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Purchasing patterns in low-income neighborhoods: Implications for studying sugar-sweetened beverage taxes

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Abstract

Objective. The present study aimed to determine the store types from which people in low-income neighborhoods purchase most sugar-sweetened beverages (SSBs) and to identify associations between purchasing location and demographic characteristics.
Design. Street intercept surveys of passers-by near high foot-traffic intersections in 2016. Participants completed a beverage frequency questionnaire and identified the type of store (e.g., corner store, chain grocery) from which they purchased most SSBs.
Setting. Eight low-income neighborhoods in four Bay Area cities
Subjects. Sample of 1,132 participants who reported consuming SSBs, aged 18-88 years, who identified as African-American (41%), Latino (29%), White (17%) and Asian (6%).
Results. Based on surveys in low-income neighborhoods, corner stores were the primary source from which most SSBs were purchased (28%), followed by discount (18%) and chain groceries (16%). In fully adjusted models, those with lower education were more likely to purchase from corner stores or discount groceries than all other store types. Compared to white participants, African-Americans purchased more frequently from corner stores, discount groceries and chain groceries while Latinos purchased more frequently from discount groceries.
Conclusions. The wide range of store types from which SSBs were purchased and demographic differences in purchasing patterns suggest that broader methodological approaches are needed to adequately capture the impact of SSB taxes and other interventions aimed at reducing SSB consumption, particularly in low-income neighborhoods.

Keywords (at least 4 keywords that contain up to 3 words): Soda Tax, Sugar-Sweetened Beverage, Purchasing Patterns, Low-income neighborhoods

Introduction

Cardiovascular morbidity and mortality have increasingly been linked to added sugars in our diets.[1-3] In the American diet, sugar-sweetened beverages (SSBs) are the primary source of added sugars.[4, 5] Low-income communities have the highest consumption of SSBs and are at greatest risk for related cardiovascular sequelae,[6, 7] contributing to health inequities.

Many jurisdictions are enacting various public health interventions to reduce SSB consumption, including SSB taxes. Early evidence demonstrates the effectiveness of SSB taxes in the U.S.[8-10] However, discrepancies exist in the magnitude of effect sizes reported in studies to date, which likely reflect disparate approaches to assessing SSB consumption. For example, in the first year of an SSB tax in Berkeley, CA, a study using a beverage frequency questionnaire found a reduction of 21% in SSB consumption (times/day)[8]; while a study using retail scanner data from grocery chains found a 9.6% decline in SSB purchases (oz/transaction).[9] Self-report data are prone to social desirability bias and recall bias. However, sources of more objective data, such as retail scanner data or data based on home scanners, may also have important limitations when assessing the impact of SSB taxes. For example, retail scanner data are unavailable from smaller and non-chain stores, many of which are located in low-income communities, an important venue in which to study the impact of SSB taxes. Additionally, the products most frequently missing from homescan data are small consumables, like beverages and snacks.[11] If SSB purchasing patterns vary by community, relying on a single source of data may incompletely and inaccurately represent tax effects.

Unfortunately, very little is known about where people typically purchase SSBs. Two studies drawing on NHANES data have shown that the source of SSBs is more likely to be stores than restaurants.[12, 13] However, it is unclear which type of stores account for the bulk of SSB purchasing; NHANES data suggest more kcals from SSBs come from grocery stores than other store types (including convenience stores),[12] while a study done among an exclusively low-income, African-American population found that participants who primarily shopped at corner stores purchased far more SSBs than those who typically patronized grocery stores.[14]

Given disproportionate advertising of SSBs and other unhealthy products in low-income neighborhoods[15-18] and associated higher prevalence of SSB consumption,[19] the impact of taxes in low-income communities is of particular interest. Additional data are needed on sources of SSB purchases in low-income neighborhoods. We sought to determine the store types from which people in low-income, urban communities purchase most of their SSBs, and whether or not purchasing location was associated with demographic characteristics, including frequency of SSB consumption.

Methods

This cross-sectional study used data from street-intercept surveys administered in 2016 in the urban California cities of Berkeley, San Francisco, Oakland, and Richmond. Compared to the U.S. as a whole, the cities had higher median household incomes in 2016 (average of $68,245 versus $55,322), but the sample neighborhoods had lower incomes (average of $48,880) and twice the percent of people below the federal poverty level (22% versus 11%). Details on the initial selection of neighborhoods have been published previously.[8] In short, the two neighborhoods in San Francisco and Berkeley with the highest proportion of Latino and African-American residents were identified using 2010 census data, and neighborhoods in Oakland were selected to closely match those characteristics. Subsequently, 2014 census tract data[20] were used to identify two neighborhoods in Richmond, CA that best matched the sample from the first 3 cities.

