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Incentives to Eat Healthy: Evidence from a Grocery Store Field Experiment

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Abstract
We use a field experiment to investigate the effect of incentives on food purchase decisions at a grocery store. We recruit over 200 participants and track their purchases for a period of 6 months, permitting us a glimpse of more than 3,500 individual shopping trips. We randomize participants to one of several treatments, in which we incentivize fresh fruit and vegetable purchases, provide tips for fruit and vegetable preparation, or both. We report several key insights. First, our informational content treatment has little effect. Second, we find an important price effect: modest pecuniary incentives more than double the proportion of dollars spent on produce in the grocery store. Third, we find an interesting pattern of consumption after the experiment ends: even when incentives are removed, the treatment group has higher fruit and vegetable purchases compared to the control group. These long-term results are in stark contrast to either a standard price model or a behavioral model of 'crowd out.' Rather, our results are consonant with a habit formation model. This opens up the distinct possibility that short term incentives can be used as a key instrument to combat obesity.

JEL Classifications: I12, C93
Keywords: field experiment, incentives, education, food choice, grocery, habit formation

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1. Introduction

Worldwide obesity has nearly doubled since 1980, with more than 1.4 billion adults now overweight (World Health Organization (WHO), 2014).[1] In the United States, the Center for Disease Control (CDC) reports that more than one-third of adults are considered obese. Obesity has been linked to chronic conditions such as heart disease, type 2 diabetes and certain cancers[2], with estimated medical costs of $147 billion per year in the United States (Finkelstein et al., 2009). In order to combat obesity, the WHO and CDC recommend lifestyle changes, including adopting healthy eating habits and regular physical exercise. Yet, little is known about the best ways that economics can be used to affect eating habits.

Our contribution is to investigate the effectiveness of using monetary incentives, combined with tips for food preparation, on food purchasing behavior of individual consumers at grocery stores. Incentives are a cornerstone of economics, and have been effective in encouraging health-promoting behaviors, such as exercise (Charness and Gneezy, 2009; Royer et al., 2014), weight loss (Volpp et al., 2008; Cawley and Price, 2011; 2013), smoking cessation (Volpp et al., 2009), and patient compliance with healthy behaviors (Giuffrida and Torgerson, 1997).[3]

Standard economic theory predicts that monetary incentives provided for an activity will increase the pursuit of the activity, and that removing incentives will restore behavior to pre-incentive levels. Behavioral theories, however, suggest alternative predictions for

[1] http://www.who.int/mediacentre/factsheets/fs311/en/
[2] http://www.cdc.gov/obesity/data/adult.html
[3] A series of recent studies have also shown that incentives can encourage healthy food consumption among children in school lunchrooms (Just and Price, 2013; Belot et al., 2013; List and Samek, 2014). After incentives are removed, List and Samek (2014) and Belot et al. (2013) find some support for habit formation, rather than crowd out.

the impact of incentives, and the literature is divided on whether monetary incentives will have positive or negative long-term effects. The 'crowd out' theory suggests that monetary incentives will diminish the intrinsic motivation to engage in the activity, possibly resulting in counter-productive behavior in the long term (Gneezy et al., 2011). 'Crowd out' is the prevailing view in social psychology (e.g., Deci, 1971; Lepper and Greene, 1978) and has been formalized in economics by Benabou and Tirole (2003). In contrast, Charness and Gneezy (2009) propose that there is scope in the health domain for incentives to result in positive long-term outcomes through habit formation. To support the habit formation theory, Charness and Gneezy (2009) present findings that monetary incentives can induce the habit to exercise. But habit formation is elusive – the long-term effect of incentives on exercise was modest in a related study (Royer et al., 2014).

A great deal of research has also explored the impact of providing education and nutritional information to consumers. Overall, educational programs increased individuals' awareness and nutritional knowledge, but had mixed to no impact on purchase and consumption decisions (Jeffrey et al., 1982; Russo et al., 1986; Gittelsohn et al., 2007). In List and Samek (2014), while educational content alone had little effect, education combined with incentives showed the greatest promise at encouraging children to eat healthy following an intervention. In the current study, we are most interested in the interaction of informational content with pecuniary incentives in grocery stores; where, according to the Economic Research Service, the majority of food purchases occurred in 2013.[4]

In our field experiment, we recruit 222 individual grocery shoppers into a rewards

[4] See http://www.ers.usda.gov/data-products/food-expenditures.aspx#26634

program and track their individual purchases at the store for a period of up to 6.5 months. We randomize participants to a control group, or to one of three interventions: information, in which at the beginning of each store visit, participants receive a flyer with preparation tips for fruits or vegetables and a note about their importance to health; incentives, in which participants receive an additional $1 each time they purchase at least 5 cups of fresh fruits or vegetables; and combination, which includes both the incentive and information components. Five months into the program, we end the interventions and continue to observe shopping behavior for an additional 1.5 months. The field experimental approach is ideal in this setting because randomization to treatment allows us to directly measure the causal impact of our interventions.

We report several key insights. First, we find little evidence of the effectiveness of informational flyers. Indeed, we find that our informational treatment results in 1.7 more cups of fresh produce purchased, a small increase from the 1.6 cups of fresh produce purchased in our control group. Second, we find that monetary incentives have large influences: the introduction of a small monetary incentive to purchase produce more than doubles the number of cups of fresh produce purchased—from 1.6 in the control group to roughly 3.4 cups in the incentivized group.

Interestingly, this result does not quickly wane after the experiment ends. In the months following the intervention, the incentivized individuals purchase almost twice as much fruit and produce as the control group. This result is at odds with either a standard price model or a behavioral model of 'crowd out.' Rather, our results are supportive of a habit formation model that incorporates prior experience. In this way, our experiment

points to a potentially effective short term policy strategy: use high powered incentives to induce grocery store purchases of healthy items to combat poor eating habits.

Our paper proceeds as follows. Section 2 provides a background and outlines the competing hypotheses. Section 3 summarizes our field experimental procedures and design. Section 4 discusses our results. Section 5 concludes.

2. Background and Hypotheses

On each shopping trip, consumers purchase a bundle of products, which may include fresh fruits and vegetables, h, and other foods, g such that $(h, g) \in \mathbb{R}_+^L$ is the choice set and $(p_h, p_g) \in \mathbb{R}_+^L$ is the set of relevant price vectors at time t. The consumer is constrained by her wealth w, so the budget set is $B(p_h, p_g, w) = \{(h, g) \in \mathbb{R}_+^L : \langle p_h, p_g, h, g \rangle \leq w\}$. The maximization problem is:

$$(h, g) = argmax_{(h,g) \in B(p_h, p_g, w)} U(h, g)$$

The standard economic hypothesis is that, by decreasing p_h (through monetary incentives) while holding all else constant, because of income and substitution effects, we move the consumer to a bundle (h^*, g^*) where $h^* > h$. However, when incentives are removed, the consumer reverts to the original preferred bundle (h, g). This is the basis of the first hypothesis:

Hypothesis 1: Pecuniary incentives in the form of cash for produce purchase will increase the quantity demanded of produce during the experiment.

Behavioral theories provide channels through which incentives may result in outcomes that diverge from standard economic theory, and the behavioral literature is divided on whether monetary incentives will have positive or negative effects. If the price effect is

expected to be relatively strong, then we may not be able to observe a direct impact from behavioral channels while incentives are in place. We may, however, observe purchase decisions consistent with the behavioral theories after incentives are removed; that is, in the long-term. The long-term effects may also be most interesting to policymakers, since in practice, perpetual incentives inducing healthier food choices may be infeasible.

