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The importance of parental knowledge: Evidence from weight report cards in Mexico☆

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ABSTRACT

The rise of childhood obesity in less developed countries is often overlooked. We study the impact of body weight report cards in Mexico. The report cards increased parental knowledge and shifted parental attitudes about children's weight. We observe no meaningful changes in parental behaviors or children's body mass index. Interestingly, parents of children in the most obese classrooms were less likely to report that their obese child weighed too much relative to those in the least obese classrooms. As obesity rates increase, reference points for appropriate body weights may rise, making it more difficult to lower obesity rates.

1. Introduction

Recent trends in obesity in developing countries have received little attention.[1] In several developing countries, both the rate of growth of childhood obesity and the level of childhood obesity exceed those of developed countries (World Bank, 2011; World Health Organization, 2012). Mexico, the country we study, is a prime example: it has one of the highest obesity rates in the world (El Universal, January 22, 2010) and is on a trajectory to surpass obesity rates in the United States.[2]

Trends like these can have important consequences for health and economic outcomes. Obese children are at increased risk of hypertension and type 2 diabetes (Chomitz et al., 2003; Must et al., 1999; Must and Strauss, 1999). In the longer run, childhood obesity may lead to reduced labor market opportunities and poorer adult health (Cawley, 2004; Conti and Heckman, 2012; Daniels, 2006; Taras and Potts-Datema, 2005). Despite these patterns, there have been very few economic studies on obesity in developing countries.[3]

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[1] Traditionally these countries have battled issues of malnutrition. The growth in obesity is a relatively new phenomenon. In countries such as Mexico, the incidence of obesity is positively correlated with wealth (Oria and Sawyer, 2007).

[2] In Mexico in 1999, 5.3% of male children and 5.9% of female children were obese and, in 2006, those percentages were 10.8% and 9%, respectively (Olaiz et al., 2006). Rates in the U.S. were relatively stable rising from 13.9% to 15.5% during the same period. Statistics come from http://www.cdc.gov/nchs/data/hestat/obesity_child_07_08/obesity_child_07_08.htm.

[3] Exceptions include Luo et al. (2006) and Bhalotra and Rawlings (2011).

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0167-6296/

There has been much discussion about what policies may counteract these changes. Across the developing and developed world, popular proposals include removing vending machines from schools, banning food vendors on school property, taxing soda, and increasing physical activity in schools. But these policy initiatives are often expensive, require significant changes in the school environment, or meet political resistance. Information interventions may be less intrusive but yet powerful alternatives. Certainly, within other domains, information interventions have been effective in changing behavior.[4] In fact, many health and obesity-related policies, such as mandatory posting of calories on menus (Bollinger et al., 2011; Wisdom et al., 2010) and nutritional labeling (Jayachandran and Cawley, 2006), are predicated on the idea that information could affect behavior.

We evaluate the effect of a tailored information intervention—the delivery of body weight report cards to parents using a randomized-controlled design in Mexico. We study the impact of weight report cards on parental knowledge, obesity-related attitudes and behaviors, and body mass index (BMI) for 2746 elementary school students. We use data collected from several sources—surveys of parents, child anthropometric measures, and observed attendance rates at an information session on healthy eating and physical activity. Mexico is an interesting and relevant location to carry out this research given their fast-growing rate of childhood obesity and limited knowledge about children's weight issues (e.g., only 21% of parents of overweight or obese children correctly classified their child as overweight or obese in our sample).

This intervention is motivated by the use of weight report cards in several states and countries.[5] Despite their use, as the Centers for Disease Control (2009) states:

> Little is known about the outcomes of BMI measurement programs, including effects on weight-related knowledge, attitudes, and behaviors of youth and their families. As a result, no consensus exists on the utility of BMI screening programs for young people. The U.S. Preventive Services Task Force concluded that insufficient evidence exists to recommend for or against BMI screening programs for youth in clinical settings as a means to prevent adverse health outcomes.

Weight report cards may be particularly successful for several reasons. First, as we find in our data, parents are poorly informed about their child's health. Second, personalized health campaigns are generally more effective than non-personalized health campaigns (Hawkins et al., 2008). Third, according to the Health Belief Model (Hochbaum et al., 1952), a highly-cited psychological model which attempts to explain health behaviors, a person must understand vulnerability to disease before any behavioral change can occur.

In this field experiment, children were randomized into one of four groups: a control group and three treatment groups. Parents of children in the treatment groups received information on the height and weight of their children and their child's weight classification (i.e., underweight, healthy weight, overweight, or obese).[6] Two of the three treatment groups (referred to as the RISK and COMPARE treatments) received information in addition to this basic information. These two treatments were designed to test the effects of different types of information. In particular, the RISK treatment provided the health risks of obesity. Making the consequences of the child's weight status more salient to parents may be important because the costs of healthy behaviors are accrued earlier than the benefits, leading people to procrastinate on engaging in health-improving behaviors (e.g., DellaVigna and Malmendier, 2006; Giné et al., 2010; Royer et al., 2012). The COMPARE treatment provided information on the number of children in each weight classification in the child's class in school.[7] The purpose of this treatment was to test the importance of social norms. In classes where the majority of students are obese, learning that your child is obese may worry parents less because the reference group is obese.

This paper complements an earlier public health and medical literature on weight report cards in developed counties (Chomitz et al., 2003; Grimmett et al., 2008; Kalich et al., 2008; Kubik et al., 2006). Only one of these studies (i.e., Chomitz et al., 2003) uses a randomized design. Their main treatment is similar to our BASIC treatment but unfortunately suffers from low response rates (29%), a small sample size (399), and significant sample imbalance across the treatment and control groups. For example, the fraction of mothers with less than a high school degree is 17.2% in the control group and 6.6% in the treatment group. Given that parental background is a strong predictor of the response to the report card, this imbalance is likely to be problematic and may bias the treatment effect estimates upwards.

Unlike many previous studies on the effect of information on behaviors, we try to understand the steps by which health information may impact behavior. Documenting these steps is important because, in the case of a null effect of information on behavior, as some studies including this one find, it is not clear whether the result is due to the lack of the information being transmitted or a lack of a response to the new information.[8]

First, we study whether the report cards changed parental knowledge and attitudes concerning the child's weight. This is likely a necessary condition for changes in behavior to occur. Many informational interventions look at behaviors without documenting whether the information is absorbed and retained, making it then difficult to understand why the intervention was ineffective in the case of null results. We do find that the intervention increased parental knowledge of their child's weight reported one to two months after the intervention. At baseline, 33% of parents of overweight children and only 6% of parents of obese children correctly reported their child's weight status. Following the intervention, those percentages rose to 59% and 20% respectively for those receiving report cards. Additionally, this knowledge translated into changes in parents' beliefs concerning their child's weight. The treatment increased the fraction of parents of overweight and obese children reporting that their child weighs too much. Moreover, reference groups and social norms may have important effects on these beliefs. In classes where parents of overweight and obese children were told that more than a third of students were overweight or obese, the report cards had no effect on parental

[4] Examples include encouraging students to finish high school (Jensen, 2010), helping low-income families choose schools (Hastings and Weinstein, 2008), and reducing AIDS prevalence (De Walque, 2007; Dupas, 2011a).

[5] Arkansas, New York City, the United Kingdom, and Malaysia have used them (Evans and Sonneville, 2009; Schocker, 2011). Additional areas have BMI surveillance programs where students are weighed on a regular basis but only aggregate statistics are reported (Nihiser et al., 2009). Some states have added a BMI calculation to their student's academic report card (http://www.huffingtonpost.com/2011/04/19/bmi-schools_n_850776.html).

[6] We describe these classifications in more detail later but they are based on the Centers for Disease Control (CDC) classifications (i.e., are not specific to Mexico).

[7] We tried to keep the information conveyed as simple as possible so we presented counts, which we thought would be easier to understand than percentages.

[8] Examples of null effects of information on behavior include Giné et al. (2010) and Meredith et al. (2012). Giné et al. (2010) estimate no impact of information on smoking behaviors in the Philippines and Meredith et al. (2012) consider the effect of health risk information on the transmission of hookworm.

beliefs about the child's weight.[9] Such a finding suggests that as obesity rates rise, parents may be less inclined to believe that their child is obese, and thus, it may be more difficult to induce change. Second, after documenting the effects on parental knowledge and perceptions, we evaluate whether these effects translate into behavioral changes. We observe no changes in observed and self-reported behaviors related to exercise and diet. Third, we estimate whether there are impacts on children's outcomes such as BMI or weight. We do not find any detectable effects on BMI or weight.

We explore several possible explanations for these null behavioral results. First, it is possible that limited resources affected parents' ability to respond to this new information. Some obesity-reducing actions such as signing a child up for a sports class could be costly. If resources are important for reducing obesity, we would expect that the most educated parents would be the most responsive to the report cards. However, there are no differential responses to the report cards by parental education. Also, a lack of resources likely cannot explain the lack of behavioral changes by parents given that when free resources (i.e., help from nutritionist and an information session on healthy eating and physical activity) were provided, few parents took advantage of them. Second, the report cards may not be meaningful to parents if they are not cognizant of ways to reduce obesity. But from the endline survey, it was clear that most parents were aware of the causes of obesity.[10] Lastly, in order to observe meaningful behavioral changes, it may be necessary that parental concerns about obesity change. We do not observe changes in such concerns nor in the ranking of concern about child's weight relative to other parental concerns. Overall, our results suggest that the provision of weight report cards is simply not enough to induce change despite the positive effects on knowledge and attitudes.

