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Abstract

We conduct a field experiment in 31 primary schools in England to test the effectiveness of different temporary incentive schemes, a standard individual based incentive scheme and a competitive scheme, on increasing the choice and consumption of healthy items at lunchtime. The individual scheme has a weak positive effect that masks significantly differential effects by age whereas all students respond to positively to the competitive scheme. For our sample of interest, the competitive scheme increases choice of healthy items by 33% and consumption of healthy items by 48%, twice and three times as much as in the individual incentive scheme, respectively. The positive effects generally carry over to the week immediately following the treatment but we find little evidence of any effects six months later. Our results show that incentives can work, at least temporarily, to increase healthy eating but that there are large differences in effectiveness between schemes. Furthermore it is important to analyse things at the individual level as average effects appear to be masking significant heterogeneous effects that are predicted by the health literature.

JEL Classification: J13, I18, I28, H51, H52

Keywords: Incentives, Health, Habits, Child nutrition, Field experiments

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1. Introduction

Poor nutrition is a primary cause behind the rising cost of health care in many developed countries.[1] According to the World Health Organization (2009) poor nutrition is related to three of the five highest risks for morality in the world: high blood pressure; high blood glucose; and overweight and obesity. In response, policy makers have been pushing information interventions, such as the "5-a-day" campaign in the UK, to encourage people to develop better eating habits. However, the success of these campaigns has been moderate.[2] Because of this lack of success, alternative interventions designed around insights from behavioural economics have recently received attention among policy circles, with, for example, a number of initiatives considered by the "Nudge-Unit" in the UK government.[3]

One instrument that is currently debated is the use of schemes that reward good behavior.[4] Recent research in education (see Angrist and Lavy (2009), Angrist, Lang, and Oreopoulos (2009), or Kremer, Miguel, and Thornton (2009)), smoking cessation (see Volpp et. al (2009) and Giné et. al. (2011)), and exercise (see Charness and Gneezy (2009) and Acland and Levy (2013)) has shown that incentives can induce individuals to engage in positive behaviour. Furthermore, the research on exercise has even shown that the habits developed during the incentive period can carry over to the post-intervention period, though, it is unclear how long any behavioural changes may last (see Acland and Levy (2013) and Charness and Gneezy (2009)). However, as pointed out by Rabin (2011), we still know very little about which health behaviours are really habitual, how important habits are, and, in particular, what type of incentive schemes are most effective in changing those bad habits.[5] In light of this debate we conduct an experiment using thirty-one primary schools in England to look at the effect of *two* different incentive schemes, a standard individual based incentive scheme and a competitive scheme, on changing choice and consumption of healthy items by school aged children. We compare and contrast effectiveness of the schemes and examine whether the effects last after the intervention period.

[1] See Bhattacharya and Sood (2011) for an overview of the costs of obesity.

[2] See Ciliska et al. (2000) for a review of many community based interventions. They appear to have been successful at informing people but have had less success in changing actual behaviour (see Robertson (2008) and Verplanken and Wood (2006)).

[3] See the Behavioural Insights Team (2010) publication for a recent overview of initiatives discussed in the UK targeting a range of health-related behaviours

[4] See the NICE citizens council report (http://www.nice.org.uk/media/9AF/56/CCReportIncentives.pdf) for a review of the issues of the National Health Service (NHS) using incentives to change health related behaviour.

[5] See Gneezy et al. (2011) for a longer discussion regarding when and why incentives may change behaviour.

In relation to nutrition, it is actually an open question if rewarding individuals for eating healthier will have any effect on behaviour or will play any long lasting role in solving the problems caused by poor nutrition. Indeed, there is evidence showing that rewarding children for eating healthy items can lead to those items being less preferred (using self-reports as a measure of preference) or displace intrinsic motivation.[6] Recent work by Just and Price (2013) has shown that schools where short term rewards are given for eating healthy items does lead to an increase in the proportion of children consuming a serving of fruits or vegetables at lunch time. Two weeks after the incentive is removed, however, there is no lasting change in the amount of fruits and vegetables consumed at the project schools. The lack of longer term effects could be due to the intervention period being too short or the incentive scheme not being effective enough. They argue that despite the potential for external incentives to crowd out intrinsic motivation (see Gneezy and Rustichini (2000) for an example) the evidence suggests that incentivising healthy choices using individual incentives can work.

The recent work on incentivising healthy eating, though, has focused on the average effect at the school or class level of an individual incentive (providing a small reward for eating healthily). However one robust finding in the literature is that health interventions tend to be less effective for boys and children from poorer socio-economic backgrounds (see Muller et al. (2005), Perry et al. (1998) and Kelder et al. (1995)). Recent work has shown that those two groups are more impatient than other children[7] and those differences could explain why these children are less likely to make healthy dietary choices. This is of particular concern because boys and children of poorer socio-economic status tend to have worse eating habits and are more likely to develop nutrition-related diseases. Therefore, while, on average, the number of healthy items consumed at an intervention schools may increase, vulnerable groups may eat worse due to the intervention. In terms of societal welfare, one may not want to implement a policy if the increase in the proportion of healthy items consumed is driven by an increase in consumption by those already eating healthily while those eating poorly decrease their consumption. However, since boys and children from poorer socio-economic backgrounds are more impatient, they may be the ones more likely to respond to the immediate rewards from the interventions. Therefore, given the push by policy makers to introduce individual based incentives for health eating it is of utmost importance to examine the effect on subgroups.

Examining the individual level effects is also of particular importance because of recent

[6]See Birch et. al. (1982), Birch et. al. (1984), and Newman and Taylor. (1992) for examples.

[7]See Delaney and Doyle (2012) for children from poorer socio-economic backgrounds and Bettinger and Slonim (2007) for boys versus girls.

insights from behavioural economics. Specifically, immediate incentives may affect choices by exploiting behavioural anomalies that underlie the 'unhealthy' behaviours. For example, present-biased (hyperbolic) preferences, such as those discussed in Laibson (1997) and O'Donoghue and Rabin (1999), can explain unhealthy dietary choices despite an individual being fully aware of (having all the information about) the effects of poor nutrition and the benefits of healthy eating: individuals may over-weight the initial costs of eating healthier and (or) under-weight the longer term benefits. Thus, using a temporary and effective incentive scheme to encourage healthier eating among children could lead to long term dietary habit changes.[8] Therefore, it is vital to know what incentive schemes are effective for which groups or one may be implementing a policy that causes those already eating poorly to have even worse long term eating habits because of the intervention.

The effectiveness of different interventions on changing behavior has not been widely examined.[9] In designing our experiment we wanted to compare the commonly used individual incentive scheme to another scheme specifically designed to target the two groups that typically do not respond to health interventions: boys and children from poorer socio-economic backgrounds. There is a well-established literature showing that boys tend to be more competitive than girls (see Geenzy et. al (2003), Gneezy and Rustichini (2004), and Booth and Nolen (2012)) yet competitive incentives have not yet been studied in exercise or health. Given the gender differences in incentivizing healthy eating, a competitive scheme such as a tournament may be more effective, on average, than an individual based compensation scheme because it could get boys to chose and consume more healthy items. Of course, if girls are discouraged from eating healthily by a competitive incentive, there may be no difference on average. With this in mind we designed out field experiment to allow us to compare a competitive tournament and an individual based incentive scheme on population sub-groups.

Besides focusing on effects during the treatment period we also look at the medium and longer term effects of both intervention schemes. Like most other papers in this area, we examined the effect of the intervention immediately after it was removed (in the week following cessation). However, we also look at longer term effects by following up with subjects six months after the intervention finished. Therefore we can examine the effects of the two incentive schemes on medium and longer run behaviour and if there are differential effects for sub-groups in the medium or longer run. Using two schemes may

[8]Work by Kelder et. al. (1994), Resnicow et. al. (1998), and Singer et. al. (1995) suggest that dietary habits appear to form in childhood and track into adulthood.

[9]Some work has looked at the effect of information only campaigns versus interventions with individual based incentives with small prizes (see List and Samek (2014) for example) but we know of no study that has looked at two reward based schemes.

also allow us examine why Just and Price (2013) found no effects beyond two weeks.

Our paper has two major contributions: it compares two reward based incentive schemes designed to increase healthy eating; furthermore, it examines the differential effects of those two schemes on key subgroups of children. Our experimental data also allows us to examine differences in the how the two incentive schemes are working and what theories are broadly consistent with the results. We also discuss how these contributions fit into the habit formation literature by looking at choice and consumption of healthy items both immediately after the incentives have been removed and six months later.

We find that incentivising children to choose fruit or vegetables has an overall positive effect on both choice and consumption: on average children choose 3% more fruits and vegetables and consume 4.5% more than the control group, though, the results are not precisely estimated. These effects are about one fifteenth of those found in Just and Price (2013) but our students were more than twice as likely to choose and consume healthy items in the baseline. The accurate comparison is what we call the less than 100% choice group later in the paper; they increased choice by 19% and consumption by 17%.[10] Those results suggest that the incentive is changing the behaviour of those students with initially poor eating habits. However, the competition treatment is nearly twice as effective in getting children to choose a healthy item and over three times as effective at getting children to consume healthy items. For the group of interest we have: children in the competitive scheme choose healthy items 33% more often than those in the control group and consume healthy items 48% more.

When we look at the effects on subgroups by scheme we get our starkest finding, the individual incentive has a small positive effect on choice and consumption but the effect differs significantly by age. We find that younger children respond *negatively* and older children respond *positively* to the incentive. These results are consistent with the non-monotonic results of neophobia (the predisposition to reject novel food) by age discussed in the health literature on how food preferences develop[11] and suggests that only looking at the average effect conceals important heterogeneous differences. In fact if eating habits are developed at a younger age than the individual incentive scheme could have a more negative effect than we find because the younger students will be eating worse when they

[10] List and Samek (2014) also found larger effects but they look at snacking after school so the results are not comparable.

[11] See Birch (1999) for a good summary of the development of food preference and neophobia. Birch and Marlin (1982), Birch et. al. (1987, 1998), Sullivan and Birch (1990), and Cooke et. al. (2003) also provide strong evidence about the role of overcoming neophobia through repeated exposure to a new food or flavours. Neophobia should be decreasing over the age of our sample meaning that the stark age effects - that year five children respond more to both incentive schemes - are consistent with the literature.

get to be the same age as the older students in our study. In contrast, the competitive incentive scheme has no significant heterogeneous effects by subgroup: everyone chooses and consumes more healthy items.

When looking at subgroups we find that, in general, females, students from poorer socio-economic backgrounds, and younger children respond more positively to competition than the individual based incentive. Boys, older children, and students from wealthier socio-economic backgrounds respond positively to both the competitive and the individual incentive scheme, though, the estimated effect is larger for the competition treatment in nearly every case. This suggests that using a competitive incentive could improve effectiveness by increasing the choice and consumption of those already responding to the individual scheme *and* those groups that typically do not respond to health interventions. Furthermore, unlike in the individual based scheme, we find no one responding negatively to competition.

The results presented in this paper are important for policy makers and health officials trying to fight problems associated with poor nutrition. It shows that positive incentives do work in encouraging healthy dietary choices and that the results of a short term intervention can have lasting effects after the intervention period but that a "one-size-fits-all" reward scheme will not likely work. The differential effects by subgroup suggest that health incentives need to be evaluated at the individual level and, consequently, different policies may have to be developed for different subgroups or an incentive scheme other than the standard individual scheme may have to be considered. Furthermore, increasing the length of time an intervention is taking place is not the only way policy makers can increase the likelihood that positive behaviours are adopted: for instance, competitions could be more effective than individual-based schemes at changing behaviour in the same time period.

The remaining part of the paper is structured as follows. In Section 2 we present the experimental design. In Section 3, we present a simple conceptual framework and hypotheses that guide the analysis of the results. We present the results in Section 4 and conclude in Section 5.

2. Experimental Design

To examine the effect of two incentive schemes on the choice and consumption of healthy items we conducted a field experiment in England. We recruited schools in a three step process.[12] First we approached all 150 Local Education Authorities (LEAs) in England to ask if they would be interested in participating; 22 responded positively. Second, we provided more information about the project to LEAs that responded and set-up meetings with them to answer questions and discuss how to recruit schools. We indicated to LEAs that we were interested in testing and comparing the effectiveness of incentives schemes in increasing choice and consumption of fruit or vegetables at lunchtime and that the interventions were specifically designed to target children who were generally considered unresponsive to health interventions. After the meetings 12 LEAs agreed to let us approach their schools and provided a list of at least three schools that would consider being involved. Finally we approached all 46 schools suggested by the LEAs; 31 of them agreed to participate.

We recruited children from year two (aged 6 and 7) and year five (aged 9 and 10) in participating schools. Parents were provided with information about the study, asked to fill out a questionnaire, and were required to give consent to have data collected about their child. As agreed with the schools, all children in years two and five were included in the project. However, data about choice and consumption of fruit or vegetables were only recorded for children whose parents gave permission. Therefore, we have data on 638 children for the main part of the analysis.

Randomisation

We randomly allocated schools to one of three groups: control; competition; or individual incentive. We were particularly careful to make sure that, *ex ante*, the average school in each group had roughly the same number of children and looked the same in terms of school characteristics.

Within LEA schools were randomly assigned to treatment arms such that the overall sample was balanced based on observables. For the purpose of balancing the three groups we used the following characteristics: (i) proportion of female pupils; (ii) number of pupils; (iii) number of pupils in class groups (year 2 and year 5); (iv) proportion of children eligible for free school meals; (v) proportion of children eating free school meals; (vi) per pupil expenditure; (vii) per pupil expenditure on catering; (viii) percent of children achieving level 4 in both English and Mathematics; (ix) average point scores of children on level 4 exams; (x) average percent of children absent on a given day; (xi) percent of children absent from the level 4 exams; (xii) school type (religious or comprehensive); (xiii) whether a school was involved in the "Food for Life" Programme; (xiv) Ofsted

[12] A companion paper, Belot and James (2013), documents the selection process of which schools choose to participate in this experiment. In particular they find that selection on observables and unobservables is unlikely to drive the results.

School Categorization; and (xv) Ofsted Health Categorization (OfHealth).

The variables listed above were used to make sure that the average school in each treatment arm was similar in ways that could have influenced whether the treatment scheme worked: socio-economic background of the student body; school quality; student quality; and school type.[13] Using a random number generator, schools were assigned to one of the three treatment arms. We then checked to see if the sample was balanced based on the 15 observable characteristics. If it was not, we re-started the randomization. This ensures that, *ex ante*, at the *school level*, our sample was balanced by treatment arm.

