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Effect of financial incentives and default options on food choices in online retail settings:

A Randomized Controlled Trial

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Abstract

Importance: Despite recent growth in online redemption of Supplemental Nutrition Assistance Program (SNAP) benefits, no previous work has tested the impact of economic and behavioral economic strategies on food purchasing behaviors in an online grocery retail setting among adults with low income.

Objective: To examine the extent to which financial incentives and default shopping cart options influence fruit and vegetable purchases.

Design: Randomized controlled experiment.

Setting: Experimental online grocery store.

Participants: Adults who currently or have ever received SNAP benefits.

Intervention: Random assignment to one of four conditions: no intervention, 50% discount on eligible fruits and vegetables, pre-filled shopping carts with tailored fruit and vegetable items (i.e., default options), or a combination of a discount and default options. From October-November 2021, participants were instructed to shop for a week's worth of groceries for their household, with a budget tailored to household size; no payment was taken.

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Results: Average age of participants (n=2,744) was 46.7 (SD=16.0) years and 53% identified as female. Approximately 67% reported currently receiving SNAP benefits and 54% reported shopping online for groceries in the previous 12 months. On average, participants spent 20.5% (SD=23.5) of total dollars on eligible fruits and vegetables. Compared to no intervention, those in the discount, default, and combination conditions spent 4.7% (98.3% CI: 1.7, 7.7; p<0.001), 7.8% (98.3% CI: 4.8, 10.7; p<0.001), and 13.0% (98.3% CI: 10.0, 16.0; p<0.001) more of total dollars on eligible fruits and vegetables, respectively. There was no difference between the discount and the default conditions (p=0.06) but the effect in the combination condition was significantly larger than both discount and default conditions (p's<0.001). Default shopping cart items were purchased by 93% and 96% of participants in the default and combination conditions, respectively; whereas, 46% and 53% of participants in the control and discount conditions, respectively, purchased those items (p's<0.001). We observed no significant variation by age, gender, or race/ethnicity, and results were similar when we excluded those who reported never shopping online for groceries.

Conclusions and Relevance: In this randomized trial, financial incentives for fruits and vegetables and default options, especially in combination, lead to meaningful increases in online fruit and vegetable purchases among adults with low income.

INTRODUCTION

Adherence to healthy eating patterns plays a critical role in mitigating cardiovascular disease risk.[1,2] Adults with low income, including Supplemental Nutrition Assistance Program (SNAP) participants,[3] have poorer diet behaviors than higher income adults.[4] Thus, interventions designed to increase the affordability of healthy foods, beyond the provision of nutrition assistance benefits, and other non-economic strategies, may help improve diet behaviors in SNAP households. Two popular and effective approaches for increasing healthy food purchases are financial incentives and behavioral nudges.[5]

Nutrition incentive programs that match SNAP dollars have been shown to increase sales of produce in brick-and-mortar supermarkets,[6–8] farmers' markets,[9] and mobile produce markets.[10,11] A smaller body of evidence suggests that such incentives also lead to modest improvements in fruit and vegetable consumption,[12,13]. This body of evidence has supported the introduction and passage of legislation to scale incentives, including the Rhode Island Public Assistance Act.[14] Previous studies, however, often do not use an unbiased study design, or do not collect data from a large, national sample. Importantly, no previous work has tested the impact of a fruit and vegetable incentive in an *online* grocery retail setting.

Interventions informed by behavioral economics may similarly increase healthy food purchasing by "nudging" consumers in low-cost ways that preserve their freedom of choice.[15] One powerful insight from behavioral economics is that people tend to stick with default options. This bias can be leveraged to promote health by changing environmental defaults to healthy choices that people can opt out of, such as legislative requirements for restaurants to serve healthy drinks as the default with kid's meals.[16] Default options have been shown to increase healthy food orders in a full-service restaurant,[17] as well as healthy food purchases in laboratory-based and online supermarket settings.[18–20] Most previous research has had small sample sizes, or has not tailored default options to past purchasing

decisions. And no research has focused on pre-filling online shopping carts with fruit and vegetable items.

Studying interventions in an online context is especially important given the recent surge in online grocery sales – which represented 10% of all U.S. grocery sales in 2021, triple the amount from 2017[21] – and the rapid expansion of the SNAP Online Purchasing Pilot, a program that authorizes retailers to accept SNAP benefits in online transactions.[22] Though shoppers with low income are less likely to shop online than their higher-income counterparts,[23,24] online redemption of SNAP benefits increased from 0.1% to 3% of total sales from just February 2020 to December 2020.[25] As opportunities to use nutrition assistance benefits in online transactions continue to grow, it is critical to test interventions designed to promote healthy online food purchases.

The goal of this study was to examine the extent to which a discount for fruits and vegetables and a default shopping cart strategy, separately and combined, would change expenditures on fruits and vegetables in an online randomized controlled experiment. We hypothesized that non-discounted dollars spent on fruits and vegetables would be higher among participants exposed to the discount plus default options than the control group, and the effect would be larger than other experimental conditions. We also explored whether the impact differed by age group, gender, race/ethnicity, and socioeconomic status.

METHODS

Sample

We used a survey research firm, CloudResearch, to recruit eligible participants from a convenience sample. This approach can yield generalizable findings for online experiments, and studies have shown that data quality is similar to studies conducted via probability-based sampling.[26–28] CloudResearch provides participants with points that can be redeemed for various cash and non-cash incentives, and employs quality control mechanisms to minimize fraudulent responses. We instructed CloudResearch to recruit a national sample of adults aged ≥18 years who have ever received SNAP benefits, read and speak English, and live with fewer than four people (to maximize incentives). The sample was recruited to approximately match the distribution of gender and age of U.S. adults in 2019.[29] As indicated in our pre-registration, we excluded participants who reused the same IP address, finished the survey in under one-third of median completion time, and/or did not finish the survey or shopping task.