Researchers stationed at intersections with the heaviest foot traffic in each of the selected neighborhoods asked passers-by if they would be willing to participate in a brief survey, for which they would receive a reusable grocery bag. The survey included a modified beverage frequency questionnaire (frequency and typical size of various beverages consumed) and the question, “In the last month, from what store did you buy the most sugary drinks like soda, punch, lemonade, energy and sports drinks?” Researchers asked for the store name and the type of the store, with the following options (names in parentheses were given to participants as examples): drugstore, chain grocery, discount grocery (like FoodMaxx or Grocery Outlet), specialty store (like Whole Foods or Trader Joe’s), gas station or convenience store, liquor store,

corner store/small grocery, box store (like Walmart or Costco), or other store type. Surveys also assessed age, race/ethnicity, gender, and educational attainment.

Among 1,604 participants completing surveys, 229 (14%) reported drinking no SSBs and were excluded from analyses. Participants who did not provide store type and for whom store name was missing (n=184; 11%) or not recognized (n=8), participants purchasing from stores categorized as "other" (n=37; 2%), and those missing demographic data (n=14) were also excluded from analyses. Those dropped from analyses were more educated (47% college grads vs. 28%), more likely to be white (26% vs. 17%), more likely to come from Berkeley (26% vs. 19%), and to consume SSBs less frequently (1.2 times/day vs. 1.9 times per day), than those remaining. When store type was missing but the store name was recognizable (n=44), stores were classified based on the research team's knowledge of local stores, with verification via the internet as needed. Similarly, if some participants classified a given store differently from the majority of other participants, researchers reclassified those stores (n=141). Drugstores, chain convenience stores and gas stations were classified as such, and fast-food establishments, delis and coffee shops were classified as restaurants. Researchers classified stores with a single register as corner stores (or liquor stores if "liquor," "smoke" or "cigarette" was in the store name). Stores with more than one register were classified based on store advertising and customer perceptions: 85% of participants identified two local chains as discount grocery chains, both of which are known for offering "grocery savings" – all mentions of these stores were classified as "Discount Grocery"; 90% classified two local chains as "Chain Grocery" – other mentions were similarly reclassified; other grocery stores were classified as "Other Grocery." Store types were further broken down to isolate those with data available directly from 2 major retail scanner data suppliers (based on 2018 release notes): chain groceries, discount groceries, drugstores, convenience stores (only some gas stations are available). The box store most often mentioned by participants was not available in retail scanner data, but other box stores were. The "Dollar" category includes dollar and 99-cent stores (none of which were available in retail scanner data), as well as stores selling discount, overstocked and closeout products.

We used multinomial logistic regression to identify characteristics associated with the type of store from which participants purchased most sugary beverages, expressing the odds ratios as

relative risks. For parsimony, Dollar stores were combined with drugstores, and corner stores were combined with liquor stores in regression models, based on preliminary analyses showing no meaningful differences between these stores types. Because the presence of stores varied by neighborhood, all models adjusted for neighborhood (n=8). Participants who had not completed high school made up the smallest category for education; therefore, college educated was the reference group for more robust comparisons. We varied the reference group in the model (using the "base" option in Stata) for analyses involving race. Fully adjusted models included education, race, age, and sex. All analyses were performed in Stata SE, version 15.1.

Results

Respondents (n=1,132) were diverse, with 41% identifying as African American, 29% as Latino, 17% as White, and 6% as Asian (8% declined to respond or stated another race/ethnicity). Age ranged from 18 to 88 years, with a mean age of 42. As shown in Table 1, 13% of respondents had less than a high school education and 30% had completed high school but no college (2% declined to give their education level).

Median frequency of SSB consumption was 0.9 times per day and was highly right-skewed (mean 1.9, SD 3.1). Figure 1 shows the distribution of stores from which participants most frequently purchased SSBs. Corner stores were reported as the primary location from which most SSBs were purchased (28% of respondents), followed by discount grocery stores (18%) and grocery chains (16%). Across all store types, the single store mentioned most frequently (n=152) was a chain grocery store (13% of respondents), followed by a discount grocery chain (n=150); all other unique stores or chains were mentioned by less than 5% of participants. Overall, 42% of participants purchased SSBs most frequently from stores available in large retail scanner data sets (discount and chain groceries, drugstores, and available box stores), with an additional 8% purchasing from stores that may be available in retail scanner data (convenience stores [4.3%] and gas stations [3.3%]).

Table 2 reports relative risk ratios (RRRs) for purchasing SSBs from different store types, adjusted for education, race, age, sex, SSB consumption and the neighborhood in which

interviews took place. RRRs are interpreted in terms of the reference store type and the reference category for the characteristic of interest. For example, when corner store is the reference store type, the RRR of 0.4 for category 1 of education (<High school) under "Chain Grocery" signifies that compared to respondents who had completed college (reference group), those with less than a high school education were 40% as likely to purchase from a chain grocery as a corner store; conversely, this could be stated as those having a college education being 2.5 times *more likely* to purchase from chain groceries than corner stores compared to those not completing high school. Groups with lower levels of education were also more likely to purchase from corner stores than other groceries or box stores, and more likely to purchase from discount groceries than all other store types. Compared to white respondents, African-American were less likely to purchase from other grocery stores, convenience stores and restaurants than from corner, discount or chain grocery stores. Latinos were more likely than whites to purchase from discount groceries than all other store types except box stores.

