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THE ROLE OF RACE IN THE ASSOCIATION BETWEEN WEIGHT STATUS
AND RISK BEHAVIORS AMONG UNITED STATES ADOLESCENTS

By

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A Thesis Presented to

The Faculty of the Yale School of Public Health

Yale University

In Candidacy for the Degree of

Master of Public Health

2013

ABSTRACT

Objective: To evaluate whether race and ethnicity moderate the association between weight status and risk behaviors in a nationally-representative sample of adolescents.

Methods: The 2009 and 2011 Youth Risk Behavior Surveys were combined (N = 25,550), and used to compare substance use, risky sexual behaviors, and violent behaviors between healthy weight, overweight, and obese adolescents. In both overall and race-stratified samples, chi-square tests and logistic regression were used to determine associations between weight status and engagement in risk behaviors among White, Black, and Hispanic adolescents. These analyses were performed separately in males and females.

Results: Overweight and obese adolescents had a significantly higher prevalence of early cigarette, alcohol, and marijuana use when compared with their healthy weight peers among both males (p=0.004; p=0.004; p=0.045) and females (p=0.006; p<0.001; p<0.001). The same trend emerged for early initiation of sexual intercourse in males (p=0.016) and females (p<0.001) as well.

Males reported a higher prevalence of current weapon (p<0.001) or gun (p=0.019) carrying, and females showed elevated rates of current weapon carrying (p<0.001) or being in a physical fight (p<0.001). In race-stratified analyses these patterns were statistically significant largely among White adolescents, with overweight and obese Hispanic females trending towards this finding as well.

Conclusion: Overweight and obese adolescents may initiate risk behaviors earlier than their healthy weight peers as well as engage in violent behavior at higher rates. These trends vary by race, and appear most saliently among White youth. This work not only highlights early adolescence as a critical time to prevent health risk behaviors, but also the importance of considering gender, weight status, and race in prevention efforts and future research.

ACKNOWLEDGEMENTS

I would like to extend my sincere thanks to Dr. Mayur Desai and Dr. Marney White for their time, guidance, and support throughout this process. Your knowledge and commitment to my work has made this a rewarding learning experience, and I greatly appreciate your mentorship.

I would also like to thank my family and friends both within and outside of Yale School of Public Health. Your consistent support for my education and this research were paramount in their completion.

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INTRODUCTION

Adolescence is a time of increased risk-taking behavior for all youth. As adolescents' autonomy and connection to peers strengthens during this phase, participation in risk behaviors rises substantially as demonstrated consistently in ongoing studies such as the Youth Risk Behavior Surveillance System.¹ Despite this marked increase in the amount and intensity of risk behavior in all youth, research indicates that overweight and obese adolescents differ in their rates of drug and alcohol use, risky sexual behaviors, and violence when compared with healthy weight peers.

The relationships between weight status and risk behavior are complex. Cross-sectional research has illustrated associations between obesity and overweight and different aspects of cigarette, alcohol, and marijuana use.²⁻⁴ Furthermore, overweight and obese females have demonstrated increased engagement in specific sexual risk behaviors such as failure to use contraceptives or engaging with multiple or risky partners.⁵⁻⁷ Finally, overweight and obese males have been shown to be significantly more likely to carry weapons or fight than their healthy weight peers.²

Much of this extant research has focused on White or regional samples, with minimal investigation of the role of race and ethnicity. With the exception of a few studies that evaluate how race influences risky sexual behavior among females,^{5,7} we are unaware of any studies that comprehensively explore race as a moderator of the weight status and risk behavior relationship.

This is a critical gap in the field since race and ethnicity play several important roles in this association. Both the prevalence of overweight and obesity,⁸ as well as rates of engagement in risk behaviors differ significantly by race among adolescents.¹ Moreover, racial differences exist in adolescents' perceptions of and reactions to overweight and obesity.^{9,10} For example, while research demonstrates that youth of all races experience weight-related teasing, White

females are particularly bothered by this victimization which may lead to increased isolation and lower self-esteem.¹⁰⁻¹²

Therefore, the aim of this study is to examine associations between weight status and risk behaviors among a nationally-representative sample of high school students and to determine whether the relationships differ among White, Black, and Hispanic students. In the overall sample of adolescents, we hypothesize that associations will remain consistent with the previous literature which was largely conducted in less diverse and representative samples. However, we hypothesize that the relationships between weight status and risk behaviors will be strongest among White females in race-stratified analyses due to differential perspectives and impacts of weight status.

METHODS

Survey and participants

The Youth Risk Behavior Survey (YRBS) evaluates six categories of health risk behaviors, with the present study focusing on tobacco use, alcohol and other drug use, sexual, and violence behaviors. The Centers for Disease Control and Prevention (CDC) conduct this survey biennially in public and private high schools throughout all 50 states and the District of Columbia. Students in grades 9-12 complete the self-administered YRBS in a classroom setting.

The cluster sampling methodology of the YRBS is designed to oversample Black and Hispanic students, and has been described in detail previously.¹³ Due to this complex method, questionnaire respondents receive a weight based on their gender, race, and grade.¹³ This weighting system is scaled to United States population statistics to create a nationally-representative sample of high school students. The present study combined the results from the 2009 and 2011 surveys to increase precision as recommended by the CDC.¹⁴

Dependent variables

Students replied to questions that asked about initiation, past, and current involvement in risk behaviors. For example, the questionnaires asked “During your life, on how many days have you had at least one drink of alcohol” to assess *ever* drinking; “How old were you when you had your first drink of alcohol other than a few sips” to evaluate *initiation* of drinking; and “During the past 30 days, on how many days did you have at least one drink of alcohol” to measure *current* drinking.^{15,16}

A response of more than one day for *ever* or *current* questions indicated endorsement of the risk behavior, and a response of 12 years old or younger for the *initiation* questions designated early use. All dependent variables were dichotomized using these methods, and therefore data reported here represent the percentage of students who participated in the risk behavior.

