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Characteristics Associated with Purchasing Sugar-Sweetened Beverages and Bottled Water Among U.S. Households, 2015

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Abstract

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Background—Frequent intake of sugar-sweetened beverages (SSBs) among U.S. adults is a public health concern, because it has been associated with increased risks for adverse health outcomes such as obesity, type 2 diabetes, and cardiovascular disease. In contrast, drinking plain water (such as tap, bottled, or unsweetened sparkling water) instead of drinking SSBs might provide health benefits by improving diet quality and helping prevent chronic diseases. However, there is limited information on estimated expenditures on SSBs or bottled water among U.S. households.

Objective—This study examined differences in SSB and bottled water purchasing according to household and geographic area characteristics and estimated costs spent on purchasing SSB and bottled water from retail stores among a nationally representative sample of U.S. households.

Design—This study is a secondary analysis of the 2015 Circana (formerly Information Resources Inc. [IRI]) Consumer Network Panel (CNP) data, which were merged with the USDA nutrition data using the USDA Purchase-to-Plate Crosswalk-2015 (PPC) dataset (the latest available version of the PPC at the time the study began), and the Child Opportunity Index 2.0 (COI) data.

Participants/settings—A total of 63,610 households, representative of the contiguous U.S. population, consistently provided food and beverage purchase scanner data from retail stores throughout 2015.

Explanatory variables—The included demographic and socioeconomic variables were household head's age, marital status, highest education level, race and ethnicity of the primary shopper in the household, family income relative to the federal poverty level, and presence of children in the household. Additionally, descriptors of households' residential areas were included, such as the county-level poverty prevalence, urbanization, census region, and census tract level Child Opportunity Index.

Main outcome measures—Annual per capita spending (USD) on SSB and bottled water and daily per capita SSB calories purchased.

Statistical analysis—Unadjusted and multivariable adjusted mean values of the main outcome measures were compared by household demographic, socioeconomic, and geographic characteristics using linear regression analysis including Circana's household projection factors.

Results—Nearly all households reported purchasing SSBs at least once during 2015 and spent on average $47 (interquartile range [IQR]: $20) per person per year on SSBs, which corresponded to 211 kcal (IQR: 125 kcal) of SSBs per person per day. About 7 in 10 households reported purchasing bottled water at least once during 2015 and spent $11 (IQR: $5) per person on bottled water per year. Both annual per capita SSB and bottled water spending, and daily per capita SSB calories purchased was highest for households whose heads were between 40–59 years of age, had low household income, or lived in poor counties, or counties with a low Child Opportunity Index. Annual per capita spending was also higher for households with never married/widowed/divorced head, or at least one non-Hispanic Black head, and households without children, or those living in the South. Daily per capita SSB calorie purchases were highest for households where at least one head had less than a high school degree, households with at least one Hispanic or married head, and households with children or those living in the Midwest.

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Conclusions—These findings suggest that households that had lower socioeconomic status had higher annual per capita spending on SSBs and bottled water and higher daily per capita total SSB calories purchased than households with higher socioeconomic status.

Keywords

sugar-sweetened beverages (SSBs); bottled water; sodas; low-income; household spending; household purchases; household scanner data; Circana Consumer Network Panel; Purchase to Plate Crosswalk (PPC); Child Opportunity Index (COI); Social Vulnerability Index (SVI)

Introduction

Sugar-sweetened beverages (SSBs) include regular sodas, fruit drinks, sweetened coffee/tea drinks, sports drinks, energy drinks, and any other drinks that are sweetened with various forms of added sugars,[1] and are one of the leading sources of added sugars in the diet of adults in the United States (U.S.).[1,2] While the consumption of SSBs has decreased over the past two decades,[3–6] SSB intake among U.S. adults still remains high. For example, 63% of U.S. adults reported consuming SSBs at least one time per day based on the 2010 and 2015 National Health Interview Survey data.[6] According to the 2015–2018 National Health and Nutrition Examination Survey (NHANES), U.S. adults consumed an average of 98 kcal from SSBs on a given day.[7] Furthermore, SSB intake is significantly higher among young adults, males, non-Hispanic Black and Hispanic adults, those with lower education level or lower household income, and those who lived in rural areas compared to their counterparts.[6–8] These disparities may be compounded given that lower-income, racial and ethnic minority, and rural communities tend to have limited access to supermarkets, chain grocery stores, and outlets with healthful food products, and easier access to convenience stores and fast-food restaurants with high prevalence of processed and energy-dense foods.[9] However, availability of different types of stores in communities is only weakly associated with the healthfulness of household food purchases.[10–12]

Frequent intake of SSBs among adults is a public health concern given the associations with increased risks for adverse health outcomes such as obesity,[13,14] type 2 diabetes,[14–16] cardiovascular disease,[17,18] dental caries,[19,20] hypertension,[21] dyslipidemia,[22,23] and asthma.[24] However, the Dietary Guidelines for Americans Advisory Committee 2020 report found only limited to moderate evidence of a link between SSBs and obesity in both children and adults.[25] In contrast, drinking plain water (such as tap, bottled, or unsweetened sparkling water) instead of drinking SSBs might provide health benefits by improving diet quality and helping prevent chronic diseases.[26–28] While the drinking water systems in the U.S. are among the safest in the world,[29] some Americans do not trust the safety of the local tap water,[30–33] which may result in consuming more SSBs and/or bottled water. Because bottled water costs significantly more than tap water on a gallon-by-gallon basis, buying bottled water may put an undue cost burden on households with lower incomes who do not trust their local tap water.[34] A previous study reported that about 68% of U.S. adults perceived their local tap water was safe to consume, and mistrust of tap water safety was related to lower plain water and higher SSB intake, particularly among U.S. Hispanic adults.[35] Tap water quality violations and contamination, such as the Flint drinking water

