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Effect of School-Based Body Mass Index Reporting in California Public Schools

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School-based body mass index reporting: A cluster-randomized trial in California public schools

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KEY POINTS

Question: Does school-based BMI screening and reporting improve weight status or have unintended consequences among diverse students in grades 3-8?

Findings: In this cluster-randomized study among 79 California schools, BMI reports sent to parents had no effect on BMI z-scores at one year or two years of follow-up, with mixed results related to potential unintended consequences.

Meaning: While thousands of schools currently send BMI reports to parents, the practice alone has no impact on pediatric obesity and may decrease student weight satisfaction. Schools should dedicate resources to evidence-based approaches to improving student health.

ABSTRACT

Importance: Annually, U.S. schools screen millions of students' body mass index (BMI) and report results to parents, with little experimental evidence on potential benefits and harms.

Objective: To determine the impact of school-based BMI reporting on weight status and adverse outcomes (weight stigmatization and weight-related perceptions and behaviors**)** among diverse students.

Design: The *Fit Study* (2014-2017) randomized 79 schools to: BMI Screening and Reporting (Arm 1); BMI Screening only (Arm 2); or Control (no BMI screening or reporting; Arm 3).

Setting: California elementary and middle schools.

Participants: Students in grades 3-7 at baseline participated for up to 3 years.

Intervention: School staff assessed BMI each spring among students in Arms 1 and 2; parents of students in Arm 1 were sent a BMI report each fall, for up to 2 years.

Main Outcome and Measures: Changes in BMI z-score and in adverse outcomes (based on surveys conducted each fall among 4^{th}-8^{th} grade students) from baseline to 1 and 2 years follow-up.

Results: Among 6534 students with a baseline BMI ≥85th percentile (39.6%), BMI reporting had no effect on z-score change (95% CI: -0.02 to 0.01 at 1 year; -0.02 to 0.03 at 2 years). Weight dissatisfaction increased more among students having BMI screened at school (Arms 1 and 2; N=8694) than among controls (Arm 3; N=5674); other adverse-outcomes results were mixed.

Conclusion and Relevance: BMI reports by themselves do not improve children's weight status and may decrease weight satisfaction. To improve student health, schools should invest their resources in evidence-based interventions.

Trial Registration: Clinical Trials ID 2012-07-4472

INTRODUCTION

In the United States, nearly 1 in 5 youth have obesity, with prevalence significantly higher among Hispanic (26%) and African American (22%) youth than among white youth (14%).[1] As of 2013, 25 states required schools to screen students' body mass index (BMI) and 11 states required that schools report BMI results to parents in an effort to reduce pediatric obesity.[2]

While widely implemented, BMI reporting has not been shown to reduce childhood obesity.[3] However, existing studies have had important limitations, including the use of BMI reports with higher than recommended literacy levels or potentially insensitive language.[4,5] Additionally, despite evidence suggesting that parents of different ethnic or racial groups respond differently to BMI reports,[6,7] to the best of our knowledge, no studies have examined the effect of BMI reporting on weight status by ethnicity or race, nor have studies compared effects between younger students, whose parents may have more control over weight-related behaviors,[8] and older students with greater autonomy.

Further, case studies suggest school-based BMI screening may increase weight stigmatization, including weight-based teasing[9,10] and other forms of weight-related talk,[11] both of which have been found to predict disordered eating behaviors in adolescents.[12,13] Weight stigmatization is particularly prevalent and harmful among students at higher BMI levels.[14,15] Additionally, BMI reporting has been shown to increase the likelihood parents will put their children on diets,[10,16] which has been found to predict weight gain in adolescents.[17,18] However, to our knowledge, no experimental studies have examined potential adverse consequences of BMI screening and reporting. It is important that efforts to curb obesity leave youth feeling empowered to make healthy changes, not increasingly stigmatized, which may foster the development of eating disorders.[19]

The *Fit Study* sought to determine the effect of a BMI report, developed with input from parents from diverse racial/ethnic backgrounds,[20] on weight status among at risk students (BMI ≥85th percentile) in grades 3-8 and to identify potential differential impacts by race/ethnicity and grade level. We also sought to identify potential adverse consequences of BMI screening and reporting, and to identify differential impacts by weight status.

METHODS

Study Design

California Education Code requires annual height and weight assessments in grades 5, 7 and 9, but BMI reporting to parents is optional.[21] We randomized 79 elementary and middle schools in 5 California school districts that did not send BMI reports to parents to 1 of 3 arms (Figure 1): Arm 1: BMI reporting - BMI was assessed and reported to parents (27 schools); Arm 2: BMI screening - BMI was assessed but not reported to parents (27 schools); or Arm 3: Control - no BMI assessments (25 schools). The 3-arm design (eFigure 2, Supplemental Materials) allowed us to compare changes in: 1) weight status between students whose families received a report stating they were at-risk for overweight or overweight (BMI ≥85th) in Arm 1 and similar students who had BMI assessed but whose families did not receive a report (Arm 2); 2) child and peer-related adverse outcomes between students who had their BMI assessed at school (Arms 1 and 2) and students who did not (Arm 3); and 3) weight stigmatization by families between students who received a BMI report (Arm 1) and those who did not (Arms 2 and 3). Schools were the unit of randomization and intervention; recruitment and study design have been described previously.[22] The study protocol and statistical analysis plan are provided in the Supplemental Materials.

Participants

Students in grades 3-7 in fall 2014 and fall 2015 (eFigure 3) were eligible (N=30542). Surveys were only administered in grades 4 and above (younger students are less reliable respondents[23]); thus, in Control schools, where data were only collected via student survey (BMI was not assessed), eligibility was limited to grades 4-7 at baseline. We used "opt-out" rather than informed consent; schools sent parents a letter describing the study that asked parents to return an enclosed form if they did not want their child to participate. Opt-out rates were similar across arms (6.2%, P=0.57). Enrolled students (N=28641) participated for up to 3 years (Figure 2). Participating school districts and the University of California Berkeley's Committee for the Protection of Human Subjects approved this study.

Intervention and fidelity

BMI screening was conducted in Arms 1 (BMI Reporting) and 2 (BMI Screening) in spring of 2015, 2016, and 2017. BMI reports (eFigure 3) were sent to Arm 1 parents in October of 2015 and 2016, approximately 6 months after BMI assessments (see Supplementary Materials). Reports, developed based on focus groups with diverse parents,[20] classified children as 'Overweight' (BMI ≥95th percentile for sex and age), 'At risk for overweight' (BMI ≥85th percentile and <95th), 'Healthy weight' (BMI ≥5th and <85th percentile) or 'Underweight' (BMI <5th percentile).[24] Reports included an infographic, visually presenting family-oriented health recommendations.[25,26] To ensure intervention fidelity, the research team mailed BMI reports directly to parents using each school's name in the return address; the 1.7% of reports "Returned to Sender" were delivered to the appropriate school to be given to students to bring home.

Measures

Change in BMI z-score[24]**.** School staff assessed BMI among participating Arm 1 and 2 students in grades 3-8, using research-grade equipment[22]; height and weight measurements were equivalent to those of trained researchers.[27] The California Department of Education excused Control (Arm 3) schools from assessing BMI during study years; however, all study schools conducted fitness assessments per usual.

Adverse consequences. Researchers administered surveys each fall to grade 4-8 students. At follow-up, surveys occurred 6-9 months after BMI assessments (and 1-2 months after BMI reports were mailed) in Arm 1 and 2 schools. Survey items were adapted from Project Eat[12,13,19] and the Family Experiences Related to Food Questionnaire.[28] *Weight stigmatization:* A peer weight-teasing index (range 1-5) averaged the frequency of the student or "other kids" being teased or made fun of at school because of weight (5-point scales from "Never" to "Almost every day"). *Weight-related perceptions and behaviors*. Weight satisfaction was assessed on a 5-point scale from "Very unhappy" to "Very happy." An index for concerning weight-control behaviors (range 0-3) summed 3 binary indicators for: dieting, skipping meals, or eating very little food in the last year to lose weight. *Family behaviors.* A weight-talk index (range 1-5), averaged responses to 2 questions concerning family talk about the student's weight or size, and frequency of weight-teasing by family (higher scores reflect greater stigmatization); family encouraging the student to diet was assessed on a 4-point scale from "Not at all" to "Very much." Students were also asked if they felt very underweight, somewhat underweight, about the right weight, somewhat overweight, or very overweight ("very" and "somewhat" underweight were collapsed in analyses).