Procedures

We used Qualtrics, an online survey platform,[30] to create and distribute a survey, which was completed on a personal computer, laptop, tablet, or mobile phone in October-November 2021. The survey included questions about sociodemographic characteristics, food security, fruit and vegetable intake, and diet and food shopping behaviors(Supplemental File 1); details described elsewhere.[31] After completing the survey, participants were randomized to one of four conditions and then asked to click the link to our experimental online grocery store (named ‘Lola’s Grocery’). A detailed description of methods for acquiring and

cleaning online store data and the design of our two-dimensional platform, and its validity and acceptability, are published elsewhere.[32] Briefly, we used an platform called Gorilla developed by Cauldron Science, Ltd.,[33] which mimics the appearance and functionalities of a top U.S. online grocery retailer, including browsing, search, product pages, shopping cart, and checkout. The store has over 20,000 products, organized by department, aisle, and shelf, with product images, price, and nutrition information.

Prior to shopping, participants were instructed to select a typical week's worth of food for their household, with details about the budget (no payment was taken) and, if relevant, additional instructions related to the discounts and/or default shopping cart items for participants randomized to the experimental conditions (Supplemental File 2). Their shopping budget was based on food-at-home expenditure data from the National Household Food Acquisition and Purchase Survey (FoodAPS), a nationally-representative survey of food purchases of SNAP and non-SNAP households in 2012–2013.[34] After accounting for inflation,[35] we estimated that SNAP households with one, two, three, or four total persons spend on average $60, $100, $120, or $130 per week on groceries, respectively. After completing the shopping task, participants answered eight questions related to the process of shopping in our store,[36] and the degree to which they would support default options as a retailer strategy, with or without discounts.

To incentivize participation and truthful responses, participants were notified they would be automatically entered into a lottery upon completion of the shopping task and that 100 participants would have their cart items delivered to their household. At the end of the study, however, we revealed to all participants that individuals who won the lottery were instead provided a gift card with the equivalent amount of money loaded onto it that they spent in the study. This approach was used to mitigate potential issues related to delivery, and to minimize the collection of personally-identifiable information.

Experimental conditions

All participants were randomly assigned to one of four conditions: no intervention, 50% discount on eligible fruits and vegetables, shopping carts pre-filled with tailored fruit and vegetable items (i.e., default options), or a combination of a discount and default options. To mimic existing incentive programs,[37,38] participants randomized to the discount condition received half-off qualifying fruits and vegetables, up to a value of $20 off. Fruits and vegetables that qualified for the discount were labeled as eligible in the store, and the discount was applied to items at the point-of-selection. Based on healthy eating guidelines,[39] eligible items included fresh, frozen, and canned fruits and vegetables with ≤140 milligrams of sodium per serving, and prepared produce intended for off-premises consumption. Ineligible items included herbs and spices, dried fruits and vegetables, fruit and vegetable juices, and fruits and vegetables with added sugars or fat.

Participants randomized to the default condition had their cart pre-filled with one fruit product and one vegetable product, which they could remove at any point while shopping. Default items were based on expenditure data from FoodAPS, which we used to identify the five most frequently purchased fruits (apples, bananas, grapes oranges, strawberries) and vegetables (carrots, green beans, lettuce, onions, tomatoes) in SNAP-participating

households. We then identified 10 corresponding products from our online store database. We chose products with the highest "shelf rank," an indicator of a product's order on a shelf when sorted by best seller. In the survey, participants were asked to select which of the five fruits and five vegetables they purchased the most frequently, and we used their selections to tailor their default options, for a total of 25 possible combinations of default products (Supplemental File 3). For participants randomized to receive both a discount and default options, the pre-filled products were discounted by 50%. Participants randomized to the control condition received no discount or default products.

Outcomes

To account for differences in item prices across conditions and shopping budget by household size, our primary outcome was the percentage of non-discounted dollars spent on eligible fruit and vegetables per basket (i.e., dollars spent before subtracting a discount). Secondary outcomes included non-discounted and out-of-pocket dollars spent on fruits and vegetables; non-discounted dollars spent on fruits only, vegetables only, fresh fruits and vegetables, frozen fruits and vegetables, and canned fruits and vegetables; and total calories, fat (g), saturated fat (g), carbohydrates (g), fiber (g), protein (g), and salt (mg) from fruits and vegetables. We calculated spending (or nutrient value) in each category by multiplying the price (or nutrient value) per item by the quantity purchased of that item, then summed across all items purchased in that category.

Statistical analyses

We used linear regression to regress the outcome variable on indicator variables for each of the experimental conditions, with the control condition as referent. Analyses indicated that enrollment of 1,264 adults would provide 90% power to detect a 9% difference between any experimental condition and the control condition, including sufficient power for a two-stage approach to hypothesis testing. This allowed us to first assess the effect of experimental conditions compared to control at a Type I error rate of 0.017, and then compare successful experimental conditions to each other using a Tukey's Honest Significant Difference approach; this allowed us to detect a 2% difference between experimental conditions. Pre-specified analyses indicated that a sample size of 2,528 adults also allowed for examination of interaction effects by age, gender, and race/ethnicity. Race/ethnicity was self-reported by participants using National Health and Nutrition Examination Survey categories (American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Pacific Islander, White, Other). Given differences in household shopping responsibilities and internet use by gender, age, and race/ethnicity,[40] we hypothesized that effects would be larger among female, younger, and White adults. In post-hoc analyses, we also examined interaction effects by income, education, food security status.

To assess robustness of our results to differences in online grocery shopping history, we conducted a sensitivity analysis excluding participants who reported they had never shopped online for groceries. We also used logistic regression to assess differences in the likelihood of purchasing a default shopping cart item (from the shopping cart or store aisles) by condition. We calculated the percentage of participants who endorsed positive statements about their experience in the store. To assess attrition bias, we compared the characteristics

of those who completed the survey task but not the shopping task to those who completed both tasks. All analyses were conducted using Stata 16.0. This study was approved by the NYU Grossman School of Medicine Institutional Review Board and participants provided electronic informed consent. Reporting followed the Consolidated Standards of Reporting Trials (CONSORT) reporting guidelines.

