Mandated School-Based BMI Assessments and Adolescent Health Behaviors

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Abstract

I provide novel evidence on how youth-targeted anti-obesity policies affect health behaviors. From 2003 to 2017, 32 states passed laws requiring schools to perform annual Body Mass Index (BMI) assessments on students. Though intended to correct imperfect information by providing teens and their parents with a report stating whether the child is overweight or obese, there is concern that these assessments may induce body dysmorphia and increase the incidence of eating disorders. Using the 1991-2017 National and State Youth Risk Behavior Surveys, I show that mandated school-based BMI assessments increased the likelihood that teen girls described themselves as overweight and reported that they were trying to lose weight. These changes were driven by overweight and obese girls holding more accurate views of their body types, suggesting that the assessments were successful in improving awareness about BMI and overweight status. While I do not detect changes in exercise, I show that teen girls with a negative body image were more likely to report calorie-limiting behaviors, such as dieting, fasting, and using diet pills. I do not detect changes in BMI, indicating that combating childhood obesity will require more than correcting imperfect information about clinical weight thresholds.

JEL Codes: I12; K32; J13; J16
Key words: school mandate; health behaviors; obesity; BMI

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'She said, 'Hey, Mom. The school told me I'm overweight.' And then she started jiggling her thighs, and saying, 'Is this what they mean?''

– Laura Bruij Williams, Mother of a 66-pound 9-year-old girl

1. Introduction

Over the last two decades, state and local policymakers have experimented with a myriad of policies intended to combat rising rates of childhood obesity, including taxing energy-dense food, subsidizing healthy food and physical activity, and informing adolescents about their obesity status. Though there is considerable work on policies intended to internalize the external costs of obesity, little is known about the role of imperfect information – and the laws intended to correct it – in childhood obesity.[1] Moreover, while recent scholarship has yielded mixed evidence as to the efficacy of many anti-obesity policies (Cawley et al. 2013; Cawley and Price 2013; Carpenter and Tello-Trillo 2015; Sabia et al. 2017), less attention has been paid to the possible negative consequences associated with these laws. Yet mental health advocates have repeatedly expressed concerns that youth-targeted anti-obesity laws could unintentionally increase the incidence of body dysmorphic disorder and result in the onset of eating disorders (CNN 2016; Sliwa et al. 2019).[2]

In this paper, I provide the first quasi-experimental evidence of how mandated school-based Body Mass Index (BMI) assessments affect self-image and weight-related health behaviors. In 2003, Arkansas became the first state to require all public-school students to have their heights and weights measured to determine if they were overweight or obese. By 2016, 32 states had similar laws, even though BMI assessments do not meet the American Academy of Pediatrics' guidelines

[1] For example, see Cawley et al. 2019 for evidence on how children are affected by sugar sweetened beverage taxes; see Bhattacharya et al. (2006) regarding the school breakfast program; and see Cawley et al. (2007), Cawley et al. (2013), and Sabia et al. (2017) regarding subsidized activity in the form of physical education classes.

[2] For example, Claire Mysko, chief executive officer for the National Eating Disorders Association, stated, 'So if someone is vulnerable and in a vulnerable place (and is) being weighed at school or being measured in whatever way … these are things that can be very triggering for those who are at risk' (CNN 2016). Sliwa et al. (2019) found that most schools had not adopted safeguards related to school-based BMI assessments which could 'potentially incur unintended consequences.'

for routine health screening (Nihiser 2007). These assessments sometimes occur in front of other children (Arkansas Times 2004), and while some states mail the results home to parents, others – such as New York – distribute 'fitness report cards' directly to students (New York Times 2007; New York Post 2014; CNN 2016). Though they have not been shown to reduce obesity (Prina and Royer 2014; Madsen et al. 2021), there is descriptive evidence that school-based BMI assessments are associated with parents placing their children on diets and making negative weight-related comments (Chomitz et al. 2003; Grimmett 2008; Kaczmarski et al. 2011; Portilla 2011), as well as more frequent weight-related discussions among students at school (Madsen et al. 2021). However, these studies often lack a clear comparison group and focus on short-run outcomes in a single state or school district.

Using the 1991-2017 State and National Youth Risk Behavior Surveys and a difference-in-differences identification strategy leveraging 32 state policy changes, I show that mandated school-based BMI assessments increased the likelihood that teen girls reported trying to lose weight by 2.1 percentage points (a 3.5 percent increase relative to the sample mean). I also find that teen girls were 1.3 percentage points (3.6 percent) more likely to describe themselves as overweight, and that the increase was driven by overweight girls more accurately describing their BMI classification. Importantly, I also show teen girls with excessively harsh views of their bodies were more likely to adopt risky calorie-limiting weight-loss strategies, supporting concerns that BMI assessments are detrimental to adolescents who are predisposed to developing eating disorders. I do not detect changes in BMI.

This paper makes several notable contributions. First, it adds to the literature exploring the role of imperfect information – and the laws intended to address this market failure – determining health behaviors and outcomes. While imperfect information has been studied extensively in the

context of other risky health behaviors, such as tobacco and alcohol consumption (Kenkel 1991; Viscusi 1992; Hu et al. 1995; Hsieh et al 1996; Rousu et al. 2014), it has received less attention in the obesity literature relative to policies seeking to help individuals internalize the costs of obesity (Finkelstein et al. 2013; Fletcher et al. 2015; Allcott et al. 2019; Cawley et al. 2019). One notable exception is a series of papers examining requirements that restaurants include calories and other nutrient information on their menus (Wisdom et al. 2010; Bollinger et al. 2011; Courtemanche et al. 2020; Fichera and von Hinke 2020; Todd et al. 2020). However, these studies focus on adults, and it is possible that adolescent health behaviors could be more malleable. Moreover, school-based BMI assessments are intended to correct a broader information problem by informing teens as to whether they are classified as overweight, while nutrient posting requirements are tailored toward specific consumption decisions.[3] This paper also contributes to literatures on reference points and social comparisons. Numerous papers have found links between weight-related perceptions and peer comparisons (Costa-Font and Jofre-Benet 2013; Yakusheva et al. 2014; Arduini et al. 2019; Huang et al. 2020). Mandated school-based BMI assessments act as shocks to these comparisons by instead emphasizing the use of clinical thresholds. However, I can rule out meaningful reductions in BMI attributed to these policies, implying that laws hoping to correct imperfect information regarding overweight status are not enough to combat rising rates of childhood obesity.

Section 2 of this paper discusses the institutional background of mandated school-based BMI assessments and reviews the literature on youth-targeted anti-obesity policies. Section 3 describes the data and outlines the empirical approach. Section 4 presents the results, and Section 5 discusses policy implications, study limitations, and areas for future work.

[3] Of course, it is possible that nutrient posting requirements lead individuals to engage in compensatory health behaviors, such as increasing their daily physical activity.

2. Background and Literature

2.1 Policy History

In 2003, the American Academy of Pediatrics (AAP) published a policy statement recommending periodic BMI assessments as an important tool in combating childhood obesity (American Academy of Pediatrics 2003).While AAP did not recommend annual school-based screening, during the 2003-2004 academic year, Arkansas became the first state to require all public-school students to undergo an such assessments. While the program seemed to increase obesity awareness – Dr. Karen Young at the Arkansas Children's Hospital reported that 13 percent of new participants at her fitness clinic came in response to their school BMI assessment – it was immediately controversial. While the policy was championed by Governor Mike Huckabee (R-AR), his successor supported repealing the law over concerns it would harm students' self-esteem and generate 'a lot of negative unintended consequences' (NBC 2007).[4] In response to a 2005 Institute of Medicine request that the federal government provide guidance on school-based BMI assessments, a CDC expert panel found that school-based BMI assessments did not meet AAP guidelines for routine health screening (Nihiser 2007).

Though controversial, Figure 1 shows that mandated school-based BMI assessments quickly gained popularity. By 2008, 18 states required that students receive BMI or weight-based assessments in school; in 2016, 32 states had such a requirement.[5] Figure 2 shows that school BMI assessments are mandated by a geographically and politically diverse group of states. They are required in both traditionally liberal (California and Massachusetts) and conservative (Mississippi

[4] In 2007, Arkansas legislators amended the act to only assess students every other year between kindergarten and 10th grade (State of Arkansas, 86th General Assembly, Regular Session, Act 201 of 2007, HB 1173).

[5] Some states allow for more general weight-related screenings not directly tied to BMIs. For exposition, I collectively refer to these mandated weight-related policies as BMI assessments.

and Oklahoma) states, as well as in both large (Texas and Florida) and small (Delaware and Rhode Island) states.

Despite the widespread proliferation of these policies, most of the research on school-based BMI assessments focuses on single state policies or school district specific interventions. In a randomized field experiment in Mexico, Prina and Royer (2014) found that providing parents of elementary school children with weight report cards increased (i) parental knowledge about their child's weight and (ii) the likelihood that parents of overweight and obese children reported that their child weighed too much. They did not detect any changes in weight-related behaviors or BMI, though outcomes were collected only 3 months after the assessment was distributed. Almond et al. (2016) found that New York City students classified as 'overweight' on their BMI reports did not subsequently lose more weight than those just under the threshold.

One study in Cambridge, Massachusetts found that parents who were provided a personalized school 'fitness report card' were more aware of their child's weight than those who did not receive a report. They were also more likely to express an intention to put their child on a diet without further medical guidance (Chomitz et al. 2003). Similarly, a large-scale randomized control trial of 28,000 California students in grades 3-8 found no detectable relationship between receiving the results of a school-based BMI assessment and subsequent changes in BMI (Madsen et al. 2021). However, the authors did detect a reduction in weight satisfaction and an increase in peer talk related to bodyweight among students who were weighed at school. These findings conform with descriptive evidence that parents receiving weight-related reports are more likely to place their children on diets and provide negative weight-related comments, though these studies

are often limited by their lack of a clear control group (Grimmett 2008; Kaczmarski et al. 2011; Portilla 2011).[6]

My study improves on these prior papers by leveraging a quasi-experimental research design comparing within-state changes in weight-related behaviors over time in states which did and did not require school-based BMI assessments. This setting allows me to exploit considerably more identifying variation than has been used by other authors who (i) were limited to policies within a lone state or school district and (ii) could only observe short-run behavior changes. In contrast, I leverage 32 policy changes occurring over a decade throughout the entire United States (see Figure 2) to arrive at, arguably, the most externally valid estimates available to policymakers.

