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Nutritional profile of purchases by store type: disparities by income and food program participation

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Abstract

Introduction—Policymakers have focused on the food retail environment for improving the dietary quality for Supplemental Nutrition Assistance Program (SNAP) participants. Yet little is known about where SNAP households make food and beverage purchases, or how purchases may vary by store type, SNAP participation, and income level. The objective of this study was to examine the association between SNAP-income status (participant, income-eligible nonparticipant, higher-income nonparticipant) and healthfulness of household purchases across store types.

Methods—Data included household packaged food purchases (n=76,458 unique households) from 2010–2014, analyzed in 2017 with multivariable adjusted models to examine the nutritional profile of purchases by store type (grocery, convenience, big box, and other stores) for SNAP participating households, income-eligible nonparticipants, and higher-income nonparticipants. Outcomes included volume and nutrients (kcal, total sugar, saturated fat, and sodium) and calories from food groups.

Results—All households purchased the greatest volume of foods and beverages from grocery stores, followed by big box and other stores, with relatively little purchased from convenience stores. The largest differences between SNAP participants and non participants were observed at

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grocery stores and big box stores, where SNAP households purchased more calories from starchy vegetables, processed meat, desserts, sweeteners and toppings, total junk food, sugar-sweetened beverages, and milk than income -eligible and higher-income SNAP nonparticipants. SNAP purchases also had considerably higher sodium density. Across store types, the nutritional profile of income-eligible nonparticipants' purchases was similar to higher-income households' purchases.

Conclusions—More research is needed to identify strategies to improve the nutritional profile of purchases among SNAP households.

Keywords

Supplemental Nutrition Assistance Program; SNAP; low income; poverty; food environment; food retailers; household food purchases; big data

Introduction

The Supplemental Nutrition Assistance Program (SNAP) is the United States' largest nutrition assistance program.¹ While previous research has found that both SNAP participants and lower-income nonparticipants show considerable room for improvement in their dietary quality, studies also find that, compared to nonparticipants, SNAP households often have lower nutritional quality of food/beverage purchases^{2–6} and overall dietary intake.^{7,8} SNAP participants also have higher rates of diet-related diseases such as metabolic syndrome and obesity than nonparticipants.⁹

The food retail environment has emerged as a key arena for reducing diet-related health disparities among SNAP participants and low-income populations in general. Many low-income individuals simultaneously have low access to supermarkets and easy access to convenience stores.¹⁰ Because supermarkets tend to offer more healthful foods than convenience stores,¹¹ improving access to supermarkets has been identified as a policy priority in an attempt to improve the nutritional quality of low-income household diets. Some evidence suggests that introducing full-service groceries does not improve dietary quality in low-socioeconomic communities.^{12–15} This lack of effect may be because many households choose to shop at stores other than the nearest store,¹⁶ or because living in a low-income area is more important for the healthfulness of purchases than living in a low-access area.¹⁷

However, other studies find that the nutritional quality of purchases is associated with the store type where the food is purchased.^{18–21} For example, some studies report that food purchases made at big box stores, warehouse-clubs, and convenience stores have higher densities of total sugar, sodium, saturated fat and energy than purchases made at grocery stores and supermarkets.^{18,21} Additionally, one national study found candy and gum account for 35% of calories purchased at convenience stores.²¹ Some research suggests that shopping at big box stores is associated with lower nutritional quality of food and beverage purchases.^{20,19}

Yet, little research has examined the nutritional profile of food and beverage purchases across different store types by SNAP participation status or income level. One study found that the majority of respondents reported supermarkets or super centers as their primary store type for food shopping, with little difference by SNAP participation or income, but did not examine the volume or nutrient contributions of different store types.¹⁶ Thus, it is unclear how the nutritional profile of purchases differs by SNAP status or income level within store type. A better understanding of disparities in nutritional profile of purchases within each store type can inform policies seeking to improve diet quality in these populations.

The objective of the current study is to examine SNAP participants and nonparticipants' food and beverage purchases in terms of volume and nutritional profiles from grocery, convenience, big box stores, and other stores.

Materials and Methods

Data

Data analyses were conducted in 2017 and included data on packaged foods and beverages from Nielsen Homescan^{22,23} quarters in which SNAP status was available (quarter 4 in 2010 and 2011, quarters 2 and 4 in 2012–2014). Products include packaged produce with a barcode (e.g., bagged lettuce), but excludes loose produce (e.g., a single lemon) as well as away-from-home food purchases (e.g., restaurants). Using a handheld scanner, after each shopping trip households record the barcode of all purchases as well as place of purchase. Each product was linked to detailed nutrition information.²⁴ Similar to previous studies,^{25–28} household purchases were aggregated to the quarterly-level in order to understand households' usual purchasing patterns. Socio-demographic characteristics include household composition, race/ethnicity, age of household members, education, income, and geographical location (i.e., 52 metropolitan areas and 24 non-metropolitan areas).