The first behavioral theory we consider is that of 'crowd out.' Benabou and Tirole (2003) propose that monetary incentives may 'crowd out' intrinsic motivation, either through signaling to the agent that the incentivized task is overly difficult, or signaling to the agent that he or she is not a high ability type.[5] In this spirit, a 'crowd out' effect is observed in the short-run in Gneezy and Rustichini (2000a, 2000b) in the case of small incentives. As argued in Gneezy et al. (2011), the psychological negative effect of 'crowd out' may be small in comparison to the positive effect of monetary incentives, so that on net, incentives may still result in improving food-purchasing habits while they are in place. However, the psychological effect of 'crowd out' may decrease intrinsic motivation to eat healthy, such that post-intervention, the incentivized group purchases fewer fruits and vegetables than the group that never received incentives. This brings us to the first competing hypothesis:

Hypothesis 2_0: Pecuniary incentives in the form of cash for produce purchase will have a 'crowd out' effect, resulting in less produce purchased, relative to the control group, after the experimental treatment ends.

[5] For a summary, see Gneezy et al. (2011). Crowd out is also the prevailing theory in the social psychology literature, see Deci (1971) and Lepper and Greene (1978) for two seminal papers. A condition for crowd out stated by Benabou and Tirole (2003) is asymmetric information between the principal and agent, which is a likely assumption in our case, since the principal (the grocery store manager) may be more knowledgeable than the agent (the customer).

A recent literature has emerged which suggests that in some cases incentives can actually have a positive long-term effect. At the forefront is a paper by Charness and Gneezy (2009), who find that incentives to exercise result in a greater likelihood of gym attendance, even after the incentives are removed. Charness and Gneezy (2009) theorize that the effect is driven by a model of habit-formation, and suggest that there is scope for habits to form, especially in the health domain. No related work that we are aware of has studied habit formation in food choice among adults, a decision that has important effects on health outcomes.

To formalize habit formation, we suppose that an individual's utility at time *t* is a function not only of current consumption of the bundle $(h, g) \in \mathbb{R}_+^L$ but also of the stock of healthy food consumption H such that $U(h, g, H)$. Suppose further that there is adjacent complementarity between H and h, meaning that the present marginal utility of consuming h is positively correlated with past consumption H, that is $\frac{dU(h,g,H)}{dhdH} > 0$ (Becker and Murphy, 1988). Why would we expect adjacent complementarity? The assumption is that experience in healthy eating causes more enjoyment of healthy foods in the future—that is healthy food consumption is complementary to future consumption of healthy foods.

As postulated by H1, short-term price decreases result in an increase in stock of consumption capital H in the short-run. This effect, in turn, raises h in the long run, leading to second competing hypothesis:

Hypothesis 2_a: Pecuniary incentives in the form of cash for produce purchase will have a habit-forming effect, resulting in more produce purchased, even after incentives are removed.

Who forms habits? As noted by Becker and Murphy (1988), the rate of time preference is key in determining whether adjacent complementarity exists and habits will form: more "future-oriented individuals" are more likely to form healthy food habits. The Becker and Murphy (1988) model, however, postulates that agents with otherwise identical utility functions and budget constraints today, might still have different degrees of habit formation if their past experiences differ.[6]

We have identified certain plausible effects of monetary incentives on healthy food consumption. Let us now turn to the question of how informational interventions may affect the impact of incentives. First consider the COMBINATION treatment in light of $H2_0$ – 'crowd out.' If 'crowd out' signals to the agent that the incentivized task is overly difficult, then providing some information on how to go about the incentivized task (as we do with food preparation tips) may mitigate the effect. If instead crowd out works through sending a signal to the consumer that she is only purchasing healthy food for the incentive, and has no intrinsic motivation to do so (as discussed in Gneezy et al., 2011), then again information may mitigate the effect by providing the consumer with a plausible additional 'intrinsic' motivation to become healthy.

Second, consider information in light of the habit formation story in $H2_a$. If indeed the utility of current consumption is based on the stock of consumption capital *H*, then information about food preparation may enhance adjacent complementary by creating more enjoyable experiences with healthy foods. This brings us to the final hypothesis:

[6] The Becker and Murphy (1988) model also postulates an *increasing* rate of habit formation over time. However, we relax this assumption and follow Charness and Gneezy (2009) in asserting that we only need to show increases in healthy food consumption post intervention relative to pre-intervention levels to find evidence of habits. Note also that Becker and Murphy (1988) incorporate additional nuances in their model, including depreciation rate for *H*.

Hypothesis 3: There is a positive interaction effect of information and incentives, which increases produce purchases during and after the experimental treatment.

We now turn to a discussion of how we test these hypotheses with a field experiment conducted in a grocery store.

3. The Experiment

3.1 Experimental Setup and Procedures

The experiment was conducted between January and June, 2014, at Louis' Groceries, a small-format grocery store located in the Greater Grand Crossing community area of Chicago, Illinois (see Appendix I for more details about the grocery store). The neighborhood has high rates of poverty, with 28.5% of its residents living below the poverty level. Before Louis' Groceries opened its doors in the fall of 2013, the community had few nearby supermarkets and grocery providers, creating what has been termed a 'food desert.'[7] This community is ideal for our intervention for two reasons. First, while one limitation of our study is the ability of consumers to substitute toward shopping elsewhere, consumers in Greater Grand Crossing have few other fresh produce options. Second, related work shows that obesity and its associated disease burdens disproportionately affect the low-income urban population in the United States; thus, targeting of this group makes our field experiment potentially more policy relevant.

[7] To be classified as a 'food desert' by the United States Department of Agriculture, the community must be at least 1 mile away from any grocery store.

Indeed, the community has higher incidences of obesity and obesity-related disease than the city of Chicago overall.[8]

Starting in January, we invited store shoppers to sign up for the Louis' Special Rewards program. Participants were made aware that the program was also part of a research study and that shopping decisions would be recorded, but they were not aware of the nature of the experiment (in this way, in the parlance of Harrison and List (2004), our approach should be denoted a framed field experiment). Thus, all participants signed a consent form and completed a short demographic survey in-store. No purchase was necessary in order to sign up, and participants received $5 for signing up and completing the survey. Upon sign-up, participants were randomized to treatment and received an ID card and information about the program (which was treatment specific).

In order to encourage all shoppers to use their cards, similar to other retail rewards programs, we decided to provide an incentive to all participants. While some rewards programs provide direct discounts listed on store marketing materials, we opted to provide a $1 cash incentive for each shopping trip. Participants in all treatment groups received $1 each time they shopped at the store (up to once per day). Participants knew about the participation incentive when they signed up.

Participants were told that on each shopping trip they would be able to use their rewards by first checking in with the cashier to obtain their coupon (which was matched to treatment using the participant's name). During shopping trips, participants kept their

[8] For 2005-2009, the rate of deaths per 100,000 residents caused by coronary heart disease was 10% higher, the rate of diabetes-related deaths was 27% higher, the rate of deaths caused by colorectal cancer was 38% higher, by kidney disease was 40% higher and by liver disease and cirrhosis was 17% higher for Greater Grand Crossing as compared to the city of Chicago overall (Chicago Department of Public Health - http://chicagohealthatlas.org/place/greater_grand_crossing).

coupon with them while shopping, and then redeemed it at checkout. The coupon provided the fresh fruit and vegetable preparation tips in the information treatments, or reminded the participant of his/her eligibility for rewards in the incentive treatments.

