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How Do Informational Prompts Affect Choices in the School Lunchroom?

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Abstract

Obesity rates have doubled in the last forty years, and a major cause is the consumption of sugar-sweetened beverages. In this paper, we identify channels through which information – about health benefits or taste - affects beverage choice. We conduct a field experiment in a school lunchroom with 2,500 children, evaluating the impact of informational prompts on beverage choice and consumption over 2 weeks. We find that prompts alone increase the proportion of children choosing and consuming the healthier white milk relative to sugar-sweetened chocolate milk from 20% in the control group to 30% in the treatment groups. Adding health or taste messaging to the prompt does not seem to make a difference. We survey students and find that most prompts affect perceived healthfulness of the milk, but not perceived taste. Finally, we find that the prompts are nearly as effective as a small non-monetary incentive.

JEL Classifications: C72; C91
Keywords: field experiment, food choice, children, information, prompts

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1. Introduction

Obesity rates have more than doubled in the last forty years, with over two thirds of adults and one third of children worldwide now considered overweight or obese.[1] A major cause is the consumption of sugar-sweetened beverages in childhood, which has been shown to lead to higher obesity rates (Ludwig et al., 2001). Childhood obesity in particular is a major public health concern, leading to many chronic health conditions such as type 2 diabetes and cardiovascular disease (Lobstein et al., 2004).

One of the main policy responses to the obesity problem has been to increase access to information about the nutritional value of different foods, such as nutrition labeling for packaged foods,[2] calorie labeling for restaurant meals[3] and nutrition education in schools.[4] Recent research has also been able to improve eating habits through creating expectations that foods will taste better, such as through giving healthy foods appealing names (Wansink et al., 2012) or displaying fruits and vegetables in attractive bowls (Smith et al., 2013; Wansink and Just, 2011). While interventions geared at manipulating taste information seem to work well, there is mixed evidence for interventions manipulating health information. A potential reason for the limited effects of health information is that eating 'healthy' has delayed and often vague benefits (Lynch et al., 2006; Rick and Lowenstein, 2008).

In this paper, we propose that the informational channels discussed above may

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[1] For obesity statistics, see the World Health Organization (WHO) http://www.who.int/mediacentre/factsheets/fs311/en/ or the Food Research and Action Center (FRAC) http://frac.org/initiatives/hunger-and-obesity/obesity-in-the-us/

[2] Nutrition labeling for packaged foods was required with the passing of the Nutrition Labeling and Education Act in 1994, see http://www.fda.gov/ICECI/Inspections/InspectionGuides/ucm074948.htm

[3] One example is a policy enacted in New York City in 2009, which now requires restaurants with 15 or more outlets to post the caloric content of each food item next to its price on menu boards, see http://www.nyc.gov/html/doh/downloads/pdf/cdp/calorie_compliance_guide.pdf

[4] According to the Institute of Education Sciences, 99% of public schools offer nutrition educations somewhere in their curriculum, see http://nces.ed.gov/surveys/frss/publications/96852/

affect food choice in different ways. We assume that individuals discount the future, so that information about present costs or benefits (such as taste) will be more effective than information about future costs or benefits (such as impact on health outcomes). Importantly, we propose that presenting information with a direct prescriptive statement that encourages healthier choices will be more effective than neutral presentations. We also advance the notion that individuals are sensitive to social pressure, and incur a decrease in utility from saying 'no' to a request to choose healthy.

To evaluate our claims, we conducted a field experiment in a school lunchroom with over 2,500 children in grades Kindergarten-8th, in which we evaluated the impact of different informational prompts on beverage choice and consumption over the course of 2 weeks. Children received one of several informational prompts, no prompt, or a small incentive, as they proceeded through the school lunch-line. We used the choice of white milk, which we call the 'healthier choice', or chocolate milk, which we call the 'less healthy choice,' due to the higher sugar content, as our outcome variable.[5] We investigated (1) the impact of health-related messaging, which promotes salience of future health benefits of the white milk, (2) the impact of taste-related messaging, which promotes perceived immediate enjoyment of white milk and (3) the impact of a prescriptive verbal prompt to choose white milk with no additional information, which measures the effect of social pressure. We also implemented a separate treatment that

[5] We consider chocolate milk the less healthy choice due to its higher added sugar content relative to white milk. Moreover, school officials prefer for children to take white milk, yet most children take the chocolate milk at baseline. According to the National Dairy Council, chocolate milk has about 4 teaspoons of added sugar per 8 oz. serving, compared to 6 teaspoons in a 8 oz. serving of Coca-Cola. Since we are not nutrition experts, we refrain from providing additional evidence for or against each type of milk. Rather, we aim to provide some evidence for the use of prompts and incentives to encourage take-up of foods that school officials may believe are more appropriate.

incentivized choosing the white milk, which allows us to back out the 'price' of each type of information. We recorded both selection and consumption of milk.

We found that prompts increased the proportion of children choosing and consuming the healthier white milk relative to sugar-sweetened chocolate milk from about 25% of the control group to about 30% of the treatment groups. Interestingly, adding health or taste messaging to the prompt does not seem to make a difference. We also found that the health prompts increased the perceived healthfulness of white milk and decreased the perceived healthfulness of chocolate milk, with no impact on perceived taste. Finally, we found that the prompts were about 60% as effective as a small incentive.

In what follows, Section 2 provides a background and related literature. Section 3 outlines our testable predictions. Section 4 describes the design of our experiment. Section 5 presents the results. Section 6 provides a discussion and concludes.

2. Background

The school lunchroom provides a 'teachable moment' for policymakers to reach children and improve food choice and consumption both now and in the future. While one could simply dictate what foods go on a child's plate in this setting, research finds that children who choose foods on their own consume more than if they were required to take the foods (Hanks et al., 2013; Hakim and Messein, 2013).

The school cafeteria has been used in field experiments to investigate the effects of changing food presentation (Smith et al., 2013; Wansink and Just, 2011), taking advantage of marketing techniques by giving foods 'attractive names' (Wansink et al.