SNAP Participation & Eligibility

Households were classified as a SNAP participant based on self-report of any member in the household currently participating in SNAP. Of the total 477,222 household-by-quarter observations from 2010–2014, SNAP status was available for 268,465 household-by-quarter observations from 76,458 unique households. Average length in the study was 3.0 years $\pm$ 1.6. Previous work with this sample found that respondents with non-missing SNAP status tended to be smaller, less likely to have children, with higher income compared with households missing SNAP status.⁴ Sensitivity analyses were performed to account for selection into the analytic sample through applying an inverse-probability weight (IPW) calculated as the inverse of the predicted probability of response to the SNAP assessment.

Non-participating households were further classified by income level based on SNAP eligibility at the federal level as either SNAP income-eligible (< 130% of the Federal Poverty Level [FPL])²⁹ or “higher-income” (>130% FPL) households.

Place of Purchase

Households recorded place of purchase, which were aggregated into four store types: grocery, convenience, big box, and other. Grocery stores included all full-service grocery stores and supermarkets; convenience stores included small stores not expected to carry a full array of groceries (e.g., convenience stores, gas mini-marts, service stations); big box stores included large discount stores (e.g., Walmart, Target) and warehouse clubs (e.g., Sam's Club, wholesale clubs, other warehouse clubs); and "other stores" included all other store types, including dollar stores, drug stores, bodegas, beverage supply stores, and bakeries, as well as non-food stores (e.g., department stores) where some food may be sold.

Food Grouping

Analyses included food and beverage groups (Appendix Table 2) that have been associated with health outcomes (e.g., fruits and vegetables,^{30,31} nuts,³² processed meat,³³ junk food,³⁴ milk³⁵) or are the focus of recent proposals to improve diet quality in SNAP (e.g., candy, sugar-sweetened beverages.)^{4,36}

Statistical Analysis

Socio-demographic characteristics, the proportion of households reporting purchases from each store type and mean number of shopping trips per quarter by store type were examined across SNAP-income groups. Within each store type, Ordinary Least Squares (OLS) regression was applied to estimate adjusted mean per capita volume and nutrient values (calories, total sugar, saturated fat, and sodium) of purchases by SNAP-income group. There were a high proportion of non-consumers of convenience and other store-types, causing some zero-inflation in purchase outcomes. To address this, sensitivity analyses were conducted among consumers-only for these store types.

All multivariate adjusted estimates controlled for household composition (household size, number of children, and household structure [married vs. not]); education (maximum educational attainment in the household [high school, some college, college graduate, post-college]), race/ethnicity (non-Hispanic white, Hispanic, non-Hispanic Black, and non-Hispanic other race/ethnicity); income (percent of FPL); age of household head and age-squared; geographical location; quarter, and year. Standard errors accounted for clustering at the household level. Stata's margins command was applied for post-estimation Wald tests to test for statistical significance, defined as $p < 0.05$. Analyses use Bonferroni-adjustment for multiple comparisons.

Secondly, analyses focused on consumers within each store type to estimate the adjusted means by SNAP-income group for per capita calories (total food, total beverage, and specific food and beverage groups), as well as nutrient density (kcal/100g, total sugar g/100g, saturated fat g/100g, and sodium mg/100g) for total food and beverage purchases.

All analyses were conducted in Stata version 14.2 (StataCorp, College Station, TX). This study used a secondary dataset of de-identified data that was deemed exempt by the Institutional Review Board.

Results

Households participating in SNAP were more likely to have children, less likely to be married, younger, more likely to be non-Hispanic Black or Hispanic, and less likely to be a college or post-college graduate than were income-eligible nonparticipants or higher-income nonparticipants (p 's < 0.01 for all comparisons; Table 1). To understand the representativeness of the Homescan sample, comparisons with adult participants in the National Health and Nutrition Survey (NHANES; 2011–2012 and 2013–2014) found that the Homescan households were smaller, less likely to have children, more likely to be married, older, more likely to be non-Hispanic White, and have higher education (Appendix Table 1), however, these differences were consistent across income-level and SNAP participation.

Nearly all households (95–97%) recorded purchases from a grocery store, while 81–86% shopped at big box stores, and 77–79% shopped at other stores (Table 1). A greater proportion of SNAP households recorded purchases from convenience stores (21%) compared to income-eligible nonparticipants (14%) and higher-income households (12%) (p < 0.001). Frequency of shopping at each store type showed little variation by SNAP-income group (all estimates within 1 trip/quarter of one another), though differences were statistically significant (p < 0.001).

