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Obesity, Overweightness, and Depressive Symptomology among American Indian Youth

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Abstract

Objectives—Despite evidence that American Indian adolescents are at a heightened risk of obesity/overweightness and experiencing depression, relative to other groups, there exists a dearth of studies that have examined the association between objective and perceptual measures of obesity and overweightness and depression with this understudied group. Our study represents one of the first studies to examine this association among American Indian youth.

Methods—Using a subsample of American Indian youth from Waves I and II of the National Longitudinal Study of Adolescent Health (a survey of schools and students in the United States, with Wave I collected in 1994 and Wave II collected in 1995), we explore this association. We examine three measures of weight: obesity, body mass index, and weight perception. We also consider gender specific models and a subsample of non-Hispanic whites, in order to assess race differences in the obesity and overweightness -depression relationship.

Results—Our findings reveal that neither of our objective measures of weight, obesity nor body mass index, are significant predictors of depressive symptoms for either American Indian or white youth. However, we find evidence that the subjective measure of weight perception is a significant predictor of depressive symptoms for white females, but not for American Indian females.

Conclusions—Our results contribute to past findings that measures of obesity/overweightness weight may be more important to white female's mental health than females from other racial groups, although additional research is warranted.

Keywords

Obesity and Overweightness; Depression; American Indian Mental Health; Racial Disparities in Health

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Ethical approval: For this type of study formal consent is not required. However, we did receive approval from our university's Institutional Review Board. See also the Add Health website for more information on the original collection of data from human subjects, including informed consent (<http://www.cpc.unc.edu/addhealth>).

According to several accounts, obesity is a significant health issues among Americans, with one estimate suggesting that 36.5% of American adults and 17% of U.S. youth are obese.^[1] Obesity has been defined as a major public health problem in the United States^[2] and globally^[3] because of its association with a number of adverse physical health consequences, including increased risk for heart disease, diabetes, hypertension, disability, and some cancers.^[4,5] While trends have stabilized in the past decade, adolescent obesity increased significantly in America between the 1960s and 2000 ^[6,7] and this increase has been particularly remarkable among American Indian youth who, as recently as the 1970s, were underweight compared to other racial groups.^[8] Concerns over obesity in the adolescent population is warranted given evidence of both short- and long-term physical health consequences of adolescent obesity^[9] and is particularly relevant for American Indian youth who already suffer from shorter lifespans and a heightened risk for experiencing myriad health problems/illnesses.^[61]

Although the physical health consequences of obesity and overweightness are well established, less research has examined the potential adverse psychosocial consequences of being overweight/obese, particularly among youth. ^[10,11] Of the studies that have examined the association between obesity and overweightness and psychosocial consequences, the results are equivocal. ^[12,13] One such consequence that has been examined is depression and depressive symptoms. Although a number of scholars have posited that being obese/overweight leads to depression, evidence supporting the association is mixed, with some studies finding support for a link ^[14–18], while others failed to find evidence of an association. ^[12] Further research into the obesity-depression association has found the relationship to be more nuanced and complex, with such factors as gender ^[11,19] and socioeconomic status ^[20] serving to condition the obesity/overweightness-depression link. Additionally, most of the prior work examining the association between obesity and depression has examined adults ^[21]—fewer studies have examined this association for adolescents, an important omission given that age may also moderate the obesity and overweightness -depression association. Finally, some evidence exists that body image, and one's self-perception of weight, is a more salient predictor of depression than objective measures of weight. ^[22,23]

One factor that has garnered more attention recently is race/ethnicity—extant evidence suggests that the prevalence rates of adolescent obesity differ significantly across various racial and ethnic groups. For example, one study reported that over 29% of African American, 17.5% of Hispanic and 14.5% of non-Hispanic white adolescent females were obese, with similar discrepancies found for adolescent males across racial and ethnic groups. ^[6] While the reasons for such differences in obesity rates across racial and ethnic groups are debated ^[24,25], few studies have examined the association between adolescent obesity and depression between and across racial/ethnic groups.^[13] Although a flurry of recent studies has begun to address this gap ^[13,24,25], one racial group that has largely been excluded in prior studies is American Indians (AIs). This omission is unfortunate, especially in light of evidence that AIs have the highest rates of obesity and overweight children and adolescents across all age groups ^[26] and that AIs experience higher prevalence rates of depression and suicide. ^[62]

