Risk-Taking Behaviors of Adolescents With Extreme Obesity: Normative or Not?

WHAT’S KNOWN ON THIS SUBJECT: Today’s obese youth are heavier than in previous decades. Increasing focus has been placed on characterizing the medical and psychosocial risks that extremely obese youth experience and the disease burden they will likely carry into young adulthood.

WHAT THIS STUDY ADDS: This is the first study to reveal that adolescents with extreme obesity engage in many high-risk behaviors at rates comparable with their healthy weight peers. In addition, those who engage in these behaviors may do so in even more dangerous ways.

OBJECTIVE: Present first published data detailing high-risk behaviors of adolescent high school students (HSS) with extreme obesity (BMI ≥ 99th percentile for age and gender) compared with healthy weight peers (5th–84th percentile).

METHODS: The 2007 Youth Risk Behavior Survey was used to compare HSS with extreme obesity (N = 410) and healthy weight peers (N = 8669) in their engagement in (1) tobacco use, (2) alcohol/other drug use, (3) high-risk sexual behaviors, and (4) suicidal behaviors. Logistic regression was used to calculate gender-stratified odds ratios (OR) and 95% confidence intervals (CI), controlling for age and race.

RESULTS: HSS with extreme obesity were similar to healthy weight peers in the prevalence of most behaviors related to alcohol/drug use, high-risk sexual activities, and suicide, with the following exceptions: relative to healthy weight HSS, both male and female students with extreme obesity more frequently reported ever trying cigarettes (female students, adjusted OR: 2.0 [95% CI: 1.3–3.2]; male students, OR: 1.5 [CI: 1.2–2.0]). Compared with healthy weight female students, female students with extreme obesity had lower odds of ever having sex (OR: 0.5 [CI: 0.3–0.9]), but greater odds of drinking alcohol/using drugs before their last sexual encounter (OR: 4.6 [CI: 1.2–17.2]), currently smoking (OR: 2.3 [CI: 1.2–4.4]), and using smokeless tobacco (OR: 4.6 [CI: 1.2–17.2]). Compared with healthy weight male students, male students with extreme obesity had greater odds of smoking before age 13 (OR: 1.4 [CI: 1.0–2.0]).


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KEY WORDS
adolescent, morbid obesity, high-risk behaviors, YRBS

ABBREVIATIONS
HSS—high school students
YRBS—Youth Risk Behavior Survey
CDG—Centers for Disease Control and Prevention

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The severity of pediatric obesity has increased in recent years such that the heaviest youth are becoming even heavier. To date, ~4% of adolescents in the United States are estimated to be extremely obese (BMI ≥ 99th percentile for age and gender). Although a growing amount of literature documents the health and psychosocial impact of obesity (BMI ≥ 95th percentile) on adolescents, there have been few studies in which the implications of obesity’s progression to extreme levels are addressed. What is known is that these youth are at a significantly heightened risk for developing obesity-related medical complications of obesity’s progression to extreme levels are addressed. What is known is that these youth are at a significantly heightened risk for developing obesity-related medical complications of obesity’s progression to extreme levels are addressed. 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Although extremely obese adolescents will remain extremely obese as adults, increasing focus has been placed on understanding the medical and psychosocial burden of this growing subpopulation.

Adolescence itself is a developmental period characterized by increased risk, with greater autonomy and exposure to social contexts (eg, peers, romantic relations, work) creating increased opportunities for engagement in risk-taking behaviors. National epidemiologic studies (eg, AddHealth, National Youth Risk Behavior Survey, Monitoring the Future) demonstrate a consistent pattern of increased substance use, risky sexual behavior, and suicidal behavior across the adolescent years. The “adolescent experience” may not be the same for all youth, however, especially for obese adolescents who are more likely to be peripheral to social networks and subject to social isolation and peer victimization than are their healthy weight (5th–84th percentile) peers. Although there are no published results for adolescents with extreme obesity, the extant literature on youth who are obese suggests significant differences in adolescent risk-taking behaviors on the basis of weight. With regard to drug and alcohol use, obese female students are less likely to report drinking alcohol, and obese male students are less likely to use marijuana compared with healthy weight adolescents. Although obese adolescents may be equally or even less likely to be sexually active compared with healthy weight adolescents, obese adolescent female students may be more likely than their healthy weight peers to engage in certain types of risky sexual behavior, including engaging in sex before the age of 13, having 3 or more lifetime sexual partners, and not using contraceptives. Finally, in regards to suicidal behavior, higher BMI and obesity status has been shown to place adolescents at heightened risk for suicidal ideation and attempts. Taken together, these data suggest that obese adolescents present with both protective and risk factors when it comes to engagement in what might be considered normative adolescent risk-taking behaviors in comparison with their healthy-weight peers. Unfortunately, adolescents with extreme obesity, a subpopulation known to be at heightened medical and psychosocial risk, are not characterized in the existing literature.