Across all SNAP-income groups, the greatest per capita volume of purchases came from grocery stores, followed by big box stores, and then other store types, with low volume purchased from convenience stores (Table 2). Within store types, SNAP households purchased a greater per capita volume of food and beverages compared to SNAP nonparticipant households at grocery stores, big box stores, and other food stores (p < 0.01 for all comparisons). SNAP households also purchased more calories, sugar, saturated fat and sodium per capita from grocery stores and big box stores compared to SNAP nonparticipants (p < 0.01 for all comparisons). Differences in sodium were particularly notable, with SNAP households purchasing +239 and +202 mg/capita/day at grocery stores, and +124 and +145 mg/capita/day at big box stores compared to income-eligible and higher-income nonparticipants, respectively. At other stores, SNAP participants also purchased more sugar than nonparticipants, as well as more calories and sodium than higher-income nonparticipants, while differences in saturated fat purchases were non-significant. SNAP households purchased more calories/capita/day at convenience stores than did non-SNAP households, but there were few other significant differences in convenience store purchase outcomes by SNAP-income group. Income-eligible and higher-income nonparticipants were similar to one another with regards to volume and nutrients of purchases at each store type. There were no significant differences in purchase outcomes between these groups at convenience or other stores. However, compared to income-eligible nonparticipants, higher-income nonparticipants purchased more energy, sugar, saturated fat and sodium at grocery stores, and less volume and less sugar at big box stores.

Among food groups, most significant differences by SNAP-group were observed for grocery stores and big box stores (Table 3). Of households who shopped at grocery or big box stores, SNAP households purchased more calories from starchy vegetables, processed meat,

desserts/sweet snacks, junk food, sugar-sweetened beverages, and milk compared to both groups of SNAP nonparticipants (all p 's < 0.01). At other stores, SNAP households also purchased more calories from sweeteners/toppings and sugar-sweetened beverages than SNAP nonparticipants, and more calories from processed meat, desserts/sweet snacks, and milk than higher-income SNAP nonparticipants (p 's < 0.05). There only differences by SNAP-income group at convenience stores were that SNAP households purchased more calories from alcohol than higher-income households ($p < 0.01$) and more calories from sugar-sweetened beverages than income-eligible nonparticipant households ($p < 0.05$). Again, nonparticipants were similar to each other and the few statistically significant differences between these groups were small in size. One exception was that higher-income nonparticipants purchased more desserts/sweet snacks and junk food at grocery stores than income-eligible nonparticipants (p 's < 0.01).

There were differences by SNAP-income group in nutrient density of purchases at grocery stores (Table 4). SNAP households' food purchases had higher density for energy, sugar, and sodium, and beverage purchases had higher sugar density compared to both nonparticipant groups (all p 's < 0.01). At big box stores, SNAP households' food purchases also had higher sodium density compared to SNAP nonparticipants ($p < 0.01$). At other store types, SNAP households had higher sodium density for food ($p < 0.05$) and higher sugar density for beverages (p 's < 0.05) than higher-income nonparticipants, but lower energy ($p < 0.05$) and sodium density ($p < 0.01$) for beverages. Among SNAP nonparticipants, higher-income households had a higher sugar density at other stores ($p < 0.05$) than lower-income households. There were no other differences in nutrient densities between nonparticipant groups.

In sensitivity analyses adjusting for the likelihood of having non-missing SNAP status, estimates of daily per capita volume and energy purchased were ~ 5% lower than main analysis estimates without this adjustment (Appendix Table 3). However, these differences were consistent across SNAP groups. The direction and magnitude of differences in per capita volume and nutrients purchased from each store type across SNAP groups remained consistent, suggesting results are robust to selection into the analytic sample. Sensitivity analyses among consumers-only of convenience store and other store types showed consistent relationships between SNAP-income group and purchase outcomes (Appendix Table 4).

Discussion

For all households, the largest source by volume of packaged food and beverage purchases was grocery stores, followed by big box stores. Virtually all SNAP households (95%) recorded purchases from a grocery store, purchasing on average 885 calories/capita/day from grocery stores. Results are consistent with previous literature reporting that 86% of SNAP benefits are redeemed at supermarkets and large grocery stores,³⁷ and that regardless of SNAP status, households' largest share of food and beverage expenditures come from grocery stores.³⁸

The current study also found that SNAP households' grocery store purchases were often less healthy compared to nonparticipants. For example, SNAP households' grocery store food purchases were more energy-dense and sugar -dense and considerably more sodium-dense than both income-eligible and higher-income nonparticipants. In addition, SNAP households purchased more junk food , processed meats, and sugar-sweetened beverages at grocery stores than both income-eligible and higher-income nonparticipants, and had lower or similar purchases of healthier food groups including non -starchy vegetables, nuts, and legumes.

By volume and calories, big box stores were the second largest source of foods and beverage for all households. Both SNAP households as well as income-eligible nonparticipants purchased greater volume and calories from big box stores compared to higher-income nonparticipants, consistent with previous findings that low-income households have higher food expenditures at big box stores than higher -income households.³⁹ This could reflect big box stores' lower prices⁴⁰ or differences in access. As with grocery stores, SNAP households' purchases from big box stores tended to have a worse nutritional profile compared to both income-eligible and higher-income nonparticipants. For example, among households that shopped at big box stores, SNAP households purchased more processed meat , junk food, and sugar-sweetened beverages than nonparticipant households. The lower nutritional quality of purchases combined with the relatively large volume of SNAP purchases made at big box stores suggests that these stores may be key targets for interventions seeking to improve dietary quality among SNAP participants.