2012) and providing small incentives (Just and Price, 2011; List and Samek, 2015a; 2015b; Angelucci et al., 2015). Similar to these techniques, verbal prompts are relatively low cost to implement.

Previous research into the effectiveness of point-of-purchase prompts has suggested that even simple prompts can influence child food choice. For example, in a small-scale study, Schwartz (2007) raised the average number of children taking a serving of fruit from 60% to 90% by simply having the cafeteria worker ask, 'Would you like fruit or juice with your lunch?' List and Samek (2015b) used a short educational message about health benefits of fruit, but did not find a significant effect. Our theory provides one possible reason for the difference in result between the two studies – while Schwartz (2007) applies social pressure through directly asking the child to take fruit, List and Samek's (2015b) informational intervention was purposely designed to maintain neutrality and thus social pressure may be lower.

Studies of verbal prompts among adults are also scarce, and tend to focus on the sales context in restaurants. For example, Ebster et al. (2006) conducted a field experiment in a fast food restaurant, finding that prompts regarding purchase of side dishes with the main meal resulted in greater sales. In general, little is understood regarding the use of verbal prompts among children. Moreover, little is known about whether health or taste related messaging is most effective.

Posters and flyers at point of purchase have also been used to promote healthy food choice. One experiment used 'healthy heart' logos on fast-food items to investigate the impact on choice for children ages 6-11. The authors found that nutrition information was only effective for high-SES children (Stutts et al., 2011). Researchers have also used ‘traffic light labeling,’ labeling healthy foods as green and less healthy foods as red, to encourage adults to purchase healthier items in the hospital cafeteria (Sonnenberg et al., 2013; Levy et al., 2012). In an effort to focus students on the immediate benefits of healthy foods, Buscher et al. (2001) used posters in a university cafeteria emphasizing taste, convenience and energy, and increased the selection of certain healthy snacks among university students. Mollen et al. (2013) conducted an experiment in a university food court, and found that posters emphasizing benefits of healthy foods, rather than costs of unhealthy foods, were most effective at improving food choice.

Interestingly, in a recent paper, Maimaran and Fishbach (2014) found that giving children ages 3-5.5 years old information about the health benefits of a food caused the children to rate the food as less tasty and consume less of it. The authors posit that there could be a negative impact of certain messages on consumption, since children exposed to one association (e.g., between vegetables and health outcomes) might assume that another association (e.g., between vegetables and taste) must be weaker.

Unlike related work, we are the first to systematically investigate the effect of manipulating different channels – i.e., social pressure, and information about costs and benefits – on food choice. We also benchmark the relative effect of information by comparing the impact of our informational prompts to the impact of a non-monetary incentive. This is the same non-monetary incentive for milk choice that we report on in List and Samek (2015a). This paper is substantially different from List and Samek (2015a), since in that paper we do not consider the effect of different prompts and only study the impact of an incentive. Verbal prompts may be less costly to implement at scale than incentives; hence, they are of great policy interest.

3. Theory

We model the behavior of an individual choosing between either a healthy option h or an unhealthy option u, which is a simplified case, but is also the decision that children in our schools face with regards to choosing white or chocolate milk. Rational choice theory would suggest that individuals make food choices that maximize their utility. Individuals will have preferences over aspects of the food(s), including taste (experienced immediately) and nutritional value (which, if it has an effect on health, is experienced in the future).[6] Thus, each individual has utility:

$$\mathrm{U}(u, h|\, a_h, b_h, \mathrm{s})$$
$$= T(u) + a_h \cdot T(h) + N(1 \cdot u + b_h \cdot h) - p_u \cdot \mathrm{u} - p_h \cdot \mathrm{h}$$

Descriptions of variables and functions are as follows:

u, h: unhealthy food and healthy food

a_h: Taste (non-negative) parameter for food h from subject's viewpoint. (Such parameter for unhealthy food is normalized to be 1 in our setting)

$\mathrm{T}(\cdot)$: Standardized joy of consuming some quantity of the food, we assume $\mathrm{T}' > 0, \mathrm{T}'' < 0$, and we normalize $\mathrm{T}(0) = 0$.

(Non-negative a_h and $\mathrm{T}' > 0$ indicate that healthy food can't taste bad.)

b_h: The indicator of overall (good) nutrition per serving of food h. If a food has larger b, then it is healthier.

$\mathrm{N}(\cdot)$: Nutrition or health outcome from consuming the food, assume $\mathrm{N}' > 0, \mathrm{N}'' < 0$

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[6] This assumption follows related literature, which suggests that people use information such as health and taste to make food-related decisions. Teisl et al. (2001) and Gould and Lin (1994) classify health information into two categories: nutrition and health knowledge. Nutrition information relates to the calories, fat, etc. contained in the food, while health knowledge relates to whether the consumer is aware of health problems linked to consumption of the food. Teisl et al. (2001) also suggests that nutrition information increases welfare, since with better information, people can make more accurate decisions. Gould and Lin (1994) shows that if a household has greater health knowledge about consumption of fat and saturated fat, that intake of these fats will be lower. This suggests that if we make the benefits of healthy diets better known, people will make more desirable food purchase decisions. Our intervention is most closely related to the "health knowledge" category of information, since we do not disclose nutritional facts as part of our interventions.

p_j: Price of food j

Given the prices of each food, the individual solves the following maximization problem (the choice variable can be continuous or discrete):

$$\max_{u,h} \mathrm{U}(u, h|a_h, b_h, \mathrm{s})$$

As what we mentioned above, u, h are the choices that we observe in the experiment. In this project, subjects face two discrete choices: $\mathrm{u} = 1$ or $\mathrm{u} = 0$ ($\mathrm{h} = 1 - u$). Therefore, if a subject chooses unhealthy food in the experiment ($u = 1, h = 0$), his utility will be:

$$U_u = T(1) + N(1) - p_u$$

Similarly, a subject choosing healthy food in the experiment ($u = 0, h = 1$) has utility:

$$U_h = a_h \cdot T(1) + N(b_h) - p_h$$

In the experiment, subject's choice is solving:

$$\max_{u \in \{0,1\}} \{u \cdot U_u + (1 - u) \cdot U_h\}$$

In addition to the pure educational effects of information, we propose that information can also carry with it a social pressure component. Information can induce social pressure if it is prescriptive in nature, for example by including a verbal request to choose the healthy item. Thus, in addition to weighing the aspects of the food, individuals are also influenced by whether or not there is pressure to choose the healthy option, because saying 'no' to the request incurs a loss in utility, which we call the social pressure cost. Suppose this pressure decreases the utility from choosing healthy food by $s > 0$. The maximization problem is changed to:

$$\max_{u \in \{0,1\}} \{u \cdot U_u{}' + (1 - u) \cdot U_h\}$$

Where,

$$U_u{}' = a_u \cdot T(1) + N(\alpha_u) - p_u - s$$

We can see that under social pressure, utility from choosing h stays the same, but utility from choosing u becomes lower. Thus, under social pressure, subjects are more likely to choose healthy food.

