Obesity Has Few Effects on Future Psychosocial Functioning of Adolescents

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Abstract

We reexamine the effects of obesity on a wide range (n=17) of indicators of functioning drawn from five broad domains: interpersonal problems, psychological problems, suicidal behaviors, academic performance, and psychiatric disorders. Evidence on this question is mixed. Data are analyzed from a large community sample of adolescents 11 – 17 at baseline (n=4175) who were followed up a year later (n=3,134). Using measured height and weight, overweight was defined as $95^{th} > BMI \geq 85^{th}$ percentile and obese as $BMI > 95^{th}$ percentile. At baseline, obesity was associated with increased odds only for any mood disorder and poor perceived mental health. For boys, there were no significant associations, but girls had higher odds of problems at school, poor perceived mental health, and mood disorders. Results from the two-wave cohort reveal obesity increased future risk only for poor perceived mental health. For boys, the same pattern was observed, but for girls there were no significant associations. Overall, we found that weight status had few deleterious effects on adolescent social functioning, in multivariate, prospective analyses. If there is an effect of obesity on functioning, it may operate through mediators such as body image.

Keywords

Mental health; obesity; adolescents

1. Introduction

Does obesity have deleterious consequences for the psychosocial functioning of adolescents? The answer to the question would seem to be straight forward, for a number of reasons.

Obesity is a significant public health problem because of the high prevalence of the condition (Odgen, et al., 2008), as well as the morbidity and mortality attributed to it (Must,

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et al., 1999; NHLBI, 1998) and the medical expenditures resulting from obesity-related conditions (Finkelstein, et al., 2004; Finkelstein, et al., 2009) The increasing prevalence of obesity has been noted in children as well (Ogden, et al., 2006). Although the most recent national obesity estimates for children indicate a plateau in the rates (Ogden, et al., 2008), the prevalence estimates still are much higher than the 5% prevalence target in Healthy People 2010. These prevalence estimates are greater in certain ethnic/racial groups (Latinos and Afro Americans), as well as in certain regions such as the South (Strauss and Pollack, 2001). As in adults, excess body weight in children is associated with increased morbidity and mortality as well as increased health care costs (Wang and Dietz, 2002). In Texas, the prevalence of child and adolescent overweight is similar to that reported in the U.S. (Hoelscher, et al., 2004).

Although obesity is a significant problem among U.S. adolescents (Odgen et al., 2008; Kumanyika et al., 2008), the etiology of obesity among children and adolescents remains poorly understood (Koplan, Liverman & Kraak, 2005; Kumanyika et al., 2008; Zametkin et al., 2004). The same can be said for the consequences of obesity for young people (Koplan, Liverman & Kraak, 2005; Kumanyika et al., 2008; Zametkin et al., 2004). Like most chronic conditions, obesity is clearly the result of the lifelong interaction of multiple risk and protective factors with exposure beginning in utero (Koplan, Liverman & Kraak, 2005; Kumanyika et al., 2008; Zametkin et al., 2004). In terms of the etiology of adolescent obesity, we now have considerable evidence for the role of behavioral determinants such as physical activity, sedentary lifestyles, and a high fat diet. We have considerable less data on the role of social and psychological factors in obesity. For example, the relation between psychiatric disorders and psychological distress and obesity is unclear, with mixed evidence thus far (Zametkin et al., 2004).

Historically, obesity has been a stigmatized condition with reports documenting social exclusion, occupational and educational discrimination, attributed to negative attitudes (Puhl & Brownell, 2001). The multiple, adverse social and interpersonal consequences of obesity have resulted in the widespread assumption that the obese suffer psychologically both as a direct consequence of social adversities and indirectly through negative "reflected appraisal" (Wardle et al., 2006). The most common mental health outcome examined in relation to obesity has been depression. Recent reviews of prospective studies of obesity and depression find no effect of obesity on subsequent depression among adolescents (see Luppino et al., 2010). Indeed, the reverse seems to be the case, e.g., depression appears to increase risk of obesity among adolescents (see Blaine, 2008).

Friedman and Brownell (1995), in their review of the literature on adults, found little evidence of an association between depression and obesity. They suggested that effect-modifiers, in particular gender, SES, and ethnicity, might be suppressing the true effect of obesity. Only one study of adolescents has directly tested this effect-modifier hypothesis. Using data for England, Wardle et al., (2006) found that in community samples of adolescents, regardless of gender, SES or ethnicity, depressive symptoms were not higher in the obese than in the non-obese.

A broad array of other outcomes also have been examined in relation to adolescent obesity, among them social isolation and marginalization, relational victimization, teasing and bullying, stigma, self-esteem, weight-related teasing, body image and body dissatisfaction, school performance, and social functioning. Data on the association of obesity with these types of outcomes thus far are rather limited and the results equivocal.

There are studies which report that obese adolescents are more isolated and marginalized (Strauss, 1985; Falkner et al., 2001; Strauss & Pollack, 2003) and experience more relational

victimization (Janssen et al., 2004; Pearce, Boergers & Prinstein, 2002) as well as more teasing and bullying (Neumark-Sztainer, Falkner et al., 2002; Janssen et al., 2004). There also is evidence that teachers stigmatize obese youths (Neumark-Sztainer, Harris & Story, 1999).