In separate models with Latinos as the reference groups (data not shown in Table 2), African Americans were more likely than Latinos to purchase at corner stores than at discount groceries (RRR 2.1, p=.003), dollar/drug stores (RRR 2.1, p=.020), box stores (RRR 3.5, p<.001), or other grocery stores (RRR 2.6, p=014), and more likely to purchase at chain groceries than discount groceries (RRR 1.8, p=.043) or box stores (RRR 2.9, p=.002). Age and sex were also significantly associated with purchasing patterns, with women and older age groups being less likely to shop at corner stores and convenience stores than men and those in the youngest age group.

The only association noted for SSB consumption was that more frequent consumers of SSBs were less likely to purchase from restaurants than discount groceries (RRR 0.8). In sensitivity analyses that excluded outliers for SSB consumption (5.6% of respondents with SSB consumption above median plus three times IQR, or 6.49 times per day), with each additional daily serving of SSBs, participants were less likely to purchase from restaurants than all stores except box and other grocery stores (RRRs for restaurant versus: corner store 0.5, p=.001; discount grocery 0.6, p=.001; chain grocery chain 0.6, p=.006; dollar/drug store 0.6, p=.012; convenience store 0.6, p=.021).

Discussion

This study is the first to examine the locations from which a diverse and low-income urban population purchases most SSBs. We found that 41% of participants purchased most of their SSBs from grocery stores (including discount, large chain, and other grocery stores), and 28% purchased from corner stores, with significant differences in purchasing location based on participant demographics. Notably, half of stores from which participants purchased most SSBs would not be available in retail scanner data.

The large proportion of SSBs being purchased from grocery stores in the present study (41%) is not dissimilar to findings based on NHANES 24-hour dietary recall data,[12] where 52% of SSB calories came from supermarkets or grocery stores. While corner stores were the main source of SSBs for 28% of participants in the present study, NHANES data, which do not include a category for corner stores, do not provide information on corner store purchases. Studies with more expansive response options, including homescan data, have found that low-income shoppers are more likely to purchase SSBs from stores other than supermarkets,[21, 22] particularly corner stores.[14] Elucidating the source of SSB purchases from a greater variety of store types, particularly for urban areas where corner stores are ubiquitous, will provide greater clarity around actual SSB purchasing patterns.

In the present study, compared to those with a college education, participants who had not graduated high school were more than twice as likely to purchase most SSBs at corner stores than at grocery chains or other grocery or box stores, and more likely to purchase SSBs at discount grocery stores than at all other store types except corner stores. Prior research has also demonstrated differences by socioeconomic status (SES) in the types of stores patronized,[23-25] which may reflect proximity to store types in different neighborhoods, as well as perceptions of the affordability of various stores.[14, 24] While we adjusted for neighborhood in all models (controlling for the presence of store type to some extent), proximity to stores has been demonstrated repeatedly to be a driver of store choice,[21, 23, 26] particularly among those who do not own cars.[14, 27-29]

Compared to white participants, African-American and Latino participants were less likely to purchase most SSBs at restaurants, similar to findings of Drewnowski and Rehm.[30] However, the overall prevalence of purchasing most SSBs from restaurants in the present study (6%) was low relative to NHANES-based studies, which found that 17-24% of SSB calories in adults' diets came from restaurants.[12, 30] This likely reflects differences in population samples, as both NHANES samples, which are nationally representative, were >60% non-Hispanic white; whites made up only 17% of participants in the present study. In our sensitivity analyses, those who purchased most SSBs from restaurants had the lowest consumption of SSBs, likely capturing the habits of people who only consume soda when they go out, as opposed to those for whom SSB consumption is part of their daily routine.

Our study's primary implications relate to methods used when studying the impact of SSB taxes or other community interventions to reduce consumption of unhealthy foods and beverages. While our question for assessing the source of most SSBs would be improved with greater clarity (as asked, responses could be based on the store individuals patronized most frequently or the store from which they purchased the greatest quantity of SSBs), we found that only 50% of the stores that participants named were available in large retail scanner datasets. Although retail scanner data are an important and objective source for tracking SSB purchasing, relying exclusively on retail scanner data may inaccurately represent consumption, particularly in low-income neighborhoods. As discussed above, this study and others find that where individuals shop varies by socioeconomic status.[23-25] If the source of most SSB purchasing for a given demographic group is not available in retail scanner data, we could miss differential effects of an intervention targeting SSB purchasing. Scanner data from corner, other grocery, and non-chain dollar-type stores is unlikely to become available in the near future, given the complexity of contracting with a large number of small stores (vs. existing contracts with large store chains), and the fact that many small "mom & pop" stores in low-income neighborhoods do not use electronic point-of-sale tracking.[31, 32]