Hypothesis 1: Treatments with social pressure increase the likelihood of choosing the healthy option h.

We now turn to the roles that educational information can play in decision-making. We start with health related information, which is the most common informational policy intervention carried out in practice (e.g., nutrition facts and calorie labeling). The premise of interventions focused on delivering health and nutrition information is that children are not aware of the health benefits of eating healthy, and may also be unaware of the health benefits of certain foods. If this assumption is correct, then the health prompt will increase the likelihood of choosing white milk. However, since the health effects happen in the future, which kids may heavily discount, then the health prompt will be less effective.

Suppose we send the healthy information to increase b_h to $b_h{}'$ (from subject's viewpoint). Utility from choosing healthy food is increasing.

$$U_h{}' = a_h \cdot T(1) + N(b_h{}') - p_h > a_h \cdot T(1) + N(b_h) - p_h = U_h$$

In addition, in health prompt treatment, health information is delivered with social pressure. Such social pressure makes utility from choosing unhealthy food lower. Therefore, increase of utility of healthy food and decrease of utility of unhealthy food bring us to hypothesis 2:

Hypothesis 2: Information about health benefits from consuming healthy food will increase the likelihood of choosing the healthy option h.

How could information about taste affect decisions? Individuals may not try healthier food items because they are unfamiliar with them and cannot accurately assess the level of enjoyment from these foods. Suppose the taste information increases a_h to $a_h{}'$, and such information is delivered with social pressure. Then, taste prompt treatment decreases the utility from choosing unhealthy food and increases utility from choosing healthy food:

$$U_h{}' = a_h{}' \cdot T(1) + N(\alpha_h) - p_h > a_h \cdot T(1) + N(\alpha_h) - p_h = U_h$$

This brings us to hypothesis 3:

Hypothesis 3: Information about the taste benefits will increase the likelihood of choosing the healthy option h.

Note that we assume no signaling effects of either taste or health information. For instance, learning about the health benefits of a food should not affect one's perception of its taste, and visa versa. To provide some support for this assumption, in the experiment we also conduct surveys with a sub-set of students from each treatment group in which we ask them about the perceived health and taste of the milk they selected.

3. The Experiment

3.1 Experimental Setup

The field experiment was conducted over a series of 9 days in the school lunch program in the Chicago Heights, Illinois School District with 11 schools, grades K-8 and a total of 2,650 children participating. Chicago Heights, IL is a low socio-economic status area with a mean household income of $14,963. Over 90% of students in these districts qualify for the National Free or Reduced School Lunch. Note that our research is of heightened policy relevance since children from low-income families are at higher risk for obesity and related health problems as compared to their middle-income counterparts (Cole et al., 2008; Neumark-Sztainer et al., 1996).[7] In these schools, about 50% of students are overweight and 23% are obese by WHO standards.[8] This district also has significant populations of minority students, including African-American (37.5%) and Hispanic (23.8%) students.[9]

During a typical lunch period, as children go through the cafeteria line, they receive the day's main menu item, required side items, and then proceed to select milk, see Figure 1. According to guidelines set by the USDA, schools are required to provide students with two milk options – while options are left to the district, many districts choose to provide a white and a chocolate milk option. The choice of milk is the only decision that students make in the lunch-line.

We recorded both the selection and consumption of milk, as well as consumption of other food items served at lunch. We tracked children at the individual level throughout the experiment using ID numbers. Milk consumption was measured by weight, while consumption of other foods was measured by visual inspection. In addition, we conducted surveys asking the child's perception of health and taste of the milk he or she selected (see appendix).

[7] Lower-income students have less food security and are more likely to be overweight or obese, so targeting this socioeconomic group is of vital importance (Casey et al., 2001; Ogden et al., 2006).
[8] These statistics were gathered in the Fall of 2009 at the beginning of a nutritional pilot study in which the height and weight of a representative sample of over 140 children were measured.
[9] Source: U.S. Census Bureau - State and County QuickFacts. Data derived from Population Estimates, 2000 Census of Population and Housing,

[Figure 1 About Here]

3.1 Experimental Design

As summarized in Table 1, in a series of treatments, we systematically measure the effect of no prompt (control), simple prompt ('try the white milk), health prompt ('try the white milk, it is good for you'), and taste prompt ('try the white milk, it tastes good'). The simple prompt treatment is designed to measure the effect of social pressure (testing H1), while the health and taste prompts measure the additive effects of educational information (testing H2 and H3, respectively). To back out the 'price' of this information, we also measure the effect of a non-monetary incentive – a glow-in-the-dark bracelet valued at $0.15 – linked to selecting white milk. Students are randomized to treatments at the school lunch period level. We also reported on the impact of the non-monetary incentive, but did not investigate prompts, in List and Samek (2015a).

We are interested in the long-term effect of our interventions. Therefore, we visited each lunchroom 10 times. The first time we visited the lunchrooms, we observed milk selection and consumption, without changing the environment. However, we noted that due to the students' preference for chocolate milk, cafeteria workers usually set out a greater amount of chocolate milk than white milk. Therefore, on day 2 we changed the environment by providing an equal amount of chocolate and white milk at all times, and again observing selection and consumption. Then, we began the treatments, which continued for 5 consecutive weekdays. Finally, we ended with 2 baseline observation days during which time we recorded selection and consumption but did not provide a prompt or incentive to any treatment group.

