*2*) high-density supplemental sampling to oversample Census block groups for target ancestry groups (Afro-Caribbean, Chinese, Filipino, Vietnamese, and Puerto Rican).

The combined analysis weights were created from the analysis weights for each study. First, population-specific weights from each study were adjusted to the 2002 Current Population Survey (CPS) totals. Second, each study was partitioned into subgroups by race and geographic region within the U.S. To create the combined analysis weights, the adjusted study-specific weights were scaled by relative size of the study subgroup to the combined subgroup across all three studies.[36]

Procedures

The NCS-R, NSAL, and NLAAS interviews were conducted in English and administered face-to-face using a computer-assisted instrument and by telephone.[19,20,28] When requested, NLAAS interviews were conducted in the respondents' native language (e.g., Spanish, Chinese, Tagalog, or Vietnamese).[28,37] CPES surveys were conducted between February 2001 and December 2003. Written informed consent was obtained for all participants in their preferred languages, and study procedures and protocols were approved by the Internal Review Boards of Cambridge Health Alliance, the University of Washington, the University of Michigan, and Harvard Medical School.[27,28,33,37]

Sample

The full CPES sample included data from 20,013 adults aged 18 and older who resided in any of the 50 contiguous states and Washington, D.C. The NCS-R sample consisted of 6,696 non-Hispanic white, 1,230 black, 883 Latino, and 189 Asian people. The NSAL sample consisted of 3,570 African American, 1,621 black of Caribbean ancestry, and 891 non-Hispanic white people.[27] The NLAAS Latino sample consisted of 868 Mexican, 495 Puerto Rican, 577 Cuban, and 614 "other" Latino people.[37] The NLAAS Asian sample comprised 2,095 individuals including 600 Chinese, 508 Filipino, 520 Vietnamese, and 467 "other" Asian people.[28] The final response rates for the surveys were as follows: 70.9% (NCS-R), 72.3% (NSAL), and 73.2% (NLAAS).

The final sample included 16,450 respondents (with complete information on all variables in the analyses) who self-identified as non-Hispanic white (n=5,691), black (n=5,434), Latino (n=3,268), and Asian (n=2,057).

Measures

The outcome of interest in our study was the 12-month prevalence (the occurrence of the depressive event within 12 months of the interview) of MDD as measured by the diagnostic interview of the World Mental Health Initiative version of the Composite International Diagnostic Interview,[38] a fully structured diagnostic instrument based on criteria of the *DSM-IV*.[39] Previous studies have shown that there are consistent similarities in the core features of MDD across racial/ethnic groups.[40,41] To date, clinical reappraisal interviews have been conducted in conjunction with the NCS-R and the NSAL. The Structured Clinical Interview of *DSM-IV* (SCID),[42] a diagnostic interview that requires clinical expertise to administer, was used in the reappraisal studies. Because the SCID does not contain a diagnosis for mania, it cannot be used to generate diagnoses for MDD. However, it can be used to diagnose major depressive episode (MDE). For example, in the NSAL, a comparison of the Composite International Diagnostic Interview and the SCID for 12-month prevalence of MDE revealed fair concordance for African Americans and lower concordance for Caribbean black people.[15] The clinical reappraisal study for the NCS-R also indicated fair concordance for 12-month MDE.[12]

Obesity. Obesity was determined from self-reports of height and weight. Respondents were classified as either obese (BMI ≥30 kilograms/meter squared [kg/m^2]) or non-obese (BMI 18.5–29.9 kg/m^2) both for consistency with previous research[2,7,20] and a lack of evidence suggesting that overweight status is statistically associated with depression.[4,5,9,17,18] In addition, the goal of this study was to examine the relationship between 12-month MDD and obesity, and the low prevalence of 12-month MDD among racial/ethnic groups precludes further subdivision of the non-obese group. Earlier research suggests that self-reported

height and weight are highly correlated with direct physical measurements, but self-reported data result in underestimation of weight and overestimation of height,[43] leading to low estimates of overweight and obesity.[7] Individuals with BMI <18.5 kg/m^2 (n=477) were excluded from the analyses because research has shown a U-shaped relationship between BMI and the prevalence of mood disorders.[10]

Covariates. In the present study, we adjusted for age, marital status, educational attainment, employment status, and current smoking status. Although aging is correlated with both MDD and BMI, all age groups were included in the analysis because evidence suggests that age moderates the association between obesity and depression, such that there is a stronger association between obesity and depression among those younger than 65 years of age.[6] Age (measured in years) was assessed as a continuous variable based on the date of the interview and self-reported date of birth.