In this study we aim to address this critical gap by presenting the first published data detailing the rate of engagement in high-risk behaviors of high school students (HSS) with extreme obesity compared with HSS of healthy weight in a nationally representative sample of youth. Given their decreased exposure to peers and peer-based activities, we hypothesized that HSS with extreme obesity would have lower odds of engaging in alcohol/tobacco/drug use behaviors and initiating sexual activity than do their healthy weight peers. Consistent with the obesity literature, we also hypothesized HSS with extreme obesity would have higher odds of reporting engagement in high-risk sexual activities and suicidal behaviors.

**Participants and Methods**

Data from the publicly available 2007 Youth Risk Behavior Survey (YRBS) data set were used to evaluate the prevalence of specific priority high-risk behaviors among HSS with extreme obesity. We examined (1) tobacco use, (2) alcohol and other drug use, (3) sexual behaviors that contribute to unintended pregnancy and sexually transmitted diseases, and (4) suicidal behaviors. The YRBS is a biennial school-based survey administered to a nationally representative sample of students in grades 9 to 12 by the Centers for Disease Control and Prevention (CDC). Additional information about the methods and sampling have been described elsewhere. Self-reported height and weight were also obtained and used to calculate BMI (kg/m²).

**Primary Outcome Measures**

The present study focused on YRBS priority high-risk behaviors (ie, alcohol/tobacco/drug use, sexual behaviors, and suicidal ideation/attempt), which were dichotomized as delineated by the 2007 National YRBS Data Users Manual. Dichotomous variables represent the percentage of students who report that they do or do not participate in a behavior. Determination of behaviors as “risky” was based on affirmative endorsement of the behavior 1 or more times during one’s life (eg, response of 1 or more times to the question “During your life how many times have you used ecstasy [also called MDMA]”), engagement in the behavior in the last 30 days, and/or with
TABLE 1 Prevalence of Extremely Obese (BMI ≥99th Percentile) and Healthy Weight (BMI 5th–84th Percentile) Male and Female US High School Students by Age and Race/Ethnicity (YRBS 2007)

<table>
<thead>
<tr>
<th></th>
<th>Total, % (95% CI)</th>
<th>Female, % (95% CI)</th>
<th>Male, % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extremely Obese</td>
<td>Healthy Weight</td>
<td>Extremely Obese</td>
</tr>
<tr>
<td>Total</td>
<td>2.5 (2.1–2.9)</td>
<td>68.8 (67.0–70.6)</td>
<td>1.2 (0.8–1.7)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12–14</td>
<td>2.3 (1.3–3.2)</td>
<td>66.9 (64.1–68.6)</td>
<td>1.0 (0.04–2.0)</td>
</tr>
<tr>
<td>15</td>
<td>2.3 (1.6–2.9)</td>
<td>67.6 (65.2–69.9)</td>
<td>1.6 (0.8–2.4)</td>
</tr>
<tr>
<td>16</td>
<td>3.0 (2.3–3.7)</td>
<td>69.3 (66.3–72.2)</td>
<td>1.5 (0.8–2.2)</td>
</tr>
<tr>
<td>17</td>
<td>2.5 (1.7–3.5)</td>
<td>69.4 (67.0–71.7)</td>
<td>1.1 (0.3–1.9)</td>
</tr>
<tr>
<td>≥18</td>
<td>2.5 (1.7–3.5)</td>
<td>70.7 (68.0–73.3)</td>
<td>0.6 (0.08–1.0)</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whitea</td>
<td>2.1 (1.5–2.7)</td>
<td>72.2 (69.7–74.8)</td>
<td>0.9 (0.3–1.6)</td>
</tr>
<tr>
<td>Blacka</td>
<td>4.3 (3.3–5.3)</td>
<td>61.1 (58.3–64.0)</td>
<td>2.8 (1.8–4.0)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2.9 (1.6–3.3)</td>
<td>63.4 (58.7–67.5)</td>
<td>1.1 (0.4–1.6)</td>
</tr>
</tbody>
</table>

CI indicates confidence interval.

a Non-Hispanic.
ative to healthy weight HSS, both male and female HSS with extreme obesity reported greater odds of ever trying cigarette smoking (Table 2). The remaining weight-related differences in engagement in health risk behaviors were different for male students and female students. Compared with female healthy weight HSS, female HSS with extreme obesity reported greater odds of current cigarette use (ie, smoked cigarettes on 1 or more of the past 30 days), current smokeless tobacco use (ie, used chewing tobacco, snuff, or dip on 1 or more days), and current marijuana use.