RESULTS

We excluded participants who reused the same IP address (n=265), finished the pre-shopping survey in under one-third of median completion time of 6.4 minutes (i.e., <2.1 minutes) (n=51), did not finish the survey (n=90), and/or did not finish the shopping task (n=782) (Figure 1). The final sample included 2,744 adults who had ever received SNAP benefits. Average age of participants was 46.7 (SD=16.0) years and 53% identified as female (Table 1; Supplemental Table 1). Median household size was 2 (IQR=1, 3) persons, including 1 (IQR=1, 2) child below 18 years. Approximately 67% of participants reported currently receiving SNAP benefits and 70% were classified as food insecure. A little over half of participants (54%) reported shopping online for groceries (Supplemental Table 2). Participants' characteristics were balanced across conditions. Those who completed the survey and shopping task (versus survey only) were more likely to be female (53.5% vs. 45.2%; p<0.001) and have at least some college education (60.1% vs. 51.7%; p<0.001).

About 93% of participants purchased a fruit or vegetable (Table 2) and on average participants spent 20.5% (SD=23.5) of total dollars on fruits and vegetables. Compared to the control condition, those in the discount, default, and combination conditions spent 4.7% (98.3% CI: 1.7, 7.7), 7.8% (98.3% CI: 4.8, 10.7), and 13.0% (98.3% CI: 10.0, 16.0) more on fruits and vegetables, respectively (p's<0.001) (Table 3). There was no difference between discount and default conditions (p=0.06), but the effect in the combination condition was larger than the other experimental conditions (p's<0.001). Default cart items were purchased by 93% and 96% of participants in the default and combination conditions, respectively, compared to 46% and 53% of participants in the control and discount conditions, respectively (p's<0.001).

Average non-discounted dollars and out-of-pocket dollars spent on eligible fruits and vegetables across conditions was $13.18 (SD=$13.79) and $9.73 (SD=11.18), respectively (Table 2). Spending in non-discounted dollars was higher in the discount condition [$3.16 (98.3% CI: 1.37, 4.95] and combination condition [$3.96 (98.3% CI: 2.17, 5.76], but not the default condition [$0.37 (98.3% CI: −1.39, 2.14)] (Table 3). Out-of-pocket spending was lower among those in the discount condition [-$3.65 (98.3% CI: −5.10, −2.21)] and combination condition [-$3.06 (98.3% CI: −4.51, −1.62)], but not the default condition [$0.37 (98.3% CI: −1.05, 1.80)]. Spending on fruits only, vegetables only, and fresh fruits and vegetables was higher among participants randomized to receive discounts (alone or in combination) versus no intervention. Total calories, carbohydrates, and fiber from fruits and vegetables were significantly higher in the discount and combination conditions compared to no intervention. We did not observe meaningful differences in expenditures on frozen or canned fruits and vegetables across conditions, or other nutrient groups.

We observed no interaction effects by age, gender, race/ethnicity, income, education, or food security status; and no differences when excluding those who reported never shopping online for groceries (Supplemental Table 3). A majority of participants reported that the store felt like a real online grocery store (86%), there were enough food and beverage options (77%), their purchases were similar to their regular purchases (75%), they could imagine doing their real-life shopping in our store (76%), and they could easily find all of the items they were looking for (74%) (Supplemental Table 4). There was a high degree of support for default options as a retailer strategy, with (67%) or without (73%) discounts.

DISCUSSION

Previous research has found that nutrition labels,[41–44] product placement,[43,45–47] and offering healthy alternatives[43,45] promote healthier food choices in online supermarkets. We found that financial incentives are also effective in promoting online fruit and vegetable purchases in a large, diverse sample of individuals with low income. The effect from our discount alone (4.7%) was smaller compared to the Healthy Incentives Pilot, which found an 11% increase in total fruit and vegetable purchases with a 30% discount.[7] This may be partially due to higher reluctance to purchase produce online versus in-store.[31] Yet, our results are consistent with previous work evaluating financial incentives in other in-person retail settings,[8,11] including a 50% discount program in Michigan supermarkets, which resulted in a 2.2% to 7.4% increase in fruit and vegetable purchases over two years. The expansion of existing incentive programs to online settings is a promising strategy to promote equitable access to food, and, given the decrease in participants' out-of-pocket spending on fruits and vegetables, may increase purchasing power for those with food insecurity – especially in combination with more cost-effective strategies like sugary drink restrictions and economic disincentives.[49]

We also observed a similar impact on purchases from a behavioral nudge that pre-filled participants' carts with default fruit and vegetable products based on their shopping history. These default options were successful in getting participants to purchase the default products in their cart, with over 90% of participants in a default condition purchasing a default item, compared to about half of participants in other conditions. Participants also expressed a high degree of support for default options as a retailer strategy. Taken together, these results suggest that default options are effective in motivating individuals to purchase fruits and vegetables.

We also found evidence that combining discounts and default options had a synergistic effect, which provides support for the implementation of multiple healthy eating strategies in an online setting. Given how changes in expenditures translated into positive changes in fruit and vegetable intake in the Healthy Incentives Pilot,[50] we expect that effects observed in this study would meaningfully improve population health. Yet, we are not aware of legislation or programs related to default options in the real world, which may reflect a lack of evidence and/or interest from retailers, potentially due to concerns about negative customer perceptions.

Limitations

Participants were recruited online, so they may have been more likely to shop online than the broader SNAP population. However, results did not differ when we excluded those who reported never shopping online for groceries. The sample may not have been representative of the target population, given how non-English speakers were excluded and those who started the shopping task were slightly more likely be female and have higher education. It is possible that hypothetical shopping choices do not reflect actual purchases, but we informed participants they were entered into a lottery to receive the items in their cart, so we expect participants selected items they actually wanted to receive. Furthermore, a large majority reported their purchases were similar to their regular purchases.

