Published in final edited form as:
J Behav Med. 2012 April ; 35(2): 149–154. doi:10.1007/s10865-011-9340-x.

The association between major depressive disorder and obesity in US adolescents: results from the 2001–2004 National Health and Nutrition Examination Survey

Alison K. Merikangas,
Department of Epidemiology and Biostatistics, The George Washington University School of Public Health and Health Services, Ross Hall, 2300 Eye Street NW, Washington, DC 20037, USA

Pauline Mendola,
CDC National Center for Health Statistics, 3311 Toledo Road, Room 6126, Hyattsville, MD 20782, USA

Patricia N. Pastor,
CDC National Center for Health Statistics, 3311 Toledo Road, Room 6126, Hyattsville, MD 20782, USA

Cynthia A. Reuben, and
CDC National Center for Health Statistics, 3311 Toledo Road, Room 6126, Hyattsville, MD 20782, USA

Sean D. Cleary
Department of Epidemiology and Biostatistics, The George Washington University School of Public Health and Health Services, Ross Hall, 2300 Eye Street NW, Washington, DC 20037, USA

Pauline Mendola: pim9@cdc.gov

Abstract

The association between major depressive disorder (MDD) and obesity was assessed in 4,150 US adolescents aged 12–19 years from the 2001–2004 National Health and Nutrition Examination Survey. Weight and height were measured by health professionals and MDD was based on a structured diagnostic interview. The prevalence of MDD in the past year among US adolescents was 3.2% and 16.8% of US adolescents were obese. After adjustment for sex, age, race/ethnicity and poverty, MDD was not significantly associated with obesity among adolescents overall (adjusted odds ratio (adjOR) = 1.6, 95% confidence interval (CI) = 0.9–2.9), but an increased odds of obesity was observed among males (adjOR = 2.7, 95% CI = 1.1–7.1) and non-Hispanic blacks (adjOR = 3.1, 95% CI = 1.1–8.3) with MDD. Future research on strategies that might reduce the risk of obesity in males and non-Hispanic black adolescents with MDD may be warranted.

Correspondence to: Pauline Mendola, pim9@cdc.gov.

Conflict of interest No conflict of interest declared.

Keywords

Obesity; Overweight; Depression; Adolescence; Epidemiology; NHANES

Introduction

There has been increasing awareness of the public health and individual impact of major depressive disorder since the release of the World Health Report (Mathers et al., 2004) that found depression was the leading cause of disability worldwide. The recurrence risk for depressive episodes is high (~60%), mortality risk is increased, and co-morbid psychological and chronic medical conditions are common (American Psychiatric Association, 1994). There is increasing evidence that depression emerges in late childhood and adolescence, and that early age at onset is associated with greater chronicity and severity (Merikangas et al., 2009). Even mild symptoms of depression in adolescents are associated with a range of chronic diseases including diabetes, asthma and heart disease (Tomfohr et al., 2008). Major depressive disorder represents the severe end of a spectrum of depressive disorders. Regardless of prevalence period or recall length, major depressive disorder is much less common (1–6%) than depressive symptoms (20–50%) in adolescents (Kessler et al., 2001).

The prevalence of obesity[1] (body mass index ≥95th percentile for age and sex) increased from 10.5% in 1988–1994 to 17.8% in 2005–2006 among US youth aged 12–19 years (National Center for Health Statistics, 2009). The complications of child and adolescent obesity are extensive and varied, including psychosocial, neurological, endocrine, cardiovascular, pulmonary, gastrointestinal, renal and musculoskeletal domains, and many of these risks persist into adulthood (Ludwig, 2007; Reilly et al., 2003).