2. Experimental design and data collection

2.1. Experimental design and timeline

The field experiment took place in the city of Puebla, Mexico, the fourth largest city in Mexico (1.5 million people). Puebla is located in central Mexico. In 2000, average income per capita in the city of Puebla was 9843 US dollars, more than the national Mexican average of 7025 US PPP 2005 dollars.[11]

Seven primary public schools were selected to participate.[12] Classes from second through sixth grade were considered. All students within each class were surveyed. The children ranged in age between 6 and 14 years old, but most of the sample (96%) was between 8 and 12 years old.

We outline the timeline of the experiment and the different treatment arms in Fig. 1. The field experiment began with the distribution of a baseline survey to students to take home to parents to complete (see the Appendix for a copy of the survey). Included in this survey is a diversity of questions – done such to not prime participants about the focus of the study. Of the 24 questions, only 5 concern weight. This survey collected information from the primary caretaker about his/her education, occupation, parental concerns (e.g., H1N1, child's weight, child's performance in school), their classification of the child's weight (i.e., underweight, healthy weight, overweight, and obese), and rates of time preference. The baseline survey response rates was 67%. These response rates are higher than some other studies using school-based samples (Angrist et al., 2002; Bettinger and Slonim, 2007). The baseline response rates are not related to treatment status since we stratified the randomization based on whether the family responded to the baseline survey.

Following the collection of the baseline survey, nutritionists weighed and measured all students in the participating classes. Each child's weight was categorized using the BMI-for-age weight status categories and corresponding percentiles established by the Centers for Disease Control.[13]

Next, the students were randomized into one of four groups: three treatment groups (BASIC, RISK, and COMPARE) and a control group. The randomization was stratified based on the combination of school, weight status, and whether or not the baseline survey was completed. An overview of these treatments is presented in Fig. 1. The three treatment groups received a personalized health report card that detailed the child's height, weight, and weight classification (i.e., underweight, healthy weight, overweight, or obese). To enable parents to understand these weight classifications, the ranges of weights for each classification were given for each of these classifications based on the child's height, age, and sex. See the Appendix for a copy of an example of the BASIC, RISK, and COMPARE report cards. The weight report cards were sent home in sealed envelopes to parents along with a letter from the school district and contact information of a nutritionist to contact, free of charge, if parents had further questions. We considered the possible adverse effects of the report cards (e.g., the lowering of children's self-esteem). However, in discussions with the research team, we heard of no mention of these type of effects. The control group did not receive this personalized health report card.

What distinguishes the three treatment groups is the level of information they received. The BASIC treatment group received the report card as detailed above. The report cards of the RISK and COMPARE treatments included additional information. In particular, the RISK treatment group had an additional script describing the health risks of their child's weight classification. For obese or overweight children, the message was "Obese/overweight children are at higher risk of living shorter lives and developing diseases such as diabetes, high blood pressure, heart disease, asthma, and cancer." For underweight children, the relevant text was "Underweight children run a higher risk of malnourishment, low scholastic achievement, and low resistance to illness." The parents of healthy weight children received information on the health risks of being overweight/obese. The purpose of this treatment was to make the health risks of being underweight, overweight, or obese more salient to parents. Given that many parents in our sample appear to have present-biased preferences, such salience may lead parents to expend more resources towards long-run investments in health. The COMPARE treatment group obtained the same report card as the BASIC treatment but also received

[9] These findings are reminiscent of those of Ali et al. (2011), who show, using observational data from the National Longitudinal Study of Adolescent Health, that an adolescents' social group affects his/her weight perceptions.

[10] However, being cognizant of the causes might not imply that one knows how to reduce obesity.

[11] These statistics come from the 2000 Mexican Census. See http://www.puebladelosangeles.gob.mx/wb/pue/ingreso_percapita_anual_por_municipio_de_la_zona_m for the Puebla statistic.

[12] Schools that were neither the poorest or the richest schools in the urban area were considered. Then the sample was restricted further to schools that expressed an interest in participating.

[13] According to the CDC, students are classified underweight if their weight is less than the 5th percentile, healthy weight if their weight is between the 5th percentile and the 85th percentile, overweight if their weight is between the 85th and the 95th percentile, and obese if their weight is equal or greater than the 95th percentile for their age in months, height, and sex.

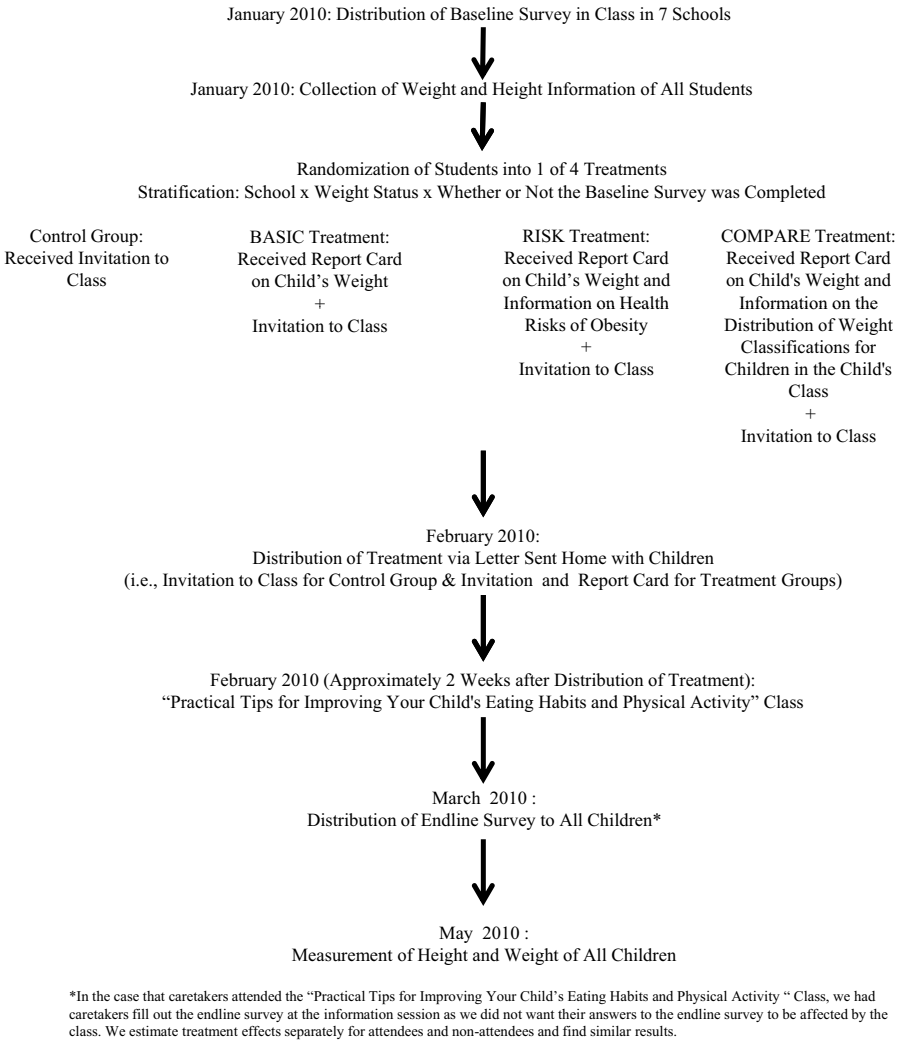

Fig. 1. Description of treatments. *In the case that caretakers attended the "Practical Tips for Improving Your Child's Eating Habits and Physical Activity" class, we had caretakers fill out the endline survey at the information session as we did not want their answers to the endline survey to be affected by the class. We estimate treatment effects separately for attendees and non-attendees and find similar results.

information about the number of children in the child's class in each of the weight categories: underweight, healthy weight, overweight, and obese. The intention of this treatment was to understand whether parents' beliefs and actions about their child's weight are dependent on the prevalence of overweight and obesity in their child's class. In observational settings, beliefs about one's own weight are impacted by the weights of one's peer group (Ali et al., 2011).

The three treatment groups and control group received an invitation to attend an information session entitled "Practical Tips for Improving Your Child's Eating Habits and Physical Activity." Note that this session does not directly address weight. For the treatment groups, this invitation was sent home along with the report card. For the control group, this invitation was sent by itself. All children regardless of their weight classification received an envelope to take home that included an invitation to this session and if they were in a treatment group, a report card. Envelopes were distributed to all children to reduce the possible adverse self-esteem effects. The main motive for this invitation was to obtain an observed (i.e., not self-reported) measure of parents' reaction to the weight report card; attendance at this session was one of our main outcome variables. Moreover, since the session was free, a lack of parental response cannot be attributed to a lack of income.[14] Observed behavior (e.g., attendance to the session) and self-reported behavior might be very different. For example, a parent may say that she intends to change her child's habits, but we care mostly about her behaviors rather than her intentions. The information sessions occurred two weeks after the delivery of the weight report card; each school had two sessions.

The administration of the experiment follows the usual operating procedures of the schools. Schools communicate with parents by sending notifications home with the students. Parents are often invited to come to school to discuss school performance and occasionally meetings regarding non-academic topics such as safety and health are scheduled. The intervention followed the traditional days of the week and times these meetings are arranged. Typical attendance at these meetings varies across schools but averages 80%.