Conclusions

Our results support the use of financial incentives as a way to meaningfully increase fruit and vegetable purchases for those shopping with SNAP benefits online. We also found evidence that prefilling shopping carts with fruits and vegetables motivated individuals to purchase default products, with a synergistic effect with discounts. Future research should explore the effectiveness of strategies designed to mitigate lack of trust, and other non-economic barriers, on purchases of fresh products online. Evaluating other interventions in online settings, such as restrictions on targeted marketing, is also a valuable next step.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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ACCESS TO DATA AND DATA ANALYSIS:

Dr. Rummo had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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KEY POINTS

Question:

Do financial incentives and default shopping cart options promote fruit and vegetable purchases among adults with low income shopping in a naturalistic online grocery store?

Findings:

In this randomized trial, participants receiving a 50% discount on eligible fruits and vegetables and/or default fruit and vegetable items in their shopping cart spent significantly more (5–13%) on fruits and vegetables compared to those who did not receive an intervention.

Meaning:

Nutrition incentives programs may be effective in promoting healthy food choices among those using nutrition assistance benefits in online retail settings.

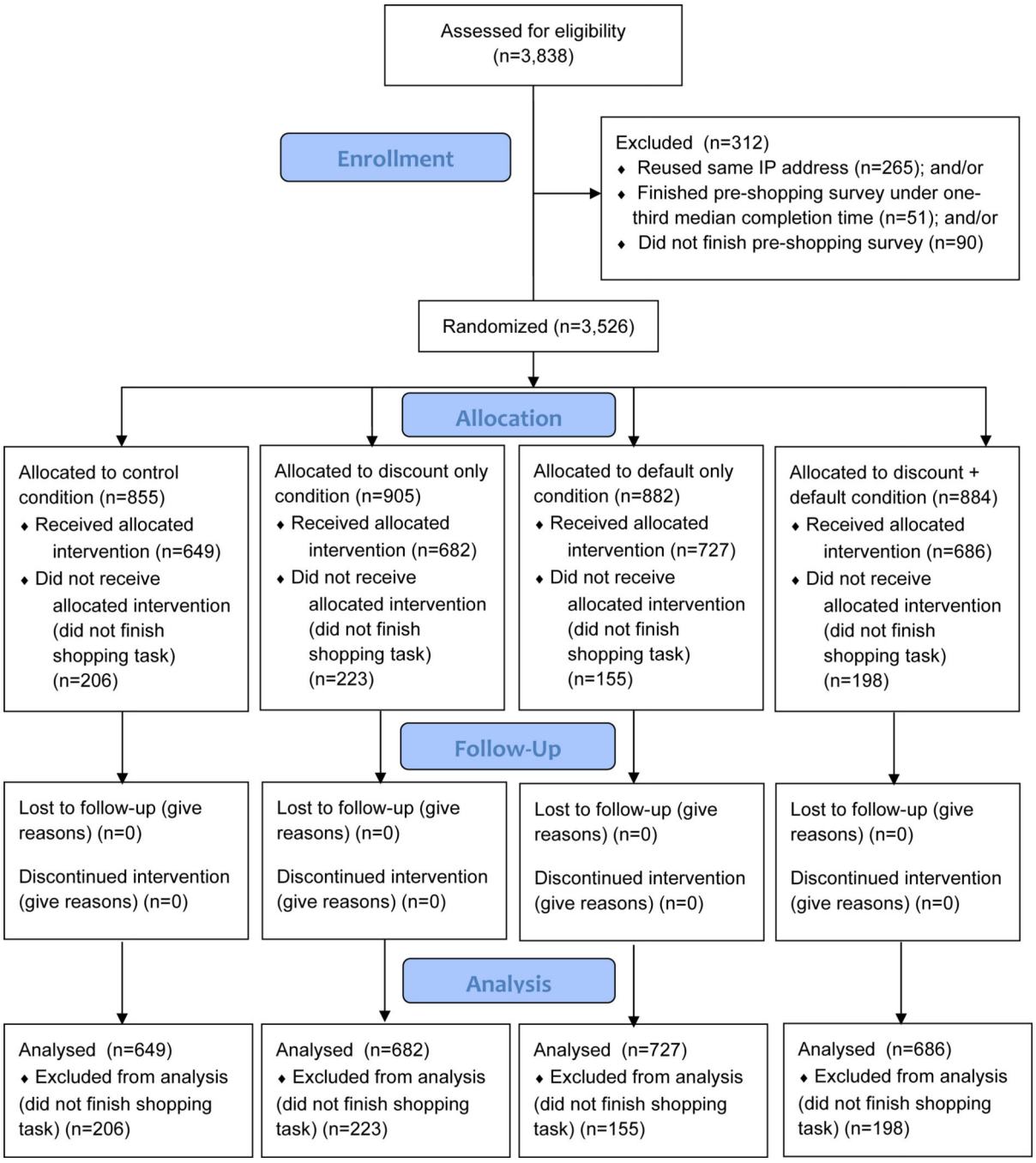

FIGURE 1.
CONSORT Flow Diagram

TABLE 1.