Figure 1 provides a timeline of the experiment. We have between 6 weeks and 5 months of individual purchase data (depending on date of sign-up), and 6 weeks of data post-treatment. A point-of-sales system was used to track all purchases made in store. Our data include information on each item purchased by participants utilizing their rewards coupons, by individual ID and date. We also have aggregate data on all non-participant purchases made in-store prior to, during, and after the intervention.

[FIGURE 1: TIMELINE, ABOUT HERE]

3.2 Treatment Design

The USDA recommends that adults consume 2 cups of fruits and 2 1/2 cups of vegetables daily;[9] yet data show that most Americans are consuming only about 1.1 cups of fruit and 1.6 cups of vegetables per day (CDC, 2013), with low-income families at the low end of the distribution (Dubowitz et al., 2008). To keep the intervention simple, we focused on promoting the purchase of fresh fruits and vegetables from the produce section of the store.

We conducted four treatments, randomizing participants to a control group (CONTROL) or to one of three behaviorally-motivated interventions: INCENTIVES, in which participants received an additional $1 each time they purchased at least 5 cups[10] of fresh fruits or vegetables, INFORMATION, in which participants received a flyer that

[9] USDA's guidelines can be accessed at http://www.choosemyplate.gov/food-groups/fruits.html

[10] Cups were used as a unit of measure since specifying dietary requirements in familiar units is suggested (Liu et al., 2014). Prior to the start of the study, we posted signs around the store indicating how much of each produce item constitutes a cup, and all treatment groups had access to this information.

provided preparation tips for fruits or vegetables at the beginning of each visit, and COMBINATION, which included both the incentive and information components. Figure 2 provides examples of the coupons that individuals received during each shopping visit. While coupons for CONTROL and INCENTIVES always contained the same language, we varied the material contained in INFORMATION and COMBINATION coupons. Specifically, we adapted the educational material available on the USDA website to create 20 different coupons.

Each INFORMATION and COMBINATION coupon included a tip for how to incorporate more fresh fruits and vegetables into one's diet. Examples of tips include, "*try tomato, avocado, or romaine lettuce in your sandwich for extra flavor*," and "*at dinner, include orange sections, grapes or berries in a tossed salad*." Each coupon also provided a picture of the fruit or vegetable in the tip and information about the health benefit of eating fresh fruits and vegetables. The information was designed partly in response to focus groups that we conducted with store customers prior to the study, which found that a barrier to healthy eating is a lack of knowledge about how to prepare and consume healthy foods, and produce more generally.[11]

[FIGURE 2: COUPON SAMPLES, ABOUT HERE]

[11] We conducted the focus groups in the fall of 2013, and involved 2 sessions with 8 store customers per session. A summary of the focus groups is available from the authors upon request. The kind of information adapted for the coupons can be found on the USDA website for fruit and vegetable preparation tips, see http://www.choosemyplate.gov/fruits-tips and http://www.choosemyplate.gov/vegetables-tips.

4. Results

4.1 Overview

A total of 222 individuals participated in the experiment and were randomized to one of the 4 treatment groups.[12] Table 1 provides information about the demographics of participants, by treatment. The average age of participants was 49.5 (standard deviation of 13.9), 48.9% were female, and most participants (90.3%) identified their race as African American. Similar to the general composition of Greater Grand Crossing, 63.1% of participants were part of the USDA Supplemental Nutrition Assistance Program (SNAP), indicating a low income. In our sample, 85.3% reported having at least a High School diploma, but only 16.6% had a college diploma; 76.1% of participants stated that they were the primary decision-maker regarding grocery shopping in their household.

[TABLE 1: PARTICIPANTS, ABOUT HERE]

Table 2 provides information about our participants typical shopping behavior at Louis' during the experiment and post-experiment periods. We gathered data from 3,635 individual shopping trips, 2,721 of which occurred during the experimental treatment period and 914 of which occurred during the post-treatment period. The average amount spent on a shopping trip was $4.19 (s.d.= $4.53), and shoppers visited Louis' on average twice a week. Despite the classification of Greater Grand Crossing as an area with few alternative options for groceries, the low average purchase amount does suggest that participants shopped elsewhere. Nevertheless, shoppers did visit Louis' often – the average shopper visited 12 times during the treatment period and 7 times during the post-

[12] An additional 9 individuals signed up for the study but did not return for any shopping visits, so they are excluded from the data.

treatment period – and spent about $60 total during the treatment period, and an additional $16 during the post-treatment period.

There is also high variance in reliance on Louis' as a primary source of food: the lowest total spent during the study was $0.05, while the highest total spent was $573.45. Twenty-five customers (11%) never spent more than $1 on any visit, appearing to come to Louis' only for the participation incentive.[13] In Appendix II, we provide analysis that restricts the sample by removing these shoppers.

There are a few differences by treatment in demographics and shopping behavior. The COMBINATION treatment has a higher proportion of SNAP participants than the other treatments (74% versus 58%-60%, a marginally significant difference, but only significant at $p<0.10$). In addition, there is some variation in the total number of visits per shopper by treatment, but the differences are not statistically significant (ranging from about 1.7 visits per week in INCENTIVE to 2.1 visits per week in CONTROL).

[TABLE 2: SHOPPING BEHAVIOR, ABOUT HERE]

4.2 Treatment Effects

Shoppers selected bundles of *(h, g)* on each shopping trip. We construct several outcome variables to measure the amount of fruits and vegetables purchased in the experiment: the cups of produce purchased, h (using the same measures of cups presented in-store during the experiment), the percentage of spending devoted to produce relative to all other goods on each shopping trip, $h/(h+g)$, the total amount spent on produce on each shopping trip, $h*p_h$, the percentage of participants purchasing any produce, fraction with

[13] This constituted 6 shoppers in CONTROL, 8 shoppers in INCENTIVE, 7 shoppers in INFORMATION and 4 shoppers in COMBINATION.

$h > 0$, and the percentage of participants purchasing at least 5 cups of produce, fraction with $h > 5$ cups of produce.

Table 3 provides a summary of produce purchasing behavior during treatment. In the CONTROL group, only 28.4% of shopping baskets contained any produce, and the total amount spent on produce (including zeros) was $0.48. Along most measures, we see that the INCENTIVE and COMBINATION treatments result in more produce purchased as compared to the CONTROL treatment. The average total cups of produce purchased increases from 1.6 cups to 3.4-3.5 cups when an incentive is introduced (Mann-Whitney $p<0.05$ for INCENTIVE vs. CONTROL and $p<0.01$ for COMBINATION vs. CONTROL), and the total amount of dollars spent on produce doubles ($p<0.10$ for INCENTIVE vs. CONTROL and $p<0.05$ for COMBINATION vs. CONTROL).

Furthermore, the proportion of participants purchasing at least 5 cups of produce increases from 12.4% to 30.8-33.1% when incentives are introduced ($p<0.01$ for INCENTIVE vs. CONTROL and COMBINATION vs. CONTROL). And, COMBINATION participants are more likely to purchase any produce ($p<0.05$) and spend a higher proportion of their visit budget on produce ($p<0.01$) than the CONTROL group.[14]

Table 4 provides the results of regressions that make produce purchases a function of treatment dummies, and include individual random effects, and demographic controls. The regression results support the two-way comparisons – the coefficient on the INCENTIVE and COMBINATION dummies is positive and statistically significant for cups of produce purchased, amount spent on produce, and purchase of at least 5 cups of

[14] The *p*-values on this measure when comparing CONTROL and INCENTIVE are 0.12 and 0.22, respectively.

produce (p<0.05 for most specifications). In terms of economic meaning, the coefficient on INCENTIVES and COMBINATION ranges from 1.89 to 2.12, and is statistically significant at p < .01. This results suggests that the total cups of produce purchased is higher by about 2 cups when incentives are introduced. This brings us to our first result, which is in support of the expected price effect (Hypothesis 1):

Result 1: Treatments that incentivize the purchase of produce result in increased purchases of produce relative to treatments without pecuniary incentives.