### Table 2: Prevalence and Odds Ratios for Alcohol/Tobacco/Drug Use Behaviors Among Extremely Obese (BMI ≥99th Percentile) and Healthy Weight (BMI 5th–84th Percentile) Male and Female US High School Students (YRBS 2007)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Female</th>
<th></th>
<th>OR (95% CI)</th>
<th></th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extremely Obese (%)</td>
<td>Healthy Weight (%)</td>
<td></td>
<td>Extremely Obese (%)</td>
<td>Healthy Weight (%)</td>
</tr>
<tr>
<td>Ever tried cigarette smoking</td>
<td>61.4</td>
<td>46.0</td>
<td>2.04 (1.31–3.20)*</td>
<td>61.8</td>
<td>49.8</td>
</tr>
<tr>
<td>Smoked a whole cigarette before age 13</td>
<td>6.6</td>
<td>10.3</td>
<td>0.64 (0.27–1.52)</td>
<td>24.4</td>
<td>20.0</td>
</tr>
<tr>
<td>Current cigarette use</td>
<td>26.2</td>
<td>17.5</td>
<td>2.28 (1.18–4.37)*</td>
<td>4.2</td>
<td>8.6</td>
</tr>
<tr>
<td>Smoked more than 10 cigarettes per day</td>
<td>6.3</td>
<td>1.9</td>
<td>4.56 (1.22–17.15)*</td>
<td>15.6</td>
<td>12.6</td>
</tr>
<tr>
<td>Current smokeless tobacco use</td>
<td>11.5</td>
<td>6.9</td>
<td>1.90 (0.79–4.56)</td>
<td>22.1</td>
<td>19.3</td>
</tr>
<tr>
<td>Ever drank alcohol</td>
<td>72.5</td>
<td>77.1</td>
<td>0.89 (0.48–1.67)</td>
<td>71.6</td>
<td>74.5</td>
</tr>
<tr>
<td>Drank alcohol before age 13</td>
<td>20.7</td>
<td>17.9</td>
<td>1.08 (0.55–2.14)</td>
<td>32.0</td>
<td>25.8</td>
</tr>
<tr>
<td>Current alcohol use</td>
<td>50.8</td>
<td>46.4</td>
<td>1.36 (0.61–3.01)</td>
<td>48.2</td>
<td>45.2</td>
</tr>
<tr>
<td>Binge drinking</td>
<td>23.4</td>
<td>22.0</td>
<td>1.22 (0.54–2.74)</td>
<td>33.2</td>
<td>27.6</td>
</tr>
<tr>
<td>Ever used marijuana</td>
<td>35.6</td>
<td>34.2</td>
<td>1.14 (0.78–1.66)</td>
<td>41.3</td>
<td>41.5</td>
</tr>
<tr>
<td>Tried marijuana before age 13</td>
<td>2.6</td>
<td>4.6</td>
<td>0.54 (0.16–1.82)</td>
<td>10.3</td>
<td>11.8</td>
</tr>
<tr>
<td>Current marijuana use</td>
<td>19.3</td>
<td>16.4</td>
<td>1.29 (0.61–2.73)</td>
<td>19.4</td>
<td>23.3</td>
</tr>
<tr>
<td>Ever used cocaine</td>
<td>1.2</td>
<td>6.5</td>
<td>0.22 (0.06–0.79)**</td>
<td>5.8</td>
<td>7.9</td>
</tr>
<tr>
<td>Current cocaine use</td>
<td>0.7</td>
<td>2.3</td>
<td>0.36 (0.08–1.66)</td>
<td>3.2</td>
<td>4.2</td>
</tr>
<tr>
<td>Ever used inhalants</td>
<td>18.5</td>
<td>13.9</td>
<td>1.60 (0.85–3.01)</td>
<td>14.1</td>
<td>11.9</td>
</tr>
<tr>
<td>Ever used heroin</td>
<td>1.5</td>
<td>1.4</td>
<td>1.18 (0.21–6.65)</td>
<td>2.8</td>
<td>2.7</td>
</tr>
<tr>
<td>Ever used methamphetamine</td>
<td>4.3</td>
<td>3.8</td>
<td>1.42 (0.50–4.08)</td>
<td>3.2</td>
<td>4.5</td>
</tr>
<tr>
<td>Ever used ecstasy</td>
<td>2.9</td>
<td>4.6</td>
<td>0.73 (0.21–2.58)</td>
<td>4.6</td>
<td>6.8</td>
</tr>
<tr>
<td>Ever took steroids without a doctor’s prescription</td>
<td>6.2</td>
<td>2.1</td>
<td>3.59 (1.03–12.44)*</td>
<td>6.3</td>
<td>4.4</td>
</tr>
<tr>
<td>Ever used hallucinogens</td>
<td>6.7</td>
<td>6.0</td>
<td>1.28 (0.47–3.53)</td>
<td>6.7%</td>
<td>9.9</td>
</tr>
</tbody>
</table>

