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## Transactions at a Northeastern Supermarket Chain: Differences by Supplemental Nutrition Assistance Program Use

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### Abstract

**Introduction**—Although one in seven Americans receives Supplemental Nutrition Assistance Program (SNAP) benefits, little is known on how these benefits for food are spent because individual-level sales data are not publicly available. The purpose of this study is to compare transactions made with and without SNAP benefits at a large regional supermarket chain.

**Methods**—Sales data were obtained from a large supermarket chain in the Northeastern U.S. for a period of 2 years (April 2012–April 2014). Multivariate multiple regression models were used to quantify relative differences in dollars spent on 31 predefined SNAP-eligible food categories. Analyses were completed in 2016.

**Results**—Transactions with SNAP benefit use included higher spending on less healthful food categories including sugar-sweetened beverages (\$1.08), red meat (\$1.55), and convenience foods (\$1.34), and lower spending on more healthful food categories such as fruits (−\$1.51), vegetables (−\$1.35) and poultry (−\$1.25), compared to transactions without SNAP benefit use.

**Conclusions**—These findings provide objective data to compare purchases made with and without SNAP benefits. Next steps should be to test proposed SNAP modifications to determine

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whether they would have the intended effect of promoting healthier purchasing patterns among SNAP beneficiaries.

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## INTRODUCTION

The Supplemental Nutrition Assistance Program (SNAP) is the largest federal food assistance program in the U.S., with approximately \$80 billion in total costs in 2013.<sup>1</sup> SNAP eligibility rules are complex, but include having a household income  $\leq$  130% of the federal poverty level and  $<$ \$2,250 in countable assets.<sup>2</sup> The program reaches one in seven Americans, and three quarters of households that receive benefits include a child, a person aged  $>$ 60 years, or a person with a disability. The average household income of participants is only about 59% of the federal poverty level, and monthly benefits average \$271/household.<sup>1</sup>

A burgeoning area of research is considering the diet quality of SNAP recipients.<sup>3–7</sup> In contrast to the Special Supplemental Program for Women, Infants and Children that provides benefits for identified foods targeted to specific nutritional needs, SNAP benefits can be used to purchase all foods and beverages except for alcohol and prepared hot foods. One recent study using nationally representative data demonstrated that SNAP recipients consumed 43% more sugar-sweetened beverages, 47% more high-fat dairy, and 44% more processed meats, but 19% fewer nuts, seeds, and legumes compared with non-recipients with similar sociodemographic characteristics,<sup>5</sup> and others have reported similar findings.<sup>6</sup> Given that participating households are disproportionately made up of minorities<sup>1</sup> and overweight or obese individuals,<sup>4,8–10</sup> these dietary differences may contribute to health inequities among these populations.

It has been suggested that restructuring SNAP could reduce both hunger and obesity in the U.S.<sup>11</sup> Recent debate has focused on whether the program should place constraints on types of purchases that are allowable with benefits or incentivize healthy purchases. For example, public health advocates have suggested removing sugar-sweetened beverages from the list of SNAP-eligible food items.<sup>12</sup> SNAP, as administered nationally, provides no incentives to purchase healthier foods or limitations on purchasing unhealthy foods with SNAP benefits,<sup>13</sup> although some evidence supports such an approach<sup>14–16</sup> and the U.S. Department of Agriculture (USDA) is currently offering grants to incentivize the purchase of fruits and vegetables via the Food Insecurity Nutrition Incentive grant program.<sup>17</sup> Without documentation of how SNAP dollars are spent it is impossible to estimate the potential impact of proposed changes.

Many studies assessing diet quality of SNAP recipients have relied on self-report,<sup>4–6</sup> and others have considered only a single food category, such as beverages.<sup>18</sup> This study adds to previous research by assessing differences in spending by SNAP benefit use across all types of SNAP-eligible food in a supermarket setting. It also builds upon a report recently published by the USDA discussing food purchase data among SNAP participants<sup>19</sup> by presenting more recent data (2012–2014 versus 2011) and by quantifying sales in a different retail chain.