Next, we turn to the question of whether the information that we provided had an effect on produce purchase. As can be noted from Tables 3 and 4, there is limited evidence of the effectiveness of the INFORMATION treatment. While INFORMATION results in directionally more cups of produce purchased relative to CONTROL (1.7 versus 1.6, coefficient of 0.33), the differences are not statistically significant for any of the measures at conventional levels. There is also little evidence in favor of the COMBINATION treatment over the INCENTIVE treatment at increasing produce purchasing. While COMBINATION results in directionally more cups of produce purchased compared to the INCENTIVE treatment (3.5 versus 3.4), the difference is not statistically significant. Moreover, tests of INCENTIVES versus COMBINATION reported in the bottom row of Table 4 do not show statistically significant differences (all p-values>0.10). This brings us to the next result:

Result 2: Information, alone or in combination with incentives, has limited impact on produce purchase decisions.

We conclude that the information we provided (food preparation tips, combined with a nutritional fact, summarized using educational material on the USDA website) is

not an effective way to improve produce-purchasing behavior among our population. This conclusion does not preclude the effectiveness of other possible forms of education, but it is in line with related work showing that nutrition education may affect knowledge but not decision-making, at least in the short term of the experiment.

4.3 Post-Treatment

The two competing hypotheses in the paper relate to the impact of incentives after they are removed: while the 'crowd out' hypothesis (Hypothesis 2_0) suggests that produce purchase will decrease relative to the control group, the habit formation hypothesis suggests that produce purchase will remain higher than the control group post-intervention (Hypothesis 2_b).

Table 5 provides a summary of produce purchasing behavior in the post-treatment period. Participants in the CONTROL group purchase at least 5 cups of produce only 5% of the time, while participants in the INCENTIVE and COMBINATION treatments purchase produce 19.5-23.2% of the time, a statistically significant difference (Wilcoxon-Mann-Whitney p-values<0.05 for CONTROL vs. INCENTIVE and CONTROL vs. COMBINATION). While differences are not statistically significant on remaining measures, produce purchases in INCENTIVE and COMBINATION treatments are directionally higher than in the CONTROL group (for instance, only about 1 cup of produce is purchased in the CONTROL group on average, versus 2.4-2.6 cups in the incentivized treatments). Because INCENTIVE and COMBINATION do not show statistically significant differences[15], and due to the small sample size (only 128

[15] Wilcoxon-Mann-Whitney tests show no differences in the treatment or post-treatment period for any of the measures.

participants remain post-treatment), we pool these two treatments for the remainder of the analysis.

Table 6 presents the results of regressions of treatment dummies on produce purchasing post-treatment.[16] The coefficient on ANY INCENTIVE is positive (1.70-1.79) and statistically significant (p-value<0.05) for the number of cups purchased, and is also statistically significant (p-value<0.01, 0.05) for whether or not the individual bought at least 5 cups (0.15-0.17). The regression results, together with the two-way tests, suggest that the habit formation hypothesis (Hypothesis 2_a) is more consistent with the data than the 'crowd out' hypothesis (Hypothesis 2_0). This brings us to our final result:

Result 3: We find evidence consistent with a habit-forming effect of pecuniary incentives.

This result is driven by the fact that after the incentives are removed, the total number of produce cups purchased, and the likelihood of purchasing at least 5 cups, are significantly higher in treatments with incentives relative to the control group in the post-intervention period. This is potentially an important result, as it provides a preliminary indication that modest incentives introduced for a short period of time have the potential to have longer term effects.

Regression results in Table 6 also include time trends, in particular the interaction of time with the treatment intervention. We find that while the *Week-Incentive Interaction* dummy is negative (-0.07 to -0.05 in Columns 1 and 2), suggesting some decrease in the habits in the weeks following the intervention, it is not statistically

[16] Appendix II Table A3 provides similar analysis with INCENTIVE and COMBINATION as separate variables. INCENTIVE and COMBINATION are not significantly different in post-estimation tests, and show similar results, though not as robust to various specifications as the pooled variable.

significant (and this coefficient is in fact positive and insignificant in some specifications, e.g., Columns 3-6).

Note that coefficients along other dimensions, like total amount spent on produce and percentage of total spent on produce, are positive but not statistically significant. One speculative reason for the strength of the "bought at least 5 cups" measure relative to most other measures is that individuals may form habits over what they buy, but not necessarily over how much they spend or consume. This feature of our data is an important consideration for future research.

4.4 Limitations

One limitation of any study conducted in a grocery store is the possibility that shoppers are nudged towards a healthier purchase in the moment, but substitute towards less healthy foods when making future food-related decisions in another store. We attempted to mitigate this concern by conducting our study in what otherwise would be a 'food desert,' classified by the lack of any other grocery store within 1 mile from Louis'. Yet, as can be noted from Table 2, the spending per visit is actually quite low, suggesting that shoppers may indeed have been shopping elsewhere besides Louis', leaving room for possible substitutions. Indeed, if this is the case, our results should be interpreted with caution.

While we still observe a habit-forming effect of incentives in the food purchase domain, it may well be the case that shoppers formed the habit to purchase healthy foods at Louis', but did not necessarily increase overall healthy food purchasing. Nevertheless, what we can say with more certainty is that our data do not support a 'crowd out' story of

driving out the intrinsic motivation to eat healthy. Future work should investigate settings where the substitution effects could be measured, for instance by incentivizing a household's purchase behavior as a whole, or using new approaches to ascertain the impact of incentives on overall food consumption.

A limitation of the post-treatment data is that many participants whose shopping behavior is captured in the treatment phase do not return to the store at any point in time during the post-treatment phase. In the post-treatment phase, we have data on 47% CONTROL subjects (25 of 53), 56% INFORMATION subjects (33 of 59) and 61% INCENTIVE/COMBINATION subjects (70 of 114). One possible reason for this is that the post-treatment phase was much shorter than our within treatment sample, meaning that if individuals had habits of shopping infrequently, their shopping trips would not have been captured. Another reason is that some individuals may have been drawn to the store in order to sign up for the rewards program, but they were not regular shoppers at Louis' and therefore did not return frequently.

The concern may be that there are differences in the decision to visit Louis' in the post-treatment period, which vary by treatment and give rise to the results presented here. One way to address this concern is to consider whether individuals who visit in the post-treatment period differ by treatment in their observable characteristics. We find on the whole only one major difference between individuals who we see in the post-treatment period relative to those we do not – they are significantly more likely to be SNAP recipients (79% SNAP versus 41% SNAP, Chi^2 $p<0.01$). However, there are no treatment differences for subjects we observe post-treatment. Those who come post-

treatment are also more likely to have included more produce as a proportion of shopping visit spending (19% versus 13%, Mann-Whitney p-value<0.01).