The evidence for the effect of obesity on self-esteem is mixed (French et al., 1995; Heskath, Wake & Waters, 2004; Strauss, 2000; Pesa, Syre & Jones, 2000). Some studies suggest that the effects of obesity on psychosocial functioning operate through body image, in particular body dissatisfaction (Crow et al., 2006; Holsen et al. 2001; Stice, 2001; Stice & Bearman, 2001; and Newmark-Sztainer et al., 2006) and weight-related teasing (Eisenberg et al., 2003; 2006; Haines et al., 2006; Neumark-Sztainer & Haines, 2004).

Two studies (Swallen et al., 2005; Pinhas-Hamiel et al., 2006) report that obesity is associated with worse general health and functioning, but not poor school and social functioning, or lower self-esteem and more depression.

Much of the data has emanated from cross-sectional school and community surveys, or from clinical settings (see Haines & Neumark-Sztainer, 2009; Heinberg & Thompson, 2009; Ringham, Levine & Marcus, 2009). Thus, even when evidence is reported linking adolescent obesity to poorer psychosocial functioning, it is unclear what the temporal sequence is, precluding causal inference. In addition, the generalizeability of results is attenuated because the array of functioning problems examined in relation to obesity is limited in most studies.

Accordingly, our purpose here is to reexamine the psychosocial consequences of obesity among adolescents. To this end, we use data from a large sample (4,175) of adolescents 11–17 at baseline, a two wave cohort (3,134) of these youths followed up a year later, and a broad array of functional sequelae (n=17) drawn from five domains: interpersonal, psychological, academic, suicidal thoughts and attempts, and psychiatric disorders, including mood and anxiety disorders.

Given the paucity of epidemiologic studies of obesity and psychosocial functioning, the lack of consistent results across studies, and the paucity of prospective data, our purpose is to reexamine the question of the role of obesity in risk of psychosocial dysfunction among adolescents.

Our hypothesis is that, using prospective data and controlling for relevant covariates, there will be few negative sequelae of obesity in terms of psychosocial functioning. Our logic is derived from recent reviews which find no effects of obesity on future risk of depression. We extend this by analogy to other mental health outcomes.

2. Methods

2.1 Sample

The data are taken from the Teen Health 2000 Study (TH2K). The sample was selected from households in the Houston metropolitan area enrolled in two local health maintenance organizations. One youth, aged 11 to 17 years, was sampled from each eligible household, oversampling for ethnic minority households. Initial recruitment was by telephone contact with parents. A brief screener was administered on ethnic status of the sample youths and to confirm data on age and sex of youths. Every household with a child 11 to 17 years of age was eligible. Because there were proportionately fewer minority subscriber households, sample weights were developed and adjusted by poststratification to reflect the age, ethnic, and sex distribution of the 5-county Houston metropolitan area in 2000. The precision of

estimates are thereby improved and sample selection bias reduced to the extent that it is related to demographic composition (Andrews et al., 1973). Thus, the weighted estimates generalize to the population 11 to 17 years of age in a metropolitan area of 4.7 million people. Chi-square tests were used to compare ethnicity, sex, and age distributions between census data for the 5-country area and sample data. After the weighted procedure, no difference was identified between the 2 distributions with respect to the 3 demographic factors of age, sec, and ethnic group (P=0.99, P=0.93, P=0.99).

Data were collected on sample youths and one adult caregiver using computer-assisted personal interviews and self-administered questionnaires. The computerized interview contained the structured psychiatric interview (see below) and demographic data on the youths and the household, as well as queries about stress exposures. The interviews were conducted by trained, lay interviewers and took on average 1 to 2 hours, depending on the number of psychiatric problems present. The questionnaires contained questions on symptoms of sleep deprivation, insomnia and items assessing an array of risk and protective factors. These took about 30 minutes to complete. Interviews and questionnaires were completed with 4175 youths at baseline. Youths and caregivers were followed up approximately 12 months later. The two-wave cohort consisted of 3134 youths plus their caregivers. All youths and parents gave written informed consent prior to participation. All study forms and procedures were approved by the University of Texas Health Science Center Committee for Protection of Human Subjects. (For study details, see Roberts & Roberts, 2007).

2.2 Measures

2.2.1 Psychiatric disorders—Psychiatric disorders among youths were assessed with the Diagnostic Interview Schedule for Children, Version IV (DISC-IV), a highly structured instrument (Shaffer et al., 2000). Outcomes of interest included any anxiety disorders (agoraphobia, generalized anxiety, panic, social phobia, posttraumatic stress disorder), any mood disorders (major depression, dysthymia, mania, hypomania), major depression, any disruptive disorders (conduct, oppositional defiant), attention-deficit hyperactivity disorder (ADHD), alcohol use (alcohol abuse, alcohol dependence), marijuana use (marijuana abuse, marijuana dependence), and other substance use (other substance abuse or dependence).