## METHODS

### Study Sample

All transaction data from a large Northeastern supermarket chain was obtained to examine food purchases. The database includes all sales from April 2012 through April 2014, from 188 stores across five states (Maine, Massachusetts, Vermont, New Hampshire, and New York).

### Measures

Individual foods are identified by their universal product code or price look-up code. Items were grouped into meaningful food categories by linking universal product codes and price look-up codes to a separate database of approximately 130,000 unique item descriptions. Based on the item description, two members of the research team manually categorized all items in the sales database into nine food and beverage groups and 34 subgroups (e.g., Appendix Table 1 provides details). Groups and subgroups were adapted for the supermarket setting from the New York City Food Standards and Good Choice food and beverage categories, which were created for institutional foodservice providers.<sup>20,21</sup> Nutritional information was not included in the sales database so further categorization based on nutritional characteristics of foods (e.g., whole versus refined grains, dried fruits with versus without added sugar) was not possible. Assignment of items to categories was aided by Internet search, as needed, to clarify item descriptions. A third member of the team was consulted to resolve disagreements, and assignment of categories was further validated by cross-referencing the food groups with the store's database on item-level SNAP eligibility. This process of data cleaning and categorization took approximately 1 year (summer 2014–2015).

A single transaction was defined as all individual foods purchased in a shopping basket at one time. Items purchased as part of a single transaction were linked via a transaction ID, and for each transaction the database includes information on time of day, date, store, whether coupons were used, method of payment, per item spending, and total transaction amount. A transaction was then categorized as either a SNAP transaction or a non-SNAP transaction based on a transaction-level identifier for payment method when any portion of the purchase was made with SNAP dollars. Because it was fairly common for transactions to include more than one method of payment (37% of SNAP transactions included at least one other payment method), these transactions were included in the definition to capture a more comprehensive representation of purchases made with SNAP benefits (i.e., all items purchased with SNAP).

SNAP-ineligible items were excluded from this analysis (i.e., alcohol, non-food items and hot convenience foods), leaving 31 SNAP-eligible food subgroups that were considered for analysis. Transactions totaling more than \$1,000 were excluded to remove extreme values, such as might occur during holidays or with institutional purchasing. Items for which an item description was unavailable and therefore a food group could not be assigned (11% of total items) were also excluded.

Stores were classified as being in high-poverty or low-poverty areas. Store locations were geocoded in ArcMap and linked to block group-level Census data from the 2013 American Community Survey.<sup>22</sup> To capture the population most likely to shop at each store, the mean percent poverty of block groups within one mile of urban stores and within five miles of other stores was calculated. Urban stores were defined as stores located in areas designated with rural–urban commuting code “1” (urbanized area).<sup>22,23</sup> High-poverty area stores were defined as stores with more than 9.8% of the population (the median for this variable) below the federal poverty line. There may be some misclassification of this variable because some evidence suggests that people travel beyond the closest retail store to shop.<sup>24</sup> The assumption is that most misclassification would be in the direction of the null (i.e., by restricting the sample to high-poverty areas stores, the assumption is that individuals would be more likely to leave these areas to shop at stores located in low-poverty areas, rather than seeking out stores in high-poverty areas).

### Statistical Analysis

Data were analyzed at the transaction level using multivariate multiple regression to assess use of SNAP benefits in relation to food purchases. Outcomes of interest were the dollar amount spent on each food subgroup. Models were adjusted for transaction-level covariates (total amount spent on all SNAP-eligible items, season of purchase [i.e., fall, winter, spring, summer]). A secondary analysis was restricted to high-poverty area stores in order to assess transactions at stores that share a similar neighborhood environment. Sensitivity analyses were also conducted with flavored milks recategorized as milk (rather than sugar-sweetened beverages, because many policy proposals related to sugar-sweetened beverages exclude flavored milk), and with dried fruits recategorized as fruit (rather than sweet or salty snacks, because many, but not all dried fruit products contain added sugar, and policy implications differ based on this characteristic). Analyses were conducted in 2016 using SAS, version 9.4. This study involved the analysis of de-identified sales data and is considered non-human subjects research.