Treatments

The two treatments we designed incentivise *choice* (rather than *consumption*) of fruit or vegetables at lunch. We decided to incentivise choice for a few reasons. First, the health literature highlights how making rewards contingent on consumption of a particular food can cause children to have a lower preference for that item (see Birch et. al. (1982, 1984) and Newman and Taylor (1992) for examples). We wanted to minimise the potential for negative effects on healthy eating. Second, we wanted the experiment to be something that was relevant to policy and simpler to implement. Rewarding for choice removes any subjective judgement of the monitor to decide what constitutes an adequate amount of food consumed to be rewarded. Furthermore, schools can require children to take a fruit or vegetable at lunch but are unlikely to be able to force them to eat the item. Therefore the results of our study are likely to be more relevant to policies that are being considered at the school level now.[14] Third, we also wanted the program to involve minimal costs.

Monitors, individual who recorded the choice and consumption of healthy items, were already people working in the school and with the children at lunch time. While we could have considered a multi-component approach such as "Food Dudes," combining such as aspects as bringing in role models, monitoring choices for each type of fruit or vegetable chosen, etc. this would have required a larger investment of resources and likely been too expensive for many schools to adopt (see Horne et. al. (1995, 1998)). Finally, rewarding for choice rather than actually consuming an item negates the possibility of cheating. For

[13]Variables (i), (ii), and (iii) relate to the demographic characteristics of the schools involved. Variables (iv) and (v) relate to the economic background of the children. Variables (vi) and (vii) relate to the financial expenditure at the school level. Variables (viii) - (xi) relate to the quality of the student body at each school. Variable (xii) denotes if a school has a religious affiliation. Variable (xiii) denotes whether the school voluntarily chose to be part of the "Food for Life" programme which involves schools agree to teach children about healthy eating (See http://www.foodforlife.org.uk/ for further information). Variable (xiv) is the overall classification of the school based on its Ofsted results: 1 = outstanding; 2 = good; 3 = requires improvement; and 4 = inadequate. Variable (xv) relates to the extent to which the pupils adopt a healthy lifestyle.

[14]Indeed the results of our study are especially relevant to determine if providing (or requiring a student to take) a fruit or vegetable at lunchtime has any follow through effect on consumption behaviour.

example, if rewards were based on eating the pupil has an incentive to dispose of the fruit or vegetable; the student may hide it, give it to a friend or try to mislead monitors regarding actual consumption. For this reason, monitoring consumption is more reliable when choice is incentivised and we will be able to check if children eat healthier options or not.

In both of our experimental schemes, the standard individual and competitive, the pupils were given a sticker for choosing or bringing in a fruit or vegetable at lunch.[15] The individual incentive scheme was chosen because it is similar to many of the other individual based incentive schemes used in the healthy eating and habit formation literature (for instance, see Charness and Gneezy (2009), Just and Price (2013), or List and Samek (2014)). The competition was chosen because the literature on gender and competition suggests that boys respond more to competition than girls (see Gneezy and Rustichini (2004), Gneezy et. al. (2003), and Booth and Nolen (2012)). Given that boys tend not to respond to traditional healthy eating interventions, the competition was seen as an incentive scheme that could get boys to respond. However, gender differences in competition can vary by task (see Iriberri and Rey-Biel (2011)). Therefore if the task of choosing a healthily item is viewed as a 'favouring females' then even the competitive scheme might not get boys to choose or consume fruit or vegetables.

In both schemes children received a sticker every day they chose or brought in a fruit or vegetable at lunchtime. Then, at the end of the week (Friday afternoon after lunch), each student had the opportunity to pick a larger prize depending on the incentive scheme in which the student was enrolled. In the individual incentive scheme, if a student collected four stickers in the week she or he was allowed to choose a prize such as an item of stationery or a small toy from a reward box. If the student had three or less stickers, though, the student could not pick a prize and the stickers did not count to earning an award next week. In the competition, children were assigned to random groups of four, and only the student with the most stickers in each group was able to select a prize from the reward box.[16] In the case of a tie all children with the highest number of stickers in the group were eligible for a prize. The groups were revealed at the end of the week after lunch so children would not engage in strategic behaviour, such as making choices based on other group member's actions or absenteeism. For example, if a pupil was absent on Monday then the others in their group would know that that pupil could only collect a

[15]Examples of the stickers can be seen in the appendix. All children were given a list of fruits and vegetables that would be rewarded if they were included in packed lunches; the list is also included in the appendix.

[16]See appendix for pictures of some of the rewards from which children were allowed to choose.

maximum of four stickers. The groups were changed each week so the children could not anticipate with whom they would be competing and, in this treatment as well, unused stickers did not carry over to the next week.

Timing

Before the interventions began a background survey was sent to the parents that covered information on age, gender, ethnicity, primary language, height, weight, and typical dietary habits. Then, starting the second week of October, we monitored what children ate at lunch in all 31 schools. Lunch monitors[17] recorded if a student chose a fruit or vegetable or brought a fruit or vegetable in with a packed lunch and if the student consumed none, some, or more than half the item. On Friday that week children took a food knowledge test and a "spot-the-difference" test.[18] The food knowledge test required students to identify seven pictures of different items (e.g. celery or snickers bar) and mark if each item was healthy or not. The "spot-the-difference" test was designed to test a student's concentration and required a student to compare two sets of 30 dice that were arranged in a six-by-five square. There were five differences between the two sets of dice; the student was asked to circle the five differences. Children had 10 minutes to complete each test.

The children went on half-term break for one week after the baseline data was collected. Upon returning to school the children were reminded of the project and children were monitored for the next five weeks. At control schools, the lunch monitors continued to monitor children in the same way they did during the week in October: they collected data on whether a student choose or consumed a fruit or vegetable. At the competition and individual incentive schools children were incentivised to choose a fruit or vegetable for a period of four weeks[19]. Each day a student choose or brought in a fruit or vegetable with a packed lunch[20] the student received a sticker. Furthermore, as discussed above, at the end of each week, children would get a large prize based on the type of incentive scheme in which they were enrolled.

On the fourth Friday of the treatment, the children completed another food knowledge and "spot-the-difference" test and were reminded that it was the last day of incentives. The following week, immediately after the treatment, the choices and consumption of children were still monitored. This allows us to see if there was any effect on choice and

[17]Lunch monitors were dinner ladies who worked in the cafeteria or school assistants who were normally present at lunch time and sat with the children as usual during the lunch period.

[18]Examples of both can be seen in the appendix.

[19]Just and Price (2013) incentivised children for a period of 2-3 weeks and found no longer run effects. Therefore, we chose to incentivise children for a longer period of time; 1-2 weeks longer.

[20]With the questionnaire and again at the start of the five weeks of monitoring, the parents of all children received lists of what items would count as healthy if they were included with packed lunches.

consumption after the incentives were removed. To examine the longer term effects of the incentives we also went back to schools six months later, in June, and monitored the choice and consumption of the same children.

3. Conceptual Framework & Hypotheses

We designed our field experiment to test the three hypotheses laid out below, to examine whether there were heterogeneous effects of incentives, and to compare the two incentive schemes.

Hypothesis 1: Children will choose more fruit or vegetables when they are rewarded for taking a fruit or vegetable at lunchtime.

By providing a reward for choosing a healthy option, the benefit of taking a fruit or vegetable at lunchtime will have increased for each student. Therefore we would expect that, while the incentive scheme is running, children are more likely to choose a fruit or vegetable. This would be consistent with the work by Gneezy and Charness (2009), Just and Price (2013), and List and Samek (2014). Furthermore, the effect is likely to differ by subgroups. Since boys and children from poorer socio-economic backgrounds have been shown to be more impatient (see Delany and Doyle (2012) and Bettinger and Slonim (2007)) then they may respond more positively to the immediate reward. The literature has also shown that there are gender differences in responses to information only campaings (see Muller et al. (2005), Perry et al. (1998) and Kelder et al. (1995)). The health literature highlights age effects with regards to food preferences and tastes (see Birch (1999) and the references therein); suggesting that there is likely to be differences in the effect of the incentive by age as well.

Hypothesis 2: Children will consume more fruit or vegetables when they are rewarded for taking a fruit or vegetable at lunchtime.

The behavioural literature has shown us that the default option can affect choices made by individuals (see Keller et. al. (2011), Choi et. al. (2003), and Johnson and Goldstein (2003) for examples) and even help reduce calorie consumption (Wisdom et. al. (2010)). As a result health initiatives at schools have started to require children to have a fruit or vegetable on their plate.[21] By incentivizing children to take a fruit or vegetable our experiment is likely to have a follow-through effect on consumption. Furthermore, unlike previous studies, our children have no incentive to lie or cheat regarding the amount of the fruit or vegetable they consumed; the rewards are only based on choice. This means that we can estimate the causal effect of how an increase in having a fruit or vegetable on one's lunch tray effects consumption. As with choice, there is reason to expect that the effect on consumption will vary with gender, age, and socio-economic background.

Hypothesis 3: Children will choose and consume more fruit or vegetables after the incentive is removed than before.

Given how food preferences develop, if children have been eating more fruit or vegetables during the intervention period they may have developed a preference for fruit or vegetables or developed a habit of eating fruit or vegetables at lunch time.[22] Becker and Murphy (1988) and Becker (1992) develop a model of habit formation where the marginal utility of today's consumption is correlated with historical consumption. Therefore a small change in today's behaviour - caused by an exogenous increase in the benefit of consuming a fruit or vegetable for instance - could lead to long term changes in consumption. More recently theory on present-bias (hyperbolic) preferences such as that in Laibson (1997) and O'Donoghue and Rabin (1999) suggest that providing incentives to overcome the initial costs of switching to healthy behaviour may have long lasting effects (see Acland and Levy (2013) for instance). Of course, if the extrinsic incentive replaced the intrinsic motivation that children had to eat healthily before the intervention, then after the prizes are removed we may see a decrease in the amount of healthy items chosen and consumed. Therefore, to see if there is a lasting effect (positive or negative) of the two schemes we examine choice and consumption of fruits and vegetables in the week immediately following the intervention and six months later.

4. Results

4.1 Summary Statistics

We begin by comparing our treatment and control schools in the baseline period. The upper half of Table 1 presents the means of the outcome variables and other covariates

[21]See Dillon and Lane (1989) for an evaluation of the differences between offering and serving a fruit or vegetable and Just and Price (2013a) for the effect of requiring schools to serve healthy items.

[22]There is some evidence that dietary habits appear to form in childhood and track into adulthood. See Kelder et. al. (1994), Resnicow et. al. (1998), and Singer et. al. (1995) for discussions.

by control and both treatment groups. The final three columns show the p-values for differences between the treatments and control and between the two treatments. The p-value were calculated, to account for intra-school correlation, by regressing each baseline variable on one of the treatment indicators, and clustering the standard errors at the school level. We have 31 schools in our sample but, when looking at sub-samples, our analysis may contain less than 30 schools. Therefore, the standard clustering methods might not be appropriate. To deal with this we correct for the potential clustering problems using the the Cameron, Gelbach, and Miller (2008) wild bootstrap method with 1000 replications. The p-values shown in Table 1 are based on this cluster correction method, though, in this case, the standard clustering method gives nearly identical results.

The upper half of Table 1 shows that, for the whole sample, there are no statistically significant differences between the control group and either treatment group. We do have one significant difference when we compare the two treatments but that is far less than the seven at the 10% level we would randomly expect from conducting the 69 tests in this panel. This suggests that, based on observables, the randomization worked as expected. Furthermore, even though they are insignificant, the size of the differences (in most cases) is less than one standard deviation, suggesting that the control and treatment groups are close to being observationally equivalent in the baseline.

The lower part of the Table 1 shows the summary statistics for the sample of pupils who chose a healthy item at lunch less than 100% of the time in the baseline week. This group is of interest because they are the ones who were most able to change their behaviour due to the treatment, as opposed to those who already chose a fruit or vegetable every day. Of the 69 tests presented in this panel we only find four significant differences at the 10% level; again, this is far below the seven significant differences one would expect to occur randomly. Furthermore, as with the whole sample, the size of the differences are generally less than one standard deviation suggesting that, again, the control and treatment groups are close to being observationally equivalent in the baseline.

4.2 Descriptive Figures

We will examine the effects of the incentive schemes on both choice and consumption. The "choice" variable is a dummy equal to one if a student choose a fruit or vegetable on a given day. To get at consumption we will use a "try" variable which will equal one if the student eats at least some of a fruit or vegetable on that day.[23] Since the incentive was

[23]We also examined the intensity of consumption by looking at whether students ate more than half their fruit or vegetable. The results are broadly similar to our findings with 'try' and there is the possibility of subjectivity due to lunch monitors judging what is more than half. Therefore, we include

based on the total amount of healthy choices made in a week, we provide a descriptive overview of the weekly mean outcomes for choice and consumption in Figures 1 and 2.

Figure 1 shows the effect of our treatments on choosing a healthy item. Panel (a) shows the full sample. During the baseline, students in control and treatment schools were choosing a healthy item with their lunch, roughly, 83% of the time. In the individual incentive scheme, to earn a small prize at the end of the week a student would have to choose a healthy item four times, 80% of the time. Therefore, on average, students already qualified for a prize in the individual incentive scheme. However, with the introduction of the incentives in week one, students in both treatments began to choose significantly more healthy items. Over time, though, the control group improves their eating habits and catches up to the treatment groups. In panel (b) of Figure 1 we see the effect of the treatment on students who did not choose healthy items 100% of the time in baseline, those with room to improve their behaviour. During baseline there is no difference in behaviour for students between the treatments or the control. In week one students who received an incentive choose healthy items more but the control group catches up quicker in this sample. Overall, this figure shows that students would gradually begin to make healthier choices after returning from a mid-term break, since the intervention started after the autumn holiday, but that the intervention can speed the return to healthier behaviour by getting students to make better choices immediately upon return to school.

Figure 2 shows the effect of the treatments on trying a healthy item. In panel (a) we again see the full sample. In the baseline there is no significant differences between the treatment and the control (refer to Table 1). The control group is much slower to improve their consumption of healthy items upon returning to school in comparison to choosing a healthy item; they only show a small increase in week three that seems to persist in week four and the week after the treatment. However the treatments have an immediate and significant effect: students increase their consumption of healthy items by, roughly, 12%. After two weeks, though, the effect of the individual incentive appears to dissipate while the effect of the competition stays constant. Panel (b) shows the effects for the sample that did not choose healthy items 100% of the time in the baseline. Here we see roughly the same results as we did with choice. The interventions increase consumption immediately but the control group catches up quicker than in the overall sample. Here, though, competition may be working better and still having an effect in the last two weeks of the experiment. Overall, this figure shows that students are much less likely to improve their consumption of healthy items when returning from a mid-term break and

those results in the appendix for the interested reader that at least the competitive incentive scheme can have a positive and consistent effect in increasing consumption of healthy items.

4.3 Short and Medium Term Effects

We begin by reporting the average treatment effects for the main outcome variables of interest: *choice* and *try*. We discuss the results for the short-term (while the intervention is taking place) and the medium term (the week immediately after the intervention finishes). Our primary estimation method is a linear probability model (LPM) with student fixed effects (FE). This technique allows us to examine within-subject treatment effects and the comparison to the control group allows us to control for any day and week effects that might be present over the course of our field experiment.