Schools provided parent-reported race/ethnicity, sex and grade for participating students. School-level free-and-reduced price meal (FRPM) eligibility (a proxy for socioeconomic status) and school enrollment were obtained from the California Department of Education website (https://data1.cde.ca.gov/dataquest/).

Statistical Analysis

Primary analyses were limited to complete cases: students with a valid BMI (0.8% if BMI values were biologically implausible, Supplemental Materials) or complete survey data at baseline and at least 1 of the 2 follow-up assessments (Figure 2). Among 20482 students enrolled in Arms 1 and 2, 5.3% had no (or invalid) baseline BMI data and 13.5% had no follow-up data, with no differences between arms (P=0.99; Figure 2), yielding 16622 complete cases. Among 20937 enrolled students in grades 4-7 at baseline, across Arms 1-3, 14.9% had no (or incomplete) baseline survey data and an additional 16.5% had no follow-up data, with no differences between arms (P=0.12; Figure 2), yielding 14368 complete cases. For all outcomes, we used linear mixed effects models with a group-by-time interaction term (including main effects) and random intercepts for students nested within schools (to account for clustering), adjusting for student sex, race, district, and grade, school-level FRPM eligibility, and calendar year (Stata/SE version 15.1, StataCorp LP). We considered a p-value of < 0.05 significant for interaction and main effects.

We compared change in BMI z-score between Arm 1 and 2 students with a baseline BMI $\geq 85^{th}$ percentile (primary outcome), for whom BMI reports are likely to have the greatest effect. Participant flow among overweight students was similar to that of all Arm 1 and 2 students (eFigure 4). We explored ethnicity (Hispanic vs. non-Hispanic) and elementary grade status (grades 3-5 at baseline vs.

grades 6-7) as effect modifiers. We used a modified intention-to-treat protocol (mITT), in which students who left their school during the study were not followed, but conducted sensitivity analyses using multiple imputation for all missing and biologically implausible follow-up BMI data. The sample size, accounting for students moving out of schools, provided 80% power to detect a difference between Arms 1 and 2 in 1-year change in BMI z-score of 0.017.[22]

To identify adverse consequences of assessing BMI in schools (secondary outcomes), models compared all students in Arms 1 and 2 to students in Arm 3 (Controls). Models included all students because disordered eating and body dissatisfaction are not limited to students with overweight or obesity.[29,30] To identify adverse consequences of sending BMI reports to parents, models compared Arm 1 to Arms 2 and 3. Models additionally adjusted for baseline weight status (BMI was only assessed in Arms 1 and 2; therefore, perceived weight status from surveys was used), and explored perceived weight status as an effect modifier.

RESULTS

Baseline characteristics are presented in Table 1. Among Arm 1 and 2 students, 39.6% had a baseline BMI $\geq 85^{th}$ percentile, among whom baseline BMI z-scores (1.74±0.43) were similar between arms (P=0.14), as were the proportion of female (46%, P=0.85), elementary-grade (66.4%, P=0.95) and Hispanic students (70.2%, P=0.13). Among the 14368 students with complete survey data (49% female), baseline measures of adverse outcomes (Table 3) and perceived weight status were similar between study arms.

BMI z-score. There was no difference in change in BMI z-score between Arm 1 and Arm 2 students (with baseline BMI≥85th percentile) after 1 year (P=0.71; 95% CI: -0.02, 0.01) or 2 years (P=0.62; 95% CI: -0.02, 0.03) of BMI reporting. Grade level did not modify the effect of the intervention (P=0.33), nor did ethnicity, though there was a trend (P=0.07) for BMI z-score to increase more among Hispanic youth receiving a BMI report than non-Hispanic youth (Table 2). Multiple imputation models and models exploring additional categories of race yielded similar results (Supplemental Materials). Exploratory models stratified on baseline weight status demonstrated small effects of BMI reports in students with a BMI<85th percentile, but without clear implications (Supplemental Materials).

Adverse consequences of assessing BMI in schools. Weight satisfaction declined more in students weighed at school (Arms 1 and 2) than in Controls after 2 years of BMI screening (-0.11, 95% CI: -0.18, -0.05) and the frequency of peer weight-talk increased more after 1 year (0.05, 95% CI: 0.01, 0.09); however, concerning weight-control behaviors declined more after 1 year (-0.06, 95% CI: -0.10, -0.02; Table 3). Students' perceived weight status did not modify the effect of BMI screening on peer-related outcomes.

Adverse consequences of sending BMI reports. Students' perceived weight status modified the effect of BMI reporting on all family-related outcomes except teasing (Table 3). Among students who considered themselves very overweight, family encouraging the child to diet increased more after 2 years in the BMI reporting arm than in the comparison group (0.44, 95% CI: 0.06, 0.82), although family talk decreased more (-0.24, -0.47, -0.00; eTable 2**)**.

DISCUSSION

Forty percent of U.S. youth[31] live in states where schools are required or known to send BMI reports to parents.[2,32] In the first randomized trial of BMI screening and reporting in the U.S., we find that BMI reports do not improve student weight status, nor are there impacts among subgroups based on race/ethnicity or grade. With respect to adverse consequences, results were mixed. For example, weight satisfaction declined and peer weight-talk increased among students who were weighed at school, but unhealthy weight control behaviors also declined. Overall, our findings suggest that the use of BMI reports by themselves do not improve children's weight status and may decrease weight satisfaction and increase peer weight talk.

With respect to null effects on weight status, findings from this cluster-randomized trial are consistent with prior research. The single randomized trial of BMI reporting, conducted among over 2700 elementary-school children in Mexico, found no decrease in weight or BMI over a follow-up period of 5 months.[33] We found no impact after up to 2 years of follow-up, extending the findings from Mexico. A study using a regression-discontinuity design found no effect of BMI reporting among students in grades K-11 in New York City.[34] However, New York's BMI reports used the term "obese" to describe children with a BMI $\geq 95^{th}$ percentile, which some parents find perjorative.[35] To maximize parents' receptivity to BMI reporting, the *Fit Study* BMI report was crafted with attention to format and language based on feedback from diverse parents.[20] Additionally, the report was sent in English and either Spanish or Chinese (depending on each school's routine practices) to ensure cultural sensitivity and comprehension, and included color-coded BMI results and an infographic for easier interpretation. Therefore, further enhancements to BMI reports would be unlikely to improve their effect on weight status.

While BMI reports have widespread reach, the magnitude of the intervention is small and may not be sufficiently salient for parents. The vast majority of *Fit Study* BMI reports were delivered as intended over 2 years (<2% of reports were "Returned to Sender"), yet among a random sample of parents, recall of the report was 54% after receiving 1 report and 70% after receiving 2 reports,[36] consistent with prior studies.[6,7,37,38] Additionally, parents of children with a BMI ≥85th percentile had poorer recall of report results than other parents, and only 1 in 5 parents were surprised by the results, suggesting BMI reports alone are not sufficient to change parents' behaviors.[36] Increasing evidence suggests that interventions to reduce obesity should focus on changing social, socioeconomic, and built environment factors, all of which play major roles in the development of obesity.[39,40]

Measuring student BMI at school is controversial[41,42] and numerous experts have raised concerns that school-based BMI screening may have unintended negative consequences.[16,43,44] Massachusetts, which instituted BMI reporting in 2009, stopped sending BMI reports in 2014 due to concerns about stigmatization.[45] Our weight-stigmatization results, the first based on a randomized controlled design, were inconclusive. Weight satisfaction decreased and peer weight-talk increased among students weighed at school, both of which are associated with the development of disordered eating behaviors.[19] However, there were also protective effects, as concerning weight control behaviors declined among youth exposed to BMI screening relative to controls. Further, no results related to weight stigmatization were consistent across both 1 and 2 years of reporting, making it difficult to draw definitive conclusions about adverse consequences. Our results are consistent with a study in Arkansas, which found no difference in the prevalence of disordered eating behaviors among high school students exposed to BMI screening and reporting and historical controls.[46] However, the few studies asking students directly about their experience with BMI screening found that while most students did not express concerns, a

small minority were very uncomfortable with the process.[47,48] Similarly, adverse consequences of sending BMI reports to parents were mixed, with families encouraging their overweight children to diet after receiving 2 consecutive reports, a problematic response since dieting in adolescents has been shown to lead to weight gain.[17,18] Conversely, family weight-talk, which is associated with body dissatisfaction and unhealthy weight control behaviors, declined after 2 years.[13]