The primary variables of interest in the present study included tobacco use, alcohol and other drug use, sexual behaviors that contribute to unintended pregnancy and sexually transmitted diseases, and violent behaviors. Specific questions examined include ever trying cigarette smoking, smoking a whole cigarette before age 13, current cigarette use, ever drinking alcohol, drinking alcohol before age 13, current alcohol use, ever using marijuana, using marijuana before age 13, current marijuana use, ever having sexual intercourse, having sexual intercourse before age 13, current engagement in sexual intercourse, drinking alcohol or using drugs before last sexual encounter, not using a condom during last sexual encounter, having sexual intercourse with more than four people in lifetime, current weapon or gun carrying, and engaging in a physical fight within the past year.

Independent variables

BMI values were calculated for each survey respondent based on self-reported height and weight (kg/m^2). The 2000 CDC growth charts were subsequently used to calculate BMI percentiles according to age and gender. BMI and BMI percentile values were unobtainable for subjects with missing or unreadable responses for height, weight, age, or gender.¹⁴ BMIs and BMI percentiles were set to missing for participants who provided biologically implausible responses as described by the CDC's Division of Nutrition, Physical Activity and Obesity.¹⁴

Respondents were then categorized into three BMI groups: healthy weight (5th–84th percentile), overweight (85th–94th percentile), and obese (≥ 95 th percentile). Underweight respondents (0–5th percentile) were excluded from further analysis. These categories follow the CDC weight definitions for children aged 2-19 years.¹⁷

To investigate the role of race and ethnicity, respondents were collapsed into three categories: White, Black, and Hispanic. The Hispanic group included a combination of respondents who indicated their ethnicity as either Hispanic/Latino or Multiple Race-Hispanic/Latino. Participants in other race categories including American Indian/Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, and Multiple-Non-Hispanic/Latino were excluded from further analysis. Additionally, the sample was limited to respondents 14 years of age or older to account for differences in risk-taking behavior and weight status between younger and older adolescents.²

Data analysis

The 2009, 2011, and combined YRBS samples were described according to age, grade, gender, race/ethnicity, and weight status. All additional analyses included only the combined sample. To further characterize respondents, the prevalence and 95% confidence intervals of

healthy weight, overweight, and obese adolescents were calculated for overall and gender-stratified samples of White, Black, and Hispanic youth.

Next, associations between weight status and participation in risk behavior were investigated for all dependent variables included in the study. Unadjusted relationships were assessed using χ^2 tests, and age-adjusted associations were evaluated using logistic regression. These analyses were conducted in both overall and race-stratified samples.

Additionally, all relationships were examined separately for females and males due to established differences in risk behavior between the sexes.¹⁸ Due to the exploratory nature of this hypothesis-generating study, no adjustments were made to account for multiple comparisons. All statistical analyses were performed with SAS 9.2.

RESULTS

Sample

After excluding those with BMI percentile, age, or race responses outside of the inclusion criteria, the final sample included 25,550 adolescents (Table 1). This sample included approximately one half females (48.0%) with considerable diversity in both race and ethnicity and weight status (Table 1). Among both overall and gender-stratified samples, White adolescents consistently reported a higher prevalence of healthy weight and lower prevalence of overweight and obesity when compared with Black and Hispanic youth (Table 2).

Substance use behaviors (Table 3)

Adolescents in the healthy weight, overweight, and obese categories were largely similar in prevalence for ever and current engagement in substance-related risk behaviors. The exceptions included ever smoking in both genders and current cigarette use in females. Overall, overweight and obese youth reported significantly higher odds of ever smoking a cigarette when

compared with their healthy weight peers. This finding was more pronounced among females, with only White and Black racial groups exhibiting the trend. Overweight (OR: 1.28, CI: 1.09-1.49) and obese (OR: 1.45, CI: 1.25-1.68) females also reported significantly increased odds for current cigarette use, but this result remained consistent across all racial categories.

When assessing early initiation of substance use behaviors, overweight and obese adolescents had a significantly higher prevalence of early cigarette, alcohol, and marijuana use when compared with their healthy weight peers. Among females, a dose-response relationship emerged such that obese adolescents had the highest prevalence of using cigarettes, alcohol, or marijuana before age 13, followed by overweight and then healthy weight youth. This increased early substance use among overweight and obese females was significant only among White youth, though similar trends appeared in Hispanic females as well.

Contrastingly, among males, unique trends emerged for White and Black adolescents. Overweight Black males reported increased early initiation of smoking cigarettes (OR: 1.81, CI: 1.09-2.99), drinking alcohol (OR: 1.30, CI: 0.91-1.85), and using marijuana (OR: 1.40, CI: 0.92-2.12) when compared with both healthy weight and obese counterparts. Alternatively, both overweight and obese White males showed elevated rates of early use for all substances when compared with healthy weight Whites. This trend was statistically significant for smoking cigarettes ($p=0.001$) and drinking alcohol ($p=0.009$) among White males.

Sexual risk behaviors (Table 4)

The prevalence of early initiation and current engagement in sexual intercourse differed based on weight status among males and females. Overall, overweight and obese adolescents reported greater odds of having sexual intercourse before age 13 in both genders. When

stratified by race, this finding was statistically significant only among White males ($p=0.016$), White females ($p<0.001$), and Hispanic females ($p=0.014$).

Engagement in sexual intercourse within the past 30 days showed a contrasting result with overweight and obese adolescents reporting decreased odds of this behavior in both genders. This relationship was statistically significant among only White males ($p=0.041$) and females ($p=0.014$), though Black and Hispanic males showed similar patterns as well.

For both of these behaviors – early and current engagement in sexual intercourse – Black adolescents reported higher prevalence when compared with White and Hispanic youth. This increased percentage remained constant across all weight categories, and was especially marked among males.

For all other sexual risk behaviors assessed, overweight and obese adolescents were similar to their healthy weight counterparts for both genders. The only exception was having sexual intercourse with more than four people, in which overweight (OR: 1.32, CI: 1.06-1.63) and obese (OR: 1.31, CI: 1.05-1.62) females reported greater odds when compared with healthy weight peers. This trend only appeared among Black females in the race-stratified analysis ($p=0.041$).

Violence behaviors (Table 5)

Among both males and females, overweight and obese adolescents reported increased participation in violence behaviors. Obese males reported significantly higher odds and overweight males reported increased odds of current weapon or gun carrying when compared with healthy weight males. When stratified by race, this strong dose-response relationship appeared only among White males with Black and Hispanic males demonstrating no distinct association between weight status and violent behavior.