Two additional sources of purchasing data, the USDA's National Household Food Acquisition and Purchase Survey (FoodAPS)[33] and the Nielsen's National Consumer Panel,[34] provide

households with a scanner and ask that participants record shopping trips they make and scan the barcodes of all products purchased. These datasets, which provide participant demographics, represent a combination of objective data (scanned products are identified via UPC) and self-report data (consumers must scan or record all items purchased). Our findings contrast with those of Gustafson et al,[21] who documented that low-income (SNAP) households in the FoodAPS dataset were no more likely to purchase SSBs from convenience stores than from box stores or grocery stores. While the FoodAPS' methodology aims to capture all food and beverage purchases (unlike the single question posed in the current study), error and bias can occur in the FoodAPS and Nielsen datasets as well. In a validation study of Nielsen's homescan data, over half (53%) of shopping trips were not recorded by participants, with smaller trips being missed more frequently; thus, a run to a store for beverages or snacks could be under-recorded. Furthermore, among recorded shopping trips, consumables like beverages and snacks were least likely to be scanned.[11] To the extent that SSB (or other product) purchases go unrecorded, homescan data could be underpowered to detect significant changes in consumption. These limitations underscore the difficulty of accurately determining purchasing patterns and highlight the need to incorporate multiple sources of data, particularly when studying consumption of SSBs and other potentially unhealthy snack foods.

Studies to date suggest that concerns for under-representing SSB purchases are most important in urban and low-income areas, where corner stores are ubiquitous and frequently the most accessible, or in low-income areas where discount grocery stores not available in retail scanner data may be patronized frequently. Purchasing patterns among higher-income populations are likely well represented in chain grocery store purchases. Homescan has the advantage of including individual demographics, and FoodAPS specifically includes the availability of food stores within a mile of each household, as well as distance traveled for foods purchased from more distant locations.

Methodological approaches to improve the generalizability and validity of SSB-consumption research include supplementing retail and household scanner data with combinations of self-reported beverage frequency or 24-hour recalls, receipt collection or observations of purchases at small stores, and supporting small stores in adopting electronic POS systems and partnering with

them to examine changes in purchase data. Combined methodologies when evaluating efforts to curb SSB consumption will likely be important not just in the U.S., but internationally as well. Studies in Mexico and France have both relied on homescan data,[35, 36] and while differential effects of Mexico's SSB tax were seen by income,[35] the magnitude of consumption change within strata may vary based on assessment approach.

It is important to interpret study findings of SSB taxes in light of the stores currently represented in retail scanner data. Given the expense of purchasing retail scanner datasets (even for a single jurisdiction), some early studies have relied on scanner data from a few stores or chains. In the present study, no single chain of stores represented more than 14% of all purchases, and combining the three most frequently cited chains accounted for only 32% of participants. While a recent study of the impact of Berkeley's SSB tax reported minimal changes in SSB purchasing,[37] that study relied on data from drugstores and a single supermarket chain. Among the urban population in the present study, all drugstores combined were the source of less than 5% of most SSB purchases and the largest grocery chain was the source of only 13% of purchases. Thus, results from a sample of drugstores and a single grocery chain are unlikely to be representative of the impacts of the SSB tax, and certainly not representative of effects in low-income neighborhoods.

Frequency of SSB consumption was not associated with purchase location in the present study. However, given the ambiguity of the question, "In the last month, from what store did you buy the most sugary drinks?", participants may have responded based on their daily routine, despite purchasing soda in bulk (infrequently but in larger quantities) from box stores. Research that investigates the volume purchased across a broad set of store types would guide future work on the impact of efforts to reduce consumption.

In addition to limitations mentioned above about our method of assessing the source of most SSBs, asking for the top 3 stores would provide greater information on purchasing patterns. Our street intercept surveys constitute a convenience sample, which may not be representative of purchasing patterns among all residents in low-income neighborhoods. Our study relied entirely on self-reported data, which is prone to multiple biases that could affect our estimates of purchase locations; however, a recent study suggests self-reported food expenditures are highly

correlated with objective purchasing data.[38] We could not classify store type for 15% of participants who, compared to remaining participants, were more educated, more likely to be white, and consumed SSBs less frequently; thus, our estimates likely under-represent purchasing patterns of this group. Findings from this study in the San Francisco Bay Area may not generalize to other low-income urban areas; while wide economic disparities exist within cities in the Bay Area, the overall level of education in our sample from low-income neighborhoods was similar to the country as a whole (data not shown).

We found that a diverse population in low-income neighborhoods purchased most SSBs from corner stores and discount grocery stores, followed closely by chain grocery stores. Our results suggest that purchasing patterns vary by education, race, sex, and age, and that retail scanner data likely present an incomplete picture of the impact of SSB taxes in urban and low-income populations. Future studies of SSB taxes and other public health approaches to improving dietary habits will need to expand their data sources to capture the full range of responses to such interventions.