Since the randomization was conducted at the school level it is important to cluster standard errors by school. In the overall sample, when we do not look at subgroups, we have 31 schools so standard clustering methods are possible. However, when we look at subgroups, especially age, the number of schools in our sample may drop below 30.[24] Therefore, standard clustering methods might not be appropriate. To calculate appropriate standard errors we use the Cameron, Gelbach, and Miller (2008) wild bootstrap method. In all of our result tables we report both the standard errors clustered at the school level using standard methods and the p-value from the wild bootstrap. There are very few instances where the results are different.

The dependent variable in our regressions is bounded upwards (at 1); children who choose and consumed a fruit or vegetable every day at baseline have an outcome variable equal to one and no improvement is possible for this group. Therefore, we estimate the LPM with student FE on the whole sample and on the sample of children who are not bounded upwards in their response, i.e. those who did not have a mean outcome equal to one in the baseline (referred to later as "Less than 100%" group). We are particularly interested in the latter group because those who are not choosing or consuming a fruit or vegetable every day is the subgroup that could most benefit from the intervention - they could be encouraged to make healthier choices.

Average treatment effects on choice

We start with the results on the whole sample in Table 2, including children who were already at the upper bound in week 1. We find little effects of either incentive scheme

[24]Some schools did not have both year two and year five or would only let one of the years participate in the field experiment.

on choice overall (Column [1]). The point estimates for competition and the individual incentive are positive but small and imprecisely estimated. When we break the sample up by gender and whether a student qualified for a free school meal (FSM)[25] we also find no significant effect: columns [2] and [3] split the sample by gender; columns [4] and [5] by FSM. However when we look at the results by age in columns [6] and [7] we find significant results. Column [6] shows that younger children, those in year two, respond negatively to the individual incentive: students *decrease* their choice of healthy items by 8% at lunchtime. Furthermore, in the week immediately after the incentive is taken away, younger students continue to choose less healthy items. This significantly negative effect does not show up in the overall effect because the older students, those in year five, respond positively to the individual incentive: they choose healthy items 16% more often than the control group.

Table 2A allows us to test whether the estimates of the effects in Table 2 are significantly different by gender, FSM status, and age. As would be expected, when we examine if the estimates for the individual incentives in column [6] are equal to those in column [7] we find that they are significantly different; older students respond more positively to the individual incentive than younger students. The comparisons by gender and FSM status, though, show no significant difference. Therefore, Tables 2 and 2A show us that the overall average treatment effect of the individual incentive on choice is masking a significant heterogeneous effect by age.

Table 2 also allows us to examine if there are differential responses to the treatment type. At the bottom of Table 2 we present the p-values for whether the estimated effect from competition equals that of the individual incentive. We find that for two groups - poorer students and younger students - the competitive incentive works better: students who qualify for FSM and those in Year 2 choose more healthy items in the competitive setting. These results carry over to the medium term as well. This suggests competition may be more effective at getting students to choose healthier items than an individual based incentive scheme.

When we consider the restricted sample - those who did not choose a fruit or vegetable every day during the baseline and, thus, have room to improve their nutritional habits - in Table 3 we find large positive and significant effects for competition in both the short and medium term but small and imprecise estimates for the individual incentive scheme. Column [1] shows that the competition increased the probability of choosing a healthy

[25]Students from poorer households qualify for free school meals. Therefore, to examine the effect of the treatment on children from poorer socio-economic backgrounds, we break the sample into students who qualify for FSM and those that do not.

item by 17.5 percentage points and we find evidence that the effect was sustained to some extent in week 6, immediately after the incentive is removed, although the size of the effect is halved to 9.6 percentage points. This means that the competition, roughly, led to students choosing one more healthy item per week during the intervention and one more healthy item every two weeks even after the intervention finished. The results for the individual incentive are positive but not significant in the short term.

Looking at subgroups we find that competition significantly increased the likelihood of consuming healthy items for nearly everyone (the point estimate for females is large but not significant). However, the effect of the individual incentive is mixed; there is evidence males responded positively to the incentive but we again have that younger children responded negatively and older children responded positively. Therefore, we observe the same pattern for choice with this sample as we did with the whole sample: there is a stark heterogeneous effect of the individual incentive by age. However, in this case we have the fact that the negative effect on younger children carries over into the medium term. The significance of the heterogeneous effect by age is shown in Table 3A.

When we compare the two treatments, looking at the results at the bottom of Table 3, we find that females and younger students responded significantly more positively to the competition than then the individual incentive.

These results suggest that competition is working well on incentivising students who have room to improve their choice of healthier items at lunchtime. While, even for students with poorer diets, the individual incentive is causing some groups to choose healthy items less often. Furthermore the positive effect of competition seems to have a lasting effect at least into the medium term by causing males and younger students (two key groups) along with non-FSM students to choose healthier items even after the incentive has been removed.

Average treatment effects on trying

We now examine our consumption variable that we call "trying" which equals one if a child ate at least part of a portion of the fruit or vegetable at lunchtime.[26] We do not condition the consumption variable or the regressions on whether a student choose a healthy item. Therefore the estimates in the tables below show the causal effect of the incentives on the probability that any given student tries a fruit or vegetable in the short and medium term.

Table 4 shows the effects on the overall sample, including those at the upper bound at

[26]We also monitored whether the children at more than half the portion they were served. We report these in Tables B1 and B2, the results are very similar to what we report for trying.

baseline. Focusing first on the short term effects, we find that the competitive incentive scheme increases trying by 11.2 percentage points during the intervention (Column [1]). We find no evidence of positive effects for the individual incentive scheme. Splitting by gender and FSM status (columns [2]-[5]) gives a similar picture as the one observed with choice: we find positive significant effects for the competitive scheme for all groups except, somewhat notably, males and we do not find significant effects for the individual incentive scheme. Similarly, when breaking the sample by age, we find positive effects of the competitive scheme on both subgroups, albeit somewhat imprecisely estimated. However, for the individual incentive, there are stark differences in the response by age. Table 4A shows that the differences we find by age are significant for the individual incentive. We estimate an increase of around 20 percentage points for the Year 5 children and a decrease of about 7 percentage points for the Year 2 children. These results provide evidence for Hypothesis 2, but the hypothesis is strongly rejected for young children. We find little evidence of persistence in week 6, except for girls and Year 2 children in the competition treatment as well as for Year 2 children in the individual incentive treatment (the latter being an adverse effect). There is evidence that the competitive incentive led to a significantly more positive response, both during the period when the incentive was in place and when the week after it was removed, among females, FSM students, and the younger children.

Table 5 shows the effects on trying when we restrict the sample (excluding those bounded upwards in terms of *choice* behaviour). The results are much larger but similar in nature to the results reported in Table 4. We find an overall significant increase of 21 percentage points due to the competition intervention and no significant effects of the individual incentive in the overall sample. Again, the imprecisely estimated positive effect of the individual incentive masks strong differences in response between younger and older children, with younger children responding negatively and older children responding positively. These differential effects by age are significant as seen in Table 5A. While the differences by age for competition are not significantly different.

We find stronger evidence of persistence once the incentive is removed, at least for the competitive incentive. Except for girls and Year 5 children, all effects are positive and significant. They are also quite large in magnitude: overall, the probability of trying a fruit or vegetable at lunch has increased by 14 percentage points in week 6 for children in the competition treatment. In contrast, the only persistent effect we find with the individual incentive is the adverse negative effect on Year 2 children. Comparing the two treatments we again find that female and younger students respond more to the competitive incentive scheme, both during the incentive period and once it had been taken away. This means that the competitive scheme, on average, caused children to choose and try more than one additional fruit or vegetable per week both during and after the treatment.

These results provide stark evidence regarding the three hypotheses by incentive scheme. There is weak and imprecise evidence that the individual incentive increases choice and consumption of healthy items (Hypotheses 1 and 2). The only significant evidence with regards to the individual incentive regarding Hypothesis 3 (the effect after the incentive is removed) is that the individual effect appears to have a lasting negative effect on younger children. Indeed the overall imprecise positive effect of the individual incentive masks the differential effect that the individual incentive has by age. However, there is a strong positive evidence that the competitive incentive encourages all students to choose and consume healthy items (Hypotheses 1 and 2) and that, for most groups, those effects are present when the incentive is removed (Hypothesis 3). Furthermore males and FSM students do respond positively to the competitive scheme (unlike under other interventions) while females, FSM students, and Year 2 students also generally respond better to the competitive scheme than the individual incentive.

Cost Effectiveness

To understand the implication of these results and what they mean for policy makers we now want to look at the costs of getting a student to try an additional healthy item under each scheme. Furthermore we compare the results to one other commonly used intervention to understand how each scheme compare to currently implemented programs.

The prizes for both schemes cost, in total, £3,727 and we had 413 students in the treatment schools. That means we spent £9 per student over the course of the intervention. When looking at the individual incentive for our group of interest (the less than 100% group) we find that, during the intervention, students increased the likelihood of trying a fruit or vegetable by 7 percentage points, though, this was imprecisely measured, and there were no medium term effects. That means that, over the first five weeks of our experiment (including medium term), students ate 1.5 more healthy items because of the intervention or, that it cost, roughly, £6 to get a student to eat an additional fruit or vegetable.

The competition scheme was more effective than the individual scheme; it increased the likelihood that, for our group of interest, the probability of trying a healthy item increased by 21 percentage points during the intervention and by 14 percentage points immediately after the incentive was removed. Thus, for the first five weeks of our experiment students ate 5 additional healthy items. That means it cost £1.8 to get a student to eat an additional healthy item. Looking at the overall sample, competition increased trying by 11 percentage points during the intervention period and 7 percentage points during the medium term. That means that, with the competition scheme, it costs £3.5 to get an average student (not just one from our group of interest) to eat an additional fruit or vegetable.

Are these costs large or small? To determine this we compare the results to the "Food Dudes" intervention that has been implemented in many countries (e.g. the UK, Ireland, Italy, and the USA). There have been many experimental studies done showing the effectiveness of the program but we will focus on the Horne et. al. (2009) study from Ireland because Ireland is one of the few countries to have released cost data. In Ireland the Food Dudes program had two main parts: (1) during an intervention period of four weeks schools provided fruits and vegetables[27] and showed six minute videos[28] of 'Food Dudes' eating and extolling the virtues of fruit and vegetables to save the world from the 'Junk Punks;' (2) prizes and 'Food Dude' lunchboxes were provided for bringing in and eating fruits and vegetables. The prizes were given out throughout the school year. According to the Irish government[29] implementing the programme for 60,000 children would cost €658,000 for the prizes and €503,550 for the fruit and vegetables or, roughly, €20 per student.

Horne et. al. (2009) find that during the intervention period (when food was being provided) students consumed, roughly 22 grams more of fruits and vegetables per week. Using the NHS living well proportion of 40g as a measure, this means that, over the nine month school year, students would have consumed nearly 9.7 more fruits and vegetables or that it costs at least £1.9 per additional fruit or vegetable consumed. This is a lower bound as these costs do not include licensing, organizational costs, etc. Indeed the Irish government puts the cost of the whole program for 60,000 students at over €2 million; nearly double the costs we are considering here. Therefore the upper bound on costs is £3.8 per additional fruit or vegetable consumed.

What does this comparison tell us? It shows that our competitive scheme has the potential to be as cost effective as a commonly used, multifaceted, individual incentive scheme that had to be augmented by videos, food provision, and teachers taking time to discuss the goals of the programme.[30] Indeed, this implies, that augmenting the com-

[27]In Ireland, generally, there is no provision of food by schools. Students are expected to bring in a packed lunch.

[28]See http://www.fooddudes.co.uk for examples of the videos.

[29]See "Strategy for School Fruit Scheme" submitted by Ireland for the 2012/2013 school year.

[30]While our 'trying' variable does not equate to the actual eating of fruits and vegetables as examined

petitive scheme with the same additions that the 'Food Dudes' programme uses with its individual incentive could have even larger results and be more cost effective.

4.4 Choice and Consumption Dynamics

Having established that there are differences in the effectiveness of the incentive schemes we now move onto explain why it might be the case the competitive scheme appears to work better in comparison to individual incentive scheme. In this section we will analyse the dynamics of choice and consumption throughout the week and as such we exclude the post incentive period. In particular we will look at if there are different dynamics during the intervention based on the two types of treatments.

First when looking at choice, the children who were most responsive to the treatments were those who had not chosen a fruit or vegetable 100% of the time during the baseline. Column [1] in Table 6 shows the effect for that sample of children.[31]

We find that competition had a large and significant effect on choice during treatment weeks; children assigned to the competition group were 17 percentage points more likely to choose a fruit or vegetable. There was a large imprecisely estimated effect due to individual incentive. Columns [2]-[6] show the effect of the treatments for each day of the week. The effect of the competitive scheme started off very strong at the beginning of the week; on Mondays and Tuesdays children were 24 and 25 percentage points, respectively, more likely to choose a fruit or vegetable. As the week went on the effect dissipated, though; the point estimate decreased from 18 percentage points on Wednesday to 6 percentage points on Friday (the latter estimate not being significant). The individual incentive had the opposite effect; children were more likely to choose their fruit or vegetable at the end of the week. The only significant increase in choice due to the individual incentive treatment took place on Friday when children were 27 percentage points more likely to choose a fruit or vegetable.

In the competitive scheme children did not know how many fruit or vegetables they would have to choose to get a prize at the end of the week; if they choose five fruit or vegetables, though, they were guaranteed a prize. Since children did not know who was in their group and some children did not choose a fruit or vegetable every day, a student could assign a subjective probability to winning given how many items she had chosen

by Horne et. al. (2009) our 'eating more than half' results are likely to be comparable. Those results would predict the same cost effectiveness as looking at 'trying' (refer to tables B1 and B2 in the appendix).

[31]There was no effect - either positive or negative - on the sample of children that had chosen a healthy item 100% of the time during the baseline week. The effect on all children is just a weighted average of these two groups.

during the week.[32] Based on a student's subjective probability one could calculate the number of fruit or vegetables that a student would ideally want to consume each week to maximise her benefit from getting a prize subject to her disutility from having to choose a fruit or vegetable. Once a student has reached that number of fruit or vegetables she could switch back to her preferred unhealthy item. This type of pattern would explain why the effect of competition tapered off during the week.