The present study addresses this omission by exploring the association between obesity and overweightness and depressive symptoms among AIs, using longitudinal data collected from a nationally representative sample of students (National Longitudinal Study of Adolescent Health). We also examine the obesity and overweightness-depressive symptoms association between whites, in order to explore race differences in the strength of the association, as well as examining a select number of other correlates of depressive symptoms (in order to minimize concerns of spuriousness). We also examine the association between obesity and overweightness and depression by gender, because of past evidence that the association differs by gender, with females being more likely to manifest depressive symptoms when overweight/obese, relative to males [19,27,28].

Background

Explanations for why there is a relationship between obesity and overweightness and depression often emphasize the prejudicial treatment of overweight/obese youth by their peers. One such explanation suggests that being an obese or overweight youth triggers cues among peers, based on stereotypes, that such children are suitable targets for teasing, bullying, and victimizing [29]. Others have noted that overweight/obese youth experience negative affect as a result of the prejudicial and discriminatory treatment of them by others. [30] Factors such as peer isolation, media images and increasing conflict between youth and parents can also mediate the obesity and overweightness-depression relationships. [23]

Although some evidence exists that being overweight/obese is associated with depression, these studies have largely not examined the role that race/ethnicity may play in moderating this relationship. According to a recent review of variables associated with the obesity-depression relationship, out of eight studies that examined the possible role of race as a moderator, only two studies found that the obesity-depression link differed by race/ethnicity. [31] However, some recent research suggests that race does matter, albeit in more complex ways. For instance, although Lincoln and colleagues failed to find evidence that race predicted obesity with depression relative to normal weight without depression status, they did find that Blacks were more likely (than non-Hispanic whites and Caribbean Blacks) to be overweight/obese without depression. [13] These authors speculate that racial minorities and the poor, groups who have been documented to experience chronic strains and stresses, may engage in such unhealthy behaviors as eating energy-dense, low nutrient foods as a coping mechanism for managing such stress, which buffers the effects of stress on depression but also contributes to obesity/overweightness. [13] Additionally, some scholars have suggested that racial and ethnic minority communities may develop norms that are more accepting of relatively high body weights and hence, are less likely to stigmatize obese/overweight people. [32] And some evidence exists that support this thesis—researchers have found that among female adolescents, whites are more likely to see themselves as overweight, have low self esteem, and greater body dissatisfaction than their black counterparts. [33–35]

American Indians, Overweight/Obesity, and Depression

By several indicators, AI adolescents are at a heightened risk of being obese or overweight. In one study of students from South Dakota, 25.9% of AI children were found to be obese, compared to 16.3% of white children (ages 5–19.9 years of age).^[36] In another study of over twelve thousand school aged children across four states, it was found that AI youth were more than three times as likely to be obese than the overall U.S. average.^[26] Using the same data as the present study (i.e., Add Health), it was found that AI adolescents were 62% more likely to be obese than whites, controlling for family and community poverty.^[37] And in a small sample of urban AI adolescents, 43% of the boys and 39% of the girls were found to be overweight.^[38]

However, the obesity problem among AIs is a relatively new phenomenon. Indeed, prior to the 1970s, AI children were disproportionately *underweight* due to poor nutrition.^[8] It has only been in the past few decades that the problem of obesity and overweightness has emerged as health problems among AIs. There are a number of explanations for the relatively high rates of obesity and overweightness in AI youth, including recent exposure to westernized food, insufficient availability of healthy foods, lower socioeconomic levels, physical activity, and genetic factors.^[39] Additionally, a number of studies have found evidence that AI adolescents are at a heightened risk of engaging in binge eating.^[40,41] Consistent with the aforementioned statement about unhealthy diets potentially serving as a coping mechanism to manage stress, the evidence is clear that AI diets have changed to high-fat, high-sugar, calorie dense foods, and that such changes are associated with the rapid increases in AI overweight and obese prevalence rates occurred.^[42]