Health screenings, where every individual is assessed, are recommended when an effective intervention exists for those identified as being at risk.[49] Our findings clearly demonstrate sending BMI reports to families of children in grades 3 and above does not improve weight status; thus, BMI screening should not be done for the purpose of sending reports to families unless effective interventions can be identified and made available. With respect to screening student BMI in schools without sending BMI reports, many researchers and advocates rely on BMI data to study the impact and cost-effectiveness of obesity prevention efforts.[50,51] However, given that we documented an increase in peer weight-talk and a decrease in weight-satisfaction as a result of school-based BMI screening, every attempt should be made to identify other sources for BMI data. There is rapid movement towards centralizing electronic health record (EHR) data in California. For example, the University of California (UC) has pooled EHRs from 5 medical centers, making de-identified data on over 15 million patients available to UC researchers,[52] and Kaiser Permanente has EHRs for 9 million Californians. With such coverage it is worth exploring the use of EHR data for BMI surveillance in California, recognizing that other states may not be situated to move as quickly in this direction.

The well-powered *Fit Study* was the first to test for differences in the effect of BMI reporting by race/ethnicity and age group. An additional strength was the large number of youth enrolled for all 3

years, which permitted assessment of the cumulative effect of 2 annual BMI reports. Important limitations of the *Fit Study* include that it was limited to California public schools (serving 1 in 8 of the country's youth); thus, results may not generalize to other states. The small proportion of African-American students could also limit generalizability. Among students in grades 5-7 with a BMI $\geq 85^{th}$ percentile, more control than intervention students were missing follow-up data, which could bias our results in either direction, although results from multiple imputation models similarly showed null effects. Student surveys were administered approximately 6 months after BMI assessments, which may not capture immediate harmful effects; however, we were interested in persistent adverse effects. Finally, the *Fit Study* did not explore the effects of BMI reporting in children in grade 2 or younger or over periods longer than 2 years, where it is possible that BMI reporting could have a different effect.

BMI reporting is widely used in an effort to reduce pediatric obesity. It is important to convey to national stakeholders who recognize the importance of schools in addressing population health – including researchers, practitioners, school districts, and education and health departments – that BMI reports alone do not improve student weight status and that resources should be directed toward comprehensive evidence-based interventions.

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53. Campbell MK, Piaggio G, Elbourne DR, Altman DG, Group C. Consort 2010 statement: extension to cluster randomised trials. *BMJ.* 2012;345:e5661.

FIGURES

Figure 1: CONSORT Flow Diagram for cluster-randomized trial[53]

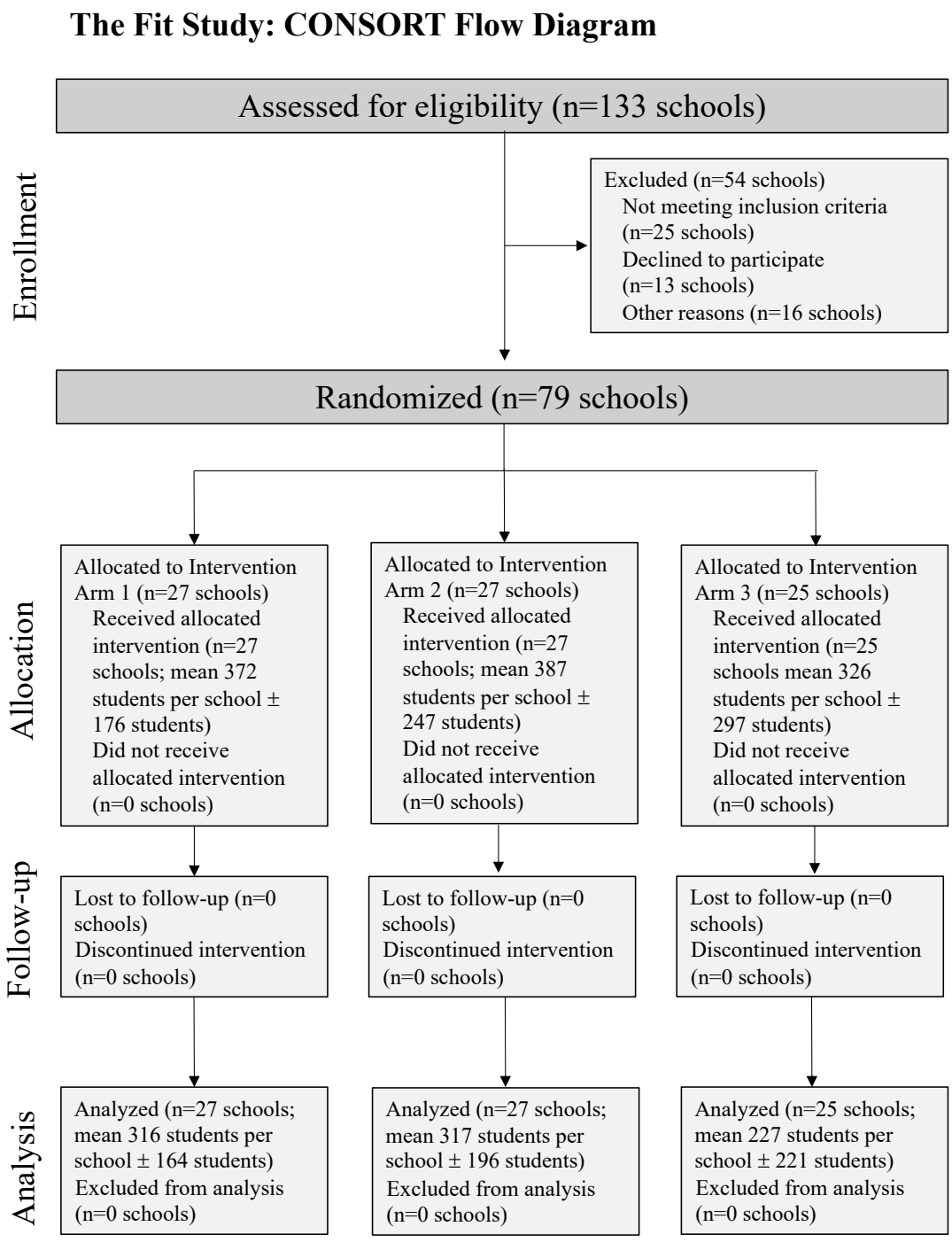
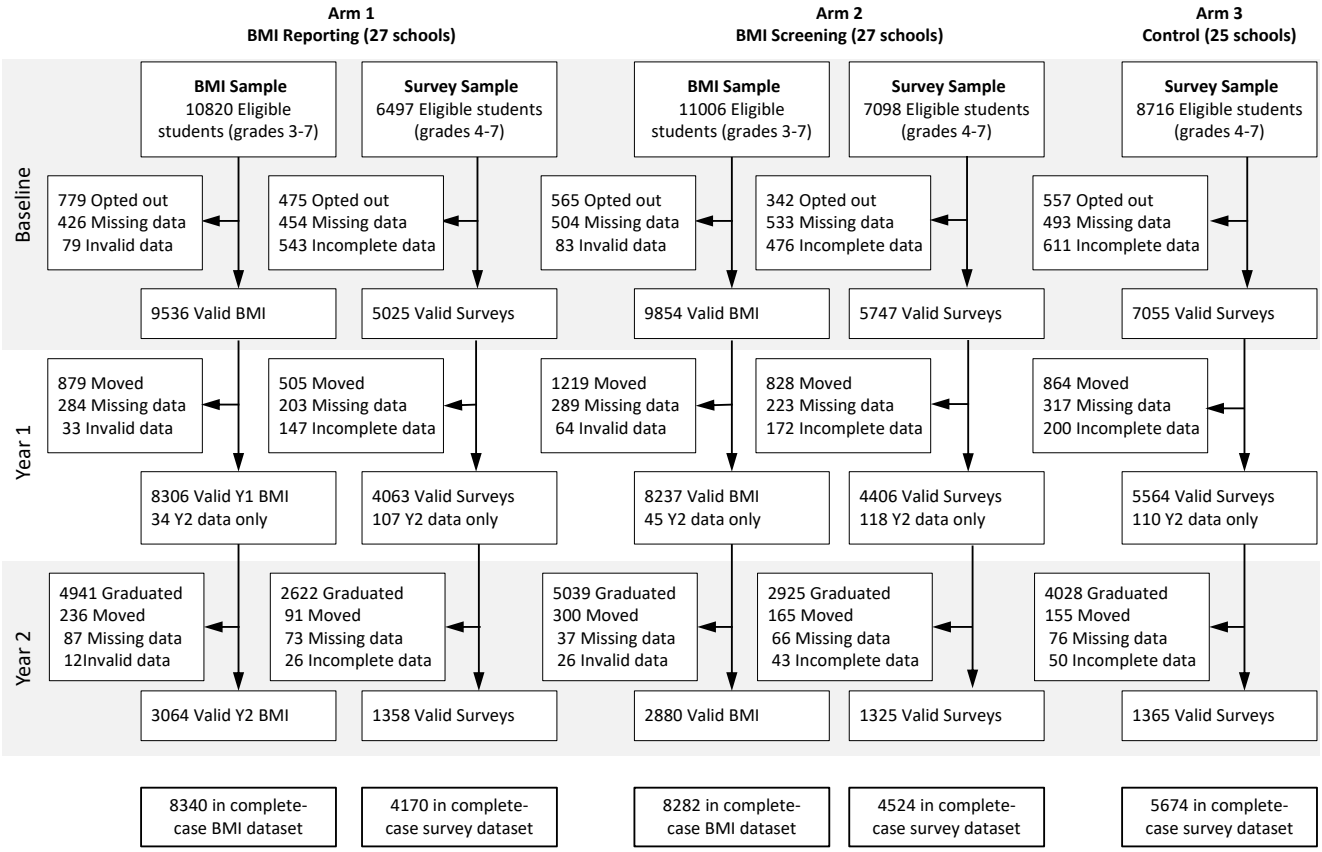