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crisis, which are more likely to happen in communities with lower socioeconomic status and large Black and Hispanic populations,[36] could be some of the reasons for mistrust of tap water safety.[37]

SSB retail purchase increases access to or availability of SSBs at home, which in turn, is associated with higher SSB intake.[38,39] Given that most SSB calories consumed in the U.S. were purchased from stores and for at-home consumption, [40] retail purchase data of SSBs and bottled water (both with a relatively long shelf life) can serve as a proxy for intake. Purchase data also provide the ability to examine the economic burden of SSB and water purchases on low-income families. While most previous studies using U.S. data examined consumption of SSBs and water among adults,[3,33,41] only a few studies examined SSB calories or SSB amounts purchased among households.[42,43] There is also limited information on estimated retail expenditure on SSBs or bottled water among U.S. households. Furthermore, the literature suggests the need to assess the relationship between SSB purchasing and community level characteristics, such as economic deprivation and geographic factors, such as rurality and region.[44] Given these gaps in the literature, this study examined differences in SSB and bottled water purchasing according to both household and geographic area characteristics, including region, area poverty, rurality, and Child Opportunity Index 2.0 (COI), and estimated costs spent on purchasing SSB and bottled water among a nationally representative sample of U.S. households. Focusing on child-related indicators such as COI is important because childhood health and eating habits may have long-term effects and influence their health and eating habits in adulthood.

Methods

Data Sources

Household purchases of SSBs and bottled water, as well as household demographics and characteristics were obtained from the 2015 Consumer Network Panel (CNP), obtained by the U.S. Department of Agriculture (USDA) from Circana (formerly IRI). Two market research companies—Circana and Nielsen—have a joint venture to collect the National Consumer Panel (NCP), which is a national panel of consumer purchases. Circana markets the data as the CNP and Nielsen as HomeScan. The NCP adds new households as other households leave the panel to maintain a balanced panel. About 60,000 households per year are included in Circana's static panel. The static panel of households regularly provides data on their food expenditures over time, and their reported spending meets Circana's specific food expenditure thresholds, indicating that they consistently provide comprehensive data. Circana provides sample projection factors for the static panel households to match Census targets for household size, age of household head(s), annual household income, race/ethnicity of the household respondent, presence of children ≤18 years of age in the household, and other variables.[45]

Participating households use a smartphone application or handheld bar code scanner to report food and beverage purchases from retail stores and on-line ordering throughout the year.[45] Detailed product information is included: product descriptions, retail food categories and package size, as well as purchase data including purchased product quantities, price paid, and discount and coupon use. There are different types of retail stores included in the

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data, such as convenience, drug, dollar, grocery, liquor, and club/mass merchandiser stores. In 2015, the number of participating households in the CNP was 127,484, of which 63,610 were included in the static panel. Only static panel households were included in the analysis. More information about household sampling, weighting, representatives, and food purchase data collection is provided in two USDA Economic Research Service's (ERS) technical bulletins.[45,46]

We used the USDA's Purchase-to-Plate Crosswalk-2015 (PPC) dataset (the latest available year for PPC when the study began), to link the CNP with the USDA nutrition databases (nutrient and food group quantities) and provided information on the added sugars content of purchased products.[47,48] This allowed identifying beverages with added sugars and excluding from the analysis those with no added sugars. ERS's technical bulletin describing the linking process states that the percent of sales within a group of foods with a valid match varies by section of the grocery store from which the reported food items originated.[47] Circana categorizes SSB products across multiple grocery store categories (e.g., carbonated soft drinks, juices, sports/energy drinks, coffee/tea drinks, etc.), with the linking rate (sales linked divided by total sales) ranging between 84.4% (refrigerated juices and drinks) and 99.9% (sports/energy drinks),[47] thus capturing the vast majority of purchased SSBs reported in the CNP.

Explanatory Variables

Explanatory variables included household demographic, socioeconomic, and geographic characteristics. Household sociodemographic characteristics were household head's age (18–39, 40–59, and ≥60 years), marital status (married or never married/widowed/divorced), race and ethnicity of the primary shopper or respondent in the household (non-Hispanic [NH] White, NH Black, Hispanic, NH Asian, and NH Other), highest education level (<high school, high school graduate, some college, college graduate, postgraduate), family income relative to the federal poverty level (FPL) (≤130% FPL, >130%–350% FPL, >350% FPL), and presence of children (<18 years) in the household (yes or no). In the CNP data, the primary respondent reported his/her/their race/ethnicity, which may represent the primary respondent's characteristics, those of other household members, or the entire household's race and ethnicity. For households with two heads, education represented the highest educational attainment amongst them, while age represented the average age of both household heads. Geographic characteristics included environment descriptors such as the county-level poverty prevalence, level of urbanization, census region (Northeast, Midwest, West, and South) and census tract level Child Opportunity Index (COI). The county-level poverty prevalence in 2015 (≤10%, >10%–20%, and >20%), was obtained from the Centers for Disease Control and Prevention's (CDC) 2016 Social Vulnerability Index dataset.[49]

The county urbanization levels were categorized as large central metro, large fringe metro, medium metro, small metro, micropolitan, and noncore based on the 2013 National Center for Health Statistics (NCHS) urban-rural classification scheme for counties,[50] which identified six levels of urbanization. One represented "Large central metro counties in metropolitan statistical areas (MSA) of ≥1 million population that contained the entire population of the largest principal city of the MSA", and 6 represented "Noncore counties

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not in micropolitan statistical areas". The Child Opportunity Index 2.0, developed at the Heller School for Social Policy and Management at Brandeis University, combined 29 census tract level indicators across educational, healthy environmental, economic, and social domains and has been associated with a variety of health outcomes and chronic disease risk factors.[51] The COI levels were from 2015 and were categorized as very low, low, moderate, high, and very high, which measure conditions and resources conducive to healthy child development.[51]

The study protocol did not require Institutional Review Board (IRB) review because of the use of secondary de-identified data not involving "human subjects" (as defined by federal regulations and guidance). Additionally, the data used in the study has received clearance from Circana.