## RESULTS

The sales dataset represents 298,003,223 unique transactions (of which 13.2 million were SNAP transactions, and 284.8 million were non-SNAP transactions) and 129,101 unique items. The average amount spent per transaction was \$34.03 (\$49.75 for SNAP transactions and \$33.30 for non-SNAP transactions). An overview of transactions in the sales database (% of total SNAP-eligible sales by food subgroup, overall, and stratified by whether the purchase was made with SNAP benefits) is presented in Table 1.

Notably, the most popular category for both types of transactions was red meat, which accounted for a larger percentage of total sales among SNAP transactions (16.9%) compared to non-SNAP transactions (11.5%). Spending on sugar-sweetened beverages as a percentage of total sales was also higher among SNAP transactions than among non-SNAP transactions (5.5% vs 3.7%). Furthermore, convenience foods (foods requiring little preparation [e.g., boxed macaroni and cheese]) comprised a higher proportion of total sales among SNAP transactions than among non-SNAP transactions (7.3% vs 5.1%).

Figure 1 depicts the food group composition of the average SNAP transaction vs average non-SNAP transaction. The greatest discrepancies in composition between SNAP and non-SNAP transactions were major protein foods (35% vs 29%) and fruits and vegetables (14% vs 21%).

Results from models examining the 31 SNAP-eligible food and beverage subgroups (in dollars) are presented in Table 2. Positive values indicate the amount (in dollars) by which spending was higher within a food or beverage category for SNAP vs non-SNAP transactions, whereas negative values indicate lower spending in SNAP vs non-SNAP transactions. In Model 1, SNAP transactions included higher spending than non-SNAP transactions on several categories, including sugar-sweetened beverages (\$1.50), red meat (\$4.57), poultry (\$1.73), and convenience foods (\$1.93). In the multivariate Model 2 (adjusted for season of the transaction and total transaction-level amount spent on SNAP eligible items), SNAP transactions included higher spending on sugar-sweetened beverages (\$1.08), red meat (\$1.55), and convenience foods (\$1.34) and lower spending on fruits (–\$1.51), vegetables (–\$1.35), and poultry (–\$1.25). Similar results were found in the adjusted model that was restricted to stores in high-poverty areas only. There was no appreciable difference in the results upon conducting sensitivity testing using robust SEs.

When the items identified as flavored milk products were recategorized as milk instead of sugar-sweetened beverages, the parameter estimate for sugar-sweetened beverages changed from \$1.08 to \$1.06 and the parameter estimate for milk changed from \$0.10 to \$0.11. When dried fruits were recategorized as fruit instead of sweet or salty snacks, the parameter estimate for fruit changed from –\$1.51 to –\$1.53 and the parameter estimate for sweet or salty snacks changed from \$0.01 to \$0.04. No other parameter estimates changed.

## DISCUSSION

The results of this study demonstrate several key differences between SNAP and non-SNAP transactions within a supermarket chain, indicating that SNAP participants may be purchasing fewer healthy food items and more unhealthy food items than non-SNAP participants. In this study, SNAP transactions included lower spending on fruits, vegetables, and poultry and higher spending on sugar-sweetened beverages, red meat, and convenience foods than non-SNAP transactions. These findings are similar to those recently reported by the USDA in that SNAP and non-SNAP transactions were similar in some ways, but both sets of results highlight that food purchases are far from consistent with the Dietary Guidelines for Americans. The differences in spending by SNAP status on several food subgroups suggest that SNAP households could benefit from new strategies to promote healthier food purchases. Findings were similar when the analysis was restricted to high-poverty area stores only, suggesting that these differences are more likely related to shopping patterns among those using SNAP benefits and not necessarily to the neighborhood environment. The sensitivity analyses for flavored milk and dried fruit demonstrated that these products are not, in large part, driving the differences in spending with regard to their respective subgroups.