2.2 Existing Literature

Weight gain is caused by excessive caloric intake, so policymakers have attempted to raise the price of calorie-dense unhealthy foods through sugar sweetened beverage taxes. While much of the work on these policies is concerned with changes in adult consumption activities and BMI (Finkelstein et al. 2013; Fletcher et al. 2015; Allcott et al. 2019), Cawley et al. (2019) exploit a unique longitudinal dataset collected on children's soda consumption before and after the implementation of Philadelphia's tax on sugar-sweetened beverages. While the tax did not generally affect consumption for children in the city of Philadelphia compared to those living in adjacent counties, they did find a reduction for children who had previously consumed the largest amounts of added sugar. One limitation of sugar-sweetened beverage taxes in addressing obesity is the possibility that any calorie reductions could be offset by increased consumption of relatively cheaper items. Fletcher et al. (2010) found a moderate reduction in adolescent soft drink consumption attributable

[6] While the parents receiving fitness report cards expressed an intention to put their children on diets, the onus for weight-related behavior changes need not come from the parents. While some states confidentially mail the reports home to families, other states distribute the results directly to students and tell them that they should deliver them to their parents unopened. Perhaps, unsurprisingly, students appear to read these reports (New York Times 2007; New York Post 2014).

to state soda taxes using the National Health Examination and Nutrition Survey. However, they did not detect a change in net calories due to increased consumption of other high calorie drinks, such as whole milk.

Another portion of the childhood obesity literature exploits policy changes intended to subsidize physical activity via physical education (PE) classes (Cawley et al. 2007). For example, Cawley et al. (2013) used the 1998-2004 Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K) data to explore how elementary school PE affected child weight. Instrumenting for PE time with the state's mandated minimum number of minutes in PE, the authors found that PE lowered BMI among teen boys.[7] Relatedly, Sabia et al. (2017) used the 1999-2011 National and State Youth Risk Behavior Surveys and a difference-in-differences identification strategy to show that high school PE requirements increased the amount of time teens reported spending in PE. However, they only detected modest increases in the number of minutes teen boys spent engaged in moderate physical activity and no subsequent changes in BMI; they did not detect changes for teen girls.

Given the concurrent reductions in youth smoking and increase in childhood obesity, several authors have explored the link between adolescent tobacco consumption and BMI. Using the National Longitudinal Survey of Youth 1997 cohort (NLSY97), Cawley et al. (2004) showed that overweight adolescent girls, those who reported that they are trying to lose weight, and those who described themselves as overweight were more likely to begin smoking. Similarly, Rees and Sabia (2010) showed that overweight female respondents in the second and third waves of the National Longitudinal Study of Adolescent Health (Add Health) were more likely to be frequent smokers.

[7] The authors posited that PE may serve as a complement with other physical activity for teen boys but a substitute for teen girls. Alternatively, they acknowledged that boys may voluntarily be more active during PE, teachers may expect different activities from boys, and/or teachers may have had different sex-specific effort expectations for the same activities.

Using the 1991-2017 National and State YRBS data, Choudhury and Conway (2020) found a negative relationship between cigarette taxes and adolescent physical activity which has grown weaker over time. Mellor (2011) found that cigarette taxes and prices increased BMI for children whose mothers smoked in the NLSY79; she posited that these mothers substituted from cigarettes towards increased household food consumption.

This paper is also related to extensive medical, psychology, and public health literatures documenting correlations between peer comparisons, body image, and weight-related behaviors (for example, see Stice and Shaw 2002 and Leahey et al. 2011). These fields have highlighted important correlations between bodyweight, social comparisons, and risky behaviors, though potential self-selection has hindered causal claims. Recent research has attempted to overcome these issues by relying on plausibly exogenous variation in cohort bodyweight. For example, Arduini et al. (2019) showed that teen girls in the Add Health data with relatively thinner peers are more likely to (i) perceive themselves as heavier than they are and (ii) engage in purging behavior. Relatedly, Costa-Font and Jofre-Benet (2013) showed that women in the Eurobarometer data with heavier peers are less likely to be anorexic, and Huang et al. (2020) used the NLSY79 Child and Young Adult data to show that children who moved to thinner areas – thereby becoming relatively heavier – experienced greater behavioral issues. Luo and Pan (2020) found that being assigned a classroom with heavier peers increases weight among Chinese middle school students. Carpenter and Churchill (2021) found that home-state beauty pageant wins were associated with greater pageant-related media exposure and an increased probability that teen girls reported exercising, dieting, fasting, and taking diet pills to lose weight.

3. Data and Methodology

3.1 School-Based BMI Assessments: State Health Access Data Assistance Center (SHADAC)

I obtained data on the timing of mandated school-based BMI assessments from the State Health Access Data Assistance Center (SHADAC), as well as from reviewing news articles about the policy changes and directly examining state statutes. SHADAC is a multidisciplinary health policy research center supported by the Robert Wood Johnson Foundation (RWJF) and affiliated with the School of Public Health at the University of Minnesota. The Center compiles datasets on various health topics, including the cost of care, health behaviors, and health outcomes, and SHADAC obtained information on mandated school-based BMI assessments by analyzing Trust for America's Health's (TFAH) *The State of Obesity* reports. TFAH is a non-partisan organization promoting illness and injury prevention that, since 2004, has compiled 17 reports examining obesity policies in the United States.[8] Figure 2 shows fours snapshots of the spatial and temporal variation in these policies over time, though I exploit the annual variation in these policies reported in Appendix Table 1.

3.2 Weight-Related Behaviors: Youth Risk Behavior Surveys (YRBS)

I obtain information on teen weight-related health behaviors from the 1991-2017 National and State Youth Risk Behavior Surveys. The YRBS are school-based surveys of high school-age youths' risky and preventative health behaviors that are administered during the spring of odd numbered years. The NYRBS are collected by the Centers for Disease Control and Prevention to monitor national trends, though these data have been widely used to evaluate state-level policies (Tauras et al. 2007; Carpenter and Cook 2008; Anderson et al. 2013; Coleman et al. 2013; Atkins and Bradford 2015). The NYRBS sample approximately 14,000 students each year. In contrast, the SYRBS, administered by state health and education agencies, are designed to be representative at the state-

[8] These reports were previously released under the name *F as in Fat*.

level. These data are not a subset of the NYRBS and include information on approximately 100,000 students each year. While the SYRBS are conducted with technical and financial assistance of the CDC, these agencies retain the rights to these data, and getting access often requires researchers to sign individual data use agreements with each state. To facilitate research into important policy questions, 44 states have allowed the CDC to harmonize their state-level data into a combined state file.[9] To maximize the number of state-years covered in my sample, I follow the literature and augment the combined SYRBS with the NYRBS (Anderson et al. 2013; Anderson and Elsea 2015; Sabia and Anderson 2016; Sabia et al. 2019).

Table 1 presents the means of the key variables relating to whether states mandated school-based BMI assessments, weight-related behaviors, and BMI. Forty-five percent of the sample reported that they were actively trying to lose weight, and teens in states with mandated BMI assessments were more likely to report that they were trying to lose weight than teens in states without these requirements (45.3 percent vs. 44.5 percent). This difference only appeared after states began requiring school-based BMI assessments; prior to the policy change, teens in the ever-treated states reported trying to lose weight with similar frequency to teens in the never-treated states (44.1 percent vs. 44.5 percent). However, once the mandate was implemented, the share rose by 2.4 percentage points to 46.5 percent. Similarly, the means in Table 2 indicate that the accuracy with which teens described their bodies increased modestly from 56.2 percent to 57.1 percent in states requiring BMI assessments. While BMI does not appear to have changed concurrent with the policy, teens were more likely to report exercising (61.7 percent vs. 48.5 percent) and dieting (40.1

[9] Not every state asks the same questions each year. Nor do individual states necessarily ask the same questions year-over-year. As such, the combined data file includes data on the core questions that are directly comparable across states and over time.

percent vs. 34.0 percent) to lose weight after they were required to undergo a school-based BMI assessment.

3.3 Empirical Strategy: Difference-in-Differences

Using the YRBS data, I explore how mandated school-based BMI assessments affected teen weight-related health behaviors using the following specification:

$$Y_{ist} = \alpha + \beta \cdot \text{BMI Assessment}_{st} + X'_{ist}\gamma + B'_{st}\pi + \theta_s + \tau_t + \varepsilon_{ist} \quad (1)$$

where the dependent variable, Y_{ist}, is the weight-related outcome for teen *i* in state *s* during time *t*. The independent variable of interest, $\text{BMI Assessment}_{st}$, is an indicator for whether the state required schools to perform a BMI/weight assessment of students.

To account for individual-level characteristics which influence health behaviors, the vector X'_{ist} contains indicators for the respondent's age (12 or less, 13, 14, 15, 16, 17, with 18 or older omitted), sex (male with female omitted), race/ethnicity (white, black, Hispanic, Asian, with 'other' omitted), and grade level (9^{th}, 10^{th}, 11^{th}, with 12^{th} omitted). The vector also includes an indicator for whether the teen was part of the NYRBS or SYRBS. Because weight-related behaviors may also be changing in response to state-level conditions concurrent with the adoption of school-based BMI assessments, the vector B'_{st} includes the state unemployment rate (Ruhm 2000; Ruhm 2015), whether the state had adopted a Commonsense Consumption Act (Wilking and Daynard 2013; Carpenter and Tello-Trillo 2015), the natural log of the real-value of cigarette taxes (Chou et al. 2004; Baum 2009; Gruber and Frakes 2006), the natural log of the real value of the minimum wage (Cotti and Tefft 2013; Clark et al. 2020), and whether the state has standards for school meals above USDA requirements (Wojcicki and Heyman 2006; Cullen et al. 2008; Capogrossi and You 2017). Given the association between indoor tanning and attitudes toward thinness (Darlow et al. 2016), the vector controls for whether the teen was bound by a youth indoor tanning prohibition, required parental presence for indoor tanning, required paternal consent for indoor tanning, or was required

to be provided a safe and clean tanning environment (Carpenter et al. 2021). Finally, I include a vector of time-invariant state fixed effects, θ_s, to account for unchanging local attitudes toward health behaviors and body image and a vector of location-invariant time fixed effects, τ_t, to capture national changes in weight-related health behaviors. Standard errors are clustered at the state level (Bertrand et al. 2004).