Outcome Variables

This study reported three measures of SSB and bottled water purchases: (1) Annual per capita spending on SSBs, (2) Daily per capita total SSB calories purchased, which included calories both from added sugars and all other ingredients, and (3) Annual per capita spending on bottled water. Per capita spending values were in 2015 U.S. dollars. The list of SSBs included in the study based on the Circana product categories consisted of aseptic juices, bottled juices, sweetened bottled water, canned juices, carbonated beverages, cocktail mixes, coffee (included pre-sweetened and not reconstituted instant coffee), drink mixes (e.g., powdered flavored drink or horchata), energy drinks, juice and drink concentrates, frozen and refrigerated juices (included drinks that are not 100% juice), non-fruit drinks, sports drinks, and ready-to-drink tea and coffee. Beverages with no added sugars, such as 100% fruit juices were not included in the study. Per capita annual measures were calculated by dividing the annual household spending on the respective category (SSBs or bottled water) by the number of household members; daily per capita SSB calories purchased was further divided by 365 (number of days in a year) to get daily values.

Statistical Analysis

We compared the unadjusted and multivariable adjusted mean values (adjusted for all explanatory variables) by household demographic, socioeconomic, and geographic characteristics using linear regression analysis in Stata 16.1.[52] Circana's household projection factors were applied in all analyses. Statistical significance (at the 0.05 level) of differences in means was obtained from the regression analysis based on the respective coefficients on each variable.

Results

Table 1 describes household demographic, socioeconomic, and geographic characteristics, and the descriptive statistics of SSB and bottled water purchases, adjusted by the Circana household projection factors. Of the 63,610 households, the vast majority purchased SSBs (95.0%) and bottled water (70.0%) at least once during 2015, annually spending about $45.8 (interquartile range [IQR]: $46.4) per person on SSBs and $10.6 (IQR: $9.9) on bottled water. Household SSB purchases corresponded to 217.4 kcal of SSB per person per day

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(IQR: 208.5 kcal). Overall, 40.4% of household heads were 40–59 years old, 61.8% of household heads were married, 54.3% were college graduates, 43.1% had family income of greater than 350% FPL, and 70.9% of primary respondents were NH White. About 33% of households had at least one child (less than 18 years) in the home, and 69.3% of households lived in counties where the poverty prevalence was more than 10%–20%. More than half of the households lived in either large central metro (28.2%) or large fringe metro (26.6%) counties, 38.0% lived in the West, and about 35% are in census tract regions with low (20.1%) or very low (14.7%) COI levels.

Table 2 illustrates unadjusted and multivariable adjusted mean values of annual per capita spending on SSB and daily per capita SSB calories purchased. Based on the adjusted means, both measures of SSB purchases were higher among households with head(s) aged 40–59 years ($52.1, 260.8 kcal), with or without a high school diploma, or households with household income below 131 percent of FPL, compared to the respective reference groups. Based on the unadjusted means, households with head(s) aged 60 and over had higher annual per capita spending on SSBs but fewer daily per capita SSB calories purchased compared to households with head(s) aged 18–39. However, after adjusting for household demographic, socioeconomic, and geographic characteristics, households with head(s) aged 60 and over had lower annual per capita spending on the SSBs compared to the reference group, and the difference in the daily per capita SSB calories purchased became statistically insignificant. Households with married heads had lower annual per person spending on SSBs but purchased more calories from SSBs than households with never married/widowed/divorced heads.

Compared to households with NH White primary respondents, those with NH Black and NH Other primary respondents spent more on SSBs, while households with NH Asian primary respondents spent less, and there was no statistically significant difference between households with NH White and Hispanic primary respondents. Compared to households with NH Black primary respondents, those with NH Asian and Hispanic primary respondents spent less on SSBs, and the difference between households with NH Black and NH Other primary respondents was not statistically significant. That is, households with NH Black and NH Other primary respondents spent the most on SSBs, followed by those with NH White and Hispanic primary respondents, while household with NH Asian primary respondents spent the least. However, based on the differences in estimated adjusted means, compared to households with NH White primary respondents, both households with NH Black and Hispanic primary respondents purchased about 48 more calories from SSBs per person/day, while those with NH Asian respondents purchased about 46 fewer calories from SSBs per person/day, and there was no statistically significant difference between households with NH White and NH Other primary respondents. That is, households with NH Black and Hispanic primary respondents purchased the highest number of calories from SSBs, with no statistically significant difference between the two groups, followed by those with NH White and NH Other primary respondents, and NH Asians. Households with at least one child under 18 spent less on SSBs but purchased about 80 more calories per person/day than those with no children.

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Households residing in medium or small metro, micropolitan, or noncore (rural) counties had higher per capita annual spending on SSBs than households residing in large central metro counties, but the difference in calories purchased was only statistically significant between large central metro residents and medium metro or noncore county residents. While no statistically significant difference was observed in the annual per capita spending on SSBs between households residing in different census regions, households residing in the Midwest purchased the highest number of calories from SSBs compared to those residing in other regions. Compared to households residing in census tracts with very low COI levels, those residing in census tracts with moderate-to-very-high COI levels had lower spending on SSBs and purchased fewer calories from SSBs.