Interestingly, at both grocery stores and big box stores, differences between SNAP participants and income-eligible nonparticipants were generally larger than differences among the SNAP nonparticipants groups. This suggests that SNAP households purchase less healthy foods and beverages than other low-income nonparticipating households. It is not clear whether this effect is attributable to who chooses to participate in SNAP, the program itself, or some other factor. Regardless, SNAP households' large volume of purchases at grocery and big box stores suggests that more research is needed on how to improve the healthfulness of food choices at these stores.

While SNAP households purchased a greater volume of foods and beverages from other store types, differences in nutrient and food group purchase outcomes across SNAP -income groups were relatively small . This store category is quite heterogeneous, including dollar stores, bakeries, beverage stores, and bodegas and additional research will be needed to establish which of these store types within the broader category of "other stores" is the most important for low-income households' food purchases.

While SNAP households were more likely than both income -eligible and higher-income nonparticipants to shop at convenience stores, all households had relatively low purchases from convenience stores (~8 to 11 kcal/capita/day). This low level of purchasing suggests that recent policy efforts focusing on convenience stores, such as healthy corner store makeovers and enhanced minimum stocking requirements, may have minimal impact on dietary quality or obesity prevalence.

One limitation of this study is potential selectivity: individuals who shop at a particular retailer may possess different underlying nutrition or health characteristics than others. However, this is less likely to be a problem for grocery or discount stores, given that nearly all households shop at these stores. Still, it is possible that households use these store types differently (for example, by using grocery stores for larger trips and convenience stores for larger trips) and that these differences are related to purchases' nutritional quality. Additional limitations relate to the data. For example, previous studies have found that Homescan participants may under-report some purchases, such as individual beverages, snacks, and other items easily consumed before recording the product's barcode.^{41,42} Compared to government surveys, under reporting in electronic purchase data appears to be higher in larger and higher-income households,^{43,44} although there is no reason to suspect underreporting differs by SNAP status. Underreporting likely affects convenience store purchases the most and these results should be interpreted with caution. Moreover, similar to previous studies on Homescan data,⁴⁵ the study sample tended to be older, more likely to be married, non-Hispanic White, and higher educated than the US adult population, although these differences were consistent by SNAP and income level. More research will be needed to understand whether the observed associations are replicated in the overall US population.

Finally, the goal of this study was to describe existing patterns of real-world behavior across store types, which may be due to a combination of underlying preferences, trip size, and the retailer's influence on behavior, among other factors. Future research on the causal effect of store type on behaviors will be needed to inform interventions. Additional considerations such as the timing of benefits issuance and the frequency of purchases (i.e., potential differences in frequent but small trips vs. less frequent but larger trips) could also provide key insight into households' decisions about where to shop and how much and what to purchase. Despite these limitations, the current study provides important insights about where households shop for foods and beverages, as well as initial insight into how disparities in nutritional profile of purchases by SNAP status and income level vary within different store types.

Conclusions

This study found that regardless of SNAP participation or income, most households purchase the vast majority of foods and beverages at grocery stores and big box stores, and the biggest nutritional disparities between SNAP participants and nonparticipants were observed at grocery stores. More research is needed to understand how to improve the healthfulness of SNAP household food purchases.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1
Sample Characteristics by Supplemental Nutrition Assistance Program (SNAP) Participation and Income Group, 2010–2014.

Household characteristics	Current SNAP Participant		Income Eligible Nonparticipant		Higher-Income Nonparticipant		p-value ^a
	Mean	SE	Mean	SE	Mean	SE	
Total number of household observations	18,841		37,900		211,724		
Total number of unique households by SNAP status across all years	8,069		15,342		60,648		
Household size	2.39	0.04	2.37	0.02	2.25	0.00	0.014
Children							
Any children (%)	27.38	.01	24.23	.01	18.79	.00	<0.001
Number of children	52.09	.01	47.53	.01	32.25	.00	<0.001
Presence of children 2–5 (%)	8.68	.00	6.37	.00	4.43	.00	<0.001
Presence of children 6–11 (%)	13.34	.00	10.79	.00	7.90	.00	<0.001
Presence of children 12–18 (%)	15.83	.00	16.07	.00	11.57	.00	<0.001
Married (%)	37.79	.01	44.87	.01	66.41	.00	<0.001
Household Head Age	54.54	.16	58.41	.18	58.52	.06	<0.001
Race/Ethnicity (%)							
Non-Hispanic White	76.50	.01	81.96	.01	82.93	.00	<0.001
Hispanic	5.72	.00	4.49	.00	4.44	.00	<0.001
Non-Hispanic Black	13.79	.00	8.27	.00	7.94	.00	<0.001
Non-Hispanic Other	3.98	.00	5.29	.00	4.69	.00	0.002
Highest household educational attainment (%)							
High school or less	31.08	.01	31.52	.01	15.36	.00	<0.001
Some college	38.80	.01	34.08	.01	27.68	.00	<0.001
College graduate	24.83	.01	26.66	.01	36.99	.00	<0.001
Post-college graduate	5.28	.00	7.73	.00	19.97	.00	<0.001
Household Income as % FPL							
Income 130% FPL	56.4	.01	1.00		0.00		<0.001
Income 131%–185% FPL	18.37	.00	0.00		9.60	.00	<0.001
Income > 185% FPL	25.49	.01	0.00		90.40	.00	<0.001
Recorded purchases at retailer type (%)							
Grocery store	95.41	.00	95.02	.00	96.85	.00	<0.001