Figure 2: Participant flow among eligible students (N=30542) in grades 3-7 in 79 California schools



"Moved" indicates students lost to follow-up because they moved from their school. "Graduated" indicates students who completed the study (graduated from school or entered study in second cohort, with only 1 year of follow-up possible)

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TABLES

Table 1: Baseline characteristics among 28641 students in grades 3-7 from 79 California schools

	Enrolled Students				Weight-status Complete Cases	Weight-stigmatization Complete Cases
	Arm 1: BMI Reporting	Arm 2: BMI Screening	Arm 3: Control	Total	Arms 1 & 2 BMI ≥ 85th %tile	Arms 1, 2 & 3 Grades 4-7
	N=10041	**N=10441**	**N=8159**	**N=28641**	**N=6534**	**N=14318**
Female (%)	48.1	49.3	49.2	48.9	45.7	49.5
Race (%)						
Hispanic	56.9	62.9	56.3	58.9	70.2	58.0
Asian	17.8	10.7	17.5	15.1	9.7	17.6
African American	5.2	9.6	7.8	7.5	5.2	6.2
White	16.9	14.9	14.6	15.5	12.8	15.1
Other	3.2	2.0	3.8	2.9	2.1	3.0
Grade (%)						
3	40.0	35.3	–	26.9	36.6	–
4	22.1	19.6	43.4	27.3	20.7	35.7
5	9.2	8.7	9.2	9.0	9.1	12.2
6	16.3	22.0	22.3	20.1	20.2	28.6
7	12.4	14.5	25.0	16.8	13.5	23.6
BMI z-score (mean±SD) [A]	0.6±1.2	0.7±1.1	–	0.6±1.1	1.7±(0.4)	0.6±(1.2)
BMI ≥85th %tile (%) [A]	38.5	40.6	–	39.6	100	40.1
Perceived weight status (%) [B]						
Underweight	21.7	21.5	22.5	22.0	12.2	21.8
About the right weight	52.9	51.4	50.6	51.5	39.9	51.7
Somewhat overweight	20.1	22.2	21.0	21.1	38.3	21.4
Very overweight	5.4	4.9	5.9	5.4	9.6	5.1
School district (%)						
1 (Northern CA)	25.4	9.8	17.9	17.5	20.0	21.4
2 (Central CA)	17.7	20.8	29.3	22.2	20.9	21.4
3 (Southern CA)	13.2	24.1	2.7	14.2	18.1	11.6
4 (Southern CA)	18.3	29.9	30.1	25.9	23.8	22.2
5 (Southern CA)	25.4	15.4	20.0	20.2	17.2	23.5
School-level FRPM (%)	64.4	72.5	68.3	68.4	69.5	67.6

[A] Values restricted to students with a valid baseline BMI (N=8458); BMI was not assessed in Arm 3.

[B] Values restricted to students in grades 4-7 who completed surveys; grade 3 students did not complete surveys.

FRPM: percentage of students eligible for free or reduced-price meals (a proxy for socioeconomic status). CA: California. Complete cases: for weight status, students in Arms 1 and 2 with valid baseline BMI ≥85th %tile and 1 valid follow-up BMI; for weight stigmatization, students in grades 4-7 at baseline with complete survey data at baseline and at 1 follow-up period.

Table 2: Adjusted BMI z-scores, among students with a baseline BMI ≥ 85th percentile (N=6534), by group

				1-yr change			2-year change		
	Baseline	1 Year	2 Year	Within-Group	Between-Group[A]	P Value[B]	Within-Group	Between-Group[A]	P Value[B]
All students									
BMI Reporting	1.74±0.01	1.69±0.01	1.69±0.02	-0.05 [-0.08, -0.02]	-0.003 [-0.02,0.01]	0.71	-0.05 [-0.11, 0.00]	0.005 [-0.02,0.03]	0.62
BMI Screening	1.75±0.01	1.70±0.01	1.69±0.02	-0.05 [-0.07, -0.02]			-0.06 [-0.12, -0.00]		
Hispanic students									
BMI Reporting	1.77±0.01	1.73±0.01	1.73±0.02	-0.04 [-0.07, -0.01]	0.003 [-0.01,0.02]	0.70	-0.04[-0.09, 0.02]	0.023 [-0.00,0.05]	0.07
BMI Screening	1.78±0.01	1.73±0.01	1.72±0.02	-0.05 [-0.07, -0.02]			-0.06 [-0.12, -0.00]		
Non-Hispanic students									
BMI Reporting	1.67±0.02	1.61±0.02	1.58±0.02	-0.06 [-0.09, -0.03]	-0.014 [-0.04, 0.01]	0.25	-0.09 [-0.15, -0.03]	-0.03[-0.07, 0.01]	0.12
BMI Screening	1.69±0.02	1.64±0.02	1.62±0.03	-0.05 [-0.08, -0.01]			-0.06 [-0.12, -0.00]		
Elementary students[C]									
BMI Reporting	1.76±0.01	1.71±0.01	1.69±0.02	-0.05 [-0.08, -0.03]	-0.008 [-0.03, 0.01]	0.32	-0.07 [-0.12, -0.02]	-0.005 [-0.03, 0.02]	0.70
BMI Screening	1.77±0.01	1.72±0.01	1.70±0.02	-0.05 [-0.07, -0.02]			-0.07 [-0.12, -0.02]		
Non-elementary students									
BMI Reporting	1.73±0.02	1.66±0.02	1.61±0.03	-0.08 [-0.11, -0.06]	0.009 [-0.01, 0.03]	0.43	-0.12 [-0.18, -.07]	0.02 [-0.02, 0.06]	0.24
BMI Screening	1.74±0.02	1.65±0.02	1.60±0.02	-0.09 [-0.12, -0.06]			-0.15 [-0.20, -0.09]		

Values are estimated marginal means±SE; 95% confidence intervals are shown in brackets [].Analyses adjusted for sex, race (except in models stratified by Hispanic students), district, grade (except for models stratified by grade-level), school-level percentage of students eligible for FRPM, and calendar year.

[A] Between-group difference: BMI Reporting minus BMI Screening group.