Sugar-sweetened beverages represented 5.5% of total SNAP sales in this database. According to the USDA's SNAP Retailer Management Annual Report, in fiscal year 2013 (the mid-point of the time period for which sales data were available), approximately \$76 billion worth of SNAP benefits were redeemed across all authorized retailers.<sup>25</sup> If the assumption is made that the composition of SNAP transactions is similar in these 188 stores to other supermarkets across the country during this 2 year period, approximately \$4.2 billion in SNAP subsidies is spent on sugar-sweetened beverages nationwide each year, compared to \$10.2 billion spent on fruits and vegetables and \$26.3 billion spent on protein sources (a subset of which is \$12.9 billion for red meat and \$3.4 billion for processed meat). This rough estimate of SNAP spending on sugar-sweetened beverages is higher than one previously published estimate,<sup>18</sup> but in line with others.<sup>26</sup> Andreyeva and colleagues<sup>18</sup> estimated that SNAP pays for \$1.7 to 2.1 billion for sugary drinks, using conservative assumptions (e.g., that SNAP households with young children in New England were representative of all SNAP households, and that spending in the first 6 months of the year are representative of the entire year). Using similar methods to those herein, Shenkin and Jacobson<sup>26</sup> estimated an annual SNAP expenditure of \$4 billion on carbonated soft drinks. Others have examined regional differences in sugar-sweetened beverage consumption among U.S. adults and found higher consumption of regular soda in the South,<sup>27</sup> indicating that the estimate of \$4.2 billion may actually underestimate the total amount of SNAP dollars spent on sugar-sweetened beverages nationally. The inclusion of transactions with multiple payment methods could have led to a modest overestimate of nationwide SNAP spending.

Currently, SNAP is not consistent with many other government subsidized nutrition programs (e.g., the National School Lunch Program), which are mandated to align with the Dietary Guidelines for Americans. Lower SES is associated with poor diet quality in the U.S., and the difference in dietary quality between low-income and high-income individuals is getting wider.<sup>28</sup> Moreover, there are disparities in obesity rates by race/ethnicity, whereby non-Hispanic blacks and Hispanics have the highest rates of obesity (47.8% and 42.5%, respectively).<sup>29</sup> Racial/ethnic minorities are disproportionately represented among SNAP recipients.<sup>1</sup> Although SNAP provides nutrition assistance to millions of low-income Americans, this study builds upon previous reports that SNAP participation is associated with poor diet quality.<sup>4-6</sup> Approximately 47 million people received SNAP benefits in fiscal year 2013<sup>30</sup>; thus, there is a huge potential to address the income-related disparity in diet quality with revisions to SNAP policy.

A SNAP+ program has been proposed<sup>31</sup> in which the beneficiary could choose to either: (1) continue with the current SNAP benefit package, or (2) agree to a revised package, in which sugar-sweetened beverages are ineligible and benefits specifically for purchase of fruits and vegetables are increased. This addresses concerns that SNAP policy is paternalistic because it provides a choice to the beneficiary and also added financial benefit to purchase healthier foods.

Surveys conducted with key stakeholders, including SNAP participants, have shown strong support for changing SNAP policies to align the program with the Dietary Guidelines for Americans.<sup>13,32,33</sup> In multiple studies a majority of stakeholders, including SNAP participants, have supported restrictions on purchasing sugar-sweetened beverages with



SNAP dollars as well as supported the provision of additional SNAP benefits for fruits and vegetables.<sup>13,32,34</sup> Counter to claims that program modifications would be difficult to implement, the Healthy Incentives Pilot showed that changes to SNAP are feasible (most retailers did not find the Healthy Incentives Pilot difficult to operate, and >90% reported no change in checkout time).<sup>35</sup> The vast majority of all food prepared at home is purchased in supermarkets and at other large retailers<sup>36</sup> where electronic point of sale technology is readily available and could be used to implement changes in SNAP policy.