The coefficient of interest, β, measures how state policies requiring school-based BMI assessments affected teen weight-related behaviors. In the presence of the covariates and fixed effects, the identifying assumption is that – in absence of the policy – the behaviors of teens bound by these requirements would have evolved similarly to teens not required to get a school-based BMI assessment. I test the validity of this assumption with the following event-study specification:

$$Y_{ist} = \alpha + \sum_{j=-7,\, j\neq -1}^{2} \beta^j I^j + \eta_{Pre} + \eta_{Post} + X'_{ist}\gamma + B'_{st}\pi + \theta_s + \tau_t + \varepsilon_{ist} \quad (2)$$

where the independent variables of interest are now indicators for being *j* surveys away from a required school-based BMI assessment.[10] The indicators η_{Pre} and η_{Post} capture observations drawn from surveys more than 7 waves before the policy and more than 3 waves after the policy, respectively.

4. Results

4.1 Weight Loss Intentions

Table 2 examines how mandated school-based BMI assessments affected adolescent weight-loss intentions. The dependent variable in all columns is an indicator for whether the respondent reported trying to lose weight, and each coefficient is from a separate regression estimated using equation (1). Column 1 examines all respondents, column 2 restricts the sample to teen girls, and

[10] Because the YRBS are only fielded in odd numbered years, policies implemented in 2006 and 2007 are first captured in the 2007 surveys.

column 3 to teen boys. Panel A uses the combined State and National YRBS data, Panel B the SYRBS data, and Panel C the NYRBS data.

Panel A column 1 shows that state mandated school-based BMI assessments were associated with a 1.1 percentage point increase in the likelihood that teens reported that they were trying to lose weight. This change was entirely driven by a 2.1 percentage point increase in the likelihood that teen girls reported trying to lose weight – a 3.5 percent increase relative to the sample mean (Panel A column 2). In contrast, the point estimate for teen boys is 90 percent smaller and statistically insignificant (Panel A column 3). This pattern persists regardless of whether I limit the sample to only the SYRBS or NYRBS data. In both cases, I estimate a 1 percentage point increase for all teens (Panels B and C column 1) driven by a nearly 2 percentage point increase in the likelihood teen girls were trying to lose weight (Panels B and C column 2).[11]

After accounting for the control variables and fixed effects, my identification assumption is that, in absence of policy change, the outcomes of teen girls in states mandating school-based BMI assessments would have evolved similarly to the outcomes of girls in states without such a requirement. While fundamentally untestable, Figure 3 assesses the validity of this assumption by plotting the results obtained from estimating equation (2). There is no evidence that girls in states which eventually required BMI assessments were differentially more likely to report that they were trying to lose weight in the pre-period. However, after the state began requiring school-based BMI assessments, this probability jumped by approximately 2 percentage points.

Recent work has highlighted the potential pitfalls of using a two-way fixed effects specification when there is variation in treatment timing (Sun and Abraham 2020; Borusyak et al. 2021; Callaway and Sant'Anna 2021; de Chaisemartin and D'HaultfŒuille 2021; Goodman-Bacon

[11] Appendix Table 2 shows that the results are robust to using the SYRBS and NYRBS sample weights, even though the NYRBS sample weights are designed to be representative at the national level.

2021).[12] Table 3 addresses these concerns by purging my estimates of the variation attributable to staggered adoption timing. The dependent variable in all columns is again an indicator for whether the teen reported trying to lose weight. Column 1 reprints the estimate from Table 2 Panel A column 2. Column 2 limits the sample to include only states which (i) never required school-based BMI assessments or (ii) were first treated in the 2005 YRBS.[13] Similarly, column 3 limits the sample to never treated states and those that were first treated in the 2007 data, column 4 to never-treated states and those first treated in the 2009 data, column 5 to never-treated states and those first treated in the 2011 data, and column 6 to never-treated states and those first treated in the 2017 data. Thus, columns 2-6 report five separate difference-in-differences coefficients obtained from comparing a single-timing group to the never-treated group. Across all columns I document a 1.9-2.9 percentage point increase in the likelihood that teen girls reported trying to lose weight, indicating that the relationship is not attributable to mechanical issues arising from variation in treatment timing.

I next test in Table 4 whether the relationship is robust to alternative specifications or methods for controlling for time-varying spatial heterogeneity. Column 1 is estimated using probit regression and column 2 is estimated using logistic regression; for ease of interpretation, both columns report the associated marginal effects. Again, I find a statistically significant 2.1 percentage point increase in the probability that teen girls reported trying to lose weight in response to mandated school-based BMI assessments. To account for state-level changes in weight-loss intentions evolving smoothly over time, column 3 interacts the state fixed effects with a variable,

[12] For one, units treated in period *t* will serve as controls for units treated in period *t+1*. If the treatment effect grows over time, then the two-way fixed effects coefficient will be biased toward zero and may in fact have the opposite sign. For a fuller discussion of these issues, including how to decompose the two-way fixed effects coefficient into a weighted average of all possible 2×2 difference-in-differences estimators and the potential for 'negative weight', see Goodman-Bacon (2021).

[13] The Arkansas policy began in the 2003/2004 school year. Because the majority of the YRBS data are collected in the spring (interview date is not observed in the data), the 2003 data were likely obtained from students interviewed during the 2002/2003 school year. Accordingly, I classify the Arkansas students as part of the 2005 treatment group.

TREND, taking on the value of 1 in 1991, 2 in 1993, up through 14 in 2017 (Wolfers 2006). After including these state-specific linear time trends, I continue to find a 1.3 percentage point increase in the likelihood that teen girls reported trying to lose weight. Finally, column 4 augments the baseline specification with a full set of four Census region-by-year fixed effects, limiting the comparison group to geographically proximate states. I continue to find a 1.8 percentage point increase in the likelihood that teen girls reported trying to lose weight.

To increase confidence that the prior estimates are not being driven by a spurious relationship, I randomly assigned treatment status, estimated equation (1), saved the estimates, and repeated this process an additional 999 times.[14] I then calculated an empirical p-value by determining the share of the 1,000 placebo coefficients exceeding the true estimate in absolute magnitude. Figure 4 plots the distribution of placebo coefficients (Buchmueller et al. 2011; Cunningham and Shah 2018). The solid dark line – denoting the estimate obtained from the true treatment data – is near the top of the placebo distribution. Indeed, it is larger in absolute magnitude than all but 2 of the 1,000 placebo coefficients, indicating that the relationship is unlikely to be attributable to chance.[15]

4.2 Body-Image

I now examine whether mandated school-based BMI assessments affected teen girls' and body-image. The dependent variable in Table 5 is an indicator for whether teens described themselves as overweight. Using both the SYRBS and NYRBS data, column 1 shows that school-based BMI assessments were associated with a 1.3 percentage point increase in the probability that teen girls

[14] I assigned treatment status based on the number of states that actually required school-based BMI assessments each year, so that in 2017 there were 32 placebo states having adopted the policy. For example, 12 states began requiring school-based BMI assessments in 2007. I randomized *which* states had the treatment variable turn on in that year.

[15] Randomization inference with coefficients can under- or over-reject the null hypothesis depending on the size of the treated clusters, so I also adopted a more conservative approach comparing the estimated cluster-robust t-statistic to the distribution of placebo statistics (MacKinnon and Webb 2020). This method yielded an empirical p-value of 0.003.

described themselves as overweight – a 3.6 percent increase relative to the mean.[16] Of course, proponents of school-based BMI assessments argue that they help educate parents who would have otherwise been unaware that their children were overweight (Bailey-Davis et al. 2017). So, this increase could be interpreted as the assessments 'working' if the girls *describing* themselves as overweight were in fact *classified* as overweight or obese. To test this possibility, column 2 augments the specification with an indicator for whether the teen girl is overweight or obese and interacts it with the treatment variable.[17] This specification indicates that school-based BMI assessments were associated with a statistically insignificant 0.5 percentage point increase in the likelihood that non-overweight teen girls described themselves as overweight. Meanwhile, overweight teen girls were 1.5 additional percentage points more likely to describe themselves as overweight, and the interaction term is statistically significant.[18] Column 4 shows that estimates from the prior tables were also strongest for girls who were classified as overweight or obese. Columns 1 and 3 imply that teen girls were 3.6 percent more likely to both describe themselves as

[16] Appendix Table 3 shows that this relationship is present individually in both the SYRBS and NYRBS. There is never an association for teen boys.

[17] Appendix Table 4 tests whether school-based BMI assessments increased the accuracy with which teen girls described their BMIs. The dependent variable is an indicator for whether their self-descriptions were in line with their BMIs as determined by a measure of Weight Misperception (Jiang et al.'s 2014). First, I define Reported Actual Weight (RAW) as equal to 1 if the individual is classified as 'very underweight,' 2 if 'underweight,' 3 if 'recommended weight,' 4 if 'overweight,' and 5 if 'obese.' I then construct a Perceived Weight (PW) score identically using self-reported body type. WM is then the difference of these two measures. Teens with WM > 0 perceive themselves heavier than indicated by their BMI, teens with WM < 0 perceive themselves as lighter, and teens with WM = 0 hold an accurate assessment. Appendix Table 4 shows that overweight teen girls were 1.8 percentage points less likely to hold too lenient of views on their bodyweight in response to school-based BMI assessments, and the estimate is statistically significant (Panel A column 1). Instead, they were 1.5 percentage points more likely to hold accurate views (Panel A column 2), though the estimate is not statistically significant at conventional levels ($p = 0.102$). I do not find any evidence that overweight girls were more likely to hold excessively harsh views of their bodyweight (Panel A column 3), nor do I find any change for non-overweight teen girls.