Household characteristics	Current SNAP Participant		Income Eligible Nonparticipant		Higher-Income Nonparticipant		p-value ^a
	Mean	SE	Mean	SE	Mean	SE	
Convenience store	21.00	.00	14.42	.00	11.89	.00	<0.001
Big Box store	81.81	.00	83.97	.00	86.2	.00	<0.001
Other	79.02	.00	78.68	.00	76.80	.00	<0.001
Number of shopping trips per quarter							
Grocery store	9.81	.09	9.94	.09	10.77	.03	<0.001
Convenience store	0.65	.02	0.47	.02	0.34	.01	<0.001
Big Box store	4.87	.06	5.29	.06	5.69	.02	<0.001
Other	4.72	.07	4.73	.07	4.16	.02	<0.001

Note: SNAP, Supplemental Nutrition Assistance program.

^aP-value from Wald test for comparisons across group.

Source: Authors' own analyses and calculations based in part on data reported by Nielsen through its Homescan Service for the 52-week periods ending on December 31, 2010 through December 31, 2014. Nielsen data were licensed from The Nielsen Company, 2017.

Table 2
Per capita mean food and beverage purchases across store types by SNAP status and income.

Volume and nutrient of purchases	Grocery	Convenience	Big Box Stores	Other
<i>Volume (g/capita/day)</i>				
SNAP participant	885.1 (8.8)	11.0 (1.9)	502.0 (7.4)	155.8 (4.0)
Income-Eligible SNAP nonparticipant	770.7 (8.5) ^b	8.0 (0.7)	437.9 (6.7) ^b	139.6 (3.4) ^b
Higher-Income SNAP nonparticipant	785.8 (2.4) ^b	7.9 (0.2)	414.2 (1.7) ^{b d}	134.7 (1.0) ^b
<i>Energy (kcal/capita/day)</i>				
SNAP participant	894.0 (8.5)	7.1 (0.8)	495.1 (6.7)	133.5 (3.3)
Income-Eligible SNAP nonparticipant	793.3 (7.6) ^b	4.9 (0.4) ^a	435.9 (6.2) ^b	125.5 (2.9)
Higher-Income SNAP nonparticipant	815.8 (2.2) ^{b d}	5.0 (0.1) ^a	424.8 (1.6) ^b	119.9 (0.8) ^b
<i>Sugar (g/capita/day)</i>				
SNAP participant	58.3 (0.8)	0.5 (0.1)	33.7 (0.6)	10.1 (0.3)
Income-Eligible SNAP nonparticipant	49.6 (0.6) ^b	0.3 (0.0) ^a	29.0 (0.5) ^b	8.8 (0.2) ^b
Higher-Income SNAP nonparticipant	51.3 (0.2) ^{b d}	0.4 (0.0)	27.5 (0.1) ^{b d}	8.5 (0.1) ^b
<i>Saturated fat (g/capita/day)</i>				
SNAP participant	17.1 (0.8)	0.1 (0.0)	7.2 (0.2)	1.6 (0.1)
Income-Eligible SNAP nonparticipant	13.3 (0.6) ^b	0.1 (0.0)	6.2 (0.1) ^b	1.5 (0.1)
Higher-Income SNAP nonparticipant	14.6 (0.2) ^{b c}	0.1 (0.0)	6.2 (0.0) ^b	1.5 (0.0)
<i>Sodium (mg/capita/day)</i>				
SNAP participant	1593.7 (19.0)	6.6 (0.8)	834.3 (18.9)	200.5 (7.0)
Income-Eligible SNAP nonparticipant	1354.7 (16.7) ^b	5.8 (0.8)	710.0 (13.1) ^b	199.7 (8.5)
Higher-Income SNAP nonparticipant	1391.8 (4.9) ^{b c}	5.1 (0.2)	688.9 (3.4) ^b	178.8 (1.8) ^b

Note. SNAP, Supplemental Nutrition Assistance Program. Adjusted means based on regressions of per capita per day values for volume or nutrient density of purchases on SNAP-income status controlling for household composition (household size, number of children, and household structure [married vs. not]); education (indicators for maximum educational attainment in the household [high school, some college, college graduate, post-college]), race/ethnicity (indicators for head of household is non-Hispanic white, Hispanic, non-Hispanic Black, and non-Hispanic other race/ethnicity); income (Federal Poverty Level index); age of the household head; geographic location; year, and quarter. Standard errors account for clustering at the household level. P-values are Bonferroni-adjusted for multiple comparisons.