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Table 1: Participant characteristics

	Total N=1132
Education, n(%)	
Less than high school	144 (13)
Completed high school/GED	339 (30)
Some college	318 (28)
College graduate	309 (27)
Declined to state	22 (2)
Race, n (%)	
African-American	467 (41)
Latino	329 (29)
White	188 (17)
Asian	60 (6)
Other/Declined	88 (8)
Age in years, mean (sd)	42 (16)
Female, n (%)	551 (49)
SSB consumption times/day, median (IQR)	0.9 (0.3, 2.2)
Store type where most SSBs purchased, n (%)	
Corner Store	315 (28)
Discount Grocery	202 (18)
Chain Grocery	178 (16)
Dollar/Drug Store	113 (10)
Box Store	89 (8)
Convenience Store	87 (8)
Other Grocery	82 (7)
Restaurant	66 (6)

Table 2: Fully adjusted relative risk ratios for location where most SSBs purchased by participant characteristics (values shown for statistically significant relationships only)

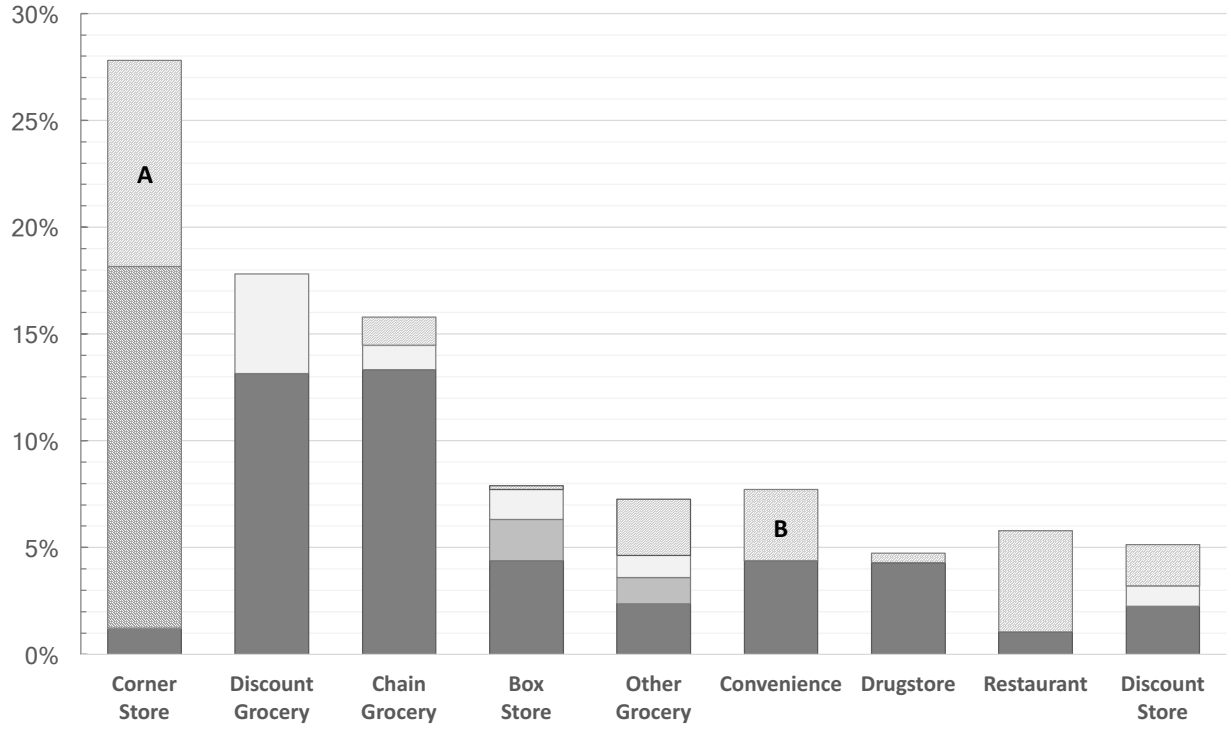
			Reference Store Type					
	Store type	**Category[A]**	**Corner Store**	**Discount Grocery**	**Chain Grocery**	**Dollar/Drug Store**	**Box**	**Conven-ience**
Education	**Chain Grocery**	[1]	0.4*	0.3**	–	–	–	–
Categories:	**Box**	[1]	0.4*	0.2**			–	–
College grad (ref)		[2]	0.4*	0.3**			–	–
[1] <High school		[3]		0.4*	0.4*	0.4*	–	–
[2] High school grad	**Convenience**	[1]		0.3*				–
[3] Some college	**Other Grocery**	[1]	0.2*	0.1**				
		[2]	0.3**	0.2***	0.3**	0.3**		0.3*
		[3]	0.5*	0.4*	0.4*	0.3**		
Race	**Discount Grocery**	[2]	3.1**	–	–	–	–	–
		[3]	3.9*	–	–	–	–	–
Categories: White (ref)	**Box**	[2]	3.5**				–	–
[1] African American	**Convenience**	[1]	0.4*	0.3*	0.4*			–
		[2]		0.2**			0.2**	–
[2] Latino	**Other Grocery**	[1]		0.3*				
[3] Asian	**Restaurant**	[1]		0.3*	0.4*			
		[2]		0.3*			0.2**	
Female	**Discount Grocery**		2.8***	–	–	–	–	–
	Chain Grocery			0.5**	–	–	–	–
	Dollar/Drug Store		1.8*			–	–	–
	Box		2.3**				–	–
	Convenience			0.3***	0.5*	0.4**	0.3***	–
	Other Grocery		1.9*					2.6**
	Restaurant			0.3**			0.4*	
Age (years)	**Chain Grocery**	[1]	1.7*		–	–	–	–
		[2]	2.4**		–	–	–	–
Categories:	**Dollar/Drug**	[1]	2.0*			–	–	–
18-29 (ref)	**Store**	[2]	3.0**			–	–	–
[1] 30-59	**Convenience**	[2]		0.3*	0.2**	0.2**	0.3*	–
[2] ≥60	**Other Grocery**	[1]			0.5*	0.4*		
		[2]	2.8**					6.0**
	Restaurant	[2]						3.7*
SSB consumption	**Restaurant**			0.8*				