Finally, limited evidence also suggests that AIs are disproportionately affected by depression, relative to other racial and ethnic groups. For instance, one national epidemiological study found that AIs had the *highest* lifetime prevalence rates of lifetime major depressive disorder of any racial/ethnic group.^[43] Indeed, AIs have the much higher rates of suicide than the overall rate in the U.S.^[63] and given evidence of an association between depression, suicide ideation, and suicide, both generally^[64] and among AI youth^[63, 65], the consequences of higher rates of depression among AIs can be dire.

Despite the cumulative evidence documenting the problem of overweightness/obesity and depression among AIs, there have been relatively few studies exploring the psychosocial consequences of being obese or overweight for AI youth.^[8] These studies have failed to find evidence of an association between weight status and such psychosocial outcomes as suicidal ideation, self-esteem, or emotional eating among a sample of AI adolescents.^[44,39] Only one study that we found examined the association between weight and depression among a sample of urban AI adolescents; no significant differences in the average level of depressive mood were found between the overweight and non-overweight students.^[38]

Beyond the studies examining objective measures of overweightness/obesity/weight (such as BMI or a dichotomous measure of obesity), a few studies have attempted to examine the relationship between weight perception and depression, although none have involved AI youth. In both studies, it was found that weight perception was a significant predictor of depressive symptoms and anxiety/depression.^[45,46]

There exists some evidence that this argument extends to AI youth, although the evidence is mixed. For instance, in one study of students in Minnesota, AI females were less likely to be satisfied with their bodies relative to white females.^[40] However, other studies have found that AI girls were *more* satisfied with their body image than whites.^[47] Still others find no racial differences.^[48] However, we are aware of no published studies that have explicitly examined the salience of weight perception in predicting depression among AI youth.

Other explanations of obesity/overweightness and depressive symptomology

While illuminating, many prior studies of the association between obesity/overweightness and depression have not considered alternative explanations of depression. Such a strategy raises concerns about both spuriousness and omitted variable bias. In order to reduce such concerns, we consider two other possible correlates of depressive symptomology—exposure to social stressors and academic performance. Considerable evidence has found links between exposure to stressors/strains to both obesity/overweightness^[59] and depression^[60]. Additionally, there exists limited evidence that being overweight is associated with poorer academic performance^[57] and depression^[58].

In summary, there are a number of compelling factors that warrant an examination of the overweightness/obesity-depression relationship among a sample of AI youth. Our study seeks to contribute to our understanding of the salience of race in understanding the overweightness/obesity-depression association in the following ways: (1) we examine a sample of AI and white youth, derived from a national longitudinal sample of schools and students; (2) we employ a comparison group (white adolescents) in order to evaluate race differences in the role of overweightness/obesity (and other factors) in predicting depressive symptoms; (3) we consider other possible explanatory factors beyond overweightness/obesity to minimize concerns of spuriousness and omitted variable bias; (4) we employ longitudinal data, so that we can consider the direction of the relationship between obesity and depression; and (5) we consider subjective as well as objective measures of weight to evaluate the potential role that weight perceptions may have in depression among AI youth.

METHODS

This study analyzes data from Waves I and II of the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a nationally representative study of adolescents (7th–12th grade in 1994 when the study began; Wave II data was collected in 1995). The Add Health sample is representative of American schools with regards to region, urbanicity, school size, racial composition and school sector.^[49] Unfortunately, wave II intentionally excluded respondents who were in the 12th grade at wave I, resulting in attrition of approximately 25 percent of the original wave I respondents excluded from the wave II sample. For our AI sample (N=655), the respondents were chosen from the wave I in-home sample based on the following criteria: a) adolescents who indicated that their racial/ethnic identity was American Indian; b) adolescents who participated in both of the first two waves of the in-home interview and for whom a valid wave II sampling weight was available; and c) respondents who answered questions about depression at wave II. Missing values on independent variables were substituted using a regression estimation procedure in