[TABLE 1 ABOUT HERE]

4. Results

4.1 Summary of Sample

Table 2 provides a summary of the number of children who participated in each treatment, with additional descriptive statistics. 51.3% of children in the experiment were female, and the median grade of all children at the time of the intervention was 4th grade. In the sample, 56.85% are Hispanic, 38% are African-American, 1.18% are multiracial and the remainder are white.[10]

[TABLE 2 ABOUT HERE]

As demonstrated by Table 2, since randomization is at the school lunch period level, some baseline differences exist across treatments. First, the composition of age differs somewhat by treatment. The most apparent difference is the slightly older ages for Prompt and Health Prompt, and slightly younger ages for Control. We also observe some differences in selection by treatment at baseline (averaged Days 1 and 2) – for instance percentage selecting white milk is 12.35% in Control, 13.13% in Prompt, 10.19% in Health Prompt, 15.69% in Taste Prompt and 13.8% in Incentive. Proportion consumed is 61.86% in Control, 71.53% in Prompt, 60.24% in Health Prompt, 60.39% in Taste Prompt and 71.53% in Incentive. Due to these treatment differences at baseline, we present results both as regressions using subject fixed-effects to account for baseline choices and demographic differences, and as non-parametric two-way t-tests comparing treatments.

[10] Gender and race are obtained from school records. Grade is available, but not age.

4.1 Treatment Effects on Selection

Table 3 presents the proportion of children selecting white milk in each treatment, including the first baseline day, the average of all treatment days and the average of post-treatment days (using the sub-sample of students we are able to match to their ID). Table 4 presents statistical models that largely confirm the summary statistics in Table 3 and provide evidence for the effects of our interventions post-treatment. In Table 4, we estimate a fixed-effects logit model with dependent variable is white milk choice (=1 if white milk is chosen and =0 if chocolate is chosen). The variables Prompt, Health, Taste and Incentive represent treatment dummies (=1 if treated with that treatment between days 3-9, =0 if not). A period trend and dummy for the ½ and ½ baseline (baseline day 2) are included as controls. The first column displays results from using all pre-treatment and treatment days (Days 1-7) while the second column also incorporates post-treatment days (Days 1-9). Column 2 also includes Post-Treatment * [Treatment] interaction effects for each treatment, to investigate the long-term effect of the intervention. Individual student fixed effects are used to account for demographic and behavioral differences at baseline, and we use robust standard errors clustered at the school level.

[TABLE 3 ABOUT HERE]

[TABLE 4 ABOUT HERE]

We find a strong and statistically significant effect of social pressure: proportion of children choosing white milk increases substantially (by almost 50%) for Prompt, Health Prompt and Taste Prompt relative to Control - Wilcoxon Mann-Whitney non-parametric two-way comparison tests using white milk choice averaged by individual in prompt treatments to control yield p-values < 0.01. We also observe a significant difference when treating the lunch-period level (randomization level) as an independent observation averaged across treatment days (p-value = 0.03)[11]. The coefficient on *Prompt* in Table 4 is positive and statistically significant at the 1% level, providing additional support for Result 1. This brings us to our first result, which is in support of Hypothesis 1:

Result 1: Prompts significantly increase the desired behavior (white milk choice) at the time of prompt.

Next, we address the question of which type of information is most important for nudging behavior by investigating the effect of the additional taste or health message added to the prompt. Neither Table 3 nor Table 4 provides evidence suggestive of increased effectiveness of the prompt when information is included. In fact, while the coefficient on *Health* is positive, similar in magnitude to *Prompt,* and statistically significant at the 1% level, the coefficient on *Taste* is lower and only marginally significant. This brings us to our next result:

Result 2: We do not observe statistically significant differences between the prompt alone and the prompt with health or taste information.

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[11] Wilcoxon Mann-Whitney non-parametric two-way comparison tests of control to prompt, health, taste, and incentive using white milk choice by individual on the first day of treatment yields p-values of 0.056, 0.015, 0.003, and 0.661, respectively. The p-value is very low for Incentive because the incentive treatment was not implemented on Day 3 in some schools as scheduled, and they are not included in the results which decreases power. When using the lunch-period level as an independent observation, the corresponding p-values are 0.4624, 0.4624, 0.1489, and 0.2482. Comparing prompt to health, taste, and incentive results in p-values of 0.526, 0.130, and 0.263 at the individual level and 0.7540, 0.8065, and 1.000 at the lunch-period level. The two-way comparison tests between incentive and health and incentive and taste yield p-values of 0.332 and 0.026 at the individual level and 0.8065 and 0.3865 at the lunch-period level on the first day of treatment. Note that the incentive treatment was not implemented in some of the schools on some days, which results in a decreased power for this treatment.

As displayed in the second column of Table 4, in the two days following the intervention the choice of white milk declines relative to the intervention period, but remains higher in the treatment groups relative to the control group (Post-Treatment*Treatment Dummy) coefficients positive and statistically significant at the 1% level, except for (Post-Treatment*Health) which is positive but not statistically significant. This provides suggestive evidence in support of a habit formation story, meaning that kids continue to choose the healthier white milk for several days even after the intervention in that study. While we do not know how these habits would fade out over time, we can confidently say that the intervention did not cause the opposing effect of ‘crowd-out’, which would have decreased the proportion of children selecting white milk relative to the baseline proportion. This brings us to our third result:

Result 3: Prompt, Health and Incentives lead to greater likelihood of white milk selection relative to control even after the intervention is removed.

Finally, we investigate the effect of non-monetary incentives. Averaging across all treatment days we find strong and significant effects in the incentive treatment as compared to control: choice of white milk increases by over 10% for Incentive relative to Control (Wilcoxon Mann-Whitney non-parametric two-way comparison tests using white milk choice averaged by individual in Incentive versus Control yield p-value < 0.01). Again, we also observe a significant difference when treating the lunch-period level (randomization level) as an independent observation (p-value = 0.02).