RRR's, which are adjusted for all variables shown in the table as well as for the neighborhood in which interview took place, are interpreted in terms of the reference store type and the reference category for the characteristic of interest. E.g., when corner store is the reference store type, the RRR of 0.4 for category 1 of education (<High school) under "Chain Grocery" signifies that compared to respondents who had completed college (reference group), those with less than a high school education were 40% as likely to purchase from a chain grocery as a corner store. Only statistically significant relationships are shown (see Supplemental Table for all RRRs and 95% confidence intervals).

*p<0.05; **p<0.01; ***p<0.001

[A] For categorical variables, Category indicates the category being compared to the reference group.

FIGURE: Store types from which consumers purchased most sugar-sweetened beverages



Solid shading represents a single store (or chain).

Patterned shading represents multiple stores within a category (no single store mentioned >9 times).

A: Liquor stores; B: Gas stations

Supplemental Table: Adjusted relative risk ratios and 95% confidence intervals for location where most SSBs purchased, by participant characteristics

			Reference Store type						
	Comparison Store type	**Category[A]**	**Corner Store**	**Discount Grocery**	**Chain Grocery**	**Dollar/Drug Store**	**Box Store**	**Convenience Store**	**Other Grocery**
Education	Discount Grocery	[1]	1.7 [0.8, 3.3]						
		[2]	1.5 [0.8, 2.6]						
Categories:		[3]	1.1 [0.6, 2.1]						
College grad (ref)	Chain Grocery	[1]	**0.4 [0.2, 0.9]**	**0.3 [0.1, 0.6]**					
[1] <High school		[2]	0.9 [0.5, 1.5]	0.6 [0.3, 1.1]					
[2] High school grad		[3]	1.2 [0.7, 2.0]	1.0 [0.5, 1.9]					
[3] Some college	Dollar/Drug Store	[1]	0.7 [0.3, 1.7]	0.4 [0.2, 1.1]	1.7 [0.6, 4.5]				
		[2]	0.9 [0.5, 1.8]	0.6 [0.3, 1.3]	1.1 [0.5, 2.2]				
		[3]	1.4 [0.7, 2.6]	1.2 [0.6, 2.5]	1.2 [0.6, 2.3]				
	Box Store	[1]	**0.4 [0.2, 0.9]**	**0.2 [0.1, 0.6]**	0.9 [0.3, 2.4]	0.5 [0.2, 1.5]			
		[2]	**0.4 [0.2, 0.9]**	**0.3 [0.1, 0.6]**	0.5 [0.2, 1.1]	0.5 [0.2, 1.1]			
		[3]	0.5 [0.3, 1.0]	**0.4 [0.2, 0.9]**	**0.4 [0.2, 0.9]**	**0.4 [0.2, 0.8]**			
	Convenience	[1]	0.5 [0.2, 1.4]	**0.3 [0.1, 0.9]**	1.1 [0.4, 3.7]	0.7 [0.2, 2.3]	1.3 [0.4, 4.1]		
		[2]	0.8 [0.4, 1.7]	0.6 [0.3, 1.2]	0.9 [0.4, 2.0]	0.9 [0.4, 2.1]	1.9 [0.8, 4.5]		
		[3]	0.8 [0.4, 1.7]	0.7 [0.3, 1.6]	0.7 [0.3, 1.5]	0.6 [0.3, 1.4]	1.7 [0.7, 3.9]		
	Other Grocery	[1]	**0.2 [0.1, 0.7]**	**0.1 [0.0, 0.5]**	0.6 [0.2, 1.9]	0.3 [0.1, 1.1]	0.6 [0.2, 2.1]	0.5 [0.1, 2]	
		[2]	**0.3 [0.1, 0.6]**	**0.2 [0.1, 0.5]**	**0.3 [0.1, 0.7]**	**0.3 [0.1, 0.7]**	0.6 [0.2, 1.6]	**0.3 [0.1, 0.9]**	
		[3]	**0.5 [0.2, 0.9]**	**0.4 [0.2, 0.9]**	**0.4 [0.2, 0.8]**	**0.3 [0.2, 0.8]**	0.9 [0.4, 2.2]	0.5 [0.2, 1.3]	
	Restaurant	[1]	0.5 [0.2, 1.7]	0.3 [0.1, 1.1]	1.2 [0.4, 4.4]	0.7 [0.2, 2.7]	1.4 [0.4, 4.9]	1.1 [0.3, 4.5]	2.2 [0.5, 9.2]
		[2]	0.6 [0.3, 1.5]	0.4 [0.2, 1.1]	0.7 [0.3, 1.8]	0.7 [0.3, 1.8]	1.5 [0.6, 3.8]	0.8 [0.3, 2.0]	2.4 [0.8, 6.7]
		[3]	0.8 [0.4, 1.7]	0.7 [0.3, 1.7]	0.7 [0.3, 1.6]	0.6 [0.3, 1.4]	1.6 [0.7, 4.0]	1.0 [0.4, 2.4]	1.8 [0.7, 4.4]
Race	Discount Grocery	[1]	1.5 [0.6, 3.3]						
		[2]	**3.1 [1.3, 7.3]**						
Categories:		[3]	**3.9 [1.2, 12.4]**						
White (ref)	Chain Grocery	[1]	1.2 [0.6, 2.2]	0.8 [0.3, 1.9]					
[1] African American		[2]	1.4 [0.7, 2.8]	0.4 [0.2, 1.1]					
[2] Latino		[3]	2.6 [1.0, 6.7]	0.7 [0.2, 2.2]					