Based on the unadjusted means, households with Hispanic primary respondents had lower spending on SSBs compared to those with NH White primary respondents, while the difference became statistically insignificant after controlling for the household demographic, socioeconomic, and geographic characteristics. The statistical significance of differences between other race and ethnicity group comparisons did not change after controlling for the household demographic, socioeconomic, and geographic characteristics. Similarly, based on the unadjusted means, households residing in counties with higher than 10% poverty prevalence had higher spending on SSBs and purchased more calories from SSBs than those residing in counties with poverty prevalence of ≤10%, but the differences became statistically insignificant in the multivariable adjusted means. The unadjusted means also suggested that there were differences in spending on SSBs among households residing in the Midwest and the South or West, while no such differences were observed in the adjusted means.

Table 3 illustrates unadjusted and multivariable adjusted mean values of bottled water purchases by household characteristics. Based on the adjusted means, annual per capita spending on bottled water was higher among households whose head was aged 40–59 years (compared to those aged 18–39); never married/widowed/divorced (compared to those with married household heads); NH Black, NH Other, or Hispanic primary respondents (compared to NH White primary respondents); households without children (compared to those with at least one child under 18); households residing in the Midwest (compared to the Northeast or West); or in census tracts with very low COI levels (compared to those in census tracts with high or very high COI levels). While these differences in the annual per capita spendings on bottled water were statistically significant, the magnitude of most differences based on the estimated adjusted means was rather small (around $2). The largest difference was observed between household with NH White and NH Black primary respondents (a difference of almost $7). Based on the unadjusted means, households whose head was aged 60 and over (compared to those aged 18–39), was NH White (compared to NH Asian), or had no high school diploma (compared to those who had some college education) had higher spending on bottled water. However, after controlling for household demographic, socioeconomic, and geographic characteristics, these differences became statistically insignificant.

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Discussion

In this study, almost all households reported purchasing SSBs at least once during 2015. In addition, the groups that spent the most on SSBs and the groups that purchased the highest number of SSB calories were not always the same. For example, compared to households with no children, those with at least one child under 18 spent less on SSBs but purchased more calories from SSBs. One explanation for this might be that households with children purchased SSBs in larger quantities or in bulk, which could potentially reduce the dollar amount spent on SSBs even though SSB calories were higher. Another explanation, which also applies to the observed differences between households with primary respondents of different races and ethnicities is that different demographic and socioeconomic groups may purchase different types of SSBs, and the caloric content and unit prices may vary based on the purchased SSB type and brand.

In line with the findings of the present study, based on the 2000–2014 Nielsen HomeScan Panel data, compared to households with NH White primary respondents, households with NH Black and Hispanic primary respondents purchased a larger percent of beverages with caloric sweeteners in relation to all types of purchased beverages (+9% for NH Black and +4% for Hispanic primary respondents),[53] and households with NH Black primary respondents purchased up to 1.24 times more SSB calories.[42] Similar racial disparities in SSB purchases/consumption have been reported in the literature based on different data sources and years.[54,55] Although a direct comparison cannot be made because the Circana Consumer Network provides household-level purchase data, while NHANES provides individual-level intake data for adults, a study based on 2015–2018 NHANES found that the mean energy intake from SSBs was significantly higher among males (122 kcal/day), adults aged 19–29 (113 kcal/day) adults aged 30–59 (114 kcal/day), or adults with lower household income (119 kcal/day) than the respective reference groups.[7]

To our knowledge, this is the first paper to analyze differences in bottled water purchases among different demographic and socioeconomic groups using a nationally representative household panel of retail food and beverage purchases. We found that 7 in 10 households reported purchasing bottled water at least once during 2015. Bottled water purchase differed by demographic, socioeconomic, and geographic characteristics. The finding that households with a primary shopper who is a racial or ethnic minority and households of lower socioeconomic status spent more on bottled water than their counterparts is consistent with the existing literature. Based on 2011–2018 NHANES, bottled water intake was higher among adults aged 20–39 or 40–59, NH Black or Hispanic adults, females, those with lower household income, and adults with lower education level than their counterparts.[33] Other studies also reported avoidance of tap water by racial and ethnic minorities and those of low socioeconomic status.[32] These households preferred bottled water over tap water because they perceived tap water to be unsafe, which, although uncommon, can be a valid concern, especially since there are over 9.2 million lead service lines in the U.S.[56] Even so, current evidence suggests that tap water is more regulated than bottled water and the latter is not safer on average than the former.[30,57–60] The majority of the U.S. population gets its drinking water from a public water system, and drinking water in U.S. is among the safest globally.[29] Unlike most bottled water, most tap water in the U.S. provides oral health

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benefits because of water fluoridation.[61,62] About 73% of the U.S. population on community water systems had access to fluoridated tap water.[63] Even though decades of research suggests that water fluoridation has been a successful public health strategy to reduce the prevalence of dental caries, there has been a growing worldwide opposition to this practice due to the potential risk of toxicity.[64] Tap water is also cheaper and more environmentally friendly than bottled water, particularly because of the incineration of used plastic bottles and the CO_2 emissions resulting from high energy consumption in the production and transportation of bottled water.65,66

In this study, the households with a primary shopper who was a member of a racial or ethnic minority (compared to households with a NH White primary shopper), and households of lower socioeconomic status (compared to households of higher socioeconomic status) spent more money on purchasing both SSBs and bottled water. Given that tap water quality violations and contamination are more likely to happen in communities of lower socioeconomic status and large Black and Hispanic populations,[36] one potential explanation for why these groups had higher spending on bottled water is that they may perceive tap water to be unsafe or of lower quality than bottled water. Another explanation for purchasing bottled water is that consumers prefer the taste, which has been found to be a major factor in choosing between tap water and bottled water.[67] Tap water avoidance is also associated with higher SSB intake[35] and negative health risk factors, such as excess weight gain[68] and higher risk of dental caries.[69] Additionally, this study was based on 2015 data, which is when the Flint, Michigan was found to have high concentrations of lead (mid 2014–2016).[70] Thus, news coverage about the Flint water crisis may have raised concerns about tap water safety among these populations,[32,70–72] further contributing to the disparities in bottled water and SSB purchases among different demographic and socioeconomic groups.