STATA. We also examined a sample of non-Hispanic white respondents (N=6805), in order to make comparisons to the AI sample.¹

Measures

Dependent Variables—*Depressive symptoms* was a scale comprised of 19 items from the Center for Epidemiologic Studies Depression (CES-D) 20 item scale. Each item utilized a 4-point ordinal response measuring depressive symptoms, asking respondents to report the frequency of symptoms in the past week from never or rarely (0) to most of the time or all of the time (3). The questions include such items as “you felt that you were just as good as other people” and “you felt depressed” and “you thought your life had been a failure.” The resulting scale average of the sum across the 19 items exhibited high reliability ($\alpha=.86$).

Overweightness/obesity—In order to comprehensively explore the association between being overweight/obesity and depression, we examined three measures. First, Body mass index, or *BMI*, is a commonly used measure to capture weight, including overweightness/obesity (weight [lb.]/height [in.]² X 703). Next, we created a dummy measure of adolescent *obesity*, using body mass index (BMI) percentile curves that are published by the Centers for Disease Control that are age and sex-adjusted.^[50] Adolescents with a BMI more than 95th percentile (for that age and gender) are coded obese, with the rest of the respondents being coded not obese. Although this measure of obesity is not conceptually distinct from the continuous measure of BMI, it is not uncommon in studies of overweightness/obesity to use BMI and/or a dichotomous measure of obesity.^[19, 39] Finally, we included a subjective measure of *weight perception*, which is a measure of self-perceived weight, asking the respondent “how do you think of yourself in terms of weight?” with possible responses ranging from very underweight (1) to very overweight (5). We consider this measure to evaluate whether one’s self-image about weight is salient in predicting depression.

Controls—As mentioned above, in order to minimize concerns over spuriousness and omitted variable bias, we also employ a number of variables as controls, including three measures of exposure to stressors/strains—negative life events, educational strain, and school-based strain. Our count measure of negative life events is comprised of 15 items asking about past year experiences such as whether the respondent, friends, or family members attempted suicide (3 items); whether the respondent was unable to seek medical care when needed (1 item), was suspended or expelled from school (2 items), had a parent die (2 items), moved (1 item), was tested or received treatment for a sexually transmitted disease (1 item), was pregnant (1 item), witnessed or experienced a violent victimization (5 items) or experienced a significant injury (1 item). Our measure of educational strain measures whether the respondent had higher aspiration for attending college than his/her expectations of attending.^[51] Finally, our measure of school-based prejudice is composed of one item asking the respondent whether he/she felt students at the school are prejudiced.

¹Because our focus was on the association between measures of obesity/overweightness and depressive symptomology on an understudied group (AIs), we did not include people who self-reported other racial/ethnic backgrounds, including African Americans (n=4807 at Wave I) and Hispanic/Latinos (n=3525 at Wave I).

Additionally, the following demographic and individual controls were included: gender (1=female), age, family structure (whether or not the child resides in a two-parent family), parental education (whether at least one parent graduated from high school, college, or neither graduated from high school), and grade point average (as a measure of academic performance; GPA). GPA was captured by averaging the responses to four items asking the student to report her/his grades (1=D to 4=A) in the subject areas of math, English, history/social studies, and the sciences.

Analysis Strategy

Our analysis plan starts with an examination of the descriptive measures (Table 1) for each subsample (AIs and whites). In order to assess race differences, we conduct an adjusted Wald test for each variable in order to see if significant mean differences exist for whites versus AIs. Next, we examined race-specific models predicting depressive symptoms (Table 2). We consider three models for each racial group—a separate model for each of the three measures of overweightness/obesity (BMI, obesity, and weight perception). Based on these results, we also examine specific models (also Table 2) that controls for exposure to stressors. Finally, we also examine separate models by gender and race (Table 3) to explore potential differences for males and females in associations between predictors and depression. Past research has found clear gender differences in the risk of experiencing depressive symptoms associated with overweightness/obesity. [52,19]