Following the informational sessions, in March 2010, the endline survey was distributed to all treatment groups and to the control group. The endline survey was intended to capture parental response to the report card information. This survey contained

[14] Of course, this statement does not take into account the opportunity cost of time.

many of the baseline survey questions but also asked parents whether they had taken particular actions – seen a medical professional in regards to the child's weight, put the child on a diet, engaged in physical activity with the child, discussed the child's weight with him or her, family members, or friends, had the child skip meals or snacks, and/or signed the child up for a sport or exercise class. Questions about these particular actions come from the public health study on body mass index report cards of Kalich et al. (2008). There were also questions inquiring about parental intentions to change the amount of food the child consumed and the amount of exercise he or she engaged in. The post-intervention survey finished with a series of questions about health knowledge and knowledge of their child's weight status. Those who attended the informational session filled out the endline survey at the session so their responses would not be affected by the class.[15]

In the second half of May 2010, at the end of the school year, the nutritionists measured the heights and weights of both treatment and control children again to see if the intervention had had any impact on children's weight or BMI.

It is important to note that the randomization was done at the individual level rather than at the school or grade level. The choice to randomize at the individual level was dictated by the fixed sample size. To maximize the power of the experiment, the randomization was performed at the individual level. Given this level of randomization, there is the possibility of cross-contamination effects biasing our estimates. Specifically, one might imagine that a parent in the control group may become more concerned about his/her child's weight if the parent talks with a parent who received the RISK treatment report card. Any spillover effects, if they exist, might dampen the differences between the treatments and the control group, leading us to be biased against finding any significant effects of the intervention. In an effort to reduce cross-contamination effects, there was an attempt to make the information private by delivering home the report cards in sealed envelopes. Moreover, we performed a series of robustness checks, discussed later, which we believe point to small spillover effects.

As some students have siblings in the same school who were also part of the experiment, children of the same household could be assigned to different treatments. Given the tight timeline dictated by the schools' schedules, there was not enough time between the baseline survey and the treatment assignment to determine which children belonged to the same families. As a robustness check, which we discuss later, we consider families with only one child in the experiment where spillovers may be minimal and our results are similar.

2.2. Sample characteristics and balance check

Table 1 provides the means for key variables across the three treatment groups and the control group in the pre-treatment period. In the last two columns, we present *p*-values from two tests: one testing the equivalence of the means of all four groups (i.e., all equal column) and the other one testing the equivalence of the overall treatment group mean (combining the three treatment groups together) and the control group mean (i.e., treatment = control column). Panel A presents the baseline anthropometric data (not conditional on completion of the baseline survey) and Panel B presents data from the baseline responses collected from the primary caretaker.

The randomization worked well. None of the *p*-values testing the equivalence of the 4 group means dip below 0.05. Only two of the *p*-values (concern about child's weight and concern about child's school performance) are less than 0.05 in a test of treatment and control mean differences. This is not surprising given the large number of means contrasted. These differences, however, are slight and suggest that parents in the control group were slightly more concerned about their children on a number of dimensions.[16]

Panel A shows that 2746 children participated in our study (i.e., were in class the day the baseline weight and height measurements were collected). Approximately, half of the children were male and the average age was nearly 10 years old. Obesity rates among these young children hovered just over 10% and overweight rates are just under 20%.[17] Moreover, 33.6% of boys and 26.5% of girls were obese or overweight. These percentages match well with published statistics from the 2008 National Schoolchildren Survey (Levy, 2010).[18]

Panel B indicates that the baseline survey respondent is most frequently the mother (67%). In the remaining cases, it was primarily the father (30% of total responses). The level of parental education is low: over 30% of primary caretakers had not completed high school.

To gauge how concerned parents were about obesity, we asked parents about their level of concern on several dimensions—parents' own weight, child's weight, H1N1, and child's performance in school. Parental concern about their child's weight was the second lowest of all concerns, only above concern about the caretaker's own weight.

Table 2 presents the analogous table to Table 1 but for the sample of overweight and obese children, the target population for this intervention. The randomization here is also fairly balanced, which is unsurprising given that weight status is one of the stratification variables. The baseline survey response rates are slightly lower for this sample than for the overall sample. Most of the means are similar to those in Table 1 with the exception of concern about child's weight and parental classification of the child's weight. Not surprisingly, parents of obese and overweight children were more likely to characterize their child as overweight or obese than the overall population was, and parents of obese and overweight children were also more concerned about their child's weight.

Since we look at several endline survey outcomes, Tables A1 and A2 replicate Tables 1 and 2 conditional on completion of the endline survey. Note we only have baseline characteristics for a subset of those for whom we have endline statistics because some individuals responding to the endline survey did not respond to the baseline survey. 74% of caretakers who responded to the endline survey responded to the baseline survey. Thus, these balancing tests based on the baseline survey characteristics are a bit insufficient because we do not observe baseline characteristics for all endline respondents. However, we do have baseline weight, height, age, and gender for nearly all.

For the overall sample in Table A1, the treatment and control groups are still balanced with the exceptions of slight differences in concern about child's weight and concern about child's school performance akin to those observed in Table 1. For the overweight and obese, across most variables, we are unable to reject the equivalence of means across the groups in Table A2. However, the primary caretaker characteristics (i.e., gender, education)

[15] In analyses not reported, we examined whether the treatment effects differ for attendees and non-attendees and find similar results across the two groups.

[16] The NAs for *p*-values are due to the fact that our *p*-values are based on regressions with strata fixed effects and as such, there is no variation in the variables we stratified on within the strata.

[17] For comparison, among children of this age in the US, the obesity rate was 19.6%. See http://www.cdc.gov/nchs/data/hestat/obesity_child_07_08/obesity_child_07_08.htm. The overweight statistic is not provided.

[18] Indeed, this survey shows that, for primary school children within the state of Puebla, 27.6% of boys and 23.9% of girls are classified as obese or overweight.

Table 1
Baseline characteristics – overall sample.

	Mean				*P*-value	
	Control	Basic	Risk	Compare	All equal	Treatment = control
Panel A: child measurement						
	N=673	*N=702*	*N=680*	*N=691*		
Male	0.50	0.47	0.48	0.51	0.41	0.55
Age	9.78	9.80	9.84	9.85	0.69	0.37
	[1.17]	[1.25]	[1.29]	[1.22]		
BMI	18.11	18.34	18.36	18.29	0.16	0.06
	[3.44]	[3.53]	[3.45]	[3.35]		
Fraction underweight	0.03	0.03	0.03	0.03	NA	NA
Fraction healthy weight	0.68	0.66	0.67	0.67	NA	NA
Fraction overweight	0.17	0.18	0.17	0.18	NA	NA
Fraction obese	0.12	0.13	0.12	0.13	NA	NA
Panel B: baseline survey responses by primary caretaker						
	N=499	*N=508*	*N=505*	*N=518*		
Primary caretaker: mother	0.67	0.69	0.68	0.65	0.61	0.84
Primary caretaker: father	0.30	0.29	0.30	0.32	0.78	0.99
Primary caretaker: other	0.03	0.02	0.02	0.03	0.24	0.58
Less than high school	0.34	0.38	0.33	0.31	0.16	0.92
High School	0.42	0.41	0.42	0.45	0.58	0.99
More than high school	0.23	0.21	0.26	0.24	0.45	0.85
Concern about H1N1 [1-4]	3.27	3.22	3.25	3.25	0.76	0.54
	[0.79]	[0.78]	[0.81]	[0.79]		
Concern about child's weight [1-4]	3.16	3.10	3.01	3.08	0.07	0.04
	[0.95]	[0.98]	[1.00]	[0.98]		
Concern about own weight [1-4]	3.06	3.03	2.98	3.03	0.59	0.35
	[0.97]	[0.98]	[0.99]	[0.94]		
Concern about child's school performance [1-4]	3.71	3.67	3.63	3.62	0.06	0.01
	[0.58]	[0.67]	[0.67]	[0.68]		
Classifies child as underweight	0.13	0.13	0.09	0.11	0.13	0.52
Classifies child as healthy weight	0.68	0.68	0.74	0.71	0.11	0.23
Classifies child as overweight	0.17	0.17	0.16	0.16	0.77	0.52
Classifies child as obese	0.01	0.01	0.01	0.01	0.70	0.96
Child's school performance relative to peers [−2-2]	−0.02	−0.09	−0.06	−0.05	0.69	0.36
	[0.73]	[0.74]	[0.71]	[0.73]		
Happy with child's school performance [0/1]	0.67	0.68	0.68	0.72	0.29	0.39
Internet access at home [0/1]	0.39	0.35	0.39	0.39	0.42	0.62
Other children in experiment [0/1]	0.30	0.29	0.27	0.28	0.50	0.25
Response rate to baseline survey	0.74	0.72	0.74	0.75	0.24	0.68

Notes: Table presents means and standard deviations in brackets for continuous variables. For child's school performance relative to peers, a response of 0 indicates that the student's performance is average; below 0 is below average and above 0 is above average. *P*-values are from regressions of these characteristics on a treatment dummy [treatment=control] or the set of treatment dummies [all equal]; these regressions include randomization strata fixed effects based on the combination of weight status, school, and whether the baseline survey was completed. All *p*-values with NA values are not defined since those are variables upon which randomization was stratified. Thus, as we include strata fixed effects in measuring the differences across groups, there is no within strata variation in these stratification variables.

and classification of the child's weight status differ across the treatment and control groups. Note for the classification of child's weight status, the control group is more likely to report that their child is overweight. Thus, this imbalance would lead us to be biased against finding an effect on this outcome in the endline survey. To deal with these differences, we can control for these characteristics, and our regression estimates are very similar.