Similar trends emerged among females with both overweight and obese girls reporting significantly elevated odds for current weapon carrying or being in a physical fight when compared with healthy weight females. The trend for overweight and obese females to show a higher prevalence of current weapon carrying appeared in all three racial categories, with statistically significant relationships among White ($p=0.002$) and Hispanic ($p=0.001$) females. Contrastingly, only overweight (OR: 1.36, CI: 1.10-1.68) and obese (OR: 1.56, CI: 1.19-2.05) White females reported greater odds of ever being in a physical fight.

DISCUSSION

The primary objective of this investigation was to explore whether race and ethnicity moderate the relationship between weight status and risk behaviors in a diverse sample of adolescents. To assess a broad range of risk behaviors with an adequate sample size, the 2009 and 2011 YRBS datasets were combined and utilized for the analysis. Evaluation of substance use, sexual, and violence behaviors among overall and race-stratified samples revealed important trends about the relationships between risk behaviors and gender, weight status, and race among adolescents.

Substance use behaviors

Overall, the most prominent trend was the increased odds of early initiation of risk behaviors among overweight and obese youth when compared with their healthy weight counterparts. With varying degrees of strength, this pattern emerged for all substance use behaviors among both males and females. Overweight and obese adolescents demonstrated significantly higher prevalence of smoking a whole cigarette, drinking alcohol, and using marijuana before age 13 when compared with healthy weight peers. This trend aligns with the few investigations that evaluate the longitudinal relationship between weight status and

substance use behaviors in which preliminary evidence suggests that substance use may precede weight gain.^{4,19}

Statistically significant elevations in early substance use among overweight and obese females occurred only among White youth, though Hispanic females demonstrated similar trends. Research consistently shows that White females report greater weight-related concerns and behaviors than their Black peers.^{20,21} Additionally, while females in general experience more weight-based teasing than males, White females tend to be more bothered by these encounters than Black females.^{12,22} Though not characterized to the same extent as Black-White differences, Hispanic females tend to report similar, if not higher, rates of body dissatisfaction and weight control behaviors when compared with Whites.^{21,23}

These weight-related issues may lead to low self-esteem, depression, and social isolation,^{10,11,22} and subsequently substance use a method to cope with these adverse experiences. Since weight-based teasing and stigma are especially prevalent among younger youth, early adolescence may be an especially vulnerable period for White and Hispanic females.²⁴ This emphasizes the need to promote healthy, supportive, and inclusive behaviors among early adolescents, with attention paid to the particular weight-related concerns of these females.

Though not as pronounced as the trends among females, overweight and obese White males and overweight Black males reported increased rates of early substance use as well when compared to their healthy weight peers. Notably, no pattern emerged among Hispanic males. This finding contributes to the varied research about weight-based perceptions and responses in adolescent males. White males have been shown to report increased levels of weight-based teasing,¹² but also decreased weight-related concerns and control behaviors in comparison to

Black males.²¹ Therefore, the implications of these findings are unclear and require further understanding of the correlates and consequences of excess weight in adolescent males.

Sexual risk behaviors

Similarly to the patterns found in substance use behaviors, overweight and obese adolescents reported significantly greater odds for early initiation of sexual intercourse among both genders. This association emerged despite overweight and obese adolescents reporting lower levels of current engagement in sexual intercourse when compared with healthy weight peers. In race-stratified analyses, this pattern occurred only among White males, and White and Hispanic females. Although these relationships have yet to be characterized in males, they correspond with previous research showing overweight Hispanic and White females to report higher rates of early sexual intercourse.⁵

Given that Black adolescents consistently report earlier sexual debut when compared with White or Hispanic youth, these trends highlight another potential at-risk population for this sexual risk behavior.²⁵⁻²⁷ One possible explanation for this finding involves the clustering of risk behaviors in early adolescence. A previous analysis of the Youth Risk Behavior Survey found correlations between early use of cigarettes and alcohol and early initiation of sexual intercourse.²⁶ Additional research on this co-occurrence of risk behaviors, along with the psychosocial predictors of early sexual activity such as peer norms or connectedness, is warranted in overweight and obese adolescents to further understand this relationship.^{27,28}

Assessment of additional sexual risk behaviors yielded one association: overweight and obese Black females reported significantly greater odds of having sexual intercourse with greater than four people in their lifetime. This result adds to currently mixed findings about race, weight, and sexual behavior. In separate investigations, both obese White females and Black

females who perceived themselves as overweight have been linked to increased engagement with multiple sexual partners.^{5,7}

These results likely reflect racial differences in perception and satisfaction with body size between White and Black females, with Black adolescents showing increased tolerance for larger body types both in general and in sexual partners.^{29,30} Furthermore, Black females and males show substantially higher prevalence of current engagement in sexual intercourse which may increase the probability of having multiple partners. These findings further highlight the need for targeted intervention and promotion activities among adolescents that account for the unique factors, including weight status, race and gender, which influence sexual behavior.

Violence behaviors

Overweight and obese youth additionally reported greater participation in violent behavior in contrast to healthy weight peers. These overall patterns were largely, though not exclusively, driven by White adolescents. Additionally, while these trends occurred in both males and females, males reported substantially higher prevalence of all violent behaviors when compared with females.

Previous research has detected similar cross-sectional associations between weight status and violent behavior in both genders, with relationships emerging most strongly among obese males.^{2,4} The present study both supports and strengthens this foundation. By uncovering race as a moderator of the relationship between weight status and violent behavior among males, and as a potential moderator in females, this study identifies several important areas for future research. Given that weight-based bullying is experienced at similar rates among overweight and obese adolescents of all races, future research should identify what mediates this relationship

among White youth, especially males.¹² Furthermore, it will be imperative to characterize the longitudinal relationship between weight status and violent behavior.

Strengths and limitations

This study holds many strengths to build upon previous research. Using a nationally-representative sample and combining two YRBS datasets provided sufficient sample size to explore risk behavior relationships among diverse adolescents. In addition, the YRBS questions adolescents about six categories of risk behaviors. This variety enabled us to assess a broad range of behaviors and associations.