One of the major novelties of this study is the comparison of SSB and bottled water purchases by the COI levels of census tracts of households' residence, suggesting that children already at potentially increased risk for adverse health and economic outcomes were also most exposed to SSBs in the household. We found that all three measures were negatively associated with the COI levels, meaning that households residing in counties with better conditions and resources conducive to healthy child development spent less on SSBs and bottled water and the purchased SSBs contained fewer calories per person. Another study using the 2010–2018 Nielsen HomeScan Panel data, found that rural households purchased more SSB calories from grocery stores, mass merchandizers, dollar, and convenience/drug stores than urban households, while households with low incomes purchased more SSB calories at almost every store type both in rural and urban areas than did households with higher incomes.[73] Assuming tap water avoidance is one of the contributors to the disparities in the three measures based on rurality, region, poverty, COI levels, and area deprivation, the findings suggest that there is a double burden of cost and health effects. That is, any alternative to tap water may cause a financial burden on the food budgets of households with low socioeconomic status or those residing in census tracts with low COI levels, without providing the benefits of drinking (fluoridated) tap water.

The study has several limitations. First, while the survey weights helped to account for differences between the composition of the static panel and the general U.S. population,

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it is possible that households meeting the requirements for being included in the static panel had different purchasing behaviors than those who did not participate in the survey or provided insufficient data to be included in the static panel.[45] Second, the data only included retail purchases, thus omitting SSB and bottled water purchases from food-away-from-home (FAFH) sources, such as restaurants, bars, and institutions such as hospital or college cafeterias. Since FAFH purchases differ by socioeconomic status (e.g., households with higher incomes spending more on FAFH than those with lower incomes[74]), not accounting for SSB and bottled water purchases from these sources may have impacted the differences in the findings. However, this is not a major concern, because store-bought purchases represent the vast majority of beverage/SSB calories consumed in the U.S.[75] Third, we did not analyze the SSB subtypes and interactions between variables, which may further elucidate the differences in the three measures between population subgroups. Fourth, because some SSB products could not be linked with the USDA nutrition information and are not included in the dataset (as described in the Data Sources section), our estimates of SSB purchases may be underestimated and might affect some of the differences observed between groups in unknown ways. There were also small differences in the linkage rates of nutrition data for different types of beverages between households of different income groups and primary shoppers' race or ethnicity. Lastly, because the study is based on 2015 data, which was the latest available year of the PPC data when the study began, current SSB and bottled water purchases may be different from those reported in the study.

Conclusions

Nearly all households reported purchasing SSBs at least once during 2015 and about 7 in 10 households reported purchasing bottled water. We found that even after controlling for household characteristics, area level variables such as rurality and the COI were still statistically significant indicators of SSB and bottled water purchases. These findings suggest that households that had lower socioeconomic status, also had higher annual per capita spending on SSBs and bottled water and higher daily per capita total SSB calories purchased than those with higher socioeconomic status.

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Research Snapshot

Research Questions:

What are the differences in sugar-sweetened beverages (SSBs) and bottled water purchasing based on both household level characteristics, as well as area level characteristics? What are the costs spent on purchasing SSB and bottled water from retail stores among U.S. households?

Key Findings:

Nearly all households reported purchasing SSBs at least once during 2015 and spent on average $47 (interquartile range [IQR]: $20) per person per year on SSBs, which corresponded to 211 kcal (IQR: 125 kcal) of SSBs per person per day. About 7 in 10 households reported purchasing bottled water at least once during 2015 and spent $11 (IQR: $5) per person on bottled water per year. Households that had lower socioeconomic status also had higher annual per capita spending on SSBs and bottled water and higher daily per capita total SSB calories purchased than households with higher socioeconomic status.

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Table 1.

Demographic and Socioeconomic Characteristics of Households and Descriptive Statistics of Sugar-Sweetened Beverage and Bottled Water Purchases from U.S. Retail Stores, 2015 (N=63,610)

Purchase Prevalence	**Mean[a] (95% CI[b])**
Sugar-Sweetened Beverages (SSB)	0.95 (0.95; 0.96)
Bottled Water	0.70 (0.70; 0.71)
Purchase Measures	
Annual Per Capita Spending on SSB (in 2015 USD)	45.84 (45.19; 46.49) Interquartile range (IQR): 46.37
Daily Per Capita SSB Calories Purchased	217.39 (211.93; 222.84) IQR: 208.55
Annual Per Capita Spending on Water (in 2015 USD)	10.66 (10.40; 10.91) IQR: 9.9
Age of Household Head [c]	
18–39	0.26 (0.26; 0.27)[d]
40–59	0.40 (0.40; 0.41)
60 and over	0.33 (0.33; 0.34)
Marital Status	
Never Married/Widowed/Divorced	0.38 (0.38; 0.39)
Married	0.62 (0.61; 0.62)
Race and Ethnicity	
Non-Hispanic White	0.71 (0.70; 0.71)
Non-Hispanic Black	0.11 (0.11; 0.11)
Non-Hispanic Asian	0.04 (0.04; 0.04)
Non-Hispanic Other	0.02 (0.02; 0.03)
Hispanic	0.12 (0.11; 0.12)
Highest Education Level [e]	