3. Results

3.1. Empirical strategy

To estimate the effect of the report cards on our outcomes of interest (e.g., parental attitudes, parental behaviors, and child's BMI), we first assess the overall treatment effect via regressions of the following form:

$$Y_i = \beta_0 + \beta_1 T_i + \gamma_{as} + \delta_r + \epsilon_i \quad (1)$$

where Y_i is an outcome of interest for individual i, T_i is a treatment indicator equal to 1 if the child is assigned to one of the three treatment groups and 0 if the child belongs to the control group, γ_{as} are child's age in years times sex fixed effects, δ_r are randomization strata fixed effects, and ϵ_i is the error term. The randomization of the treatment makes the inclusion of age by sex fixed effects unnecessary but, as many of the studied outcomes vary with age and sex, we include these fixed effects as a means of obtaining more precise estimates.[19] Our estimates are similar to those without these fixed effects. In unreported results, we have also run all our regressions controlling for these baseline characteristics and we observed no substantial changes in our treatment effect estimates. We estimate heteroskedastic-consistent standard errors.

Second, to discern how the effect of the report card varies across the type of report card, we estimate the following:

$$Y_i = \beta_0 + \beta_1 BASIC_i + \beta_2 RISK_i + \beta_3 COMPARE_i + \gamma_{as} + \delta_r + \epsilon_i \quad (2)$$

where $BASIC_i$, $RISK_i$, and $COMPARE_i$ are each treatment indicators equal to 1 if the child is assigned to that treatment group respectively and 0 otherwise.

[19] In principle, one could include baseline survey measures as controls to increase precision, but in our case, their inclusion does not change our standard errors much so we exclude them.

Table 2
Baseline characteristics – overweight and obese.

	Mean				*P*-value	
	Control	Basic	Risk	Compare	All equal	Treatment = control
Panel A: child measurement						
	N=196	*N=217*	*N=202*	*N=209*		
Male	0.59	0.51	0.53	0.57	0.27	0.17
Age	9.81	9.86	9.82	9.92	0.73	0.51
BMI	22.32	22.55	22.44	22.37	0.76	0.54
	[2.68]	[2.63]	[2.74]	[2.48]		
Fraction overweight	0.59	0.57	0.58	0.58	NA	NA
Fraction obese	0.41	0.43	0.42	0.42	NA	NA
Panel B: baseline survey responses by primary caretaker						
	N=131	*N=142*	*N=134*	*N=139*		
Primary caretaker: mother	0.67	0.67	0.64	0.58	0.33	0.41
Primary caretaker: father	0.31	0.30	0.34	0.38	0.48	0.52
Primary caretaker: other	0.02	0.02	0.03	0.04	0.86	0.54
Less than high school	0.34	0.28	0.28	0.22	0.13	0.05
High school	0.41	0.45	0.44	0.47	0.91	0.63
More than high school	0.24	0.28	0.28	0.30	0.51	0.16
Concern about H1N1 [1-4]	3.30	3.20	3.27	3.28	0.71	0.59
	[0.84]	[0.79]	[0.85]	[0.83]		
Concern about child's weight [1-4]	3.31	3.29	3.20	3.23	0.51	0.29
	[0.82]	[0.82]	[0.90]	[0.82]		
Concern about own weight [1-4]	3.12	3.08	3.01	3.11	0.77	0.59
	[0.97]	[0.96]	[1.00]	[0.87]		
Concern about child's school performance [1-4]	3.70	3.70	3.66	3.57	0.29	0.24
	[0.57]	[0.69]	[0.64]	[0.76]		
Classifies child as underweight	0.01	0.00	0.01	0.00	0.58	0.52
Classifies child as healthy weight	0.43	0.45	0.48	0.53	0.17	0.20
Classifies child as overweight	0.53	0.50	0.49	0.43	0.25	0.20
Classifies child as obese	0.02	0.04	0.02	0.02	0.71	0.68
Child's school performance relative to peers [−2-2]	−0.01	−0.03	0.01	0.00	0.98	0.94
	[0.78]	[0.73]	[0.69]	[0.75]		
Happy with child's school performance [0/1]	0.62	0.63	0.73	0.76	0.01	0.07
Internet access at home [0/1]	0.39	0.37	0.46	0.41	0.56	0.63
Other children in experiment [0/1]	0.30	0.22	0.24	0.24	0.37	0.09
Response rate to baseline survey	0.67	0.65	0.66	0.67	NA	NA

Notes: Table presents means and standard deviations in brackets for continuous variables. For child's school performance relative to peers, a response of 0 indicates that the student's performance is average; below 0 is below average and above 0 is above average. *P*-values are from regressions of these characteristics on a treatment dummy [treatment = control] or the set of treatment dummies [all equal]; these regressions include randomization strata fixed effects based on the combination of weight status, school, and whether the baseline survey was completed. All *p*-values with NA values are not defined since those are variables upon which randomization was stratified. Thus, as we include strata fixed effects in measuring the differences across groups, there is no within strata variation in these stratification variables.

3.2. Attrition – endline survey and endline weight and height measurements

Many of our main outcome variables come from responses to an endline survey. To insure that our subsequent analyses are not impacted by selection bias due to differential response rates across the treatment and control groups, we estimate whether endline response rates are different for the treatment and control groups. The results are presented in Table 3. We consider the overweight/obese, healthy weight, and underweight samples separately as the effects of the report cards are likely to be heterogeneous across these groups and in our main analysis, we examine these subsamples separately. For each subsample, we estimate two regressions: (a) endline survey response rates as a function of treatment and (b) endline weight and height measurement rates as a function of treatment. Across the three subsamples, we see no statistically significant differences in response or measurement rates across the treatment and control groups although those receiving a report card are less likely to respond to the endline survey. For the overweight/obese sample, endline survey response rates are arguably quite high given that the surveys were not personally administered (63% for the control group). These response rates for the overweight/obese are slightly higher than that for the underweight and healthy weight. The mean endline measurement rates

Table 3
Sample selection as a function of treatment.

	Whether responded to endline survey (1)	Whether was present for endline weight and height measurements (2)
Panel A: overweight/obese sample		
Treatment	−0.065	0.003
	(0.039)	(0.022)
Observations	824	824
Dep. var. mean	0.633	0.923
Panel B: healthy weight sample		
Treatment	−0.014	−0.008
	(0.025)	(0.015)
Observations	1,839	1,839
Dep. var. mean	0.564	0.917
Panel C: underweight sample		
Treatment	−0.007	−0.078
	(0.121)	(0.078)
Observations	83	83
Dep. var. mean	0.619	0.952

Notes: Robust standard errors are presented in parentheses. Regressions include age × sex fixed effects and strata fixed effects. Sample includes all subjects assigned to treatment (i.e., those with baseline height and weight measurements).

Table 4
Parental classification versus actual classification of weight status at baseline.

Actual classification	Parental classification				
	Underweight	Healthy weight	Overweight	Obese	Don't know
Underweight	27	38	0	1	0
	(41 %)	(58%)	(0%)	(2%)	(0%)
Healthy weight	205	1,090	32	0	7
	(15%)	(82%)	(2%)	(0%)	(1%)
Overweight	2	240	113	1	6
	(<1%)	(66%)	(33%)	(<1%)	(2%)
Obese	0	52	189	14	2
	0%	(20%)	(74%)	(5%)	(1%)

Notes: Table shows the count in each category. Classifications along both dimensions are based on pre-treatment classifications. Percentages in parentheses represent percentages for each row (i.e., each row percentages add to 100%).

of weight and height all exceed 90%. Since these measurements occurred during the school day and no one, to our knowledge, declined being measured, the lack of endline height/weight measurements is due to school absences. These measurement rates are consistent with attendance rates.[20]

3.3. Parents' knowledge about child's weight status

Before showing our main treatment results, it is useful to know how knowledgeable parents are about their child's weight status at baseline. In Table 4, we examine parental misperceptions of their child's weight by looking at parental classification at baseline versus actual classification of weight status. If caretakers can accurately classify their child's weight, the main impact of the report cards would likely be a salience effect. It is clear, however, that there are large misperceptions. 67% of caretakers of overweight children and 94% of caretakers of obese children underestimated their children's weight status. These misclassification percentages are much higher than those found in U.S. samples, which ranged from 35 to 50% (Neumark-Sztainer et al., 2008; Warschburger and Kroller, 2009).

3.4. Treatment results

We are primarily interested in the effects among the overweight/obese population, the main target group for this intervention. Table 5 presents our main treatment effect estimates for the overweight/obese from estimating Eq. (1). Each estimate comes from a separate regression. We separate the outcomes into 3 groups: outcomes measured in the endline survey, outcomes measured from observed behavior, and endline height and weight measurements. The sample sizes differ across these 3 groups due to survey response. For endline survey outcomes, the estimates are based on the sample of endline survey responders. The sample sizes also vary across these outcomes due to item non-response. For the observed behavior outcome, the sample is all students who were initially weighed, and for the endline measurements, the sample consists of those who attended class on the day of the endline weight/height measurements and who were present for the baseline weight/height measurements. Thus, endline measurement sample and endline survey sample are subsets of the observed behavior sample, but the endline measurement sample is a bigger subset as there was less attrition for these measurements when compared to the endline survey.

One important consideration is whether the endline survey responses vary by whether the father or the mother was the primary caretaker. However, when we estimated these effects separately by whether the father or the mother responded to the survey, we found no differential responses across these two groups. Thus, we pooled them together.

