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Overweight Status, Self-Perception and Suicidal Behaviors among Adolescents

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Abstract

Suicide is the third leading cause of death for adolescents. The suicide rate for individuals 15-19 years of age in 2003, while having recently declined, still remains more than twice that in 1960. At the same time, the prevalence of being overweight has also steadily risen among adolescents, and has tripled since 1960. This study utilizes data from the Youth Risk Behavioral Surveillance System (1991-2003) to explore the causal relationship between overweight status and the perception of overweight on suicide ideation and attempts. Studies have shown a high degree of correlation between overweight, depressive disorders, and suicidal behaviors. This study analyzes these indicators in conjunction with individuals' perception of their weight. The empirical methodology is based on bivariate probit models, propensity score matching, and sample stratification, along with robustness checks, to gauge whether the link between overweight indicators and suicide is causal or whether it is driven by unobserved selection. Results indicate that body dissatisfaction, as measured by the perception of overweight, has a strong causal impact on all suicidal behaviors for girls. It raises the risk of suicide ideation by 6.1 percent, suicide attempt by 3.6 percent, and a serious suicide attempt by 0.5 percent. For males, the association is mostly driven by nonrandom selection, though there is a small positive effect on ideation. Conditional on overweight perception, actual weight does not have an independent effect on suicidal behaviors. Policies aimed at reducing the prevalence of overweight among adolescents will further reduce suicidal behaviors by limiting overweight perception, especially among girls. However, the independent role of perception also highlights the importance of educating youths and fostering healthy attitudes regarding body image. Conservative estimates indicate that the risk of higher female suicides adds about \$280 - \$350 million to the costs of adolescent overweight. In addition, decreasing the prevalence of being very overweight among girls, consistent with the *Healthy People 2010* objectives, would reduce the number of suicide attempts by between 12,000 and 16,000.

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I. Introduction

More adolescents die from suicide in the U.S. than from all leading natural causes of death combined. In 2003, 1487 adolescents aged 15-19 years took their own lives, making suicide the third leading cause of death among youth behind accidents and homicides. While the suicide rate has leveled off and declined in recent years, it still remains more than double what it was in 1960. There are also striking gender differences. Male adolescents are almost six times as likely to commit suicide as females. However, suicides among females have risen in rank as a cause of mortality from fourth to second. Public concern over adolescent mortality from suicides is signaled by the Surgeon General's *Call to Action to Prevent Suicide* (U.S. Public Health Service, 1999).

Suicide attempts and suicide ideation, ranging from serious thoughts about suicide to suicide planning, are even more prevalent than completed suicide. It has been estimated that there are as many as 200-400 attempts for every suicide completion.¹ Data from the 2003 Youth Risk Behavior Surveillance System (YRBSS) indicate that over 16 percent of high-school students have seriously considered committing suicide in the past year and almost three percent have attempted a suicide that resulted in injury and required medical attention. While these highly prevalent behaviors are considered to be leading risk factors for completed suicides, they are also psychologically harmful behaviors in and of themselves and impose real costs. The costs associated with completed and medically-treated suicides by youths aged 20 and younger, including health care and lost earnings, amounted to \$4.6 billion in 1996 (Miller et al., 1999).²

¹ Data from the Youth Risk Behavior Surveillance System indicate that 2.5 percent of the respondents aged 15-19 reported a serious suicide attempt in the past year. With a suicide death rate of 7.44 per 100,000 in 2002, this translates to 334 serious attempts from every completion.

² The estimates in Miller et al. (1999) are reported in 1998 dollars. The \$4.6 billion estimate has been converted to current 2005 dollars. In addition, costs accruing from the loss in the quality of life, resulting from suicide, have been estimated at an additional \$14.2 billion.

One of the *Health People 2010* objectives concerns reducing the rate of suicide attempts by adolescents to one percent (U.S. Department of Health and Human Services, 2000).

Numerous studies have identified various risk factors associated with suicidal behaviors, including substance use and abuse, mental disorders, and family environment (see, for example, Chatterji et al. 2004). However, there has been very limited research relating overweight status and overweight perception to suicidal behaviors. Concurrent with the rising trend in youth suicides, the percentage of overweight adolescents (ages 12-19) in the U.S. has more than tripled since the late 1960s (Ogden et al., 2002). Overweight status is strongly linked with depressive and mood disorders, maladjustment, antisocial behaviors and other behavioral problems, all of which may induce suicidal behaviors. For instance, the prevalence of suicide attempts is higher among overweight adolescents by more than two percentage points (10.3 versus 7.9 percent). Furthermore, being overweight significantly increases the risk of multiple attempts by over 40 percent.

The characteristics of today's youth are considerably different from their counterparts just three decades ago. Adolescents are faced with higher probabilities of being overweight, being depressed and attempting suicide. Adolescence also represents a major physical and psychological transition that exposes children to pubertal growth, social stressors, and cultural and peer expectations (Ge et al. 2001). It is noteworthy that seven percent of males and over 24 percent of females who are of normal weight perceive themselves as being overweight. Among adolescents who perceive themselves to be very overweight, the risk of attempting suicide is more than twice that for those who perceive themselves to be of normal weight. Thus there is an even stronger positive correlation between weight perception and suicidal behaviors. Indeed, it

has been shown that body dissatisfaction plays a seminal role in altering mental health, particularly for females (see, for example, Siegel 2002).

The strong association between suicidal behaviors and being overweight, as well as perceiving oneself as overweight, is significant from a policy perspective because it suggests that combating the rising prevalence of overweight among children may succeed in reducing suicidal behaviors as well. Furthermore, identifying the role of overweight perception may aid in identifying and assisting at-risk youths through targeted interventions. If being overweight raises the propensity to commit suicide, then this should be incorporated into the accounting of economic and social costs of overweight. Of course, this presumes that overweight status and overweight perception are causal determinants of suicidal behaviors. However, the sparse existing literature has not established whether or not this link is causal in nature because of statistical problems associated with confounding factors. The absence of such information undermines the formulation of effective public policies to lower adolescent suicides and reach *Healthy People 2010* goals.

The objective of this study is to investigate whether overweight status and overweight perception are causal factors affecting suicide ideation and attempts among high-school students. In particular, this study hypothesizes that it is the perception of being overweight, rather than the extra weight per se, that triggers suicidal behaviors. Using a nationally representative sample of adolescents in high school from the Youth Risk Behavioral Surveillance System (YRBSS, 1991-2003), the empirical strategy aims at correcting for biases due to non-random selection. The first approach exploits the rich data in the YRBSS on risky activities and behavioral problems to compare marginal effects in sparse and extended model specifications. This informs on the sensitivity of the effect of overweight indicators on suicidal behaviors and the extent to which it

may be driven by selection bias. The second approach is a bivariate probit framework, which explicitly controls for correlation between unobserved factors affecting both overweight perception and suicidal outcomes. In order to gauge the robustness of the results, the analysis is supplemented by a propensity score matching methodology based on overweight perception as a binary treatment. The YRBSS data on both actual and perceived overweight status also allow estimation of specifications stratified along these dimensions for further investigation of the linkages between these indicators and suicidal behaviors. The marginal effects are used to derive the first estimates of how much the increased risk of suicide adds to the economic costs of adolescent overweight.

The remainder of the study proceeds as follows. Section 2 reviews prior research dealing with the correlation between overweight status, overweight perception, depression and suicidal behaviors. Section 3 outlines the analytical and empirical framework. Section 4 describes the data used in the analyses. Section 5 discusses the results, and Section 6 concludes.

II. Background

Sociologists, psychologists, and economists have developed a variety of analytical frameworks to explain suicide.³ In the broad context of these theories, there are compelling reasons a priori to expect positive effects of overweight and self-perception on suicidal behaviors. In his classic work on suicide, Durkheim (1966) asserts that the suicide rate is inversely related to the degree of social integration. While his work does not consider the linkage between overweight status and suicide, studies have documented that overweight adolescents are more likely to have difficulties with peer relationships, become socially isolated and psychologically maladjusted, and are less likely to develop romantic relationships (see, for example, Daniels 2006; Pearce et al. 2002, and Falkner et al. 2001).

³ See, for instance, Cutler et al. (2001), Hamermesh and Soss (1974), Durkheim (1966), and Wilkins (1967).

Cutler et al. (2001) summarize several economic models of suicide. In conjunction with the rational-suicide theory developed by Hamermesh and Soss (1974), negative shocks to the expected value of future utility can induce an individual to “rationally” end his own life. That is, suicide is viewed as a purposive action based on a cost-benefit calculus of continued living versus death. This framework predicts that suicide is more likely with age, when unhappiness is persistent and correlated over time, when the variance of happiness or utility is high, and when individuals have high discount rates. For adolescents, the variability in emotions may be particularly large. Furthermore, there is a strong direct correlation between depression and suicidal behaviors for youths. To the extent that actual overweight status, and particularly self-perception, may induce depression along with other emotional and behavioral problems, the risk of suicide would be increased. The interaction between depression and social maladjustment may reinforce this risk. There is also evidence that youths discount the future more heavily than adults (Bishai, 2004; Grossman et al., 2002), and that the rate of time preference increases with body mass index for youths (Smith et al., 2005). While the direction of causality between weight and time preference is difficult to establish, likely running in both directions, an increasing risk of suicide among adolescents who are overweight or perceive themselves to be such is consistent with this channel.

Cutler et al. (2001) also note that youth suicides may be strategic in that they are attempted merely to signal unhappiness and represent a cry for more parental input and resources. This theory is also consistent with the positive correlation between depressive disorders and overweight status, which in turn can induce an attempt to end one’s life. Within the strategic-suicide theory, suicide attempts serving as a signal of unhappiness are less likely to be serious, though sometimes on occasion death can occur. Differentiating between any attempt

and attempts that resulted in injury and medical attention in the YRBSS may shed some light on the underlying reasons for the attempt.

A causal link from overweight status, particularly self-perception of weight, to suicidal behaviors can be imparted within all of these theories. While several studies have addressed adolescent suicide and overweight as outcomes, very few have examined these outcomes jointly. Studies documenting other correlates of overweight status, including depressive and mood disorders, social disorders, and other behavioral problems, are more numerous.