2.2.2 BMI and weight status—Height and weight were measured using standard field procedures (Lohman, 1986). BMI is defined as weight in kg/squared height in meter (kg/m2). For those whose age was less than or equal to 20 years old, weight status was categorized as healthy weight – BMI <85th percentile, overweight – 95th>BMI 85th percentile and obese – BMI>95th percentile (CDC, 2006; Ogden et al., 2008).

2.2.3 Body Image—Body image is measured with two items used in Teen Health 2000. One item inquires whether youths perceive themselves as: (a) skinny; (b) somewhat skinny; (c) average weight; (d) somewhat overweight, or (e) overweight. The other inquires how satisfied youths are with their weight: (a) very dissatisfied; (b) somewhat dissatisfied; (c) neither; (d) somewhat satisfied; or (e) very satisfied. Youths who rate themselves as somewhat or overweight are scored as having poor body image. Those who rate themselves as somewhat or very dissatisfied also are scored as having poor body image.

2.2.4 Functioning problems—Four groups of functioning problems, including somatic problems, interpersonal problems, psychological problems, and academic problems, were measured using the National Institute of Mental Health Diagnostic Interview Schedule for Children, Version IV (DISC-IV) (Shaffer et al, 2000) and a self-administered questionnaires.

Somatic functioning, or physical health problems, was measured with three indicators, perceived health, limitations, and impact of illness, taken from the Child Health Questionnaire (Landgraf, Abetz & Ware, 1996). The first indicator was measured by asking youths to rate their health as excellent, very good, good, fair or poor. Fair or poor was coded as having health problems. The second indicator measured how difficult in the past 4 weeks had physical health problems made it to perform nine activities of daily living. Responses were not difficult, a little difficult, somewhat difficult, or very difficult. The score ranged from 0 to 27 (a=0.88). The third indicator assessed how often in the past four weeks health problems impacted six types of family activities. Responses were very often, fairly often, sometimes, almost never, and never. Scores ranged from 0–24 (a=0.87). The median was used as the cut point to categorize low and high levels of limitations and impact of illness.

Interpersonal functioning was measured by three items that inquired the extent of problems (a lot, some, only a few, no problems) experienced with friends or peers, at home with family members, and at school. A lot or some problems was coded as having problems.

Psychological problems were measured by 7 indicators including low life satisfaction, poor perceived mental health, low self-esteem, depressed mood, alcohol use, and other drug use. Youths were asked to rate their life satisfaction as very satisfied, pretty satisfied, about equal, pretty dissatisfied and very dissatisfied. About equal or pretty dissatisfied or very dissatisfied was coded as having low life satisfaction. The second indicator asked youths to rate their emotional or mental health as excellent, good, fair, poor and very poor. Fair or poor or very poor was coded as poor perceived mental health. The third indicator was measured using an eight item version of Rosenberg's (1965) self-esteem scale (a=0.77). Scores ranged from 0–32. The median was used as the cut point to categorize low and high levels of self esteem. Youths who responded yes to symptoms involving suicidal thoughts, plans or attempts in the past year were defined as cases.

Four remaining indicators (depression, alcohol use, other drugs use, and suicidality) were derived from the DISC-IV (Diagnostic Interview Schedule for Children, Version 4, Shaffer et al., 2000). Students with at least one of these disorders (mania, hypomania, major depression, and dysthymic disorder) in the past year were diagnosed as having depression. Alcohol use was measured by reports of consuming any alcohol in the past year. Drug use similarly was assessed by use of marijuana and any other substances in the past year.

Sleep disturbance was measured using DSM-IV symptom criteria (American Psychiatric Association, 1994). Four indicators of sleep disturbance are used here: short sleep on weeknights (6 hours), short sleep on weeknights and weekends (6 hours), nonrestorative sleep (rarely or never really rested when walking), and insomnia. Insomnia was defined as having at least one of the five insomnia items: having trouble falling asleep (DIS), waking up in the middle of the night and finding it hard to go back to sleep (DMS), waking up frequently but falling back to sleep (DMS), waking up very early almost every day (EMA), and rarely or never really rested when waking (NRS). The time referent was the past 4 weeks (see Roberts, Roberts & Chan, 2006; Roberts, Roberts & Duong, 2008).

Academic performance was also measured. Students were asked how well they had been doing in their school work during the past six months. Responses were better than average, average, somewhat below average, and below average. The latter two categories were scored as poor academic performance, or low grades.

We have published a number of papers using virtually all of these measures and have good evidence on their operating characteristics, including good evidence for their construct validity (see Roberts, Roberts & Chen, 2002; Roberts, Roberts & Duong, 2008; Roberts, Roberts & Duong, 2009).

2.3 Analyses

First, the relationship between weight status (healthy weight, overweight, and obese) and functioning at Wave 1 was examined separately, using crude odds ratios and then controlling for age, gender, and family income. Healthy weight group (BMI <85th percentile) was the referent. Results are presented overall and by gender. Second, weight status at Wave 1 was examined to predict functioning at Wave 2, first examining crude odds ratios and then controlling for age, gender, family income, and functioning at Wave 1. Again, results are presented overall and by gender.