[B] P-value for between-group difference.

[C] Elementary: In grade 3-5 at baseline.

Table 3: Adjusted weight stigmatization outcomes for students with complete surveys (N=14318), by group

				1-yr change			2-year change		
	Baseline	1 Year	2 Year	Within-Group	Between-Group	P Value[B]	Within-Group	Between-Group	P Value[B]
Child and Peer Outcomes [A]									
Peer weight-teasing index (range 1 to 5)									
BMI Reporting & BMI Screening	1.73±0.03	1.68±0.02	1.65±0.03	-0.06 [-0.10,-0.02]	0.01 [-0.02,0.04] [A]	0.67	-0.08 [-0.15,-0.01]	-0.02 [-0.07,0.03] [A]	0.35
Control	1.76±0.03	1.70±0.03	1.70±0.04	-0.06 [-0.11,-0.02]			-0.06 [-0.13, 0.01]		
Peer weight-talk (range 1 to 5)									
BMI Reporting & BMI Screening	1.67±0.02	1.70±0.01	1.67±0.03	0.03 [-0.01,0.07]	0.05 [0.01,0.09] [A]	0.007	-0.00 [-0.08, 0.07]	-0.00 [-0.07,0.06] [A]	0.99
Control	1.69±0.02	1.67±0.02	1.69±0.03	-0.03 [-0.07,0.02]			-0.00 [-0.08,0.08]		
Teacher weight talk (range 1 to 5)									
BMI Reporting & BMI Screening	1.14±0.01	1.10±0.01	1.06±0.02	-0.04 [-0.06,-0.01]	-0.01 [-0.03,0.02] [A]	0.53	-0.07 [-0.11, -0.03]	-0.00 [-0.04,0.03] [A]	0.82
Control	1.13±0.01	1.11±0.01	1.07±0.02	-0.03 [-0.06,-0.00]			-0.07 [-0.11,-0.02]		
Weight satisfaction (range 1 to 5)									
BMI Reporting & BMI Screening	3.43±0.02	3.45±0.02	3.37±0.03	0.02 [-0.03,0.06]	-0.03 [-0.07,0.01] [A]	0.13	-0.06 [-0.15,0.02]	-0.11 [-0.18,-0.05] [A]	0.001
Control	3.41±0.02	3.46±0.02	3.46±0.04	0.05 [-0.00,0.10]			0.05 [-0.04,0.14]		
Weight-control behaviors index (range 0 to 3)									
BMI Reporting & BMI Screening	1.14±0.02	1.13±0.01	1.12±0.03	-0.01 [-0.05,0.03]	-0.06 [-0.10,-0.02] [A]	0.001	-0.02 [-0.10,0.06]	-0.04 [-0.10,0.02] [A]	0.19
Control	1.13±0.02	1.18±0.02	1.15±0.04	0.05 [0.00,0.10]			0.02 [-0.06,0.11]		
Family Outcomes [C]									
Family weight-teasing (range 1 to 5)									
BMI Reporting	1.32±0.02	1.28±0.02	1.28±0.03	-0.03 [-0.07,0.01]	-0.01 [-0.04,0.03] [C]	0.73	-0.04 [-0.11,0.03]	-0.01 [-0.06,0.04] [C]	0.59
BMI Screening & Control	1.33±0.01	1.30±0.01	1.30±0.02	-0.03 [-0.06,0.01]			-0.03 [-0.09,0.03]		

Values are estimated marginal means±SE; 95% confidence intervals are shown in brackets []. Analyses adjusted for baseline perceived weight status, sex, race, district, grade, school-level percentage of students eligible for FRPM, and calendar year. For all outcomes except weight satisfaction, higher scores reflect poorer outcomes (increased teasing, talk or concerning weight control behaviors).

[A] Between-group difference: BMI Reporting and BMI Screening Arms combined minus Control Arm.

[B] P-value for between-group difference.

[C] Between-group difference: BMI Reporting Arm minus BMI Screening and Control arms combined.

Supplementary Materials

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1. Physiologically implausible BMI values

Students' height and weight measurements were used to calculate their BMI, defined as weight in kilograms divided by height in meters squared. Z-scores for height, weight, and BMI were calculated according to the 2000 CDC Growth Reference chart with Stata package zanthro (version dm0004_1) [1] using each student's sex, age (in years), and measured height, weight, or BMI, respectively. Height, weight, and BMI z-scores were converted into percentiles based on a standard Normal distribution.

For each strata of age in years (range 8 to 14), we calculated the median, 25th percentile, 75th percentile and interquartile range for both height and weight. A student's BMI was considered physiologically improbable and excluded if:

a) height or weight was below the 25th percentile of height/weight less three times the interquartile range for height/weight or above the 75th percentile plus three times the interquartile range for height/weight
b) height or weight change was below the 25th percentile of height/weight change less three times the interquartile range for height/weight change or above the 75th percentile plus three times the interquartile range for height/weight change
c) the absolute value of height or weight z-score was greater than or equal to 5
d) BMI z-score was less than -5

2. Multiple imputation

For students with valid baseline BMI values, missing follow-up BMI, height, and weight measurements were estimated using multiple imputation by chained equations (MICE) in 25 imputed datasets; variables used in imputation included baseline BMI, baseline height, baseline weight, age, sex, race, district, school, grade, school-level FRPM, and calendar year. MICE was performed using the MI suite of commands in Stata[2]. Imputation was performed separately on the intervention (BMI reporting) and control (BMI screening) groups using the command mi impute with the 'by' option. Values were imputed using truncated regressions,[3] where the lower and upper bounds for truncation were set equal to the minimum and maximum observed BMI, height, and weight values in the sample, respectively.

Linear mixed effects models that included a group by time interaction term and random intercepts for school and student were estimated on the 25 multiply imputed datasets with the mi estimate command in Stata's mi suite. As in the complete-case analyses, the outcome of interest in these models was student BMI z-score, and we adjusted for sex, race, district, grade, school-level percentage of students eligible for free-and-reduced price (FRPM) meals, and calendar year. Effect modification by ethnicity (Hispanic vs. non-Hispanic) and elementary grade status (grades 3 to 5 at baseline vs. grades 6-7 at baseline) was explored in separate mixed effect models also estimated using the multiply imputed data. Stata package

[1] Vidmar, S., Carlin, J., Hesketh, K., and Cole, T. 2004. dm0004. Standardizing anthropometric measures inchildren and adolescents with new functions for egen. *Stata Journal* 4: 50-55.
[2] StataCorp. 2015. *Stata Multiple-Imputation Reference Manual Release 14*.
[3] Sterne J et al. Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. *BMJ* 2009;338:b2393. https://www.bmj.com/content/338/bmj.b2393.full.pdf+html

mimrgns was used to obtain adjusted predictions following estimation of regression models on multiply imputed BMI data.

3. Student survey items

Outcome	Question	Response scale
Peer weight-teasing index	I am teased or made fun of at school because of my weight. Other kids are teased at school because of their weight.	5-pt scale from *Never* to *Almost every day*
Peer weight talk	How often do kids at your school talk about weight, weight loss or dieting?	
Teacher weight talk	Teachers talk about my weight or size.	
Body satisfaction	How happy are you with your height? How happy are you with your weight? How happy are you with your body shape? How happy are you with your body build?	5-pt scale from *Very unhappy* to *Very happy*
Concerning weight-control behaviors index	Have you done any of the following things in order to lose weight or keep from gaining weight during the past year? • Ate very little food • Skipped meals Have you gone on a diet during the last year? (By "diet" we mean changing the way you eat so you can lose weight.)	Yes/No
Family weight-talk index	My family talks about my weight or size. My family says things about my weight or size that make me feel bad.	5-pt scale from *Never* to *Almost every day*
Family weight teasing	My family teases or makes fun of me because of my weight.	
Family encouraging dieting	My family encourages me to diet to control my weight.	4-pt scale from *Not at all* to *Very much*

4. Body satisfaction

Drawing on the body satisfaction instrument used in the Project EAT study,[4] the student survey asked how happy students were with their weight, height, body shape, and body build, on a 5-point scale from "Very unhappy" to "Very happy." Body satisfaction was calculated as the mean of the 4 items. During survey administration elementary students frequently asked questions about the meaning of "body shape" and "body build," and across years, the response for satisfaction with body build was twice as likely to be missing as the response for satisfaction with weight ($p<0.001$). Therefore, to minimize bias related to dropping students with missing values, weight satisfaction was used as the primary outcome. Results were similar for the outcomes of body satisfaction and weight satisfaction, as shown below.