Finally, to probe the findings of significant race and gender interactions, we used the postestimation command in STATA 13 for seemingly unrelated estimation [SUEST] and a Wald test to determine whether a coefficient varies significantly across the models. Although such a strategy results in a loss of efficiency (due to smaller sample sizes), it is a reasonable method to examine conditional associations. [53] Due to the unequal probability of sample selection in Add Health, all analyses were weighted to account for the Add Health design effects. [54]

RESULTS

Bivariate analyses of variables by race

Table 1 presents the descriptive statistics for both the AI and white subsamples. As one can adduce from this table, AI and white youth demonstrate a number of significant differences on the variables involved in the analysis, including the dependent variable. AI youth, on average, display significantly higher depressive symptoms than their white counterparts. However, we only find that one of the three measures of overweightness/obesity —BMI— differs significantly by race ($p<.05$), with AI youth scoring about one point higher on the BMI scales than white youth, on average. The other two measures, obesity and weight perception, failed to reach statistical significance, however. Beyond these core variables, AI youth also were found to experience more negative life events and school-based strains than white youth (on average), while being less likely to have a parent as a college graduate or be raised in a two parent family.

Multivariate predictors of depressive symptomology by race

Table 2 presents the results of the multivariate analyses predicting depressive symptoms for AI youth (columns 1–4) and white youth (columns 5–8). For AI youth, we find that the demographic characteristics that predict depressive symptoms are consistent with past findings examining other racial groups: gender, parental education, and grade point average are each significant predictors of depressive symptoms, in the expected direction. Females, on average, report more depressive symptoms than males, while being raised by a college graduate and performing better in school (i.e., higher grade point average) both serve as protective factors against experiencing depressive symptoms, holding all other factors constant.

We find a similar pattern of significant predictors for white youth: Being female is associated with more depressive symptoms, while being raised by a college graduate and performing well in school are each associated with fewer depressive symptoms. Additionally, age and being raised by a high school graduate (versus a parent who did not graduate from high school) were each found to be significant predictors of depressive symptoms, in the expected direction (older youth report more symptoms while being raised by a high school graduate is a protective factor).

Overall, we find no evidence that the objective measures of weight, obesity and BMI, are predictive of depressive symptoms, controlling for other basic demographic characteristics. Neither objective measure of weight is associated with depressive symptoms for either AI or white youth. However, we do find that the subjective measure of weight, weight perception, is a significant predictor of depressive symptoms for white youth (column 7), although it is not a significant predictor of the dependent variable for AI youth (column 3). For white youth, having the perception that you are overweight is associated with greater depressive symptoms (holding all other variables constant). However, once we control for exposure to stressors (column 8), we see that the strength of the association between weight perception and depressive symptoms is attenuated, although it remains statistically significant.

Despite the differences in the patterns of statistical significance across the two racial groups, our post estimation cross-hypotheses tests failed to find that the association between weight perception and depressive symptoms differs by race. Indeed, the results of the post estimation cross-hypotheses tests failed to find that any of the associations between the predictor and dependent variables differed by race.

Multivariate predictors of depressive symptomology by race and gender

Because prior evidence suggests that gender may moderate the overweightness/obesity-depression relationship, we conducted analyses probing this relationship for males and females of both races. The results of these analyses are reported in Table 3, with the results for AI youth presented first (columns 1–4), followed by the results for white youth (columns 5–8). We only report findings for the subjective measure, weight perception, because our analyses failed to find that the two objective measures of weight were associated with depressive symptoms. The most salient finding that is adduced from these results reported here is gender moderates the relationship between weight perception and depressive

symptoms, but only for whites. Using this standard, we find that weight perception is a significant predictor of depressive symptoms for white females. While having a self-perception that one is overweight is associated with more depressive symptoms for females, we find no significant association between weight perception and depressive symptoms for males of either racial group, or for AI females. And again, we find that if one controls for stress exposure (column 6), the strength of the association between weight perception and depressive symptoms is attenuated considerably. Indeed, the coefficient for weight perception is greatly attenuated for white females, although the association remains statistically significant.