[18] I note that the probability that teen girls were classified as overweight or obese could also be affected by school-based BMI assessments, implying that column 2 includes a potentially endogenous variable on the right-hand side of the regression. While I show later in the paper (Table 9) that school-based BMI assessments were not related to teen girls' BMI or the probability they were classified as overweight, out of an abundance of caution I interpret column 2 as highlighting an interesting association and not necessarily a causal relationship.

overweight and report trying to lose weight, relative to their respective sample means, indicating an elasticity of weight loss intention with respect to self-perceived overweight status near 1.[19,20]

4.3 Weight-Loss Strategies and Outcomes

In the prior exhibits, I have found that mandated school-based BMI assessments were associated with an increased likelihood that teen girls (i) reported trying to lose weight and (ii) described themselves as overweight. In Table 6, I test whether the reported desire to lose weight resulted in changes to calorie-expending behaviors. The dependent variable in column 1 is an indicator for whether the teen reported that she had exercised to lose weight during the prior 30 days. The dependent variable in column 2 is the number of days that she reported being active for at least 60 minutes during the prior week and in column 3 the number of days she reported attending physical education during the prior week. Column 1 is estimated via ordinary least squares, and columns 2 and 3 are estimated via Poisson regressions. Because not every question is available in both the SYRBS and the NYRBS, and availability also varies across years, I report the dataset and sample window at the bottom of the table.

Overall, Table 6 provides little evidence that school-based BMI assessments were related to changes in calorie-expending behaviors. Column 1 shows that teen girls were not significantly more likely to report that they were trying to lose weight, nor does column 2 indicate any meaningful change in the number of days physically active. Finally, given the concern that states may have mandated school-based BMI assessments concurrent with other policies intended to combat obesity – such as increasing the number of days spent in PE – it is reassuring that the

[19] Appendix Table 5 replicates Table 5 for teen boys. There is no evidence that school-based BMI assessments were related to the likelihood that teen boys described themselves as overweight. However, column 4 indicates that these assessments were related to a 1.6 percentage point increase in the probability that overweight teen boys reported that they were trying to lose weight.

[20] Appendix Table 6 explores other mental health related measures, including the likelihood that a teen was bullied at school, reported feeling hopeless, and considered suicide. The point estimates are uniformly small and statistically indistinguishable from zero.

relationship in column 3 is in fact negative and statistically insignificant. There is no evidence that school-based BMI assessments were related the number of days spent in PE.[21]

Though Table 6 does not indicate a meaningful relationship between mandated school-based BMI assessments and calorie-expending activities, these policies might instead affect calorie intake. Indeed, critics of school-based BMI assessments worry that these policies could increase the use of risky weight-loss strategies, such as fasting and consuming diet pills, especially among teens with a negative body image. Table 7 tests this possibility using an index of calorie-limiting activities constructed by adding indicators for whether the teen reported dieting, fasting, consuming diet pills, and vomiting/using laxatives.[22] Thus, it takes on values 0 through 4. Column 1 examines all teen girls. Column 2 limits the sample to teen girls who describe themselves as heavier than their BMIs, and column 3 examines teen girls not possessing an excessively harsh view of their bodies. Note that I did not detect a relationship between school-based BMI assessments and the likelihood that teen girls held excessively harsh views about their bodies (see footnote 14 and Appendix Table 4). However, I cautiously interpret the estimates as associations, given the possibility that these policies could have increased negative self-image. The columns are estimated via Poisson regression.

[21] Appendix Table 7 shows that the relationship between school-based BMI assessments and calorie-expending activities is robust to stratifying the sample by whether the teen viewed herself as heavier than indicated by her BMI.

[22] A clinical report from the American Academy of Pediatrics states that adolescent dieting is 'counterproductive' to weight-management and can predispose teens to eating disorders (Golden et al. 2016). However, because information on dieting is only available through 2009, while the remaining indicators are available through 2013. Appendix Table 8 shows that the pattern is robust to excluding dieting from the index. Similarly, data on fasting is only available beginning in 1999. Appendix Table 9 shows that the pattern is robust to dropping this measure from the index to obtain a longer sample period. Appendix Table 10 separately analyzes each behavior using the maximum sample period for each measure and finds increases in the likelihood that teen girls with a negative body image reported dieting, fasting, and using diet pills.

Table 7 column 2 shows that school-based BMI assessments were positively related to the number of calorie-limiting strategies utilized by teen girls with a negative body image.[23] Figure 4 assesses the validity of the parallel trends assumption by examining whether the risky weight-loss index was differentially trending in states which eventually mandated school-based BMI assessments compared to those that did not. The event study coefficients obtained from estimation equation (2) via Poisson regression indicate that teen girls in states which eventually required BMI assessments did not employ more risky weight-loss strategies than their counterparts in the remaining states during the pre-period. However, after states began requiring school-based BMI assessments, the point estimates suggest that these girls used more risky calorie-limiting weight-loss techniques. Figure 5 uses randomization inference to show that the estimated increase is unlikely to be attributable to chance.[24]

Table 8 explores whether school-based BMI assessments were related to changes in BMI. The dependent variable in column 1 is the teen girl's BMI, in column 2 an indicator for whether she was classified as underweight, in column 3 if she was in the recommended region, and in column 4 if she was classified as overweight or obese. Consistent with prior short-term evaluations of BMI assessments (Prina and Royer 2014; Madsen et al. 2021), I do not detect any change in BMI. Indeed, the 95 percent confidence interval for column 1 (-0.120, 0.123) can rule out reductions in BMI larger than 0.5 percent relative to the sample mean ((-0.120/22.904) × 100 percent).

[23] Appendix Table 11 presents the estimates for teen boys. Given that very few boys held excessively harsh views of their bodies compared to their BMIs (5.7 percent of boys compared to 17.8 percent of girls), the estimates are imprecisely estimated. However, I report them for completeness.

[24] Appendix Table 12 addresses recent developments in the difference-in-differences literature by comparing individual timing groups to never-treated states, purging the estimates of any bias driven by variation in treatment timing. While less precisely estimated, the table is generally consistent with increased risky weight-loss strategies attributable to each timing group.

5. Conclusion

This paper provides the first quasi-experimental evidence of how mandated school-based BMI assessments affect self-image and weight-related health behaviors. Leveraging 32 state policy changes, I use the 1991-2017 State and National YRBS data to show that these policies increased the likelihood that overweight teen girls described themselves as overweight and reported trying to lose weight. These results are in line with claims made by proponents of these laws who argue that school-based BMI assessments educate teens who would otherwise be unaware that they are overweight. However, consistent with the concerns raised by critics of these policies, I find evidence that teen girls with a negative self-image were more likely to adopt risky weight-loss strategies, including dieting, fasting, and consuming diet pills. Consistent with prior short-term evidence on these assessments, I do not detect changes in BMI and can rule out reductions exceeding 0.5 percent.

This study is subject to some notable limitations. First, I cannot definitively say whether students and/or their parents read the BMI assessments. While I find evidence that overweight teen girls more accurately described their body types after these laws went into effect, I am unable to isolate whether this was because of the assessment or a general increase in BMI-awareness occurring concurrent with the passage of these laws. Nor am I able to determine whether the estimated relationships are due to the girls internalizing the messaging on the assessment, increased weight-related conversations at school, or changes in parental attitudes at home. Uncovering ways to isolate how each of these pathways can affect weight-related behaviors remains an important area for future work. Finally, the YRBS data are self-reported and may not accurately capture all behavior changes. While this limitation is common to these types of analyses – and in this case weight perception is perhaps as interesting as objectively measured clinical outcomes – future work

should explore datasets allowing researchers to precisely measure behavior changes, especially regarding risky weight-loss activities.

Despite these limitations, these results provide the most externally valid evidence that school-based BMI assessments are successful in their goal of increasing overweight and obesity awareness. However, they do not appear to meaningfully affect student BMI and are positively related to risky calorie-limiting behaviors among teen girls with a negative body image. These results suggest that combating childhood obesity will require more than laws intended to correct imperfect information about clinical weight thresholds.