Married individuals have consistently been shown to have a lower prevalence of MDD than those who are unmarried.[44,45] Marital status was dichotomized: married or cohabitating vs. not married (widowed/separated/divorced/never married). Given the gender differences in the obesity-depression relationship and increased risk of 12-month MDD among women with ≥16 years of education,[46] educational attainment (measured in years) was treated as a dichotomized variable based on self-reported number of years of education (≥16 years vs. <16 years).

With few exceptions, being unemployed and out of the labor force, compared with being employed, is consistently associated with a higher risk of 12-month MDD.[46] Employment status was dichotomized: being employed vs. being unemployed (includes being out of the labor force). In line with previous findings that current smoking is associated with MDD[47,48] and smoking initiation,[49] current smoking was dichotomized: current smoker vs. nonsmoker (never smoked, previously smoked).

Analysis

All analyses used SVY LOGISTIC procedure of STATA® version 10.0, which provides estimates that account for the incorporation of complex survey sampling methods, including multistage and cluster study designs.[50] Weighted cross-tabulations were used to describe characteristics of the CPES data. Prior to conducting the multivariate analysis, we assessed the variation in 12-month MDD prevalence by obesity status for a variety of sociodemographic characteristics, as well as the bivariate association between obesity and the 12-month MDD. Next, a series of logistic regression analyses were conducted to assess the unadjusted and adjusted association between obesity and 12-month MDD stratified by gender. Interaction terms between obesity and race were created, and included obesity and black, obesity and Latino, obesity and Asian, and obesity and non-Hispanic white. These interaction terms were included in the unadjusted and adjusted models to determine whether the obesity-depression association varied according to racial/ethnic status. Wald tests were conducted to determine whether there were statistically significant differences in the association between obesity and MDD by race.

RESULTS

Table 1 shows the sociodemographic characteristics of the sample stratified by gender and race. As expected, women reported a higher prevalence of 12-month MDD than men, except among Asian populations. Among racial/ethnic groups, both men and women reported a similar prevalence of obesity, except among black people; black women were more likely to report BMIs ≥30 kg/m^2.

Table 2 shows the variation in the 12-month prevalence of MDD with obesity by a range of sociodemographic characteristics. Column 3 of Table 2 gives the unadjusted odds ratios comparing the prevalence of 12-month MDD among the BMI ≥30 kg/m^2 group relative to the non-obese group (BMI 18.5–29.9 kg/m^2). Obesity was significantly associated with higher odds of 12-month MDD among respondents ≤29 years of age (odds ratio [OR] = 1.48; 95% confidence interval [CI] 1.07, 2.03) and among women (OR=1.42; 95% CI 1.11, 1.82). Other subgroups where obesity was significantly associated with increased MDD were non-Hispanic white people (OR=1.31; 95% CI 1.05, 1.63) and those with ≥16 years of education (OR=1.34; 95% CI 1.07, 1.67).

In Table 3, we examined whether race moderated the association between obesity and 12-month MDD among black, Latino, and Asian populations compared with the non-Hispanic white group. In the fully adjusted models, the association between obesity and 12-month MDD was significant only among white women (adjusted odds ratio [AOR] = 1.73; 95% CI 1.27, 2.35). A formal test for an interaction effect found significant variation by race between non-Hispanic white and black women (p=0.004), white women and Latinas (p=0.004), and white and Asian women (p=0.03). No statistically significant associations were evident between obesity and 12-month MDD by race among men.