[4] Neumark-Sztainer D, Paxton SJ, Hannan PJ, Haines J, Story M. Does body satisfaction matter? Five-year longitudinal associations between body satisfaction and health behaviors in adolescent females and males. *J Adolesc Health.* 2006;39(2):244-251.

Adjusted weight stigmatization outcomes

				1-yr change			2-year change		
	Baseline	1 Year	2 Year	Within-Group	Between-Group	P Value[B]	Within-Group	Between-Group	P Value[B]
Child and peer-based outcomes: BMI Reporting and BMI Screening arms combined vs. Control arm									
Weight satisfaction (range 1 to 5), **N=14318**									
BMI Reporting & BMI Screening	3.43±0.02	3.45±0.02	3.36±0.03	0.01 [-0.03,0.06]	-0.03 [A] [-0.07,0.01]	0.14	-0.07 [-0.15,0.01]	-0.11 [A] [-0.18,-0.05]	0.001
Control	3.41±0.02	3.46±0.02	3.46±0.04	0.04 [-0.01,0.09]			0.04 [-0.05,0.13]		
Body satisfaction (range 1 to 5), **N=14029**									
BMI Reporting & BMI Screening	3.65±0.02	3.66±0.01	3.59±0.02	0.01 [-0.02,0.05]	-0.01 [A] [-0.04,0.02]	0.43	-0.06 [-0.13,0.00]	-0.08 [A] [-0.13,-0.03]	0.001
Control	3.64±0.02	3.66±0.02	3.66±0.03	0.02 [-0.02,0.06]			0.02 [-0.05,0.09]		

Plus–minus values are estimated marginal means±SE

[A] Between-group difference: BMI Reporting and BMI Screening Arms combined minus Control Arm.

5. Analyses with additional categories of race/ethnicity as effect modifiers

We additionally explored race as an effect modifier in models comparing non-Hispanic white students to all others, non-Hispanic black students to all others, non-Hispanic Asian students to all others, Hispanic students to non-Hispanic white students, and non-Hispanic black students to non-Hispanic white students.

P-values for overall test of effect modification of group by time interaction by additional race/ethnicity categories were as follows:

- Non-Hispanic White vs. all others 0.26
- Non-Hispanic Black vs. all others 0.81
- Non-Hispanic Asian vs. all others 0.097
- Hispanic vs. non-Hispanic White 0.16
- Non-Hispanic Black vs. non-Hispanic White 0.67

6. Timing of BMI Reports

California schools are required to conduct BMI assessments and fitness testing between February and April of each year and to submit data to the California Department of Education (CDE) by early May. Like the CDE, we received BMI data from schools by the end of May, and data processing and report preparation took approximately 8 weeks. Rather than send reports over the summer, when families might be traveling, we elected to send them as soon as school was back in session. This led to an approximate 6-9 month lag, with a range of 5 to 10 months. To determine if the time lag might decrease the salience of reports for parents, we used data from parent surveys distributed as part of the larger Fit Study (parent surveys are described in detail

in: Thompson HR, Linchey J, Liu NF, Madsen KA. Parent recall, reactions, and responses to school-based BMI reports. *Childhood Obesity.* 2019 Dec;15(8):548-554.) We used mixed effects logistic regression to see if time elapsed between BMI being measured and the report being sent to parents was associated with either parent recall of receiving a report or concern about the report's results. Among 487 parents, there was no association between time elapsed and parents remembering the report (OR 0.1, 95% CI: -0.2, 0.4); among parents who remembered receiving a report, there was no association between time elapsed and being surprised at results (OR -0.1, 95% CI: -1.4, 1.2).

7. Differential effect of BMI reports by baseline weight status

While our primary aim was to determine the effect of BMI reports on pediatric obesity among students with a BMI ≥ 85th percentile at baseline, we also examined the effect of BMI reporting stratified by baseline weight category (eTable 1). Below, we summarize these findings and provide the equivalent change in weight to provide context for the results, since as baseline BMI z-scores increase, smaller changes in z-score represent larger absolute changes in weight.

eTable 1: Adjusted BMI z-scores, by students' baseline weight category and group

				1-yr change			2-year change		
	Baseline	1 Year	2 Year	Within-Group	Between-Group[A]	P Value[B]	Within-Group	Between-Group[A]	P Value[B]
All Students (N=16622)									
BMI <5th percentile (n=511)									
BMI Reporting	-2.19±0.04	-1.84±0.04	-1.69±0.04	0.35 [0.30, 0.40]	0.08 [0.01, 0.15]	0.021	0.50 [0.42, 0.57]	0.18 [0.08, 0.27]	0.000
BMI Screening	-2.13±0.04	-1.86±0.04	-1.81±0.04	0.27 [0.21, 0.32]			0.32 [0.23, 0.41]		
BMI 5th - 85th percentile (n=9577)									
BMI Reporting	-0.02±0.01	-0.001±0.01	0.06±0.02	0.02 [-0.01, 0.04]	-0.02 [-0.04, -0.01]	0.002	0.08 [0.03, 0.13]	0.03 [0.00, 0.05]	0.025
BMI Screening	0.003±0.01	0.05±0.01	0.06±0.02	0.04 [0.02, 0.07]			0.05 [0.01, 0.10]		
BMI 85th - 95th percentile (n=2938)									
BMI Reporting	1.34±0.02	1.29±0.02	1.27±0.03	-0.05 [-0.08, -0.02]	0.01 [-0.02, 0.04]	0.660	-0.07 [-0.12, -0.01]	0.004 [-0.04, 0.05]	0.848
BMI Screening	1.36±0.02	1.30±0.02	1.29±0.03	-0.06 [-0.09, -0.03]			-0.07 [-0.13, -0.02]		
BMI ≥95th percentile (n=3596)									
BMI Reporting	2.05±0.02	1.98±0.02	1.95±0.02	-0.07 [-0.10, -0.04]	-0.01 [-0.03, 0.02]	0.593	-0.10 [-0.15, -0.05]	0.01 [-0.03, 0.05]	0.653
BMI Screening	2.07±0.02	2.00±0.02	1.96±0.02	-0.06 [-0.09, -0.03]			-0.11 [-0.16, -0.06]		

Values are estimated marginal means±SE; 95% confidence intervals are shown in brackets []. Analyses adjusted for sex, race, district, grade, school-level percentage of students eligible for FRPM, and calendar year (except for model limited to students with 3 years of data).

[A] Between-group difference: BMI Reporting minus BMI Screening group.

[B] P-value for between-group difference.

Students with a BMI < 5th %tile at baseline: At baseline, 3% of students in both the BMI reporting and BMI screening groups fell into the lowest weight category. Among students in the BMI screening group (control), BMI z-scores increased by 0.27 from baseline to 1 year (which represents a 2.6 kg increase in weight), and by 0.32 from baseline to 2 years (equivalent to 6 kg). BMI z-scores among students in the BMI reporting group increased by an additional 0.08 z-scores (95% CI 0.01, 0.15) after 1-year (equivalent to 0.2 kg) and 0.18 z-scores (95% CI 0.08, 0.27) after 2 years (equivalent to 0.5 kg). There was no significant difference in the proportion of

students who moved from the lowest weight category to a higher weight category after 1 (65% retained a BMI <5th %tile) or 2 years (54% retained a BMI <5th %tile).

The greater increase in weight among BMI reporting students compared to BMI screening students suggests that parents who received a BMI report stating that their child was underweight encouraged their child to increase their caloric intake. It is difficult to know if this represents a positive response or not, since it is not clear how students' diets might have changed (e.g., more low-nutrient/high-calorie foods or more total calories from a balanced diet). Similarly, if parents encouraged greater caloric intake, the form of that encouragement is not known, but it could represent a positive and supportive approach or an authoritative approach that created discord.