There are several important limitations to address as well. The BMI variable calculated in this study was derived from self-reported data. While adolescents reliability self-report anthropomorphic measures, they tend to overestimate height and underestimate weight resulting in some error observed between self-reported and measured weights. However, at a population level, self-reported and measured weights are strongly correlated ($r = 0.89$), indicating the suitability of the data.³¹ Inaccurate self-report, however, varies by race with White adolescents being the most likely to over-report height when compared with Black and Hispanic youth.³¹ Though unavoidable due to the design and magnitude of the YRBS, this potential measurement error requires consideration.

In addition, the design of this investigation increased the risk for Type I error. In evaluating a broad range of risk behaviors, we conducted multiple comparisons thereby increasing the risk of falsely detecting positive associations. Also, the cross-sectional nature of this data limits the ability to assess the emerging notion that participation in risk behaviors may precede excess weight.^{4,19} Since the current study suggests that overweight and obese youth may be more likely to engage in risk behaviors at an early age, this represents an important area for

future research. Finally, the YRBS collects data only on adolescents enrolled and present at public and private high schools. As these high school students may differ systematically when compared with those not attending high school, this limits the generalizability of the findings.

Conclusion

This analysis fills a critical gap in the understanding of health risk behaviors among overweight and obese adolescents. It provides preliminary insights by illustrating increased levels of early substance use and sexual intercourse as well as elevated violent behaviors among overweight and obese youth. These trends, which tended to be driven by White adolescents, implicate the increased susceptibility and impact of weight-based victimization on this population (Table 6).

Moreover, the findings further support early adolescence as a critical time to prevent a range of health risk behaviors including substance abuse, sexual intercourse, unhealthy diets, and physical inactivity. Though important for all adolescents, specific consideration for the moderating role of race should be given during the design of these health promotion or intervention programs. Finally, as research moves forward in uncovering the complex and longitudinal relationships between weight status and risk behaviors, race needs to be considered as an important factor in both analysis and interpretation. In order to prevent the increasingly costly consequences of overweight and obesity on individuals and society, it will become imperative to expand on this basic understanding about the connections between race, weight, and risk behaviors.

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Table 1. Survey-weighted characteristics of participants in the 2009, 2011, and combined YRBS samples.^{a, b}

Characteristic	2009 YRBS Sample, n (%) n = 13,249	2011 YRBS sample, n (%) n = 12,301	Combined YRBS sample, n (%) n = 25,550
Age (years)^c	16.06 ± 0.03	16.03 ± 0.03	16.04 ± 0.02
Grade			
9th	3,213 (27.2)	2,936 (27.3)	6,149 (27.3)
10th	3,190 (26.3)	2,961 (25.8)	6,151 (26.1)
11th	3,417 (23.8)	3,348 (24.0)	6,765 (23.9)
12th	3,407 (22.6)	3,013 (22.8)	6,420 (22.7)
Sex			
Male	6,601 (52.8)	6,094 (48.8)	12,695 (52.0)
Female	6,648 (47.2)	6,207 (51.2)	12,855 (48.0)
Race/ethnicity			
White	6,424 (64.8)	5,721 (63.6)	12,145 (64.2)
Black	2,579 (15.5)	2,459 (15.0)	5,038 (15.3)
Hispanic	4,246 (19.8)	4,121 (21.3)	8,367 (20.5)
Weight status			
Healthy weight	9,177 (70.7)	8,555 (71.0)	17,732 (70.9)
Overweight	2,228 (16.0)	1,997 (15.6)	4,225 (15.8)
Obese	1,844 (13.3)	1,749 (13.4)	3,593 (13.3)

^a Percentages may not sum to 100% due to rounding.

^b All sample sizes are unweighted values. All means, standard errors, and percentages are weighted.

^c Values represent the mean age ± standard error.

Table 2. Prevalence of healthy weight (BMI 5th–84th percentile), overweight (BMI 85th–94th percentile), and obese adolescents (BMI ≥ 95th percentile) by race.^{a, b}

	Overall, % (95% CI) n = 25,550			Males, % (95% CI) n = 12,695			Females, % (95% CI) n = 12,855		
	Healthy weight	Overweight	Obese	Healthy weight	Overweight	Obese	Healthy weight	Overweight	Obese
White	74.2 (72.5-75.8)	14.2 (13.1-15.3)	11.6 (10.5-12.8)	70.1 (67.9-72.3)	14.6 (13.3-16.0)	15.2 (13.4-17.1)	78.7 (76.9-80.5)	13.7 (12.4-15.1)	7.6 (6.5-8.6)
Black	63.6 (61.6-65.6)	18.5 (16.8-20.2)	17.9 (16.6-19.2)	65.3 (62.1-68.4)	16.2 (14.3-18.1)	18.5 (16.5-20.6)	61.9 (59.1-64.8)	20.8 (18.3-23.2)	17.3 (14.8-19.8)
Hispanic	65.8 (64.0-67.6)	18.9 (17.6-20.1)	15.4 (14.3-16.5)	61.3 (59.1-63.5)	18.6 (17.2-20.1)	20.0 (18.3-21.8)	70.5 (68.4-72.7)	19.1 (17.5-20.7)	10.4 (9.4-11.4)

^a Percentages may not sum to 100% due to rounding.

^b CI indicates confidence interval.

Table 3. Prevalence and age-adjusted odds-ratios of substance use behaviors in healthy weight (BMI 5th–84th percentile), overweight (BMI 85th–94th percentile), and obese (BMI ≥ 95th percentile) adolescents by gender and race.^{a, b}