Finally, the results of post-estimation cross-hypotheses tests again reveal few significant race differences in the strength of the coefficients. Indeed, we failed to find that the relationship between weight perception and depressive symptoms differed by race for females. Overall, these results suggest that neither gender nor race is an important moderator of this association.

DISCUSSION

The purpose of our study was to extend research that has examined the association between obesity/overweightness and depression to an understudied racial minority group--American Indians. Our findings suggest that while gender matters in understanding the relationship between overweightness/obesity and depressive symptoms for whites, such measures were not associated with depressive symptoms among AIs. However, results of our post estimation cross-hypotheses tests failed to provide evidence of race differences in the relationship between overweightness/obesity and depressive symptoms, which is consistent with some prior research findings that have failed to find evidence of race serving as a moderator.^[31] Our failure to detect significant race differences, especially when comparing white and AI females, may be due to sample size concerns; future studies with a larger sample of AI females may adduce findings contrary to those reported here.

While we failed to find evidence of an association between our measures of obesity/overweightness and depression, the lack of prior studies exploring the association between overweightness/obesity and depression among AI youth warranted our study. Indeed, our findings can be interpreted as consistent with the observations made years earlier:

The weak and inconsistent associations between overweight status and psychological and social concerns suggest greater acceptance of overweight persons in this culture, or at the least that being overweight has a limited impact on psychosocial health. ^[44(603)]

However, our failure to find an association between our measures of obesity/overweightness and depressive symptomology is inconsistent with some prior studies that have identified high rates of negative body image among AI female youth. ^[40,48,55] Clearly, more research, preferably with larger samples of AI youth, are needed to gain further clarity on the role that obesity/overweightness may play in the mental health of AI female youth.

While we failed to find evidence of an association between AI obesity/overweightness and depression, one provocative finding that we adduced from our results was that only our subjective measure of weight—weight perception—was found to be a significant predictor of depressive symptoms for white females. Prior research has revealed mixed support for the association between objective measures of obesity/overweightness, and our study is consistent with other research that has failed to find an association between objective measures (such as obesity and BMI) and depression.^[12] Our research demonstrates that for white female youth, one's self-perception of weight is a stronger predictor of depressive symptoms than either obesity or BMI. As noted in a review of studies of weight perception and psychological distress, "...depressive symptoms may be more common among the subgroup of obese adults who perceive themselves as overweight, rather than obese individuals who perceive themselves as having an acceptable weight."^[22(716)] While our study did not examine cross-interactions between our measure of obesity and weight perception, our findings regarding which measures were statistically significant predictors (weight perception) versus which were not (obesity, BMI) supports this notion that how one perceives themselves, even if it is a misperception (relative to objective measures) is more salient in understanding the role of adiposity in experiencing depressive symptoms. Our findings suggest that among white youth, efforts to support adolescents developing a positive body image may be fruitful in reducing depression, especially among females.²

Finally, it bears mentioning that in models for both AIs and whites, the inclusion of other stressors significantly attenuated the strength of the weight perception coefficient. As mentioned earlier, a limitation of many prior studies of the obesity-depression link was that other potent sources of depression, namely stress exposure, are not considered. Our research illustrates the importance of including such measures, although interpreting what role such stressors play in informing the weight-perception-depressive symptom relationship is a bit daunting. It is plausible that some other factor, such as socioeconomic status, is associated with both negative weight perception and stress exposure. We are unable to disentangle these relationships, but clearly more research examining the role that other stressors may play in clarifying the adiposity-depression association are warranted.