In the individual scheme the threshold to obtain the weekly prize was known and fixed. Given the exogenous pre-determined goal a student had to reach there was room for discouragement to take place; if a student had not eaten a fruit or vegetable on Monday and Tuesday then there was zero probability the student would get a prize that week. Besides having no external incentive from Wednesday onwards, a student might also feel discouraged and choose not to select a healthy option. Therefore, to examine this discouragement effect we break the sample into two groups in columns [7] and [8]. Column [7] contains children who had 'missed' the prize as of Wednesday, i.e. they had not chosen a fruit or vegetable on Monday and Tuesday. Column [8] contains those children who had chosen at least one fruit or vegetable before Wednesday. The effect of individual incentive is large and significant for those who still have a chance of getting a prize, i.e. those in column [8]. However, for those that have missed the chance of getting a prize the effect of individual incentive is estimated to be negative, though, it is insignificant. This means that as the week goes on the incentive to choose a fruit or vegetable wears off for those that miss the goal in the individual incentive scheme. However, this is not the case in the competition treatment because there is always a positive probability of winning the prize no matter how many items the student has consumed during the week.[33]

These results speak to the intrinsic incentive differences between the two treatments. The external, known goal in the individual scheme can lead to a lack of incentive because of previous choice patterns. However, there is always a positive chance of winning in the competition treatment because the goal is unknown and endogenous to the system. In the habit formation literature with regards to healthy eating the goals have all been exogenous and known. Therefore, there is room to design rewards like the competitive scheme that can have a greater effect (than an individual scheme) over the same period

[32]In fact there was an increasing probability of winning the prize based on the number of healthy items one chose. There was a small probability (under 5%) chance of winning if a student had chosen zero or one item, a 6.7% chance of winning if a student chose two items, a 21% chance of winning if a student chose three items, and a 39% chance of winning if a student chose 4 items.

[33]Indeed we cannot reject that the point estimates for competition are the same in columns [7] and [8] showing that the choice pattern before Wednesday does not change the effect that the competition treatment has from Wednesday onwards. However we can reject that the point estimates in columns [7] and [8] are the same in the individual incentive scheme.

of time.

The effect of the competitive scheme on consuming at least part of a fruit or vegetable is similar to what we found for choice. Table 7, Columns [2]-[6] shows again a large positive effect of competition that is relatively constant but drops off slightly on Friday. The individual incentive only has a significant effect on Friday, and again when comparing children who missed the chance to win a prize and those who are still eligible (columns [7] and [8]), we find that the individual incentive has a positive significant effect only for the latter group. Also, the point estimate for competition is not significantly different between columns [7] and [8]. This means that previous choice patterns in the week do not effect consumption choices later in the week systematically, unlike for the individual incentive treatment.

Summarising, we find that each incentive scheme is associated with different dynamics of choice and consumption behaviour. The competition works throughout the week, while the individual incentive only has an end-of-the-week effect. This effect is particularly pronounced for children who still have the chance to win a prize, while it is basically zero for those who know they have already forgone the chance to win a prize by Wednesday. These differences is choice and consumption are, thus, likely due to the way the goals are defined; the known constant goal of the individual incentive causing discouragement and the unknown endogenous goal of the competitive treatment providing at least some positive incentive to choose a healthy item every day.

4.5 Long term effects

To evaluate whether the effects we find lead to permanent changes in habits, we contacted the schools again 6 months later and asked them to conduct an additional week of monitoring; 21 out of the 31 schools agreed to conduct an additional week of monitoring.[34] To get at the longer run effects we redid the analysis presented in the section 4.3 on that selected sample only. In creating those tables we included an additional interaction term of the treatment with an indicator denoting 6 months later. For brevity, in Tables 8 (choice) and 9 (trying), we only present this additional interaction term. In both tables panel A shows is for the overall sample and panel B is for the restricted sample.

[34] To be sure that the sample used for the long-term analysis is not a positively selected sample (of schools that have had a positive experience with the incentive schemes in particular) we ran the previous analysis on the subset of 21 schools to check the selection. The results are very similar in nature to the ones found with the whole sample (Tables 2 - 5), so we are confident that the long-term results are not driven by selection. We also recreated the descriptive table, Table 1, and found similar results, i.e. no significant differences between treatments and control or the treatments. The results are not reported here but are available upon request.

We find little evidence of any persistence 6 months later on the overall sample or in the restricted sample. In Table 8 for choice, the largest positive point estimates for both samples occur for the free school meal registered pupils in the competition scheme (column [4]). However, this is a small group and the estimates are imprecise. We do not find any significant differences across groups and only one significant difference across treatments; the wild p-value is not significant for any estimate, though. Turning to trying in Table 9, again the largest point estimates we find are for the free school registered group, but again they imprecisely estimated. We do find a significant difference for the overall sample (Panel A) between the treatments for the year 5 pupils. With the individual incentive scheme having a larger effect than in the long run than the competitive scheme. We also find a significant estimate for FSM students in the less than 100% group for the individual incentive scheme. However, given the wild p-value for the estimate is 0.651 and that the individual incentive scheme never had a significant effect or a positive point estimate above 0.027 for FSM students in the previous analysis, this estimate does not provide any strong evidence for a longer term effect. Overall, we find little, if any, evidence for long run effects as a result of either of the treatments. This means there is little evidence for Hypothesis 3 with regards to the longer term.

4.6 Learning: Food Knowledge

One question is whether the intervention triggered a response only through the incentives, or also through learning. It could be that the intervention taught children that fruit and vegetables are healthy and that they respond to that information rather than the incentives. We are able to test for this possibility by comparing the results on a knowledge test that was conducted just before and at the end of the intervention. The test shows pictures of seven food items, including three or four fruit or vegetables and unhealthy items (such as sweets, chips, ice cream, crisps, fish fingers). On the test children were asked to identify what the item was and whether the item was healthy or not (see Figure A2 for an example). On average, we find that children described 92% items correctly as healthy or not and were able to identify 83% of the items correctly before the intervention.

We estimate a simple linear model with the change in the test score of identifying items correctly as the dependent variable and include indicators for the two treatment groups. The results are presented in Table 10 for the whole sample and in Table 11 for the sample of children who chose less than 100% in the first week. The effects across group are not consistent and we fail to find evidence that the scores improved more in the treated schools than in the control schools. If anything, we find negative effects for the children in the individual incentive group (restricted sample). We only find a positive significant effect for the Year 5 children in the competition treatment. These results indicate that knowledge was very high before the intervention and that the positive effects we find on choice and trying are not due to improvement in knowledge. Children know very well that fruit and vegetables are healthy and we can safely rule out the hypothesis that the responses to the intervention are driven by learning.

4.7 Effects on other outcomes

An additional exercise we propose is to check whether the interventions affected other relevant outcomes that could partially explain the treatment effects we found. These results are reported in Appendix B.

A first outcome of interest is attendance. One concern could be that the prospect of receiving (or not) a reward may affect attendance rates. We investigate this possibility in Tables B3 and B4. Table B3 reports results for the whole sample, while Table B4 reports results for the less than 100% sample). We do not find any significant effect on attendance overall or by sub-group. We do find positive and significant effects on attendance for males in the individual incentive scheme for the restricted sample. However, in the main results we do not find positive and significant effects of the individual incentive for boys when looking at either choice or try. Thus, these effects appear to be difficult to reconcile with the treatment effects we found. We conclude that changes in attendance rates are unlikely to drive the treatment effects on choice and consumption.

A second outcome that seems worth considering is whether children are more or less likely to bring a packed lunch as a result of the intervention. This would not be a confounding factor though. But it would provide some information regarding how children adjusted to the introduction of the incentive schemes. For example, students may have put pressure on their parents to provide a packed lunch if they do not like the fruits or vegetables on offer at school. Table B5 and B6 report the results. We find no evidence that children were more or less likely to bring a packed lunch overall. In the restricted sample, we find a positive and significant effect for males in the competitive scheme for week 6 but not while the intervention is actually taking place. This means that the treatment effects we find are driven by children changing their behaviour within the meal context they started with (packed lunch or school meal).

5. Conclusion

This paper provides field evidence on how two incentive scheme change how children choose and consume healthy items at lunchtime. We conducted a large scale field experiment in 31 primary schools in England testing for the effects of two different incentive schemes: a competition and an individual incentive scheme. Both schemes lasted 4 weeks and we monitored choice and consumption of healthy items by children made over that period, as well as one week before, one week after and 6 months later.

We find two main results. First, competitive and individual incentives have very different effects and one cannot draw a unique conclusion on whether incentives work or not. The competitive incentive is overall more effective and more robust. Children respond positively to the competition and increase their choice and consumption of fruit and vegetables. The individual incentive, in contrast, has very heterogeneous effects. Older children respond positively, while younger children are affected negatively. Second, we do find evidence that the intervention continues to affect behaviour after the incentives are removed. However, we find little evidence of behaviour change six months later; the effects of the temporary incentive appear to be short lived.

Overall our results show the need to study various forms of incentive schemes as it is not clear that incentives will work in the same way for different subgroups of the population. In particular, an exogenous, know incentive can lead some groups to become discouraged. In terms of policy implications, our findings suggest that the competitive incentive is more effective overall, while the individual incentive can have adverse effects on some subgroups of children. But we also advocate for more research, particularly using field experiments, to investigate in more detail how incentive schemes work and for whom.

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Figures & Tables

Table 1: Summary Statistics Control and Treatment Groups

	Control (C)	Individual (T1)	Comp. (T2)	Ctrl vs Ind C vs T1	Ctrl Vs Comp C vs T2	Comp Vs Ind T1 vs T2
Panel A: All Pupils						
Choice	0.841	0.847	0.821	0.925	0.769	0.713
Try	0.739	0.769	0.72	0.721	0.815	0.599
Eat more than half	0.554	0.618	0.614	0.352	0.571	0.985
Female %	0.513	0.438	0.558	0.188	0.414	0.040
English first language	0.977	0.983	0.931	0.945	0.244	0.152
White British	0.905	0.926	0.805	0.771	0.322	0.254
Year 2	0.5	0.537	0.619	0.835	0.286	0.647
Free School Meal %	0.206	0.197	0.154	0.901	0.406	0.515
School Dinner %	0.52	0.453	0.479	0.539	0.699	0.795
Packed Lunch %	0.479	0.547	0.521	0.531	0.671	0.795
Special dietary requirements %	0.053	0.097	0.128	0.162	0.132	0.699
Specific health cond. %	0.144	0.167	0.161	0.561	0.585	0.887
Ofsted overall score	2.066	1.875	2.206	0.418	0.569	0.244
Ofsted health score	1.396	1.536	1.424	0.633	0.971	0.667
Per pupil expenditure	4097	4126	3816	0.941	0.370	0.280
Catering costs	112.1	94.1	62.6	0.573	0.236	0.336
Food for life status	0.205	0.395	0.173	0.364	0.815	0.292
Headcount girls	106.4	122.1	122.8	0.667	0.362	0.979
Headcount boys	114.3	138.0	131.2	0.625	0.358	0.875
Average point score	0.288	0.28	0.283	0.144	0.272	0.731
Achieving Level 4 or > in Eng/Maths	0.815	0.789	0.751	0.607	0.200	0.571
Persistent Absence	0.024	0.017	0.021	0.671	0.831	0.693
Absence	0.054	0.051	0.054	0.569	0.959	0.677
Panel B: Restricted sample (Chose less than 100% Choice in baseline week)						
Choice	0.545	0.515	0.477	0.735	0.464	0.639
Try	0.455	0.458	0.375	0.977	0.388	0.300
Eat more than half	0.329	0.356	0.323	0.715	0.929	0.675
Female	0.396	0.419	0.575	0.769	0.064	0.084
1st Language English	0.961	0.965	0.946	0.889	0.777	0.659
White British	0.854	0.944	0.784	0.262	0.617	0.202
Year 2	0.382	0.303	0.624	0.771	0.048	0.348
Free School Meal %	0.154	0.102	0.162	0.635	0.947	0.533
School Dinner %	0.441	0.371	0.558	0.729	0.452	0.302
Packed Lunch %	0.556	0.629	0.442	0.723	0.456	0.302
Special dietary requirements %	0.028	0.108	0.177	0.104	0.072	0.350
Specific health cond. %	0.179	0.228	0.128	0.625	0.482	0.236
Ofsted overall score	2.169	2.079	2.263	0.613	0.759	0.422
Ofsted health score	1.346	1.485	1.468	0.815	0.749	0.965
Per pupil expenditure	3727	3919	3743	0.282	1.009	0.521
Catering costs	84.2	77.1	40.5	0.823	0.112	0.188

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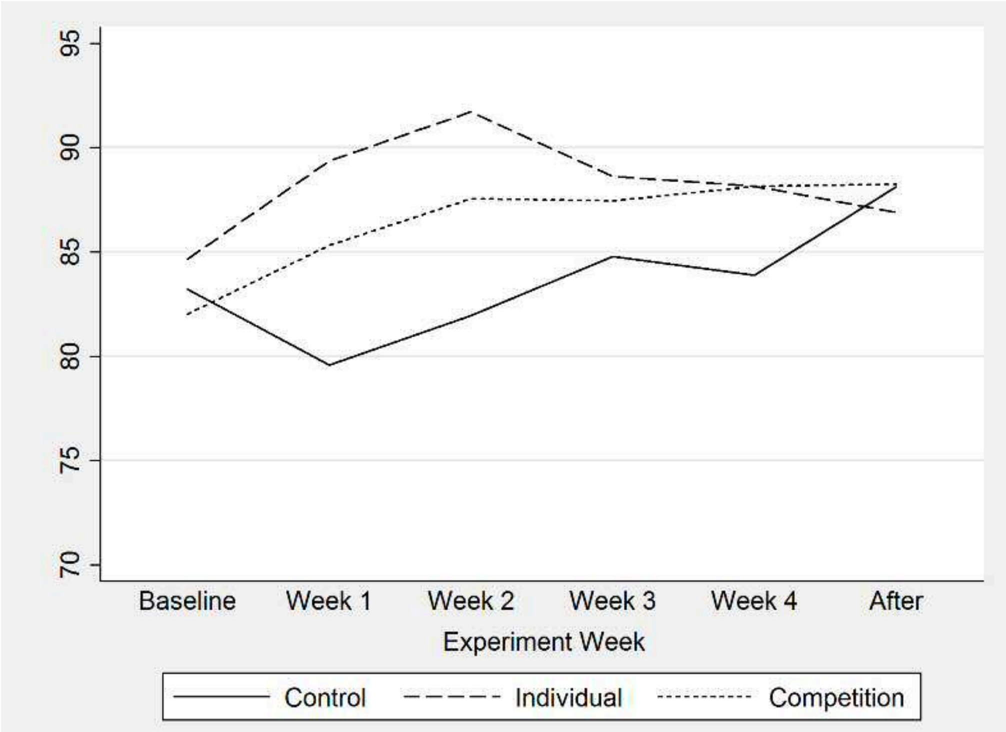
Table 1 – *Continued from previous page*

	Control	Individual	Comp.	Ctrl vs Ind	Ctrl Vs Comp	Comp Vs Ind
	(C)	(T1)	(T2)	C vs T1	C vs T2	T1 vs T2
Food for life status	0.244	0.062	0.124	0.545	0.667	0.675
Headcount girls	111.1	120.0	119.1	0.603	0.671	0.947
Headcount boys	116.3	133.2	127.5	0.434	0.595	0.773
Average point score	0.287	0.289	0.283	0.677	0.306	0.156
Achieving Level 4 or > in Eng/Maths	0.838	0.827	0.752	0.813	0.152	0.138
Persistent Absence	0.017	0.011	0.018	0.667	0.847	0.482
Absence	0.052	0.047	0.053	0.539	0.915	0.490

notes: All variables are evaluated for the first week, before the start of the treatment. The first column shows the means for the pupils in the control school in the, the second column for schools in the individual incentive scheme and the third column in the competition schools. The fourth and fifth columns show the p-value difference in the means of each treatment compared to the control group. The p-value were calculated, to account for intra-school correlation, by regressing each baseline variable on one of the treatment indicators, standard errors are clustered at the school level and due to the small number clusters we present wild bootstrapped p-values using 1000 replications which are estimated following Cameron, Gelbach, Miller (2008), the p-value is matched to the t-statistic on the treatment dummy.