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Purchase Prevalence	**Mean[a] (95% CI[b])**
<High School	0.01 (0.01; 0.02)
High School Graduate	0.17 (0.16; 0.17)
Some College	0.28 (0.27; 0.28)
College Graduate	0.35 (0.35; 0.35)
Postgraduate	0.19 (0.19; 0.20)
Family Income Relative to Federal Poverty	
130% or less FPL	0.15 (0.15; 0.16)
More than 130% through 350% FPL	0.42 (0.41; 0.42)
More than 350% FPL	0.43 (0.43; 0.44)
Children <18 years in home	
No	0.67 (0.66; 0.67)
Yes	0.33 (0.33; 0.34)
Poverty Prevalence of County	
10% or less	0.19 (0.18; 0.19)
More than 10% through 20%	0.69 (0.69; 0.70)
More than 20%	0.12 (0.12; 0.12)
County Urbanization Level	
Large Central Metro	0.28 (0.28; 0.29)
Large Fringe Metro	0.27 (0.26; 0.27)
Medium Metro	0.21 (0.21; 0.21)
Small Metro	0.10 (0.10; 0.10)
Micropolitan	0.09 (0.09; 0.09)
Noncore	0.05 (0.05; 0.06)
Census Region	
Northeast	0.18 (0.18; 0.18)
Midwest	0.22 (0.22; 0.23)
West	0.38 (0.38; 0.38)
South	0.22 (0.21; 0.22)
Child Opportunity Index Level	
Very Low	0.15 (0.14; 0.15)
Low	0.20 (0.20; 0.21)

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Purchase Prevalence	Mean[a] (95% CI[b])
Moderate	0.24 (0.24; 0.25)
High	0.23 (0.23; 0.24)
Very High	0.18 (0.17; 0.18)

Note: The analysis, findings, and conclusions expressed in this report should not be attributed to Circana (formerly Information Resources Inc. [IRI]).

[a] Weighted percent may not add up to 100% because of rounding.

[b] Confidence interval.

[c] For households with two heads, age represents the average age of both household heads.

[d] Source: Model estimates using data from the 2015 Circana Consumer Network Panel static panel. Circana projection factors/survey weights applied.

[e] For households with two heads (who were likely to make joint food purchase decisions even if only one was the primary shopper), education represents the highest educational attainment amongst them

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Table 2.

Mean Values of Sugar-Sweetened Beverage (SSB) Purchase Measures by Household Characteristics[a]

Characteristic	Annual Per Capita Spending on SSB (in 2015 USD)				Daily Per Capita SSB Calories Purchased			
	Unadjusted Mean (95% CI[b])	p-value[c]	Multivariable Adjusted Mean[d] (95% CI)	p-value	Unadjusted Mean (95% CI)	p-value	Multivariable Adjusted Mean (95% CI)	p-value
Age of Household Head [e]								
18–39 (reference [ref.])	39.5 (38.1; 40.9)		46.6 (45.0; 48.2)		216.3 (201.1; 231.6)		184.4 (171.5; 197.2)	
40–59	50.1 (49.1; 51.2)	<0.001	52.1 (51.0; 53.2)	<0.001	263.3 (255.5; 271.1)	<0.001	260.8 (253.2; 268.4)	<0.001
60 and over	45.6 (44.7; 46.6)	<0.001	37.5 (36.5; 38.6)	<0.001	162.2 (156.6; 167.8)	<0.001	190.7 (182.6; 198.8)	0.380
Marital Status								
Never Married/Widowed/ Divorced (ref.)	56.4 (55.0; 57.7)		51.6 (50.3; 52.9)		170.9 (163.6; 178.1)		171.2 (162.7; 179.6)	
Married	39.3 (38.7; 40.0)	<0.001	42.3 (41.5; 43.0)	<0.001	246.2 (238.6; 253.8)	<0.001	246.0 (239.3; 252.7)	<0.001
Race and Ethnicity								
Non-Hispanic White (ref.)	45.6 (44.9; 46.3)		45.0 (44.3; 45.7)		206.0 (201.1; 211.0)		208.1 (202.7; 213.4)	
Non-Hispanic Black	55.9 (53.8; 58.0)	<0.001	53.6 (51.5; 55.8)	<0.001	253.1 (239.7; 266.5)	<0.001	255.9 (241.7; 270.1)	<0.001
Non-Hispanic Asian	31.6 (28.6; 34.6)[f]	<0.001	39.7 (36.7; 42.8)[f]	0.001	142.7 (125.0; 160.3)[f]	<0.001	162.4 (143.8; 181.0)[f]	<0.001
Non-Hispanic Other	52.9 (47.7; 58.2)[g]	0.006	52.8 (47.6; 57.9)[g]	0.003	208.0 (183.3; 232.7)[f,g]	0.880	208.5 (183.9; 233.1)[f,g]	0.975
Hispanic	41.2 (38.6; 43.7)[f,g,h]	0.001	44.4 (41.9; 46.8)[f,g,h]	0.660	277.8 (245.7; 310.0)[g,h]	<0.001	256.6 (224.5; 288.8)[g,h]	0.004
Highest Education Level [i]								
<High School (ref.)	63.6 (56.4; 70.8)		57.7 (50.6; 64.8)		291.0 (246.7; 335.3)		289.7 (246.4; 332.9)	
High School Graduate	59.6 (57.7; 61.5)	0.289	56.1 (54.2; 58.0)	0.666	260.4 (247.8; 273.0)	0.193	258.0 (245.0; 271.0)	0.167
Some College	50.6 (49.1; 52.0)	<0.001	49.1 (47.8; 50.5)	0.021	247.8 (236.2; 259.5)	0.065	239.0 (227.7; 250.3)	0.027
College Graduate	41.4 (40.5; 42.4)	<0.001	42.6 (41.7; 43.6)	<0.001	201.4 (191.5; 211.3)	<0.001	201.2 (192.0; 210.5)	<0.001
Postgraduate	33.9 (32.8; 34.9)	<0.001	37.2 (36.0; 38.3)	<0.001	160.1 (151.8; 168.3)	<0.001	175.2 (166.1; 184.3)	<0.001
Family income relative to federal poverty								
130% or less FPL (ref.)	55.9 (53.4; 58.4)		50.8 (48.2; 53.4)		304.1 (285.5; 322.7)		284.3 (265.7; 303.0)	
More than 130% through 350% FPL	48.7 (47.7; 49.7)	<0.001	46.4 (45.4; 47.3)	0.002	224.6 (217.3; 231.9)	<0.001	225.5 (218.0; 233.0)	<0.001