First, we are interested in whether the cards affected parental knowledge among the overweight/obese. At the center of the Health Belief Model (Hochbaum et al., 1952) is the idea that health behavioral change is contingent on understanding vulnerability to disease. Column (1) reports estimates of the report cards on whether parents correctly classified the weight of the child in the endline survey. The intervention had a strongly statistically significant and positive impact on correctly classifying the child's weight. The treatment increased this percentage by nearly 60%.

Next, we explore how this new knowledge changed parental perceptions about their child's weight. While the intervention changes parental classification of the child's weight, it is not immediately clear how parents interpret this information. In the recent past, being obese/overweight in Mexico was indicative of wealth and thus desirable (Oria and Sawyer, 2007). The impacts on perceptions are quantified in column (2) of Table 5. For the obese/overweight sample, the report card raised the propensity to report that the child weighed too much by a statistically significant 12 percentage points off of a base of 58%.

Despite the effects on knowledge and beliefs for overweight/obese, there are no statistically significant effects on behaviors or parental concern for this sample. The effect of the intervention on parental concern is small at 0.04, 1/20th of a standard deviation. Given this null effect, it is not surprising that we observe no effects on actions - either looking at the total number of actions or whether parents had at least one action.[21] Like the parental concern effect, these treatment effects are very modest. For example, the upper bound of the 95% confidence interval for the number of actions is 0.36 (a standard deviation for this variable is 1.51). Moreover, when looking at the actions separately, there are no statistically significant impacts (see Table A3).[22]

Next we examine the effects on intentions in regards to eating and physical activity. We view these outcomes as less preferred compared to actual actions because parents may not follow through with their intentions. In terms of eating behaviors, the effect of the treatment is sizable but not statistically significant. Treatment effects on intentions in relation to physical activity are more

[20] The school district did not notify parents about the timing of the height and weight measurements.

[21] These actions include: seen a medical professional in regards to the child's weight, put the child on a diet, had the child skip meals or snacks, engaged in physical activity with the child, discussed the child's weight with him or her, family members, or friends, and/or signed the child up for a sport or exercise class.

[22] One can also categorize these actions in different ways (e.g., combining the physical activity actions together or the weight actions together) and there are still no statistically significant effects on these outcomes.

Table 5
Effects of treatment on behaviors/outcomes – overweight/obese sample.

	Endline survey questions							Observed behavior	Endline measurements	
	Correct classification of child's weight	Child weighs too much?	Concern about child's weight	Number of actions taken	Any action taken?	Intend to have child eat less food	Intend to have child get more physical activity	Attend class	BMI	Weight (kg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sample: obese/overweight										
Treatment	0.156**	0.122*	0.044	0.034	0.019	0.069	−0.018	0.002	0.199	0.144
	(0.046)	(0.049)	(0.093)	(0.168)	(0.026)	(0.049)	(0.018)	(0.033)	(0.184)	(0.535)
Observations	459	450	471	465	465	424	449	824	755	755
Dep. var. mean	0.267	0.581	3.387	2.197	0.934	0.718	0.983	0.204	21.38	43.35

Notes: Robust standard errors are presented in parentheses. The possible actions undertaken by parents are: discussed weight with family/friends, discussed child's weight with him/her, seen doctor in regards to child's weight, put child on a diet, had child skip meals, engaged in physical activity with child, and signed child up for sport/exercise class. * Denotes statistical significance at the 5% level. ** Denotes statistical significance at the 1% level.

challenging to identify as most parents intend to have their children engage in more physical activity.[23]

In terms of non-self-reported outcomes, the intervention did not induce changes for the obese/overweight sample. Although nearly all parents expressed that a class on eating habits and physical activity would be useful and that child's BMI is positively associated with attendance at the session, the report card did not induce parents of overweight/obese to attend the informational session. Given the null results on parents' actions and self-reported behaviors, the treatment effects on weight and BMI are not unexpected. The confidence intervals of these estimates exclude negative effects larger in magnitude than −0.7% and −2.1% on BMI and weight, respectively.[24] For comparison, in a study of similarly aged children in the United States conducted over a period of 6 months (a little longer than our study), Spiegel and Foulk (2012) find that their randomized intervention which consisted mainly of an educational campaign about physical activity and eating reduced BMI by 0.3, an effect size outside of our 95% confidence interval.

We can also gauge the size of these effects by comparing these changes to the average changes between the pre-intervention and post-intervention period. These were −2.5% and 0.6% for BMI and weight, respectively.[25] For Mexican children of similar age groups, Gómez-Díaz et al. (2004) also find that BMI does not necessarily monotonically increase with age. Although the gap in time between the two sets of weight and height measurements was only four to five months, students' body compositions were changing sufficiently that we might have expected to observe an effect on BMI and weight if the report card delivery induced behavioral modifications. However, it is possible that the examined time period may have been too short for parents to have had adequate time to alter their actions (e.g., enroll child in a sports class) although lots of parents partake in these actions (over 2 actions on average for the control group). On the other hand, the effect of the intervention might dissipate over time as the disseminated information becomes less salient, implying that if there are effects of the cards, their effects would be largest in the short-run.

In Table 6, we present estimates for the healthy weight and underweight, mainly as a plausibility check for our main results for the overweight/obese. Like that for the overweight/obese, the report card has a positive effect on correctly classifying the child's weight. For the healthy weight, the intervention lowers the fraction misclassifying their child by over 50%, an effect that is statistically significant at the 1% level. The effect for the underweight is of nearly the same size in percentage points although

[23] We have also examined whether the treatment affected health knowledge using questions from the endline survey and found no effects.

[24] As a robustness check, we trimmed the sample to deal with outlier observations; the second round of height and weight measures had some obvious measurement errors. To address this issue, we dropped observations with weights exceeding the minimum and maximum weights observed with the pre-intervention measurements (16 kg was the minimum and 83 kg was the maximum). In the post-intervention period, 16 kg corresponds to the 0.16 percentile (i.e., only 3 observations have values below that threshold) and 83 kg corresponds to the 99.92 percentile (i.e., only 2 observations have values above that threshold). This will necessarily drop a few possibly valid observations that were near 83 kg at the outset but our results are not sensitive to this inclusion or exclusion. We also dropped observations for whom the weight change between the two measurements exceeded 10 kg (the 99.2 percentile of the distribution). We performed similar exclusions for observations based on their height measurements. We dropped students (7 in total) with heights below the minimum height observed in the pre-intervention period (111 cm) and one student with a height of 199 cm, which was an outlier by 30 cm. Finally, we dropped observations (34 observations) where the change in height was less than −5 cm. As a robustness check we also use robust regressions, which give less weight to outlier observations, and end up with similar estimates.

[25] The trends in weight are skewed; the median change is 0 whereas for BMI, the median is −2.3%.

Table 6
Effects of treatment on behaviors/outcomes among healthy weight and underweight.

	Endline survey questions							Observed behavior	Endline measurements	
	Correct classification of child's weight	Child weighs too much?	Concern about child's weight	Number of actions taken	Any action taken?	Intend to have child eat less food	Intend to have child get more physical activity	Attend class	BMI	Weight (kg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sample: healthy weight										
Treatment	0.114*	−0.015	−0.032	0.091	0.033	−0.018	0.019	−0.056*	0.031	−0.059
	(0.029)	(0.013)	(0.071)	(0.073)	(0.028)	(0.031)	(0.023)	(0.020)	(0.107)	(0.295)
Observations	968	963	1005	993	993	854	953	1839	1,636	1,636
Dep. var. mean	0.791	0.033	3.148	1.227	0.821	0.203	0.883	0.178	16.24	30.83
Sample: underweight										
Treatment	0.119	0.000	0.045	−0.049	−0.094	0.057	0.069	0.111	0.069	−0.166
	(0.188)	(0.000)	(0.250)	(0.325)	(0.124)	(0.095)	(0.089)	(0.094)	(0.260)	(0.794)
Observations	52	50	53	51	51	47	48	83	71	71
Dep. var. mean	0.538	0	3.385	1.308	0.923	0.077	0.923	0.143	13.04	23.61

Notes: Robust standard errors are presented in parentheses. *Denotes statistical significant at the 1% level. The possible actions undertaken by parents are: discussed weight with family/friends, discussed child's weight with him/her, seen doctor in regards to child's weight, put child on a diet, had child skip meals, engaged in physical activity with child, and signed child up for sport/exercise class.

not statistically significant due to the small sample size. For the remaining outcomes (e.g., actions and weight), as expected a priori, the report card has little impact on the healthy weight subsample. The one exception is attendance at the information session where the treatment leads to lower rates of attendance for the healthy weight. To understand this effect, one can think of the report card as resolving some uncertainty. For the more concerned parent, the report card may act as assurance (i.e., good news), leading them to be less likely to go to the informational session than those who did not receive a report card (i.e., the control group). For the less concerned, this assurance may not be important. Indeed the treatment effects follow this pattern with the effect on attendance being concentrated among the most concerned (75% of the sample); for the less concerned, the treatment effect on attendance is positive although not statistically significant. Overall the effects on the healthy weight and underweight largely confirm that the intervention had little effect on behaviors and outcomes, aside from the impacts on attendance at the information session for the healthy weight and on knowledge about the child's weight.