Figure 1: Proportion of students choosing a healthy item

a) Full Sample



a) Sample with less than 100% Choice in Baseline

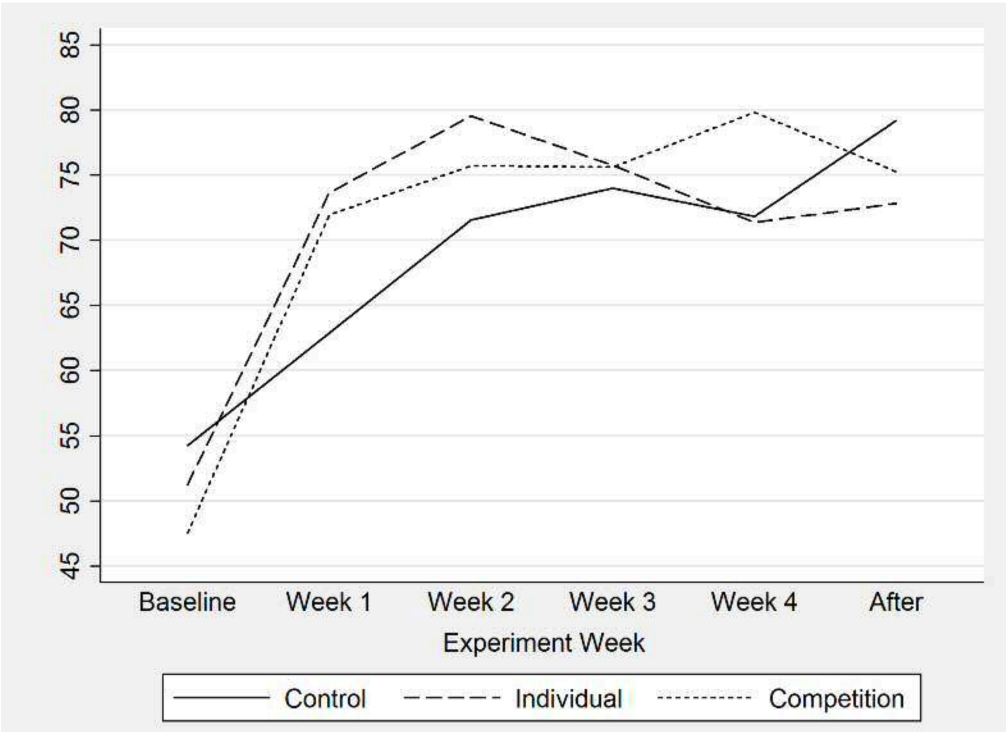
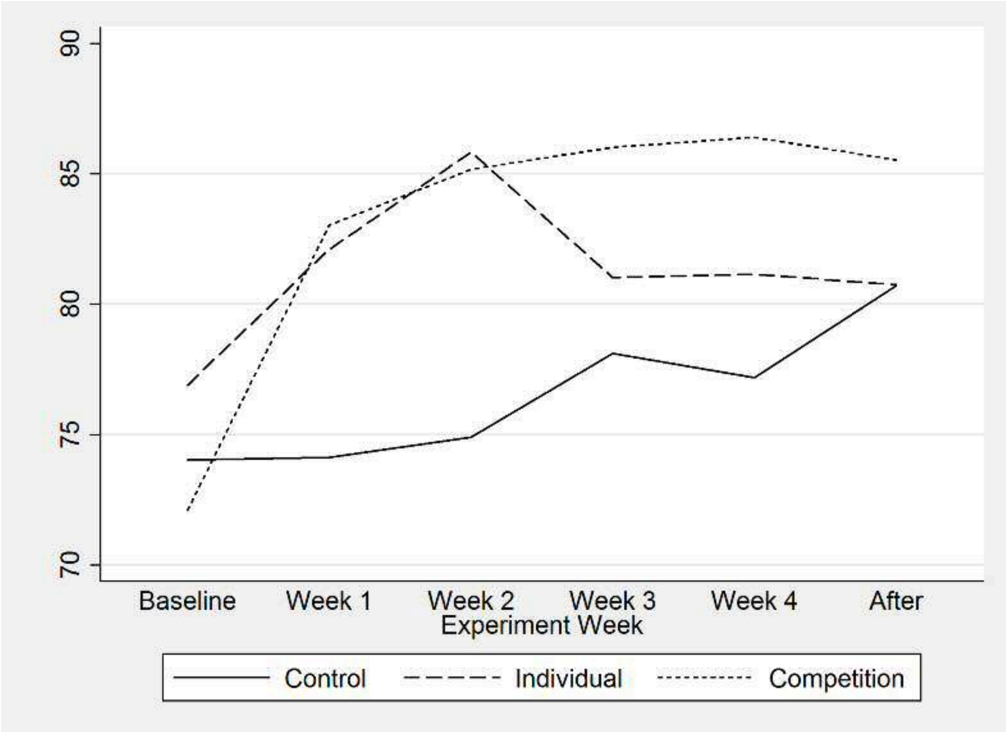


Figure 2: Proportion of students trying a healthy item

a) Full Sample



a) Sample with less than 100% Choice in Baseline

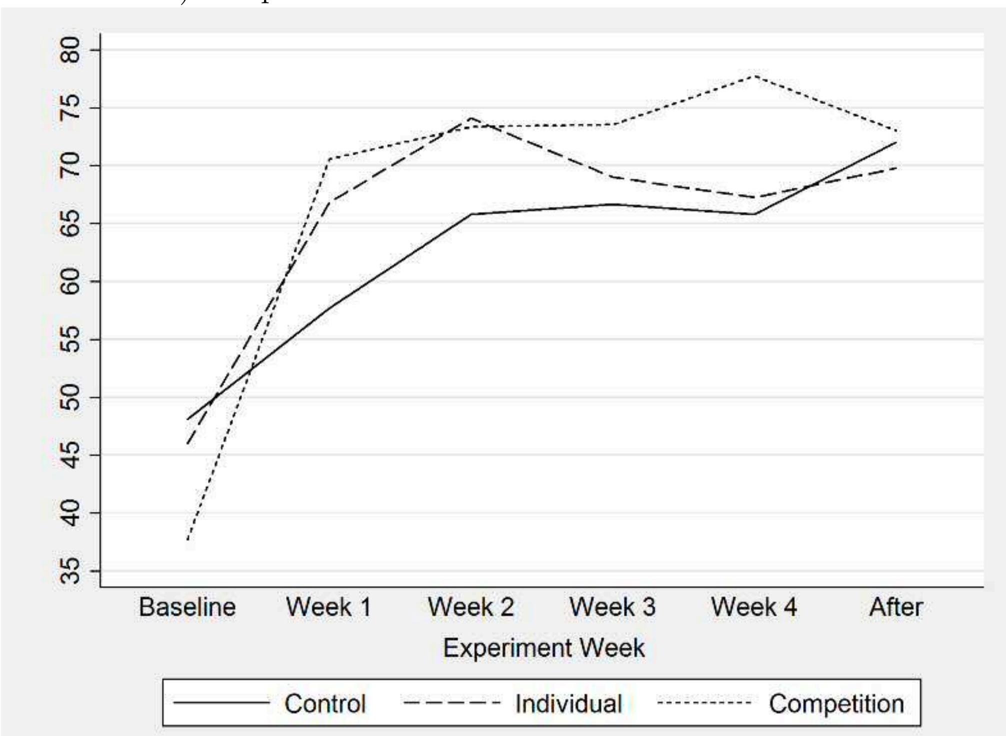


Table 2: Effect on Choice for Overall Sample and Its Subgroups

	Dependent Variable (=1) if Student Chose a Healthy Item						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1) * Week 2-5	0.045	0.059	0.026	0.071	0.045	0.057	0.023
	(0.031)	(0.036)	(0.049)	(0.065)	(0.032)	(0.043)	(0.048)
	[0.180]	[0.144]	[0.739]	[0.352]	[0.164]	[0.246]	[0.667]
Competition (=1) * Week 6	0.001	0.027	-0.030	0.002	0.003	0.040	-0.051
	(0.034)	(0.044)	(0.029)	(0.100)	(0.029)	(0.033)	(0.065)
	[0.955]	[0.595]	[0.390]	[1.00]	[0.889]	[0.294]	[0.492]
Individual Incentive (=1) * Week 2-5	0.024	0.010	0.037	-0.033	0.033	-0.066**	0.126*
	(0.050)	(0.045)	(0.061)	(0.052)	(0.053)	(0.027)	(0.072)
	[0.659]	[0.863]	[0.549]	[0.537]	[0.515]	[0.034]	[0.236]
Individual Incentive (=1) * Week 6	-0.045	-0.045	-0.051	-0.164	-0.027	-0.122***	0.048
	(0.059)	(0.058)	(0.063)	(0.114)	(0.059)	(0.036)	(0.083)
	[0.567]	[0.450]	[0.486]	[0.166]	[0.701]	[0.004]	[0.641]
Constant	0.821***	0.843***	0.798***	0.838***	0.819***	0.852***	0.788***
	(0.014)	(0.014)	(0.020)	(0.021)	(0.015)	(0.013)	(0.022)
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-Value: Comp = Ind Incentive Week 2-5	0.698	0.278	0.875	***0.088***	0.837	***0.012***	0.198
P-Value: Comp = Ind Incentive Week 2-5 (wild)	0.711	0.276	0.809	0.108	0.859	***0.020***	0.340
P-Value: Comp = Ind Incentive Week 6	0.415	0.218	0.733	***0.071***	0.606	***0.000***	0.273
P-Value: Comp = Ind Incentive Week 6 (wild)	0.396	0.222	0.755	***0.068***	0.627	***0.002***	0.364
Observations	15,338	7,986	7,352	2,664	12,256	8,033	7,305
R-squared	0.007	0.009	0.006	0.021	0.006	0.011	0.014
Number of pupils	638	328	310	114	509	343	295

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008) using 1000 replications. Column [2] includes only female and column [3] contains only males. Column [4] includes only students who are eligible for free school meals (FSM) and column [5] contains those students not eligible for FSM; there are 15 students for whom we are missing FSM status. Column [6] contains only students in Year 2 and column [7] contains only students in Year 5.*

Table 2A: Tests for Differences Between Subgroups			
	Column [2] = [3]	Column [4] = [5]	Column [6] = [7]
Competition (=1) * Week 2-5	0.577	0.686	0.611
Competition (=1) * Week 2-5 (wild-p)	0.595	0.681	0.687
Competition (=1) * Week 6	0.164	0.985	0.216
Competition (=1) * Week 6 (wild-p)	0.186	1.019	0.240
Individual Incentive (=1) * Week 2-5	0.543	0.316	***0.020***
Individual Incentive (=1) * Week 2-5 (wild-p)	0.571	0.316	***0.076***
Individual Incentive (=1) * Week 6	0.871	0.269	***0.067***
Individual Incentive (=1) * Week 6 (wild-p)	0.893	0.322	0.132
First Group in Column Heading	Female	FSM	Year 2
Second Group in Column Heading	Male	Non-FSM	Year 5

notes: The table contains the p-values for the tests of whether the coefficient on the variables in Table 2 for the two columns listed are equal. Wild p-values shown are estimated following Cameron, Gelbrach, Miller (2008) using 1000 replications.

Table 3: Effect on Choice for Sample with Week 1 less than 100% Choice and Its Subgroups

	Dependent Variable (=1) if Student Chose a Healthy Item						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1) * Week 2-5	0.175***	0.108	0.214***	0.256*	0.165***	0.157*	0.160**
	(0.060)	(0.081)	(0.073)	(0.131)	(0.057)	(0.076)	(0.068)
	[0.018]	[0.302]	[0.002]	[0.112]	[0.016]	[0.176]	[0.042]
Competition (=1) * Week 6	0.096**	0.058	0.111**	0.085	0.094**	0.110*	0.060
	(0.043)	(0.064)	(0.053)	(0.152)	(0.037)	(0.057)	(0.068)
	[0.048]	[0.370]	[0.126]	[0.723]	[0.020]	[0.174]	[0.456]
Individual Incentive (=1) * Week 2-5	0.096	-0.014	0.173*	0.027	0.088	-0.194***	0.231***
	(0.080)	(0.095)	(0.095)	(0.188)	(0.071)	(0.068)	(0.076)
	[0.340]	[0.871]	[0.260]	[0.847]	[0.382]	[0.108]	[0.032]
Individual Incentive (=1) * Week 6	-0.035	-0.104	0.010	-0.298	-0.023	-0.389***	0.109
	(0.094)	(0.086)	(0.116)	(0.351)	(0.084)	(0.068)	(0.082)
	[0.687]	[0.200]	[0.961]	[0.727]	[0.765]	[0.000]	[0.212]
Constant	0.517***	0.540***	0.495***	0.459***	0.527***	0.511***	0.523***
	(0.024)	(0.026)	(0.030)	(0.054)	(0.022)	(0.025)	(0.025)
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-Value: Comp = Ind Incentive Week 2-5	0.371	0.170	0.721	0.260	0.348	***0.000***	0.383
P-Value: Comp = Ind Incentive Week 2-5 (wild)	0.428	0.168	0.755	0.490	0.346	***0.014***	0.468
P-Value: Comp = Ind Incentive Week 6	0.191	***0.069***	0.426	0.288	0.189	***0.000***	0.559
P-Value: Comp = Ind Incentive Week 6 (wild)	0.204	***0.050***	0.436	0.639	0.182	***0.000***	0.593
Observations	5,586	2,641	2,945	802	4,587	2,369	3,217
R-squared	0.054	0.067	0.046	0.089	0.047	0.065	0.061
Number of pupils	215	102	113	29	179	93	122

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008) using 1000 replications. Column [2] includes only female and column [3] contains only males. Column [4] includes only students who are eligible for free school meals (FSM) and column [5] contains those students not eligible for FSM; there are 15 students for whom we are missing FSM status. Column [6] contains only students in Year 2 and column [7] contains only students in Year 5.*

Table 3A: Tests for Differences Between Subgroups

	Column [2] = [3]	Column [4] = [5]	Column [6] = [7]
Competition (=1) * Week 2-5	0.240	0.456	0.972
Competition (=1) * Week 2-5 (wild-p)	0.276	0.573	0.911
Competition (=1) * Week 6	0.473	0.951	0.570
Competition (=1) * Week 6 (wild-p)	0.529	0.907	0.637
Individual Incentive (=1) * Week 2-5	***0.072***	0.729	***0.000***
Individual Incentive (=1) * Week 2-5 (wild-p)	0.154	0.733	***0.002***
Individual Incentive (=1) * Week 6	0.205	0.444	***0.000***
Individual Incentive (=1) * Week 6 (wild-p)	0.252	0.611	***0.002***
First Group in Column Heading	Female	FSM	Year 2
Second Group in Column Heading	Male	Non-FSM	Year 5

notes: The table contains the p-values for the tests of whether the coefficient on the variables in Table 2 for the two columns listed are equal. Wild p-values shown are estimated following Cameron, Gelbrach, Miller (2008) using 1000 replications.