[3] Asian

			Reference Store type						
	Comparison Store type	**Category[A]**	**Corner Store**	**Discount Grocery**	**Chain Grocery**	**Dollar/Drug Store**	**Box Store**	**Convenience Store**	**Other Grocery**
Categories:	Dollar/Drug Store	[1]	0.8 [0.4, 1.6]	0.5 [0.2, 1.4]	0.7 [0.3, 1.5]				
White (ref)		[2]	1.6 [0.7, 3.5]	0.5 [0.2, 1.4]	1.2 [0.5, 2.7]				
[1] African American		[3]	2.1 [0.7, 6.3]	0.5 [0.1, 2.0]	0.8 [0.3, 2.4]				
[2] Latino	Box Store	[1]	1.0 [0.4, 2.5]	0.7 [0.2, 2.0]	0.8 [0.3, 2.2]	1.3 [0.5, 3.6]			
[3] Asian		[2]	**3.5 [1.4, 8.5]**	1.1 [0.4, 3.3]	2.5 [0.9, 6.6]	2.2 [0.8, 6.1]			
		[3]	1.8 [0.5, 7.1]	0.5 [0.1, 2.1]	0.7 [0.2, 2.7]	0.9 [0.2, 4.0]			
	Convenience	[1]	**0.4 [0.2, 0.9]**	**0.3 [0.1, 0.8]**	**0.4 [0.2, 0.8]**	0.5 [0.2, 1.3]	0.4 [0.1, 1.2]		
		[2]	0.7 [0.3, 1.7]	**0.2 [0.1, 0.7]**	0.5 [0.2, 1.3]	0.5 [0.2, 1.2]	**0.2 [0.1, 0.6]**		
		[3]	1.1 [0.3, 3.6]	0.3 [0.1, 1.1]	0.4 [0.1, 1.4]	0.5 [0.1, 2.0]	0.6 [0.1, 2.9]		
	Other Grocery	[1]	0.5 [0.2, 1.1]	**0.3 [0.1, 1.0]**	0.4 [0.2, 1.0]	0.6 [0.3, 1.6]	0.5 [0.2, 1.5]	1.2 [0.5, 3.1]	
		[2]	1.3 [0.6, 3.0]	0.4 [0.1, 1.2]	1.0 [0.4, 2.3]	0.8 [0.3, 2.2]	0.4 [0.1, 1.1]	1.8 [0.7, 4.9]	
		[3]	1.2 [0.4, 3.8]	0.3 [0.1, 1.2]	0.4 [0.1, 1.4]	0.6 [0.2, 2.1]	0.7 [0.1, 3.1]	1.1 [0.3, 4.5]	
	Restaurant	[1]	0.5 [0.2, 1.0]	**0.3 [0.1, 0.9]**	**0.4 [0.2, 0.9]**	0.6 [0.2, 1.5]	0.5 [0.2, 1.4]	1.1 [0.4, 2.9]	0.9 [0.3, 2.5]
		[2]	0.8 [0.3, 1.9]	**0.3 [0.1, 0.7]**	0.6 [0.2, 1.5]	0.5 [0.2, 1.4]	**0.2 [0.1, 0.7]**	1.1 [0.4, 3.0]	0.6 [0.2, 1.7]
		[3]	1.4 [0.4, 4.6]	0.4 [0.1, 1.5]	0.5 [0.2, 1.8]	0.7 [0.2, 2.6]	0.8 [0.2, 3.7]	1.3 [0.3, 5.3]	1.2 [0.3, 4.6]
Female	Discount Grocery		**2.8 [1.9, 4.2]**						
	Chain Grocery		1.3 [0.9, 2.0]	**0.5 [0.3, 0.7]**					
	Dollar/Drug Store		**1.8 [1.1, 2.7]**	0.6 [0.4, 1.0]	1.3 [0.8, 2.1]				
	Box Store		**2.3 [1.4, 3.7]**	0.8 [0.5, 1.4]	1.7 [1.0, 2.9]	1.3 [0.7, 2.3]			
	Convenience		0.7 [0.4, 1.2]	**0.3 [0.1, 0.4]**	**0.5 [0.3, 0.9]**	**0.4 [0.2, 0.7]**	**0.3 [0.2, 0.6]**		
	Other Grocery		**1.9 [1.1, 3.2]**	0.7 [0.4, 1.2]	1.4 [0.8, 2.4]	1.1 [0.6, 1.9]	0.8 [0.4, 1.6]	**2.6 [1.4, 5.1]**	
	Restaurant		1.0 [0.6, 1.7]	**0.3 [0.2, 0.6]**	0.7 [0.4, 1.3]	0.6 [0.3, 1.1]	**0.4 [0.2, 0.9]**	1.4 [0.7, 2.8]	0.5 [0.3, 1.0]
SSB Consumption	Discount Grocery		1.0 [1, 1.1]						
	Chain Grocery		1.0 [0.9, 1.1]	1.0 [0.9, 1.0]					
	Dollar/Drug Store		1.0 [0.9, 1.1]	1.0 [0.9, 1.0]	1.0 [0.9, 1.1]				
	Box Store		1.0 [0.9, 1.1]	0.9 [0.8, 1.0]	1.0 [0.9, 1.1]	1.0 [0.9, 1.1]			
	Convenience		1.0 [0.9, 1.1]	1.0 [0.9, 1.1]	1.0 [0.9, 1.1]	1.0 [0.9, 1.1]	1.0 [0.9, 1.2]		
	Other Grocery		0.8 [0.7, 1.0]	0.8 [0.7, 1.0]	0.8 [0.7, 1.0]	0.9 [0.7, 1.1]	0.9 [0.7, 1.1]	0.8 [0.7, 1.1]	