Carpenter et al. (2000) analyze data on 42,862 adults from the 1992 National Longitudinal Alcohol Epidemiologic Survey. Their results indicate differential and inconsistent effects of body weight on major depression, suicide attempts, and suicide ideation. While they find a positive relationship between relative body weight and depression and suicidal behaviors for females, for males they find the opposite. Their models control for drug and alcohol use but do not account for other risk-taking activities or family history. Other studies looking at the link between obesity and depression have been similarly mixed, with some studies finding a relationship (Wadden et al. 1988; Roberts et al. 2002; Roberts et al. 2003; Dixon et al. 2003; Goodman and Whitaker 2002), and others not or only for morbidly obese females (Friedman et al. 1995; Faith et al. 2002; Hopkinson 1982; Black 1992; Istvan et al. 1992; Onyike et al. 2003; Crisp et al. 1976; Crisp et al. 1980). These studies do however point to strong differential effects by gender and a possibly non-linear relationship.

In a representative sample of about 10,000 public school students (7th, 9th, and 11th grades) in Connecticut, Falkner et al. (2001) find that boys and girls at higher than the 95th percentile of the weight distribution are less likely to hang out with friends, more likely to experience serious emotional problems and hopelessness, and also more likely to consider

themselves poor students. For girls, their results also show a positive correlation between overweight status and the likelihood of attempting suicide. Pearce et al. (2002) examine data on 416 high-school students in a southern New England city. They find that obese girls are less likely to date than their peers and are more likely to report relational victimization. Both obese boys and girls reported more dissatisfaction with their romantic relationships and dating status.

Pritchard et al. (1997) document the often divergent association between actual body mass index and self-perception. They analyze data from the High School and Beyond Study, which sampled over 35,000 students in the 10th and 12th grades between 1980 and 1982. Their results show strong discrepancies between perceived-weight and BMI-weight status for girls, while for males weight perception appears to be reasonably accurate. For instance, of the females who considered themselves to be overweight, actual body mass index revealed that almost 85 percent were of normal weight.

Some studies highlight the impact of perceived weight on mental disorders and other problem behaviors. Siegel (2002) shows that body image is significantly associated with future depressive symptoms, especially for adolescent girls. Eisenberg et al. (2003) find, in a sample of 4,746 public and high school students from the Minneapolis-St. Paul metropolitan area, that teasing about body weight is consistently associated with low body satisfaction, low self-esteem, and high depressive symptoms. Even after controlling for actual weight status, their results indicate that adolescents who are teased by their peers and family members regarding their weight are more likely to think about and attempt suicide. Eaton et al. (2005) analyze data from the 2001 YRBSS. They find that actual weight indicators are strongly correlated with suicide ideation and attempts in models that do not control for perception; however, the effects become insignificant once perception is included in the specifications.

These studies suggest that how adolescents perceive their body weight may be more relevant than their actual weight in affecting depression and other problem behaviors. The studies are limited, however, in several respects. Often, they are based on older or small community-based samples, the results of which may not be applicable to broader population groups. Many of these studies also do not adequately control for relevant confounders that may potentially bias the effects of interest. As a result, they do not directly address the issue of causation, which limits implications for public policy. Furthermore, the link between actual overweight status and self-perception and how these impact adolescent suicidal behaviors has not been addressed with richer specifications and outside these limitations by any of these studies.

III. Analytical Framework

Prior studies have indicated that self-perception is strongly correlated with depression and other disorders. This study specifically focuses on the relationship between overweight perception and suicidal behaviors and assesses the extent to which this connection may be causal. It should be noted that since actual overweight status is a significant predictor of negative weight perception (Pritchard et al. 1997), the effects of actual weight on suicidal behaviors are not discounted. However, the focus on perception also underscores an independent effect of body image conditional on actual weight.

Consider linear specifications of the structural production functions for suicidal behaviors (S^*) and the perception of overweight (OW^*):⁴

$$S_i^* = \alpha_0 + \alpha_1 OP_i^* + \alpha_2 X_i + \alpha_3 \mu_i + \varepsilon_{i1} \quad (1)$$

$$OP_i^* = \beta_0 + \beta_1 X_i + \beta_2 OW_i + \beta_3 TV + \beta_4 \mu_i + \varepsilon_{i2}. \quad (2)$$

⁴ The structural equation for suicidal behaviors is derived from the model of violence in Markowitz and Grossman (1998). The structural equation for overweight perception may be interpreted as a mental illness production function as estimated in Saffer and Dave (2005).

Equation (1) is a production function for suicidal behaviors (S^*), which is a function of perception of overweight status (OP^*), observable characteristics such as age, gender, grade, and race (X), and unobservable characteristics such as time preference, family history, risk-encouraging environment, and mental disorders (μ). Equation (2) postulates the production function for overweight perception (OP^*).⁵ This depends on the same vector of observable and unobservable factors, along with actual overweight status (OW) and media exposure (TV). The subscript i denotes the individual, and ε represents random disturbance terms.

The key parameter of interest is α_1 , the structural effect of overweight perception on suicidal behaviors.⁶ Simple estimation of equation (1) may be biased since the common unmeasured factors (μ) lead to a correlation between overweight perception and the error term. In the specifications above, S_i^* and OW_i^* are interpreted as continuous latent variables measuring an individual's unobserved propensity to engage in suicidal behaviors and perceive themselves as overweight, respectively. This study measures suicidal behaviors and overweight perception as observed dichotomous indicators reflecting these underlying indices:

$$\begin{array}{ll} S_i = 1 \text{ if } S_i^* > 0 & OW_i = 1 \text{ if } OW_i^* > 0 \\ S_i = 0 \text{ otherwise} & OW_i = 0 \text{ otherwise} . \end{array}$$

The estimation strategy proceeds in a stepwise fashion. Initially, equation (1) is estimated using a standard probit model with a parsimonious set of covariates and then with an expanded set of covariates. The YRBSS is a rich data set containing information on school environment and several risk-taking activities, which are usually unobserved in other studies. They may therefore proxy for part of the unmeasured components vector μ_i . Estimating both the basic and extended

⁵ Suicidal behaviors (S^*) are excluded from equation (2) since reverse causality from suicidal behaviors to weight perception, conditional on other factors including depression, does not appear likely. The bivariate probit estimates will be consistent regardless of whether or not S^* affects OP^* .

⁶ The parameter β_2 is also of interest in that it relates actual overweight status to perception, which together with α_1 can inform on the indirect effect of weight on suicidal behaviors. These marginal effects enter into the calculation of how much the increased likelihood of suicide adds to the costs of overweight.

specifications allows an evaluation of how much of the association between weight perception and suicide is driven by such omitted individual heterogeneity or non-random selection.

Since both suicidal behaviors and self-perception are measured as dichotomous indicators, the next set of models estimates both equations jointly using a bivariate probit approach. The bivariate probit is a full-information maximum likelihood estimator based on the assumption that the unmeasured determinants in equations (1) and (2) have a joint, bivariate normal distribution. This procedure accounts for the correlation between the errors in both equations stemming from non-random selection: $\text{Corr} [\mu_i + \varepsilon_{i1}, \mu_i + \varepsilon_{i2}] = \rho$.

If the same vector of individual factors is included in both equations, identification comes purely from functional form restrictions. In practice, such functional form restrictions are difficult to defend, and the bivariate probit model performs relatively poorly (unstable and imprecise estimates).⁷ However, as specified, equations (1) and (2) do not rely purely on functional form for the joint estimation since a subset of the variables is excluded from the structural suicide production function. It is presumed that actual overweight status (OW) and exposure to media (TV) affect self-perception of overweight, but do not directly have an effect on suicidal behaviors, conditional on perception. Figure 1 summarizes the key relationships.

Research has shown that media exposure has a strong and adverse effect on body satisfaction, particularly among young females (see, for instance, Schooler et al. 2004; Groesz et al. 2002; Hargreaves et al. 2002). Media exposure in this study is measured as hours spent watching television on an average school day. While television exposure may have an independent effect on suicidal behaviors, the literature on this issue has been contradictory (Kessler et al. 1989). Diagnostic statistical tests in this study do not show any conditional

⁷ See Rashad and Kaestner (2003) for an analysis that illustrates the poor performance of bivariate probit models in such circumstances. See Chatterji et al. (2004) for an implementation of the bivariate probit to study the link between alcohol use and suicide among adolescents.

correlation between television viewing and suicidal behaviors. Including television in both structural equations also does not materially alter the results.

The benefit of the YRBSS data is that there is separate information on self-perception regarding one's weight along with actual weight status. The premise underlying the causal pathways is that actual weight does not have an independent causal effect on suicidal behaviors outside of self-perception. In order for an individual to have attempted suicide causally due to his or her being overweight, it would be logical to assume that this individual obsesses about his weight and perceives himself as being overweight. If an overweight individual attempts suicide, but does not report any body dissatisfaction, it is very likely that the weight was not causal on the suicide. It is more likely that both the overweight and suicide attempt are caused by some unobserved factor such as depression or time preference. Consistent with this channel, Eaton et al. (2005) find that body weight has no impact on suicide conditional on body image.

Observing self-perception also allows a cleaner separation of the mediating and causal effects of depression. It is important to control for depression in all models since it may be a confounding correlate of both suicide and overweight perceptions; depression can induce eating binges, body dissatisfaction, and suicidal impulses. However, the causal effect of overweight status on suicidal behaviors may also operate through depression. That is, being overweight may induce depression, leading to suicide. In this context, self-perception of overweight status may be interpreted as a proxy for overweight-induced depression. If an overweight individual attempts suicide and reports being depressed, several causal pathways can be possible. If this individual does not report any body dissatisfaction, then the causal pathway operating from overweight to depression to suicide is ruled out. If this individual does report body

dissatisfaction, then it indicates some weight-induced depression or other problems such as being teased regarding one's weight.