As is the case with all studies, readers should take note of some of the limitations of the present study. First, while the Add-Health data are a nationally representative sample of schools and students, there was no specific sample of AI schools and students specifically. Indeed, the sample of AI youth in this data are comprised of largely urban and suburban dwellers—there was not a single school chosen to participate in this study that was situated on a reservation or tribal lands. While this means that our sample excludes AI youth who live in such places, the majority of AIs actually do not live on reservations or tribal lands (78%)^[56], so our sample may be seen as reflective of the urban AI experience. Nonetheless, we cannot assess regional or tribal-related variation and what influence local/regional cultural factors may play conditioning the association between weight-perception and

²It should be noted that the weight perception coefficient (Column 1, Table 3) approaches statistical significance ($p=.057$) and that if the reader adopts a more liberal definition of statistical significance, one would find evidence that weight perception matters for AI females as well as white females in predicting depressive symptomology. Given the relatively small sample size of AI females included in these analyses ($n=322$) and the known association between sample size and p values, future studies may uncover stronger evidence that would support a finding of an association between AI female weight perception and depressive symptomology.

depressive symptoms. Additionally, our study is largely based on self-report data, and other means of collecting information on the respondents may produce different results. Finally, although our research employed longitudinal data, we cannot assume that prior experiences of negative affect (i.e., negative affect that occurred before Wave I and therefore was considered in the analyses) may have shaped our measure of weight perception. Thus, we know little about the possible reciprocal relationship between weight perception and depression and future research needs to explore this association over a longer period of time to assess this possible complexity. And as mentioned earlier, the data used in the current study were collected a number of years ago and the reader should consider the dated nature of the data when assessing the study's contributions. Nonetheless, the clear advantage of the Add-Health data is that is one of a few datasets that is representative of American schools with regards to region, urbanicity, school size, racial composition and school sector, that has an American Indian sample included, and is comprehensive in its coverage of relevant indicators of health and well-being. However, our strong hope is that future research can continue to explore the nexus between obesity/overweightness and depression across racial and ethnic groups, with more recent data.

Despite these limitations, our study provides support for past research that suggests that AI youth may not experience the same degree of stigma or distress from being obese/overweight (especially one's perceptions) as white youth. Indeed, this is consistent with prior studies that have failed to find a significant association between obesity and depressive symptoms among non-white samples.^[33–35] Given the relative dearth of studies examining subjective measures of overweightness/obesity and depression, our study should reinforce calls to explore the psychosocial consequences of negative body perceptions among adolescents of various racial and ethnic backgrounds, in order to evaluate whether subjective measures of body weight 'matter' across these groups.

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Table 1

Descriptive Characteristics for American Indians and Non-Hispanic White Adolescents (Standard Deviations in parentheses)

	American Indians (n=655)	Non-Hispanic Whites (n=6806)	Adjusted Wald Test
Depressive Symptoms	12.37 (.56)	10.11 (.15)	***
Female (=1)	.47 (.03)	.50 (.01)	
Age	14.95 (.17)	14.96 (.17)	
Parental Education			
<i>High School Graduate</i>	.58 (.03)	.53 (.01)	
<i>College Graduate</i>	.21 (.02)	.38 (.02)	***
Family Structure (1=two parent family)	.49 (.04)	.61 (.01)	**
Grade Point Average	2.63 (.05)	2.88 (.03)	***
Body Mass Index (BMI)	23.22 (.06)	22.06 (.12)	*
Obesity	.19 (.04)	.11 (.04)	
Weight perception	3.26 (.05)	3.18 (.01)	
Negative Life Events	1.60 (.10)	1.11 (.03)	***
School-based Strains	.14 (.06)	-.05 (.03)	**
School-based Prejudice	3.20 (.08)	3.27 (.05)	

Note: $p < .001 = ***$; $p < .01 = **$; $p < .05 = *$ based on Adjusted Wald Test.