Sociodemographic characteristics and diet behaviors of adult study participants,[a] overall and by condition, 2021

	All (n=2744)	Control (n=649)	Default (n=727)	Discount (n=682)	Default + Discount (n=686)
	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)
Age	46.7 (16.0)	45.9 (15.4)	47.0 (16.3)	47.2 (16.1)	46.7 (16.1)
Female	1447 (52.7%)	344 (53.0%)	396 (54.5%)	346 (50.7%)	361 (52.6%)
Household size, total	2.3 (1.0)	2.3 (1.0)	2.3 (1.0)	2.2 (1.0)	1.1 (2.3)
Household size, children <18 years	1.4 (0.7)	1.4 (0.7)	1.4 (0.7)	1.4 (0.7)	0.7 (1.4)
Hispanic, Latino, or Spanish	269 (9.8%)	63 (9.7%)	75 (10.3%)	67 (9.8%)	64 (9.3%)
Race					
American Indian or Alaska Native	39 (1.4%)	9 (1.4%)	6 (0.8%)	18 (2.6%)	6 (0.9%)
Asian	49 (1.8%)	13 (2.0%)	10 (1.4%)	10 (1.5%)	16 (2.3%)
Black or African American	390 (14.2%)	99 (15.3%)	93 (12.8%)	91 (13.3%)	107 (15.6%)
Native Hawaiian or Pacific Islander	8 (0.3%)	2 (0.3%)	2 (0.3%)	516 (75.7%)	4 (0.6%)
White	2074 (75.6%)	490 (75.5%)	562 (77.3%)	18 (2.6%)	506 (73.8%)
Other	70 (2.6%)	20 (3.1%)	15 (2.1%)	1 (0.1%)	17 (2.5%)
More than 1	12 (0.4%)	16 (2.5%)	4 (0.6%)	28 (4.1%)	7 (1.0%)
Prefer not to answer	102 (3.7%)	-	35 (4.8%)	-	23 (3.4%)
Education					
Less than 9th grade	17 (0.6%)	4 (0.6%)	4 (0.6%)	3 (0.4%)	6 (0.9%)
9th to 12th grade - No diploma	150 (5.5%)	41 (6.3%)	36 (5.0%)	38 (5.6%)	35 (5.1%)
High school graduate	749 (27.3%)	180 (27.7%)	194 (26.7%)	175 (25.7%)	200 (29.2%)
GED or equivalent	182 (6.6%)	42 (6.5%)	53 (7.3%)	43 (6.3%)	44 (6.4%)
Some college, no degree	859 (31.3%)	201 (31.0%)	227 (31.2%)	216 (31.7%)	215 (31.3%)
Associate’s degree	367 (13.4%)	83 (12.8%)	107 (14.7%)	97 (14.2%)	80 (11.7%)
Bachelor’s degree	307 (11.2%)	69 (10.6%)	80 (11.0%)	80 (11.7%)	78 (11.4%)
Graduate or professional degree	110 (4.0%)	28 (4.3%)	26 (3.6%)	29 (4.3%)	27 (3.9%)
Prefer not to answer	3 (0.1%)	1 (0.2%)	-	1 (0.1%)	1 (0.1%)
Income					
<$20,000	1187 (43.3%)	266 (41.0%)	307 (42.2%)	297 (43.5%)	317 (46.2%)
$20,000–39,999	1017 (37.1%)	247 (38.1%)	278 (38.2%)	257 (37.7%)	235 (34.3%)
$40,000–59,999	348 (12.7%)	84 (12.9%)	93 (12.8%)	90 (13.2%)	81 (11.8%)
$60,000-$79,999	108 (3.9%)	25 (3.9%)	30 (4.1%)	25 (3.7%)	28 (4.1%)
$80,000-$99,999	32 (1.2%)	11 (1.7%)	7 (1.0%)	4 (0.6%)	10 (1.5%)
$100,000–119,999	10 (0.4%)	2 (0.3%)	2 (0.3%)	1 (0.1%)	5 (0.7%)
$120,000 to $139,999	3 (0.1%)	2 (0.3%)	1 (0.1%)	1 (0.1%)	2 (0.3%)
$140,000 to $159,999	4 (0.1%)	3 (0.5%)	3 (0.4%)	1 (0.1%)	2 (0.3%)

	All (n=2744)	Control (n=649)	Default (n=727)	Discount (n=682)	Default + Discount (n=686)
	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)
$160,000 to $179,999	3 (0.1%)	2 (0.3%)	5 (0.7%)	1 (0.1%)	3 (0.4%)
$180,000 to $199,999	3 (0.1%)	3 (0.5%)	1 (0.1%)	1 (0.1%)	3 (0.4%)
≥$200,000	6 (0.2%)	4 (0.6%)	-	1 (0.1%)	-
Don't know	12 (0.4%)	-	-	3 (0.4%)	-
Prefer not to answer	11 (0.4%)	-	-	-	-
Marital status					
Married	618 (22.5%)	163 (25.1%)	141 (19.4%)	155 (22.7%)	159 (23.2%)
Widowed	191 (7.0%)	47 (7.2%)	49 (6.7%)	44 (6.5%)	51 (7.4%)
Divorced	476 (17.3%)	105 (16.2%)	139 (19.1%)	120 (17.6%)	112 (16.3%)
Separated	107 (3.9%)	30 (4.6%)	23 (3.2%)	21 (3.1%)	33 (4.8%)
Never Married	920 (33.5%)	207 (31.9%)	243 (33.4%)	241 (35.3%)	229 (33.4%)
Living with Partner	418 (15.2%)	94 (14.5%)	131 (18.0%)	99 (14.5%)	94 (13.7%)
Prefer not to answer	14 (0.5%)	3 (0.5%)	1 (0.1%)	2 (0.3%)	8 (1.2%)
Employment					
Working at a job or business	845 (30.8%)	193 (29.7%)	222 (30.5%)	223 (32.7%)	207 (30.2%)
With a job or business but not at work	70 (2.6%)	18 (2.8%)	24 (3.3%)	11 (1.6%)	17 (2.5%)
Looking for work	501 (18.3%)	114 (17.6%)	137 (18.8%)	133 (19.5%)	117 (17.1%)
Not working at a job or business	1131 (41.2%)	268 (41.3%)	296 (40.7%)	281 (41.2%)	286 (41.7%)
Part-time or full-time student	103 (3.8%)	30 (4.6%)	23 (3.2%)	22 (3.2%)	28 (4.1%)
Prefer not to answer	94 (3.4%)	26 (4.0%)	25 (3.4%)	12 (1.8%)	31 (4.5%)
Food insecurity[b]	1917 (69.9%)	449 (69.2%)	483 (70.8%)	502 (69.1%)	483 (70.4%)
SNAP participation, currently	1842 (67.1%)	424 (65.3%)	494 (68.0%)	445 (65.2%)	479 (69.8%)
Fruit, purchased most often[c]					
Apples	472 (17.2%)	102 (15.7%)	115 (15.8%)	137 (20.1%)	118 (17.2%)
Bananas	1319 (48.1%)	310 (47.8%)	348 (47.9%)	325 (47.7%)	336 (49.0%)
Grapes	390 (14.2%)	96 (14.8%)	114 (15.7%)	82 (12.0%)	98 (14.3%)
Oranges	232 (8.5%)	60 (9.2%)	54 (7.4%)	60 (8.8%)	58 (8.5%)
Strawberries	331 (12.1%)	81 (12.5%)	96 (13.2%)	78 (11.4%)	76 (11.1%)
Vegetable, purchased most often[c]					
Carrots	409 (14.9%)	94 (14.5%)	107 (14.7%)	96 (14.1%)	112 (16.3%)
Lettuce	726 (26.5%)	154 (23.7%)	200 (27.5%)	186 (27.3%)	186 (27.1%)
Onions	685 (25.0%)	176 (27.1%)	190 (26.1%)	167 (24.5%)	152 (22.2%)
String beans	281 (10.2%)	70 (10.8%)	61 (8.4%)	78 (11.4%)	72 (10.5%)
Tomatoes	643 (23.4%)	155 (23.9%)	169 (23.2%)	155 (22.7%)	164 (23.9%)
BRFSS 2017 screener, times per week					
Fruit juice	2.6 (4.2)	2.4 (4.0)	2.5 (4.0)	2.7 (4.2)	2.9 (4.6)
Fruit	3.9 (4.6)	3.7 (4.6)	3.9 (4.7)	3.8 (4.5)	4.1 (4.8)