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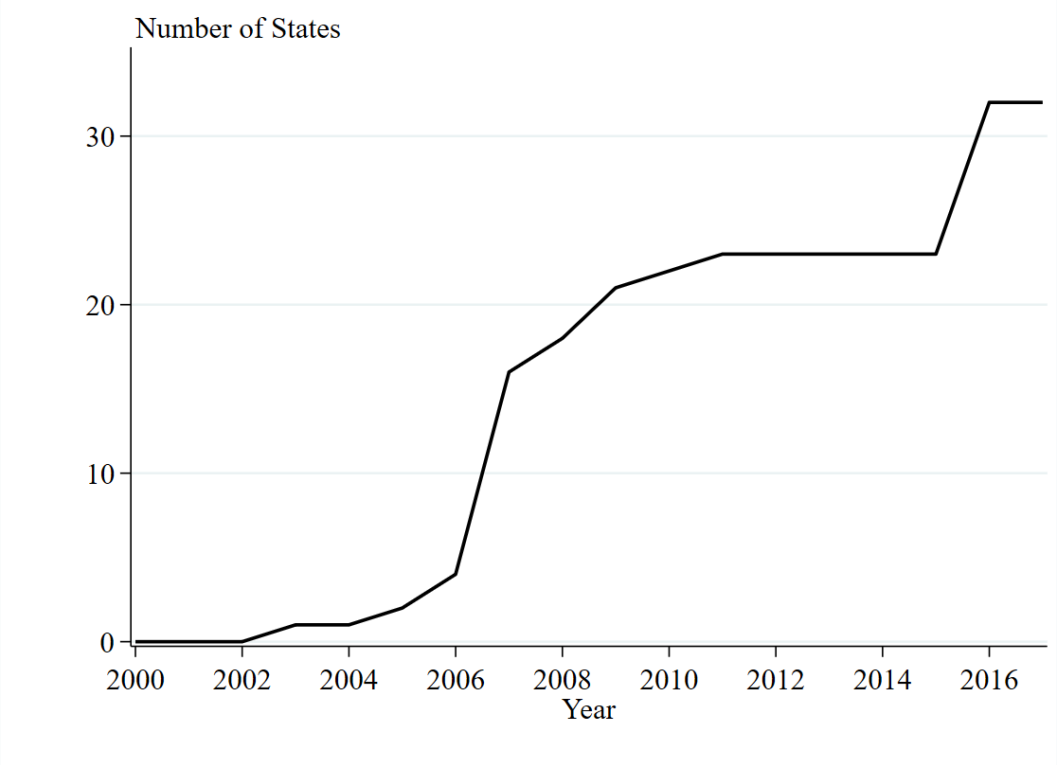
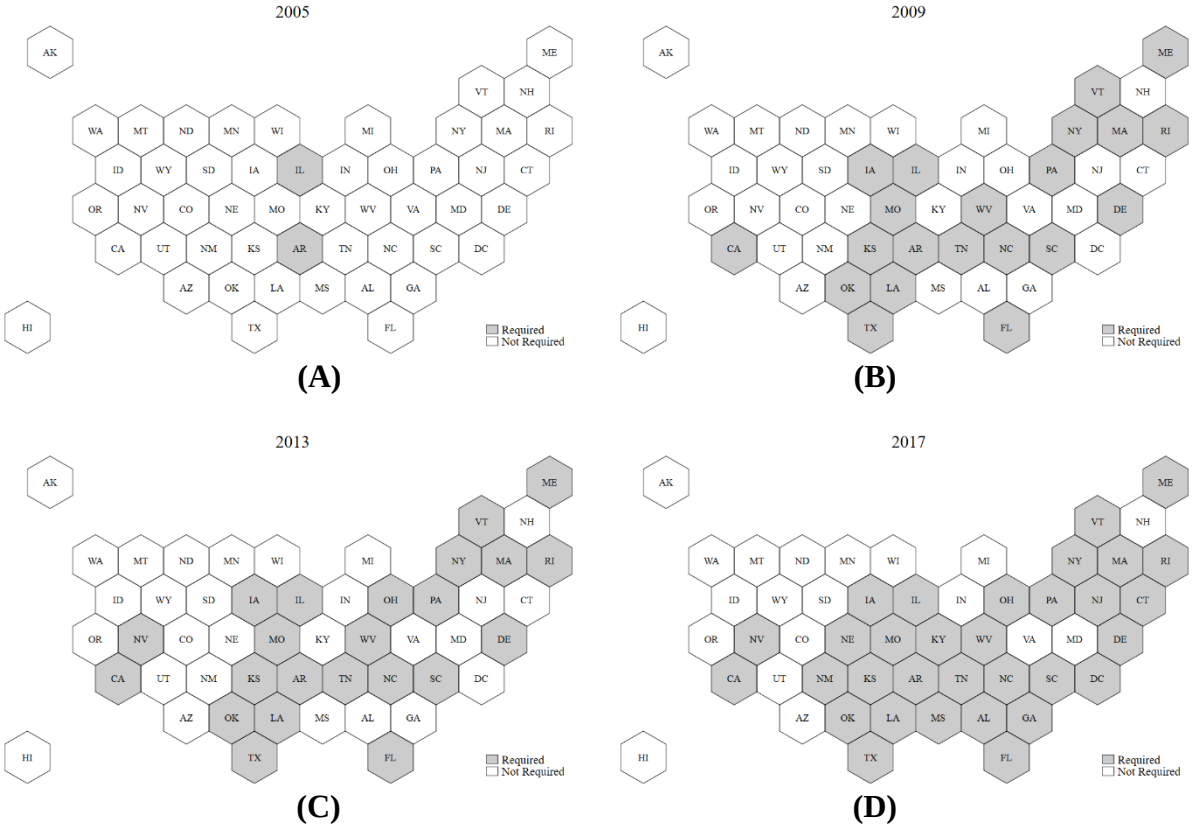
Figure 1: Number of States with Mandated School-Based BMI Assessments



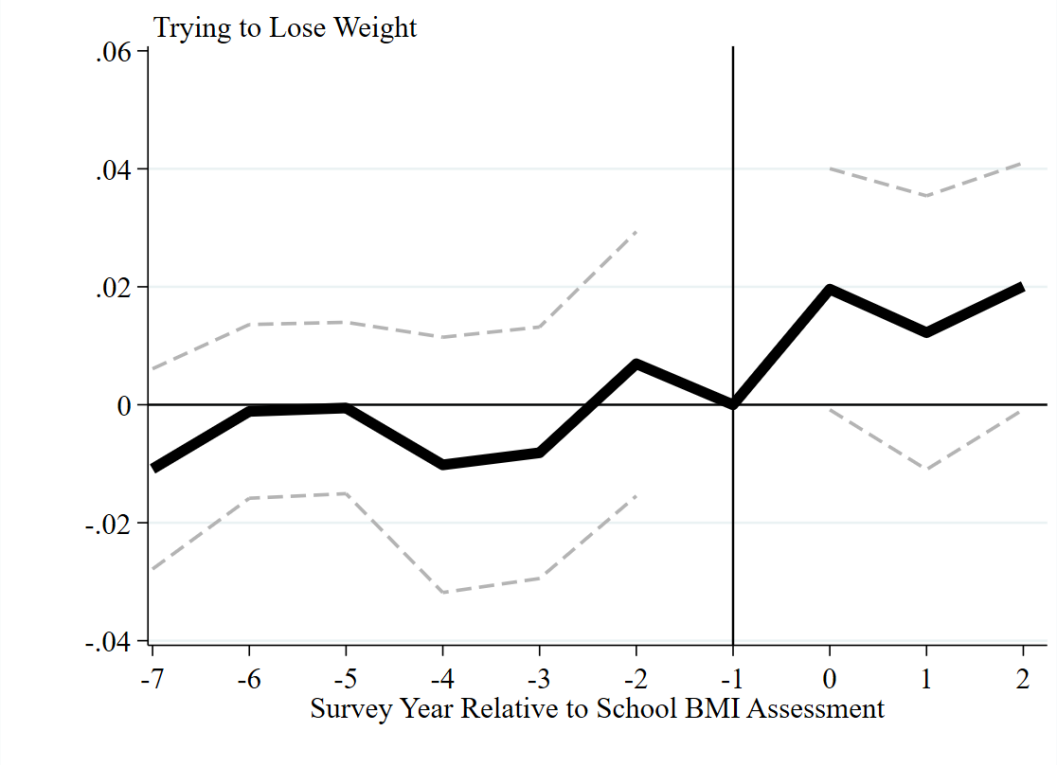
Source: State Health Access Data Assistance Center 2021
Note: The solid dark line plots the number of states mandating school-based BMI assessments over time.

Figure 2: Spatial and Temporal Variation in Mandated School BMI Assessments



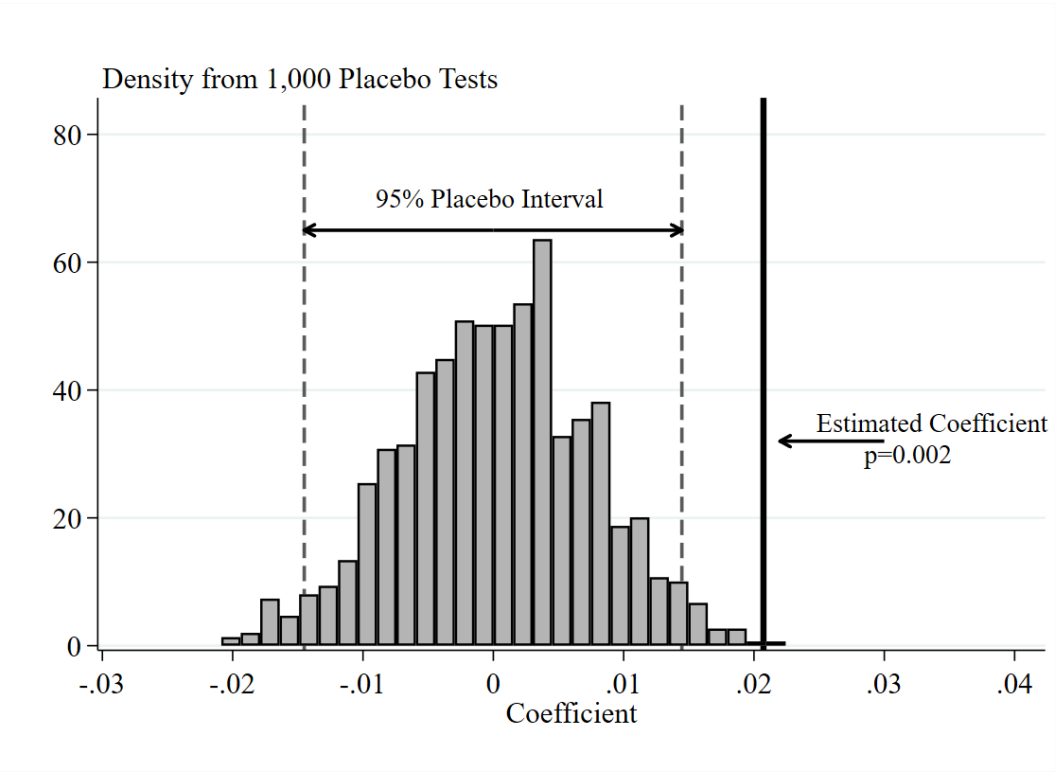
Source: State Health Access Data Assistance Center 2021
Note: Shaded states required school-based BMI assessments. Panel A plots the policy environment in 2005, Panel B in 2009, Panel C in 2013, and Panel D in 2017.