In Table 4, we examined the association between

Table 1. Descriptive statistics[a] for study variables stratified by race/ethnicity, Comprehensive Psychiatric Epidemiology Surveys

	Non-Hispanic white		*Black*		*Latino*		*Asian*		*Overall*
Variables	*Women (n=3,082)[b] Percent*	*Men (n=2,609)[b] Percent*	*Women (n=3,396)[b] Percent*	*Men (n=2,038)[b] Percent*	*Women (n=1,821)[b] Percent*	*Men (n=1,447)[b] Percent*	*Women (n=1,041)[b] Percent*	*Men (n=1,016)[b] Percent*	*(n=16,450)[b] Percent*
BMI ≥30 kg/m^2 (obese)	25.3	24.9	40.9	28.8	31.3	29.3	9.8	9.3	26.3
12-month MDD	13.1	8.1	8.8	5.1	10.8	6.9	4.8	4.7	9.7
Age in years, mean (SD)	37.4 (16.5)	45.1 (11.5)	39.2 (20.1)	46.1 (12.5)	40.6 (24.2)	41.6 (23.3)	42.7 (24.2)	42.0 (28.0)	43.9 (16.7)
≥16 years of education	56.0	54.0	39.5	39.4	30.5	30.6	65.8	69.2	60.4
Employed	62.8	72.3	63.2	71.2	52.7	74.6	57.4	74.2	66.8
Married or cohabiting	59.8	65.5	35.6	51.0	57.8	66.4	70.0	69.2	50.4
Current smoker	21.4	26.5	4.5	5.9	15.2	24.7	7.2	20.4	20.5
Foreign-born	2.7	2.7	5.6	7.8	49.1	49.7	77.6	75.8	13.3

[a]Data are presented as percentage of respondents unless otherwise indicated.

[b]Sample size numbers reflect actual number of respondents; all percentages are weighted and incorporate sampling weights.

BMI = body mass index

kg/m^2 = kilograms per meter squared

MDD = major depressive disorder

SD = standard deviation

Table 2. Twelve-month prevalence[a] of MDD by obesity status stratified by sociodemographic characteristics, Comprehensive Psychiatric Epidemiology Surveys

Variables	*Prevalence if BMI 18.5–29.9 kg/m²* *(SE)*	*Prevalence if BMI ≥30 kg/m²* *(SE)*	*OR (95% CI)*
Age (in years)			
≤29	9.0 (0.01)	12.7 (0.01)	1.48 (1.07, 2.03)
30–44	9.6 (0.01)	11.0 (0.01)	1.15 (0.90, 1.47)
45–59	7.4 (0.01)	9.2 (0.01)	1.26 (0.85, 1.87)
≥60	3.1 (0.00)	4.0 (0.01)	1.27 (0.74, 2.18)
Gender			
Female	9.0 (0.00)	12.4 (0.01)	1.42 (1.11, 1.82)
Male	6.2 (0.00)	6.0 (0.01)	0.96 (0.73, 1.28)
Race/ethnicity			
Non-Hispanic white	7.8 (0.00)	10.1 (0.01)	1.31 (1.05, 1.63)
Black	6.5 (0.00)	7.3 (0.00)	1.13 (0.88, 1.44)
Latino/a	8.1 (0.00)	8.4 (0.01)	1.04 (0.76, 1.41)
Asian	4.5 (0.00)	4.6 (0.01)	1.01 (0.49, 2.05)
≥16 years of education	7.2 (0.00)	9.4 (0.01)	1.34 (1.07, 1.67)
Employed	7.1 (0.00)	8.3 (0.01)	1.18 (0.96, 1.44)
Married or cohabiting	5.7 (0.00)	6.7 (0.01)	1.19 (0.94, 1.51)
Current smoker	13.4 (0.00)	13.7 (0.01)	1.02 (0.75, 1.39)
U.S.-born	9.8 (0.00)	11.1 (0.01)	1.15 (0.98, 1.36)

[a]All proportions are weighted and incorporate sampling weights.