OR indicates odds ratio; CI, confidence interval.

* Significant odds ratio.

### Table 3: Prevalence and Odds Ratios for Sexual Risk-Taking Behaviors Among Extremely Obese (BMI ≥99th Percentile) and Healthy Weight (BMI 5th–84th Percentile) Male and Female US High School Students (YRBS 2007)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Female</th>
<th></th>
<th>OR (95% CI)</th>
<th></th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extremely Obese (%)</td>
<td>Healthy Weight (%)</td>
<td></td>
<td>Extremely Obese (%)</td>
<td>Healthy Weight (%)</td>
</tr>
<tr>
<td>Ever had sexual intercourse</td>
<td>31.6</td>
<td>45.9</td>
<td>0.47 (0.26–0.85)*</td>
<td>48.6</td>
<td>49.1</td>
</tr>
<tr>
<td>Had first sexual intercourse before age 13</td>
<td>7.3</td>
<td>3.0</td>
<td>2.08 (0.48–8.97)</td>
<td>13.6</td>
<td>8.9</td>
</tr>
<tr>
<td>Had sexual intercourse with four or more persons during lifetime</td>
<td>9.9</td>
<td>11.4</td>
<td>0.79 (0.43–1.45)</td>
<td>20.0</td>
<td>16.9</td>
</tr>
<tr>
<td>Drank alcohol or used drugs before last sexual intercourse</td>
<td>42.0</td>
<td>18.5</td>
<td>4.57 (1.18–17.61)*</td>
<td>24.6</td>
<td>26.9</td>
</tr>
<tr>
<td>Did not use condom during last sexual encounter</td>
<td>54.0</td>
<td>42.4</td>
<td>1.88 (0.42–6.70)</td>
<td>35.5</td>
<td>29.9</td>
</tr>
<tr>
<td>Tested for HIV</td>
<td>17.1</td>
<td>13.8</td>
<td>1.18 (0.28–4.91)</td>
<td>12.7</td>
<td>10.6</td>
</tr>
</tbody>
</table>

OR indicates odds ratio; CI, confidence interval.

* Significant odds ratio.

### Table 4: Prevalence and Odds Ratios for Suicidal Behaviors Among Extremely Obese (BMI ≥99th Percentile) and Healthy Weight (BMI 5th–84th Percentile) Male and Female US High School Students (YRBS 2007)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Female</th>
<th></th>
<th>OR (95% CI)</th>
<th></th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extremely Obese (%)</td>
<td>Healthy Weight (%)</td>
<td></td>
<td>Extremely Obese (%)</td>
<td>Healthy Weight (%)</td>
</tr>
<tr>
<td>Seriously considered attempting suicide</td>
<td>26.9</td>
<td>17.8</td>
<td>1.71 (1.00–2.92)</td>
<td>14.0</td>
<td>9.7</td>
</tr>
<tr>
<td>Made a suicide plan</td>
<td>7.3</td>
<td>12.7</td>
<td>0.55 (0.24–1.26)</td>
<td>12.6</td>
<td>8.3</td>
</tr>
<tr>
<td>Attempted suicide</td>
<td>12.6</td>
<td>7.9</td>
<td>1.55 (0.55–4.55)</td>
<td>4.5</td>
<td>4.0</td>
</tr>
</tbody>
</table>

OR indicates odds ratio; CI, confidence interval.
of the past 30 days), and ever taking steroids without a doctor’s prescription, but lower odds of ever using cocaine (See Table 2). Compared with female healthy weight HSS, female HSS with extreme obesity also reported lower odds of ever having sexual intercourse, but greater odds of drinking alcohol or using drugs before their last sexual encounter (See Table 3).