Figure 3: Event Study Estimates on Mandated School BMI Assessments and the Likelihood Teen Girls Reported Trying to Lose Weight



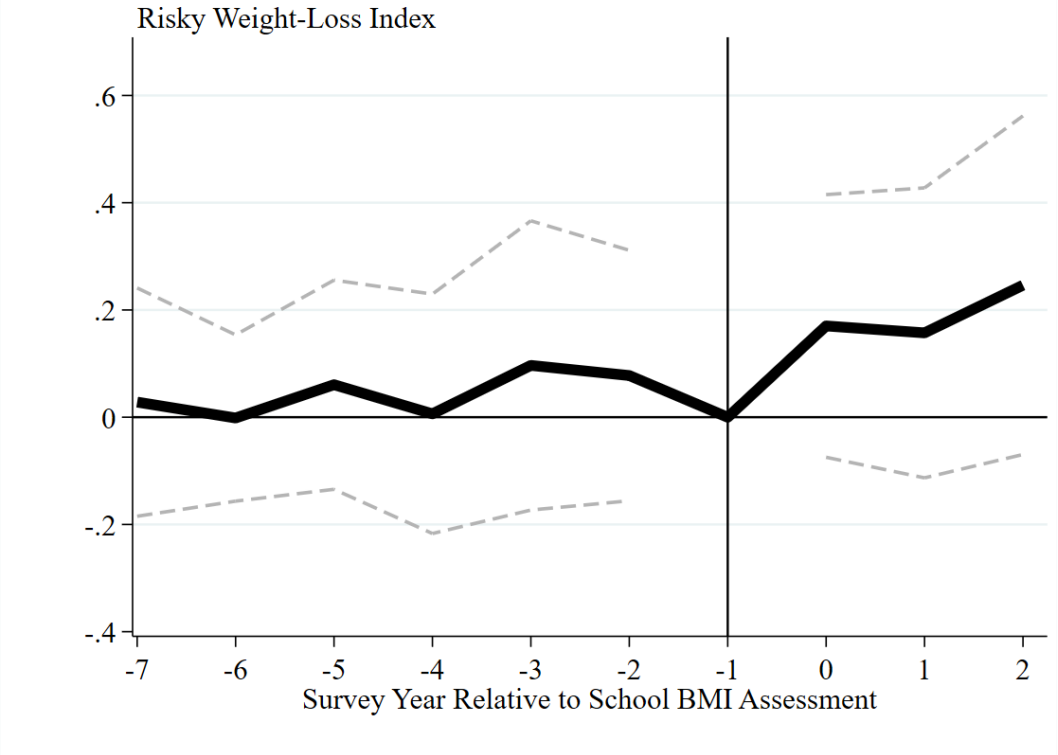
Source: National and State Youth Risk Behavior Surveys 1991-2017
Note: The dependent variable is an indicator for whether the teen girl reported that she was trying to lose weight. The solid dark line plots the event study coefficients, and the lighter dashed line plots the associated 95 percent confidence intervals. The values are estimated using the full set of controls from equation (2).

Figure 4: The Relationship Between School-Based BMI Assessments and Trying to Lose Weight is Robust to Randomization Inference



Source: National and State Youth Risk Behavior Surveys 1991-2017
Note: The dependent variable is an indicator for whether the teen girl reported that she was trying to lose weight. The figure plots the distribution of placebo coefficients obtained from randomly assigning treatment status and estimating equation (1) 1,000 times. The solid dark line shows the coefficient obtained when estimating equation (1) using the true treatment assignment. The empirical p-value is computed by determining the share of placebo coefficients exceeding the true coefficient in absolute magnitude. A similar process comparing the observed cluster robust t-statistic to the distribution of cluster robust placebo t-statistics yields an empirical p-value of 0.003.

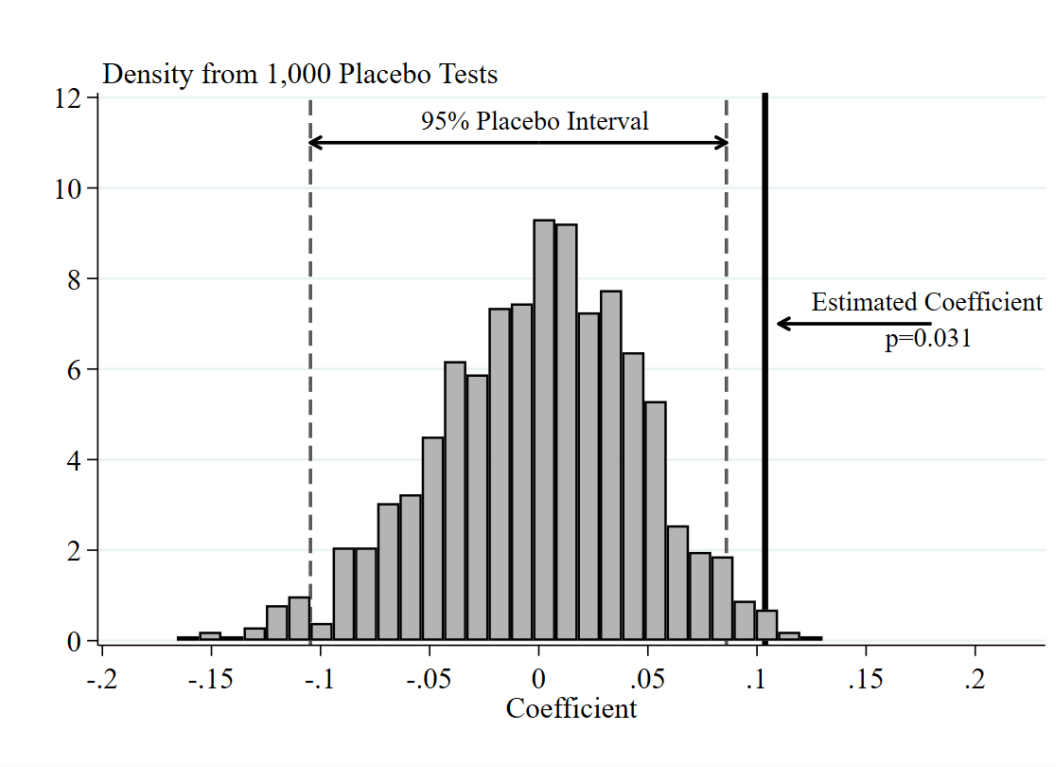
Figure 4: Event Study Estimates on Mandated School BMI Assessments Risky Weight-Loss Strategies among Teen Girls with a Negative Body Image



Source: National and State Youth Risk Behavior Surveys 1999-2009

Note: The dependent variable is an index taking on the values 0 through 4 by adding the number of risky weight-loss strategies (dieted, fasted, consumed diet pills, vomited/took laxatives) reported by teen girls with a negative body image. The solid dark line plots the event study coefficients, and the lighter dashed line plots the associated 95 percent confidence intervals. The values are estimated using the full set of controls from equation (2) and obtained using a Poisson regression.

Figure 6: The Relationship Between School-Based BMI Assessments and Risky Weight-Loss Strategies is Robust to Randomization Inference



Source: National and State Youth Risk Behavior Surveys 1999-2009
Note: The dependent variable is an index taking on the values 0 through 4 by adding the number of risky weight-loss strategies (dieted, fasted, consumed diet pills, vomited/took laxatives) reported by teen girls with a negative body image. The figure plots the distribution of placebo coefficients obtained from randomly assigning treatment status and estimating equation (1) 1,000 times via Poisson regression. The solid dark line shows the coefficient obtained when estimating equation (1) using the true treatment assignment. The empirical p-value is computed by determining the share of placebo coefficients exceeding the true coefficient in absolute magnitude. A similar process comparing the observed cluster robust t-statistic to the distribution of cluster robust placebo t-statistics yields an empirical p-value of 0.031.

Table 1: Summary Statistics

	Full Sample	Did the State Ever Mandate School-Based BMI Assessments?		Timing Among States Ever Requiring School-Based BMI Assessments	
		No	Yes	Pre-Policy	Post-Policy
Trying to Lose Weight	0.450	0.445	0.453	0.441	0.465
Self-Described Overweight	0.301	0.303	0.300	0.300	0.299
Accurate Self-Description	0.570	0.572	0.569	0.562	0.571
Body Mass Index (BMI)	23.219	22.968	23.363	23.314	23.393
Weight-Loss Strategies					
Exercised	0.503	0.493	0.506	0.485	0.617
Dieted	0.347	0.339	0.349	0.340	0.401
Fasted	0.124	0.129	0.122	0.123	0.121
Used Diet Pills	0.055	0.052	0.056	0.057	0.054
Vomited/Took Laxatives	0.044	0.042	0.044	0.043	0.045

Source: National and State Youth Risk Behavior Surveys 1991-2017

Note: The table displays the unweighted means from combining the national and state YRBS data. The p-values indicate whether the averages were different for states which did and did not *ever* require school-based BMI assessments and whether the pre- and post-policy averages are different in states which *did* adopt such a policy.

Table 2: School-Based BMI Assessments Increased the Likelihood Teen Girls Reported Trying to Lose Weight

	(1)	(2)	(3)
Outcome →	Trying to Lose Weight	Trying to Lose Weight	Trying to Lose Weight
Sample →	All Teens	Teen Girls	Teen Boys
Panel A: Combined YRBS			
BMI Assessment	0.011***	0.021***	0.002
	(0.004)	(0.006)	(0.004)
Mean	0.450	0.592	0.300
R^2	0.093	0.010	0.015
Observations	886,237	455,167	431,070
Panel B: State YRBS			
BMI Assessment	0.010***	0.019***	0.001
	(0.003)	(0.006)	(0.004)
Mean	0.452	0.594	0.301
R^2	0.092	0.007	0.013
Observations	697,405	359,226	338,179
Panel C: National YRBS			
BMI Assessment	0.010	0.017*	0.004
	(0.006)	(0.009)	(0.008)
Mean	0.443	0.586	0.296
R^2	0.100	0.019	0.024
Observations	188,832	95,941	92,891

Source: National and State Youth Risk Behavior Surveys, 1991-2017

Note: The dependent variable is an indicator for whether the respondent reported that s/he was trying to lose weight. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1). Column 1 examines all teens, column 2 teen girls, and column 3 teen boys. Panel A uses data from both the National and State YRBS. Panel B only uses data from the SYRBS and Panel C from the NYRBS. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 3: The Relationship is Robust to Accounting for Variation in Treatment Timing

	(1)	(2)	(3)	(4)	(5)	(6)
Sample →	Full Sample	Never Treated and First Treated in 2005 YRBS	Never Treated and First Treated in 2007 YRBS	Never Treated and First Treated in 2009 YRBS	Never Treated and First Treated in 2011 YRBS	Never Treated and First Treated in 2017 YRBS
BMI Assessment	0.021***	0.029***	0.024***	0.026**	0.019**	0.024
	(0.006)	(0.007)	(0.009)	(0.011)	(0.009)	(0.016)
State YRBS?	Y	Y	Y	Y	Y	Y
National YRBS?	Y	Y	Y	Y	Y	Y
Mean	0.592	0.602	0.592	0.603	0.604	0.597
R^2	0.010	0.007	0.009	0.006	0.006	0.009
Observations	436,466	173,569	319,067	198,511	157,608	199,416