Several recent comprehensive reviews and meta-analyses on the association between obesity and depression have yielded inconsistent results (Atlantis & Baker, 2008; Blaine, 2008; de Wit et al., 2010; Luppino et al., 2010; Scott et al., 2008). Overall, the literature on adults suggests that obesity[2] is weakly associated with major depression. Findings appear stronger in US studies, with two nationally-representative surveys of adults reporting significantly elevated risk for major depression associated with obesity (Petry et al., 2008; Simon et al., 2006). Although the cross-sectional nature of these studies precludes inferences regarding directionality of the association, the few prospective studies reveal that depression is more likely to elevate the risk of subsequent obesity than the converse (Blaine, 2008; Hasler et al., 2005; Luppino et al., 2010). The recent results of the US CARDIA study confirm that depression precipitates weight gain (Needham et al., 2010). The largest meta-analysis of adult international population-based cross-sectional studies (de Wit et al., 2010) also concluded that there is a moderate association between depression and obesity, particularly in women.

[1]The 95th percentile of body mass index for age and sex is described interchangeably in the literature as “obese” and “overweight” for children and adolescents. We have chosen to use the terminology “obesity” as defined by the Centers for Disease Control and Prevention (CDC) (http://www.cdc.gov/obesity/childhood/defining.html).

[2]The standard definition for obesity in adults is a body mass index ≥30.

While many clinical and community studies have observed associations between obesity and depression in adolescents or subgroups of adolescents (Anderson et al., 2006; BeLue et al., 2009; Goodman & Whitaker, 2002; Mustillo et al., 2003), this is not uniformly the case (Wardle et al., 2006). A recent meta-analysis of prospective studies revealed that the association between obesity and depression is greater in adolescents, particularly females (Blaine, 2008). In a cross-sectional analysis, the National Longitudinal Study of Adolescent Health (Add Health) found no association between weight and depressive symptoms among girls, but did find associations among boys that varied by ethnicity (Frisco et al., 2009). Greater rates of depressive symptoms were reported by Hispanic and non-Hispanic black normal weight, but not overweight boys. Perhaps more significant, however, is the finding that boys and African-American youth tend to underestimate their weight relative to girls and to white youth (Martin et al., 2009) suggesting that studies of measured height and weight may decrease bias.

The conflicting findings from previous research are related to both sociodemographic characteristics of the samples as well as to methodologic differences in assessment of depression and weight. Measures of weight ranged from self reports of perceived overweight to self-reported body mass index to measures of waist circumference and body mass index by a health professional. Likewise, assessment of depression varies from self-reported checklists of depressive symptoms to cross-sectional diagnoses of major depression elicited by structured interviews and Diagnostic and Statistical Manual of Mental Disorders-IV major depressive disorder assessed through structured diagnostic interviews. In terms of demographic correlates, gender differences appear to be more pronounced in studies that rely on self-reported weight (Ge et al., 2001). Although obesity and overweight have been associated with socioeconomic status and ethnicity in adults (Paeratakul et al., 2002) and children (Taveras et al., 2010), few previous studies have had sufficient samples across diverse ethnic subgroups to assess the association between obesity and depression by ethnicity and socioeconomic status. Given the public health significance of this issue, an assessment of the relation between major depressive disorder and obesity in American adolescents could help to clarify the nature of the co-morbidity as well as identify any potential impact of demographic characteristics that have been shown to be related to either obesity or depression, such as gender, age and poverty. Investigation of this association with reliable and valid measures of body mass index and major depressive disorder in a large, diverse sample could help to resolve some of the inconsistent findings from previous studies.

The present study estimates the prevalence of obesity in adolescents with and without major depressive disorder in the past year using nationally-representative data from the National Health and Nutrition Examination Survey (NHANES) which included direct professional measures of body mass index and major depressive disorder defined according to the Diagnostic and Statistical Manual of Mental Disorders-IV criteria. Potential modification of the association by sex, age and ethnic subgroups of the US was also examined.

Methods

The 2001–2004 NHANES includes interviews and medical examination of a nationally-representative sample of non-institutionalized US citizens. The NHANES is designed to assess the health of the US population and additional detail on the survey and exams can be found at: http://www.cdc.gov/nchs/nhanes.htm.