Individuals in the incentive treatments are marginally more likely to be observed in the post-treatment period relative to individuals in the control group (Chi^2 p=0.08 when comparing CONTROL to treatments with any incentive), and there are no differences in the likelihood of being observed in the post-treatment period when comparing INFORMATION to CONTROL (p=0.18). However, there are no demographic differences by treatment for individuals who return – they are equally as likely to be on SNAP (60% of returners are on SNAP in CONTROL, relative to 58% in INFORMATION and 67% in any incentive treatments), they are equally as likely to be the primary decision-maker in the household (75% in CONTROL, relative to 74% in INFORMATION and 80% in any incentive treatments) and they are equally educated (85% (17%) have at least a high school (college) degree in the control group, relative to 84% (20%) in INFORMATION and 86% (15%) in treatments with any incentive). Thus, we conclude that there is no major observable difference by treatment in the participants whom we observe in the post-treatment period.

5. Conclusion

One of the most pressing health problems facing modern societies today is obesity. With millions of individuals touched by obesity, and billions of dollars at stake, policymakers are considering every option available—from fat taxes to information dissemination to teach a healthy lifestyle. Of course, with complex issues like obesity,

there is no one simple solution. In this study, we make a modest step to understanding the set of available policy instruments by exploring food purchase decisions.

By partnering with a grocery store in Chicago, Louis' Groceries, we are able to leverage a field experiment to explore how information and pecuniary incentives can be used to affect purchases of healthy foods in the grocery store. Using evidence from more than 3,500 individual shopping trips, we find that information, either alone or with pecuniary incentives to purchase the item, has modest effects. Yet, pecuniary incentives are found to work on two dimensions. First, during the experiment the proportion of food dollars spent on produce considerably increase when monetary incentives to purchase are in place. This result is in line with related work on incentives in school lunchrooms (e.g., Just and Price, 2013; List and Samek, 2014; 2015). Second, a positive effect remains long after (at least 1.5 months) the experiment concludes. In this way, our results are consonant with a habit formation model.

The contribution of our work is relevant for several reasons. For practitioners, we provide a direct comparison of the impact of informational content versus financial incentives at improving food choice, finding that financial incentives are a clear winner in the food purchase domain. While there may be some worry that incentives lead to 'crowd out' of intrinsic motivation, this is not evident in our data. Indeed, we find quite the opposite: incentives lead to the formation of habits in practice. For academics, our field experiment provides a horse-race between two prominent behavioral economics models, finding empirical evidence in support of habit formation versus 'crowd out' in a key behavior for weight management, food purchase. Finally, our field experiment

showcases that one can learn a lot when moving from experiments that measure short run substitution effects to experiments where long-term outcomes can be assessed.

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Table 1: Summary of Participants

Treatment	Number of Participants	Age	% Female	% Black	% At least HS Diploma	% College Diploma	% Primary decision-maker	% SNAP
CONTROL	53	48.93 (13.05)	54.72%	92.45%	84.91%	16.98%	75.47%	60.38%
INCENTIVE	55	47.37 (14.19)	52.85%	84.13%	88.46%	17.31%	78.18%	58.18%
INFORMATION	55	50.91 (15.30)	40.00%	90.74%	83.63%	20.00%	74.55%	58.18%
COMBINATION	59	50.66 (13.06)	49.15%	93.22%	84.21%	12.28%	76.27%	74.58%
Total/Average	222	49.48 (13.87)	48.87%	90.32%	85.25%	16.59%	76.13%	63.06%

Note: This table provides demographic information about participants in the experiment, by treatment. The data on SNAP participation is taken from shopping data, and we consider someone as a SNAP shopper if they have used SNAP cards at least once while participating in Louis' Special Rewards. Remaining data is self-reported and taken from the questionnaire completed upon sign-up. 5 participants did not report their educational attainment, 1 participant did not report their race and we are missing gender for 1 participant.

Table 2: Shopping Behavior

	During Treatment					**Post Treatment**			
Treatment	Number of Visits per Person	Spending per Visit	Number of Visits per Week	Days of Time in Treatment	Total Spending	Number of Visits per Person	Spending per Visit	Number of Visits per Week	Total Spending
CONTROL	13.06	$4.05	2.13	73.43	$28.58	8.03	$3.44	2.45	$13.09
	(19.91)	(3.73)	(1.65)	(38.00)	(33.85)	(10.27)	(3.47)	(1.71)	(14.87)
INCENTIVE	8.75	$5.31	1.72	76.55	$42.84	5.75	$5.88	1.83	$19.21
	(12.19)	(6.31)	(1.18)	(32.30)	(40.84)	(6.64)	(8.88)	(1.23)	(23.64)
INFORMATION	12.20	$3.52	1.94	82.36	$40.01	5.74	$4.27	1.91	$17.95
	(15.19)	(3.38)	(1.39)	(33.48)	(55.97)	(7.71)	(6.47)	(1.50)	(29.77)
COMBINATION	14.86	$3.92	2.08	81.71	$43.71	7.58	$3.22	2.12	$14.62
	(16.91)	(4.03)	(1.41)	(29.40)	(59.67)	(7.83)	(3.11)	(1.33)	(14.82)
Average	12.26	$4.19	1.99	78.62	$38.97	6.77	$4.18	2.07	$16.26
	(16.31)	(4.53)	(1.43)	(33.30)	(59.57)	(8.09)	(5.95)	(1.45)	(21.62)

Note: This table provides data on shopping behavior in general. Data is collected from the point-of-purchase data during and after the intervention for all participants. Spending per visit is calculated by first taking the average spending per person. Total purchasing is lower in the post-treatment period relative to the treatment period, because there are fewer days of data collection post-treatment. Standard deviation in parentheses.

Table 3: Treatment Effects

Treatment	Cups of Produce Purchased	Amount Spent on Produce	% of Total Spent on Produce	% Buying Any Produce	% Buying 5 Cups of Produce	Observations
CONTROL	1.58	$0.48	14.29%	28.19%	12.36%	53
	(2.87)	($0.79)	(24.40%)	(36.68%)	(26.30%)	
INCENTIVE	3.36	$0.93	17.14%	42.03%	33.11%	55
	(4.06)	($1.27)	(21.08%)	(40.15%)	(35.55%)	
INFORMATION	1.65	$0.39	11.37%	25.09%	13.00%	55
	(2.89)	($0.65)	(17.59%)	(31.51%)	(24.16%)	
COMBINATION	3.49	$1.02	23.87%	42.46%	30.86%	59
	(5.34)	($2.05)	(27.73%)	(39.13%)	(37.73%)	
Average	2.54	$0.72	16.82%	34.64%	22.58%	222
	(4.04)	($1.35)	(23.42%)	(37.65%)	(32.89%)	

Note: This table provides point-of-purchase data on produce purchasing in an average visit during the treatment period. Statistics calculated after taking the average for each individual. Standard deviation in parentheses.