Source: National and State Youth Risk Behavior Surveys, 1991-2017

Note: The dependent variable is an indicator for whether the respondent reported that s/he was trying to lose weight. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1). The sample is teen girls. Column 1 reproduces the estimate from Table 2 Panel A column 2. Column 2 restricts the sample to never treated states and students in states which first appeared as treated in the 2005 YRBS (schools implementing the policy in 2004 or 2005). Column 3 restricts the sample to never treated states and states first treated in the 2007 YRBS, column 4 to never treated states and those first treated in the 2009 YRBS, column 5 to never treated states and those first treated in the 2011 YRBS, and column 6 to never treated states and those first treated in the 2017 YRBS. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 4: The Relationship between Mandated School-Based BMI Assessments and the Likelihood Teen Girls Reported Trying to Lose Weight is Robust to Alternative Estimation Methods and Controls for Time-Varying Spatial Heterogeneity

	(1)	(2)	(3)	(4)
Specification →	Probit Regression	Logistic Regression	State-Specific Linear Time Trends	Census Region-by-Year FE
BMI Assessment	0.021***	0.021***	0.013**	0.018***
	(0.006)	(0.006)	(0.006)	(0.006)
State YRBS?	Y	Y	Y	Y
National YRBS?	Y	Y	Y	Y
Mean	0.592	0.592	0.592	0.592
R^2	0.007	0.007	0.010	0.010
Observations	455,167	455,167	455,167	455,167

Source: National and State Youth Risk Behavior Surveys, 1991-2017

Note: The dependent variable is an indicator for whether the respondent reported that s/he was trying to lose weight. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1). The sample is teen girls. However, rather than use ordinary least squares, column 1 employs probit regression and reports the marginal effect. Similarly, column 2 uses a logistic regression and reports the marginal effect. Column 3 uses OLS to estimate equation (1) but augments the specification with state-specific linear time trends. Column 4 instead augments equation (1) with Census region-by-year fixed effects. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 5: School-Based BMI Assessments Increased the Likelihood That Overweight Teen Girls Described Themselves as Overweight

	(1)	(2)	(3)	(4)
Outcome →	Self-Described Overweight	Self-Described Overweight	Trying to Lose Weight	Trying to Lose Weight
BMI Assessment	0.013**	0.005	0.021***	0.009
	(0.006)	(0.004)	(0.006)	(0.005)
BMI Assessment × Overweight or Obese		0.015**		0.030***
		(0.006)		(0.006)
Mean	0.361	0.350	0.592	0.592
R^2	0.008	0.274	0.010	0.113
Observations	503,521	373,676	455,167	379,079

Source: National and State Youth Risk Behavior Surveys, 1991-2017

Note: The dependent variable is an indicator for whether the respondent described herself as overweight. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1). The sample is teen girls. Column 1 examines all girls, column 2 limits the sample to overweight and obese teen girls, and column 3 to non-overweight or obese teen girls. Column 4 again examines all teen girls but includes an indicator for whether the girl is overweight or obese and interacts it with the independent variable of interest. BMI is only available from 1999-2017. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 6: School-Based BMI Assessments Were Not Statistically Related to Calorie-Expending Activities

	(1)	(2)	(3)
Outcome →	Exercised to Lose Weight	Number of Days Active for ≥ 60 Minutes	Number of Days in PE Class
BMI Assessment	0.006	0.005	-0.019
	(0.014)	(0.015)	(0.026)
State YRBS?	N	Y	Y
National YRBS?	Y	Y	Y
Years	1991-2009	2005-2017	1991-2017
Mean	0.576	3.282	1.835
R^2	0.092	-	-
Observations	69,655	313,540	509,389

Source: National and State Youth Risk Behavior Surveys, 1991-2017

Note: The dependent variable in column 1 is an indicator for whether the respondent reported that she was exercising to lose weight. The dependent variables in columns 2 and 3 are the number of days the respondent reported getting at least 60 minutes of physical activity and the number of days spent in PE class. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1) and the sample is teen girls. Column is estimated via ordinary least squares. Columns 2 and 3 are estimated using a Poisson regression. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 7: School-Based BMI Assessments Were Positively Associated with Calorie-Limiting Activity among Teen Girls with a Negative Body Image

	(1)	(2)	(3)
Sample →	Teen Girls	Teen Girls with a Negative Body Image	Teen Girls without a Negative Body Image
BMI Assessment	0.047	0.084***	0.036
	(0.036)	(0.031)	(0.041)
State YRBS?	N	N	N
National YRBS?	Y	Y	Y
Mean	0.836	1.256	0.751
Observations	42,723	7,047	32,623

Source: National Youth Risk Behavior Surveys, 1999-2009

Note: The dependent variable is an index taking on values 0 to 4 depending on the total number of risky weight loss strategies a teen utilized (dieted, fasted, consumed diet pills, vomited/took laxatives). The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1) and are estimated using a Poisson regression. The sample is teen girls. Column 1 examines all teen girls. Column 2 limits the sample to teen girls whose view of their bodies is too harsh compared to their BMI. Column 3 is the complement to column 2. BMI is available beginning in 1999. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 8: School-Based BMI Assessments Unrelated to Changes in BMI

	(1)	(2)	(3)	(4)
Outcome →	BMI	Underweight	Recommended Weight	Overweight or Obese
BMI Assessment	0.002	0.000	-0.001	0.000
	(0.061)	(0.001)	(0.004)	(0.004)
State YRBS?	Y	Y	Y	Y
National YRBS?	Y	Y	Y	Y
Mean	22.904	0.020	0.721	0.260
R^2	0.050	0.005	0.026	0.031
Observations	435,957	435,957	435,957	435,957

Source: National Youth Risk Behavior Surveys 1999-2017

Note: The dependent variable in column 1 is the teens body mass index. In column 2, the dependent variable is an indicator for being classified as underweight, in column 3 for being within the recommended BMI range, and in column 4 for being classified as overweight or obese. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1) and are estimated via ordinary least squares. The sample is teen girls. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

7. Appendix

Appendix Table 1: Policy Dates

State	Year
Alabama	2016
Arkansas	2003
California	2007
Connecticut	2016
Delaware	2007
District of Columbia	2016
Florida	2007
Georgia	2016
Illinois	2005
Iowa	2007
Kansas	2007
Kentucky	2016
Louisiana	2007
Maine	2007
Massachusetts	2007
Mississippi	2016
Missouri	2007
Nebraska	2016
Nevada	2010
New Jersey	2016
New Mexico	2016
New York	2007
North Carolina	2009
Ohio	2012
Oklahoma	2009
Pennsylvania	2007
Rhode Island	2008
South Carolina	2007
Tennessee	2006
Texas	2008
Vermont	2009
West Virginia	2006

Source: State Health Access Data Assistance Center 2021

Appendix Table 2: The Relationship is Robust to Utilizing the Sample Weights

	(1)	(2)	(3)
Outcome →	Trying to Lose Weight	Trying to Lose Weight	Trying to Lose Weight
Sample →	All Teens	Teen Girls	Teen Boys
Panel A: State YRBS			
BMI Assessment	0.009***	0.017***	0.002
	(0.003)	(0.006)	(0.005)
Mean	0.448	0.594	0.304
R^2	0.091	0.008	0.011
Observations	697,405	359,226	338,179
Panel B: National YRBS			
BMI Assessment	0.010	0.015*	0.005
	(0.006)	(0.008)	(0.009)
Mean	0.441	0.284	0.605
R^2	0.115	0.014	0.019
Observations	188,832	95,941	92,891

Source: National and State Youth Risk Behavior Surveys, 1991-2017

Note: The dependent variable is an indicator for whether the respondent reported that s/he was trying to lose weight. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1). Column 1 examines all teens, column 2 teen girls, and column 3 teen boys. Panel A uses data from the SYRBS and Panel B from the NYRBS. The estimates utilize the sample weights. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table 3: The Relationship Between School-Based BMI Assessments and the Likelihood Teen Girls Described Themselves as Overweight is Robust to Using the National or State YRBS Data

	(1)	(2)	(3)	(4)	(5)	(6)
Outcome →	Teen Girls	Teen Girls	Teen Girls	Teen Boys	Teen Boys	Teen Boys
BMI Assessment	0.013**	0.013**	0.015**	-0.003	-0.005	-0.005
	(0.006)	(0.006)	(0.007)	(0.003)	(0.003)	(0.006)
State YRBS?	Y	Y	Y	Y	Y	Y
National YRBS?	Y	N	Y	Y	N	Y
Mean	0.361	0.360	0.363	0.238	0.237	0.239
R^2	0.008	0.008	0.011	0.008	0.007	0.011
Observations	503,521	405,791	97,730	476,966	382,362	94,604

Source: National and State Youth Risk Behavior Surveys, 1991-2017

Note: The dependent variable is an indicator for whether the respondent described his/herself as overweight. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1). The sample in columns 1-3 includes teen girls and in columns 4-6 teen boys. Columns 1 and 4 use both the state and national YRBS data. Columns 2 and 5 use only the SYRBS. Columns 3 and 6 use only the NYRBS. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table 4: School-Based BMI Assessments Improved the Accuracy of Overweight Teen Girls' Self-Assessments of Their Weight

	(1)	(2)	(3)
Self-Description Compared to BMI →	Too Lenient	Accurate	Too Harsh
Panel A: Overweight Girls			
BMI Assessment	-0.018*	0.015	0.003
	(0.009)	(0.009)	(0.003)
Mean			
R^2	0.044	0.032	0.010
Observations	96,583	96,583	96,583
Panel B: Non-Overweight Girls			
BMI Assessment	0.001	-0.008	0.006
	(0.002)	(0.006)	(0.005)
Mean			
R^2	0.008	0.009	0.016
Observations	277,093	277,093	277,093

Source: National and State Youth Risk Behavior Surveys, 1991-2017

Note: The dependent variable in column 1 is an indicator for whether the respondent described herself as lighter than indicated by her BMI, in column 2 whether her self-description was in line with her BMI, and in column 3 whether her self-description was heavier than her BMI. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1). The sample in Panel A includes overweight teen girls and in Panel B non-overweight teen girls. BMI is only available from 1999-2017. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table 5: School-Based BMI Assessments Increased the Likelihood That Overweight Teen Boys Reported Trying to Lose Weight