The sample available for this analysis includes a total of 4,659 adolescents aged 12–19 years who were oversampled in the NHANES 2001–2004 surveys. The response rate in this subsample was 86%, and no differences emerged between participants and non participants in the survey. All youth were evaluated in person in the Mobile Examination Centers. Adolescents were excluded from the analysis if they were pregnant (n = 102), missing data on depression (n = 364) or obesity (n = 43). This analysis is based on 4,150 youth with complete data on study variables (89% of the total examined sample and 76% of the screened sample).

The diagnosis of major depressive disorder in the past year was based on the National Institute of Mental Health (NIMH) Computerized Diagnostic Interview Schedule for Children, a structured diagnostic interview. The Computerized Diagnostic Interview Schedule for Children is equivalent to the NIMH-Diagnostic Interview Schedule for Children-IV and includes probes that address specific Diagnostic and Statistical Manual of Mental Disorders-IV diagnostic criteria (American Psychiatric Association, 1994; Shaffer et al., 2000). Depending on the age of the child, diagnostic information is obtained from the adolescent only (participants aged 16–19 years) or from both the adolescent and his or her parent (participants ages 12–15 years). The Computerized Diagnostic Interview Schedule for Children reduces error by automating the interview, with scoring algorithms that provide current and past-year diagnoses based on the youth-report, parent-report, or a combined report. Because parents and children provide unique information, responses from both parents and youth were used to classify major depressive disorder in this analysis (Costello et al., 1985; Jensen et al., 1999).

Obesity was based on clinical measurements and was defined as body mass index (kg/m^2) at the 95th percentile or above using the age- and sex-specific Centers for Disease Control and Prevention (CDC) 2000 Growth Charts (Ogden et al., 2002). Sex, age, race/ethnicity, and poverty-income ratio were selected for analysis a priori. Age was categorized in two groups (12–15 years and 16–19 years) to compare results for younger and older adolescents. Race/ethnicity was based upon NHANES parent or self-report and national estimates are available for Mexican–American, non-Hispanic white, and non-Hispanic black youth. During the study time period, NHANES oversampled Mexican–American and non-Hispanic black youth, so while all adolescents are included in analyses, no national estimates are possible for the smaller race/ethnicity subgroups. The poverty-income ratio was used to compare family income level for families of given size and composition to the poverty threshold established by the US Census Bureau. We analyzed three categories (<1.0, 1.0–1.9, and 2.0+) based on the distribution of the data with attention to those near or below the poverty level.

All NHANES participants completed informed consent/assent before participation. This project was designated exempt by the George Washington School of Public Health Institutional Review Board. We received restricted-use access to the Computerized Diagnostic Interview Schedule for Children data based on our approved application and data confidentiality agreement. Analyses were conducted in the Research Data Center at the National Center for Health Statistics.

SAS (version 9.1) and SUDAAN (version 9.0.1) were used to adjust for NHANES sampling weights and clustering. Descriptive statistics were calculated and chi-square tests conducted between each covariate and obesity and depression. Crude and adjusted logistic regression assessed the odds of obesity among adolescents with major depressive disorder compared to those without major depressive disorder given the prospective evidence that obesity is a consequence of depression, although we recognize that the relationship may be reciprocal. Interactions between major depressive disorder and each of the potential confounders were examined and stratified analyses were conducted by sex, age, race/ethnicity, and the poverty-income ratio to assess potential effect modification on the association between obesity and major depressive disorder.

Results

The prevalence of obesity was 16.8% among US adolescents aged 12–19 years (Table 1) and no significant variation in obesity was observed for gender, age or poverty. Non-Hispanic black adolescents had the highest rate of obesity (21.3%), followed by Mexican-Americans (18.8%) and non-Hispanic whites (16.2%). The prevalence of major depressive disorder in the past year was 3.2% among adolescents aged 12–19 years. The percent of female adolescents with a diagnosis of major depressive disorder (4.9%) was higher than the percent of males with major depressive disorder (1.7%). No significant variation in major depressive disorder was observed for age, race/ethnicity or poverty.