Table 4: Regressions During Treatment

	(1) Produce Cups	(2) Produce Cups	(3) Produce Spending	(4) Produce Spending	(5) Percent on Produce	(6) Percent on Produce	(7) Bought 5 Cups	(8) Bought 5 Cups
INCENTIVES	2.11***	1.89***	0.49**	0.45**	0.06*	0.06	0.25***	0.23***
	(0.63)	(0.62)	(0.19)	(0.19)	(0.04)	(0.04)	(0.05)	(0.05)
INFORMATION	0.33	0.33	-0.04	-0.03	0.01	0.01	0.03	0.03
	(0.51)	(0.52)	(0.14)	(0.14)	(0.04)	(0.04)	(0.04)	(0.04)
COMBINATION	2.04***	2.12***	0.55**	0.57**	0.11***	0.12***	0.21***	0.20***
	(0.72)	(0.74)	(0.27)	(0.27)	(0.04)	(0.04)	(0.05)	(0.05)
Week (0-17)	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Female		0.52		0.21		0.03		0.01
		(0.48)		(0.16)		(0.03)		(0.04)
Black		-0.85		-0.04		0.02		-0.01
		(0.96)		(0.22)		(0.04)		(0.06)
HS Diploma		0.41		0.16		0.02		0.00
		(0.53)		(0.13)		(0.03)		(0.05)
College Diploma		2.51**		0.86**		0.07		0.15**
		(1.05)		(0.41)		(0.04)		(0.06)
Primary Decision-Maker		1.57***		0.35***		0.08**		0.12***
		(0.42)		(0.13)		(0.03)		(0.04)
SNAP Recipient		0.55		0.15		-0.02		0.09**
		(0.50)		(0.14)		(0.03)		(0.04)
Constant	1.43***	-0.37	0.44***	-0.28	0.10***	-0.01	0.10***	-0.07
	(0.36)	(1.09)	(0.10)	(0.33)	(0.03)	(0.06)	(0.03)	(0.08)
Observations	2,721	2,699	2,721	2,699	2,721	2,699	2,721	2,699
Number of id	222	217	222	217	222	217	222	217
Test Incentive=Combination	0.941	0.776	0.845	0.685	0.218	0.167	0.463	0.608

Note: CONTROL is the omitted group. All demographics are dummy variables. For regressions with demographics, the omitted groups are Male, White, no diploma, not primary decision-maker, not SNAP recipient. Regressions (1) through (6) are Ordinary Least Squares with robust standard errors in parentheses, (7) and (8) are maximum likelihood estimates. Bottom row reports p-values from post-estimation tests of Incentives=Combination, which are always not statistically significant. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Post-Treatment Effects

Treatment	Cups of Produce Purchased	Amount Spent on Produce	% of Total Spent on Produce	% Buying Any Produce	% Buying 5 Cups of Produce	Observations
CONTROL	0.95	$0.39	10.89%	22.80%	5.14%	25
	(1.55)	($0.67)	(22.22%)	(33.88%)	(14.66%)	
INCENTIVE	2.63	$0.93	16.78%	32.79%	19.51%	30
	(4.69)	($2.31)	(30.01%)	(42.39%)	(32.63%)	
INFORMATION	1.18	$0.33	8.37%	22.34%	11.11%	33
	(2.56)	($0.67)	(18.85%)	(33.52%)	(29.27%)	
COMBINATION	2.42	$0.95	18.97%	35.08%	23.19%	40
	(3.76)	($2.05)	(25.55%)	(41.17%)	(37.24%)	
Average	1.86	$0.67	14.15%	28.86%	15.69%	128
	(3.46)	($1.67)	(24.69%)	(38.28%)	(31.21%)	

Note: This table provides point-of-purchase data on produce purchasing in an average visit during the treatment period. Statistics calculated after taking the average for each individual. Standard deviation in parentheses.

Table 6: Regressions Post-Treatment

	(1) Produce Cups	(2) Produce Cups	(3) Produce Spending	(4) Produce Spending	(5) Percent on Produce	(6) Percent on Produce	(7) Bought 5 Cups	(8) Bought 5 Cups
ANY INCENTIVE	1.70**	1.79**	0.47	0.58	0.06	0.07	0.17***	0.15**
	(0.70)	(0.78)	(0.30)	(0.38)	(0.06)	(0.06)	(0.06)	(0.07)
INFORMATION	0.39	0.74	-0.16	0.06	-0.01	0.00	0.07	0.09
	(0.68)	(0.72)	(0.22)	(0.29)	(0.06)	(0.06)	(0.06)	(0.07)
Week (0-6)	-0.06	-0.06	-0.02*	-0.02	-0.01	-0.01	-0.00	-0.00
	(0.04)	(0.04)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
Week-Incentive Interaction	-0.07	-0.05	0.02	0.02	0.00	0.01	-0.01	-0.00
	(0.09)	(0.09)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Week-Information Interact.	-0.05	-0.04	0.03	0.03	-0.00	-0.00	-0.00	-0.00
	(0.08)	(0.08)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)
Female		0.39		0.55*		0.05		0.04
		(0.58)		(0.29)		(0.04)		(0.05)
Black		-1.10		-0.27		-0.01		-0.03
		(1.13)		(0.42)		(0.06)		(0.08)
HS Diploma		0.36		0.27		0.04		0.03
		(0.66)		(0.20)		(0.05)		(0.07)
College Diploma		1.48		0.94		0.10		0.06
		(0.97)		(0.61)		(0.07)		(0.07)
Primary Decision-Maker		1.32**		0.55**		0.04		0.12***
		(0.52)		(0.23)		(0.05)		(0.04)
SNAP Recipient		0.67		-0.05		-0.03		0.08*
		(0.68)		(0.42)		(0.06)		(0.05)
Constant	1.09***	-0.39	0.46***	-0.46	0.12***	0.03	0.06*	-0.12
	(0.40)	(1.15)	(0.17)	(0.52)	(0.04)	(0.10)	(0.04)	(0.10)
Observations	914	907	914	907	914	907	914	907
Number of id	128	126	128	126	128	126	128	126

Note: CONTROL is the omitted group, INCENTIVE and COMBINATION are pooled and are counted in ANY INCENTIVE. All demographics are dummy variables. For regressions with demographics, the omitted groups are Male, White, no diploma, not primary decision-maker, not SNAP recipient. Regressions (1) through (6) are Ordinary Least Squares with robust standard errors in parentheses, (7) and (8) are maximum likelihood estimates. *** p<0.01, ** p<0.05, * p<0.1

Figure 1: Experiment Timeline

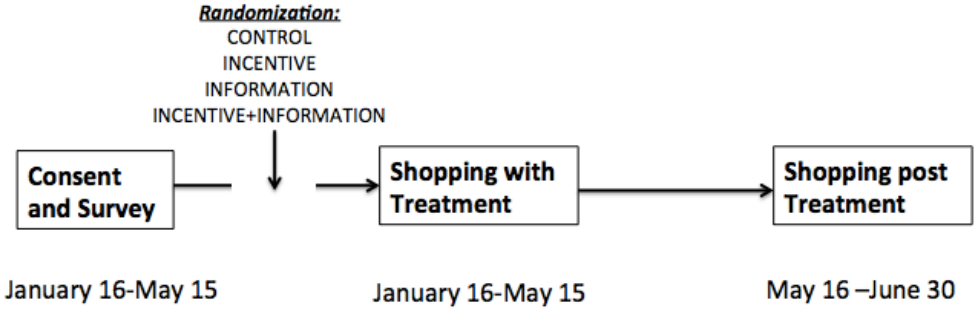


Figure 2: Coupon Samples

CONTROL

INCENTIVES

Louis' GROCERIES *Special Rewards*

Did you know?

Buy 5 cups of fresh fruits
or veggies and get $1 in
addition each time you shop.

Remember: You are in Louis' Special Rewards program.
For a limited time, you get $1 in cash each time you shop!

Tell the cashier your name each time you shop to redeem your personal offer. Limit (1) per day.

INFORMATION

Louis' GROCERIES *Special Rewards*

Did you know?
Eating fruit provides health benefits!

Tip: Snack on fruit.
Keep a bowl of whole fruit on the
table, counter, or in the refrigerator.
Snack away!

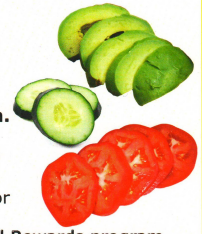
Remember: You are in Louis' Special Rewards program.
For a limited time, you get $1 in cash each time you shop!