In the YRBSS, adolescents who perceive themselves as being overweight are three times as likely to report trying to lose weight. More alarmingly, weight loss attempts in these individuals are more than three times as likely to occur through diet pills or vomiting, indicating obsessive body dissatisfaction. These rates of dieting, using diet pills, and vomiting are also significantly higher along the same magnitudes for normal weight adolescents who perceive themselves as being overweight. Among normal-weight adolescents, those who report dissatisfaction with their weight also tend to have low self-esteem; they are more likely to consider themselves as below-average students even when there is no significant difference in their GPA. These adolescents are also less likely to be social as indicated by participation in team sports. Thus, overweight perception leads to depression, several unhealthy behaviors, and low self-esteem, which may in turn motivate suicidal behaviors.

Identifying the bivariate probit with exclusion restrictions on actual overweight status and television exposure is analogous to an instrumental variables estimator where overweight perception is instrumented by these measures. Practical implementation of the exclusion restrictions-identified bivariate probit requires that the instruments are valid. That is, they should not have a direct effect on suicidal behaviors and they should be strongly correlated with overweight perception. Standard diagnostics confirm this. The instrumental set satisfies the exclusion restriction based on the tests proposed in Davidson and MacKinnon (1993) and Bollen et al. (1995) for an overidentified equation. To gauge the strength of the identifying instruments, the joint-F statistic is examined from equation (2). In all models, the instruments are significant at less than the one-percent level and the F-statistics exceed 100. Further evidence in support of

these identifying variables is obtained from stratified samples. Restricting the sample to normal-weight adolescents, perception of overweight has a significant positive effect on suicidal behaviors. Alternately, restricting the sample to adolescents who are satisfied with their weight, actual overweight status has no effect on any suicidal behavior. Thus, there does not appear to be any independent effect of actual weight beyond its effect on body dissatisfaction.

As adolescents are not randomly sorted into suicidal and overweight behaviors, the bivariate probit provides one method of correction by accounting for correlated errors. To further lend support to the results, propensity score matching estimators are used to estimate the average effect of the treatment (overweight perception) on suicidal behaviors for the treated (ATT). Following Becker and Ichino (2002) and Rosenbaum and Rubin (1983), the propensity score can be defined as the conditional probability of receiving the treatment given pre-treatment characteristics:

$$p(Z) \equiv \Pr\{OW=1 \mid Z\} = E\{OW \mid X\}. \quad (3)$$

The average effect of treatment on the treated can then be estimated as follows:

$$\begin{aligned} \tau &\equiv E\{S_{1i} - S_{0i} \mid OP_i = 1\} \\ &= E\{E\{S_{1i} - S_{0i} \mid OP_i = 1, p(Z_i)\}\} \\ &= E\{E\{S_{1i} \mid OP_i = 1, p(Z_i)\} - E\{S_{0i} \mid OP_i = 0, p(Z_i)\} \mid OP_i = 1\} \end{aligned} \quad (4)$$

where S_{1i} and S_{0i} are the suicidal outcomes in the two counterfactual situations of treatment and no treatment, respectively.

The motivation behind propensity score matching is to address the nonrandom nature of the treatment and control groups by comparing treatment and control observations that are as similar as possible based on observed characteristics (Z). Here vector Z is a less parsimonious version of vector X (representing the characteristics used in the prior regressions) in order to account for as many characteristics (and their interactions) as possible in predicting overweight

perception (*OP*). The counterfactual of the outcome of the treated individual if he were not treated is, by definition, unobserved. Matching estimators impute the missing outcome by finding other individuals in the data whose covariates are similar but who were not exposed to the treatment. Indeed, the degree to which the bias is reduced “depends crucially on the richness and quality of the control variables on which the propensity score is computed and the matching performed” (Becker and Ichino 2002). Consistent estimation of the ATT requires that the assignment to treatment is independent of the outcomes, conditional on the propensity score. Thus, the groups should be balanced on both the observable and unobservable factors or the observable factors should have the same effect on the propensity score as the unobservables. A sufficient condition for this “unconfoundedness” assumption is that the observable determinants of an outcome are a random subset of the complete set of determinants, which may hold for large multi-purpose datasets (Altonji et al. 2005).

Estimates of the ATT are compared based on nearest-neighbor matching and stratification matching.⁸ Stratification matching consists of classifying the range of variation of the propensity score into intervals, for instance quintiles, such that all covariates are balanced within each block. The ATT is then computed as the weighted average (by the number of treated) of the interval-specific treatment effects. Nearest-neighbor matching takes each treated unit and searches for the control unit with the closest propensity score. The ATT is obtained by averaging over the unit-level treatment effects. In both cases, the common support restriction is imposed prior to matching in order to improve the quality of the matches (Becker and Ichino 2002). This condition involves considering only those observations whose propensity score belongs to the intersection of the distributions of the propensity score of the treatment and the control groups – that is, those who do and do not perceive themselves as overweight. The

⁸ Other matching algorithms yielded similar results.

distribution of overweight perception propensity scores is compared for individuals with and without actual overweight perception. Individuals without such perception with propensity scores close to zero and below the minimum propensity score observed among their perceived-overweight counterparts are deleted, since their observed characteristics are not comparable to any of the individuals in this group. Similarly, individuals with overweight perception who have a propensity score close to one and that exceeds the upper bound of the propensity score distribution for their comparison group are also deleted.

All models are estimated separately by gender. Pritchard et al. (1997) document that male students are less tolerant of overweight partners than female students, females are more stigmatized by obesity than males, and body dissatisfaction increases significantly between the ages of 12 and 18, particularly for females. There are also considerable gender differences in suicidal behaviors. For instance, although completed suicides are more common among male adolescents, female adolescents are about twice as likely attempt suicide. In the YRBSS, among those attempting suicides, males are thus more likely to report a serious attempt resulting in injury and requiring medical attention.

IV. Data

Our analysis relies on the Youth Behavioral Risk Factor Surveillance System (YRBSS), conducted by the Centers for Disease Control and Prevention. Every two years, the Centers for Disease Control and Prevention conduct this nationally-representative survey in public and private high schools for grades 9 through 12, covering all 50 states and the District of Columbia. The YRBSS was developed in 1990 by the Centers for Disease Control to monitor priority health-risk behaviors among youth, including those leading to unintentional injuries and violence, tobacco use, substance abuse, sexual behaviors that contribute to unintended pregnancy

and sexually transmitted diseases, and obesity (Brener et al. 2004; U.S. Department of Health 2005). As such, it is particularly appropriate for our analysis. We analyze seven years of data: 1991, 1993, 1995, 1997, 1999, 2001, and 2003. Data on the body mass index (BMI) are not available until 1999. Prior to 1999, questions are asked on whether the respondent believes he or she is very underweight, slightly underweight, of normal weight, slightly overweight, or very overweight. About thirty percent of respondents believe they are slightly overweight or very overweight, which is analogous to those who are actually overweight – at or above the 85th percentile based on CDC growth charts.⁹ We restrict the sample to those reporting information on suicide and perception of weight, which yields a maximum sample size of about 96,000 observations.

Dichotomous indicators are defined for suicide ideation in the past year, any suicide attempt in the past year, and any serious suicide attempt in the past year. Suicide ideation involves seriously contemplating or making a plan to commit suicide. A serious suicide attempt is defined as an attempt that resulted in injury and required medical attention (denoted suicide injury). Tables 1 and 2 present weighted sample means for males and females, stratified by both overweight perception and actual overweight status. These tables reveal that as many as 19 percent of males and 30 percent of females, respectively, reported having serious thoughts about attempting suicide in the year prior to being surveyed. There is a striking difference between the genders when overweight perception and overweight status for the whole samples are compared: Twenty-three percent of males believe they are overweight, whereas 33.5 percent actually are. This is reversed for females, 37.5 percent of which believe they are overweight, while only 23

⁹ Those children and adolescents at or above the 85th percentile with respect to BMI are actually classified as “at risk of overweight” by the Centers for Disease Control and Prevention, while those at or above the 95th percentile are classified as being “overweight.” In this paper, we define those at or above the 85th percentile as being overweight, and those at or above the 95th percentile as being obese. The CDC growth charts are age- and gender-specific BMI charts reflecting the distribution of the body mass index of children and adolescents in the 1970s.

percent actually are.¹⁰ The figures also indicate that suicidal behaviors are more prevalent among youths who perceive themselves as overweight relative to those who do not. For instance, 6.4 percent of adolescent males and 13.5 percent of adolescent females who believe they are overweight have attempted suicide in the past year compared to 4.6 percent and 10.2 percent among those with no perception of being overweight. Similar differences are also observed for other suicidal behaviors. Differences in suicidal behaviors in the same direction also exist across actual overweight status. It is noteworthy to observe differences between males and females. For males, we observe significant differences in means for the suicidal variables by overweight perception, but not by overweight status. This is in contrast to means for females, which are consistently higher and statistically significantly different by both overweight perception and overweight status.

Finer stratifications reveal differences in means consistent with the causal pathways outlined above. For instance, even within adolescents who are all of normal weight, there is a significantly higher prevalence of suicidal behaviors for those who perceive themselves to be overweight. For instance, for suicide attempts, the prevalence is 9.2 percent (versus 4.9 percent among those with no overweight perception) for males, and 13.2 percent (versus nine percent) for females. On the other hand, limiting the sample to those with no self-perception of overweight, there is no significant difference in ideation across actual overweight status. There is a small difference in attempts, which the ensuing analysis shows to be spurious correlation resulting from the other factors. These simple correlations indicate that overweight perception is

¹⁰ This percentage is actually lower than that reported by the National Institutes of Health based on actual measurements of weight and height in the National Health and Nutrition Examination Survey. This could be due to the self-reported nature of the weight variables in our sample. Females have been shown to underreport weight (see, for example, Engstrom et al. 2003; Villanueva 2001; Black et al. 1998).

a stronger predictor of suicidal behaviors, and that conditional on perception, actual overweight status is not very significant.