MDD = major depressive disorder

BMI = body mass index

kg/m² = kilograms per meter squared

SE = standard error

OR = odds ratio

CI = confidence interval

obesity and 12-month MDD among U.S.-born and foreign-born women and men. In the adjusted models, among U.S.-born women, the association between obesity and 12-month MDD was significant among U.S.-born non-Hispanic white women compared with U.S.-born nonwhite women (AOR=1.62; 95% CI 1.16, 2.27). In addition, U.S.-born black women had higher odds of experiencing 12-month MDD compared with U.S.-born nonblack women (AOR=1.29; 95% CI 1.01, 1.66). A formal test for interaction showed significant variation by race between U.S.-born non-Hispanic white and U.S.-born black women ($p<0.001$), U.S.-born white women and U.S.-born Latinas ($p=0.03$), and U.S.-born white and U.S.-born Asian women ($p=0.03$). Foreign-born women with BMIs ≥30 kg/m² reported being at lower risk of 12-month MDD and, in the case of foreign-born black women, the odds of 12-month MDD were significantly lower than among foreign-born nonblack women (AOR=0.26; 95% CI 0.09, 0.70). Although the association between obesity and 12-month MDD appeared stronger among foreign-born black women, a formal test for interaction showed no significant variation ($p=0.12$). Again, no statistically significant associations were evident between obesity and 12-month MDD by nativity among men.

DISCUSSION

In this study, we examined whether the association between obesity and the 12-month prevalence of MDD varied according to racial/ethnic status and nativity in nationally representative samples of black, Latino, Asian, and non-Hispanic white populations. Our findings suggest that racial/ethnic status moderated the association between obesity and 12-month MDD. The results indicated that non-Hispanic white women who were obese had significantly higher odds of experiencing 12-month MDD compared with black, Latina, and Asian women. We also observed an interesting variation in the relationship between obesity and depression across racial/ethnic groups. The association was stronger among non-Hispanic

Table 3. Results from logistic regression of obesity on 12-month MDD by race/ethnicity among women and men in the Comprehensive Psychiatric Epidemiology Surveys

Variables	*Women (n=9,340) AOR (95% CI)*	*Men (n=7,110) AOR (95% CI)*
Non-Hispanic white	Ref.	Ref.
Black	0.78 (0.62, 0.98)	0.79 (0.57, 1.12)
Latino	0.95 (0.73, 1.23)	0.90 (0.64, 1.27)
Asian	0.48 (0.32, 0.70)	0.73 (0.51, 1.04)
Obesity * white	1.73 (1.27, 2.35)	1.15 (0.81, 1.65)
Obesity * black	1.24 (0.95, 1.62)	1.07 (0.65, 1.76)
Obesity * Latino	1.17 (0.82, 1.68)	1.10 (0.67, 1.84)
Obesity * Asian	1.42 (0.64, 3.14)	0.64 (0.20, 2.03)
Age	0.97 (0.97, 0.98)	0.98 (0.98, 0.99)
Married or cohabiting	0.59 (0.50, 0.69)	0.66 (0.45, 0.95)
≥16 years of education	1.14 (0.94, 1.38)	0.85 (0.63, 1.15)
Employed	0.78 (0.63, 0.97)	0.51 (0.33, 0.80)
Current smoker	1.96 (1.53, 2.51)	2.01 (1.55, 2.62)

MDD = major depressive disorder

AOR = adjusted odds ratio

CI = confidence interval

Ref. = referent group

white women, such that significant interactions were present among non-Hispanic white and black, Latina, and Asian women. Our finding, in part, is consistent with another U.S. survey that suggested a borderline significant difference in the obesity-depression relationship between non-Hispanic white and nonwhite populations. However, unlike Simon and colleagues,[7] we were able to show a significant positive association between obesity and a specific mood disorder, and that the obesity-depression relationship significantly varied across racial/ethnic groups.

Although previous studies have documented a positive association between obesity and MDD among women regardless of race,[6,10] it is clear from our study that race moderates the association between obesity and MDD. Potential explanations for the divergent results may include differences in study design. The CPES is the first psychiatric epidemiologic survey that includes nationally representative samples of black Caribbean, English- and Spanish-speaking Latino, and Asian American populations.[27,28,37] The inherent racial/ethnic diversity present in the CPES may have allowed us to detect subtle and significant differences in the obesity-depression relationship among racial/ethnic groups.