Table 2

Linear regression models predicting depressive symptoms for American Indian and white adolescents (American Indians=655, Whites=6806; standard errors in parentheses)

	American Indians				Whites			
	1	2	3	4	5	6	7	8
Gender (female=1)	3.38** (.93)	3.38** (.89)	3.10** (.96)	2.34* (.95)	2.50** (.20)	2.51** (.21)	2.32** (.24)	2.13** (.20)
Age	.47 (.28)	.49 (.27)	.48 (.28)	.38 (.27)	.32** (.08)	.33** (.07)	.49** (.07)	.18* (.07)
<i>Parental Education</i>								
High School Graduate	-1.37 (1.21)	-1.38 (1.23)	-1.48 (1.20)	-2.10 (1.19)	-1.41** (.41)	-1.41** (.41)	-1.49** (.34)	-1.12** (.40)
College Graduate	-3.88** (1.13)	-3.95** (1.14)	-3.95** (1.10)	-4.18** (1.16)	-2.02** (.44)	-2.02** (.44)	-1.83** (.42)	-1.62** (.44)
Family Structure	-.87 (1.07)	-.82 (1.11)	-.91 (1.06)	.17 (1.04)	-1.01** (.25)	-1.02** (.25)	-.98** (.25)	-.33 (.26)
Grade point average	-1.74** (.49)	-1.76** (.49)	-1.73** (.48)	-1.06* (.51)	-1.90** (.16)	-1.89** (.16)	-2.15** (.14)	-1.12** (.14)
BMI	.05 (.09)				.02 (.03)			
Obesity		.15 (1.22)				.50 (.42)		
Weight Perception			.62 (.57)	.47 (.54)			.67** (.16)	.39* (.15)
<i>Stressors</i>								
Negative Life Events				1.36** (.27)				1.05** (.12)
School-based Strains				.92 (.47)				1.54** (.12)
School-based prejudice				-.15 (.34)				-.10 (.09)
Constant	9.22* (4.57)	10.06* (1.22)	8.39 (4.28)	7.02 (4.00)	11.28** (1.32)	11.44** (1.30)	7.91** (1.33)	8.98** (1.27)
R ²	.11	.11	.10	.18	.09	.09	.10	.19

Note: $p < .01$ = **; $p < .05$ = * (two-tailed tests)

Table 3

Linear regression models predicting depressive symptoms for adolescents, by race and gender (AI females=322; AI males=333; white females=3476; white males=3330; standard errors in parentheses)

	American Indians				Whites			
	Females		Males		Females		Males	
	1	2	3	4	5	6	7	8
Age	.18 (.43)	.05 (.42)	.70* (.28)	.61* (.29)	.23* (.09)	-.03 (.09)	.39** (.11)	.35** (.10)
<i>Parental Education</i>								
High School Graduate	-1.75 (1.70)	-2.58 (1.59)	-1.28 (1.51)	-1.64 (1.57)	-.26 (.62)	.32 (.60)	-2.55** (.54)	-2.53** (.54)
College Graduate	-4.20* (1.63)	-4.42** (1.60)	-3.81* (1.56)	-3.97* (1.58)	-.96 (.59)	-.30 (.59)	-2.99** (.60)	-2.91** (.60)
Family Structure	-.56 (1.44)	.49 (1.38)	-.96 (1.15)	.06 (1.22)	-1.31** (.39)	-.58 (.38)	-.74 (.39)	-.12 (.34)
Grade point average	-2.65** (.86)	-2.01* (.94)	-.80 (.55)	.004 (.55)	-2.28** (.26)	-1.43** (.24)	-1.53** (.18)	-.84** (.18)
Weight Perception	1.57 (.80)	1.33 (.84)	-.28 (.79)	-.28 (.75)	.95** (.19)	.65** (.17)	.16 (.26)	.13 (.24)
<i>Stressors</i>								
Negative Life Events		1.47** (.46)		1.19** (.32)		1.29** (.18)		.73** (.13)
School-based Strains		.76 (.66)		1.18* (.45)		1.51** (.17)		1.64** (.18)
School-based prejudice		-.33 (.61)		.11 (.43)		-.04 (.15)		-.13 (.11)
Constant	15.29* (6.86)	14.60* (6.06)	5.39 (4.83)	2.4 (5.19)	12.66** (1.60)	12.75** (1.61)	9.89** (1.87)	8.02** (1.72)
R ²	.10	.18	.10	.19	.09	.18	.08	.16

Note: $p < .01$ = **; $p < .05$ = * (two-tailed tests)