Weight	Overall		White		Black		Hispanic	
	Endorsed behavior,%	Age-adjusted OR (95% CI)	Endorsed behavior,%	Age-adjusted OR (95% CI)	Endorsed behavior,%	Age-adjusted OR (95% CI)	Endorsed behavior,%	Age-adjusted OR (95% CI)
MALES								
<i>Ever tried cigarette smoking</i>								
Healthy weight	43.30	1.00	44.40	1.00	39.83	1.00	52.95	1.00
Overweight	47.63	1.15 (1.03-1.30) ^b	46.20	1.13 (0.95-1.35)	47.18	1.39 (1.04-1.86) ^b	51.68	0.98 (0.78-1.23)
Obese	49.24	1.17 (1.02-1.33) ^b	48.16	1.14 (0.95-1.37)	43.67	1.18 (0.87-1.60)	55.67	1.13 (0.93-1.37)
<i>p-value</i>	0.021		0.202		0.136		0.393	
<i>Smoked a whole cigarette before age 13</i>								
Healthy weight	10.69	1.00	9.95	1.00	9.04	1.00	14.79	1.00
Overweight	12.16	1.15 (0.97-1.37)	11.10	1.14 (0.88-1.46)	15.83	1.81 (1.09-2.99) ^b	12.64	0.82 (0.60-1.12)
Obese	13.46	1.30 (1.11-1.53) ^b	14.32	1.51 (1.21-1.88) ^b	10.37	1.16 (0.68-1.98)	13.38	0.89 (0.67-1.18)
<i>p-value</i>	0.004		0.001		0.051		0.421	
<i>Current cigarette use</i>								
Healthy weight	19.72	1.00	21.95	1.00	10.93	1.00	18.12	1.00
Overweight	20.14	1.08 (0.90-1.30)	21.78	1.04 (0.82-1.33)	13.51	1.32 (0.82-2.10)	20.12	1.18 (0.90-1.57)
Obese	19.67	0.98 (0.84-1.15)	20.67	0.90 (0.72-1.11)	13.19	1.24 (0.85-1.81)	21.52	1.25 (0.97-1.60)
<i>p-value</i>	0.951		0.803		0.436		0.241	
<i>Ever drank alcohol</i>								
Healthy weight	71.39	1.00	72.37	1.00	63.74	1.00	73.58	1.00
Overweight	73.22	1.15 (1.00-1.32)	75.29	1.22 (0.97-1.51)	62.83	1.00 (0.73-1.36)	74.22	1.07 (0.84-1.37)
Obese	71.05	0.98 (0.84-1.13)	70.73	0.90 (0.74-1.09)	64.49	1.05 (0.78-1.41)	76.07	1.15 (0.87-1.51)
<i>p-value</i>	0.415		0.200		0.935		0.581	
<i>Drank alcohol before age 13</i>								
Healthy weight	21.73	1.00	19.15	1.00	23.89	1.00	29.64	1.00
Overweight	25.73	1.22 (1.04-1.44) ^b	23.72	1.29 (1.02-1.64) ^b	29.84	1.30 (0.91-1.85)	28.33	0.92 (0.74-1.13)
Obese	25.22	1.22 (1.05-1.42) ^b	24.09	1.36 (1.08-1.70) ^b	26.40	1.14 (0.85-1.52)	27.21	0.89 (0.71-1.11)
<i>p-value</i>	0.004		0.009		0.179		0.504	
<i>Current alcohol use</i>								
Healthy weight	41.10	1.00	43.02	1.00	29.98	1.00	42.24	1.00
Overweight	42.60	1.12 (1.00-1.27)	45.95	1.19 (1.01-1.41) ^b	29.69	1.04 (0.72-1.49)	41.67	1.02 (0.84-1.23)
Obese	39.65	0.93 (0.81-1.08)	40.28	0.86 (0.69-1.08)	31.32	1.08 (0.77-1.50)	43.42	1.06 (0.87-1.30)
<i>p-value</i>	0.337		0.155		0.915		0.826	

Weight	Overall		White		Black		Hispanic	
	Endorsed behavior, %	Age-adjusted OR (95% CI)	Endorsed behavior, %	Age-adjusted OR (95% CI)	Endorsed behavior, %	Age-adjusted OR (95% CI)	Endorsed behavior, %	Age-adjusted OR (95% CI)
<i>Ever used marijuana</i>								
Healthy weight	40.85	1.00	38.77	1.00	45.16	1.00	45.32	1.00
Overweight	41.60	1.08 (0.94-1.25)	39.76	1.10 (0.89-1.34)	49.42	1.26 (0.99-1.60)	41.51	0.88 (0.70-1.12)
Obese	41.44	1.02 (0.90-1.15)	38.31	0.95 (0.80-1.13)	45.89	1.04 (0.80-1.35)	46.19	1.04 (0.86-1.27)
<i>p-value</i>	0.866		0.876		0.430		0.274	
<i>Used marijuana before age 13</i>								
Healthy weight	8.88	1.00	6.98	1.00	14.33	1.00	11.82	1.00
Overweight	10.96	1.26 (1.02-1.55) ^b	8.58	1.26 (0.89-1.77)	19.23	1.40 (0.92-2.12)	11.88	0.99 (0.77-1.27)
Obese	10.33	1.18 (0.97-1.45)	8.92	1.30 (0.93-1.82)	12.83	0.88 (0.56-1.38)	12.11	1.03 (0.82-1.29)
<i>p-value</i>	0.045		0.164		0.183		0.974	
<i>Current marijuana use</i>								
Healthy weight	25.10	1.00	24.46	1.00	27.00	1.00	26.03	1.00
Overweight	22.93	0.92 (0.77-1.10)	22.05	0.90 (0.70-1.17)	28.04	1.10 (0.83-1.46)	22.08	0.82 (0.65-1.05)
Obese	24.21	0.94 (0.82-1.09)	22.15	0.86 (0.69-1.06)	26.76	1.00 (0.76-1.33)	27.57	1.08 (0.87-1.35)
<i>p-value</i>	0.333		0.339		0.926		0.104	
FEMALES								
<i>Ever tried cigarette smoking</i>								
Healthy weight	43.08	1.00	43.09	1.00	38.40	1.00	49.08	1.00
Overweight	48.83	1.28 (1.12-1.46) ^b	50.01	1.37 (1.12-1.67) ^b	44.25	1.26 (0.95-1.65)	49.86	1.17 (0.96-1.42)
Obese	53.74	1.53 (1.30-1.81) ^b	58.16	1.82 (1.42-2.34) ^b	48.70	1.52 (1.07-2.17) ^b	50.00	1.17 (0.90-1.52)
<i>p-value</i>	<0.001		<0.001		0.021		0.217	
<i>Smoked a whole cigarette before age 13</i>								
Healthy weight	8.15	1.00	8.17	1.00	6.91	1.00	8.89	1.00
Overweight	10.45	1.32 (1.03-1.68) ^b	12.80	1.66 (1.18-2.32) ^b	4.86	0.71 (0.45-1.12)	9.89	1.12 (0.84-1.50)
Obese	10.84	1.37 (1.09-1.72) ^b	11.93	1.52 (1.08-2.13) ^b	8.82	1.31 (0.80-2.16)	10.92	1.26 (0.85-1.85)
<i>p-value</i>	0.006		0.001		0.114		0.395	
<i>Current cigarette use</i>								
Healthy weight	16.57	1.00	19.16	1.00	6.53	1.00	14.40	1.00
Overweight	20.13	1.28 (1.09-1.49) ^b	23.36	1.32 (1.07-1.62) ^b	12.66	2.04 (1.21-3.44) ^b	19.18	1.41 (1.04-1.91) ^b
Obese	22.48	1.45 (1.25-1.68) ^b	31.02	1.87 (1.54-2.27) ^b	9.27	1.44 (0.94-2.23)	19.43	1.44 (1.01-2.07) ^b
<i>p-value</i>	<0.001		<0.001		0.003		0.027	
<i>Ever drank alcohol</i>								
Healthy weight	73.49	1.00	73.45	1.00	69.41	1.00	76.36	1.00
Overweight	74.82	1.08 (0.97-1.21)	75.04	1.12 (0.95-1.33)	70.12	1.02 (0.77-1.35)	78.17	1.11 (0.87-1.42)
Obese	75.08	1.08 (0.88-1.32)	77.67	1.24 (0.92-1.67)	68.15	0.94 (0.67-1.32)	78.17	1.11 (0.83-1.47)
<i>p-value</i>	0.456		0.195		0.897		0.598	