In this study, it is not possible to determine the mechanisms that explain the elevated risk of 12-month MDD among non-Hispanic white women relative to nonwhite women. However, previous research has proposed various underlying pathways that link obesity to depression among women. Body dissatisfaction among obese people (especially among white women) may contribute to depression.[51–60] Alternatively, weight-based stigma or discrimination has been proposed as a mechanism that may result in an adverse mental health

Table 4. Results from logistic regression of obesity on 12-month MDD by race/ethnicity among U.S.-born and foreign-born women and men in the Comprehensive Psychiatric Epidemiology Surveys

Variables	*U.S.-born women (n=6,728) AOR (95% CI)*	*Foreign-born women (n=2,612) AOR (95% CI)*	*U.S.-born men (n=4,973) AOR (95% CI)*	*Foreign-born men (n=2,137) AOR (95% CI)*
Non-Hispanic white	Ref.	Ref.	Ref.	Ref.
Black	0.60 (0.47, 0.76)	1.01 (0.36, 2.81)	0.62 (0.43, 0.89)	0.89 (0.23, 3.47)
Latino	0.75 (0.51, 1.10)	0.92 (0.38, 2.19)	0.80 (0.50, 1.28)	1.43 (0.43, 4.70)
Asian	0.52 (0.27, 0.99)	0.36 (0.14, 0.87)	0.34 (0.11, 1.01)	1.29 (0.42, 3.97)
Obesity * white	1.62 (1.16, 2.27)	0.82 (0.16, 4.06)	1.04 (0.71, 1.52)	NE
Obesity * black	1.29 (1.01, 1.66)	0.26 (0.09, 0.70)	1.04 (0.62, 1.76)	1.96 (0.35, 10.89)
Obesity * Latino	1.28 (0.71, 2.31)	0.96 (0.61, 1.53)	0.93 (0.37, 2.36)	1.38 (0.47, 4.08)
Obesity * Asian	2.02 (0.69, 5.92)	0.50 (0.11, 2.33)	1.93 (0.45, 8.28)	NE
Age	0.97 (0.97, 0.98)	0.98 (0.97, 0.99)	0.98 (0.97, 0.99)	0.99 (0.97, 1.01)
Married or cohabiting	0.51 (0.43, 0.61)	0.58 (0.36, 0.94)	0.56 (0.38, 0.84)	0.32 (0.17, 0.60)
≥16 years of education	1.16 (0.93, 1.44)	1.04 (0.62, 1.75)	0.89 (0.66, 1.21)	0.94 (0.54, 1.63)
Employed	0.77 (0.60, 0.98)	0.73 (0.47, 1.12)	0.55 (0.35, 0.87)	0.51 (0.29, 0.88)
Current smoking	1.87 (1.47, 2.38)	2.30 (1.30, 4.05)	1.93 (1.45, 2.58)	2.35 (1.32, 4.17)

MDD = major depressive disorder

AOR = adjusted odds ratio

CI = confidence interval

Ref. = referent group

NE = not estimable

outcome.[61–65] Specifically, perceived weight discrimination has been found to be significantly associated with 12-month MDD.[63] Finally, obesity and depression may be linked through early-life adversity, such as childhood abuse, which is a causal factor in both obesity and depression among women.[66,67]

Among men, obesity was associated with an increased risk of 12-month MDD. However, the higher odds were not statistically significant. This result supports findings from another U.S. psychiatric epidemiology study that investigated the obesity-depression relationship.[9] Despite our findings, other studies suggest a significant positive association between obesity and 12-month MDD among obese men.[5,7] Considering that there were no statistically significant effects of the interaction between gender and obesity in the studies that found a positive significant obesity-depression relationship among men, we posit that the divergent results may be a function of differences in statistical power (due to the relatively low prevalence of depression among men across studies) rather than differences in the magnitude of the obesity-depression relationship.