The estimated odds ratios and their 95% confidence limits were calculated using survey logistic regression (Proc Surveylogistic) procedures in SAS V9.1 (SAS Institute, 2004) using Taylor series approximation to compute the standard error of the odds ratio. Lepkowski and Bowles (1996) have indicated that the difference in computing standard error between this method and other repeated replication methods such as the jackknife is very small.

3. RESULTS

For the overall sample at baseline, 16.5% were overweight (85th BMI > 95th) and 19.7% were obese. Thus, 36% were overweight or obese. The distribution of weight status is presented in Table 1. Younger youth were heavier, as were males, minority youths, and those from lower income families.

In Wave 1, being obese was associated with a significantly increased odds of only 2 of the 17 outcomes examined: poor perceived mental health and any mood disorder (Table 2A). Adjusting for age, gender and family income did not change these results (data not shown).

When we examined the effect of gender, there was no significant association between weight status and functioning in either crude or adjusted analyses for boys (data not shown). However, for girls, there was an association between being obese and worse perceived mental health and any mood disorder (Table 2B). Adjusting for age and family income, girls were at greater risk of problems at school, worse perceived mental health, and any mood disorders (Table 2C).

When we examined future risk of dysfunction for the obese for the overall sample (Table 3A), the obese were at greater risk of lower life satisfaction and worse perceived mental health. When we adjusted for gender, age and family income at baseline (Table 3B), the obese remained at greater risk for poor perceived mental health but were at decreased risk of other drug use.

Examining Wave 1-Wave 2 patterns by gender, there were increased odds of poor perceived mental health for the obese among boys, but decreased odds of other drug use and poor grades for the overweight (Table 3C). Adjusting for age and family income, the associations for poor perceived mental health and other drug use remained significant, but poor grades did not (data not shown). For girls, using crude odds there was increased risk of poor perceived mental health and depressed mood (Table 3D). However, after adjustment for age and family income, no associations with obesity were significant (data not shown).

4. DISCUSSION

Overall, we found that obesity had limited deleterious effects on psychosocial functioning of adolescents.

Using Wave 1 cross sectional data, there were only two of 17 measures of functioning associated with obesity or overweight – any mood disorder, and poor perceived health. For boys there were no negative effects observed. For girls, obesity increased risk of problems at school, poor perceived mental health, and any mood disorder. Multivariate analyses of obesity and future functioning revealed increased odds of poor perceived mental health, and decreased odds of other drug use. For boys, the only negative sequelea was poor perceived mental health. For girls, there were none.

We found no evidence that self-esteem was negatively impacted by obesity, nor was social functioning, academic performance or depression. In fact one is struck by the similarities rather than the differences between the obese and other adolescents in terms of functioning.

Most previous studies have been based on cross-sectional data. Thus, we first analyzed the data using only Wave 1 to assess cross-sectional association. We found that obesity was positively associated with poor perceived mental health and any mood disorder. For boys, there was no association and for girls, we found the same associations as in the overall sample, as well as problems at school. Thus, there was evidence using cross-sectional data for poor perceived mental health and depression, contrary to the results by Wardle et al. (2006) but consistent with those of Mustillo et al. (2003) and Boutelle et al. (2002).

Using prospective data, obesity increased risk only for poor perceived mental health. Since perceived mental health includes many components, including depression, this could be construed as consistent with risk for disturbed mood. This held for boys as well, but for girls baseline obesity did not increase risk for any outcome examined. Thus, we were not able to confirm the results by Boutelle et al. (2002) for increased future mental health risk for obese adolescent girls. Our findings are consistent with two recent meta-analyses of studies of adolescent obesity and depression which find no evidence for adolescents with weight problems being at increased risk of depression (Blaine, 2008; Luppino et al., 2010).

5. Limitations

Questions might arise about our sample design. We did not select a strictly area probability sample. In an attempt to compensate for this design effect, we post-stratified the TH2K sample using 2000 census data to approximate the age, gender and ethnic distribution of the 5-county metropolitan area in which all of our study households were located. We used the DISC-IV and DSM- IV diagnostic criteria. We would argue that comparability between our overall prevalence rates and other studies suggests evidence for external validity of our results and indicate that our sampling strategy did not yield atypical results. At this point, data from a US rural study (Angold et al., 2002) the island of Puerto Rico (Canino et al., 2004), and England (Ford, Goodman, & Meltzer, 2003) yield prevalence rates very similar to those from our sample (see Roberts, Roberts, & Xing, 2007b), both with and without adjustment for impairment. Elsewhere, we have reported that the 12-month prevalence and lifetime prevalence of suicide attempts in our baseline sample are highly comparable to those found in other studies (Roberts, Roberts & Xing, 2007a) again suggesting external validity for our data and no evidence that our sample is atypical in terms of its mental health.

Our initial response rate (66%) and our follow-up response rate (75%), while comparable to a number of other studies, still are lower than one would prefer and pose a potential risk for bias. The issue of the initial response rate was addressed above. We addressed the issue of bias in the follow-up study in two ways. First, we contrasted status factors for those in the baseline survey and those in the Wave 2 cohort, and found essentially no difference. Second, we then examined the prevalence of mental health problems in the base line study and in the Wave 2 cohort. Again, there were few differences. We further explored this issue, comparing prevalences between the 3,134 at baseline who also were in Wave 2 with those

1,041 who were not in Wave 2 (data not shown). There were few other differences. Thus, we would argue there is little evidence of bias due to attrition.