Mental health outcomes vary across many dimensions, both observable and unobservable. We control for observable demographic and socioeconomic factors by creating dichotomous indicators for race, ethnicity, and parental education, and by including controls for age and current grade level in school. Engaging in risky behaviors is also likely to be an influential force in determining suicide. Controls for seatbelt use, driving under the influence, weapon possession, physical violence, smoking, alcoholic consumption, binge drinking, drug abuse, sexual behavior, sports participation, school environment, and parental education and involvement are thus defined and included.¹¹ The means in Tables 1 and 2 indicate that overweight perception (and overweight status) is correlated with other observed characteristics, such as race, other risky activities including risky sexual behavior, parental education, and participation in team sports. Selection on these observable factors indicates that additional unobserved selection may also play a mediating role in the effect of overweight perception on suicide. The multivariate models, presented next, address this possibility.

V. Results

Univariate probit estimates of the marginal effects of overweight perception and other factors on suicide ideation for males and females are presented in Table 3.¹² Column 1 presents models with a parsimonious set of observed correlates. Overweight perception raises the probability of suicide ideation by 4.1 and 7.7 percentage points respectively for males and females. Given that 19.1 percent of males and 30.2 percent of females seriously think about

¹¹ More detail on variable definitions can be found in Tables 1 and 2.

¹² All models were also estimated with state fixed effects, yielding virtually identical results. However, for the bivariate probit estimation, in some cases models with state fixed effects failed to converge. To ensure consistent comparison, a set of nine census division fixed effects are used instead.

suicide, these effects represent a 21 – 25 percent increase. Columns 2 and 3 expand on the explanatory vector by including indicators of other risky behaviors, school environment, participation in team sports, and depression.¹³ The marginal effects, while statistically significant, decline in magnitude (to 1.7 percent for males, and 5.1 percent for females), indicating considerable selection on observables. The effects of other factors are as expected. There is some evidence, consistent with rational suicide, that suicidal behaviors increase with age for most of the observed sample range. Relative to whites, blacks and Hispanics engage less and adolescents of other race engage more in suicide ideation. Other risk-taking behaviors as proxied by seatbelt use, addictive substance use, carrying weapons, and being involved in a fight, also raise suicidal tendencies. Measures of risky sexual behavior and forced sex also increase suicide ideation, as do indicators of a risky school environment. Feeling depressed or hopeless in the past two weeks has the strongest positive effect on suicidal ideation (as well as on the other suicidal behaviors).

Table 4 presents the full set of marginal effects of all overweight indicators on suicide ideation, suicide attempt, and suicide injury. Results from the extended specifications indicate that any perception of overweight positively impacts the probability of engaging in suicide ideation and attempting suicide for both male and female adolescents. It does not have a significant effect on suicide injury. Perception of being very overweight significantly impacts all suicidal behaviors, with expectedly larger marginal effects, for both genders. Comparison of the estimates from the sparse versus the expanded specifications provides information on non-random selection. It is interesting to note that the decline in the marginal effects is substantially

¹³ Models including parental education, parental discussion about HIV, and dental visits, as proxies for family environment, were also estimated. The marginal effects are very similar to those reported. Since these variables had had missing information for a relatively large number of individuals, they are excluded from subsequent specifications.

greater for males than for females. For instance, the effect of a perception of being very overweight on any suicide attempt falls by about 44 percent for females and 81 percent for males, across the basic and extended models. Altonji et al. (2005) suggest that selection on observable factors may also inform us about selection on unobservable factors. The lower marginal effects indicate that there is far greater selection on observables, and by association unobservables, for males than for females. The results for the indicators of actual overweight status are generally similar to those for perception. In the context of the causal pathways, the models for actual overweight should be interpreted as reduced form estimates where the effect of overweight on suicide operates through perception.

Table 5 presents marginal effects of self-perception indicators on suicidal behaviors based on joint estimation of equations (1) and (2) through bivariate probit. These estimates account for any unobserved selection that may be biasing the results from single-equation estimates. The estimates drop in magnitude considerably for males, consistent with the above evidence that selection on observables (and potentially unobservables) plays a larger role for them relative to females. Perceiving oneself to be overweight or very overweight does have some positive effect on suicide ideation for male adolescents, though the effects are imprecisely estimated. For suicide attempts or injury, there is no discernible effect. For females, the effect of perception is robust in all specifications. The marginal effects are also not much affected in comparison with the univariate probit estimates, suggesting that after controlling for the expanded set of violence, risky sex, substance use, depression, and other variables, additional selection on unobservables is not a mediating factor. The parameter ρ represents the correlation between the errors in the suicide and overweight perception equations. While the estimates are imprecise for the most part, the magnitudes for males are generally much larger

relative to females, indicating that a greater component of the link between overweight perception and suicide is due to unobservables for male adolescents. It is also interesting to note that for female adolescents, rho was significantly positive and larger in magnitude in many of the basic specifications (not reported). Controlling for the additional variables causes the rho to decline in magnitude and become insignificant, indicating that these expanded factors do a better job of proxying for the non-random selection, compared to males.

Estimates of the average treatment effect on the treated, based on propensity score matching, are presented in Table 6. Generally, the qualitative results are consistent with the prior methodologies. The average effect of perceiving oneself to be very overweight is larger than any overweight perception. The treatment effects for females are larger relative to males. The magnitude of the ATT, for females, is generally in line with those estimated from the single-equation and bivariate probit models. For males, the magnitudes of the ATT tend to be larger than the prior estimates. Consistent with the prior results, this suggests that balancing on observables may still leave substantial non-random selection that is not accounted for. There are no significant differences across matching algorithms.

Tables 7 and 8 present estimates from samples stratified across the overweight and perception indicators. Table 8 indicates that there is generally no effect of actual overweight status once the samples are limited to those individuals who perceive themselves as overweight and those with no such body dissatisfaction. These results are consistent with the hypothesized causal pathways and the identifying instruments, confirming that there is no independent link between actual overweight and suicidal behaviors, conditional on perception and the other covariates. Table 8 splits the sample by actual overweight status. Even for normal-weight individuals, the perception of overweight status significantly raises the likelihood of engaging in

suicidal behaviors. The marginal effects for female adolescents are very similar to the previous estimates. For males, the marginal effects of a perception of being very overweight tend to be larger than the bivariate probit estimates due to the unobserved selection. Restricting the sample to actual overweight status, female adolescents who possess a strong sense of body dissatisfaction are more likely to engage in all suicidal behaviors. For males, there is generally no effect on attempts or suicide injury. Since overweight status is strongly correlated with unobservables for male adolescents, this sample is likely to be more homogeneous and thus yields estimates similar to the bivariate probit.

VI. Conclusions

This study analyzes the causal effects of overweight perception on suicidal behaviors. While the means and single-equation estimates suggest a strong positive effect of body dissatisfaction on suicide ideation, any suicide attempt, and suicide injury, the concern was to examine whether this association was driven by unobserved selection. To assess the extent to which this effect is causal in nature, operating through weight-induced depression or other problems, data from the YRBSS differentiating actual from perceived overweight along with information on a rich set of confounding factors were exploited.

The estimation strategy relied on a set of approaches to gauge the robustness of the estimates: comparison between parsimonious versus extended specifications, bivariate probit models, propensity score matching, and sample stratification. Certain consistent results emerge from these methodologies. For female adolescents, body dissatisfaction has a significant and positive effect on the likelihood of all suicidal behaviors. For instance, any perception of being overweight raises the probability of suicide ideation by 6.1 percentage points, the probability of a suicide attempt by 3.6 percentage points, and the probability of an injury-causing suicide attempt

by 0.5 percentage points.¹⁴ These effects are larger if the respondent reports that she perceives herself to be very overweight. For male adolescents, the results tend to be mixed, with the conservative estimates from the bivariate probit models indicating no consistent effect of overweight perception on any suicidal behavior. All models also suggest that more of the link between weight perception and suicide is driven by unobserved selection for males relative to females. This is consistent with the differential responses of boys and girls to their body dissatisfaction. For instance, among all adolescents who perceive themselves as being overweight, significantly more girls actively try to lose weight. These girls are also two to three times more likely to use diet pills or vomiting for weight loss relative to boys. Even among adolescents who are of normal weight but express dissatisfaction with their bodies, the likelihood of actively trying to lose weight and doing so through unhealthy means is much higher for girls relative to boys. This suggests that body dissatisfaction is a much more serious problem for female adolescents, and thus more likely to lead to depression and prompt suicidal thoughts and actions. For male adolescents, body dissatisfaction, while an unhealthy attitude in itself, is less acted upon. This is consistent with the results suggesting that overweight perception has a small or zero causal effect on male suicidal behaviors. The other consistent result to emerge from the estimates is that, conditional on overweight perception, actual weight has no independent effect for both genders.

The results suggest that the most likely channel of effect runs from actual overweight to overweight perception and weight-induced depression and finally to suicidal ideation or attempt.

¹⁴ Evaluated relative to the mean, these marginal effects translate to 20.3 percent, 31.0 percent, and 14.4 percent, respectively. That there is a significant effect on suicide attempts causing injury and requiring medical attention suggests that the strategic suicide theory does not provide a complete explanation of adolescent suicides related to weight.

Based on the 2003 data, the prevalence of being very overweight is 8.9 percent among girls and 16.6 percent among boys. Reducing this prevalence to four percent, consistent with the objective stated in *Healthy People 2010*, would prevent between 21,092 and 27,176 girls from engaging in suicide ideation, based on the bivariate probit and first-stage estimates.¹⁵ Between 12,386 and 15,852 girls would be prevented from attempting suicide.¹⁶ For male adolescents, the results suggest that there may not be a causal link from overweight or perception to suicide attempts. Using conservative estimates, reducing the prevalence of very overweight among boys to 7.5 percent (in conjunction with the *Healthy People 2010* objectives) would prevent 7,977 boys from seriously contemplating suicide.