We can also directly investigate the effect of incentives as compared to prompts. We find that incentives are somewhat more effective than the prompts, leading to a positive and statistically significant coefficient on *Incentive* that is higher than the coefficient on *Prompt*. Incentives have been shown to have strong effects in related work on child food choice as well, and our finding here that prompts are equally effective is important since it suggests the value of our approach, which is less costly than providing incentives. The impact of the incentive treatment is also discussed in List and Samek (2015). This brings us to our next result:

Result 4: Prompts are nearly as effective as small, non-monetary incentives at increasing selection of white milk.

Since we conducted an experiment with four treatment arms and a control group, we also conduct the robustness test discussed in List et al. (2016) to account for multiple hypothesis testing (MHT). To do so, we first average selection (proportion of times each person selects white milk) across all treatment days by individual in the experiment and conduct non-parametric t-tests comparing treatment and control groups. We obtain *p*-values of >0.01 when comparing control to any of the treatment groups (*Prompt, Taste, Health* or *Incentive*). Next, we adjust the t-tests for MHT using the statistical package supplied by List et al. (2016). Adjusted for MHT, we continue to obtain *p*-values of >0.01, suggesting that our treatment effects results are robust to MHT.

We do a similar exercise averaging selection across all post-treatment days. We obtain *p*-values of 0.29 when comparing *Prompt* to control, 0.34 when comparing *Health Prompt* to control, 0.12 when comparing *Taste Prompt* to control and 0.01 when comparing *Incentive* to control. Next, we adjust the t-tests for MHT using the statistical package supplied by List et al. (2016). Adjusted for MHT, only the comparison of the incentive treatment with control remains significant at the 5% level. One of the reasons why we may observe stronger effects in the regressions is that there we control for baseline selection and other background characteristics of participants.

4.2 Consumption

While prompts and incentives may change the targeted selection behavior, we may worry that they will have a negative effect on consumption. This is important to investigate for several reasons. First, if children do not actually consume the healthier item, then we cannot claim that the intervention improves health. Second, from a practical standpoint, school administrators and policy-makers care about decreasing food waste – in our experiment, at baseline almost 40% of milk is thrown out.

Table 5 reports the average, unconditional consumption of milk by treatment, which is calculated by *(Total weight of milk with carton)-(weight at end of lunch)* / *(Total weight of milk with carton)*. As shown in Table 5, children consume about 60% of their milk on average. We do not observe statistically significant differences in consumption between any of the treatments, suggesting that our prompt and incentive treatments have the same positive impact on consumption as they do on selection.

Tables 6 and 7 provide additional regressions, in which the dependent variable is the grams of white or chocolate milk consumed. Since the selection has changed but overall milk consumption has not, we expect the trends in consumption to be similar to those of selection. Indeed, we find that all prompts and the incentive statistically significantly increase the consumption of white milk. Prompts also decrease the consumption of chocolate milk, though results are not statistically significant. The incentive statistically significantly decreases the consumption of chocolate milk.

Result 5: Prompts and incentives are effective at increasing the consumption of white milk, while decreasing consumption of added sugars from chocolate milk.

[TABLE 5 ABOUT HERE]

4.3 Mechanisms

As described in Section 3, there are three possible mechanisms that could be at work: social pressure, changes to perceived healthfulness of the milk, or changes to the perceived taste of the milk. In order to explore the impact of the prompts on the two latter measures, we conducted surveys with a randomly selected sub-set of children on each day of the study. We randomly selected children because we did not have the manpower to survey all children, as we determined surveys worked best when conducted in a one-on-one interview format. As children were eating lunch, we asked them to check their tray for a hidden sticker that indicated they had been randomly selected for the survey (we pre-labeled trays in advance, and children do not have the opportunity to choose their tray). The data we collected thus includes children who were in the middle of eating lunch, and who had selected either white or chocolate milk. The survey questions we asked mirrored the prompts. For the taste question, we asked: "*how good does your milk taste?*" and for the health question, we asked: "*how <u>good for you</u> is the milk?*" Children responded by pointing to the corresponding smiley face on a visual of a 5-point Likert scale with smiley faces, from *very bad* to *very good*.

Table 8 and Table 9 display the results to these survey questions. Since the questions were asked of children conditional on already selecting white or chocolate milk, these results include this selection effect. The results of the treatments can therefore be interpreted as the perceptions of children who would normally choose this particular milk, in addition to children who choose the milk as a result of the prompt or incentive. Hence, the results include both a treatment effect (changing perceptions) and a selection effect (changing respondents).

In Table 8, we observe a small, insignificant negative impact of the treatments on perceptions of white milk taste and a corresponding small, insignificant positive impact of the treatments on perceptions of chocolate milk taste. Interestingly, in Table 9, we observe large and statistically significant impacts on the perceptions of health: both the taste and health prompts result in a 0.5-0.6 statistically significant increase in perceived healthfulness of white milk. Perceptions of healthfulness of chocolate milk are negative (but small and insignificant) for the health prompt and positive (but also small and insignificant) for the taste prompt. The prompt without information and the incentive also cause health perceptions of chocolate milk to decrease by 0.3-0.4 and this result is statistically significant.

In summary, it seems that taste perceptions are difficult to change through a prompt. On the other hand, health perceptions are relatively more malleable. This makes sense intuitively, since children have first-hand experience of taste when they drink the milk at the time of the survey, but do not have concrete evidence of the health effects. What is particularly surprising is that the health prompt is not the only one that has an impact on health perceptions; indeed, all treatments seem to have a strong impact on health perceptions. Since the prompts are delivered by a person of authority, it could be that children take these interventions as signals about what is good for them. This is potentially important since it suggests that interventions may operate through the health channel, *even when the intervention does not provide health information*.

Finally, we investigated social norms by asking the question "*If five kids today went to pick up milk, how many of them do you think picked the chocolate milk?"* We find that children receiving the prompt with no additional information, or children receiving the incentive, are more likely to believe that others were less likely to choose chocolate milk (see Table 10). This is potentially interesting since it suggests that prompts affect beliefs about the social norm.