^a p<.05 comparison of income-eligible or higher-income nonparticipant households to SNAP participant households;

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^b $p < .01$ comparison of income-eligible or higher-income nonparticipant households to SNAP participant households;

^c $p < .05$ comparison of higher-income SNAP nonparticipant households to income-eligible SNAP nonparticipant households;

^d $p < .01$ comparison of higher-income SNAP nonparticipant households to income-eligible SNAP nonparticipant households.

Source: Authors' own analyses and calculations based in part on data reported by Nielsen through its Homescan Service for the 52-week periods ending on December 31, 2010 through December 31, 2014. Nielsen data were licensed from The Nielsen Company, 2017.

Table 3

Mean calories by food and beverage groups across store types by SNAP status and income.

Food Groups and SNAP/Income status	Grocery	Convenience	Big Box Stores	Other
Foods (kcal/capita/day)				
<i>Total food</i>				
SNAP participant	808.4 (7.9)	24.4 (2.1)	517.6 (7.3)	133.7 (3.7)
Income-Eligible SNAP nonparticipant	719.3 (7.1) ^b	20.5 (2.2)	452.9 (6.6) ^b	127.9 (3.4)
Higher-Income SNAP nonparticipant	741.1 (2.0) ^{bd}	20.6 (0.7)	443.4 (1.7) ^b	122.4 (0.9) ^a
<i>Fruit</i>				
SNAP participant	14.4 (0.3)	0.2 (0.0)	11.7 (0.3)	2.1 (0.1)
Income-Eligible SNAP nonparticipant	14.8 (0.4)	0.2 (0.1)	12.4 (0.4)	2.4 (0.2)
Higher-Income SNAP nonparticipant	15.7 (0.1) ^{bc}	0.2 (0.0)	11.4 (0.1) ^d	2.2 (0.0)
<i>Non-starchy vegetables</i>				
SNAP participant	13.0 (0.2)	0.2 (0.0)	6.7 (0.2)	1.4 (0.1)
Income-Eligible SNAP nonparticipant	12.8 (0.2)	0.1 (0.0)	6.6 (0.2)	1.4 (0.1)
Higher-Income SNAP nonparticipant	13.2 (0.1)	0.1 (0.0)	6.3 (0.1) ^a	1.2 (0.0)
<i>Starchy vegetables</i>				
SNAP participant	24.0 (0.4)	0.2 (0.1)	10.4 (0.3)	2.0 (0.1)
Income-Eligible SNAP nonparticipant	19.9 (0.4) ^b	0.3 (0.1)	8.9 (0.3) ^b	1.8 (0.2)
Higher-Income SNAP nonparticipant	20.9 (0.1) ^{bd}	0.2 (0.0)	8.2 (0.1) ^{bc}	1.6 (0.0)
<i>Nuts, legumes, cheese, and other dairy</i>				
SNAP participant	71.7 (1.0)	1.0 (0.4)	45.1 (0.9)	6.7 (0.3)
Income-Eligible SNAP nonparticipant	69.5 (1.0)	0.7 (0.2)	42.8 (0.9) ^b	7.3 (0.4)
Higher-Income SNAP nonparticipant	71.7 (0.3) ^c	0.6 (0.1)	43.4 (0.3) ^b	6.8 (0.1)
<i>Processed meat</i>				
SNAP participant	32.9 (0.6)	0.5 (0.1)	18.9 (0.5)	3.4 (0.2)
Income-Eligible SNAP nonparticipant	26.1 (0.5) ^b	0.4 (0.1)	15.0 (0.5) ^b	3.1 (0.2)
Higher-Income SNAP nonparticipant	27.0 (0.1) ^b	0.3 (0.0) ^a	14.4 (0.1) ^b	2.8 (0.1) ^b