Studies have highlighted role of economic factors in explaining the rising trend in obesity. Chou et al. (2005) show that advertising of fast-food restaurants has a significant positive impact on the prevalence of overweight among adolescents. These results, along with other studies, suggest that eliminating of the tax-deductibility of fast-food advertising, limiting the number of fast-food restaurants per capita, raising the price of fast food, and raising the gasoline tax would reduce the number of overweight individuals (Rashad et al. forthcoming). Variyam and Cawley (2006) show that the Nutrition Labeling and Education Act, which required more transparent labels regarding nutrients, calories, and fat content, was associated with a decrease in body weight and the probability of obesity for certain demographic groups. In this context, greater transparency in the caloric and nutritional information for fast food may also

¹⁵ The marginal effect of being very overweight on the perception of overweight is 0.580 and on the perception of being very overweight is 0.28 for females, based on the first-stage models in the bivariate probit. For males, the marginal effects are 0.66 and 0.13, respectively. The simulations are based on adolescents between the ages of 14 and 19. In bivariate probit models where television exposure is omitted as an identifier for perception, the results are highly similar. In addition, with a single identifying instrument, the Wald estimate can be calculated. Estimates of the reduced form marginal effect of actual overweight on suicidal behaviors accorded with estimates of the marginal effect of overweight status on perception and the effect of perception on suicidal behaviors.

¹⁶ Since body mass index and actual overweight status are based on self-reports, underreporting of actual weight by females is likely. If the underreporting is positively correlated with body dissatisfaction (which is less likely to be underreported), then the actual number of preventable suicides would increase.

improve eating habits and reduce the prevalence of overweight. Kaestner and Xu (2006) exploit a natural experiment afforded by Title IX, which increased girls' sports participation. They find that this proxy for expanded athletic opportunity was associated with greater physical activity and improved weight and body mass.

To the extent that such policies curb the rise in obesity, they will also have a beneficial impact on suicidal behaviors, particularly among adolescent females. The results from this study also highlight the role of overweight perception independent of actual weight. This suggests that efforts aimed at preventing youth suicides should also focus on educating youths and fostering healthy attitudes regarding weight. Cohen et al. (2005) express concern about the singular focus on the "O-word" (obesity). They document that focusing on weight alone has serious consequences for mental health, and engenders prejudice and stigma towards the overweight. In this context, a proposal by a Texas state senator requiring obesity reports for children to be generated and sent home would exacerbate body dissatisfaction and eating disorders and potentially induce suicidal behaviors. During the adolescent phase, girls especially are particularly sensitive about their bodies. The prevalence of body dissatisfaction, among special populations of youths such as non-black girls, is significantly higher than the general youth population, even when the underlying weight is in a healthy range. Interventions that identify and assist these youths and educate them regarding a healthy body image will thus succeed in lowering suicide attempts.

Current estimates place the economic costs of obesity in the U.S. at about \$100 billion for 1995 (Wolf and Colditz, 1998). These are based on several components including the direct costs of illnesses and associated health care and indirect costs such as productivity losses, reduced income, and premature mortality. However, none of the estimates include the costs

related to induced-suicide. Currently, 24.5 percent of female adolescents are overweight, which raises the probability of attempting suicide by 0.52 percent, based on the bivariate probit estimates. This suggests that, in 2003, 63,481 suicide attempts, out of which about 8,000 would result in injury and require medical attention, were caused by being overweight. There were a total of 295 deaths due to suicide for girls aged 14-19, and overweight status was causal on 14 of these deaths.

Miller et al. (1999) document the total cost of completed and medically treated youth suicides in the U.S. for 1996 at \$18.7 billion. Of this, \$7.0 billion can be attributed to female suicides and attempts.¹⁷ Since overweight status is estimated to cause about four to five percent of the suicide attempts and completed suicides, the risk of suicide by adolescent females adds about \$280 to \$350 million to the costs of adolescent obesity. The above costs do not include the costs of mental health care, which may also constitute an important component since estimates indicate that overweight perception has a strong direct effect on suicide ideation. Suicide ideation and non-injury causing suicide attempts are also unhealthy behaviors in and of themselves and would add to the above costs.

¹⁷ Authors' own calculations based on male-female differences in suicide injury and completed suicides. For instance, in 2003, completed suicides by adolescent females represented only about 20 percent of all adolescent suicides, whereas injury-causing unsuccessful suicide attempts by females comprised about 60 percent of all such suicides.

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Figure 1
Hypothesized Causal Relationships

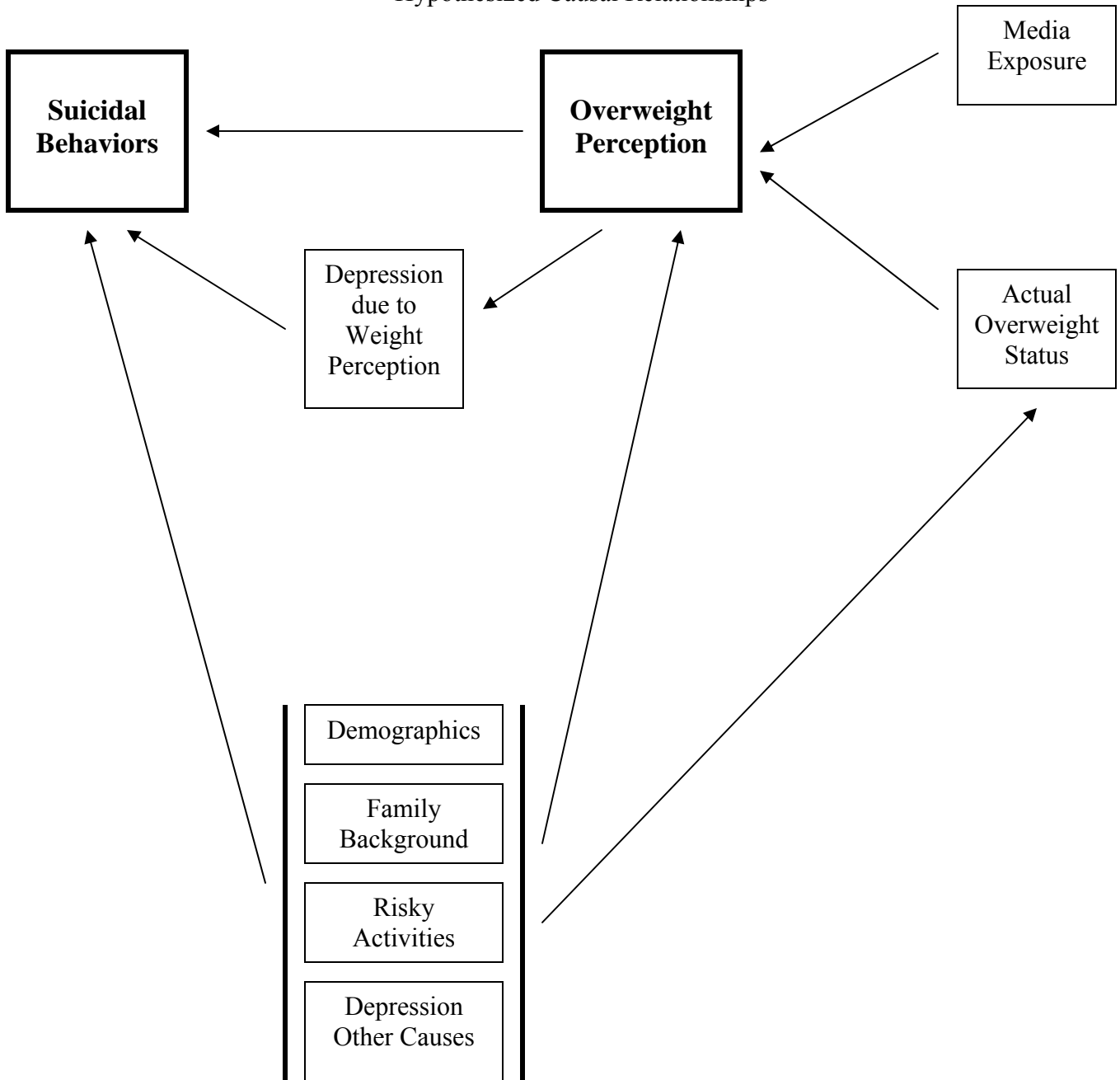


Table 1
YRBSS Data
Weighted Sample Means – Males

Variable	Definition	All	By Overweight Perception		By Overweight Status	
			1	0	1	0
Suicide Ideation	Dichotomous indicator for whether respondent seriously contemplated or made a plan for committing suicide in the past year	0.188 (0.390)	0.217*** (0.412)	0.179 (0.383)	0.166 (0.372)	0.159 (0.366)
Suicide Attempt	Dichotomous indicator for whether respondent attempted suicide in the past year	0.050 (0.219)	0.064*** (0.245)	0.046 (0.210)	0.056 (0.230)	0.052 (0.221)
Suicide Injury	Dichotomous indicator for whether respondent attempted suicide that resulted in injury and required medical attention	0.018 (0.133)	0.023*** (0.150)	0.017 (0.128)	0.018 (0.134)	0.018 (0.131)
Overweight - Perception	Dichotomous indicator for whether respondent believes he is overweight	0.231 (0.422)	1.000*** (0.000)	0.000 (0.000)	0.564*** (0.496)	0.067 (0.250)
Overweight Very - Perception	Dichotomous indicator for whether respondent believes he is very overweight	0.028 (0.166)	0.122*** (0.327)	0.000 (0.000)	0.086*** (0.280)	0.004 (0.066)
Overweight	Dichotomous indicator for whether respondent has a body mass index greater than or equal to the 85 th percentile based on CDC growth charts	0.335 (0.472)	0.809*** (0.393)	0.190 (0.393)	1.000*** (0.000)	0.000 (0.000)
Obese	Dichotomous indicator for whether respondent has a body mass index greater than or equal to the 95 th percentile based on CDC growth charts	0.153 (0.360)	0.503*** (0.500)	0.047 (0.211)	0.458*** (0.498)	0.000 (0.000)
Body Mass Index	Body mass index, measured in kilograms per squared meters	23.501 (4.773)	28.455*** (5.556)	21.992 (3.251)	28.551*** (4.663)	20.959 (2.003)
Age	Age of respondent	16.155 (1.222)	16.083*** (1.218)	16.176 (1.223)	16.010*** (1.209)	16.150 (1.212)
Black	Dichotomous indicator for whether respondent is black but not Hispanic	0.126 (0.331)	0.094*** (0.292)	0.135 (0.342)	0.143*** (0.350)	0.123 (0.329)
Other Race	Dichotomous indicator for whether respondent's race is other than white, black, or Hispanic	0.098 (0.297)	0.106*** (0.308)	0.095 (0.294)	0.094 (0.292)	0.099 (0.298)
Hispanic	Dichotomous indicator for whether respondent is Hispanic	0.107 (0.308)	0.129*** (0.335)	0.100 (0.300)	0.153*** (0.360)	0.114 (0.318)
Grade	Current grade level of respondent	10.471 (1.121)	10.438*** (1.107)	10.481 (1.125)	10.318*** (1.110)	10.411 (1.117)
Seatbelt	Dichotomous indicator for whether respondent wears a seatbelt most of the time or	0.594 (0.491)	0.588 (0.492)	0.595 (0.491)	0.609*** (0.488)	0.653 (0.476)