Table 4: Effect on Trying for Overall Sample and Its Subgroups

	Dependent Variable (=1) if Student Tried a Healthy Item						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1) * Week 2-5	0.112**	0.142***	0.073	0.195**	0.099**	0.116*	0.105*
	(0.049)	(0.051)	(0.069)	(0.088)	(0.047)	(0.059)	(0.054)
	[0.022]	[0.012]	[0.456]	[0.080]	[0.036]	[0.084]	[0.114]
Competition (=1) * Week 6	0.067	0.099*	0.027	0.156	0.050	0.097*	0.032
	(0.050)	(0.052)	(0.062)	(0.107)	(0.043)	(0.047)	(0.069)
	[0.210]	[0.110]	[0.799]	[0.260]	[0.282]	[0.070]	[0.671]
Individual Incentive (=1) * Week 2-5	0.033	0.021	0.042	-0.024	0.043	-0.073*	0.199***
	(0.058)	(0.053)	(0.077)	(0.080)	(0.059)	(0.041)	(0.066)
	[0.587]	[0.707]	[0.623]	[0.763]	[0.557]	[0.124]	[0.0961]
Individual Incentive (=1) * Week 6	-0.025	-0.025	-0.028	-0.125	-0.012	-0.121**	0.130
	(0.072)	(0.069)	(0.085)	(0.131)	(0.068)	(0.044)	(0.096)
	[0.869]	[0.723]	[0.753]	[0.386]	[0.855]	[0.016]	[0.282]
Constant	0.736***	0.760***	0.711***	0.759***	0.734***	0.769***	0.692***
	(0.019)	(0.018)	(0.026)	(0.028)	(0.019)	(0.017)	(0.022)
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-Value: Comp = Ind Incentive Week 2-5	0.251	***0.041***	0.730	***0.010***	0.418	***0.002***	0.247
wild P-Value: Comp = Ind Incentive Week 2-5	0.286	***0.068***	0.807	***0.020***	0.464	***0.002***	0.378
P-Value: Comp = Ind Incentive Week 6	0.164	***0.054***	0.484	***0.012***	0.323	***0.000***	0.256
wild P-Value: Comp = Ind Incentive Week 6	0.220	***0.080***	0.565	***0.016***	0.326	***0.000***	0.328
Observations	14,714	7,719	6,994	2,495	11,838	7,916	6,798
R-squared	0.012	0.018	0.008	0.026	0.011	0.015	0.023
Number of pupils	638	328	310	114	509	343	295

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008) using 1000 replications. Column [2] includes only female and column [3] contains only males. Column [4] includes only students who are eligible for free school meals (FSM) and column [5] contains those students not eligible for FSM; there are 15 students for whom we are missing FSM status. Column [6] contains only students in Year 2 and column [7] contains only students in Year 5.*

Table 4A: Tests for Differences Between Subgroups

	Column [2] = [3]	Column [4] = [5]	Column [6] = [7]
Competition (=1) * Week 2-5	0.324	0.204	0.831
Competition (=1) * Week 2-5 (wild-p)	0.376	0.284	0.847
Competition (=1) * Week 6	0.229	0.202	0.299
Competition (=1) * Week 6 (wild-p)	0.248	0.316	0.338
Individual Incentive (=1) * Week 2-5	0.745	0.437	***0.001***
Individual Incentive (=1) * Week 2-5 (wild-p)	0.775	0.452	***0.020***
Individual Incentive (=1) * Week 6	0.965	0.364	***0.012***
Individual Incentive (=1) * Week 6 (wild-p)	0.969	0.378	***0.068***
First Group in Column Heading	Female	FSM	Year 2
Second Group in Column Heading	Male	Non-FSM	Year 5

notes: The table contains the p-values for the tests of whether the coefficient on the variables in Table 2 for the two columns listed are equal. Wild p-values shown are estimated following Cameron, Gelbrach, Miller (2008) using 1000 replications.

Table 5: Effect on Try for Sample with Week 1 less than 100% Choice and Its Subgroups

	Dependent Variable (=1) if Student Tried a Healthy Item						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1) * Week 2-5	0.211***	0.158**	0.235**	0.275**	0.198***	0.171*	0.210***
	(0.066)	(0.073)	(0.086)	(0.097)	(0.067)	(0.086)	(0.066)
	[0.002]	[0.072]	[0.008]	[0.050]	[0.004]	[0.094]	[0.002]
Competition (=1) * Week 6	0.141**	0.101	0.154**	0.196**	0.120**	0.170***	0.090
	(0.054)	(0.080)	(0.059)	(0.088)	(0.051)	(0.057)	(0.073)
	[0.002]	[0.220]	[0.042]	[0.058]	[0.022]	[0.008]	[0.260]
Individual Incentive (=1) * Week 2-5	0.074	-0.023	0.140	0.019	0.074	-0.265***	0.245***
	(0.078)	(0.079)	(0.105)	(0.192)	(0.072)	(0.056)	(0.050)
	[0.364]	[0.821]	[0.374]	[0.879]	[0.414]	[0.008]	[0.008]
Individual Incentive (=1) * Week 6	-0.020	-0.081	0.018	-0.140	-0.026	-0.352***	0.123
	(0.095)	(0.091)	(0.119)	(0.322)	(0.091)	(0.057)	(0.081)
	[0.788]	[0.454]	[0.915]	[0.727]	[0.791]	[0.006]	[0.176]
Constant	0.436***	0.458***	0.414***	0.357***	0.449***	0.416***	0.452***
	(0.025)	(0.026)	(0.032)	(0.043)	(0.024)	(0.027)	(0.021)
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-value for Competition=Individual for Wks 2-5	0.167	***0.067***	0.463	0.239	0.192	***0.000***	0.662
wild P-Value: Comp = Ind Incentive Week 2-5	0.188	***0.092***	0.527	0.484	0.206	***0.004***	0.743
P-value for Competition=Individual for Wk 6	0.117	***0.047***	0.301	0.322	0.126	***0.000***	0.715
wild P-Value: Comp = Ind Incentive Week 6	0.134	***0.038***	0.326	0.521	***0.098***	***0.000***	0.779
Observations	5,466	2,583	2,883	799	4,476	2,360	3,106
R-squared	0.066	0.083	0.053	0.107	0.058	0.083	0.070
Number of pupils	215	102	113	29	179	93	122

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008) using 1000 replications. Column [2] includes only female and column [3] contains only males. Column [4] includes only students who are eligible for free school meals (FSM) and column [5] contains those students not eligible for FSM; there are 15 students for whom we are missing FSM status. Column [6] contains only students in Year 2 and column [7] contains only students in Year 5.*

Table 5A: Tests for Differences Between Subgroups

	Column [2] = [3]	Column [4] = [5]	Column [6] = [7]
Competition (=1) * Week 2-5	0.362	0.444	0.608
Competition (=1) * Week 2-5 (wild-p)	0.360	0.468	0.679
Competition (=1) * Week 6	0.528	0.441	0.292
Competition (=1) * Week 6 (wild-p)	0.601	0.513	0.324
Individual Incentive (=1) * Week 2-5	0.139	0.768	***0.000***
Individual Incentive (=1) * Week 2-5 (wild-p)	0.280	0.765	***0.000***
Individual Incentive (=1) * Week 6	0.322	0.727	***0.000***
Individual Incentive (=1) * Week 6 (wild-p)	0.362	0.695	***0.000***
First Group in Column Heading	Female	FSM	Year 2
Second Group in Column Heading	Male	Non-FSM	Year 5

notes: The table contains the p-values for the tests of whether the coefficient on the variables in Table 2 for the two columns listed are equal. Wild p-values shown are estimated following Cameron, Gelbrach, Miller (2008) using 1000 replications.

Table 6: Effects on Choice Over Treatment Weeks on Sample with Week 1 less than 100% Choice

	Dependent Variable (=1) if Student Chose a Healthy Item							
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Competition (=1) * Week 2-5	0.172***	0.243***	0.251*	0.177*	0.151	0.057	0.043	0.112
	(0.061)	(0.047)	(0.135)	(0.100)	(0.113)	(0.097)	(0.085)	(0.093)
	[0.024]	[0.002]	[0.150]	[0.156]	[0.236]	[0.607]	[0.649]	[0.330]
Individual Incentive (=1) * Week 2-5	0.099	0.033	0.056	0.073	0.064	0.266**	-0.044	0.176**
	(0.079)	(0.067)	(0.133)	(0.102)	(0.127)	(0.115)	(0.200)	(0.064)
	[0.336]	[0.643]	[0.785]	[0.557]	[0.663]	[0.254]	[0.799]	[0.162]
Constant	0.477***	0.440***	0.562***	0.587***	0.564***	0.431***	0.327***	0.546***
	(0.018)	(0.027)	(0.041)	(0.033)	(0.042)	(0.039)	(0.050)	(0.038)
Days of the Week Used	Mon-Fri	Mon	Tue	Wed	Thur	Fri	Wed-Fri	Wed-Fri
Sample Used	All	All	All	All	All	All	Missed	Not Missed
Day of Week Controls	Yes	No	No	No	No	No	Yes	Yes
P-Value: Comp = Ind Incentive	0.402	***0.006***	***0.084***	0.368	0.608	0.148	0.664	0.557
P-Value: Comp = Ind Incentive (wild)	0.432	***0.016***	***0.084***	0.384	0.621	0.348	0.677	0.661
Observations	4,745	910	977	952	975	931	876	1,982
R-squared	0.060	0.103	0.049	0.050	0.068	0.092	0.029	0.080
Number of pupils	215	212	214	215	213	213	158	202

*notes: Robust Standard Errors clustered at the school level are in brackets; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008) using 1000 replications. The sample used in this regression are children who did not try at least some of a healthy option 100% of the time during the baseline week. The "Missed" sample in column [7] includes only those children who had not eaten any healthy times on Monday and Tuesday of the given week. The "Not Missed" sample in column [8] includes only those children who had eaten at least one healthy item on Monday or Tuesday during the given week.*

Table 7: Effects on Try Over the Week During Treatment on Sample with Week 1 less than 100% Choice

	Dependent Variable (=1) if Student Chose a Healthy Item							
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Competition (=1) * Week 2-5	0.212***	0.243**	0.241**	0.223	0.224**	0.132	0.120	0.182
	(0.069)	(0.097)	(0.100)	(0.136)	(0.104)	(0.079)	(0.110)	(0.111)
	[0.006]	[0.038]	[0.068]	[0.162]	[0.084]	[0.160]	[0.346]	[0.192]
Individual Incentive (=1) * Week 2-5	0.075	0.006	-0.060	0.047	0.121	0.240*	-0.044	0.185**
	(0.077)	(0.104)	(0.091)	(0.086)	(0.145)	(0.137)	(0.201)	(0.073)
	[0.342]	[0.955]	[0.569]	[0.595]	[0.547]	[0.348]	[0.873]	[0.242]
Constant	0.393***	0.341***	0.460***	0.497***	0.490***	0.392***	0.223***	0.589***
	(0.023)	(0.031)	(0.034)	(0.043)	(0.042)	(0.037)	(0.045)	(0.042)
Days of the Week Used	Mon-Fri	Mon	Tue	Wed	Thur	Fri	Wed-Fri	Wed-Fri
Sample Used	All	All	All	All	All	All	Missed	Not Missed
Day of Week Controls	Yes	No	No	No	No	No	Yes	Yes
P-value for Competition=Individual	0.176	***0.002***	***0.020***	0.241	0.552	0.489	0.435	0.984
P-value for Competition=Individual (wild)	0.204	***0.006***	***0.026***	0.292	0.591	0.595	0.490	1.007
Observations	4,639	884	944	935	956	920	887	1,924
R-squared	0.074	0.128	0.074	0.069	0.080	0.083	0.035	0.081
Number of pupils	215	211	213	215	212	213	157	203

*notes: Robust Standard Errors clustered at the school level are in brackets; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008) using 1000 replications. The sample used in this regression are children who did not try at least some of a healthy option 100% of the time during the baseline week. The "Missed" sample in column [7] includes only those children who had not eaten any healthy times on Monday and Tuesday of the given week. The "Not Missed" sample in column [8] includes only those children who had eaten at least one healthy item on Monday or Tuesday during the given week.*

Table 8: Long Run Effect on Choice for Overall Sample and Its Subgroups

	Dependent Variable (=1) if Student Tried a Healthy Item						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Panel A: Choice							
Competition (=1) * 6 months later	-0.058	-0.018	-0.104	0.045	-0.084*	-0.027	-0.102
	(0.057)	(0.055)	(0.069)	(0.127)	(0.047)	(0.057)	(0.097)
	[0.358]	[0.731]	[0.250]	[0.725]	[0.149]	[0.615]	[0.356]
Individual Incentive (=1) * 6 months later	-0.016	-0.004	-0.035	-0.121	-0.015	-0.081	0.035
	(0.070)	(0.053)	(0.091)	(0.133)	(0.067)	(0.060)	(0.100)
	[0.853]	[0.490]	[0.350]	[0.629]	[0.416]	[0.150]	[1.38]
P-Value: Comp = Ind Incentive 6 Months	0.492	0.806	0.360	***0.0943***	0.298	0.414	0.105
P-Value: Comp = Ind Incentive 6 Months (wild)	0.496	0.851	0.388	0.154	0.374	0.464	0.182
Observations	11,630	6,045	5,585	2,125	9,092	5,575	6,055
R-squared	0.013	0.013	0.015	0.023	0.014	0.012	0.023
Number of pupils	392	204	188	68	311	195	197
Panel B: Choice < 100% Choice in Week 1							
Competition (=1) * 6 months later	0.055	0.089	0.020	0.237	0.009	0.042	0.044
	(0.104)	(0.100)	(0.127)	(0.258)	(0.075)	(0.099)	(0.148)
	[0.629]	[0.394]	[0.923]	[0.432]	[0.903]	[0.677]	[0.775]
Individual Incentive (=1) * 6 months later	0.017	-0.015	0.037	0.078	-0.010	-0.040	0.044
	(0.066)	(0.064)	(0.082)	(0.186)	(0.061)	(0.138)	(0.110)
	[0.853]	[0.913]	[0.749]	[0.593]	[0.987]	[0.787]	[0.793]
P-Value: Comp = Ind Incentive 6 Months	0.695	0.297	0.888	0.402	0.825	0.625	0.996
P-Value: Comp = Ind Incentive 6 Months (wild)	0.753	0.406	0.885	0.424	0.847	0.659	1.027
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
Observations	5,072	2,321	2,751	679	4,197	1,794	3,278
R-squared	0.051	0.058	0.052	0.108	0.044	0.065	0.055
Number of pupils	168	78	90	21	141	62	106

*notes: Robust Standard Errors clustered at the school level are in brackets; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008) using 1000 replications.*

Table 8A: Tests for Differences Between Subgroups

	Column [2] = [3]	Column [4] = [5]	Column [6] = [7]
Competition (=1) * 6 months later	0.152	0.223	0.490
Competition (=1) * 6 months later (wild-p)	0.206	0.282	0.484
Individual Incentive (=1) * 6 months later	0.601	0.406	0.332
Individual Incentive (=1) * 6 months later (wild-p)	0.587	0.478	0.448
First Group in Column Heading	Female	FSM	Year 2
Second Group in Column Heading	Male	Non-FSM	Year 5

notes: The table contains the p-values for the tests of whether the coefficient on the variables in Table 2 for the two columns listed are equal. Wild p-values shown are estimated following Cameron, Gelbrach, Miller (2008).