We looked to see whether these overall results hide some interesting treatment effect heterogeneity. One of the most obvious heterogeneity cuts relates to the surprise of the report card information. Given issues with power, we focus on the overall sample rather than just the overweight/obese. We measure the degree of surprise as the difference between the child's actual weight classification and the caretaker's perceived weight classification of the child. We then categorize these surprises into negative (i.e., child is in a lower weight classification than the caretaker thought), no surprise, and positive surprise (i.e., child is in a higher weight classification than the caretaker thought). We then see how this measure of surprise interacts with the treatment effect. To further increase power, we create a summary measure of all of our outcomes by combining all measures from regressions (1)–(4) and (6)–(8) in Table 5, which is simply the addition of all of those measures except for caretaker concern about weight. Rather than use the full range of the concern variable, we create a binary caretaker concern variable which is equal to 1 if the caretaker is moderately or very concerned about the child's weight and 0 otherwise. This index can range from 0 to 13.

Table 7 reports the results from this regression. The treatment effect for those experiencing no surprise is not significantly

Table 7
Effects by degree of surprise – overall sample.

	Composite index (1)
Treatment	−0.060
	(0.141)
Treatment × Positive surprise	0.564*
	(0.266)
Treatment × Negative surprise	0.604
	(0.709)
Observations	1008
Dep. var. mean	4.198

Notes: Robust standard errors are presented in parentheses. *Denotes statistical significance at the 5% level. The composite index is the sum of whether discussed weight with family/friends, whether discussed child's weight with him/her, whether seen doctor in regards to child's weight,whether put child on a diet, whether had child skip meals, whether engaged in physical activity with child, whether signed child up for sport/exercise class, whether intended to change child's food, whether intended to change child's physical activity, whether attended class, whether caretaker reported that child weighed too much, and whether the parent was moderately or very concerned about the child's weight. A positive surprise is defined as whether the child's actual weight classification exceeds that of the caretaker's guess. A negative surprise is defined as whether the child's actual weight classification is below that of the caretaker's guess. In addition to the variables whose coefficients are reported above, these regressions include controls for positive surprise and negative surprise along with age x sex fixed effects and randomization strata fixed effects.

different from 0 and is small (i.e., less than 0.03 of a standard deviation). On the other hand, for those caretakers who had a positive surprise, the treatment effect is positive, statistically significant, and sizable (i.e., 0.27 of a standard deviation). From these results, it does not appear that the treatment effect is simply a salience effect. If a salience effect existed, we would expect that the no surprise individuals to also be impacted by the intervention, which they are not.

3.4.1. Robustness checks – possible cross-treatment contamination effect

The randomization at the child level left open the possibility that there were spillover effects across the different treatments. We gauge the extent of cross-contamination effects in three ways: (a) examining changes in survey responses from baseline to endline for the overweight/obese control group, (b) looking at the results for children who have no siblings in the experiment, and (c) estimating how the treatment effects vary with the fraction of students treated in each class.

Starting with the first approach, for the outcomes for which we have baseline and endline measures, we estimate whether there are statistically significant changes in the outcomes for the control group. We focus on outcomes for which we do not expect strong age effects (i.e., non-weight outcomes).[26]

Table A4 presents estimates from regressions of the control group change on an intercept for the subsample of the overweight and obese. Any intercept estimates statistically different from zero imply that the control group mean changed during the intervention. We do not observe any significant differences in responses between the baseline survey and endline survey when considering the outcomes of correctly classifying the child's weight, parental beliefs about whether the child weighs too much, and parental concern about the child's weight. The magnitudes of the changes are small relative to the main treatment effects reported in Table 5. For instance, the main treatment effect for classifying the child's weight correctly is 0.156 whereas the difference for the control group reported in Table A4 is 0.020. Similarly, for the outcome of weighing too much, the treatment effect is 0.122 whereas the control group difference is 0.041. Thus, the experiment does not appear to affect the control group behavior.

Our next robustness check considers the effect of the treatment on families with only one child in the experiment in Table A5. One could imagine that spillovers might be larger among families with more than one child in the intervention because for instance, two children in the same family may have received two different treatments. In general, the magnitudes of the estimates are similar across the overall sample and the sample with only one child in the experiment.[27]

Finally, we examine how the treatment effects vary with the fraction treated in the class (results not reported).[28] Due to small sample variation, the fraction treated varies from 0.58 to 0.96 across classes (72 classes in total). Of the 3 robustness checks, this check is the least precise; for none of the outcomes in Table 5 does the treatment effect vary significantly in a statistical sense with the fraction treated albeit the results are imprecise. For the outcomes of correctly classifying the child's weight and believing that the child weighs too much, the larger the fraction treated the more likely a caretaker is to correctly classify the child's weight or report that they weigh too much. Interestingly, for the action outcomes, the treatment effect varies negatively with the fraction treated. As such, these results taken literally imply that randomization at the classroom or school level might have led to larger effects on knowledge but even smaller effects on actions. Together these robustness checks give us some confidence that cross-contamination effects are not a first-order concern.

3.5. Results by treatment type

So far, we have considered the general effect of the report card without regards to the type of report card received. We now look at the effects by treatment type (BASIC, RISK, and COMPARE). Table 8 reports the regression results of estimating Eq. (2).

Ex ante, we might expect that the RISK treatment would have a stronger effect than the BASIC treatment because relaying the health risks of obesity would make such risks more salient to parents. On the other hand, recent economics and psychology literature argues that people sometimes suffer from limited attention.[29] This phenomenon implies that the provision of additional information could be distracting to people, leading the BASIC treatment to be at least as powerful as the RISK treatment.

As for the COMPARE treatment, the effects could vary with the fraction overweight/obese in the class. If many of the children in the class are overweight or obese, the COMPARE treatment may not impact behavior much because the norm is overweight/obese. In contrast, if few classmates have high BMIs, the report card information may be more prominent to parents. This implies that the effects of this treatment may be predictably heterogenous, a possibility we investigate later. Even more than the RISK treatment, problems of cognitive errors may impact the effects of this treatment because the information conveyed is more complicated (i.e., distributions may be hard to understand).

Looking at the results reported in Table 8, differences in the treatment effects across the different report cards seem small; none of the treatment effects are statistically distinguishable across the three treatment groups. For the outcome of weighing too much, the BASIC treatment effects exceed those of the other two treatments. But the BASIC treatment does not always trump the other treatments if we look across the other outcomes. The possible differential effects are too small to discern with the sample at hand.[30]

3.6. Effect of norms

Ex ante, we suspected the impact of the COMPARE treatment to be a decreasing function of the fraction of children who are overweight/obese in the class. A parent of an overweight/obese child may be more concerned when fewer of his/her child's classmates are obese/overweight.

In Table 9, we consider exclusively the control and COMPARE treatment subsamples and we test these predictions by interacting the treatment dummy with a variable indicating whether the fraction of obese/overweight students in the class is more than 36%, between 25 and 36%, and less than 25%. These groupings represent the upper quartile, interquartile range, and lower quartile of the distribution of the classroom fraction of obese/overweight

[26] For example, in the presence of strong age effects, changes from the baseline survey to the endline survey may be large.

[27] For example, the overall estimate for correctly classifying your child's weight for the overweight/obese sample in Table 5 is 0.122 whereas among the sample considered in Table A5, it is 0.118.

[28] We use fraction treated in the whole class, not the fraction of the overweight/obese treated.

[29] See, for instance, DellaVigna (2009) and Lacetera et al. (2011).

[30] For example, to distinguish a 0.02 difference across the treatments, we would need a sample roughly 6 times as large for the outcome of a child weighing too much. In fact, even if we consider the full sample - overweight/obese, healthy weight, and underweight, where we have more power, for the outcome of correctly classifying your child's weight, the effects across the treatment groups are so similar that they are statistically indistinguishable.

Table 8
Effects on behaviors/outcomes by treatment type – obese/overweight sample.

	Endline survey questions							Observed behavior	Endline measurements	
	Correct classification of child's weight	Child weighs too much?	Concern about child's weight	Number of actions taken	Any action taken?	Intend to have child eat less food	Intend to have child get more physical activity	Attend class	BMI	Weight (kg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
BASIC treatment	0.208**	0.135*	−0.022	0.044	0.029	0.045	−0.023	−0.008	0.139	0.012
	(0.059)	(0.060)	(0.112)	(0.205)	(0.030)	(0.059)	(0.026)	(0.039)	(0.185)	(0.601)
RISK treatment	0.121*	0.116*	0.008	0.024	0.033	0.046	−0.032	−0.005	0.160	0.396
	(0.057)	(0.059)	(0.113)	(0.203)	(0.030)	(0.060)	(0.026)	(0.040)	(0.186)	(0.604)
COMPARE treatment	0.141*	0.116*	0.139	0.034	−0.004	0.112	−0.001	0.020	0.066	−0.475
	(0.057)	(0.059)	(0.105)	(0.201)	(0.033)	(0.059)	(0.022)	(0.040)	(0.185)	(0.599)
Observations	459	450	471	465	465	424	449	824	755	755
Dep. var. mean	0.267	0.581	3.387	2.197	0.934	0.718	0.983	0.204	21.38	43.35

Notes: Robust standard errors are presented in parentheses. The possible actions undertaken by parents are: discussed weight with family/friends, discussed child's weight with him/her, seen doctor in regards to child's weight, put child on a diet, had child skip meals, engaged in physical activity with child, and signed child up for sport/exercise class. *Denotes statistical significance at the 5%. **Denotes statistical significance at the 1% level.