Food Groups and SNAP/income status	Grocery	Convenience	Big Box Stores	Other
<i>Desserts and sweet snacks</i>				
SNAP participant	93.2 (1.5)	3.6 (0.4)	49.6 (1.1)	16.5 (0.6)
Income-Eligible SNAP nonparticipant	82.7 (1.4) ^b	3.5 (0.5)	41.1 (1.0) ^b	14.9 (0.5)
Higher-Income SNAP nonparticipant	89.4 (0.4) ^{ad}	3.5 (0.2)	42.0 (0.3) ^b	14.5 (0.2) ^b
<i>Salty snacks</i>				
SNAP participant	74.9 (1.2)	4.3 (0.4)	58.2 (1.0)	18.7 (0.6)
Income-Eligible SNAP nonparticipant	73.4 (1.2)	5.2 (0.7)	56.9 (1.0)	20.1 (0.7)
Higher-Income SNAP nonparticipant	76.4 (0.3) ^d	4.0 (0.2)	56.3 (0.3)	19.9 (0.2)
<i>Sweeteners and toppings</i>				
SNAP participant	51.5 (1.2)	1.2 (0.3)	33.6 (1.2)	6.1 (0.4)
Income-Eligible SNAP nonparticipant	41.0 (1.1) ^b	1.1 (0.4)	25.1 (1.0) ^b	4.8 (0.3) ^b
Higher-Income SNAP nonparticipant	41.0 (0.3) ^b	0.5 (0.1)	23.9 (0.3) ^b	4.7 (0.1) ^b
<i>Candy and gum</i>				
SNAP participant	28.7 (0.6)	3.0 (0.5)	43.2 (0.9)	27.4 (1.2)
Income-Eligible SNAP nonparticipant	27.7 (0.7)	1.7 (0.7)	44.3 (1.6)	25.4 (0.8)
Higher-Income SNAP nonparticipant	29.2 (0.2) ^c	3.3 (0.5)	41.5 (0.3)	26.4 (0.2)
<i>Junk food</i>				
SNAP participant	248.3 (3.0)	11.9 (0.9)	184.6 (2.8)	68.7 (1.7)
Income-Eligible SNAP nonparticipant	224.8 (2.9) ^b	11.5 (1.3)	167.4 (2.9) ^b	65.1 (1.5)
Higher-Income SNAP nonparticipant	236.1 (0.8) ^{bd}	11.3 (0.6)	163.7 (0.7) ^b	65.5 (0.4)
Beverages (kcal/capita/day)				
<i>Total beverages</i>				
SNAP participant	119.7 (1.9)	25.4 (3.3)	66.0 (1.5)	40.3 (1.4)
Income-Eligible SNAP nonparticipant	102.0 (1.8) ^b	18.2 (2.0)	56.4 (1.4) ^b	35.9 (1.3) ^a
Higher-Income SNAP nonparticipant	102.9 (0.5) ^b	19.0 (0.6)	52.3 (0.4) ^{bd}	33.0 (0.4) ^{bc}
<i>Sugar-sweetened beverages</i>				
SNAP participant	37.7 (1.1)	5.4 (0.9)	23.9 (1.0)	10.2 (0.6)

Food Groups and SNAP/income status	Grocery	Convenience	Big Box Stores	Other
Income-Eligible SNAP nonparticipant	26.0 (0.9) ^b	2.9 (0.5) ^a	17.0 (0.8) ^b	8.1 (0.5) ^a
Higher-Income SNAP nonparticipant	26.8 (0.2) ^b	3.8 (0.2)	14.2 (0.2) ^{bd}	6.7 (0.1) ^{bd}
<i>Alcohol</i>				
SNAP participant	14.7 (0.8)	12.7 (3.3)	7.9 (0.6)	19.9 (1.2)
Income-Eligible SNAP nonparticipant	15.2 (1.0)	7.4 (1.7)	8.2 (0.1.6)	19.1 (1.2)
Higher-Income SNAP nonparticipant	14.8 (0.3)	5.8 (0.4) ^b	7.8 (0.2)	18.0 (0.4)
<i>Milk</i>				
SNAP participant	44.7 (0.8)	6.1 (0.6)	20.5 (0.6)	6.2 (0.3)
Income-Eligible SNAP nonparticipant	40.6 (0.9) ^b	7.0 (0.9)	17.8 (0.6) ^b	5.2 (0.4)
Higher-Income SNAP nonparticipant	41.3 (0.2) ^b	8.4 (0.3)	17.7 (0.2) ^b	4.9 (0.1) ^b
<i>100% juice</i>				
SNAP participant	10.8 (0.3)	0.4 (0.1)	5.6 (0.2)	1.2 (0.1)
Income-Eligible SNAP nonparticipant	10.6 (0.3)	0.3 (0.1)	5.6 (0.2)	1.2 (0.1)
Higher-Income SNAP nonparticipant	10.8 (0.1)	0.3 (0.0)	5.5 (0.1)	1.1 (0.0)

Note. SNAP, Supplemental Nutrition Assistance Program. Analyses included household-quarter observations among consumers within each store type. Adjusted means based on regressions of calories per capita per day on SNAP-income status controlling for household composition (household size, number of children, and household structure [married vs. not]); education (indicators for maximum educational attainment in the household [high school, some college, college graduate, post-college]), race/ethnicity (indicators for head of household is non-Hispanic white, Hispanic, non-Hispanic Black, and non-Hispanic other race/ethnicity); income (Federal Poverty Level index); age of the household head; geographic location; year, and quarter. Standard errors account for clustering at the household level. P-values are Bonferroni-adjusted for multiple comparisons.

^a p<.05 comparison of income-eligible or higher-income nonparticipant households to SNAP participant households;

^b p<.01 comparison of income-eligible or higher-income nonparticipant households to SNAP participant households;

^c p<.05 comparison of higher-income SNAP nonparticipant households to income-eligible SNAP nonparticipant households;

^d p<.01 comparison of higher-income SNAP nonparticipant households to income-eligible SNAP nonparticipant households.

Source: Authors' own analyses and calculations based in part on data reported by Nielsen through its Homescan Service for the 52-week periods ending on December 31, 2010 through December 31, 2014. Nielsen data were licensed from The Nielsen Company, 2017.

Table 4

Adjusted means (SE) for nutrient density of food and beverage purchases by store type among current SNAP participant households, income-eligible SNAP non-participant households, and higher income SNAP non-participant households, Nielsen Homescan Panel 2010–2014.