	All (n=2744)	Control (n=649)	Default (n=727)	Discount (n=682)	Default + Discount (n=686)
	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)
Beans	2.0 (3.1)	2.1 (3.3)	1.9 (2.9)	1.9 (3.0)	2.1 (3.3)
Dark green vegetables	2.9 (3.6)	2.9 (3.9)	2.8 (3.4)	2.7 (3.3)	3.1 (3.7)
Orange-colored vegetables	2.1 (3.3)	2.0 (3.3)	2.0 (3.2)	2.0 (3.3)	2.4 (3.6)
Other vegetables	3.5 (3.9)	3.6 (4.1)	3.4 (3.9)	3.6 (4.1)	3.3 (3.5)
Total	16.9 (16.8)	16.8 (17.7)	16.4 (15.7)	16.7 (16.4)	17.9 (17.5)
Responsible for most of household food shopping					
Yes	2362 (86.1%)	555 (85.5%)	618 (85.0%)	582 (85.3%)	607 (88.5%)
No	198 (7.2%)	54 (8.3%)	52 (7.2%)	59 (8.7%)	33 (4.8%)
No one person is responsible	184 (6.7%)	40 (6.2%)	57 (7.8%)	41 (6.0%)	46 (6.7%)
Responsible for most of household food preparation					
Yes	2239 (81.6%)	517 (79.7%)	590 (81.2%)	563 (82.6%)	569 (82.9%)
No	327 (11.9%)	91 (14.0%)	75 (10.3%)	86 (12.6%)	75 (10.9%)
No one person is responsible	178 (6.5%)	41 (6.3%)	62 (8.5%)	33 (4.8%)	42 (6.1%)

Note: SNAP=Supplemental Nutrition Assistance Program; BRFFS=Behavioral Risk Factor Surveillance System

[a] Sociodemographic and food insecurity questions were derived from the 2017–2018 National Health and Nutrition Examination Survey. We captured weekly fruit and vegetable intake using a 6-item fruit and vegetable dietary intake module from the Behavioral Risk Factor Surveillance System.

[b] Based on the two-item Hunger Vital Sign food security screener, food insecurity defined as yes if a participant indicated that it was true or sometimes true that 1) their household was worried whether their food would run out before they got money to buy more, and/or 2) the food that they bought just didn't last and they didn't have enough money to get more.

[c] The five fruit items and five vegetable items were based on expenditure data in SNAP-participating households in the Food Acquisition and Purchase Survey.

TABLE 2.