We also found evidence that the obesity-depression association varied according to nativity. Our findings add to the literature and suggest that obesity is a significant risk factor for MDD only among native-born, non-Hispanic white women. This finding is interesting because there were no racial differences in the association between obesity and MDD among foreign-born women. A potential explanation as to why foreign-born individuals who are obese may not be at risk for MDD has been suggested by previous studies. A recent review article showed that foreign-born individuals in the U.S. have better health outcomes, over a range of physical conditions, than native-born Americans.[68]

Empirical evidence from previous studies supports this pattern. In the case of MDD, foreign-born black, Latina, and Asian women reported a lower prevalence of MDD compared with their native-born counterparts.[27,28,37] Upon arrival to the U.S., female immigrants were less likely to be obese (15%) than U.S.-born females (19%). These percentages, however, are marked by group differences. Specifically, foreign-born Latinas were four percentage points less likely to be obese than their native-born counterparts, and foreign-born black women were 10 percentage points less likely to be obese than their native-born counterparts.[69] Our findings provide evidence in support of the "healthy immigrant effect." This phenomenon is generally supported in the literature and suggests that upon arrival to the U.S., immigrants are healthier than their native-born counterparts but that over time, this health advantage disappears.[70]

The cross-sectional nature of our data precludes us from fully examining the healthy immigrant effect. However, there is ample evidence that shows selective immigration processes may explain why immigrants, upon arrival to the U.S., are in better health than their native-born counterparts. First, healthier immigrants are more likely to enter the country either by choice or due to the U.S. immigration screening process (Unpublished report. Jasso G, Massey DS, Rosenzweig MR, Smith JP. Immigrant health—selectivity and acculturation. Santa Monica (CA): RAND Corp.; 2004). Second, unhealthy immigrants may be more likely to return to their country of origin.[71] Finally, immigrants of higher socioeconomic status may be healthier, and may be more likely to remain in the U.S., while immigrants who are less healthy may be more likely to die prematurely.[69]

Limitations

The findings from this study should be interpreted in light of the following limitations. First, the use of cross-sectional data limited our ability to establish causal associations between obesity and MDD. Second, our analyses relied upon the World Mental Health Composite International Diagnostic Instrument to diagnose MDD. Although this diagnostic instrument has been validated in diverse community settings, we cannot rule out the possibility that the prevalence of MDD among nonwhite people may have been underestimated, especially if respondents expressed their problems in unique ways that were not identified by *DSM-IV*. This may be a particular issue, as culture can affect both the clinical presentation of specific psychiatric disorders and the ability to recall or report symptoms.[15,35]

Third, height and weight were assessed by self-report. Past methodological research suggests that self-reported height and weight are highly correlated with direct physical measurement,[72–74] but self-reported measurements tend to consistently underestimate weight and overestimate height.[73] We know of no evidence to suggest that underestimation of weight would affect the association between obesity and depression. Previous studies that suggest an association between obesity and depression have included self-report[3–7,9,10] and actual measurements of height and weight.[9,75,76]

Fourth, our analyses did not consider the potential influence of previous depressive episodes on weight. Depression can be a chronic disease with remission, relapse, and recurrence.[77,78] However, misclassification of depression would be expected to lessen or obscure the association between obesity and depression.[19] Fifth, our analysis did not include assessments of psychotropic medication use. Medication used to manage depressive

or anxiety disorders may result in weight gain.[79] However, the prevalence of psychotropic medication use is more prevalent among non-Hispanic white people than among black and Latino populations.[80] This suggests that psychotropic medication use would be expected to blunt the obesity-depression relationship among non-Hispanic white people.

CONCLUSIONS

Our findings complement findings from other U.S.-based psychiatric epidemiology studies that indicate that obesity is a significant risk factor for 12-month MDD among women.[9] We add to this literature by suggesting that both race and nativity status moderate the obesity-depression relationship. Given the dramatic increase in obesity among the general population, and the high prevalence of obesity among certain racial/ethnic groups, our study's findings highlight the importance of interventions that not only address weight maintenance and reduction strategies, but also address the effects of MDD among obese women.

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