Sample size per se is problematic, given the relatively low base rates for some variables. The issue is power, or lack thereof. For example, increased odds ratios of 1.6, 1.9, and 2.1 are not statistically significant in some contrasts. Likewise, decreased odds ratios of .40 and .50 are not statistically significant in others. In absolute terms, none of these are trivial effect sizes. Part of the problem no doubt is due to truncated or attenuated rates of change in obesity between assessments. For example, 93.4% of healthy weight individuals at baseline remained so in Wave 2. Of those overweight at Wave 1, 55.8% were still overweight at Wave 2, 13.5% had become obese and 30.7% were healthy weight. At Wave 2, 78.6% were still obese but 16.8% dropped to overweight and 4.6% were healthy weight. Our two-wave cohort was 3,134. A larger cohort clearly would have yielded more significant results and changed our conclusion accordingly.

There is a broad range of constructs relating to the psychosocial impact of obesity (see Haines & Neumark-Sztainer, 2009; Ringham, Levine & Marcus, 2009). Most studies focus on only a few. Ours is no exception. Among those we did not examine are social isolation and marginalization, relational victimization, teasing and bullying, stigma, weight-related teasing as well as body image and body dissatisfaction.

6. Conclusion

Thus far, the evidence is at best mixed on the role of obesity in the social and psychological functioning of adolescents. Recent reviews document this (see Haines & Neumark-Stainer, 2009; Ringham, Levine & Marcus, 2009). As we noted in the introduction, these conclusions are based on relatively few studies and even fewer prospective studies. Using data from TH2K we reexamined this question cross-sectionally and prospectively. Echoing the extant literature, our results also were mixed. Multivariate analyses found little evidence overall that the obese were at increased risk for future social and psychological dysfunction.

The literature on obese children and adults has focused largely on depression (see Luppino et al., 2010; Blaine, 2008). We found no prospective association between obesity and depression, overall or by gender, as these recent reviews document, (see data on adolescents in the review by Luppino et al., 2010).

The etiology of social and psychological dysfunction is complex, the result of as yet poorly understood interactions between genes and environment. The same can be said for obesity. However, at this juncture evidence for the role of the latter in the etiology of the former suggests at best a minor role for obesity. There is very little consistency among studies and thus, little evidence on which to base, or even argue for, interventions which target obesity and psychosocial functioning. Our findings, based on a rigorous comprehensive reexamination, clearly find minimal mental health consequences for overweight or obese youths.

Given the paucity of studies in general, and of prospective studies in particular, there clearly is need for more studies of the association between obesity and psychosocial functioning among children and adolescents. Relatively few studies of children have been done and, given that both obesity and maladaptive psychosocial functioning have their origins in childhood, more studies of children are clearly warranted. Long term studies following children into adolescence and adulthood are in order. We also need studies with sample sizes large enough to examine the role of factors such as socioeconomic status, gender and ethnicity, as well as gradations of obesity, including community-based studies of the extremely or morbidly obese. If the findings summarized in recent meta-analyses on the

association between obesity and depression (Blaine, 2008; Luppino et al., 2010) generalize to maladaptive psychosocial functioning in general, then the focus of our research should shift to the role of psychosocial functioning on risk of future overweight and obesity among youths. Future research also would benefit from a grounded, well-articulated theory of the pathways linking obesity and social and behavioral sequelae. Until we have such theory-driven, methodologically rigorous studies, our understanding of the association between these major public health problems will remain unclear.

Acknowledgments

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Highlights

○   Prospective data on adolescents examine effects of obesity on functioning.

○   Only 2 of the 17 psychosocial outcomes examined were associated with obesity.

○   For boys, this same result was observed; for girls there were no effects for obesity.

○   Results provide little evidence for negative effects of obesity on adolescents.

Table 1

Distribution of Weight Status in Wave 1 Sample

Demographic factors	Prevalence (%, 95%CI)	
	At-risk of overweight or overweight BMI 85th	Overweight BMI 95th
Overall	38.99 (37.39–40.59)	20.79 (19.47–22.11)
Age		
12 or less	42.55 (39.40–45.69)	22.75 (20.14–25.36)
Between 13–15	39.78 (37.50–42.06)	20.84 (18.96–22.72)
16 +	34.20 (31.07–37.32)	18.72 (16.13–21.31)
p-value	p<0.001	p>0.05
Gender		
male	41.51 (39.25–43.78)	22.96 (21.02–24.89)
Female	36.34 (34.08–38.60)	18.51 (16.71–20.31)
p-value	p<0.01	p<0.01
Ethnicity		
Euro American	31.17 (28.76–33.57)	13.93 (12.14–15.71)
African American	44.35 (41.77–46.92)	25.01 (22.77–27.24)
Mexican/Hispanic	44.86 (41.74–47.99)	27.68 (24.87–30.48)
p-value	p<0.0001	p<0.0001
Family income		
< $35,000	46.68 (43.11–50.25)	26.26 (23.14–29.38)
$ 35,000 – $ 64,999	41.67 (39.02–44.32)	22.12 (19.90–24.35)
$65,000 +	31.92 (29.31–34.54)	16.13 (14.08–18.18)
p-value	p<0.0001	p<0.0001

Table 2A

Relations Between Weight Status and Functioning Problems (Wave 1).