Table 9: Long Run Effect on Try for Overall Sample and Its Subgroups

	Dependent Variable (=1) if Student Tried a Healthy Item						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Panel A: Try							
Competition (=1) * 6 months later	-0.030	-0.009	-0.057	0.142	-0.072	-0.038	-0.022
	(0.079)	(0.059)	(0.113)	(0.151)	(0.061)	(0.067)	(0.107)
	[0.697]	[0.827]	[0.649]	[0.370]	[0.354]	[0.639]	[0.885]
Individual Incentive (=1) * 6 months later	-0.019	-0.017	-0.023	-0.023	-0.049	-0.118	0.099
	(0.092)	(0.067)	(0.127)	(0.172)	(0.080)	(0.076)	(0.111)
	[0.819]	[0.366]	[0.551]	[0.905]	[0.358]	[0.126]	[1.089]
P-Value: Comp = Ind Incentive 6 Months	0.867	0.899	0.679	0.162	0.727	0.244	***0.006***
P-Value: Comp = Ind Incentive 6 Months (wild)	0.875	0.911	0.681	0.168	0.759	0.304	***0.010***
Observations	11,021	5,796	5,224	1,974	8,673	5,504	5,517
R-squared	0.016	0.018	0.013	0.018	0.019	0.012	0.033
Number of pupils	392	204	188	68	311	195	197
Panel B: Try and <100% choice in baseline week							
Competition (=1) * 6 months later	0.029	0.020	0.035	0.159	-0.010	-0.006	0.036
	(0.110)	(0.108)	(0.129)	(0.175)	(0.091)	(0.106)	(0.157)
	[0.779]	[0.829]	[0.827]	[0.434]	[0.903]	[0.981]	[0.829]
Individual Incentive (=1) * 6 months later	-0.030	-0.060	-0.015	0.119*	-0.060	-0.130	0.023
	(0.074)	(0.080)	(0.086)	(0.061)	(0.081)	(0.125)	(0.113)
	[0.817]	[0.607]	[0.889]	[0.651]	[0.585]	[0.432]	[0.873]
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-Value: Comp = Ind Incentive 6 Months	0.547	0.412	0.693	0.809	0.582	0.406	0.907
P-Value: Comp = Ind Incentive 6 Months (wild)	0.523	0.513	0.711	0.817	0.581	0.468	0.913
Observations	4,944	2,258	2,686	678	4,076	1,793	3,151
R-squared	0.057	0.066	0.052	0.110	0.051	0.070	0.062
Number of pupils	168	78	90	21	141	62	106

*notes: Robust Standard Errors clustered at the school level are in brackets; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008) using 1000 replications.*

Table 9A: Tests for Differences Between Subgroups

	Column [2] = [3]	Column [4] = [5]	Column [6] = [7]
Competition (=1) * 6 months later	0.581	***0.044***	0.865
Competition (=1) * 6 months later (wild-p)	0.631	0.144	0.887
Individual Incentive (=1) * 6 months later	0.940	0.843	***0.053***
Individual Incentive (=1) * 6 months later (wild-p)	0.927	0.859	0.112
First Group in Column Heading	Female	FSM	Year 2
Second Group in Column Heading	Male	Non-FSM	Year 5

notes: The table contains the p-values for the tests of whether the coefficent on the variables in Table 2 for the two columns listed are equal. Wild p-values shown are estimated following Cameron, Gelbrach, Miller (2008) using 1000 replications

Table 10: Food Knowledge

	Dependent Variable: Change in Food knowledge Test Score						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1)	-0.041	-0.047	-0.035	-0.115**	-0.025	-0.059	-0.019
	(0.031)	(0.040)	(0.051)	(0.052)	(0.034)	(0.048)	(0.028)
	[0.230]	[0.256]	[0.589]	[0.076]	[0.521]	[0.204]	[0.551]
Individual Incentive (=1)	-0.018	-0.045	-0.005	0.005	-0.017	0.015	-0.048
	(0.041)	(0.053)	(0.057)	(0.061)	(0.041)	(0.062)	(0.043)
	[0.739]	[0.442]	[0.959]	[0.875]	[0.663]	[0.851]	[0.374]
Constant	0.045	0.038	0.055	0.109***	0.028	0.049	0.039
	(0.026)	(0.033)	(0.048)	(0.030)	(0.029)	(0.037)	(0.027)
1st Test Score	0.827	0.852	0.798	0.754	0.843	0.806	0.853
Mean of Dependent Variable	0.022	0.008	0.038	0.061	0.013	0.024	0.020
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-Value: Comp = Ind Incentive Week 2-5	0.516	0.965	0.388	***0.093***	0.818	0.220	0.418
P-Value: Comp = Ind Incentive Week 2-5 (wild)	0.507	1.003	0.426	0.172	0.801	0.234	0.494
Observations	302	162	140	45	247	164	138
R-squared	0.007	0.011	0.005	0.065	0.002	0.017	0.008

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008) using 1000 replications.*

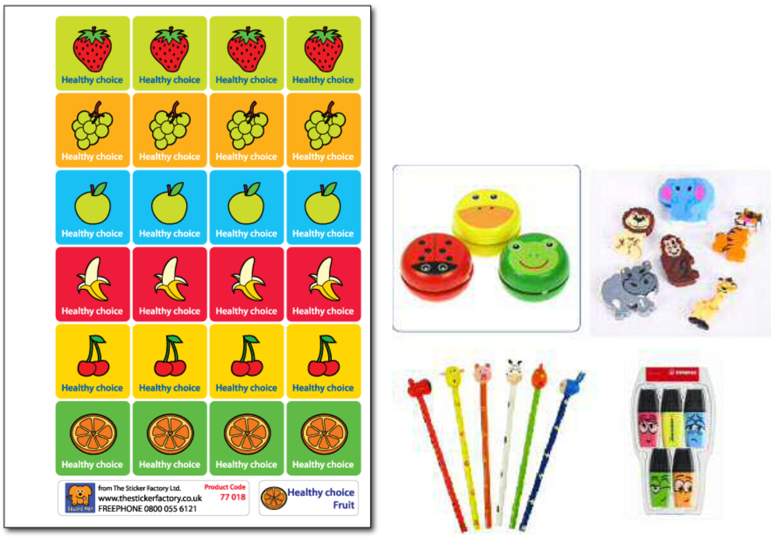
Table 11: Food Knowledge on Sample with Week 1 less than 100% Choice

	Dependent Variable: Change in Food knowledge Test Score						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1)	-0.011	-0.032	0.017	-0.133	-0.003	-0.113	0.061***
	(0.039)	(0.040)	(0.074)	(0.182)	(0.044)	(0.097)	(0.018)
	[0.793]	[0.428]	[0.897]	[0.579]	[0.945]	[0.226]	[0.020]
Individual Incentive (=1)	-0.012	-0.076*	0.035	-0.103***	-0.017	0.044	-0.023*
	(0.038)	(0.038)	(0.063)	(0.009)	(0.044)	(0.125)	(0.011)
	[0.765]	[0.136]	[0.663]	[0.509]	[0.745]	[0.819]	[0.292]
Constant	0.023	0.035***	0.013	0.032**	0.022	0.052	0.005
	(0.027)	(0.006)	(0.046)	(0.009)	(0.035)	(0.080)	(0.005)
1st Test Score	0.847	0.872	0.821	0.848	0.854	0.798	0.874
Mean of Dependent Variable	0.015	0.001	0.030	-0.032	0.015	0.013	0.017
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-Value: Comp = Ind Incentive Week 2-5	0.963	0.431	0.802	0.875	0.730	0.178	***0.002***
P-Value: Comp = Ind Incentive Week 2-5 (wild)	0.987	0.484	0.751	0.935	0.753	0.222	***0.006***
Observations	118	60	58	12	99	42	76
R-squared	0.001	0.025	0.003	0.064	0.001	0.050	0.037

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008) using 1000 replications.*

Appendix A: Experimental Materials

Figure A1: Stickers and rewards



Appendix B: Additional Figures and Tables

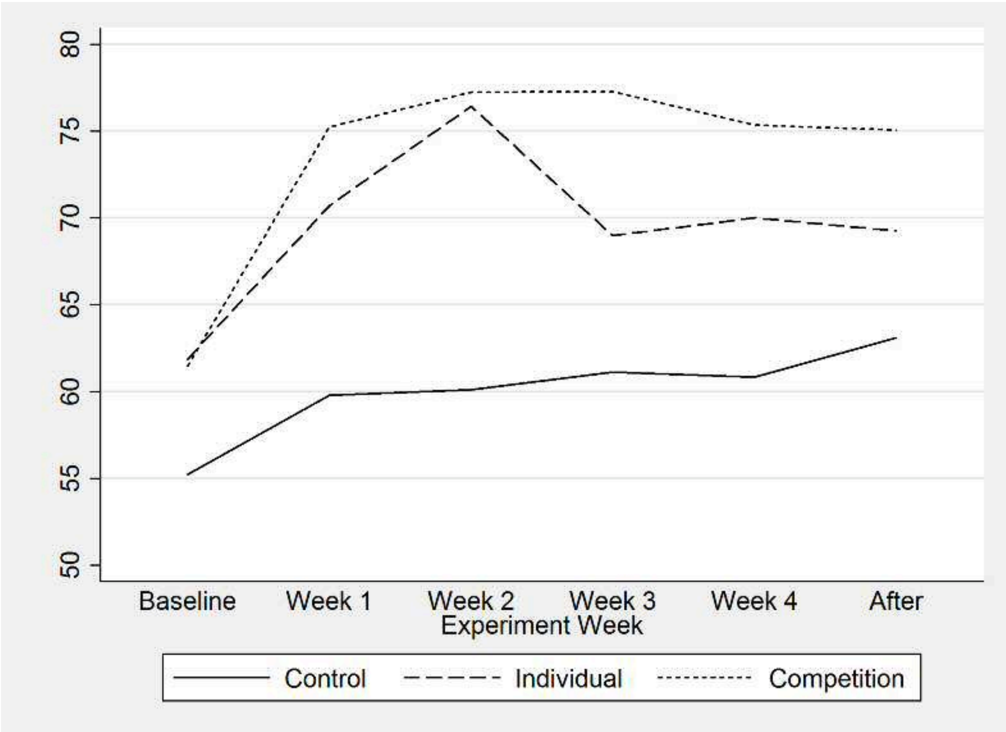
Not for Publication

Figure A2: Example food knowledge test

	What is it?	Is it healthy?
		Yes ☐ No ☐
		Yes ☐ No ☐
		Yes ☐ No ☐
		Yes ☐ No ☐
		Yes ☐ No ☐
		Yes ☐ No ☐

Figure B1: Proportion of students eating more than half a healthy item

a) Full Sample



a) Sample with less than 100% Choice in Baseline

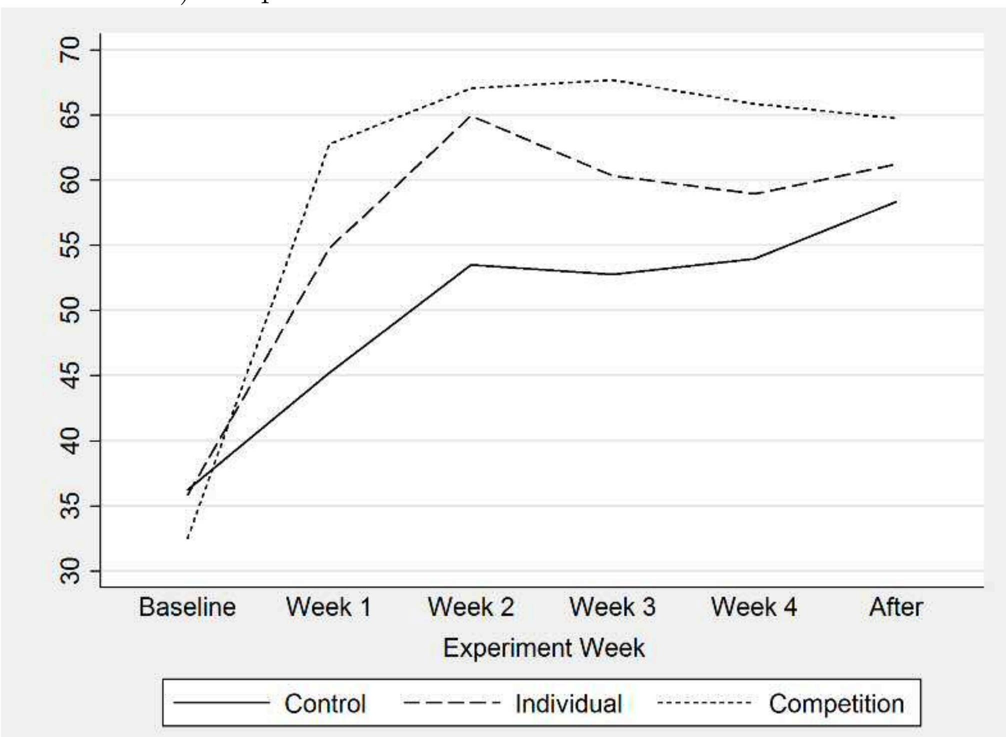


Table B1: Effect on Eating More than Half for Overall Sample and Its Subgroups

	Dependent Variable (=1) if Student Ate More than Half a Healthy Item						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1) * Week 2-5	0.114*	0.129	0.096	0.107	0.120	0.096	0.133**
	(0.063)	(0.084)	(0.079)	(0.086)	(0.072)	(0.108)	(0.063)
	[0.194]	[0.178]	[0.288]	[0.272]	[0.144]	[0.438]	[0.070]
Competition (=1) * Week 6	0.082	0.099	0.061	0.124	0.078	0.108	0.062
	(0.073)	(0.104)	(0.073)	(0.086)	(0.088)	(0.111)	(0.083)
	[0.354]	[0.416]	[0.490]	[0.168]	[0.420]	[0.418]	[0.505]
Individual Incentive (=1) * Week 2-5	0.054	0.051	0.053	0.008	0.057	-0.054	0.219***
	(0.060)	(0.076)	(0.067)	(0.072)	(0.066)	(0.072)	(0.048)
	[0.464]	[0.561]	[0.438]	[0.927]	[0.452]	[0.498]	[0.014]
Individual Incentive (=1) * Week 6	0.008	0.040	-0.023	-0.010	0.005	-0.068	0.143
	(0.075)	(0.091)	(0.078)	(0.101)	(0.083)	(0.083)	(0.090)
	[0.893]	[0.695]	[0.813]	[0.915]	[0.989]	[0.488]	[0.172]
Constant	0.599***	0.628***	0.567***	0.592***	0.606***	0.602***	0.588***
	(0.022)	(0.029)	(0.026)	(0.029)	(0.025)	(0.032)	(0.021)
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-Value: Comp = Ind Incentive Week 2-5	0.410	0.356	0.638	0.320	0.437	0.109	0.193
P-Value: Comp = Ind Incentive Week 2-5 (wild)	0.488	0.428	0.687	0.360	0.460	0.164	0.256
P-Value: Comp = Ind Incentive Week 6	0.327	0.502	0.340	0.212	0.387	***0.049***	0.294
P-Value: Comp = Ind Incentive Week 6 (wild)	0.446	0.607	0.390	0.256	0.444	0.054	0.352
Observations	14,714	7,719	6,994	2,495	11,838	7,916	6,798
R-squared	0.012	0.012	0.013	0.010	0.011	0.009	0.025
Number of pupils	638	328	310	114	509	343	295