Weight	Overall		White		Black		Hispanic	
	Endorsed behavior,%	Age-adjusted OR (95% CI)	Endorsed behavior,%	Age-adjusted OR (95% CI)	Endorsed behavior,%	Age-adjusted OR (95% CI)	Endorsed behavior,%	Age-adjusted OR (95% CI)
<i>Drank alcohol before age 13</i>								
Healthy weight	16.74	1.00	14.36	1.00	21.28	1.00	21.83	1.00
Overweight	19.45	1.19 (1.04-1.36) ^b	16.98	1.19 (0.95-1.50)	18.89	0.90 (0.69-1.18)	25.29	1.21 (0.98-1.50)
Obese	21.26	1.37 (1.13-1.65) ^b	19.71	1.50 (1.11-2.04) ^b	20.81	0.98 (0.68-1.42)	25.31	1.22 (0.92-1.61)
<i>p-value</i>	<0.001		0.012		0.650		0.124	
<i>Current alcohol use</i>								
Healthy weight	41.56	1.00	42.81	1.00	32.97	1.00	42.74	1.00
Overweight	41.14	0.99 (0.88-1.11)	41.87	0.99 (0.84-1.17)	36.95	1.18 (0.91-1.51)	42.82	1.00 (0.80-1.26)
Obese	41.46	0.98 (0.85-1.14)	42.06	0.94 (0.75-1.18)	36.85	1.19 (0.89-1.57)	45.91	1.14 (0.87-1.50)
<i>p-value</i>	0.957		0.885		0.265		0.663	
<i>Ever used marijuana</i>								
Healthy weight	35.81	1.00	34.95	1.00	37.87	1.00	37.39	1.00
Overweight	37.10	1.07 (0.95-1.20)	33.35	0.95 (0.78-1.16)	43.28	1.22 (0.96-1.56)	40.21	1.31 (0.91-1.40)
Obese	35.79	0.98 (0.94-1.15)	34.09	0.93 (0.74-1.17)	35.82	0.91 (0.71-1.16)	39.56	1.10 (0.81-1.48)
<i>p-value</i>	0.663		0.731		0.111		0.524	
<i>Used marijuana before age 13</i>								
Healthy weight	4.36	1.00	3.62	1.00	5.28	1.00	6.25	1.00
Overweight	5.92	1.38 (1.10-1.72) ^b	5.40	1.51 (1.08-2.12) ^b	5.07	0.96 (0.47-1.95)	7.76	1.26 (0.87-1.82)
Obese	7.38	1.76 (1.36-2.27) ^b	7.25	2.09 (1.40-3.12) ^b	6.70	1.29 (0.72-2.31)	8.53	1.40 (0.85-2.30)
<i>p-value</i>	<0.001		<0.001		0.681		0.234	
<i>Current marijuana use</i>								
Healthy weight	18.74	1.00	18.49	1.00	18.77	1.00	19.59	1.00
Overweight	19.54	1.06 (0.92-1.21)	17.41	0.94 (0.79-1.12)	23.62	1.32 (1.01-1.74) ^b	20.85	1.08 (0.83-1.42)
Obese	19.57	1.05 (0.88-1.24)	17.25	0.90 (0.70-1.17)	21.53	1.18 (0.83-1.68)	22.33	1.18 (0.85-1.64)
<i>p-value</i>	0.654		0.618		0.126		0.567	

^a OR represents odd ratios. CI represents confidence interval.

^b Indicates a statistically significance OR.

Table 4. Prevalence and age-adjusted odds-ratios of sexual risk behaviors in healthy weight (BMI 5th–84th percentile), overweight (BMI 85th–94th percentile), and obese females (BMI ≥ 95th percentile) by gender and race.^{a,b}