Weight Status	Interpersonal Problems, W1				Psychological Problems, W1				
	OR, 95% C.I.				OR, 95% C.I.				
	Problems at Home	Problems with Peers	Problems at school	Low Life Satisfaction	Poor Perceived Mental Health	Depressed Mood	Alcohol Use	Other Drug Use	Low Self Esteem
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	0.89 (0.71–1.11)	0.90 (0.65–1.24)	1.00 (0.81–1.23)	0.91 (0.72–1.16)	0.93 (0.73–1.19)	1.12 (0.93–1.35)	0.88 (0.71–1.08)	0.90 (0.66–1.24)	0.97 (0.80–1.16)
Obese (BMI 95th)	1.09 (0.89–1.33)	1.29 (0.98–1.70)	1.03 (0.85–1.25)	1.16 (0.93–1.44)	1.36+ (1.09–1.69)	1.11 (0.93–1.32)	0.95 (0.78–1.16)	0.82 (0.60–1.13)	1.08 (0.91–1.29)

Weight Status	Suicide, W1			Academic Problems, W1	Disorders, W1			
	OR, 95% C.I.			OR, 95% C.I.	OR, 95% C.I.			
	Suicide Thought	Suicide Plan	Suicide Attempt	Poor Grades	Any Anxiety Disorder	Any Mood Disorder	DX 1+	DX 2+
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	1.02 (0.64–1.63)	1.12 (0.53–2.40)	1.65 (0.86–3.19)	0.94 (0.70–1.27)	0.90 (0.62–1.31)	1.38 (0.81–2.35)	0.89 (0.69–1.14)	0.72 (0.47–1.11)
Obese (BMI 95th)	0.74 (0.46–1.21)	0.88 (0.39–2.00)	0.51 (0.19–1.34)	1.13 (0.87–1.46)	1.27 (0.92–1.74)	1.78+ (1.11–2.87)	1.16 (0.93–1.46)	1.09 (0.74–1.59)

† Odds ratios are statistically significant (p<0.05).

Table 2B

Relations Between Weight Status and Functioning Problems in Girls (Wave 1).

| Weight Status | Interpersonal Problems, W1 | | | | Psychological Problems, W1 | | | | |
| | OR, 95% C.I. | | | | OR, 95% C.I. | | | | |
	Problems at Home	Problems with Peers	Problems at school	Low Life Satisfaction	Poor Perceived Mental Health	Depressed Mood	Alcohol Use	Other Drug Use	Low Self Esteem
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	1.07 (0.79–1.45)	0.91 (0.59–1.42)	1.21 (0.89–1.64)	0.92 (0.66–1.27)	1.00 (0.71–1.39)	1.20 (0.92–1.57)	0.82 (0.60–1.12)	0.90 (0.54–1.51)	0.89 (0.68–1.15)
Obese (BMI 95th)	1.14 (0.85–1.53)	1.30 (0.87–1.93)	1.40+ (1.05–1.87)	1.35 (0.99–1.83)	1.60+ (1.18–2.16)	1.25 (0.96–1.62)	0.85 (0.63–1.16)	1.00 (0.62–1.61)	0.91 (0.70–1.18)

| Weight Status | Suicide, W1 | | | Academic Problems, W1 | Disorders, W1 | | | |
| | OR, 95% C.I. | | | OR, 95% C.I. | OR, 95% C.I. | | | |
	Suicide Thought	Suicide Plan	Suicide Attempt	Poor Grades	Any Anxiety Disorder	Any Mood Disorder	DX 1+	DX 2+
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	0.79 (0.41–1.51)	0.50 (0.14–1.86)	1.14 (0.47–2.73)	1.18 (0.73–1.91)	0.82 (0.50–1.34)	1.02 (0.49–2.15)	0.83 (0.57–1.22)	0.83 (0.43–1.59)
Obese (BMI 95th)	0.74 (0.38–1.43)	1.06 (0.38–2.95)	0.83 (0.31–2.24)	1.55+ (1.04–2.32)	1.32 (0.88–1.97)	2.16+ (1.17–4.01)	1.39+ (1.00–1.93)	1.66 (0.96–2.87)

† Odds ratios are statistically significant (p<0.05).

Table 2C

Relations * Between Weight Status and Functioning Problems in Girls (Wave 1).