Students with a BMI ≥5th %tile and < 85th %tile at baseline: On average, BMI z-scores among students in the BMI screening group increased by 0.04 from baseline to 1 year, which represents a 5 kg increase in weight, and by 0.05 from baseline to 2 years (equivalent to almost 10 kgs). BMI z-scores among students in the BMI reporting group increased by 0.02 z-scores **less** (95% CI -0.04, -0.01) after 1-year (equivalent to 0.1 kg) and increased by an additional 0.03 z-scores (95% CI 0.00, 0.05) after 2 years (equivalent to 0.1 kg). There were no significant differences in the proportion of students who moved to the BMI <5th %tile category after 1 (2%) or 2 years (2%), nor in the proportion moving to a higher weight category after 1 (8%) or 2 years (11%). Less than 1% moved up by 2 categories, to the BMI >95th %tile, after 2 years.

The implications of the between-group differences at 1 and 2 years of follow-up are not clear. The differences are in opposite directions (a smaller increase at year 1 and a larger increase at year 2) and are small, making it difficult to draw a conclusion about any potential longer-term trends or impacts.

Students with a BMI ≥85th %tile. There was no effect of BMI reporting among students with a BMI between the 85th and 95th %tile, nor for students with a baseline BMI >95th %tile. There were significant between-group differences for students in the 2 lower weight categories (eTable 1).

8. Additional tables

eTable 2: Adjusted BMI z-scores by study arm, among students with a baseline BMI ≥ 85th percentile for sex and age in grades 3-7 based on estimation using multiply imputed datasets (n=7672)

				1-yr change			2-year change		
	Baseline	1 Year	2 Year	Within-Group	Between-Group[A]	P Value[B]	Within-Group	Between-Group[A]	P Value[B]
All students									
BMI Reporting	1.74±0.13	1.69±0.01	1.69±0.02	-0.05 -0.08, -0.02]	-0.004 [-0.02, 0.01]	0.51	-0.06 [-0.11, -0.00]	0.005 [-0.01, 0.02]	0.61
BMI Screening	1.76±0.01	1.71±0.01	1.70±0.02	-0.045 [-0.07, -0.02]			-0.06 [-0.11, -0.01]		
Hispanic students									
BMI Reporting	1.77±0.01	1.72±0.01	1.73±0.02	-0.04 [-0.07, -0.02]	0.001 [-0.01, 0.02]	0.93	-0.04 [-0.10, 0.01]	0.019 [-0.00, 0.04]	0.10
BMI Screening	1.79±0.01	1.74±0.01	1.72±0.02	-0.05 [-0.07, -0.02]			-0.06 [-0.11, -0.01]		
Non-Hispanic students									
BMI Reporting	1.68±0.02	1.61±0.02	1.59±0.02	-0.06 [-0.09, -0.03]	-0.015 [-0.04, 0.01]	0.22	-0.09 [-0.14, -0.03]	-0.023 [-0.06, 0.01]	0.20
BMI Screening	1.70±0.02	1.66±0.02	1.64±0.025	-0.05 [-0.08, -0.02]			-0.06 [-0.12, -0.01]		
Elementary students[C]									
BMI Reporting	1.76±0.01	1.70±0.01	1.69±0.02	-0.05 [-0.08, -0.03]	-0.009 [-0.02, 0.01]	0.28	-0.07 [-0.12, -0.02]	0.001 [-0.02, 0.02]	0.93
BMI Screening	1.77±0.01	1.73±0.01	1.70±0.02	-0.05 [-0.07, -0.02]			-0.07 [-0.12, -0.02]		
Non-Elementary students									
BMI Reporting	1.74±0.02	1.66±0.02	1.62±0.03	-0.07 [-0.10, -0.05]	0.004 [-0.02, 0.03]	0.70	-0.11 [-0.16, -0.06]	0.010 [-0.02, 0.05]	0.57
BMI Screening	1.76±0.02	1.68±0.02	1.63±0.02	-0.08 [-0.10, -0.05]			-0.12 [-0.17, -0.07]		

Values are estimated marginal means±SE; 95% confidence intervals are shown in brackets []. Analyses adjusted for sex, race (except in models stratified by Hispanic students), district, grade (except for models stratified by grade-level), school-level percentage of students eligible for FRPM, and calendar year.

[A] Between-group difference: intervention less control group

[B] p-value for groupXtime interaction

[C] Elementary: In grade 3-5 at baseline

eTable 3: Adjusted weight stigmatization outcomes in grades 4-8, stratified by baseline perceived weight status (n=14318). BMI Reporting arm vs. BMI Screening and Control arms combined.

				1-yr change			2-year change		
	Baseline	1 Year	2 Year	Within-Group	Between-Group	P Value[A]	Within-Group	Between-Group	P Value[A]
Family weight talk index (range 1 to 5)									
Underweight									
BMI Reporting	1.59±0.03	1.63±0.03	1.58±0.04	0.03 [-0.03, 0.10]	0.07 [0.01, 0.14][B]	0.035	-0.01 [-0.11, 0.08]	0.05 [-0.05, 0.15][B]	0.33
BMI Screening	1.61±0.02	1.57±0.02	1.55±0.03	-0.04 [-0.09, 0.01]			-0.07 [-0.14, 0.01]		
About the right weight									
BMI Reporting	1.40±0.02	1.40±0.02	1.41±0.03	-0.00 [-0.05, 0.04]	-0.01 [-0.06, 0.03] [B]	0.042	0.01 [-0.06, 0.09]	-0.02 [-0.09, 0.04] [B]	0.50
BMI Screening	1.39±0.02	1.40±0.01	1.42±0.03	0.01 [-0.02, 0.05]			0.04 [-0.03, 0.10]		
Somewhat overweight									
BMI Reporting	1.70±0.03	1.65±0.03	1.68±0.05	-0.06 [-0.12, 0.01]	-0.04 [-0.11, 0.03] [B]	0.27	-0.03 [-0.13, 0.08]	0.06 [-0.05, 0.17] [B]	0.25
BMI Screening	1.72±0.02	1.79±0.02	1.63±0.04	-0.02 [-0.07, 0.03]			-0.09 [-0.17, -0.01]		
Very overweight									
BMI Reporting	2.19±0.04	1.98±0.03	1.98±0.07	-0.21 [-0.29,-0.13]			-0.22 [-0.36, -0.07]		
BMI Screening	2.10±0.05	2.03±0.05	1.66±0.10	0.08 [-0.20, 0.04]	0.13 [0.01, 0.27] [B]	0.075	-0.45 [-0.66, -0.25]	-0.24 [-0.47,-0.00] [B]	0.046
Family encourages dieting (range 1 to 4)									
Underweight									
BMI Reporting	2.23±0.05	2.20±0.04	2.03±0.07	-0.03 [-0.14,0.07]	0.03 [-0.07,0.14][B]	0.54	-0.21 [-0.37,-0.04]	0.01 [-0.15,0.17][B]	0.91
BMI Screening	2.29±0.03	2.23±0.03	2.08±0.06	-0.07 [-0.14,0.01]			-0.22 [-0.34,-0.09]		
About the right weight									
BMI Reporting	2.24±0.04	2.18±0.03	2.16±0.05	-0.07 [-0.14,0.01]	-0.05 [-0.12,0.02] [B]	0.14	-0.09 [-0.21,0.04]	0.07 [-0.03,0.18] [B]	0.17
BMI Screening	2.26±0.03	2.25±0.02	2.10±0.04	-0.02 [-0.08,0.04]			-0.16 [-0.27,-0.06]		
Somewhat overweight									
BMI Reporting	2.75±0.05	2.70±0.05	2.53±0.08	-0.06 [-0.16,0.05]	0.03 [-0.08,0.14] [B]	0.64	-0.22 [-0.39,-0.05]	-0.11 [-0.28,0.07] [B]	0.23
BMI Screening	2.75±0.03	2.67±0.03	2.64±0.06	-0.08 [-0.16,-0.01]			-0.11 [-0.25,0.02]		
Very overweight									
BMI Reporting	2.87±0.09	2.94±0.09	3.11±0.16	0.07 [-0.13,0.26]	0.14 [-0.08,0.37] [B]	0.21	0.24 [-0.09,0.57]	0.44 [0.06,0.82] [B]	0.024
BMI Screening	2.85±0.06	2.77±0.06	2.66±0.11	-0.08 [-0.21,0.05]			-0.20 [-0.42,0.03]		

Values are estimated marginal means±SE; 95% confidence intervals are shown in brackets []. Analyses adjusted for sex, race, district, grade, school-level percentage of students eligible for FRPM, and calendar year. P-values for Wald test indicating interaction by weight status: Family weight talk: P=0.007; Family weight stigma: P=0.01; Family encourages dieting: P=0.0495.