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008). Column [2] includes only female and column [3] contains only males. Column [4] includes only students who are eligible for free school meals (FSM) and column [5] contains those students not eligible for FSM; there are 15 students for whom we are missing FSM status. Column [6] contains only students in Year 2 and column [7] contains only students in Year 5.*

Table B2: Effect on Eating More Than Half for Sample with Week 1 less than 100% Choice and Its Subgroups

	Dependent Variable (=1) if Student Ate Mopre than Half a Healthy Item						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1) * Week 2-5	0.190**	0.145	0.218**	0.268**	0.175**	0.141	0.203**
	(0.076)	(0.095)	(0.088)	(0.114)	(0.076)	(0.100)	(0.087)
	[0.024]	[0.178]	[0.042]	[0.104]	[0.038]	[0.230]	[0.036]
Competition (=1) * Week 6	0.117*	0.074	0.143**	0.245**	0.086	0.119	0.094
	(0.066)	(0.102)	(0.064)	(0.095)	(0.068)	(0.069)	(0.099)
	[0.126]	[0.501]	[0.052]	[0.058]	[0.288]	[0.172]	[0.404]
Individual Incentive (=1) * Week 2-5	0.078	0.001	0.130	0.096	0.061	-0.193***	0.216***
	(0.068)	(0.091)	(0.082)	(0.171)	(0.069)	(0.063)	(0.063)
	[0.318]	[0.973]	[0.292]	[0.695]	[0.466]	[0.016]	[0.008]
Individual Incentive (=1) * Week 6	-0.006	-0.024	0.003	0.049	-0.030	-0.326***	0.133
	(0.096)	(0.102)	(0.118)	(0.272)	(0.097)	(0.073)	(0.106)
	[0.979]	[0.795]	[0.979]	[0.617]	[0.773]	[0.004]	[0.270]
Constant	0.342***	0.372***	0.314***	0.231***	0.363***	0.291***	0.381***
	(0.025)	(0.030)	(0.029)	(0.047)	(0.025)	(0.031)	(0.027)
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-value for Competition=Individual for Wks 2-5	0.199	0.104	0.420	0.391	0.183	***0.001***	0.883
P-value for Competition=Individual for Wks 2-5 (wild)	0.220	0.134	0.513	0.511	0.228	***0.008***	0.879
P-value for Competition=Individual for Wk 6	0.166	0.121	0.274	0.507	0.156	***0.000***	0.692
P-value for Competition=Individual for Wk 6 (wild)	0.210	0.110	0.322	0.555	0.124	***0.000***	0.665
Observations	5,466	2,583	2,883	799	4,476	2,360	3,106
R-squared	0.057	0.065	0.052	0.082	0.051	0.072	0.058
Number of pupils	215	102	113	29	179	93	122

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008). Column [2] includes only female and column [3] contains only males. Column [4] includes only students who are eligible for free school meals (FSM) and column [5] contains those students not eligible for FSM; there are 15 students for whom we are missing FSM status. Column [6] contains only students in Year 2 and column [7] contains only students in Year 5.*

Table B3: Effect on Attendance On Overall Sample and Its Subgroups

	Dependent Variable (=1) if Student Attended School						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1) * Week 2-5	0.017	0.002	0.037*	0.029	0.015	0.021	0.016
	(0.014)	(0.021)	(0.018)	(0.051)	(0.016)	(0.017)	(0.021)
	[0.276]	[0.897]	[0.068]	[0.621]	[0.396]	[0.304]	[0.559]
Competition (=1) * Week 6	-0.009	-0.023	0.014	-0.014	-0.006	-0.011	-0.004
	(0.017)	(0.026)	(0.020)	(0.061)	(0.015)	(0.027)	(0.028)
	[0.655]	[0.412]	[0.474]	[0.811]	[0.675]	[0.645]	[0.833]
Individual Incentive (=1) * Week 2-5	0.023	0.009	0.040*	0.002	0.029	0.015	0.032
	(0.022)	(0.029)	(0.023)	(0.042)	(0.026)	(0.018)	(0.037)
	[0.414]	[0.783]	[0.116]	[0.931]	[0.306]	[0.444]	[0.482]
Individual Incentive (=1) * Week 6	-0.022	-0.031	-0.007	-0.061*	-0.007	-0.007	-0.035
	(0.048)	(0.050)	(0.050)	(0.032)	(0.049)	(0.020)	(0.099)
	[0.733]	[0.581]	[0.937]	[0.104]	[0.865]	[0.717]	[0.809]
Constant	0.945***	0.945***	0.946***	0.971***	0.938***	0.956***	0.934***
	(0.007)	(0.009)	(0.008)	(0.014)	(0.008)	(0.007)	(0.013)
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-value for Competition=Individual for Wks 2-5	0.800	0.814	0.877	0.411	0.551	0.790	0.634
P-value for Competition=Individual for Wks 2-5 (wild)	0.831	0.859	0.917	0.482	0.579	0.837	0.689
Observations	16,472	8,548	7,917	2,843	13,200	8,596	7,876
R-squared	0.003	0.002	0.004	0.009	0.002	0.001	0.007
Number of pupils	643	331	312	115	513	345	298

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008). Column [2] includes only female and column [3] contains only males. Column [4] includes only students who are eligible for free school meals (FSM) and column [5] contains those students not eligible for FSM; there are 15 students for whom we are missing FSM status. Column [6] contains only students in Year 2 and column [7] contains only students in Year 5.*

Table B4: Effect on Attendance for Sample with Week 1 less than 100% Choice and Its Subgroups

	Dependent Variable (=1) if Student Attended School						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1) * Week 2-5	-0.015	-0.063	0.030	0.046**	-0.025	-0.032	0.011
	(0.023)	(0.037)	(0.027)	(0.019)	(0.028)	(0.038)	(0.034)
	[0.563]	[0.322]	[0.380]	[0.076]	[0.424]	[0.424]	[0.785]
Competition (=1) * Week 6	-0.062**	-0.130***	0.010	-0.003	-0.067**	-0.081*	-0.034
	(0.022)	(0.041)	(0.034)	(0.036)	(0.029)	(0.042)	(0.036)
	[0.034]	[0.04]	[0.765]	[0.777]	[0.070]	[0.054]	[0.394]
Individual Incentive (=1) * Week 2-5	0.062	0.041	0.078**	0.040***	0.065	0.057	0.063
	(0.040)	(0.060)	(0.035)	(0.005)	(0.044)	(0.070)	(0.048)
	[0.204]	[0.533]	[0.066]	[0.124]	[0.208]	[0.440]	[0.386]
Individual Incentive (=1) * Week 6	0.045	-0.020	0.091**	-0.100	0.059	0.028	0.053
	(0.041)	(0.071)	(0.042)	(0.059)	(0.044)	(0.096)	(0.034)
	[0.266]	[0.823]	[0.014]	[0.507]	[0.206]	[0.789]	[0.240]
Constant	0.909***	0.901***	0.915***	0.980***	0.894***	0.931***	0.892***
	(0.010)	(0.014)	(0.011)	(0.007)	(0.012)	(0.016)	(0.014)
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-value for Competition=Individual for Wks 2-5	0.0443	0.0496	0.256	0.757	0.0324	0.163	0.233
P-value for Competition=Individual for Wks 2-5 (wild)	0.130	0.228	0.306	0.785	0.136	0.150	0.430
Observations	6,085	2,870	3,210	838	5,047	2,582	3,503
R-squared	0.008	0.016	0.006	0.014	0.010	0.006	0.011
Number of pupil_id	220	105	115	30	183	95	125

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008). Column [2] includes only female and column [3] contains only males. Column [4] includes only students who are eligible for free school meals (FSM) and column [5] contains those students not eligible for FSM; there are 15 students for whom we are missing FSM status. Column [6] contains only students in Year 2 and column [7] contains only students in Year 5.*

Table B5: Effect on Bringing Packed Lunch On Overall Sample and Its Subgroups

	Dependent Variable (=1) if Student Brought a Packed Lunch						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1) * Week 2-5	0.000	0.000	-0.001	0.014	0.001	0.008	-0.014
	(0.021)	(0.032)	(0.023)	(0.039)	(0.025)	(0.034)	(0.025)
	[0.993]	[0.995]	[0.957]	[0.737]	[0.951]	[0.849]	[0.635]
Competition (=1) * Week 6	-0.038	-0.065	-0.003	0.008	-0.042	-0.063	-0.020
	(0.030)	(0.046)	(0.033)	(0.044)	(0.038)	(0.043)	(0.036)
	[0.220]	[0.176]	[0.923]	[0.883]	[0.332]	[0.202]	[0.621]
Individual Incentive (=1) * Week 2-5	-0.013	-0.001	-0.022	-0.038*	0.004	-0.014	-0.014
	(0.025)	(0.035)	(0.020)	(0.021)	(0.024)	(0.033)	(0.037)
	[0.569]	[1.02]	[0.394]	[0.200]	[0.827]	[0.681]	[0.815]
Individual Incentive (=1) * Week 6	-0.041	-0.037	-0.040	-0.057	-0.021	-0.078*	-0.008
	(0.036)	(0.052)	(0.029)	(0.042)	(0.036)	(0.043)	(0.055)
	[0.256]	[0.509]	[0.268]	[0.258]	[0.587]	[0.128]	[0.919]
Constant	0.499***	0.489***	0.511***	0.187***	0.566***	0.461***	0.539***
	(0.008)	(0.011)	(0.008)	(0.013)	(0.009)	(0.009)	(0.012)
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-value for Competition=Individual for Wks 2-5	0.525	0.968	0.421	0.255	0.919	0.0684	0.996
P-value for Competition=Individual for Wks 2-5 (wild)	0.583	1.035	0.482	0.306	0.865	0.092	0.957
Observations	14,575	7,622	6,953	2,501	11,671	7,348	7,227
R-squared	0.002	0.002	0.002	0.004	0.002	0.003	0.002
Number of pupils	623	322	301	110	498	329	294

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008). Column [2] includes only female and column [3] contains only males. Column [4] includes only students who are eligible for free school meals (FSM) and column [5] contains those students not eligible for FSM; there are 15 students for whom we are missing FSM status. Column [6] contains only students in Year 2 and column [7] contains only students in Year 5.*

Table B6: Effect on Bringing Packed Lunch for Sample with Week 1 less than 100% Choice and Its Subgroups

	Dependent Variable (=1) if Student Brought a Packed Lunch						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Competition (=1) * Week 2-5	0.007	-0.021	0.040	0.033	-0.000	0.020	-0.019
	(0.023)	(0.040)	(0.026)	(0.118)	(0.023)	(0.029)	(0.041)
	[0.719]	[0.641]	[0.124]	[0.783]	[0.991]	[0.543]	[0.657]
Competition (=1) * Week 6	-0.004	-0.076	0.080**	-0.006	0.003	-0.039	0.005
	(0.036)	(0.071)	(0.030)	(0.121)	(0.043)	(0.071)	(0.058)
	[0.957]	[0.348]	[0.032]	[0.985]	[0.971]	[0.515]	[0.925]
Individual Incentive (=1) * Week 2-5	0.036	0.054*	0.022	0.007	0.053*	0.060	0.027
	(0.025)	(0.030)	(0.038)	(0.005)	(0.028)	(0.054)	(0.022)
	[0.204]	[0.182]	[0.643]	[0.430]	[0.072]	[0.595]	[0.408]
Individual Incentive (=1) * Week 6	0.018	0.044	-0.003	-0.017	0.048	-0.039	0.050
	(0.046)	(0.076)	(0.041)	(0.014)	(0.041)	(0.072)	(0.057)
	[0.751]	[0.651]	[0.941]	[0.505]	[0.350]	[0.527]	[0.645]
Constant	0.532***	0.527***	0.536***	0.355***	0.564***	0.509***	0.549***
	(0.009)	(0.015)	(0.011)	(0.042)	(0.009)	(0.013)	(0.012)
Sample	All	Females	Males	FSM	Non-FSM	Year 2	Year 5
P-value for Competition=Individual for Wks 2-5	0.318	***0.0518***	0.646	0.825	***0.0749***	0.466	0.262
P-value for Competition=Individual for Wks 2-5 (wild)	0.384	0.112	0.697	0.821	0.100	0.781	0.302
Observations	5,376	2,555	2,821	771	4,412	2,195	3,181
R-squared	0.001	0.004	0.002	0.002	0.001	0.004	0.002
Number of pupils	214	102	112	29	178	93	121

*notes: Robust standard errors clustered at school level are included in parentheses; * sig at 10%, ** sig at 5%, *** sig at 1%. Wild P-Values are shown in brackets and are estimated following Cameron, Gelbach, Miller (2008). Column [2] includes only female and column [3] contains only males. Column [4] includes only students who are eligible for free school meals (FSM) and column [5] contains those students not eligible for FSM; there are 15 students for whom we are missing FSM status. Column [6] contains only students in Year 2 and column [7] contains only students in Year 5.*