Among all adolescents, both the unadjusted and adjusted analyses resulted in a non-significant sixty percent increase in the odds of obesity associated with major depressive disorder (Table 2). None of the interactions tested were statistically significant, likely due to a lack of power to detect an interaction. However, the stratified analyses indicated that the odds of obesity were increased among male adolescents with major depressive disorder (adjusted Odds Ratio (adjOR) = 2.7, 95% Confidence Interval (CI) = 1.1–7.1) and among all non-Hispanic blacks with major depressive disorder (adjOR = 3.1, CI = 1.1–8.3). No significant differences were observed with respect to poverty or age.

Discussion

To our knowledge, this is the first study to examine the association between major depressive disorder and obesity in a nationally-representative group of US adolescents using clinically assessed height and weight and clinical diagnoses of major depressive disorder. In addition, the over-sampling of adolescents of ethnic subgroups enabled us to expand prior research based on smaller studies of US youth. In contrast to our expectations, we did not observe a significant association of obesity and major depressive disorder among all

adolescents. However, subgroup analyses revealed that there was an association between depression and obesity in boys and non-Hispanic black adolescents.

The increased odds of obesity among boys with major depressive disorder is consistent with the results of Mustillo et al. (2003) who demonstrated an association between depressive disorders and chronic obesity in boys, but not in girls, from age 9 to 16 years. However, Anderson et al. (2007) reported that depression among young females was associated with higher body mass index z-scores in adulthood. The low frequency of depressive disorder in young males in prior studies, as well as our own in which only 1.7% of boys had major depressive disorder, may be a factor in the lack of consistency across studies.

The significant positive association between obesity and depression among non-Hispanic black adolescents appears to be a novel finding. Consistent with our findings, African-American or non-Hispanic black youth are generally more likely to be overweight (Ogden et al., 2008) and less likely to be depressed (Roberts et al. 2006) than non-Hispanic white youth, but the increased odds of obesity among non-Hispanic black adolescents with major depressive disorder has not been previously reported. Stratification of the analysis by race/ethnicity within genders was not possible because of the small sample size. However, future studies of this intriguing question are warranted.

Somewhat surprisingly, we did not observe any significant variation in obesity prevalence by age or poverty status among the adolescents studied. This may in part be due to the small age range studied (12–19 years). While lower socio-economic status has been associated with poorer diet and lower physical activity in adolescence, the findings are not as consistent or strong as those for adults (Hanson & Chen, 2007).

Prior US nationally-representative investigations of depression and overweight or obesity in adolescents have relied on less rigorous measures. The 2003 National Survey of Children's Health, for example, used a single question about mood disorders to identify youth with depression, "Has a health professional ever told you that your child has a problem with depression or anxiety?" (BeLue et al. 2009). Further, many previous studies of adolescent depression and obesity have used height and weight as reported by parents or youth, introducing the possibility of greater measurement error and bias in these data (Akinbami & Ogden, 2009). A major strength of the current analysis is the use of clinically-measured height and weight to calculate body mass index. Self-reported weight is prone to error, particularly with a bias among adolescent girls who under-report their weight (Ge et al., 2001). The use of the Computerized Diagnostic Interview Schedule for Children, a detailed diagnostic survey instrument, to determine the diagnosis of major depressive disorder is an additional strength.

The cross-sectional design of the study is a limitation in that it does not allow us to determine causality; however, prospective research has consistently shown that depressive symptoms and disorders tend to precede the onset of weight gain and obesity (Blaine, 2008; Hasler et al., 2005; Luppino et al., 2010). The recent finding that depression preceded weight gain in a very large prospective study of US adults also supports a depression-to-obesity interpretation of this cross-sectional association (Needham et al., 2010). The nature

of this association is also complicated by the fact that appetite and weight change are symptoms of depression so the recurrence and chronicity of depression may be an important determinant of this association.

In summary, we found a significant association between major depressive disorder and obesity among males and among non-Hispanic black adolescents. Given the recent recommendation of the US Preventive Services Task Force for primary care physicians to screen adolescents for major depressive disorder, further exploration of the association between major depressive disorder and obesity for various subgroups of adolescents is warranted (US Preventive Services Task Force, 2009). An integrated approach including careful monitoring of depression and obesity among mental and physical health professionals may help to address and minimize the consequences of these important public health problems.