	always, as a passenger					
Drink & Drive	Dichotomous indicator for whether respondent has driven under the influence of alcohol or been a passenger when the driver was under the influence, in the past month	0.162 (0.368)	0.155** (0.362)	0.164 (0.370)	0.145* (0.353)	0.155 (0.362)
Carry Weapon	Dichotomous indicator for whether respondent carried a weapon in the past month	0.308 (0.462)	0.343*** (0.475)	0.297 (0.457)	0.312*** (0.463)	0.264 (0.441)
Gun	Dichotomous indicator for whether respondent has carried a gun in the past month	0.104 (0.306)	0.113*** (0.316)	0.102 (0.302)	0.100*** (0.300)	0.088 (0.283)
Fight	Dichotomous indicator for whether respondent was in a physical fight in the past year	1.504 (2.743)	1.535 (2.820)	1.495 (2.719)	1.349 (2.609)	1.318 (2.560)
Smoke-Lifetime	Dichotomous indicator for whether respondent has smoked at least one cigarette in his life	0.562 (0.496)	0.557 (0.497)	0.563 (0.496)	0.524 (0.499)	0.530 (0.499)
Smoke-Past Month	Dichotomous indicator for whether respondent has smoked in the past month	0.309 (0.462)	0.313 (0.464)	0.308 (0.461)	0.278 (0.448)	0.288 (0.453)
Drink-Lifetime	Dichotomous indicator for whether respondent has ever consumed at least one alcoholic drink in his life	0.801 (0.399)	0.799 (0.401)	0.802 (0.399)	0.804*** (0.397)	0.781 (0.414)
Drink-Past Month	Dichotomous indicator for whether respondent consumed alcohol in the past month	0.509 (0.500)	0.508 (0.500)	0.510 (0.500)	0.484 (0.500)	0.492 (0.500)
Binge-Past Month	Dichotomous indicator for whether respondent consumed 5 or more alcoholic drinks in a row in the past month	0.345 (0.475)	0.340 (0.474)	0.346 (0.476)	0.325 (0.468)	0.325 (0.468)
Any Drugs-Lifetime	Dichotomous indicator for whether respondent has ever consumed illegal drugs	0.673 (0.469)	0.669 (0.471)	0.675 (0.468)	0.992*** (0.088)	0.996 (0.064)
Cocaine-Past Month	Dichotomous indicator for whether respondent had cocaine in the past month	0.039 (0.193)	0.039 (0.194)	0.038 (0.192)	0.045 (0.207)	0.046 (0.209)
Marijuana-Past Month	Dichotomous indicator for whether respondent had marijuana in the past month	0.258 (0.437)	0.240*** (0.427)	0.263 (0.440)	0.258*** (0.437)	0.288 (0.453)
Sex-Lifetime	Dichotomous indicator for whether respondent has ever had sexual intercourse	0.518 (0.500)	0.463*** (0.499)	0.534 (0.499)	0.500 (0.500)	0.491 (0.500)
Sex-Past 3 Months	Dichotomous indicator for whether respondent had sexual intercourse in the past month	0.350 (0.477)	0.289*** (0.453)	0.368 (0.482)	0.333* (0.471)	0.346 (0.476)
Condom	Dichotomous indicator for whether respondent used a condom while having sexual intercourse	0.217 (0.412)	0.162*** (0.369)	0.233 (0.423)	0.222* (0.415)	0.233 (0.423)
Team Sports	Dichotomous indicator for whether respondent was a	0.656 (0.475)	0.580*** (0.494)	0.679 (0.467)	0.614** (0.487)	0.631 (0.482)

	member of a sports team in the past year					
Pregnant	Number of times respondent has been pregnant or has gotten someone pregnant	0.063 (0.297)	0.066 (0.314)	0.062 (0.292)	0.048 (0.250)	0.052 (0.269)
Mother High School	Dichotomous indicator for whether respondent's mother has at least a high school education	0.895 (0.307)	0.881*** (0.324)	0.899 (0.302)	-	-
Father High School	Dichotomous indicator for whether respondent's father has at least a high school education	0.887 (0.317)	0.866*** (0.341)	0.893 (0.309)	-	-
Year	Year of interview	1997.123 (3.904)	1997.170 (3.908)	1997.108 (3.902)	2000.977 (1.678)	2000.936 (1.670)
Observations		46,994	10,707	36,287	6,667	12,914

Note: Data are for individuals from the Youth Behavioral Risk Factor Surveillance System (YRBSS). Standard deviations are in parentheses. Number of observations listed represents the maximum number in regressions. For some variables, the actual sample size is slightly less due to missing information. Asterisks denote that the difference between samples by overweight perception and by overweight status are statistically significant as follows: *** significant at the one-percent level ** significant at the five-percent level * significant at the ten-percent level.

Table 2
YRBSS Data
Weighted Sample Means – Females

Variable	Definition	All	By Overweight Perception		By Overweight Status	
			1	0	1	0
Suicide Ideation	Dichotomous indicator for whether respondent seriously contemplated or made a plan for committing suicide in the past year	0.300 (0.458)	0.353*** (0.478)	0.267 (0.443)	0.302*** (0.459)	0.257 (0.437)
Suicide Attempt	Dichotomous indicator for whether respondent attempted suicide in the past year	0.114 (0.318)	0.135*** (0.342)	0.102 (0.302)	0.145*** (0.352)	0.099 (0.299)
Suicide Injury	Dichotomous indicator for whether respondent attempted suicide that resulted in injury and required medical attention	0.032 (0.176)	0.036*** (0.186)	0.030 (0.170)	0.043*** (0.203)	0.026 (0.160)
Overweight - Perception	Dichotomous indicator for whether respondent believes she is overweight	0.375 (0.484)	1.000*** (0.000)	0.000 (0.000)	0.786*** (0.410)	0.243 (0.429)
Overweight Very - Perception	Dichotomous indicator for whether respondent believes she is very overweight	0.052 (0.223)	0.140*** (0.347)	0.000 (0.000)	0.183*** (0.387)	0.013 (0.113)
Overweight	Dichotomous indicator for whether respondent has a body mass index greater than or equal to the 85 th percentile based on CDC growth charts	0.226 (0.418)	0.486*** (0.500)	0.076 (0.266)	1.000*** (0.000)	0.000 (0.000)
Obese	Dichotomous indicator for whether respondent has a body mass index greater than or equal to the 95 th percentile based on CDC growth charts	0.084 (0.277)	0.199*** (0.399)	0.017 (0.130)	0.370*** (0.483)	0.000 (0.000)
Body Mass Index	Body mass index, measured in kilograms per squared meters	22.495 (4.388)	25.495*** (4.981)	20.765 (2.804)	28.807*** (4.392)	20.650 (2.048)
Age	Age of respondent	16.044 (1.216)	16.079*** (1.221)	16.022 (1.213)	15.952*** (1.222)	16.017 (1.207)
Black	Dichotomous indicator for whether respondent is black but not Hispanic	0.143 (0.350)	0.116*** (0.321)	0.159 (0.366)	0.216*** (0.412)	0.112 (0.316)
Other Race	Dichotomous indicator for whether respondent's race is other than white, black, or Hispanic	0.098 (0.297)	0.095* (0.293)	0.100 (0.300)	0.089*** (0.285)	0.108 (0.311)
Hispanic	Dichotomous indicator for whether respondent is Hispanic	0.112 (0.315)	0.119*** (0.324)	0.107 (0.310)	0.167*** (0.373)	0.118 (0.323)
Grade	Current grade level of respondent	10.465 (1.125)	10.511*** (1.127)	10.438 (1.124)	10.325*** (1.109)	10.414 (1.120)
Seatbelt	Dichotomous indicator for whether respondent wears a seatbelt most of the time or	0.690 (0.462)	0.669*** (0.471)	0.703 (0.457)	0.701*** (0.458)	0.750 (0.433)