Shopping task purchase descriptive statistics, overall and by condition

	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)
FULL SAMPLE	**All (n=2744)**	**Control (n=649)**	**Default (n=727)**	**Discount (n=682)**	**Default + Discount (n=686)**
Primary outcome					
Percentage of non-discounted dollars spent on eligible fruits and vegetables, all	20.5% (23.5)	14.0% (16.2)	21.8% (25.5)	18.7% (18.8)	27.1% (28.7)
Secondary outcomes					
Non-discounted dollars spent on eligible fruits and vegetables, all	$13.18 (13.79)	$11.31 (12.82)	$11.68 (11.36)	$15.27 (16.08)	$14.47 (14.18)
Out-of-pocket dollars spent on eligible fruits and vegetables, all	$9.73 (11.18)	$11.31 (12.82)	$11.68 (11.36)	$8.25 (10.78)	$7.66 (8.96)
Non-discounted dollars spent on eligible fruits	$5.45 (8.08)	$4.28 (7.14)	$4.85 (6.78)	$6.51 (9.94)	$6.12 (7.91)
Non-discounted dollars spent on eligible vegetables	$7.74 (9.64)	$7.03 (9.34)	$6.84 (7.93)	$8.76 (11.04)	$8.34 (9.94)
Non-discounted dollars spent on eligible fresh fruits and vegetables	$11.39 (12.52)	$9.61 (11.83)	$10.49 (10.67)	$12.94 (14.56)	$12.48 (12.51)
Non-discounted dollars spent on eligible frozen fruits and vegetables	$1.60 (4.63)	$1.48 (4.01)	$1.05 (3.23)	$2.07 (5.49)	$1.83 (5.38)
Non-discounted dollars spent on eligible canned fruits and vegetables	$0.19 (0.90)	$0.22 (0.92)	$0.13 (0.65)	$0.27 (1.20)	$0.16 (0.75)
Total calories from fruits and vegetables, kcal	1505.5 (1574.8)	1298.1 (1595.0)	1496.8 (1472.8)	1526.2 (1641.3)	1690.5 (1572.0)
Total fat from fruits and vegetables, g	9.1 (21.8)	7.6 (21.1)	8.3 (20.4)	10.0 (22.8)	10.3 (22.6)
Total saturated fat from fruits and vegetables, g	1.2 (3.0)	1.0 (2.8)	1.1 (2.7)	1.2 (3.1)	1.4 (3.3)
Total carbohydrates from fruits and vegetables, g	346.4 (359.5)	294.4 (367.9)	349.9 (335.6)	345.9 (372.7)	392.3 (357.0)
Total salt from fruits and vegetables, mg	414.5 (680.4)	380.5 (656.1)	376.7 (616.2)	451.0 (746.7)	450.4 (696.0)
Total fiber from fruits and vegetables, g	57.5 (54.9)	47.9 (53.1)	56.1 (48.6)	58.9 (58.8)	66.5 (57.4)
Total protein from fruits and vegetables, g	36.8 (42.8)	34.2 (43.4)	35.2 (40.6)	38.3 (44.3)	39.3 (42.7)
Participants who purchased fruits and/or vegetables, %	2554 (93.1%)	550 (84.7%)	714 (98.2%)	612 (89.7%)	678 (98.8%)
Participants who purchased default shopping cart items, %	1992 (72.6%)	297 (45.8%)	679 (93.4%)	361 (52.9%)	655 (95.5%)
FEMALE PARTICIPANTS	**All (n=1447)**	**Controls (n=344)**	**Defaults (n=396)**	**Discounts (n=361)**	**Defaults + Discounts (n=346)**
Primary outcome					
Percentage of non-discounted dollars spent on eligible fruits and vegetables, all	20.8% (25.3%)	14.6% (18.6%)	23.0% (27.6%)	17.4% (19.3%)	27.8% (31.1%)
Secondary outcomes					
Non-discounted dollars spent on eligible fruits and vegetables, all	$14.25 (13.46)	$12.05 (12.31)	$12.10 (10.63)	$17.00 (14.99)	$16.08 (14.95)
Out-of-pocket dollars spent on eligible fruits and vegetables, all	$10.48 (10.67)	$12.05 (12.31)	$12.10 (10.63)	$9.03 (9.18)	$8.61 (9.86)

	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)
FULL SAMPLE	**All (n=2744)**	**Control (n=649)**	**Default (n=727)**	**Discount (n=682)**	**Default + Discount (n=686)**
Non-discounted dollars spent on eligible fruits	$5.66 (7.11)	$4.21 (5.80)	$4.97 (5.17)	$7.02 (8.19)	$6.50 (8.52)
Non-discounted dollars spent on eligible vegetables	$8.59 (9.72)	$7.84 (9.36)	$7.12 (7.80)	$9.98 (11.00)	$9.57 (10.36)
Non-discounted dollars spent on eligible fresh fruits and vegetables	$12.27 (12.30)	$10.07 (11.59)	$10.75 (9.82)	$14.60 (13.75)	$13.80 (13.33)
Non-discounted dollars spent on eligible frozen fruits and vegetables	$1.73 (4.53)	$1.66 (3.72)	$1.15 (3.34)	$2.06 (4.97)	$2.10 (5.71)
Non-discounted dollars spent on eligible canned fruits and vegetables	$0.25 (1.05)	$0.32 (1.16)	$0.19 (0.79)	$0.34 (1.42)	$0.17 (0.70)
Total calories from fruits and vegetables, kcal	1653.0 (1642.0)	1454.3 (1727.3)	1561.8 (1446.9)	1721.9 (1726.0)	1876.1 (1653.3)
Total fat from fruits and vegetables, g	10.5 (23.5)	8.6 (23.3)	9.5 (20.0)	13.0 (26.4)	11.2 (24.2)
Total saturated fat from fruits and vegetables, g	1.4 (3.2)	1.1 (3.0)	1.3 (2.7)	1.6 (3.6)	1.5 (3.5)
Total carbohydrates from fruits and vegetables, g	378.3 (375.9)	327.5 (397.1)	363.8 (334.4)	387.8 (390.4)	433.3 (377.8)
Total salt from fruits and vegetables, mg	489.3 (754.7)	444.5 (728.7)	411.0 (653.5)	570.5 (861.9)	540.1 (764.0)
Total fiber from fruits and vegetables, g	63.8 (57.9)	53.7 (58.0)	58.8 (47.8)	68.8 (62.7)	74.0 (61.2)
Total protein from fruits and vegetables, g	41.2 (44.4)	39.5 (47.0)	37.0 (39.8)	43.3 (46.0)	45.5 (44.8)
Participants who purchased fruits and/or vegetables, %	1374 (95.0%)	301 (87.5%)	391 (98.7%)	337 (93.4%)	344 (99.4%)
Participants who purchased default shopping cart items, %	1085 (75.0%)	165 (48.0%)	371 (93.7%)	211 (58.4%)	333 (96.1%)
MALE PARTICIPANTS	**All (n=1286)**	**Controls (n=304)**	**Defaults (n=727)**	**Discounts (n=321)**	**Defaults + Discounts (n=332)**
Primary outcome					
Percentage of non-discounted dollars spent on eligible fruits and vegetables, all	20.3% (21.7%)	13.6% (13.7%)	20.9% (23.7%)	20.1% (18.3%)	26.3% (26.3%)
Secondary outcomes					
Non-discounted dollars spent on eligible fruits and vegetables, all	$12.01 (14.10)	$10.50 (13.35)	$11.24 (12.19)	$13.57 (17.06)	$12.61 (13.06)
Out-of-pocket dollars spent on eligible fruits and vegetables, all	$8.93 (11.72)	$10.50 (13.35)	$11.24 (12.19)	$7.49 (12.24)	$6.57 (7.73)
Non-discounted dollars spent on eligible fruits	$5.22 (9.06)	$4.37 (8.43)	$4.72 (8.34)	$6.02 (11.52)	$5.70 (7.20)
Non-discounted dollars spent on eligible vegetables	$6.79 (9.46)	$6.12 (9.26)	$6.52 (8.09)	$7.55 (11.00)	$6.91 (9.21)
Non-discounted dollars spent on eligible fresh fruits and vegetables	$10.42 (12.72)	$9.11 (12.12)	$10.24 (11.62)	$11.29 (15.25)	$10.93 (11.37)
Non-discounted dollars spent on eligible frozen fruits and vegetables	$1.47 (4.75)	$1.29 (4.32)	$0.93 (3.11)	$2.09 (6.01)	$1.53 (5.01)
Non-discounted dollars spent on eligible canned fruits and vegetables	$0.12 (0.68)	$0.10 (0.50)	$0.07 (0.40)	$0.19 (0.90)	$0.14 (0.79)
Total calories from fruits and vegetables, kcal	1342.6 (1478.7)	1125.2 (1414.5)	1424.6 (1504.0)	1333.8 (1530.0)	1473.5 (1441.3)