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Characteristic	Annual Per Capita Spending on SSB (in 2015 USD)				Daily Per Capita SSB Calories Purchased			
	Unadjusted Mean (95% CI[b])	p-value[c]	Multivariable Adjusted Mean[d] (95% CI)	p-value	Unadjusted Mean (95% CI)	p-value	Multivariable Adjusted Mean (95% CI)	p-value
Age of Household Head [e]								
More than 350% FPL	39.5 (38.8; 40.3)	<0.001	43.6 (42.7; 44.4)	<0.001	179.9 (171.7; 188.0)	<0.001	186.0 (175.7; 196.2)	<0.001
Children <18 years in home								
No (ref.)	51.6 (50.8; 52.5)		51.6 (50.6; 52.6)		181.1 (176.5; 185.7)		190.6 (185.2; 196.0)	
Yes	34.2 (33.4; 34.9)	<0.001	34.3 (33.2; 35.3)	<0.001	290.2 (276.7; 303.6)	<0.001	271.2 (258.5; 283.9)	<0.001
Poverty Prevalence of County								
10% or less (ref.)	41.3 (40.0; 42.5)		46.1 (44.6; 47.7)		198.4 (186.7; 210.2)		215.9 (202.8; 229.0)	
More than 10% through 20%	46.1 (45.3; 46.9)	<0.001	45.7 (45.0; 46.5)	0.657	217.9 (211.3; 224.6)	0.005	218.2 (211.6; 224.9)	0.751
More than 20%	51.5 (49.3; 53.7)	<0.001	45.9 (43.7; 48.1)	0.863	243.7 (228.1; 259.2)	<0.001	214.7 (198.4; 231.1)	0.919
County Urbanization Level								
Large Central Metro (ref.)	44.3 (42.9; 45.7)		44.1 (42.8; 45.4)		200.5 (189.7; 211.4)		210.7 (199.7; 221.7)	
Large Fringe Metro	42.4 (41.4; 43.5)	0.034	44.2 (43.0; 45.4)	0.923	199.5 (190.3; 208.7)	0.888	205.1 (195.9; 214.3)	0.448
Medium Metro	46.6 (45.2; 48.1)	0.022	46.9 (45.5; 48.3)	0.004	231.9 (222.2; 241.5)	<0.001	227.6 (218.0; 237.3)	0.027
Small Metro	48.4 (46.5; 50.4)	0.001	47.7 (45.8; 49.6)	0.003	232.8 (204.3; 261.2)	0.038	229.1 (199.3; 258.9)	0.276
Micropolitan	50.9 (48.7; 53.1)	<0.001	48.7 (46.5; 51.0)	0.001	240.8 (227.4; 254.2)	<0.001	222.0 (208.3; 235.7)	0.215
Noncore	54.5 (51.6; 57.4)	<0.001	50.7 (47.8; 53.6)	<0.001	269.7 (252.8; 286.7)	<0.001	243.7 (226.1; 261.3)	0.002
Census Region								
Midwest (ref.)	45.4 (43.9; 46.9)		46.3 (44.8; 47.8)		247.1 (230.1; 264.1)		263.0 (245.8; 280.2)	
Northeast	45.5 (44.4; 46.7)	0.895	45.0 (43.8; 46.1)	0.172	213.5 (200.0; 227.1)	0.003	218.6 (203.7; 233.6)	<0.001
South	48.0 (46.9; 49.0)	0.005	46.7 (45.7; 47.7)	0.630	220.3 (213.7; 226.8)	0.004	209.0 (202.5; 215.5)	<0.001
West	42.8 (41.2; 44.4)	0.021	44.9 (43.4; 46.4)	0.198	191.6 (181.4; 201.9)	<0.001	192.9 (182.5; 203.2)	<0.001
Child Opportunity Index Level								
Very Low (ref.)	53.7 (51.9; 55.6)		48.8 (47.0; 50.7)		260.6 (242.5; 278.8)		247.2 (227.7; 266.7)	
Low	50.4 (49.0; 51.8)	0.005	47.9 (46.5; 49.3)	0.406	246.6 (229.9; 263.4)	0.267	238.5 (220.7; 256.3)	0.486
Moderate	46.4 (44.8; 48.0)	<0.001	46.1 (44.5; 47.6)	0.033	215.5 (207.5; 223.6)	<0.001	212.1 (204.1; 220.1)	0.001
High	42.5 (41.3; 43.6)	<0.001	44.1 (43.0; 45.3)	<0.001	198.3 (190.3; 206.3)	<0.001	204.3 (196.1; 212.6)	<0.001
Very High	37.8 (36.6; 39.0)	<0.001	43.0 (41.6; 44.3)	<0.001	175.9 (164.9; 187.0)	<0.001	193.1 (180.6; 205.5)	<0.001

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[a] Source: Model estimates using data from the 2015 Circana Consumer Network Panel static panel. Circana projection factors/survey weights applied to reflect national estimates.

[b] Confidence interval.

[c] P-values are obtained from linear regression analysis.

[d] Adjusted means reflect inclusion of all variables presented in the table in the regression analysis.