Tell the cashier your name each time you shop to redeem your personal offer. Limit (1) per day.

COMBINATION

Louis' GROCERIES *Special Rewards*

Did you know?
Veggies don't just add nutrition. They
can add color, flavor and texture.



Tip: Add veggies to your sandwich.
Whether it is a sandwich or wrap,
vegetables make a great addition. Try
sliced tomatoes, romaine lettuce or
avocado in your everyday sandwich for
extra flavor.

Remember: You are in Louis' Special Rewards program.
For a limited time, you get $1 in cash each time you shop!

Tell the cashier your name each time you shop to redeem your personal offer. Limit (1) per day.

Louis' GROCERIES *Special Rewards*

Did you know?

Buy 5 cups of fresh fruits
or veggies and get $1 in
addition each time you shop.

Remember: You are in Louis' Special Rewards program.
For a limited time, you get $1 in cash each time you shop!

Tell the cashier your name each time you shop to redeem your personal offer. Limit (1) per day.

Appendix I: Louis' Groceries at Greater Grand Crossing

The experiment was conducted at Louis' Groceries, a small-format neighborhood grocery store, which opened in December 2012 in the Greater Grand Crossing community area of Chicago, Illinois. The Greater Grand Crossing community area has a total population of 35,217 (Census, 2010), the majority of whom are African Americans (97.8%). The neighborhood has high rates of poverty, with 28.5% of its residents living on an income below the poverty level. The community also has high incidences of obesity and basic prophylactic health neglect, which are higher than the city of Chicago overall. For 2005-2009, the rate of deaths per 100,000 residents caused by coronary heart disease was 10% higher, the rate of diabetes-related deaths was 27% higher, the rate of deaths caused by colorectal cancer was 38% higher, by kidney disease was 40% higher and by liver disease and cirrhosis was 17% higher for Greater Grand Crossing as compared to the city of Chicago overall (Chicago Department of Public Health, accessed 2014 - http://chicagohealthatlas.org/place/greater_grand_crossing).

Louis' Groceries is a non-profit pilot project to improve access to fruits, vegetables and other healthy options in an urban food desert. With a retail space of approximately 1,000 square feet, the store was conceived of as a modified convenience store. Louis' Groceries carries the snack items found in a typical convenience store, but does not sell alcohol, tobacco or lottery products, which are standard components of the convenience-store business model. Instead, the store stocks a wide assortment of fresh fruits and vegetables; perishables like bread, eggs, meat, dairy products; shelf-stable groceries including hot and cold cereals, rice, pasta, canned and dried legumes, canned fruits, vegetables, meat and fish, baking ingredients, condiments and spices; and frozen vegetables, meat, fish, heat-and-serve meals and snacks. Louis' Groceries subsidizes its grocery prices through charitable donations to the non-profit organization to maintain affordability for the store's predominantly low-income customers. The store is open six days a week.

Customers comprise those buying only a few snacks as well as those shopping for ingredients to prepare meals. Approximately 40% of items sold are perishable groceries, 20% shelf-stable and frozen groceries, and 40% snacks (cookies, candy, chips, soda, etc.). During the period of the study, Louis' Groceries served approximately 420 customers per week, with weekly revenue of roughly $1,500. The average receipt was $3.72. Supplemental Nutrition Assistance Program (SNAP) customers accounted for approximately 50% of revenue. The average receipt for which SNAP was used was an amount totaling $6.46.

Appendix II: Additional Analysis

[See TABLES / FIGURES]

Appendix II – Additional Analysis

Table A1: Regressions During Treatment, Restrict to Remove Low-Purchasers

	(1) Produce Cups	(2) Produce Cups	(3) Produce Spending	(4) Produce Spending	(5) Percent on Produce	(6) Percent on Produce	(7) Bought 5 Cups	(8) Bought 5 Cups
INCENTIVES	2.51***	2.24***	0.59***	0.53**	0.10***	0.09**	0.29***	0.26***
	(0.68)	(0.69)	(0.21)	(0.21)	(0.04)	(0.04)	(0.06)	(0.06)
INFORMATION	0.41	0.33	-0.03	-0.04	0.02	0.02	0.04	0.03
	(0.56)	(0.58)	(0.15)	(0.16)	(0.04)	(0.04)	(0.05)	(0.05)
COMBINATION	2.15***	2.45***	0.57**	0.65**	0.14***	0.14***	0.21***	0.22***
	(0.77)	(0.79)	(0.28)	(0.30)	(0.04)	(0.04)	(0.06)	(0.06)
Week	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Female		0.59		0.24		0.02		0.01
		(0.52)		(0.18)		(0.03)		(0.04)
Black		-1.69		-0.21		-0.02		-0.06
		(1.20)		(0.28)		(0.05)		(0.07)
HS Diploma		0.31		0.16		0.03		-0.01
		(0.60)		(0.15)		(0.03)		(0.06)
College Diploma		2.66**		0.93**		0.07		0.15**
		(1.11)		(0.45)		(0.04)		(0.06)
Primary Decision-Maker		1.65***		0.38**		0.07*		0.12***
		(0.49)		(0.16)		(0.04)		(0.05)
SNAP Recipient Dummy		-0.09		-0.00		-0.04		0.04
		(0.60)		(0.17)		(0.04)		(0.05)
Constant	1.55***	0.85	0.48***	-0.05	0.09***	0.04	0.11***	0.03
	(0.39)	(1.50)	(0.11)	(0.46)	(0.03)	(0.07)	(0.04)	(0.11)
Observations	2,483	2,461	2,483	2,461	2,483	2,461	2,483	2,461
Number of id	197	192	197	192	197	192	197	192
Test Incentive=Combination	0.687	0.820	0.954	0.719	0.341	0.219	0.255	0.559

Note: Restricted to remove participants who spent less than $1 in all visits during program. CONTROL is the omitted group. All demographics are dummy variables. For regressions with demographics, the omitted groups are Male, White, no diploma, not primary decision-maker, not SNAP recipient. Regressions (1) through (6) are Ordinary Least Squares with robust standard errors in parentheses, (7) and (8) are maximum likelihood estimates. *** p<0.01, ** p<0.05, * p<0.1

Table A2: Regressions Post-Treatment, Restrict to Remove Low-Purchasers

	(1) Produce Cups	(2) Produce Cups	(3) Produce Spending	(4) Produce Spending	(5) Percent on Produce	(6) Percent on Produce	(7) Bought 5 Cups	(8) Bought 5 Cups
ANY INCENTIVE	1.77**	2.01**	0.48	0.64	0.09	0.11*	0.17**	0.16**
	(0.76)	(0.85)	(0.32)	(0.41)	(0.06)	(0.06)	(0.07)	(0.07)
INFORMATION	0.39	0.82	-0.17	0.10	0.01	0.03	0.06	0.09
	(0.73)	(0.79)	(0.24)	(0.33)	(0.05)	(0.05)	(0.07)	(0.07)
Week	-0.06	-0.06	-0.03	-0.03	-0.00	-0.00	-0.01	-0.01
	(0.05)	(0.05)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)
Week-Incentive Interaction	-0.07	-0.05	0.02	0.02	0.00	0.00	-0.01	-0.00
	(0.10)	(0.10)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Week-Information Intx.	-0.04	-0.04	0.03	0.03	-0.00	-0.00	-0.00	-0.00
	(0.09)	(0.09)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)
Female		0.41		0.59*		0.05		0.04
		(0.61)		(0.31)		(0.04)		(0.05)
Black		-1.66		-0.48		-0.06		-0.05
		(1.31)		(0.48)		(0.07)		(0.10)
HS Diploma		0.38		0.29		0.07**		0.02
		(0.71)		(0.22)		(0.04)		(0.08)
College Diploma		1.44		0.91		0.10		0.05
		(0.98)		(0.61)		(0.07)		(0.07)
Primary Decision-Maker		1.52***		0.65**		0.04		0.14***
		(0.57)		(0.28)		(0.05)		(0.05)
SNAP Recipient		0.43		-0.19		-0.03		0.06
		(0.83)		(0.52)		(0.07)		(0.05)
Constant	1.15**	0.08	0.49**	-0.27	0.09***	0.02	0.08*	-0.09
	(0.46)	(1.44)	(0.19)	(0.64)	(0.04)	(0.09)	(0.04)	(0.13)
Observations	848	841	848	841	848	841	848	841
Number of id	120	118	120	118	120	118	120	118