5. Discussion & Conclusion

We set out to discover low-cost, scalable nudges to improve child food choice and consumption during a teachable moment: the school lunch line. Our sample consisted of over 2,500 children from low-income households in the Chicago Heights, Illinois school district, who may be at highest risk for poor nutrition. We were motivated to investigate the impact of different messaging: health-related messaging that promotes the salience of health consequences of choosing certain-foods, and taste-related messaging, which promotes perceived immediate enjoyment.

What we found was surprising: the information carried in the health- or taste-related messaging was less effective than the prompt itself. In fact, all forms of prompts significantly increased the proportion choosing white milk. We call this the social pressure effect: just like in studies on charitable giving, 'the ask' is a powerful tool that affects behavior, and what is contained in the ask is secondary. The impact of social pressure has remained largely un-explored in the area of child food choice. Our finding in this paper can also explain why List and Samek (2014) found that a 5-minute information-focused message was not effective for dessert choice (it did not include social pressure in the form of an 'ask'; rather, it contained information alone). Moreover, we found that all prompts affected the perceived healthfulness of the milk, but not the perceived taste.

We also compared the impact of the prompt to a small, non-monetary incentive in order to benchmark the impact of the effect. Related work shows a large positive effect of non-monetary incentives (e.g., List and Samek, 2014, 2015; Just and Price, 2013; Belot et al., 2013). We find that incentives and prompts have similar positive effects, which is of practical relevance since prompts may be a more scalable solution to improving food selection and consumption than an incentive that must be given out on a daily basis.

Our findings have practical relevance for policy-makers. First, policy dollars may be better spent on encouraging greater interaction between cafeteria staff and children, since this interaction, especially if it is in the form of social pressure through a prompt or 'ask', is very important in child decision-making in our setting. Such interventions seem to affect children through changing the perceived healthfulness of food, even when a direct 'health' message is not part of the intervention.

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Table 1: Treatment Summary

Treatment	Description	Schedule
Control	No prompt.	Day 1 – "Regular" Lunch line Day 2 – Display ½ white, ½ chocolate Day 3 – Treatment Day 4 – Treatment Day 5 – Treatment Day 6 – Treatment Day 7 – Treatment Day 8 – Display ½ white, ½ chocolate Day 9 – "Regular" Lunch line
Prompt	*"Try the white milk"*	
Health Prompt	*"Try the white milk, it is good for you"*	
Taste Prompt	*"Try the white milk, it tastes good today"*	
Incentive	Non-Monetary incentive tied to white milk selection.	

Note: This table displays the treatments that were implemented in each of days 1-9 in the school lunchroom, including the messages used for each prompt.

Table 2: Number of Observations

Treatment	Number of Observations (Total Unique)	Number of Observations (Typical Day)	% Female (Typical Day)	Median Grade (Typical Day)
Control	466	319	51.74	2nd Grade
Prompt	548	315	51.22	5th Grade
Health Prompt	582	339	50.76	4th Grade
Taste Prompt	515	329	49.16	3rd Grade
Incentive	539	280	54.43	3rd Grade
Total/Average	N=2,650	N=1,582	51.34	3th Grade

Note: "Total unique" refers to the total number of children who were ever in the study. "Typical day" refers to how many kids we observe on average in each day, including only children for whom an ID is available. Typical is considerably lower due to field trips, absences, and days that we do not have sufficient quantities of milk and stop data collection early. We use only the sub-sample for whom we are able to identify by ID number.

Table 3: White Milk Selection (Proportion of Children)

Treatment	Baseline Days (Average 2)	Treatment Days (Average 5)	Post-Treatment Days (Average 2)
Control	12.88	19.85	18.82
Prompt	13.42	24.80	21.26
Health Prompt	10.22	23.88	20.17
Taste Prompt	16.07	27.30	22.74
Incentive	13.80	33.84	26.25
Average	13.36	25.72	21.59

Note: While the first 2 baseline days differ slightly (in Day 1 we do not control the amount of each milk displayed while in Day 2 we assure equal amounts are displayed), in general there are not significant differences in decision-making between these two days so we merge the data. We ran out of one type of milk in some lunch periods. When this happened, we dropped the entire lunch period from the analysis.

Table 4: Statistical Tests of Selection (Dependent Variable: White Milk Choice)

	Days 1-7	Days 1-9
Prompt	2.282***	2.251***
	(0.609)	(0.586)
Health	2.083***	2.134***
	(0.678)	(0.582)
Taste	1.563*	1.607*
	(0.886)	(0.830)
Incentive	2.633***	2.788***
	(0.411)	(0.485)
Period Trend	-0.0385	-0.011
	(0.085)	(0.063)
Post-Treatment * Prompt		1.408***
		(0.391)
Post-Treatment * Health		1.315***
		(0.489)
Post-Treatment * Taste		0.804
		(0.616)
Post-Treatment * Incentive		1.545***
		(0.486)
Display ½ White, ½ Chocolate	0.710*	0.528***
	(0.401)	(0.184)
Observations	5,062	7,084

Note: The omitted group contains observations in control group for day 1-9 and observations in all 4 treatment groups for day 1-2 (pre-treatment). (2) Prompt, health, taste, and incentives are dummies showing that the observation is in the corresponding treatment group and in day 3-7 (treatment days). Post-Treatment * X is the dummy indicating that the observation is in X treatment group and in day 8-9 (post-treatment days). Robust standard errors clustered at the school-level in parentheses. The above coefficients are point estimates from a Logit individual student fixed effects regression in STATA. Post-treatment interaction effects are dummies at post-periods, while treatment effects are dummies for both treated and post periods. Thus, the level of selection above that of baseline is measured by Treatment Dummy + Post-Treatment Interaction dummy (for Prompt, 2.251-0.843, for Health 2.134-0.819, for Taste 1.607-0.804 and for Incentive, 2.788-1.243). *** p<0.01, ** p<0.05, * p<0.1

Table 5: Overall Milk Consumption (Percent)

Treatment	Baseline Days (Average 2)	Treatment Days (Average 5)	Post-Treatment Days (Average 2)
Control	61.69	62.48	65.24
	(38.75)	(37.62)	(36.28)
Prompt	64.41	65.59	70.08
	(36.57)	(37.62)	(34.56)
Health Prompt	60.54	60.42	62.63
	(37.30)	(37.87)	(36.24)
Taste Prompt	62.02	60.91	59.86
	(37.51)	(37.97)	(37.66)
Incentive	71.65	65.96	65.50
	(34.14)	(37.01)	(37.28)
Average	64.20	62.95	64.33
	(36.97)	(37.63)	(36.59)

Note: Standard deviations in parenthesis. Consumption is calculated by (total weight of milk with carton – weight at end of lunch) / (total weight of milk with carton).