Acknowledgments

The authors are grateful for the valuable contributions of Lara Akinbami, MD, Debra Brody, PhD, Karen Davis, MA, and Diane Makuc, DrPH from NCHS; and Jianping He, MS from NIMH. This work was supported in part by the Centers for Disease Control and Prevention, National Center for Health Statistics.

References

Akinbami LJ, Ogden CL. Childhood overweight prevalence in the United States: The impact of parent-reported height and weight. Obesity. 2009; 17:1574–1580. [PubMed: 19629061]

American Psychiatric Association. Diagnostic and statistical manual of mental disorders DSM-IV. 4. Arlington, VA: American Psychiatric Association; 1994.

Anderson SE, Cohen P, Naumova EN, Jacques PF, Must A. Adolescent obesity and risk for subsequent major depressive disorder and anxiety disorder: prospective evidence. Psychosomatic Medicine. 2007; 69:740–747. [PubMed: 17942847]

Anderson SE, Cohen P, Naumova EN, Must A. Association of depression and anxiety disorders with weight change in a prospective community-based study of children followed up into adulthood. Archives of Pediatrics and Adolescent Medicine. 2006; 160:285–291. [PubMed: 16520448]

Atlantis E, Baker M. Obesity effects on depression: Systematic review of epidemiological studies. International Journal of Obesity. 2008; 32:881–891. [PubMed: 18414420]

BeLue R, Francis LA, Colaco B. Mental health problems and overweight in a nationally representative sample of adolescents: effects of race and ethnicity. Pediatrics. 2009; 123:697–702. [PubMed: 19171640]

Blaine B. Does depression cause obesity? A meta-analysis of longitudinal studies of depression and weight control. Journal of Health Psychology. 2008; 13:1190–1197. [PubMed: 18987092]

Costello EJ, Edelbrock CS, Costello AJ. Validity of the NIMH diagnostic interview schedule for children: A comparison between psychiatric and pediatric referrals. Journal of Abnormal Child Psychology. 1985; 13:579–595. [PubMed: 4078188]

de Wit L, Luppino F, van Straten A, Penninx B, Zitman F, Cuijpers P. Depression and obesity: A meta-analysis of community-based studies. Psychiatry Research. 2010; 178:230–235. [PubMed: 20462641]

Frisco ML, Houle JN, Martin MA. Adolescent weight and depressive symptoms: For whom is weight a burden? Social Science Quarterly. 2009; 90:1019–1038. [PubMed: 23585698]

Ge X, Elder GH, Regnerus M, Cox C. Pubertal transitions, perceptions of being overweight, and adolescents' psychological maladjustment: Gender and ethnic differences. Social Psychology Quarterly. 2001; 64:363–375.

Goodman E, Whitaker RC. A prospective study of the role of depression in the development and persistence of adolescent obesity. Pediatrics. 2002; 110:497–504. [PubMed: 12205250]

Hanson MD, Chen E. Socioeconomic status and health behaviors in adolescence: A review of the literature. Journal of Behavioral Medicine. 2007; 30:263–285. [PubMed: 17514418]

Hasler G, Pine DS, Kleinbaum DG, Gamma A, Luckenbaugh D, Ajdacic V, et al. Depressive symptoms during childhood and adult obesity: The Zurich Cohort Study. Molecular Psychiatry. 2005; 10:842–850. [PubMed: 15838533]

Jensen PS, Rubio-Stipec M, Canino G, Bird HR, Dulcan MK, Schwab-Stone ME, et al. Parent and child contributions to diagnosis of mental disorder: Are both informants always necessary? Journal of the American Academy of Child and Adolescent Psychiatry. 1999; 38:1569–1579. [PubMed: 10596258]

Kessler RC, Avenevoli S, Ries Merikangas K. Mood disorders in children and adolescents: An epidemiologic perspective. Biological Psychiatry. 2001; 49:1002–1014. [PubMed: 11430842]