Table 9
Heterogeneous treatment effects of COMPARE treatment among overweight and obese.

	Endline survey questions							Observed behavior
	Correct classification of child's weight	Child weighs too much?	Concern about child's weight	Number of actions taken	Any action taken?	Intend to have child eat less food	Intend to have child get more physical activity	Attend class
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	0.099	0.379**	0.206	0.029	0.052	0.193	−0.013	0.017
	(0.140)	(0.142)	(0.221)	(0.431)	(0.096)	(0.180)	(0.056)	(0.104)
Treatment×fraction obese and overweight in class between 25% and 36%	−0.044	−0.254	0.009	−0.048	−0.053	−0.038	0.009	−0.031
	(0.166)	(0.169)	(0.267)	(0.512)	(0.108)	(0.197)	(0.060)	(0.126)
Treatment×fraction obese and overweight in class more than 36%	0.066	−0.401*	−0.310	0.155	−0.127	−0.175	0.012	−0.008
	(0.178)	(0.193)	(0.298)	(0.575)	(0.111)	(0.208)	(0.069)	(0.129)
Observations	238	232	245	243	243	218	235	405
Dep. var. mean	0.267	0.581	3.387	2.197	0.934	0.718	0.983	0.204

Notes: Robust standard errors are presented in parentheses. The possible actions undertaken by parents are: discussed weight with family/friends, discussed child's weight with him/her, seen doctor in regards to weight, put child on a diet, had child skip meals, engaged in physical activity with child, and signed child up for sport/exercise class. Sample includes only the control and the COMPARE treatment group. *Denotes statistical significance at the 5% level. **Denotes statistical significance at the 1% level.

students. To estimate these effects, we estimate regressions of the following form:

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 T_i D_{2i} + \beta_3 T_i D_{3i} + \beta_4 D_{2i} + \beta_5 D_{3i} + \alpha_g + \epsilon_i \quad (3)$$

where T_i is an indicator variable equal to 1 if the student is in the COMPARE group and 0 if the student is in the control group, D_{2i} is an indicator variable equal to 1 if the student is in a class where the fraction of obese/overweight students is between 25 and 36% and 0 otherwise, D_{3i} is an indicator variable equal to 1 if the student is in a class where the fraction of obese/overweight students is more than 36%, and α_g are school by grade fixed effects. Since the fraction of obese/overweight children in each class is not random, we include grade by school fixed effects to try to get closer to assessing causality, effectively comparing students across classrooms within the same grade and school.[31] However, because the fraction of overweight/obese is not randomly assigned, one must be cautious in interpreting these estimates as causal. There are 28 grade by school combinations and all but 7 of them have variation across classrooms in the quartile of the classroom fraction of obese/overweight students. We exclude the age by sex fixed effects and stratification fixed effects since the grade times school fixed effects are nearly collinear with the grade by school fixed effects.

The results in Table 9 imply that the larger the fraction of obese/overweight in the class, the less likely a parent was to report that his/her overweight/obese child weighed too much. For example, for obese/overweight children in a class with the largest fraction of obese/overweight, the treatment effect on parental beliefs that the child weighed too much is small (i.e., 0.379–0.401=−0.022). On the other hand, the treatment effect on this outcome for classes with the smallest fraction of overweight/obese (<25% overweight/obese) is positive and much larger (0.379). Not surprisingly given the earlier estimates, effects on parental beliefs about whether the child weighs too much do not translate into observable effects on parental behaviors.[32] We take these estimates as suggestive as there are several regression estimates in Table 9, so there is, of course, the possibility of a type I error.

However, we do test the plausibility of the estimates in column (2) in three ways. First, as a placebo test, we use the same parental beliefs question but use the baseline survey response. We should not expect to find a similar pattern as in the endline survey and we do not. Second, we assess whether information about the distribution of the weights of children in the class was retained. Specifically, we estimate whether the COMPARE treatment affected whether parents answered the question "How would you classify the weight of most of the children in your child's class?" correctly. Here we find a significant effect of the COMPARE treatment relative to the control and the other treatment arms. This finding also serves to validate these survey questions; one worry with the correct weight classification measure as an outcome is that our main results could be the result of an increased willingness to report their child's weight accurately, perhaps due to reduced stigma, rather than due to the treatment. The correct characterization of the weight of the children's peers may be subject less to this source of reporting bias and thus, since we find an effect here on the characterization of the weight of the children's peers, this may alleviate concerns about reporting bias. Third, we investigate whether for the other treatments (BASIC and RISK), we observe similar patterns as those for the COMPARE treatment. We do not. Specifically, the treatment effects for these other treatments do not interact with the size of the obese/overweight population in the class.

This finding that obesity perceptions are related to the obesity levels of the peer group is consistent with Ali et al. (2011), who use the National Longitudinal Study of Adolescent Health and conclude that the obesity rates of one's peers affect one's own weight perceptions. Also, Guendelman et al. (2010) finds that norms affect perceptions of ideal body weights. In their study, parents of Mexican children in Mexico had higher ideal body weights for their children than similar parents living in the United States. These results imply that as obesity rates increase, it may become harder for individuals to recognize that obesity is a health issue. Thus, policies relying on individuals to make lifestyle changes may be increasingly difficult as more individuals become obese or overweight because individuals' reference points in regards to the accepted healthy weight may change. On the positive side, interventions that induce some individuals to reduce obesity may have important spillover effects and precipitate change amongst others by altering the reference point.

4. Concluding thoughts

We study how the provision of information affects behavior. Specifically, we examine the effect of weight report cards on parental behaviors and children's outcomes in Mexico. Despite the rapid growth in obesity in developing countries, and particularly in Mexico, there has been a dearth of obesity research, both looking at the causes of obesity and understanding effective policies to curb these trends. Relative to many other childhood obesity policies (e.g., increases in physical activity classes), weight report cards have advantages: they are low-cost, interfere minimally with the school curriculum, and are easily scaled up. The potential usefulness of our intervention is grounded in the idea that a necessary pre-requisite for behavioral modification is the understanding of the risks associated with the disease (Health Belief Model Hochbaum et al., 1952). Thus, childhood obesity policies may only be effective if people are cognizant of the risks of childhood obesity and their child's obesity status. But, if people do not understand or care about their child's susceptibility to obesity and its risks, the many paternalistic obesity policies (e.g., soft drink taxes, the banning of trans-fat foods) may be less successful because of unintended consequences. As an example, Fletcher et al. (2010) conclude that increases in soft drink taxes lead to the consumption of other high calorie beverages, effectively undoing the intended effects of the policy.

Our main results suggest that weight report cards are an effective means of transmitting obesity information to parents. Parents become more informed about their child's weight, and, for parents of overweight/obese children, this information changes their beliefs about their child's weight. These perceptions appear to have an important interaction with peer obesity levels. In particular, the more obese/overweight a class is, the less likely a parent is to report an overweight/obese child as weighing too much. Extrapolating these findings, growth in the prevalence of obesity may shift perceptions about healthy body weights. As these social norms change, parents of obese children may be less inclined to believe that their obese child is obese, making it challenging to encourage parental behavior changes that will improve their children's health. On a more promising note, interventions may harness the power of the norm if the intervention precipitates behavioral change amongst some subsample.

To put our results in context, we can compare our results to those of Chomitz et al. (2003), the only other randomized controlled study of weight report cards. However, one should keep in mind that this study had the unfortunate luck of the randomization not working well (i.e., there were significant differences between the treatment and control groups) and small sample sizes. Not

[31] Results are similar without adding these controls.

[32] In results not reported, the effects on BMI and weight are also statistically insignificant.

Table A1
Baseline characteristics – overall sample, conditional on filling out endline survey.

	Mean				*P*-value	
	Control	Basic	Risk	Compare	All equal	Treatment = control
Panel A: child measurement						
	N=394	*N=355*	*N=405*	*N=381*		
Male	0.49	0.44	0.46	0.51	0.36	0.57
Age	9.77	9.76	9.80	9.82	0.85	0.64
	[1.14]	[1.19]	[1.25]	[1.18]		
BMI	18.13	18.25	18.23	18.42	0.30	0.08
	[3.41]	[3.61]	[3.47]	[3.43]		
Fraction underweight	0.03	0.03	0.04	0.03	NA	NA
Fraction healthy weight	0.65	0.65	0.68	0.65	NA	NA
Fraction overweight	0.19	0.19	0.16	0.17	NA	NA
Fraction obese	0.12	0.13	0.13	0.15	NA	NA
Panel B: pre-survey responses by primary caretaker						
	N=290	*N=268*	*N=305*	*N=277*		
Primary caretaker: mother	0.67	0.69	0.68	0.63	0.48	0.99
Primary caretaker: father	0.30	0.30	0.30	0.33	0.72	0.75
Primary caretaker: other	0.03	0.02	0.02	0.03	0.37	0.35
Less than high school	0.34	0.39	0.32	0.31	0.15	0.68
High School	0.43	0.41	0.43	0.45	0.69	0.77
More than high school	0.23	0.20	0.25	0.24	0.55	0.82
Concern about H1N1 [1-4]	3.33	3.21	3.26	3.29	0.29	0.21
	[0.78]	[0.78]	[0.79]	[0.75]		
Concern about child's weight [1-4]	3.19	3.09	3.00	3.13	0.08	0.04
	[0.92]	[1.01]	[1.00]	[0.95]		
Concern about own weight [1-4]	3.08	2.99	2.98	3.05	0.52	0.26
	[0.93]	[1.04]	[1.00]	[0.90]		
Concern about child's school performance [1-4]	3.76	3.65	3.64	3.64	0.05	0.00
	[0.55]	[0.70]	[0.69]	[0.65]		
Classifies child as underweight	0.11	0.18	0.11	0.13	0.37	0.56
Classifies child as healthy weight	0.69	0.65	0.73	0.71	0.09	0.91
Classifies child as overweight	0.18	0.19	0.15	0.15	0.12	0.57
Classifies child as obese	0.01	0.01	0.01	0.01	0.81	0.83
Child's school performance relative to peers [−2-2]	−0.03	−0.04	−0.03	−0.05	NA	0.88
	[0.76]	[0.77]	[0.69]	[0.71]		
Happy with child's school performance [0/1]	0.67	0.70	0.68	0.73	0.28	0.33
Internet access at home [0/1]	0.38	0.34	0.38	0.37	0.79	0.60
Other children in experiment [0/1]	0.31	0.29	0.25	0.26	0.12	0.06
Response rate to baseline survey	0.74	0.75	0.76	0.73	0.20	0.26