Weight	Overall		White		Black		Hispanic	
	Endorsed behavior, %	Age-adjusted OR (95% CI)	Endorsed behavior, %	Age-adjusted OR (95% CI)	Endorsed behavior, %	Age-adjusted OR (95% CI)	Endorsed behavior, %	Age-adjusted OR (95% CI)
MALES								
<i>Ever had sexual intercourse</i>								
Healthy weight	48.24	1.00	42.55	1.00	69.79	1.00	54.66	1.00
Overweight	47.92	1.06 (0.92-1.22)	41.79	1.03 (0.85-1.26)	72.14	1.24 (0.92-1.65)	49.23	0.85 (0.69-1.05)
Obese	45.35	0.88 (0.72-1.06)	36.93	0.74 (0.58-0.96)	70.16	1.06 (0.75-1.49)	51.18	0.89 (0.72-1.10)
<i>p-value</i>	0.365		0.105		0.788		0.067	
<i>Had sexual intercourse before age 13</i>								
Healthy weight	7.51	1.00	4.28	1.00	22.54	1.00	9.18	1.00
Overweight	9.42	1.26 (1.04-1.54) ^b	4.10	0.94 (0.64-1.39)	27.71	1.29 (0.95-1.77)	12.14	1.34 (0.95-1.89)
Obese	9.20	1.25 (1.00-1.56)	6.42	1.54 (1.08-2.19) ^b	20.77	0.89 (0.61-1.32)	9.02	0.97 (0.72-1.32)
<i>p-value</i>	0.016		0.034		0.180		0.127	
<i>Current engagement in sexual intercourse</i>								
Healthy weight	33.99	1.00	30.36	1.00	50.58	1.00	36.10	1.00
Overweight	33.12	1.03 (0.90-1.18)	28.77	0.98 (0.80-1.21)	49.86	1.07 (0.80-1.43)	34.44	0.99 (0.80-1.22)
Obese	29.23	0.78 (0.65-0.94)	24.79	0.71 (0.56-0.92)	42.57	0.74 (0.53-1.02)	32.29	0.86 (0.70-1.05)
<i>p-value</i>	0.020		0.041		0.087		0.242	
<i>Drank alcohol or used drugs before last sexual encounter</i>								
Healthy weight	25.08	1.00	28.28	1.00	18.21	1.00	21.49	1.00
Overweight	25.21	1.02 (0.79-1.31)	28.35	1.00 (0.69-1.46)	17.55	1.01 (0.59-1.74)	24.91	1.23 (0.81-1.87)
Obese	23.68	0.93 (0.71-1.21)	24.32	0.82 (0.56-1.19)	23.29	1.39 (0.81-2.38)	22.72	1.07 (0.72-1.57)
<i>p-value</i>	0.839		0.587		0.436		0.639	
<i>Did not use condom during last sexual encounter</i>								
Healthy weight	69.48	1.00	69.48	1.00	75.75	1.00	63.30	1.00
Overweight	67.03	0.88 (0.73-1.07)	67.90	0.93 (0.68-1.26)	71.81	0.77 (0.52-1.16)	61.08	0.91 (0.64-1.30)
Obese	69.89	1.02 (0.82-1.26)	71.79	1.11 (0.78-1.59)	72.56	0.82 (0.53-1.26)	64.06	1.03 (0.75-1.43)
<i>p-value</i>	0.492		0.705		0.527		0.818	
<i>Have sexual intercourse with >4 people in lifetime</i>								
Healthy weight	16.83	1.00	12.37	1.00	37.44	1.00	19.35	1.00
Overweight	16.42	1.03 (0.87-1.23)	10.18	0.85 (0.66-1.09)	37.41	1.09 (0.81-1.47)	20.00	1.10 (0.83-1.47)
Obese	15.55	0.90 (0.72-1.12)	10.68	0.80 (0.57-1.14)	33.00	0.85 (0.61-1.20)	17.18	0.88 (0.69-1.12)
<i>p-value</i>	0.597		0.208		0.458		0.494	

Weight	Overall		White		Black		Hispanic	
	Endorsed behavior,%	Age-adjusted OR (95% CI)	Endorsed behavior,%	Age-adjusted OR (95% CI)	Endorsed behavior,%	Age-adjusted OR (95% CI)	Endorsed behavior, %	Age-adjusted OR (95% CI)
FEMALES								
<i>Ever had sexual intercourse</i>								
Healthy weight	47.04	1.00	45.62	1.00	56.93	1.00	45.74	1.00
Overweight	46.71	1.00 (0.89-1.13)	42.51	0.91 (0.75-1.11)	59.41	1.03 (0.80-1.33)	45.97	1.01 (0.83-1.24)
Obese	44.84	0.89 (0.76-1.04)	41.27	0.79 (0.62-1.00)	52.88	0.82 (0.58-1.17)	43.01	0.88 (0.66-1.17)
<i>p-value</i>	0.469		0.161		0.318		0.697	
<i>Had sexual intercourse before age 13</i>								
Healthy weight	2.47	1.00	1.90	1.00	5.83	1.00	2.37	1.00
Overweight	4.16	1.70 (1.23-2.36) ^b	3.28	1.73 (1.10-2.73) ^b	6.04	1.05 (0.58-1.88)	4.63	2.00 (1.18-3.39) ^b
Obese	5.80	2.44 (1.66-3.57) ^b	4.79	2.61 (1.37-4.96) ^b	8.66	1.55 (0.85-2.80)	4.58	1.99 (1.04-3.82) ^b
<i>p-value</i>	<0.001		<0.001		0.331		0.014	
<i>Current engagement in sexual intercourse</i>								
Healthy weight	36.54	1.00	36.44	1.00	41.53	1.00	33.77	1.00
Overweight	35.11	0.94 (0.83-1.07)	31.86	0.83 (0.68-1.02)	45.15	1.07 (0.80-1.44)	34.40	1.03 (0.83-1.28)
Obese	32.24	0.80 (0.68-0.94)	30.31	0.71 (0.56-0.92)	38.10	0.84 (0.58-1.23)	29.47	0.80 (0.61-1.05)
<i>p-value</i>	0.039		0.014		0.323		0.317	
<i>Drank alcohol or used drugs before last sexual encounter</i>								
Healthy weight	17.15	1.00	17.98	1.00	16.02	1.00	14.89	1.00
Overweight	17.89	1.05 (0.81-1.37)	19.24	1.09 (0.73-1.64)	18.60	1.19 (0.74-1.93)	14.24	0.94 (0.59-1.52)
Obese	16.47	0.94 (0.65-1.36)	18.90	1.04 (0.63-1.71)	10.55	0.62 (0.34-1.12)	20.17	1.45 (0.72-2.90)
<i>p-value</i>	0.885		0.899		0.172		0.473	
<i>Did not use condom during last sexual encounter</i>								
Healthy weight	54.78	1.00	55.68	1.00	53.60	1.00	52.28	1.00
Overweight	51.77	0.89 (0.72-1.09)	52.71	0.89 (0.66-1.22)	53.16	1.03 (0.71-1.49)	48.30	0.84 (0.59-1.21)
Obese	49.23	0.79 (0.61-1.02)	46.45	0.67 (0.44-1.03)	54.26	1.01 (0.61-1.65)	48.01	0.85 (0.49-1.45)
<i>p-value</i>	0.158		0.170		0.987		0.624	
<i>Have sexual intercourse with >4 people in lifetime</i>								
Healthy weight	11.38	1.00	11.19	1.00	15.89	1.00	9.19	1.00
Overweight	14.27	1.32 (1.06-1.63) ^b	12.23	1.15 (0.87-1.51)	22.94	1.46 (0.92-2.33)	11.87	1.34 (0.92-1.96)
Obese	14.56	1.31 (1.05-1.62) ^b	12.29	1.06 (0.79-1.44)	21.93	1.49 (1.01-2.21) ^b	10.75	1.17 (0.74-1.87)
<i>p-value</i>	0.004		0.642		0.041		0.271	

^a OR represents odd ratios. CI represents confidence interval.