Ludwig DS. Childhood obesity—the shape of things to come. New England Journal of Medicine. 2007; 357:2325–2327. [PubMed: 18057334]

Luppino FS, de Wit LM, Bouvy PF, Stijnen T, Cuijpers P, Penninx BW, et al. Overweight, obesity, and depression: A systematic review and meta-analysis of longitudinal studies. Archives of General Psychiatry. 2010; 67:220–229. [PubMed: 20194822]

Martin MA, Frisco ML, May AL. Gender and race/ethnic differences in inaccurate weight perceptions among U.S. adolescents. Women's Health Issues. 2009; 19:292–299. [PubMed: 19733799]

Mathers, C.; Fat, DM.; Boerma, JT. World Health Organization. The global burden of disease: 2004 update. Geneva, Switzerland: WHO Press; 2004.

Merikangas KR, Nakamura EF, Kessler RC. Epidemiology of mental disorders in children and adolescents. Dialogues in Clinical Neuroscience. 2009; 11:7–20. [PubMed: 19432384]

Mustillo S, Worthman C, Erkanli A, Keeler G, Angold A, Costello EJ. Obesity and psychiatric disorder: Developmental trajectories. Pediatrics. 2003; 111:851–859. [PubMed: 12671123]

National Center for Health Statistics. Health, United States, 2008 with special feature on the health of young adults. Hyattsville, MD: National Center for Health Statistics; 2009.

Needham BL, Epel ES, Adler NE, Kiefe C. Trajectories of change in obesity and symptoms of depression: The CARDIA study. American Journal of Public Health. 2010; 100:1040–1046. [PubMed: 20395582]

Ogden CL, Carroll MD, Flegal KM. High body mass index for age among US children and adolescents, 2003–2006. JAMA: The Journal of the American Medical Association. 2008; 299:2401–2405. [PubMed: 18505949]

Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among US children and adolescents, 1999–2000. JAMA: The Journal of the American Medical Association. 2002; 288:1728–1732. [PubMed: 12365956]

Paeratakul S, Lovejoy JC, Ryan DH, Bray GA. The relation of gender, race and socioeconomic status to obesity and obesity comorbidities in a sample of US adults. International Journal of Obesity and Related Metabolic Disorders. 2002; 26:1205–1210. [PubMed: 12187397]

Petry NM, Barry D, Pietrzak RH, Wagner JA. Overweight and obesity are associated with psychiatric disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. Psychosomatic Medicine. 2008; 70:288–297. [PubMed: 18378873]

Reilly JJ, Methven E, McDowell ZC, Hacking B, Alexander D, Stewart L, et al. Health consequences of obesity. Archives of Disease in Childhood. 2003; 88:748–752. [PubMed: 12937090]

Roberts RE, Roberts CR, Xing Y. Prevalence of youth-reported DSM-IV psychiatric disorders among African, European, and Mexican American adolescents. Journal of the American Academy of Child and Adolescent Psychiatry. 2006; 45:1329–1337. [PubMed: 17075355]

Scott KM, Bruffaerts R, Simon GE, Alonso J, Angermeyer M, de Girolamo G, et al. Obesity and mental disorders in the general population: Results from the world mental health surveys. International Journal of Obesity. 2008; 32:192–200. [PubMed: 17712309]

Shaffer D, Fisher P, Lucas CP, Dulcan MK, Schwab-Stone ME. NIMH Diagnostic Interview Schedule for Children Version IV (NIMH DISC-IV): Description, differences from previous versions, and reliability of some common diagnoses. Journal of the American Academy of Child and Adolescent Psychiatry. 2000; 39:28–38. [PubMed: 10638065]

Simon GE, Von Korff M, Saunders K, Miglioretti DL, Crane PK, van Belle G, et al. Association between obesity and psychiatric disorders in the US adult population. Archives of General Psychiatry. 2006; 63:824–830. [PubMed: 16818872]

Taveras EM, Gillman MW, Kleinman K, Rich-Edwards JW, Rifas-Shiman SL. Racial/ethnic differences in early-life risk factors for childhood obesity. Pediatrics. 2010; 125:686–695. [PubMed: 20194284]