Compared with male healthy weight HSS, male HSS with extreme obesity reported greater odds of smoking a whole cigarette before age 13 (See Table 2). There were no high-risk behaviors that male HSS with extreme obesity reported lower odds of engaging in compared with male healthy weight HSS.

**DISCUSSION**

Our primary aim of this article was to highlight the vulnerability of adolescents with extreme obesity. Accordingly, comparisons were made between HSS with extreme obesity and those of healthy weight, the standard to which health care providers strive. This is consistent with the “extreme group approach” (ie, comparing group of interest to another group that is disparate on a key variable; in this case, weight) that is typically seen in preliminary studies when little is known on a specific subpopulation. This approach allows for detection of general trends that otherwise might be obscured with the inclusion of a full range of data (eg, overweight and less obese youth). 32

Documenting the prevalence of engagement in high-risk behaviors for this already vulnerable subpopulation of adolescents is not only timely but also imperative, especially given health care providers’ conundrum of how best to intervene when such youth are under their care. 33,34 Unfortunately, the weight loss intervention literature (eg, behavioral 35–37 and pharmacotherapy 38,39) has not progressed sufficiently, and thus, the vast majority of today’s youth with extreme obesity will carry their excess weight and associated medical and psychosocial burden into adulthood. 12 In addition, as bariatric surgery emerges as a potential and viable treatment option for this age and weight status group 40–42 it is critical to establish a most comprehensive picture of the health and mental health needs of this patient population.

These are the first published data characterizing the risk-taking behaviors of HSS with extreme obesity in the United States. The results reveal that there may be reason for concern given that HSS with extreme obesity report similar, and in some cases, even more dangerous engagement in risk-taking behaviors compared with their healthy weight peers. One of the strengths of the present study is that the data were derived from a large, nationally representative data set for which method reliability is well established. 43 The YRBS data set provided a large sample of adolescent HSS with extreme obesity from which descriptive data could be accurately presented and stratified, an important consideration given the significant differences in prevalence of risk-taking behaviors between male students and female students. 44 In addition, use of this data resource minimized the potential for selection bias, which characterizes most existing data on adolescents with extreme obesity who often are identified for research participation while seeking treatment for weight loss and/or obesity-related comorbidities. The use of a comparison group of healthy weight peers also allowed for meaningful comparisons. Finally, the YRBS allowed consideration of a relatively broad spectrum of high-risk behaviors relevant to the priority areas outlined by Healthy People 2010. 45 This is important given research that reveals that engagement in multiple risk behaviors may result in heightened overall risk. 46

Obese adolescents are more likely to be socially isolated and peripheral to social networks than are healthy weight peers. 18,47 Arguably, adolescents with extreme obesity may be even less fully engaged in age-salient contexts (school, work, peers, romantic relations), and therefore less likely to be exposed to or engage in what might be considered normative high-risk behaviors. With few exceptions, the present findings challenge these assumptions, which indicates that regardless of any social impairment, HSS with extreme obesity engage in high-risk behaviors at comparable, if not higher, rates than healthy weight peers. For instance, the majority of alcohol/tobacco/other drug use behaviors were similar among extremely obese and healthy weight HSS, regardless of whether the behaviors related to age at initiation, current use, or abuse (eg, 5 or more alcoholic drinks in a row), with the exception of cigarette, cocaine, and steroid use. Although female HSS with extreme obesity were less likely to report ever having sex relative to healthy weight female students, HSS with extreme obesity were not at any lower odds of engaging in other sexual behaviors that might be considered high-risk, including first sexual intercourse before age 13, sexual intercourse with 4 or more partners during one’s lifetime, not using a condom during the last sexual encounter, and rate of testing for HIV. Finally, HSS with extreme obesity were similar to healthy weight peers in their serious consideration of attempting suicide (ie, suicidal ideation), development of a suicide plan, and suicide attempts. Taken together, these results suggest that excess weight does not “protect” HSS from engagement in what might be considered...
somewhat normative adolescent risk-taking behaviors.