	always, as a passenger					
Drink & Drive	Dichotomous indicator for whether respondent has driven under the influence of alcohol or been a passenger when the driver was under the influence, in the past month	0.166 (0.372)	0.168 (0.374)	0.165 (0.371)	0.139*** (0.346)	0.164 (0.370)
Carry Weapon	Dichotomous indicator for whether respondent carried a weapon in the past month	0.076 (0.264)	0.080*** (0.272)	0.073 (0.260)	0.080*** (0.272)	0.055 (0.228)
Gun	Dichotomous indicator for whether respondent has carried a gun in the past month	0.014 (0.118)	0.015* (0.123)	0.013 (0.115)	0.014** (0.119)	0.010 (0.099)
Fight	Dichotomous indicator for whether respondent was in a physical fight in the past year	0.775 (1.913)	0.896*** (2.093)	0.702 (1.791)	0.767*** (1.794)	0.584 (1.582)
Smoke-Lifetime	Dichotomous indicator for whether respondent has smoked at least one cigarette in her life	0.540 (0.498)	0.583*** (0.493)	0.515 (0.500)	0.540*** (0.498)	0.503 (0.500)
Smoke-Past Month	Dichotomous indicator for whether respondent has smoked in the past month	0.303 (0.460)	0.339*** (0.473)	0.282 (0.450)	0.292 (0.455)	0.285 (0.451)
Drink-Lifetime	Dichotomous indicator for whether respondent has ever consumed at least one alcoholic drink in her life	0.799 (0.401)	0.825*** (0.380)	0.783 (0.412)	0.790*** (0.408)	0.807 (0.395)
Drink-Past Month	Dichotomous indicator for whether respondent consumed alcohol in the past month	0.473 (0.499)	0.497*** (0.500)	0.459 (0.498)	0.443*** (0.497)	0.479 (0.500)
Binge-Past Month	Dichotomous indicator for whether respondent consumed 5 or more alcoholic drinks in a row in the past month	0.274 (0.446)	0.292*** (0.455)	0.263 (0.440)	0.244*** (0.430)	0.290 (0.454)
Any Drugs-Lifetime	Dichotomous indicator for whether respondent has ever consumed illegal drugs	0.652 (0.476)	0.646** (0.478)	0.656 (0.475)	0.993 (0.086)	0.993 (0.083)
Cocaine-Past Month	Dichotomous indicator for whether respondent had cocaine in the past month	0.024 (0.154)	0.026** (0.161)	0.023 (0.150)	0.030* (0.171)	0.035 (0.183)
Marijuana-Past Month	Dichotomous indicator for whether respondent had marijuana in the past month	0.190 (0.392)	0.187 (0.390)	0.191 (0.393)	0.193*** (0.394)	0.212 (0.409)
Sex-Lifetime	Dichotomous indicator for whether respondent has ever had sexual intercourse	0.480 (0.500)	0.458*** (0.498)	0.493 (0.500)	0.449 (0.497)	0.461 (0.498)
Sex-Past 3 Months	Dichotomous indicator for whether respondent had sexual intercourse in the past month	0.365 (0.481)	0.329*** (0.470)	0.386 (0.487)	0.321*** (0.467)	0.359 (0.480)
Condom	Dichotomous indicator for whether respondent used a condom while having sexual intercourse	0.179 (0.383)	0.155*** (0.362)	0.193 (0.395)	0.163*** (0.370)	0.191 (0.393)
Team Sports	Dichotomous indicator for whether respondent was a	0.496 (0.500)	0.456*** (0.498)	0.521 (0.500)	0.405*** (0.491)	0.533 (0.499)

	member of a sports team in the past year					
Pregnant	Number of times respondent has been pregnant or has gotten someone pregnant	0.080 (0.306)	0.075*** (0.300)	0.083 (0.310)	0.100*** (0.344)	0.060 (0.266)
Mother High School	Dichotomous indicator for whether respondent's mother has at least a high school education	0.852 (0.355)	0.834*** (0.372)	0.863 (0.344)	-	-
Father High School	Dichotomous indicator for whether respondent's father has at least a high school education	0.858 (0.349)	0.839*** (0.368)	0.869 (0.337)	-	-
Year	Year of interview	1997.192 (3.959)	1996.914* ** (4.044)	1997.359 (3.898)	2000.981* (1.691)	2000.932 (1.633)
Observations		49,050	17,977	31,073	5,121	14,974

Note: Data are for individuals from the Youth Behavioral Risk Factor Surveillance System (YRBSS). Standard deviations are in parentheses. Number of observations listed represents the maximum number in regressions. For some variables, the actual sample size is slightly less due to missing information. Asterisks denote that the difference between samples by overweight perception and by overweight status are statistically significant as follows: *** significant at the one-percent level ** significant at the five-percent level * significant at the ten-percent level.

Table 3
YRBSS Data
Probit

Variable	Suicide Ideation					
	Males			Females		
	1	2	3	1	2	3
Overweight - Perception	0.04149*** (0.00437)	0.02004*** (0.00652)	0.01733** (0.00701)	0.07660*** (0.00435)	0.05694*** (0.00730)	0.05129*** (0.00788)
Age	0.03750 (0.04126)	0.09030 (0.06675)	0.06674 (0.07316)	0.10672** (0.05125)	-0.08608 (0.09029)	-0.14202 (0.09882)
Age Squared	-0.00080 (0.00128)	-0.00320 (0.00207)	-0.00253 (0.00226)	-0.00317** (0.00160)	0.00235 (0.00281)	0.00412 (0.00307)
Black	-0.05568*** (0.00422)	-0.05281*** (0.00654)	-0.05108*** (0.00731)	-0.07005*** (0.00508)	-0.07336*** (0.00914)	-0.07404*** (0.01013)
Other Race	0.04483*** (0.00721)	0.00803 (0.01032)	0.01527 (0.01176)	0.05851*** (0.00853)	0.05428*** (0.01443)	0.06421*** (0.01607)
Hispanic	-0.01188*** (0.00442)	-0.03334*** (0.00639)	-0.03046*** (0.00710)	0.01634*** (0.00547)	-0.02795*** (0.00915)	-0.02170** (0.01029)
Grade 10	-0.00486 (0.00586)	0.01080 (0.00977)	0.00926 (0.01060)	-0.00772 (0.00709)	0.01171 (0.01236)	0.02026 (0.01378)
Grade 11	-0.00428 (0.00709)	0.02224* (0.01238)	0.02790** (0.01374)	-0.03427*** (0.00864)	-0.00703 (0.01539)	0.00256 (0.01719)
Grade 12	-0.02522*** (0.00832)	0.03258** (0.01545)	0.03691** (0.01690)	-0.07335*** (0.01024)	-0.03396* (0.01850)	-0.02329 (0.02057)
Seatbelt	-	-0.00060 (0.00590)	0.00272 (0.00638)	-	-0.01967** (0.00810)	-0.01808** (0.00879)
Drink & Drive	-	-0.00483 (0.00722)	-0.00599 (0.00779)	-	-0.00551 (0.00915)	-0.00591 (0.00984)
Carry Weapon	-	0.03837*** (0.00767)	0.04003*** (0.00832)	-	0.08732*** (0.01704)	0.07852*** (0.01835)
Gun	-	0.00227 (0.01018)	0.00258 (0.01107)	-	-0.05481* (0.02762)	-0.04551 (0.03071)
Fight	-	0.00325*** (0.00112)	0.00278** (0.00123)	-	0.01746*** (0.00212)	0.01800*** (0.00232)
Smoke-Lifetime	-	0.01435** (0.00730)	0.01381* (0.00791)	-	0.03222*** (0.00917)	0.02831*** (0.00993)
Smoke-Past Month	-	0.00978 (0.00768)	0.01115 (0.00836)	-	0.02373** (0.01026)	0.01762 (0.01103)
Drink-Lifetime	-	0.02177*** (0.00813)	0.02452*** (0.00866)	-	0.05688*** (0.01027)	0.05342*** (0.01125)
Drink-Past Month	-	-0.00316 (0.00822)	-0.00889 (0.00893)	-	0.01057 (0.00968)	0.01820* (0.01045)
Binge-Past Month	-	-0.01570** (0.00780)	-0.01624* (0.00846)	-	-0.01250 (0.00988)	-0.01481 (0.01064)
Any Drugs-Lifetime	-	-0.01647 (0.04661)	0.00672 (0.04547)	-	-0.05832 (0.04875)	-0.01404 (0.04777)
Cocaine-Past Month	-	0.02892** (0.01355)	0.02582* (0.01457)	-	0.07515*** (0.02227)	0.06199*** (0.02351)
Marijuana-Past Month	-	0.02714*** (0.00755)	0.02655*** (0.00816)	-	0.00681 (0.00989)	0.00206 (0.01064)
Sex-Lifetime	-	0.00513 (0.00800)	0.00876 (0.00863)	-	0.04042*** (0.01146)	0.00841 (0.01260)

Sex-Past 3 Months	-	0.01782* (0.00997)	0.01778* (0.01077)	-	-0.01014 (0.01259)	-0.00052 (0.01369)
Condom	-	-0.02395*** (0.00803)	-0.02657*** (0.00861)	-	-0.00878 (0.01069)	-0.00356 (0.01163)
Team Sports	-	-0.02566*** (0.00569)	-0.02821*** (0.00624)	-	-0.00805 (0.00703)	-0.00947 (0.00763)
Unsafe at School	-	0.03919*** (0.01378)	0.03645*** (0.01475)	-	0.04291*** (0.01463)	0.03612** (0.01601)
Offered Drugs	-	0.02704*** (0.00623)	0.02559*** (0.00672)	-	0.06503*** (0.00886)	0.06979*** (0.00962)
Doctor	-	-	-0.00395 (0.00627)	-	-	-0.01752** (0.00795)
Pregnant	-	0.02595*** (0.00856)	0.02268** (0.00922)	-	0.00813 (0.01098)	-0.00201 (0.01186)
Forced Sex	-	-	0.02593* (0.01539)	-	-	0.12546*** (0.01388)
Suburban	-	-	0.01536 (0.00990)	-	-	0.00713 (0.01207)
Urban	-	-	0.02166** (0.01036)	-	-	0.00251 (0.01249)
Depressed	-	0.28078*** (0.00936)	0.28578*** (0.01021)	-	0.30874*** (0.00773)	0.30870*** (0.00837)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo – R ²	0.013	0.187	0.189	0.021	0.191	0.200
Observations	46,994	14,174	12,192	49,050	16,170	13,881

Note: Marginal effects are reported with standard errors underneath in parentheses. Significance is defined as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 4
YRBSS Data
Probit