Table 6: Regressions of White Milk Consumption, Unconditional

Percent (white milk consumption)	Days 1-7	Days 1-9
Prompt	5.807**	5.458**
	(2.411)	(2.057)
Health	6.884*	7.176**
	(3.306)	(2.794)
Taste	7.542*	7.507**
	(3.501)	(3.257)
Incentive	14.64*	14.56**
	(6.787)	(6.230)
Period Trend	-0.025	0.031
	(0.432)	(0.368)
Post-Treatment * Prompt		3.812
		(2.566)
Post-Treatment * Health		3.268
		(2.447)
Post-Treatment * Taste		3.230
		(3.301)
Post-Treatment * Incentive		4.330
		(4.367)
Display ½ White, ½ Chocolate	1.628	1.933**
	(1.803)	(0.759)
Observations	11,085	14,234

Note: The omitted group contains observations in control group for day 1-9 and observations in all 4 treatment groups for day 1-2 (pre-treatment). (2) Prompt, health, taste, and incentives are dummies showing that the observation is in the corresponding treatment group and in day 3-7 (treatment days). Post-Treatment * X is the dummy indicating that the observation is in X treatment group and in day 8-9 (post-treatment days). Robust standard errors clustered at the school-level in parentheses. The dependent variable is unconditional consumption of white milk, meaning that choice of chocolate milk or other milk sets consumption of white milk to 0).

Table 7: Regressions of Chocolate Milk Consumption, Unconditional

Percent (chocolate milk consumption)	Days 1-7	Days 1-9
Prompt	-6.785	-7.608*
	(4.409)	(3.399)
Health	-7.291	-9.539*
	(4.249)	(4.251)
Taste	-8.617	-8.544
	(5.798)	(5.151)
Incentive	-22.601**	-23.014**
	(8.696)	(8.398)
Period Trend	1.002	0.515
	(0.175)	(0.438)
Post-Treatment * Prompt		0.514
		(3.542)
Post-Treatment * Health		-4.500
		(6.430)
Post-Treatment * Taste		-7.936
		(4.865)
Post-Treatment * Incentive		-13.903
		(8.369)
Display ½ White, ½ Chocolate	-7.010	-3.328
	(2.312)	(2.277)
Observations	11,085	14,234

Note: The omitted group contains observations in control group for day 1-9 and observations in all 4 treatment groups for day 1-2 (pre-treatment). (2) Prompt, health, taste, and incentives are dummies showing that the observation is in the corresponding treatment group and in day 3-7 (treatment days). Post-Treatment * X is the dummy indicating that the observation is in X treatment group and in day 8-9 (post-treatment days). Robust standard errors clustered at the school-level in parentheses. The dependent variable is unconditional consumption of chocolate milk, meaning that choice of white milk or other milk sets consumption of chocolate milk to 0).

Table 8: Perceived Taste, Conditioned on Milk Choice

	White Milk		Chocolate Milk	
	Days 1-7	Days 1-9	Days 1-7	Days 1-9
Prompt	-0.274	-0.265	0.179	0.134
	(0.209)	(0.204)	(0.121)	(0.110)
Health	-0.130	-0.153	-0.049	-0.095
	(0.290)	(0.262)	(0.142)	(0.129)
Taste	-0.0016	-0.022	0.099	0.054
	(0.210)	(0.184)	(0.128)	(0.117)
Incentive	-0.382	-0.401*	0.223	0.175
	(0.244)	(0.229)	(0.143)	(0.137)
Period Trend	-0.021	0.022	0.005	0.00009
	(0.058)	(0.044)	(0.279)	(0.018)
Post-Treatment * Prompt		-0.171		-0.146
		(0.325)		(0.209)
Post-Treatment * Health		0.334		0.112
		(0.311)		(0.161)
Post-Treatment * Taste		0.350		0.235*
		(0.286)		(0.141)
Post-Treatment * Incentive		-0.180		-0.182
		(0.459)		(0.224)
Display ½ White, ½ Chocolate	0.468	0.111	-0.185	-0.061
	(0.419)	(0.226)	(0.139)	(0.092)
Observations	219	278	618	837

Note: (1) The omitted group contains observations (choosing white milk and answering the question) in control group for day1-9 and observations (choosing white milk and answering the question) in all 4 treatment groups for day 1-2 (pre-treatment). (2) Prompt, health, taste, and incentives are dummies showing that the observation is in the corresponding treatment group and in day 3-7 (treatment days). Post-Treatment * X is the dummy indicating that the observation is in X treatment group and in day 8-9 (post-treatment days). (3) The observations in this table are observations choosing white milk. If a student chose white milk on day 1 and chose chocolate milk in day 3, then his answer on day 1 should be included in this table, but his answer on day 3 shouldn't be included in this table. Therefore, the result in this table is **conditioned on choosing white milk** for Columns (1) and (2) and **conditioned on choosing chocolate milk** for Columns (3) and (4)**.**