Notes: Table presents means and standard deviations in brackets for continuous variables. For child's school performance relative to peers, a response of 0 indicates that the student is average; below 0 is below average and above 0 is above average. *P*-values are from regressions of these characteristics on a treatment dummy [treatment=control] or the set of treatment dummies [all equal]; these regressions include randomization strata fixed effects based on the combination of weight status, school, and whether the baseline survey was completed. All *p*-values with NA values are not defined since those are variables upon which randomization was stratified. Thus, as we include strata fixed effects in measuring the differences across groups, there is no within strata variation in these stratification variables.

surprisingly, the degree of misclassification of weight status is more severe in our study. Chomitz et al. (2003) report that 16% of parents with an obese child classify their child's weight status correctly compared to 6% in our study. In our study, report cards have a larger effect on correct classification. But unlike our own study, Chomitz et al. (2003) find that among both the overweight/obese and the healthy weight, parents receiving report cards are more likely to report to having engaged in weight-modifying behaviors for their children including physical activity and dieting.[33]

The puzzling finding of the paper is why we did not observe any impacts on behaviors, given that parental knowledge increased. There are many possible explanations for these null results—most of which we are not able to rule out. First, parents could believe that childhood obesity has little relevance for adult obesity. However, this explanation is somewhat at odds with the observation that the treatment affected parental beliefs about the child weighing too much. Second, the risks of obesity may not yet be particularly salient, especially in a society where obesity is a relatively new health problem and which has battled problems of underweight in the past. It is possible that once parents become more aware of the risks of obesity, we will see more of them taking pro-active steps to reduce childhood obesity. Third, parents may not have either the income or the knowledge about how to decrease the incidence of childhood obesity. A healthy diet is often more expensive (Monsivais et al., 2011). We do not however estimate differential treatment effects by parental education. Also, when provided free resources to help address obesity (i.e., the informational session and assistance from a nutritionist), we see relatively few families taking advantage of such resources.

Information is simply not enough to induce to change in this context. Indeed some of the most successful informational interventions in developing countries couple information with remedies (Dupas, 2011b). Thus, an effective weight report card intervention may also need to be combined with a set of actions helpful for reducing obesity. In some sense, the informational session of this intervention served as this set of actions. But we saw little interest in the session. However, the provision of direct information on how to reduce childhood obesity may be more fruitful. Future research should test whether the report cards combined with specific suggested actions (e.g., restricting portion sizes) are more effective.

Appendix A.

See Tables A1–A5.

[33] Chomitz et al. (2003) do not explore the effects on weight or BMI.

Table A2
Baseline characteristics – overweight and obese, conditional on filling out endline survey.

	Mean				*P*-value	
	Control	Basic	Risk	Compare	All equal	Treatment = control
Panel A: child measurement						
	N=124	*N = 112*	*N=115*	*N=121*		
Male	0.61	0.48	0.55	0.59	0.26	0.16
Age	9.74	9.72	9.83	9.85	0.83	0.52
	[1.03]	[1.04]	[1.15]	[1.07]		
BMI	22.10	22.44	22.48	22.46	0.69	0.40
	[2.54]	[2.90]	[2.69]	[2.46]		
Fraction overweight	0.61	0.59	0.55	0.53	NA	NA
Fraction obese	0.39	0.41	0.45	0.47	NA	NA
Panel B: baseline survey responses by primary caretaker						
	N=91	*N=85*	*N=85*	*N=85*		
Primary caretaker: mother	0.72	0.68	0.63	0.55	0.11	0.09
Primary caretaker: father	0.25	0.32	0.35	0.42	0.12	0.04
Primary caretaker: other	0.03	0.00	0.02	0.03	0.07	0.44
Less than high school	0.34	0.28	0.29	0.17	0.00	0.02
High school	0.40	0.44	0.42	0.47	0.72	0.44
More than high school	0.26	0.29	0.29	0.36	0.25	0.16
Concern about H1N1 [1-4]	3.32	3.16	3.37	3.36	0.18	0.92
	[0.85]	[0.75]	[0.78]	[0.80]		
Concern about child's weight [1-4]	3.26	3.29	3.28	3.29	0.99	0.97
	[0.86]	[0.87]	[0.88]	[0.83]		
Concern about own weight [1-4]	3.05	3.09	3.09	3.15	0.87	0.66
	[0.98]	[1.02]	[0.98]	[0.86]		
Concern about child's school performance [1-4]	3.75	3.71	3.68	3.62	0.44	0.21
	[0.51]	[0.70]	[0.62]	[0.70]		
Classifies child as underweight	0.01	0.00	0.01	0.00	0.58	0.63
Classifies child as healthy weight	0.45	0.37	0.49	0.53	0.01	0.44
Classifies child as overweight	0.51	0.59	0.47	0.43	0.01	0.41
Classifies child as obese	0.02	0.03	0.03	0.02	0.81	0.71
Child's school performance relative to peers [−2-2]	−0.04	0.02	0.05	0.03	0.61	0.23
	[0.79]	[0.77]	[0.61]	[0.71]		
Happy with child's school performance [0/1]	0.64	0.67	0.78	0.75	0.07	0.09
Internet access at home [0/1]	0.39	0.40	0.44	0.43	0.92	0.54
Other children in experiment [0/1]	0.27	0.21	0.26	0.21	0.70	0.27
Response rate to baseline survey	0.73	0.76	0.74	0.70	NA	NA

Notes: Table presents means and standard deviations in brackets for continuous variables. For child's school performance relative to peers, a response of 0 indicates that the student is average; below 0 is below average and above 0 is above average. *P*-values are from regressions of these characteristics on a treatment dummy [treatment=control] or the set of treatment dummies [all equal]; these regressions include randomization strata fixed effects based on the combination of weight status, school, and whether the baseline survey was completed. All *p*-values with NA values are not defined since those are variables upon which randomization was stratified. Thus, as we include strata fixed effects in measuring the differences across groups, there is no within strata variation in these stratification variables.

Table A3
Effects of treatment on behavior and bmi among overweight and obese.

	Endline survey questions						
	Discussed weight with family/friends (1)	Discussed child's weight with him/her (2)	Seen doctor in regards to weight (3)	Put child on a diet (4)	Had child skip meals (5)	Engaged in physical activity with child (6)	Signed child up for sport/exercise class (7)
Treatment	0.031	0.095	0.078	−0.038	−0.070	−0.064	0.002
	(0.056)	(0.053)	(0.041)	(0.033)	(0.039)	(0.053)	(0.043)
Observations	465	465	465	465	465	465	465
Dep. var. mean	0.402	0.541	0.139	0.107	0.172	0.648	0.189

Notes: Robust standard errors are presented in parentheses. The dependent variable mean is the mean for the control group.

Table A4
Post-survey-pre-survey differences for overweight and obese in control group.

	Classify child's weight correctly (1)	Child weighs too much? (2)	Concern about child's weight (3)
Difference	0.020	0.041	0.152
	(0.028)	(0.043)	(0.081)
Mean at Baseline	0.28	0.56	3.41
Observations	102	98	105

Notes: Robust standard errors are presented in parentheses. Estimates come from the regression of the difference in post-intervention and pre-intervention survey measures on a constant. The reported coefficient estimate is the intercept.

Table A5
Overall effects of treatment on behavior and BMI for sample of lone overweight and obese children.

	Endline survey questions							Observed behavior	Endline measurements	
	Correct classification of child's weight	Child weighs too much?	Concern about child's weight	Number of actions taken	Any action taken?	Intend to have child eat less food	Intend to have child get more physical activity	Attend class	BMI	Weight (kg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Treatment	0.118*	0.099	−0.037	0.150	0.035	0.028	−0.031	0.034	0.288	0.198
	(0.059)	(0.062)	(0.112)	(0.197)	(0.034)	(0.063)	(0.023)	(0.047)	(0.208)	(0.592)
Observations	291	287	298	294	294	268	282	464	429	429
Dep. var. mean	0.276	0.547	3.436	2.115	0.923	0.729	0.987	0.217	21.13	42.73

Notes: Robust standard errors are presented in parentheses.* Denotes statistical significance at the 5% level. The possible actions undertaken by parents are: discussed weight with family/friends, discussed child's weight with him/her, seen doctor in regards to child's weight, put child on a diet, had child skip meals, engaged in physical activity with child, and signed child up for sport/exercise class.

Appendix B. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.jhealeco.2014.07.001.

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