Variable	1	2	3	1	2	3
	Males			Females		
	Suicide Ideation					
Overweight - Perception	0.04149*** (0.00437)	0.02004*** (0.00652)	0.01733** (0.00701)	0.07660*** (0.00435)	0.05694*** (0.00730)	0.05129*** (0.00788)
Very Overweight - Perception	0.13940*** (0.12646)	0.07921*** (0.01983)	0.07088*** (0.02106)	0.16406*** (0.01005)	0.12271*** (0.01796)	0.11203*** (0.01932)
Overweight - Actual	0.01507*** (0.00547)	0.00633 (0.00580)	0.00571 (0.00626)	0.04999*** (0.00737)	0.03736*** (0.00863)	0.03505*** (0.00935)
Very Overweight - Actual	0.02040*** (0.00714)	0.00057 (0.00739)	-0.00435 (0.00788)	0.06993*** (0.01124)	0.05765*** (0.01332)	0.05357*** (0.01439)
	Suicide Attempt					
Overweight - Perception	0.01288*** (0.00272)	0.00483** (0.00253)	0.00362 (0.00265)	0.03237*** (0.00323)	0.02125*** (0.00430)	0.01837*** (0.00465)
Very Overweight - Perception	0.07434*** (0.00944)	0.01646*** (0.00792)	0.01429** (0.00819)	0.08366*** (0.00827)	0.05560*** (0.01160)	0.04711*** (0.01212)
Overweight - Actual	0.00626* (0.00362)	0.00189 (0.00220)	0.00149 (0.00232)	0.03901*** (0.00572)	0.02113*** (0.00518)	0.02112*** (0.00563)
Very Overweight - Actual	0.00999** (0.00481)	0.00378 (0.00303)	0.00243 (0.00313)	0.05824*** (0.00921)	0.03989*** (0.00878)	0.03878*** (0.00948)
	Suicide Injury					
Overweight - Perception	0.00360** (0.00157)	0.00049 (0.00057)	0.00019 (0.00057)	0.00526*** (0.00174)	0.00219 (0.00128)	0.00217* (0.00133)
Very Overweight - Perception	0.04727*** (0.00693)	0.00461*** (0.00279)	0.00389** (0.00276)	0.02450*** (0.00473)	0.00834*** (0.00362)	0.00677** (0.00358)
Overweight - Actual	0.00237 (0.00216)	-0.00011 (0.00050)	-0.00005 (0.00051)	0.01186*** (0.00312)	0.00267* (0.00156)	0.00258* (0.00161)
Very Overweight - Actual	0.00077 (0.00273)	-0.00011 (0.00063)	-0.00004 (0.00065)	0.01269*** (0.00490)	0.00180 (0.00229)	0.00156 (0.00233)

Note: Each cell represents a separate regression. Marginal effects are reported with standard errors (associated with the coefficients) underneath in parentheses. Significance is defined as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Sample sizes range from 12192 to 49050. The independent variables in specifications 1 through 3 are listed in Table 3.

Table 5
YRBSS Data
Bivariate Probit

Variable	2	3	2	3
	Males		Females	
	Suicide Ideation			
Overweight - Perception	0.01278 (0.01056) (rho=0.033)	0.00946 (0.01139) (rho=0.036)	0.06711*** (0.01482) (rho=-0.017)	0.06141*** (0.01599) (rho=-0.019)
Very Overweight - Perception	0.05729 (0.06228) (rho=0.057)	0.05282 (0.06860) (rho=0.058)	0.17772*** (0.05020) (rho=-0.074)	0.17268*** (0.05464) (rho=-0.090)
	Suicide Attempt			
Overweight - Perception	0.00210 (0.00419) (rho=0.048)	0.00149 (0.00403) (rho=0.040)	0.03709*** (0.00834) (rho=-0.087**)	0.03563*** (0.00902) (rho=-0.095**)
Very Overweight - Perception	-0.00399 (0.00972) (rho=0.215)	-0.00376 (0.01075) (rho=0.211)	0.08414*** (0.02814) (rho=-0.079)	0.09544*** (0.03192) (rho=-0.131)
	Suicide Injury			
Overweight - Perception	-0.00044 (0.00081) (rho=0.125)	-0.00034 (0.00085) (rho=0.083)	0.00468* (0.00252) (rho=-0.063)	0.00434* (0.00262) (rho=-0.061)
Very Overweight - Perception	-0.00152 (0.00109) (rho=0.438**)	-0.00128 (0.00117) (rho=0.420**)	0.01415 (0.00919) (rho=-0.070)	0.01738* (0.01034) (rho=-0.129)

Note: Each cell represents a separate regression. Marginal effects are reported with standard errors underneath in parentheses. Significance is defined as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Sample sizes range from 12192 to 49050. The independent variables in specifications 2 and 3 are listed in Table 3.

Table 6
YRBSS Data
Propensity Score

Nearest Neighbor Matching						
Variable	Suicide Ideation		Suicide Attempt		Suicide Injury	
	1	2	3	4	5	6
	Males	Females	Males	Females	Males	Females
Overweight - Perception	0.026** (0.013)	0.074*** (0.013)	0.007 (0.008)	0.024*** (0.010)	0.003 (0.005)	0.003 (0.005)
Very Overweight - Perception	0.138*** (0.023)	0.145*** (0.021)	0.059*** (0.015)	0.085*** (0.016)	0.032*** (0.009)	0.030*** (0.009)

Stratification Matching						
Variable	Suicide Ideation		Suicide Attempt		Suicide Injury	
	1	2	3	4	5	6
	Males	Females	Males	Females	Males	Females
Overweight - Perception	0.027*** (0.010)	0.065*** (0.012)	0.012* (0.006)	0.014 (0.009)	0.005 (0.003)	0.000 (0.005)
Very Overweight - Perception	0.138*** (0.023)	0.145*** (0.019)	0.047*** (0.015)	0.082*** (0.016)	0.026*** (0.010)	0.028*** (0.009)

Note: Each cell represents the average treatment effect on the treated, based on a separate propensity score equation corresponding to the cell. The common support restriction is imposed in the matching. Standard errors are reported in parentheses. Significance is defined as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Sample sizes range from 12192 to 16170.

Table 7
YRBSS Data
Stratified Samples (Overweight Perception)

Overweight Perception				
Variable	2	3	2	3
	Males		Females	
Suicide Ideation				
Overweight - Actual	-0.02429 (0.01722)	-0.02952 (0.01880)	0.00859 (0.01337)	0.00963 (0.01439)
Suicide Attempt				
Overweight - Actual	-0.00904 (0.00727)	-0.00685 (0.00700)	0.01246 (0.00829)	0.01628* (0.00886)
Suicide Injury				
Overweight - Actual	-0.00126 (0.00137)	-0.00073 (0.00089)	0.00130 (0.00245)	0.00242 (0.00249)

Note: Each cell represents a separate probit regression. Marginal effects are reported with standard errors (associated with the coefficients) underneath in parentheses. Significance is defined as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Sample sizes range from 2509 to 3190 for males and 4596 to 5681 for females. The independent variables in specifications 2 and 3 are listed in Table 3.

No Overweight Perception				
Variable	2	3	2	3
	Males		Females	
Suicide Ideation				
Overweight - Actual	0.00159 (0.00843)	-0.00187 (0.00772)	-0.00263 (0.01522)	-0.00053 (0.01691)
Suicide Attempt				
Overweight - Actual	0.00136 (0.00307)	0.00114 (0.00284)	0.01586* (0.00929)	0.01506 (0.01030)
Suicide Injury				
Overweight - Actual	0.00041 (0.00072)	0.00009 (0.00062)	0.00238 (0.00269)	0.00055 (0.00241)

Note: Each cell represents a separate probit regression. Marginal effects are reported with standard errors (associated with the coefficients) underneath in parentheses. Significance is defined as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Sample sizes range from 8085 to 10368 for males and 7429 to 9509 for females. The independent variables in specifications 2 and 3 are listed in Table 3.

Table 8
YRBSS Data
Stratified Samples (Overweight Status)

Not Overweight				
Variable	2	3	2	3
	Males		Females	
Suicide Ideation				
Overweight - Perception	0.03529*** (0.01489)	0.03784*** (0.01625)	0.05687*** (0.00991)	0.04960*** (0.01060)
Very Overweight - Perception	0.22540** (0.11672)	0.29904*** (0.14669)	0.19441*** (0.04278)	0.18732*** (0.04659)
Suicide Attempt				
Overweight - Perception	0.00888* (0.00561)	0.00784 (0.00596)	0.01844*** (0.00547)	0.01467*** (0.00581)
Very Overweight - Perception	0.12840*** (0.07809)	0.11831*** (0.08396)	0.09702*** (0.02847)	0.07576*** (0.02888)
Suicide Injury				
Overweight - Perception	0.00219* (0.00180)	0.00134 (0.00149)	0.00216 (0.00160)	0.00131 (0.00153)
Very Overweight - Perception	0.05316*** (0.04223)	0.03473*** (0.03492)	0.00815 (0.00680)	0.00231 (0.00503)

Note: Each cell represents a separate probit regression. Marginal effects are reported with standard errors (associated with the coefficients) underneath in parentheses. Significance is defined as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Sample sizes range from 7062 to 9019 for males and 9069 to 11375 for females. The independent variables in specifications 2 and 3 are listed in Table 3.

Overweight				
Variable	2	3	2	3
	Males		Females	
Suicide Ideation				
Overweight - Perception	0.01781* (0.00980)	0.01299 (0.01059)	0.06836*** (0.01778)	0.06287*** (0.01960)
Very Overweight - Perception	0.07442*** (0.02132)	0.06788*** (0.02273)	0.10145*** (0.02229)	0.08527*** (0.02388)
Suicide Attempt				
Overweight - Perception	0.00246 (0.00395)	0.00153 (0.00393)	0.00851 (0.01226)	0.00678 (0.01367)
Very Overweight - Perception	0.00971 (0.00820)	0.00974 (0.00846)	0.03330** (0.01468)	0.02695* (0.01549)
Suicide Injury				
Overweight - Perception	0.00013 (0.00045)	0.00003 (0.00028)	-0.00141 (0.00374)	0.00163 (0.00344)
Very Overweight - Perception	0.00062 (0.00111)	0.00661 (0.00096)	0.00682* (0.00464)	0.00688** (0.00487)

Note: Each cell represents a separate probit regression. Marginal effects are reported with standard errors (associated with the coefficients) underneath in parentheses. Significance is defined as follows: *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Sample sizes range from 3478 to 4539 for males and 2956 to 3815 for females. The independent variables in specifications 2 and 3 are listed in Table 3.