	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)	Mean (SD) or n (%)
FULL SAMPLE	**All (n=2744)**	**Control (n=649)**	**Default (n=727)**	**Discount (n=682)**	**Default + Discount (n=686)**
Total fat from fruits and vegetables, g	7.4 (19.6)	6.5 (18.4)	6.9 (20.9)	6.9 (18.0)	9.3 (20.8)
Total saturated fat from fruits and vegetables, g	1.0 (2.6)	0.8 (2.5)	0.9 (2.6)	0.9 (2.5)	1.3 (3.0)
Total carbohydrates from fruits and vegetables, g	311.2 (336.8)	257.9 (328.7)	334.6 (337.1)	304.7 (349.7)	344.3 (325.2)
Total salt from fruits and vegetables, mg	330.9 (575.3)	309.2 (556.3)	337.4 (568.0)	329.2 (584.1)	346.5 (593.1)
Total fiber from fruits and vegetables, g	50.5 (50.4)	41.5 (46.1)	53.1 (49.4)	49.1 (52.7)	57.8 (51.6)
Total protein from fruits and vegetables, g	31.8 (40.3)	28.2 (38.3)	33.2 (41.7)	33.5 (42.2)	32.1 (38.7)
Participants who purchased fruits and/or vegetables, %	1170 (91.0%)	248 (81.6%)	322 (97.9%)	276 (85.8%)	326 (98.1%)
Participants who purchased default shopping cart items, %	900 (70.0%)	131 (43.1%)	307 (93.3%)	153 (47.6%)	314 (94.7%)

TABLE 3.

Experimental results, primary and secondary outcomes

	Control (n=649)	Default (n=727)	Discount (n=682)	Default + Discount (n=686)
	β (98.3% CI)	β (98.3% CI)	β (98.3% CI)	β (98.3% CI)
Primary outcome				
Percentage of non-discounted dollars spent on eligible fruits and vegetables, all	-	7.8 (4.8–10.7)	4.7 (1.7–7.7)	13.0 (10.0–16.0)
Secondary outcomes				
Non-discounted dollars spent on eligible fruits and vegetables, all	-	$0.37 (−1.39–2.14)	$3.96 (2.17–5.76)	$3.16 (1.37–4.95)
Out-of-pocket dollars spent on eligible fruits and vegetables, all	-	$0.37 (−1.05–1.80)	−$3.06 (−4.51−-1.62)	−$3.65 (−5.10−-2.21)
Non-discounted dollars spent on eligible fruits	-	$0.57 (−0.47–1.60)	$2.23 (1.18–3.28)	$1.85 (0.80–2.90)
Non-discounted dollars spent on eligible vegetables	-	−$0.20 (−1.43–1.04)	$1.73 (0.47–2.99)	$1.31 (0.06–2.57)
Non-discounted dollars spent on eligible fresh fruits and vegetables	-	$0.88 (−0.72–2.49)	$3.33 (1.70–4.96)	$2.87 (1.24–4.50)
Non-discounted dollars spent on eligible frozen fruits and vegetables	-	−$0.43 (−1.03–0.16)	$0.59 (−0.02–1.19)	$0.34 (−0.26–0.95)
Non-discounted dollars spent on eligible canned fruits and vegetables	-	−$0.08 (−0.20–0.03)	$0.05 (−0.07–0.17)	−$0.06 (−0.18–0.06)
Total calories from fruits and vegetables, kcal	-	198.7 (−3.7–401.1)	228.1 (22.6–433.7)	392.4 (187.1–597.7)
Total fat from fruits and vegetables, g	-	0.7 (−2.1–3.5)	2.4 (−0.5–5.2)	2.7 (−0.1–5.6)
Total saturated fat from fruits and vegetables, g	-	0.1 (−0.3–0.5)	0.3 (−0.1–0.7)	0.4 (0.0–0.8)
Total carbohydrates from fruits and vegetables, g	-	55.5 (9.3–101.7)	51.5 (4.6–98.4)	97.9 (51.1–144.7)
Total salt from fruits and vegetables, mg	-	−3.8 (−91.4–83.9)	70.5 (−18.5–159.5)	70.0 (−18.9–158.9)
Total fiber from fruits and vegetables, g	-	8.2 (1.1–15.2)	11.0 (3.9–18.2)	18.6 (11.4–25.7)
Total protein from fruits and vegetables, g	-	1.0 (−4.5–6.5)	4.2 (−1.4–9.8)	5.2 (−0.4–10.7)