Weight Status	Interpersonal Problems, W1				Psychological Problems, W1					
	OR, 95% C.I.				OR, 95% C.I.					
	Problems at Home	Problems with Peers	Problems at school	Low Life Satisfaction	Poor Perceived Mental Health	Depressed Mood	Alcohol Use	Other Drug Use	Low Self Esteem
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	1.02 (0.74–1.41)	0.92 (0.58–1.45)	1.21 (0.88–1.66)	0.87 (0.62–1.23)	0.96 (0.67–1.36)	1.18 (0.88–1.57)	0.95 (0.66–1.38)	1.00 (0.58–1.72)	0.89 (0.68–1.17)
Obese (BMI 95th)	1.06 (0.77–1.46)	1.31 (0.87–1.98)	1.37+ (1.01–1.86)	1.27 (0.92–1.75)	1.62+ (1.17–2.24)	1.16 (0.87–1.55)	0.89 (0.61–1.30)	1.01 (0.59–1.70)	0.99 (0.75–1.30)

Weight Status	Suicide, W1			Academic Problems, W1	Disorders, W1			
	OR, 95% C.I.			OR, 95% C.I.	OR, 95% C.I.			
	Suicide Thought	Suicide Plan	Suicide Attempt	Poor Grades	Any Anxiety Disorder	Any Mood Disorder	DX 1+	DX 2+
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	0.81 (0.42–1.57)	0.51 (0.14–1.89)	1.20 (0.49–2.90)	1.20 (0.73–1.96)	0.71 (0.42–1.21)	1.02 (0.49–2.16)	0.79 (0.53–1.16)	0.81 (0.41–1.60)
Obese (BMI 95th)	0.67 (0.34–1.32)	0.90 (0.32–2.53)	0.72 (0.25–2.02)	1.44 (0.94–2.20)	1.13 (0.74–1.73)	2.12+ (1.14–3.95)	1.23 (0.87–1.75)	1.64 (0.93–2.89)

*
Adjusting for age and family income.

†
Odds ratios are statistically significant (p<0.05).

Table 3A

Relations Between Weight Status at Wave 1 and Functioning Problems at Wave 2.

Weight Status	Interpersonal Problems, W1			Psychological Problems, W1					
	OR, 95% C.I.			OR, 95% C.I.					
	Problems at Home	Problems with Peers	Problems at school	Low Life Satisfaction	Poor Perceived Mental Health	Depressed Mood	Alcohol Use	Other Drug Use	Low Self Esteem
Healthy Weight (BMI >85th)	1	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	1.00 (0.78–1.28)	1.10 (0.77–1.57)	1.05 (0.80–1.38)	0.99 (0.74–1.31)	1.07 (0.80–1.43)	1.02 (0.82–1.25)	0.76 (0.60–0.96)	0.66 (0.46–0.97)	0.91 (0.73–1.12)
Obese (BMI 95th)	1.13 (0.89–1.42)	1.13 (0.80–1.59)	1.06 (0.82–1.37)	1.32† (1.02–1.70)	1.66† (1.29–2.14)	1.15 (0.94–1.40)	0.88 (0.71–1.10)	0.82 (0.58–1.15)	1.09 (0.89–1.35)

Weight Status	Suicide, W1				Academic Problems, W1		Disorders, W1			
	OR, 95% C.I.				OR, 95% C.I.		OR, 95% C.I.			
	Suicide Thought	Suicide Plan	Suicide Attempt		Poor Grades	Any Anxiety Disorder	Any Mood Disorder	DX 1+	DX 2+	
Healthy Weight (BMI <85th)	1	1	1		1	1	1	1	1	
Overweight (95th>BMI 85th)	0.89 (0.47–1.70)	0.94 (0.35–2.54)	0.55 (0.15–1.96)		0.76 (0.53–1.08)	1.16 (0.69–1.96)	0.78 (0.34–1.80)	0.95 (0.70–1.31)	1.00 (0.56–1.79)	
Obese (BMI 95th)	1.35 (0.76–2.37)	1.92 (0.85–4.36)	1.42 (0.60–3.36)		1.17 (0.87–1.57)	0.89 (0.52–1.52)	1.43 (0.77–2.63)	0.85 (0.63–1.16)	1.35 (0.84–2.18)	

†Odds ratios are statistically significant (p<0.05).

Table 3B

Relations [*] Between Weight Status at Wave 1 and Functioning Problems at Wave 2.

Weight Status	Interpersonal Problems, W1			Psychological Problems, W1					
	OR, 95% C.I.			OR, 95% C.I.					
	Problems at Home	Problems with Peers	Problems at school	Low Life Satisfaction	Poor Perceived Mental Health	Depressed Mood	Alcohol Use	Other Drug Use	Low Self Esteem
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	0.95 (0.72–1.25)	1.11 (0.75–1.64)	1.02 (0.76–1.37)	1.05 (0.77–1.43)	1.06 (0.76–1.47)	1.00 (0.80–1.25)	0.88 (0.65–1.18)	0.63+ (0.40–0.97)	0.92 (0.73–1.15)
Obese (BMI 95th)	0.99 (0.77–1.29)	1.08 (0.74–1.57)	1.04 (0.79–1.38)	1.30 (0.98–1.74)	1.45+ (1.10–1.92)	1.11 (0.90–1.38)	0.93 (0.70–1.22)	0.82 (0.54–1.25)	1.04 (0.83–1.31)

Weight Status	Suicide, W1			Academic Problems, W1	Disorders, W1			
	OR, 95% C.I.			OR, 95% C.I.	OR, 95% C.I.			
	Suicide Thought	Suicide Plan	Suicide Attempt	Poor Grades	Any Anxiety Disorder	Any Mood Disorder	DX 1+	DX 2+
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	0.90 (0.44–1.85)	1.08 (0.39–2.99)	0.65 (0.18–2.40)	0.77 (0.52–1.15)	1.10 (0.64–1.92)	0.83 (0.37–1.89)	0.90 (0.65–1.25)	0.88 (0.46–1.69)
Obese (BMI 95th)	1.52 (0.79–2.91)	2.08 (0.83–5.18)	1.43 (0.51–3.99)	1.04 (0.75–1.44)	0.79 (0.44–1.40)	1.13 (0.60–2.13)	0.73 (0.52–1.03)	1.09 (0.64–1.84)

[*] Adjusting for Wave 1 values of functioning problems, age, gender and family income.