[e] For households with two heads, age represents the average age of both household heads.

[f] An anonymous reviewer suggested comparisons by race and ethnicity to be reported for all group comparisons, instead of a single reference group. Subscript "f" indicates statistically significant difference at 0.05 significance level with the reference group being household with Non-Hispanic Black primary shoppers.

[g] Statistically significant difference at 0.05 significance level with the reference group being households with Non-Hispanic Asian primary shoppers.

[h] Statistically significant difference at 0.05 significance level with the reference group being households with Non-Hispanic Other primary shoppers.

[i] For households with two heads (who were likely to make joint food purchase decisions even if only one was the primary shopper), education represents the highest educational attainment amongst them.

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Table 3.

Annual Per Capita Spending on Bottled Water by Household Characteristics[a]

Characteristic	Annual Per Capita Spending on Water (in 2015 USD)			
	Unadjusted Mean (95% CI[b])	p-value[c]	Multivariable Adjusted Mean[d] (95% CI)	p-value
Age of Household Head [e]				
18–39 (reference [ref.])	7.4 (7.0; 7.9)		9.4 (8.8; 10.0)	
40–59	11.6 (11.2; 12.0)	<0.001	11.8 (11.4; 12.3)	<0.001
60 and over	12.1 (11.7; 12.5)	<0.001	10.2 (9.7; 10.7)	0.074
Marital Status				
Never Married/Widowed/Divorced (ref.)	13.7 (13.1; 14.2)		12.2 (11.7; 12.7)	
Married	8.8 (8.6; 9.0)	<0.001	9.7 (9.4; 10.0)	<0.001
Race and Ethnicity				
Non-Hispanic White (ref.)	9.6 (9.3; 9.8)		9.4 (9.1; 9.7)	
Non-Hispanic Black	17.3 (16.4; 18.2)	<0.001	16.3 (15.4; 17.2)	<0.001
Non-Hispanic Asian	8.0 (7.0; 8.9)[f]	0.002	9.8 (8.7; 10.8)[f]	0.525
Non-Hispanic Other	14.6 (12.0; 17.3)[g]	<0.001	14.8 (12.2; 17.4)[g]	<0.001
Hispanic	11.0 (10.0; 11.9)[f,g,h]	0.005	12.3 (11.3; 13.2)[f,g]	<0.001
Highest Education Level [i]				
<High School (ref.)	14.3 (11.8; 16.7)		12.9 (10.5; 15.3)	
High School Graduate	13.5 (12.6; 14.5)	0.581	13.1 (12.1; 14.0)	0.907
Some College	11.3 (10.8; 11.8)	0.020	11.2 (10.8; 11.7)	0.192
College Graduate	9.8 (9.4; 10.1)	<0.001	10.1 (9.7; 10.4)	0.024
Postgraduate	8.5 (8.1; 9.0)	<0.001	8.7 (8.2; 9.1)	0.001
Family income relative to federal poverty				
130% or less FPL (ref.)	11.3 (10.5; 12.1)		10.3 (9.5; 11.2)	
More than 130% through 350% FPL	10.8 (10.3; 11.2)	0.259	10.2 (9.8; 10.6)	0.809
More than 350% FPL	10.3 (10.0; 10.6)	0.026	11.2 (10.9; 11.6)	0.065
Children <18 years in home				
No (ref.)	12.8 (12.4; 13.1)		12.4 (12.0; 12.8)	
Yes	6.4 (6.2; 6.6)	<0.001	7.1 (6.8; 7.5)	<0.001
Poverty Prevalence of County				
10% or less (ref.)	9.8 (9.2; 10.4)		10.6 (9.9; 11.3)	
More than 10% through 20%	10.5 (10.2; 10.7)	0.058	10.5 (10.2; 10.8)	0.754
More than 20%	13.1 (12.0; 14.1)	<0.001	11.6 (10.6; 12.6)	0.113
County Urbanization Level				
Large Central Metro (ref.)	11.4 (10.8; 11.9)		10.6 (10.1; 11.2)	
Large Fringe Metro	10.5 (10.0; 11.0)	0.015	10.7 (10.1; 11.2)	0.965
Medium Metro	10.1 (9.7; 10.6)	<0.001	10.4 (9.9; 10.8)	0.449

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Characteristic	Annual Per Capita Spending on Water (in 2015 USD)			
	Unadjusted Mean (95% CI[b])	p-value[c]	Multivariable Adjusted Mean[d] (95% CI)	p-value
Small Metro	10.3 (9.5; 11.0)	0.022	10.8 (10.0; 11.6)	0.729
Micropolitan	10.5 (9.6; 11.4)	0.094	10.9 (10.0; 11.8)	0.642
Noncore	11.0 (10.1; 12.0)	0.523	11.0 (10.1; 12.0)	0.493
Census Region				
Midwest (ref.)	11.8 (11.1; 12.4)		11.8 (11.1; 12.5)	
Northeast	8.3 (8.0; 8.7)	<0.001	8.6 (8.2; 9.0)	<0.001
South	12.0 (11.6; 12.4)	0.567	11.5 (11.1; 11.9)	0.494
West	9.8 (9.1; 10.5)	<0.001	10.3 (9.5; 11.0)	0.006
Child Opportunity Index Level				
Very Low (ref.)	13.6 (12.7; 14.5)		11.5 (10.7; 12.3)	
Low	11.3 (10.7; 11.9)	<0.001	10.8 (10.3; 11.4)	0.150
Moderate	10.6 (10.1; 11.0)	<0.001	10.7 (10.3; 11.2)	0.098
High	9.6 (9.2; 10.0)	<0.001	10.3 (9.9; 10.7)	0.008
Very High	9.0 (8.3; 9.6)	<0.001	10.1 (9.4; 10.8)	0.008

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