There are several strengths to this study, including the direct analysis of grocery sales data to compare purchases made with and without SNAP benefits, capturing seasonal variation with 25 months of data from multiple states with different SNAP distribution policies, and inclusion of both rural and urban stores. Furthermore, the American Community Survey was utilized to establish percent poverty levels within the catchment area of each store, enabling an examination of shopping patterns specifically for stores in areas with high levels of poverty.

### Limitations

There are also several limitations that should be acknowledged. First, with such a large dataset even small differences were statistically significant, so the discussion is focused on those that appear meaningful. There is a possibility of differential purchasing patterns by type of store (i.e., shoppers may use multiple, different types of stores for different items). However, previous work has shown that 91.1% of traditional food sales take place at grocery stores and supermarkets as opposed to convenience stores or specialized markets,<sup>37</sup> and the nutritional content of packaged food purchases is not linked to where people shop.<sup>38</sup>

It is also important to note that this analysis examined SNAP transactions versus non-SNAP transactions, which couldn't be linked to individual shoppers. Thus, results should not be interpreted to mean that starting to receive SNAP benefits would lead to food purchases of lesser dietary quality. Rather, these findings help to elucidate potential points of intervention for researchers, policy makers, and others seeking to improve diet quality among SNAP recipients. Given that the sales data were not linked to individuals or households, it was not possible to control for individual or household characteristics that may influence purchases.

Additionally, there were items in the database that could not be classified into food groups and thus were excluded from analysis (11% of items and 11% of total sales). Communication with regional sales directors and store managers confirmed that many of these items had product codes added at the store level to accommodate new non-food items or occasional only locally available items. Finally, it was not possible to determine how SNAP beneficiaries' shopping patterns vary over the course of each month after receiving benefits. Previous work has observed a spike in spending by benefit recipients in the three days following benefit issuance,<sup>39</sup> so there was likely some misclassification whereby those sales categorized as non-SNAP sales included transactions made by people who do receive SNAP, but who made a purchase using other resources (e.g., cash or credit) because of benefit depletion. This would likely bias results towards the null because some people on SNAP potentially buying less healthy foods will be in the non-SNAP comparison group.

## CONCLUSIONS

These findings help to establish a comparison of purchases made with and without SNAP benefits, using a large dataset in the supermarket setting where most food purchases are made. Modifications to SNAP policy, such as restricting sugar-sweetened beverage purchases and/or incentivizing healthier options such as fruits and vegetables, are strategies that have been suggested to address the differences in dietary quality of grocery purchases by recipients. Given that the SNAP program is designed to reduce food insecurity and help families to obtain healthful proteins, fruits, and vegetables, future work should explore the differences in purchasing patterns within other types of food categories including proteins and convenience foods. Next steps should include testing these proposed strategies to determine whether they have the intended effect of promoting healthier purchasing patterns among SNAP beneficiaries.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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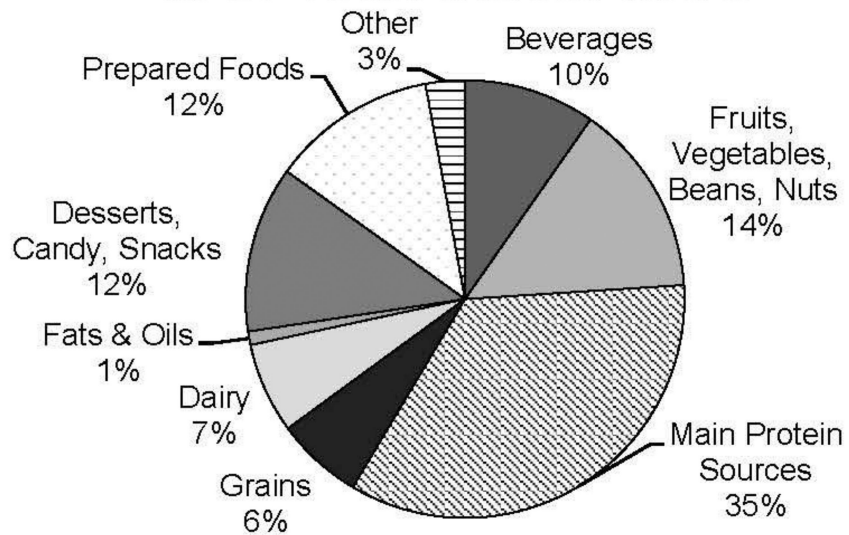
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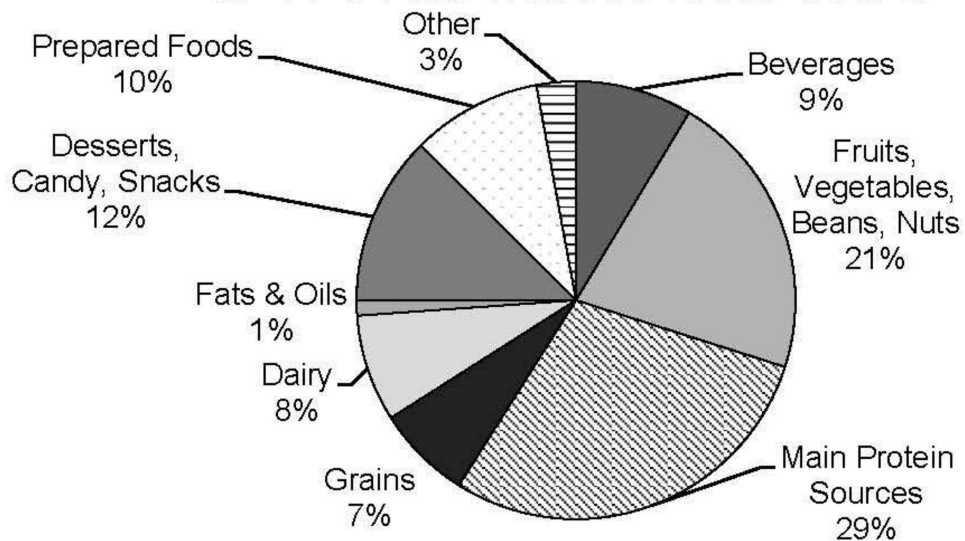
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### % of Total Sales: SNAP