[†] Odds ratios are statistically significant (p<0.05).

Table 3C

Relations Between Weight Status at Wave 1 and Functioning Problems at Wave 2 in Boys.

Weight Status	Interpersonal Problems, W1 OR, 95% C.I.				Psychological Problems, W1 OR, 95% C.I.				
	Problems at Home	Problems with Peers	Problems at school	Low Life Satisfaction	Poor Perceived Mental Health	Depressed Mood	Alcohol Use	Other Drug Use	Low Self Esteem
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	0.76 (0.52–1.11)	0.93 (0.53–1.64)	0.91 (0.62–1.32)	1.15 (0.76–1.73)	0.90 (0.58–1.40)	0.87 (0.65–1.17)	0.80 (0.59–1.09)	0.62+ (0.39–0.99)	0.77 (0.57–1.04)
Obese (BMI 95th)	1.07 (0.77–1.49)	1.05 (0.63–1.75)	0.96 (0.67–1.36)	1.40 (0.95–2.04)	1.69+ (1.17–2.43)	1.04 (0.79–1.36)	0.93 (0.69–1.23)	0.64+ (0.41–0.99)	0.97 (0.73–1.29)

Weight Status	Suicide, W1 OR, 95% C.I.			Academic Problems, W1 OR, 95% C.I.	Disorders, W1 OR, 95% C.I.			
	Suicide Thought	Suicide Plan	Suicide Attempt	Poor Grades	Any Anxiety Disorder	Any Mood Disorder	DX 1+	DX 2+
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	0.55 (0.15–1.96)	1.31 (0.22–7.86)	1.00 (0.18–5.55)	0.61+ (0.40–0.95)	0.90 (0.42–1.95)	1.14 (0.24–5.51)	0.76 (0.50–1.16)	0.85 (0.40–1.80)
Obese (BMI 95th)	1.34 (0.52–3.45)	2.67 (0.54–13.32)	0.79 (0.13–4.68)	0.99 (0.68–1.45)	0.79 (0.34–1.82)	2.72 (1.00–7.42)	0.67 (0.44–1.01)	1.11 (0.60–2.07)

[†]Odds ratios are statistically significant (p<0.05).

Table 3D

Relations Between Weight Status at Wave 1 and Functioning Problems at Wave 2 in Girls.

Weight Status	Interpersonal Problems, W1			Psychological Problems, W1					
	OR, 95% C.I.			OR, 95% C.I.					
	Problems at Home	Problems with Peers	Problems at school	Low Life Satisfaction	Poor Perceived Mental Health	Depressed Mood	Alcohol Use	Other Drug Use	Low Self Esteem
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	1.27 (0.90–1.78)	1.26 (0.79–2.02)	1.21 (0.81–1.81)	0.90 (0.61–1.33)	1.24 (0.84–1.84)	1.21 (0.89–1.63)	0.70 (0.49–1.00)	0.70 (0.36–1.34)	1.05 (0.77–1.43)
Obese (BMI 95th)	1.24 (0.89–1.72)	1.27 (0.80–2.02)	1.15 (0.78–1.70)	1.38 (0.97–1.95)	1.73+ (1.22–2.46)	1.35+ (1.01–1.82)	0.78 (0.55–1.09)	1.10 (0.65–1.87)	1.19 (0.88–1.62)

Weight Status	Suicide, W1			Academic Problems, W1	Disorders, W1			
	OR, 95% C.I.			OR, 95% C.I.	OR, 95% C.I.			
	Suicide Thought	Suicide Plan	Suicide Attempt	Poor Grades	Any Anxiety Disorder	Any Mood Disorder	DX 1+	DX 2+
Healthy Weight (BMI <85th)	1	1	1	1	1	1	1	1
Overweight (95th>BMI 85th)	1.12 (0.53–2.37)	0.87 (0.26–2.93)	0.37 (0.05–2.82)	0.98 (0.54–1.77)	1.43 (0.71–2.88)	0.70 (0.27–1.85)	1.24 (0.77–2.01)	1.24 (0.48–3.17)
Obese (BMI 95th)	1.50 (0.74–3.06)	1.91 (0.73–4.99)	1.97 (0.74–5.28)	1.39 (0.87–2.21)	1.04 (0.52–2.06)	1.10 (0.50–2.45)	1.13 (0.72–1.78)	1.70 (0.81–3.55)

†Odds ratios are statistically significant (p<0.05).