When group (ie, extreme obesity versus healthy weight) differences in high-risk behaviors were detected, the present data indicate HSS with extreme obesity may actually be at heightened risk. For instance, both male and female HSS with extreme obesity reported greater odds of ever trying cigarette smoking compared with gender-specific healthy weight peers, with female students also more likely to have smoked cigarettes and used smokeless tobacco in the past 30 days and male students more likely to have smoked a whole cigarette before the age of 13. Obese adolescents are already at greater risk for the development of additional chronic health conditions,\textsuperscript{12,48–54} the likes of which may be exacerbated by cigarette smoking, resulting in compound health risk.\textsuperscript{51} In addition, smoking has been identified as a “gateway” drug that may predispose adolescents (especially female students) to engage in illicit drug use.\textsuperscript{55} Given these findings, HSS with extreme obesity may warrant tailored nicotine prevention and intervention programs.

Although female HSS with extreme obesity may be less likely to report ever having sexual intercourse, when they do, it may be unduly influenced by substance use. Forty-two percent of female HSS with extreme obesity reported using alcohol or drugs before their last sexual encounter, a fourfold greater likelihood than their healthy weight female peers. These results are concerning given data that reveal drinking and drug use have been found to not only influence adolescents’ decisions to engage in sexual activity, but also affect adolescents’ decisions to “do more” sexually than they had planned and to have unprotected sex.\textsuperscript{56} These data highlight that, at least among female HSS, extreme obesity may indicate a greater likelihood of sexual risk-taking, alerting health care providers to conduct a thorough assessment of sexual history and behaviors and provision of appropriate counseling and recommendations regarding healthy sexual behavior.

There are several study limitations worth noting. First, whereas the YRBS database provides reliable data on HSS behavior, adolescent weight and height were self-reported. BMI values on the basis of adolescent self-report of height and weight have been shown to be highly correlated with data on the basis of measured height and weight \( (r = 0.89; \text{mean difference, } 2.6 \text{ kg/m}^2) \),\textsuperscript{52} although adolescent self-report likely results in an underestimation of weight and an overestimation of height. In addition, BMI scores > 55 were considered “biologically implausible values” and not included in the public-release data set. Although it is understandably necessary to set parameters to exclude implausible data, a BMI > 55 is not only plausible but increasingly common in adolescents as indicated by mean and SD values of BMI for the growing number of adolescents pursuing weight loss surgery.\textsuperscript{56} Thus, the present study was limited in its ability to characterize the most upper extremes of obesity. Replication of these findings will be important, and includes both measured height/weight and the full spectrum of BMI. Second, YRBS data are cross-sectional in design and, accordingly, causality cannot be inferred. Finally, YRBS is limited to adolescents who attend high school and is therefore not fully representative of this age group.

Comprehensive and longitudinal studies will be critical to ascertain any temporal sequence between obesity development and risk-taking behaviors in adolescence. In addition, more complex pathways that link obesity and risk-taking behaviors need to be considered, such as those involving pubertal timing and psychological dysregulation. For example, higher BMIs have been associated with earlier pubertal onset among female students\textsuperscript{56,58} and later pubertal onset for male students.\textsuperscript{61} These gender-specific trajectories on the basis of pubertal timing, regardless of weight, have been associated with negative psychosocial\textsuperscript{62} and behavioral outcomes such as alcohol/tobacco/other drug use,\textsuperscript{63–65} sexual initiation, and engagement in delinquent behaviors.\textsuperscript{66} Psychological dysregulation (ie, one’s ability to modulate affect, cognition, and behavior) is also believed to increase an adolescent’s risk of substance use, high-risk sexual behavior, and suicidal behaviors.\textsuperscript{67} Finally, although we controlled for race/ethnicity and age in this study, future research in which differential engagement in risk behaviors is explored on the basis of these factors may reveal noteworthy findings.

CONCLUSIONS

With few exceptions, HSS with extreme obesity engage in many high-risk behaviors at rates comparable with healthy weight peers. In some cases, HSS with extreme obesity engaging in these risky behaviors may do so in even more dangerous ways (eg, engaging in sexual activity while under the influence of alcohol/drugs, or initiating cigarette smoking before age 13). These findings challenge assumptions that HSS with extreme obesity may be protected from engagement in “normative” high-risk behaviors. These behavioral risks, combined with the well documented medical and psychosocial comorbidities associated with adolescent extreme obesity, further illustrate the vulnerability of this cohort of youth. Pediatric health care providers, who are increasingly adept at tracking BMI and addressing weight-related concerns, should persist in assessing...
“normative” adolescent behaviors, even among the most extremely obese youth, given the potential for their engagement in comparable, if not more dangerous, risk-taking.

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