### % of Total Sales: Non-SNAP



**Figure 1.** Composition of the average SNAP transaction versus average non-SNAP transaction (% of total SNAP eligible sales by food group). SNAP, Supplemental Nutrition Assistance Program

**Table 1**

SNAP Eligible Sales by Food Subgroup, SNAP Versus Non-SNAP Transactions, for One Northeastern Supermarket Chain (April 2012–April 2014)

Category	% of total SNAP eligible sales		Total
	Non-SNAP transactions <sup>a</sup>	SNAP transactions <sup>a</sup>	
Beverages			
Sugar-sweetened beverage	3.7	5.5	3.8
Lower-calorie beverage	0.6	0.5	0.6
Unsweetened beverage	3.1	2.6	3.0
100% fruit juice	1.4	1.1	1.3
Fruits, vegetables, beans, nuts			
Fruit	10.3	6.8	10.0
Vegetable	9.5	6.6	9.4
Bean	0.4	0.3	0.3
Nut or seed	1.2	0.7	1.1
Main protein sources			
Red meat	11.5	16.9	11.9
Poultry	9.4	9.7	9.4
Seafood	3.2	2.7	3.1
Processed soy	0.2	0.1	0.2
Processed meat	3.9	4.5	3.9
Eggs	0.9	0.7	0.8
Grains			
Bread	3.8	3.2	3.8
Cereal	1.7	1.6	1.7
Pasta, rice, or other grain	1.5	1.5	1.5
Dairy			
Milk	2.5	2.4	2.5
Yogurt	1.6	1.0	1.6
Cheese	3.8	3.3	3.8
Fats and oils			
Fat or oil - liquid	0.3	0.2	0.3
Fat or oil - solid	0.8	0.8	0.8
Desserts, candy, snacks			
Candy	1.3	1.2	1.3
Cold or frozen dessert	1.7	1.7	1.7
Sweet or salty snack	4.7	4.4	4.7
Sweet bread, cake, cookies	4.8	5.0	4.8
Prepared foods			
Condiments, sauces, salad dressing	2.9	2.8	2.9
Soup	0.9	0.9	0.9