Note: Restricted to remove participants who spent less than $1 in all visits during program. CONTROL is the omitted group, INCENTIVE and COMBINATION are pooled and are counted in ANY INCENTIVE. All demographics are dummy variables. For regressions with demographics, the omitted groups are Male, White, no diploma, not primary decision-maker, not SNAP recipient. Regressions (1) through (6) are Ordinary Least Squares with robust standard errors in parentheses, (7) and (8) are maximum likelihood estimates. *** p<0.01, ** p<0.05, * p<0.1

Table A3: Regressions Post-Treatment, Including All Treatment Dummies

VARIABLES	(1) Produce Cups	(2) Produce Cups	(3) Produce Spending	(4) Produce Spending	(5) Percent on Produce	(6) Percent on Produce	(7) Bought 5 Cups	(8) Bought 5 Cups
INCENTIVE	1.77**	1.84*	0.54	0.58	0.09	0.10	0.15**	0.11
	(0.90)	(0.99)	(0.44)	(0.47)	(0.06)	(0.06)	(0.07)	(0.08)
INFORMATION	0.27	0.70	-0.07	0.20	0.00	0.03	0.05	0.08
	(0.57)	(0.64)	(0.19)	(0.29)	(0.04)	(0.04)	(0.06)	(0.06)
COMBINATION	1.41**	1.86**	0.52	0.81*	0.10**	0.13**	0.16**	0.18**
	(0.66)	(0.77)	(0.34)	(0.43)	(0.05)	(0.05)	(0.06)	(0.07)
Week	-0.06	-0.06	-0.03	-0.03	-0.00	-0.00	-0.01	-0.01
	(0.05)	(0.05)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)
Week-Incentive Interaction	-0.07	-0.05	0.02	0.02	0.00	0.00	-0.01	-0.00
	(0.10)	(0.10)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Week-Information Intx.	-0.04	-0.04	0.03	0.03	-0.00	-0.00	-0.00	-0.00
	(0.09)	(0.09)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)
Female		0.42		0.60*		0.05		0.04
		(0.62)		(0.31)		(0.04)		(0.05)
Black		-1.66		-0.49		-0.06		-0.05
		(1.33)		(0.48)		(0.06)		(0.10)
HS Diploma		0.38		0.30		0.07**		0.03
		(0.72)		(0.23)		(0.04)		(0.08)
College Diploma		1.44		0.91		0.10		0.05
		(0.98)		(0.61)		(0.07)		(0.08)
Primary Decision-Maker		1.52***		0.71**		0.05		0.15***
		(0.57)		(0.28)		(0.05)		(0.05)
SNAP Recipient		0.42		-0.24		-0.03		0.04
		(0.82)		(0.48)		(0.07)		(0.06)
Constant	0.96***	-0.11	0.41***	-0.36	0.08***	0.00	0.06*	-0.11
	(0.34)	(1.43)	(0.15)	(0.64)	(0.03)	(0.09)	(0.03)	(0.13)
Observations	848	841	848	841	848	841	848	841
Number of id	120	118	120	118	120	118	120	118
Test Incentive=Combination	0.718	0.977	0.969	0.593	0.890	0.616	0.844	0.442

Note: CONTROL is the omitted group. All demographics are dummy variables. For regressions with demographics, the omitted groups are Male, White, no diploma, not primary decision-maker, not SNAP recipient. Regressions (1) through (6) are Ordinary Least Squares with robust standard errors in parentheses, (7) and (8) are maximum likelihood estimates. *** p<0.01, ** p<0.05, * p<0.1

Table A3: Regressions Post-Treatment, Including All Treatment Dummies, Restricted

	(1) Produce Cups	(2) Produce Cups	(3) Produce Spending	(4) Produce Spending	(5) Percent on Produce	(6) Percent on Produce	(7) Bought 5 Cups	(8) Bought 5 Cups
INCENTIVE	1.98*	2.00*	0.49	0.51	0.08	0.09	0.17**	0.12
	(1.03)	(1.12)	(0.45)	(0.49)	(0.07)	(0.07)	(0.08)	(0.09)
INFORMATION	0.39	0.82	-0.17	0.10	0.01	0.03	0.06	0.09
	(0.73)	(0.79)	(0.24)	(0.33)	(0.05)	(0.05)	(0.07)	(0.07)
COMBINATION	1.62**	2.03**	0.47	0.74	0.09	0.12*	0.18**	0.19**
	(0.80)	(0.88)	(0.37)	(0.46)	(0.06)	(0.07)	(0.08)	(0.08)
Week	-0.06	-0.06	-0.03	-0.03	-0.00	-0.00	-0.01	-0.01
	(0.05)	(0.05)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)
Week-Incentive Interaction	-0.07	-0.05	0.02	0.02	0.00	0.00	-0.01	-0.00
	(0.10)	(0.10)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Week-Information Intx.	-0.04	-0.04	0.03	0.03	-0.00	-0.00	-0.00	-0.00
	(0.09)	(0.09)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)
Female		0.42		0.60*		0.05		0.04
		(0.62)		(0.31)		(0.04)		(0.05)
Black		-1.66		-0.49		-0.06		-0.05
		(1.33)		(0.48)		(0.06)		(0.10)
HS Diploma		0.38		0.30		0.07**		0.03
		(0.72)		(0.23)		(0.04)		(0.08)
College Diploma		1.44		0.91		0.10		0.05
		(0.98)		(0.61)		(0.07)		(0.08)
Primary Decision-Maker		1.52***		0.71**		0.05		0.15***
		(0.57)		(0.28)		(0.05)		(0.05)
SNAP Recipient		0.42		-0.24		-0.03		0.04
		(0.82)		(0.48)		(0.07)		(0.06)
Constant	1.15**	0.08	0.49**	-0.27	0.09***	0.02	0.08*	-0.09
	(0.46)	(1.44)	(0.19)	(0.64)	(0.04)	(0.09)	(0.04)	(0.13)
Observations	848	841	848	841	848	841	848	841
Number of id	120	118	120	118	120	118	120	118
Test Incentive=Combination	0.718	0.977	0.969	0.593	0.890	0.616	0.844	0.442

Note: Restricted to remove participants who spent less than $1 in all visits during program. CONTROL is the omitted group. All demographics are dummy variables. For regressions with demographics, the omitted groups are Male, White, no diploma, not primary decision-maker, not SNAP recipient. Regressions (1) through (6) are Ordinary Least Squares with robust standard errors in parentheses, (7) and (8) are maximum likelihood estimates. *** p<0.01, ** p<0.05, * p<0.1