^b Indicates a statistically significance OR.

Table 5. Prevalence and age-adjusted odds-ratios of violence behaviors in healthy weight (BMI 5th–84th percentile), overweight (BMI 85th–94th percentile), and obese females (BMI ≥ 95th percentile) by gender and race.^{a,b}

Weight	Overall		White		Black		Hispanic	
	Endorsed behavior, %	Age-adjusted OR (95% CI)	Endorsed behavior, %	Age-adjusted OR (95% CI)	Endorsed behavior, %	Age-adjusted OR (95% CI)	Endorsed behavior, %	Age-adjusted OR (95% CI)
MALES								
<i>Current weapon carrying</i>								
Healthy weight	24.84	1.00	25.75	1.00	20.68	1.00	24.63	1.00
Overweight	27.51	1.15 (0.99-1.34)	30.05	1.25 (1.05-1.48) ^b	19.29	0.92 (0.59-1.41)	26.22	1.09 (0.83-1.42)
Obese	30.97	1.36 (1.18-1.57) ^b	36.67	1.67 (1.38-2.01) ^b	18.50	0.87 (0.60-1.26)	25.18	1.03 (0.82-1.29)
<i>p-value</i>	<0.001		<0.001		0.768		0.801	
<i>Current gun carrying</i>								
Healthy weight	8.07	1.00	7.60	1.00	11.05	1.00	7.52	1.00
Overweight	9.19	1.17 (0.96-1.42)	9.24	1.26 (0.99-1.60)	10.25	0.94 (0.56-1.58)	8.39	1.13 (0.81-1.59)
Obese	10.30	1.31 (1.05-1.63) ^b	10.37	1.40 (1.01-1.93) ^b	12.58	1.17 (0.82-1.67)	8.57	1.15 (0.83-1.61)
<i>p-value</i>	0.019		0.024		0.693		0.628	
<i>Engaging in a physical fight in the past year</i>								
Healthy weight	38.58	1.00	35.46	1.00	46.80	1.00	43.81	1.00
Overweight	41.00	1.09 (0.91-1.31)	39.78	1.19 (0.93-1.52)	44.32	0.87 (0.63-1.18)	42.09	0.93 (0.75-1.15)
Obese	41.53	1.14 (0.99-1.30)	39.42	1.20 (1.00-1.43)	44.97	0.92 (0.73-1.17)	44.45	1.03 (0.82-1.28)
<i>p-value</i>	0.195		0.099		0.718		0.757	
FEMALES								
<i>Current weapon carrying</i>								
Healthy weight	6.00	1.00	5.81	1.00	6.52	1.00	6.30	1.00
Overweight	8.00	1.36 (1.08-1.72) ^b	6.53	1.14 (0.80-1.62)	9.44	1.46 (0.90-2.38)	9.99	1.65 (1.28-2.13) ^b
Obese	9.80	1.70 (1.33-2.17) ^b	10.47	1.89 (1.33-2.68) ^b	9.17	1.44 (0.90-2.30)	9.11	1.49 (0.98-2.28)
<i>p-value</i>	<0.001		0.002		0.139		0.001	
<i>Current gun carrying</i>								
Healthy weight	1.25	1.00	1.36	1.00	1.32	1.00	0.79	1.00
Overweight	1.32	1.06 (0.61-1.82)	1.06	0.78 (0.28-2.17)	1.93	1.39 (0.63-3.04)	1.38	1.75 (0.88-3.51)
Obese	1.57	1.24 (0.58-2.68)	1.43	1.04 (0.32-3.36)	1.55	1.17 (0.38-3.55)	1.89	2.40 (0.91-6.34)
<i>p-value</i>	0.816		0.883		0.711		0.093	
<i>Been in a physical fight in the past year</i>								
Healthy weight	21.84	1.00	17.78	1.00	33.65	1.00	27.79	1.00
Overweight	26.67	1.30 (1.13-1.49) ^b	22.93	1.36 (1.10-1.68) ^b	31.83	0.92 (0.72-1.19)	30.62	1.15 (0.92-1.43)
Obese	27.65	1.38 (1.15-1.65) ^b	25.05	1.56 (1.19-2.05) ^b	31.95	0.93 (0.67-1.28)	27.92	1.01 (0.74-1.37)
<i>p-value</i>	<0.001		<0.001		0.789		0.466	

^a OR represents odd ratios. CI represents confidence interval.

^b Indicates a statistically significance OR.

Table 6. Summary of statistically significant unadjusted associations between weight status and risk-taking behavior by gender and race where “X” indicates an association.

Risk-taking behavior	Overall		White		Black		Hispanic	
	Male	Female	Male	Female	Male	Female	Male	Female
Ever tried cigarette smoking	X	X		X		X		
Smoked a whole cigarette before age 13	X	X	X	X				
Current cigarette use		X		X		X		X
Ever drank alcohol								
Drank alcohol before age 13	X	X	X	X				
Current alcohol use								
Ever used marijuana								
Used marijuana before age 13	X	X		X				
Current marijuana use								
Ever had sexual intercourse								
Had sexual intercourse before age 13	X	X	X	X				X
Current engagement in sexual intercourse	X	X	X	X				
Drank alcohol or used drugs before last sexual encounter								
Did not use condom during last sexual encounter								
Have sexual intercourse with >4 people in lifetime		X				X		
Current weapon carrying	X	X	X	X				X
Current gun carrying	X		X					
Been in a physical fight in the past year		X		X				