Category	% of total SNAP eligible sales		
	Non-SNAP transactions <sup>a</sup>	SNAP transactions <sup>a</sup>	Total
Pizza	0.7	1.1	0.7
Convenience food (cold)	5.1	7.3	5.3
Other			
Other food	3.0	2.9	2.9

<sup>a</sup>A “SNAP transaction” is defined as a transaction where any portion of the purchase was made with SNAP dollars, whereas a “non-SNAP transaction” was paid for entirely with means other than SNAP dollars.

SNAP, Supplemental Nutrition Assistance Program

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**Table 2**

Association Between SNAP<sup>a</sup> Benefit Usage and Dollar Amount of Grocery Purchases, by Food Subgroups

Food subgroup	Model 1 (unadjusted) <sup>d</sup>	Model 2 (adjusted) <sup>b,d</sup>	Model 2 (high- poverty area stores only) <sup>b,c,d</sup>
	$\beta$ (in \$) <sup>a</sup>	$\beta$ (in \$) <sup>a</sup>	$\beta$ (in \$) <sup>a</sup>
Beverages			
Sugar-sweetened beverage	1.50	1.08	1.09
Lower-calorie beverage	0.07	0.00	0.01
Unsweetened beverage	0.27	-0.11	-0.09
100% fruit juice	0.09	-0.06	-0.06
Fruits, vegetables, beans, nuts			
Fruit	-0.03	-1.51	-1.46
Vegetable	0.11	-1.35	-1.35
Bean	0.03	-0.02	-0.02
Nut or seed	-0.07	-0.21	-0.21
Main protein sources			
Red meat	4.57	1.55	1.42
Poultry	1.73	-1.25	-1.44
Seafood	0.27	-0.48	-0.46
Processed soy	-0.01	-0.03	-0.03
Processed meat	0.97	0.44	0.44
Eggs	0.04	-0.06	-0.06
Grains			
Bread	0.32	-0.11	-0.08
Cereal	0.26	0.05	0.06
Pasta, rice, or other grain	0.26	0.05	0.05
Dairy			
Milk	0.34	0.10	0.10
Yogurt	-0.02	-0.23	-0.20
Cheese	0.38	-0.11	-0.11
Fats and oils			
Fat or oil - liquid	0.01	-0.03	-0.03
Fat or oil - solid	0.11	0.00	-0.01
Desserts, candy, snacks			
Candy	0.17	0.04	0.05
Cold or frozen dessert	0.29	0.15	0.15
Sweet or salty snack	0.59	0.01	0.07
Sweet bread, cake, cookies	0.90	0.38	0.41
Prepared foods			
Condiments, sauces, salad dressing	0.43	0.05	0.06
Soup	0.13	0.01	0.02

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Food subgroup	Model 1 (unadjusted) <sup>d</sup>	Model 2 (adjusted) <sup>b,d</sup>	Model 2 (high-poverty area stores only) <sup>b,c,d</sup>
	$\beta$ (in \$) <sup>a</sup>	$\beta$ (in \$) <sup>a</sup>	$\beta$ (in \$) <sup>a</sup>
Pizza	0.34	0.26	0.27
Convenience food (cold)	1.93	1.34	1.41
Other			
Other food	0.45	0.04	0.00

<sup>a</sup>Positive parameter estimates represent the amount in dollars by which spending was higher within a food or beverage category for SNAP versus non-SNAP transactions, and negative values indicate lower spending in SNAP versus non-SNAP transactions on that food category.

<sup>b</sup>Adjusted for season and total dollar amount spent on SNAP-eligible items.

<sup>c</sup>Restricted to stores with > median % of population below the Federal Poverty Line in the area within a one mile radius of urban stores and within a five mile radius of other stores (based on average distance traveled to primary store; sources: American Community Survey 2013; USDA; Rural Urban Community Area score)

<sup>d</sup>All results significant with *p*-value <0.0001.

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