Tomfohr LM, Martin TM, Miller GE. Symptoms of depression and impaired endothelial function in healthy adolescent women. Journal of Behavioral Medicine. 2008; 31:137–143. [PubMed: 18165894]

U.S. Preventive Services Task Force. Screening and treatment for major depressive disorder in children and adolescents: US Preventive Services Task Force Recommendation Statement. Pediatrics. 2009; 123:1223–1228. [PubMed: 19336383]

Wardle J, Williamson S, Johnson F, Edwards C. Depression in adolescent obesity: Cultural moderators of the association between obesity and depressive symptoms. International Journal of Obesity. 2006; 30:634–643. [PubMed: 16570093]

Table 1

Prevalence of obesity and major depressive disorder in the past year among adolescents aged 12–19 years: United States, 2001–2004

	n	Obesity			Major depressive disorder		
		%	SE	P value	%	SE	P value
Total	4,150	16.8	1.06		3.2	0.40	
Sex							
Males	2,147	18.0	1.21	0.16	1.7	0.43	< 0.001
Females	2,003	15.6	1.47		4.9	0.60	
Age							
12–15 years	2,124	16.8	1.39	0.97	3.3	0.63	0.80
16–19 years	2,026	16.9	1.33		3.1	0.52	
Race/ethnicity							
Mexican–American	1,273	18.8	1.22	< 0.01[a]	3.8	0.58	0.39[a]
Non-Hispanic Black	1,348	21.3	1.13		2.6	0.58	
Non-Hispanic White	1,212	16.2	1.45		3.0	0.57	
Poverty income ratio[b]							
< 1.0	1,411	18.4	1.49	0.39	3.3	0.57	0.91
1.0–1.9	1,039	17.0	1.78		3.5	0.74	
2.0+	1,700	16.0	1.35		3.1	0.61	

Obesity is defined as greater than or equal to the 95th percentile of the 2000 CDC growth chart by age and gender

[a] P value based on four race/ethnicity categories: Mexican–American, Non-Hispanic Black, Non-Hispanic White, and all other races including multiple races

[b] An index calculated by dividing family income by a poverty threshold specific to family size and composition

Table 2

Odds of obesity among adolescents aged 12–19 years with major depressive disorder in the past year compared to adolescents without major depressive disorder: United States, 2001–2004

	n	Unadjusted odds ratio (95% CI)	Adjusted[a] odds ratio (95% CI)
Total	4,150	1.5 (0.8–2.7)	1.6 (0.9–2.9)
Sex			
Males	2,147	**2.7 (1.0–7.0)**	**2.7 (1.1 – 7.1)**
Females	2,003	1.2 (0.6–2.5)	1.3 (0.6 – 2.7)
Age			
12–15 years	2,124	2.0 (0.9–4.5)	2.0 (0.9–4.6)
16–19 years	2,026	1.0 (0.4–2.9)	1.3 (0.5–3.3)
Race/ethnicity			
Mexican–American	1,273	1.7 (0.8–3.5)	1.7 (0.8–3.5)
Non-Hispanic Black	1,348	**3.2 (1.2–8.3)**	**3.1 (1.1–8.3)**
Non-Hispanic White	1,212	1.7 (0.7–3.9)	1.9 (0.8–4.3)
Poverty income ratio[b]			
< 1.0	1,411	1.4 (0.5–3.5)	1.4 (0.5–3.4)
1.0–1.9	1,039	1.1 (0.4–2.7)	1.1 (0.4–2.9)
2.0+	1,700	1.8 (0.8–4.4)	2.1 (0.9–5.0)

Obesity is defined as greater than or equal to the 95th percentile of the 2000 CDC growth chart by age and gender

95% CI 95% confidence interval

[a] Total adjusted for age, sex, race/ethnicity, and poverty income ratio; other models adjusted for the remaining control variables

[b] An index calculated by dividing family income by a poverty threshold specific to family size and composition Bold values indicate significant findings