Table 9: Perceived Health, Conditioned on Milk Choice

	White Milk		Chocolate Milk	
	Days 1-7	Days 1-9	Days 1-7	Days 1-9
Prompt	0.227	0.132	-0.331**	-0.437***
	(0.213)	(0.192)	(0.162)	(0.148)
Health	0.596***	0.445**	-0.067	-0.173
	(0.216)	(0.192)	(0.157)	(0.143)
Taste	0.556**	0.419**	0.188	0.078
	(0.219)	(0.184)	(0.138)	(0.124)
Incentive	-0.080	-0.220	-0.572**	-0.650***
	(0.289)	(0.262)	(0.242)	(0.236)
Period Trend	-0.050	0.025	-0.057*	0.0018
	(0/052)	(0.037)	(0.033)	(0.020)
Post-Treatment * Prompt		-0.205		-0.232
		(0.357)		(0.192)
Post-Treatment * Health		0.211		0.058
		(0.307)		(0.191)
Post-Treatment * Taste		0.723***		0.064
		(0.210)		(0.194)
Post-Treatment * Incentive		0.378		-0.561**
		(0.247)		(0.242)
Display ½ White, ½ Chocolate	0.385	0.022	0.215	0.013
	(0.403)	(0.189)	(0.164)	(0.102)
Observations	226	286	630	850

Note: (1) The omitted group contains observations (choosing white milk and answering the question) in control group for day1-9 and observations (choosing white milk and answering the question) in all 4 treatment groups for day 1-2 (pre-treatment). (2) Prompt, health, taste, and incentives are dummies showing that the observation is in the corresponding treatment group and in day 3-7 (treatment days). Post-Treatment * X is the dummy indicating that the observation is in X treatment group and in day 8-9 (post-treatment days). (3) The observations in this table are observations choosing white milk. If a student chose white milk on day 1 and chose chocolate milk in day 3, then his answer on day 1 should be included in this table, but his answer on day 3 shouldn't be included in this table. Therefore, the result in this table is **conditioned on choosing white milk** for Columns (1) and (2) and **conditioned on choosing chocolate milk** for Columns (3) and (4)**.**

Table 10: Social Norm Questions (How many of the 5 children picked chocolate)

	White Milk		Chocolate Milk	
	Days 1-7	Days 1-9	Days 1-7	Days 1-9
Prompt	-0.513*	-0.539**	-0.140	-0.191
	(0.274)	(0.262)	(0.152)	(0.140)
Health	0.158	0.141	0.141	0.091
	(0.325)	(0.306)	(0.144)	(0.130)
Taste	-0.010	-0.030	0.054	0.002
	(0.255)	(0.238)	(0.136)	(0.122)
Incentive	-0.497	-0.516*	-0.255	-0.292
	(0.378)	(0.294)	(0.207)	(0.201)
Period Trend	-0.018	-0.028	-0.041	-0.011
	(0.067)	(0.050)	(0.032)	(0.021)
Post-Treatment * Prompt		0.118		-0.125
		(0.354)		(0.234)
Post-Treatment * Health		0.218		0.418**
		(0.435)		(0.183)
Post-Treatment * Taste		0.572		-0.053
		(0.416)		(0.190)
Post-Treatment * Incentive		0.347		-0.018
		(0.427)		(0.211)
Display ½ White, ½ Chocolate	0.049	0.196	0.026	-0.086
	(0.378)	(0.238)	(0.160)	(0.102)
Observations	230	290	633	855

Note: The dependent variable is the answer to the question "If five kids today went to pick up milk, how many of them do you think picked the chocolate milk?" The regressions are split by whether the respondent him/herself selected white or chocolate milk on the day he/she was surveyed.

Figure 1: The Lunchroom

Appendix I – Experiment Procedure and Surveys

Experiment protocol (in addition to what children normally do)

In order to conduct a study of milk choice and how short and long term prompts and incentives affect choice, the following additions will be implemented.

- While children stand in line before going to the lunch counter, an RA will put a sticker on each child with their first name, classroom number, and date/time (Kindergarteners will be asked to line up in alphabetical order to make the process easier)
- When walking through the lunchroom, as children pick up their milk (chocolate or regular) they will put their ID sticker on the milk
- Children will also receive a prompt or incentive during the "Treatment" days depending on which treatment they are randomized into
- Children will sit down and eat lunch as normal
- On some days, a randomly selected sample of children will be surveyed about the taste of their food and healthfulness (Survey.doc)
- At the end of lunch, children will "throw away" their tray at a trash station arranged next to the garbage can.
- After children leave and at the end of all lunch periods, the milk cartons will be weighed and the amount in each will be recorded to together with the name of the child
- Data will be entered into the computer and we will match each child's name with a random unique ID, and the original will be destroyed at the end of the study

Control & Incentive

In the control, children will only be observed, but an RA will help put the milk out to assure conformity with the other sites. In incentive, the only difference is that a bracelet is attached to each white milk carton.

Prompt

The RA will mention, "Try the white milk"

Taste Prompt

The RA will mention "Try the white milk, it tastes good"

Healthy Prompt

The RA will mention "Try the white milk, it is good for you"

Survey

Child Milk/Food Survey – Interview Format

Assistants will ask survey questions and have the child point to the corresponding Likert Scale smiley face. We are interested in finding out the child's opinions on how good the food tastes, how good for you (healthy) the food is, and what milk they think other children have been selecting. The research assistant records the answers on the record sheet.

Can I ask you a few questions about your lunch today?

Okay, great. When you answer, you are going to point to this smiley if you definitely agree with what I said, this one if you definitely don't agree, and one of these in between if you feel in between. I'll show you how to do the first one.

1. How good does your [insert side item] taste today?

If it tastes VERY GOOD, you point to this face (point to 5). If it tastes a LITTLE GOOD you point to this face (point to 4). If it tastes not good or bad, you point to this face (point to 3). If it tastes a little BAD you point to this face (point to 2). If it tastes VERY BAD you point to this face (point to 1).

2. How good does your milk taste today?

3. How good does your [insert main course item] taste today?

4. How good **for you** is the [insert side item] that we are having today?

5. How good **for you** is the milk?

6. How good **for you** is the [insert main course item]?

Okay, now a few without the faces.

7. If five kids today went to pick up milk, how many of them do you think picked the chocolate milk? How many picked regular?

8. Do you remember what kind of milk the person got who was before you in line?

1	2	3	4	5
VERY BAD	*A LITTLE BAD*	*NOT GOOD OR BAD*	*A LITTLE GOOD*	*VERY GOOD*