	(1)	(2)	(3)	(4)
Outcome →	Self-Described Overweight	Self-Described Overweight	Trying to Lose Weight	Trying to Lose Weight
BMI Assessment	-0.003	0.000	0.002	-0.003
	(0.003)	(0.003)	(0.004)	(0.004)
BMI Assessment × Overweight or Obese		-0.001		0.019***
		(0.006)		(0.006)
Mean	0.238	0.238	0.300	0.306
R^2	0.008	0.314	0.015	0.214
Observations	476,966	353,865	431,070	358,909

Source: National and State Youth Risk Behavior Surveys, 1991-2017

Note: The dependent variable in columns 1 and 2 is an indicator for whether the respondent described himself as overweight. The dependent variable in columns 3 and 4 is an indicator for whether the teen reported trying to lose weight. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1). The sample is teen boys. Column 1 examines all boys, column 2 limits the sample to overweight and obese teen boys, and column 3 to non-overweight or obese teen boys. Column 4 again examines all teen girls but includes an indicator for whether the girl is overweight or obese and interacts it with the independent variable of interest. BMI is only available from 1999-2017. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table 6: School-Based BMI Assessments Were Not Statistically Related to School Bullying, Feeling Hopeless, or Suicidal Behaviors

	(1)	(2)	(3)	(4)	(5)
Outcome→	Bullied at School During Prior 12 Months	Felt Sad/Hopeless for More than 2 Weeks During Prior 12 Months	Considered Suicide During Prior 12 Months	Planned Suicide During Prior 12 Months	Attempted Suicide During Prior 12 Months
BMI Assessment	-0.007	-0.003	-0.002	-0.002	0.000
	(0.010)	(0.006)	(0.006)	(0.005)	(0.004)
State YRBS	Y	Y	Y	Y	Y
National YRBS	Y	Y	Y	Y	Y
Years	2009-2017	1999-2017	1991-2017	1991-2017	1991-2017
Mean	0.224	0.359	0.218	0.171	0.107
R^2	0.029	0.014	0.019	0.015	0.015
Observations	276,951	461,523	561,965	508,518	499,876

Source: National and State Youth Risk Behavior Surveys, 1991-2017

Note: The dependent variable in column 1 is an indicator for whether the respondent reported being bullied at school during the prior 12 months and in column 2 an indicator for reporting feeling so sad/hopeless for more than 2 weeks such that she stopped doing regular activities. The dependent variables in columns 3-5 refer to suicidal behavior during the prior 12 months. The dependent variable in column 3 is an indicator for having considered suicide, in column 4 an indicator for having planned suicide, and in column 5 an indicator for having attempted suicide. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1). The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table 7: School-Based BMI Assessments Did Not Increase Calorie-Expending Activities

	(1)	(2)	(3)
Outcome →	Exercised to Lose Weight	Number of Days Active for ≥ 60 Minutes	Number of Days in PE Class
Panel A: Teen Girls with a Negative Body Image			
BMI Assessment	0.003	-0.058*	-0.027
	(0.021)	(0.030)	(0.029)
Mean	0.777	3.167	1.737
Observations	7,178	60,226	38,920
Panel B: Teen Girls without a Negative Body Image			
BMI Assessment	0.029	-0.051*	0.015
	(0.018)	(0031)	(0.016)
Mean	0.627	3.305	1.853
Observations	33,238	281,009	202,926
Years	1991-2009	2005-2017	1991-2017
State YRBS?	N	Y	Y
National YRBS?	Y	Y	Y

Source: National and State Youth Risk Behavior Surveys, 1991-2017

Note: The dependent variable in column 1 is an indicator for whether the respondent reported that she was exercising to lose weight. The dependent variables in columns 2 and 3 are the number of days the respondent reported getting at least 60 minutes of physical activity and the number of days spent in PE class. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1) and the sample is teen girls. Column is estimated via ordinary least squares. Columns 2 and 3 are estimated using a Poisson regression. Panel A limits the sample to teen girls who describe their bodies as heavier than determined by their BMI. Panel B is the complement to Panel A. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table 8: The Relationship Between School-Based BMI Assessments and Teen Girls' Risky Weight-Loss Strategies is Robust to Excluding 'Dieting' to Yield a Longer Sample Period

	(1)	(2)	(3)
Sample →	Teen Girls	Teen Girls with a Negative Body Image	Teen Girls without a Negative Body Image
BMI Assessment	0.059	0.156***	0.031
	(0.036)	(0.040)	(0.052)
State YRBS?	N	N	N
National YRBS?	Y	Y	Y
Mean	0.314	0.528	0.266
Observations	56,494	9,025	43,487

Source: National Youth Risk Behavior Surveys, 1999-2013

Note: The dependent variable is an index taking on values 0 to 3 depending on the total number of risky weight loss strategies a teen utilized (fasted, consumed diet pills, vomited/took laxatives). The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1) and are estimated using a Poisson regression. The sample is teen girls. Column 1 examines all teen girls. Column 2 limits the sample to teen girls whose view of their bodies is too harsh compared to their BMI. Column 3 is the complement to column 2. BMI is available beginning in 1999. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table 9: The Relationship Between School-Based BMI Assessments and Teen Girls' Risky Weight-Loss Strategies is Robust to Excluding 'Fasting' to Yield a Longer Sample Period

	(1)	(2)	(3)
Sample →	Teen Girls	Teen Girls with a Negative Body Image	Teen Girls without a Negative Body Image
BMI Assessment	0.023	0.085**	0.033
	(0.027)	(0.033)	(0.041)
State YRBS?	N	N	N
National YRBS?	Y	Y	Y
Mean	0.599	0.992	0.608
Observations	68,906	7,101	32,835

Source: National Youth Risk Behavior Surveys, 1991-2009

Note: The dependent variable is an index taking on values 0 to 3 depending on the total number of risky weight loss strategies a teen utilized (dieted, consumed diet pills, vomited/took laxatives). The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1) and are estimated using a Poisson regression. The sample is teen girls. Column 1 examines all teen girls. Column 2 limits the sample to teen girls whose view of their bodies is too harsh compared to their BMI. Column 3 is the complement to column 2. BMI is available beginning in 1999. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table 10: School-Based BMI Assessments Were Positively Associated with More Frequent Dieting, Fasting, and Use of Diet Pills among Girls with a Negative Body Image

	(1)	(2)	(3)	(4)
Outcome →	Dieted	Fasted	Used Diet Pills	Vomited or Took Laxatives
Panel A: Teen Girls				
BMI Assessment	0.004	0.004	0.005	0.002
	(0.013)	(0.006)	(0.004)	(0.004)
Mean	0.466	0.168	0.071	0.061
R^2	0.054	0.010	0.022	0.011
Observations	69,477	56,851	83,148	83,277
Panel B: Teen Girls with a Negative Body Image				
BMI Assessment	0.038	0.034***	0.037**	0.009
	(0.026)	(0.012)	(0.015)	(0.012)
Mean	0.722	0.266	0.141	0.122
R^2	0.027	0.022	0.026	0.012
Observations	7,169	9,072	9,130	9,148
Panel C: Teen Girls without a Negative Body Image				
BMI Assessment	0.008	-0.001	0.005	0.001
	(0.018)	(0.007)	(0.006)	(0.005)
Mean	0.482	0.147	0.068	0.051
R^2	0.029	0.009	0.016	0.006
Observations	33,167	43,720	43,966	44,033
State YRBS?	N	N	N	N
National YRBS?	Y	Y	Y	Y
Years	1991-2009	1999-2013	1991-2013	1991-2013

Source: National Youth Risk Behavior Surveys 1991-2013

Note: The dependent variable in column 1 is an indicator for whether the respondent reported dieting to lose weight, in column 2 fasting, in column 3 using diet pills, and in column 4 vomiting/taking laxatives. The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1), and the sample is teen girls. Panel A uses all teen girls, Panel B those who describe themselves heavier than their BMIs, and Panel C those who do not describe themselves as heavier than their BMIs. BMI is available beginning in 1999. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table 11: School-Based BMI Assessments Were Inconclusively Related to the Likelihood Teen Boys Utilized Risky Weight-Loss Strategies

	(1)	(2)	(3)
Sample →	Teen Boys	Teen Boys with a Negative Body Image	Teen Boys without a Negative Body Image
BMI Assessment	0.027	0.125	0.021
	(0.050)	(0.161)	(0.057)
State YRBS?	N	N	N
National YRBS?	Y	Y	Y
Mean	0.429	0.720	0.402
Observations	40,618	2,177	36,187

Source: National Youth Risk Behavior Surveys, 1999-2009

Note: The dependent variable is an index taking on values 0 to 4 depending on the total number of risky weight loss strategies a teen utilized (dieted, fasted, consumed diet pills, vomited/took laxatives). The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1) and are estimated using a Poisson regression. The sample is teen boys. Column 1 examines all teen girls. Column 2 limits the sample to teen girls whose view of their bodies is too harsh compared to their BMI. Column 3 is the complement to column 2. BMI is available beginning in 1999. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table 11: The Relationship Between Mandated School BMI Assessments and the Likelihood That Teen Girls with a Negative Body Image Used Diet Pills is Robust to Utilizing the National Sample Weights

	(1)	(2)	(3)	(4)
Outcome →	Full Sample	Never Treated States and States First Treated in the 2005 YRBS	Never Treated States and States First Treated in the 2007 YRBS	Never Treated States and States First Treated in the 2009 YRBS
BMI Assessment	0.084***	0.101*	0.046	0.119
	(0.031)	(0.055)	(0.064)	(0.111)
Mean	1.256	1.256	1.248	1.283
Observations	7,047	1,627	4,391	2,570

Source: National Youth Risk Behavior Surveys 1999-2013

Note: The dependent variable is an index taking on values 0 to 3 depending on the total number of risky weight loss strategies a teen utilized (dieted, consumed diet pills, vomited/took laxatives). The independent variable of interest is an indicator for whether the student's state required school-based BMI assessments. The regressions include the full set of controls from equation (1) and are estimated using a Poisson regression. The sample is teen girls whose view of their bodies is too harsh compared to their BMI. Column 1 uses the full sample, column 2 limits the sample to non-treated states and those first treated in the 2005 YRBS, column 3 to non-treated states and those first treated in the 2007 YRBS, and column 4 to non-treated states and those first treated in the 2009 YRBS. The estimates are unweighted. Standard errors, shown in parentheses, are clustered at the state level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$