[A] P-value for between-group difference.

[B] Between-group difference: BMI Reporting Arm minus BMI Screening and Control arms combined.

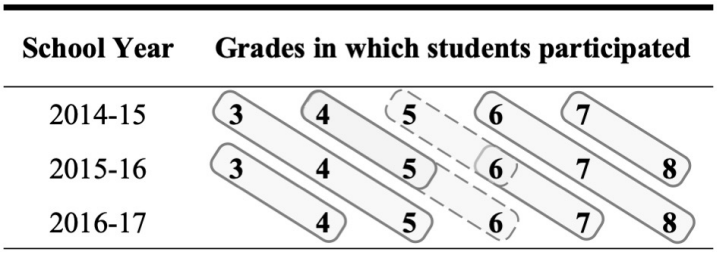
9. Figures

eFigure 1: Study arms constituting the exposed/intervention and control groups for each study outcome

Outcome	Exposed/ Intervention Group	Control Group
Weight Status [A]	BMI Reporting (Arm 1)	BMI Screening (Arm 2)
Child- & Peer-related Adverse Outcomes [B]	BMI Reporting & BMI Screening (Arms 1 & 2)	Control (Arm 3)
Family-related Adverse Outcomes [B]	BMI Reporting (Arm 1)	BMI Screening & Control (Arms 2 & 3)

[A] Restricted to students with baseline BMI ≥ 85th percentile
[B] Restricted to students in grades 4-7 at baseline

eFigure 2: Longitudinal data collection

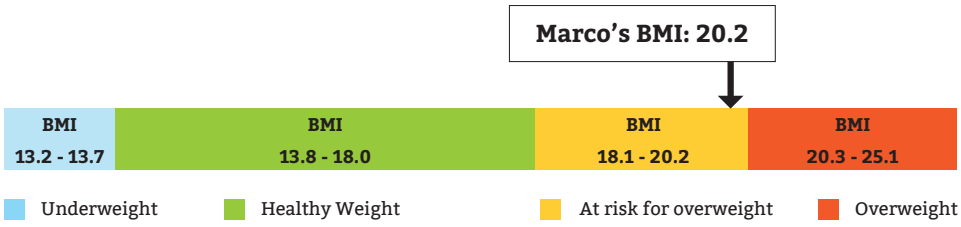


Diagonal boxes indicate students being followed over time. Solid boxes - students in K-5 and 6-8 schools; dashed boxes - students in K-6 and K-8 schools. BMI was assessed in all grades; surveys were administered to students in grades 4-8.

eFigure 3A: Front of BMI report

Your son, Marco Smith, was measured at school in March 2015. He was 3 feet 12 inches tall and weighed 65 pounds. **Marco's body mass index (BMI) was 20.2.**

BMI is a ratio of a child's weight to height. Doctors use BMI to see if a child's weight might be putting him or her at risk for health problems. The colored bar below shows BMI ranges for **8-year-old boys.** The arrow points to Marco's BMI, which places him in the **at risk for overweight range.**



Why does this matter?

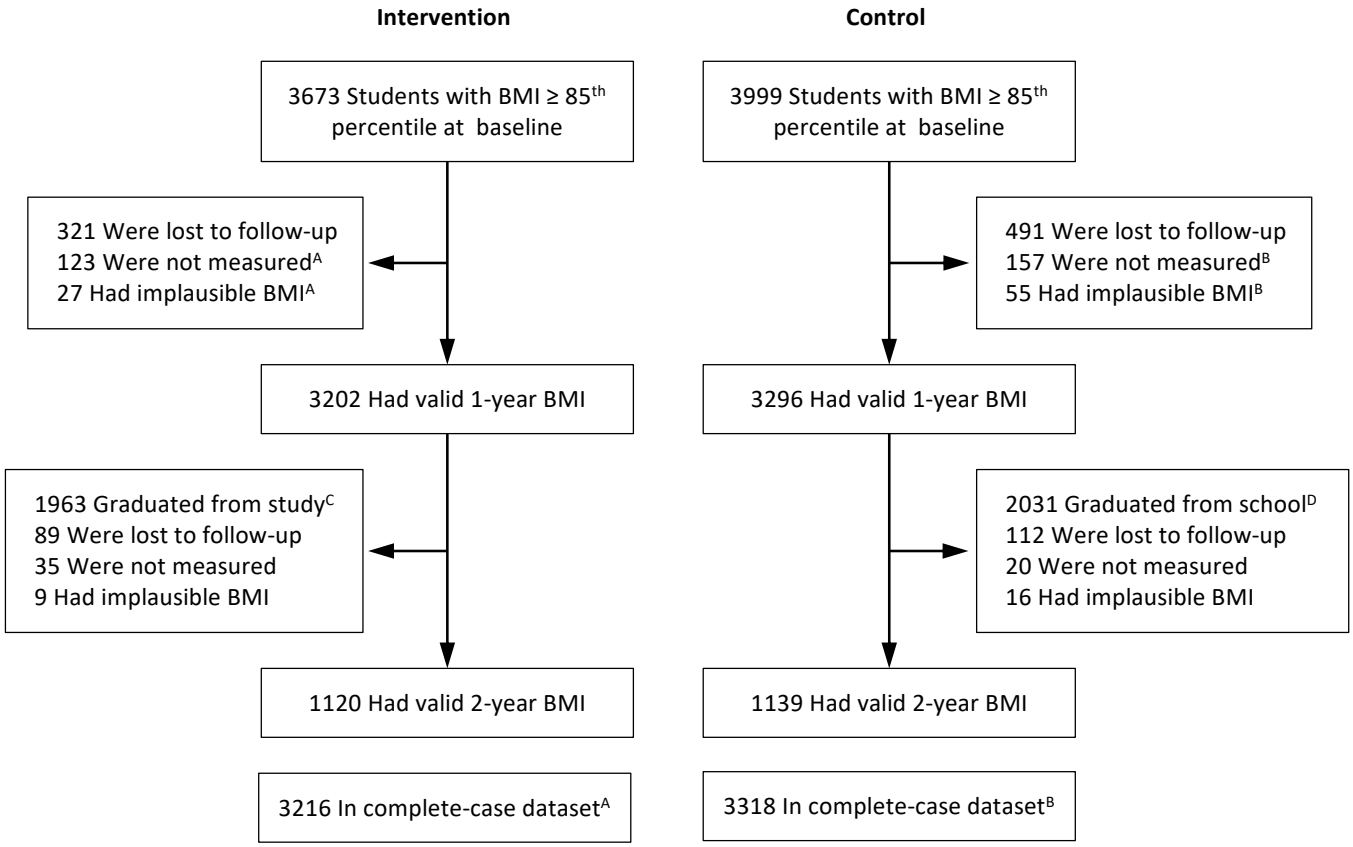
Studies have shown that many overweight children already have high blood pressure, high cholesterol, or early signs of diabetes. Also, overweight children are more likely to become obese as adults, which can lead to serious health problems. If you have any questions or concerns about Marco's BMI, please share this letter with his doctor or our school health staff.

What can you do?

The good news is that even small changes can make a big difference in your child's health. **Turn the page** to see what you can do to keep your family healthy. You can also visit **www.choosemyplate.gov** for more tips and resources. All children, no matter what their weight, should be physically active and eat a healthy diet.

eFigure 3B: Infographic on reverse of both BMI report

eFigure 4: Participant flow among students with a baseline BMI ≥ 85th percentile for age and sex.



[A] 14 students not measured or with implausible values in Year 1 had a valid BMI in Year 2.
[B] 22 students not measured or with implausible values in Year 1 had a valid BMI in Year 2.
[C] 894 students in first cohort (Fall 2014) graduated from the study school; 1069 students were in the second cohort, for whom study ended after 1 year of follow-up.
[D] 903 students in first cohort graduated from the study school; 1128 students were in the second cohort, for whom study ended after 1 year of follow-up.