Nutrient Density	Grocery	Convenience	Big Box Stores	Other
Food Purchases				
<i>Energy density (kcal/100g)</i>				
SNAP participant	254.8 (0.6)	379.7 (3.3)	289.7 (0.9)	353.2 (1.2)
Income-Eligible SNAP non-participant	252.2 (0.7) ^b	381.0 (4.6)	289.7 (1.0)	352.6 (1.3)
Higher-Income SNAP non-participant	251.7 (0.2) ^b	378.8 (1.4)	291.7 (0.3) ^c	354.7 (0.4)
<i>Sugar density (g/100g)</i>				
SNAP participant	11.8 (0.1)	22.0 (0.5)	16.6 (0.1)	28.1 (0.2)
Income-Eligible SNAP non-participant	11.5 (0.1) ^b	20.7 (0.6)	16.5 (0.2)	27.9 (0.2)
Higher-Income SNAP non-participant	11.5 (0.0) ^b	21.4 (0.2)	16.8 (0.0)	28.4 (0.1) ^c
<i>Saturated fat density (g/100g)</i>				
SNAP participant	4.9 (0.2)	7.3 (0.3)	4.9 (0.1)	5.9 (0.1)
Income-Eligible SNAP non-participant	4.6 (0.2)	6.8 (0.2)	4.7 (0.1)	5.8 (0.1)
Higher-Income SNAP non-participant	5.0 (0.1)	6.9 (0.1)	5.0 (0.1)	5.9 (0.1)
<i>Sodium density (mg/100g)</i>				
SNAP participant	653.4 (5.5)	503.4 (22.4)	657.0 (10.3)	656.6 (16.2)
Income-Eligible SNAP non-participant	600.3 (5.5) ^b	531.7 (42.4)	620.1 (9.5) ^b	639.9 (18.2)
Higher-Income SNAP non-participant	604.8 (1.4) ^b	531.6 (15.4)	604.1 (2.6) ^b	613.5 (4.5) ^a
Beverage Purchases				
<i>Energy density (kcal/100g)</i>				
SNAP participant	47.2 (0.4)	37.2 (0.7)	48.7 (0.6)	59.2 (0.8)
Income-Eligible SNAP non-participant	47.0 (0.4)	36.9 (1.0)	50.7 (0.8)	60.5 (1.0)
Higher-Income SNAP non-participant	46.5 (0.1)	37.7 (0.3)	49.6 (0.2)	61.2 (0.3) ^a
<i>Sugar density (g/100g)</i>				
SNAP participant	6.9 (0.1)	5.8 (0.1)	6.8 (0.1)	5.5 (0.1)

Nutrient Density	Grocery	Convenience	Big Box Stores	Other
Income-Eligible SNAP non-participant	6.6 (0.1) ^b	5.6 (0.2)	6.9 (0.1)	5.4 (0.1)
Higher-Income SNAP non-participant	6.6 (0.0) ^b	5.8 (0.1)	6.8 (0.0)	5.3 (0.0) ^a
<i>Saturated fat density (g/100g)</i>				
SNAP participant	0.5 (0.0)	0.3 (0.0)	0.4 (0.0)	0.3 (0.0)
Income-Eligible SNAP non-participant	0.5 (0.0)	0.3 (0.0)	0.5 (0.0)	0.3 (0.0)
Higher-Income SNAP non-participant	0.4 (0.0)	0.3 (0.0)	0.5 (0.0)	0.3 (0.0)
<i>Sodium density (mg/100g)</i>				
SNAP participant	40.9 (0.6)	28.6 (0.9)	44.1 (1.1)	37.5 (1.1)
Income-Eligible SNAP non-participant	42.0 (0.7)	29.9 (1.0)	47.0 (1.2)	41.0 (1.4)
Higher-Income SNAP non-participant	42.2 (0.2)	31.8 (0.4) ^b	46.2 (0.3)	43.3 (0.5) ^b

Note. SNAP, Supplemental Nutrition Assistance Program. Analyses included household-quarter observations among consumers within each store type. Adjusted means based on regressions of nutrient density of purchases on SNAP-income status controlling for household composition (household size, number of children, and household structure [married vs. not]); education (indicators for maximum educational attainment in the household [high school, some college, college graduate, post-college]), race/ethnicity (indicators for head of household is non-Hispanic white, Hispanic, non-Hispanic Black, and non-Hispanic other race/ethnicity); income (Federal Poverty Level index); age of the household head; geographic location; year, and quarter. Standard errors account for clustering at the household level. P-values are Bonferroni-adjusted for multiple comparisons.

^a p<.05 comparison of income-eligible or higher-income nonparticipant households to SNAP participant households;

^b p<.01 comparison of income-eligible or higher-income nonparticipant households to SNAP participant households;

^c p<.05 comparison of higher-income SNAP nonparticipant households to income-eligible SNAP nonparticipant households;

^d p<.01 comparison of higher-income SNAP nonparticipant households to income-eligible SNAP nonparticipant households.

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