	Restaurant		0.8 [0.7, 1.0]	**0.8 [0.6, 1.0]**	0.8 [0.7, 1.0]	0.8 [0.7, 1.0]	0.9 [0.7, 1.1]	0.8 [0.7, 1.0]	0.6 [0.2, 1.6]
					Reference Store type				
	Comparison Store type	**Category[A]**	**Corner Store**	**Discount Grocery**	**Chain Grocery**	**Dollar/Drug Store**	**Box Store**	**Convenience Store**	**Other Grocery**
Age (years)	Discount Grocery	[1]	1.5 [1.0, 2.4]						
		[2]	1.6 [0.8, 2.9]						
Categories:	Chain Grocery	[1]	**1.7 [1.1, 2.6]**	1.1 [0.6, 1.8]					
18-29 (ref)		[2]	**2.4 [1.3, 4.3]**	1.5 [0.8, 3]					
[1] 30-59	Dollar/Drug Store	[1]	**2.0 [1.1, 3.4]**	1.3 [0.7, 2.3]	1.2 [0.6, 2.2]				
[2] ≥60		[2]	**3.0 [1.5, 6.1]**	1.9 [0.9, 4.2]	1.3 [0.6, 2.7]				
	Box Store	[1]	1.2 [0.7, 2.1]	0.8 [0.4, 1.4]	0.7 [0.4, 1.4]	0.6 [0.3, 1.2]			
		[2]	1.8 [0.8, 3.8]	1.1 [0.5, 2.6]	0.7 [0.3, 1.7]	0.6 [0.2, 1.4]			
	Convenience	[1]	1.1 [0.6, 1.9]	0.7 [0.4, 1.3]	0.6 [0.3, 1.2]	0.5 [0.3, 1.1]	0.9 [0.4, 1.8]		
		[2]	0.5 [0.2, 1.2]	**0.3 [0.1, 0.8]**	**0.2 [0.1, 0.5]**	**0.2 [0.1, 0.4]**	**0.3 [0.1, 0.8]**		
	Other Grocery	[1]	0.8 [0.4, 1.6]	0.5 [0.3, 1.1]	**0.5 [0.2, 1]**	**0.4 [0.2, 0.9]**	0.7 [0.3, 1.5]	0.8 [0.4, 1.6]	
		[2]	**2.8 [1.3, 5.8]**	1.8 [0.8, 4.1]	1.2 [0.5, 2.6]	0.9 [0.4, 2.2]	1.6 [0.6, 4.0]	**6.0 [2, 17.7]**	
	Restaurant	[1]	1.1 [0.6, 2.1]	0.7 [0.3, 1.4]	0.7 [0.3, 1.3]	0.5 [0.3, 1.2]	0.9 [0.4, 2.0]	1.0 [0.5, 2.2]	0.5 [0.3, 1.0]
		[2]	1.7 [0.7, 3.9]	1.1 [0.4, 2.7]	0.7 [0.3, 1.7]	0.6 [0.2, 1.5]	1.0 [0.3, 2.6]	**3.7 [1.2, 11.5]**	1.3 [0.6, 3.0]

RRR's, which are adjusted for all variables shown in the table as well as for the neighborhood in which interview took place, are interpreted in terms of the reference store type and the reference category for the characteristic of interest. E.g., when corner store is the reference store type, the RRR of 0.4 for category 1 of education (<High school) under "Chain Grocery" signifies that compared to respondents who had completed college (reference group), those with less than a high school education were 40% as likely to purchase from a chain grocery as a corner store. RRRs shown in bold were significant at $p<0.05$.

[A] For categorical variables, Category indicates the category being compared to the reference group