

Spring 5-1-2022

Household Composition and Sugar-Sweetened Beverage Intake and Purchases among Low Wage Workers

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Household Composition and Sugar-Sweetened Beverage Intake and Purchases among Low

Wage Workers

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Acknowledgements

First and foremost, I would like to extend gratitude toward my thesis supervisor, Caitlin Caspi (ScD) who has facilitated the conduction of this undergraduate thesis project as well as my assistance on the research study she is spearheading as the principal investigator (The Wage\$ Study). This work familiarized me with coding and categorizing datasets. Along multiple steps of this journey, I have received encouragement and beneficial critiques that have improved my understanding of the scientific method. As a student researcher, I was able to gain insight into the field of public health, as well as the real-world implications for those being studied.

Secondly, I would not have gathered the courage to seek out a thesis supervisor or pursue this rigorous endeavor without the guidance of my academic advisor, Cheryl Eckert. Although my academic career never wavered, the pandemic certainly took a toll on my expectations like millions of other college students.

Thirdly, I would like to thank the Allied Health Sciences Department within the College of Agriculture, Health, and Natural Resources for fostering environments in which honors students such as myself feel comfortable enough to explore a multitude of research opportunities. It was truly an unforgettable experience that adds on to my list of achievements made possible by the support of the AHS department.

Abstract

Sugar-sweetened beverages (SSBs) are linked to preventable chronic health conditions that low-income individuals are susceptible to. The Centers for Disease Control and Prevention (CDC) reports that American adults consume 145 daily calories from SSBs even though the American Heart Association (AHA) recommends 100-150 total calories of added sugar per day. The present study investigated SSB intake and purchases from a cohort of low-wage workers (N = 434) in different household (HH) types. HH composition was designated as “Households with children,” and “Households without children,” based on self-report. SSB consumption was measured on a 3-item Food Frequency Questionnaire (FFQ), summed, and converted into daily servings. SSB purchases were measured by food receipts collected over 2 weeks and calculated as dollars spent per household member. A Mann-Whitney U test determined differences between HH types for consumption and per person purchase of SSBs, with the median spending for HH with children being \$1.69 more than HH with no children ($p < 0.001$). There were no statistically significant differences in the daily servings of SSBs consumed by participants ($p = 0.065$), although the median serving for HH with children was 0.24 more than HH without children. SSBs comprised a greater percent of food receipt costs for HH with no children (4.91%, $p < 0.001$). Overall, the presence of HH children was associated with less per person spending on SSBs, but minimally related to SSB consumption in this sample.

Keywords: Sugar-sweetened beverages, household composition, low-wage, individual purchase

Household Composition and Sugar-Sweetened Beverage Intake and Purchases among Low Wage Workers

Sugar sweetened beverages, also known as SSBs, have gained both global and domestic popularity throughout the decades. They are seen by many living outside and within the United States of America as a staple of the Western diet and are reflected in current dietary patterns. Effective marketing and strategic placement of sugary beverages in communities of lower socioeconomic status (Caspi et al., 2016) have contributed to heightened sales in the latter half of the 20th century. Although recent studies have found a slight decrease in American SSB consumption following a plateau from 2005-2012 (Healthy Food America, 2017), the difference was not significant leading to a minimal reduction in calories from SSBs. The 2020-2025 Dietary Guidelines recommends that added sugars account for 10% of total energy, yet male and female adults aged 19-29 exceed the limit by 59% (348kcal) and 63% (233kcal) (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020). This comes as no surprise considering that one 12 oz soda contains almost as much added sugar as the daily recommended limit.

SSBs are defined by the CDC as drinks that are sweetened with substances such as high fructose corn syrup, maltose, and other forms of added sugars. Examples of drinks falling into the category of SSBs include coffee, energy drinks, and sports drinks. According to the CDC (2021), rates of consumption vary by geography, such that 59% of adults in the Midwest and 67% of adults in the South drank SSBs 1+ times a day from 2013-2017. Unfortunately, SSBs are linked to an increased risk of preventable health conditions like cardiovascular disease and Type II diabetes (Malik & Hu, 2019). Furthermore, there is a subsequent impact on healthcare, as 30-40% of healthcare expenditures in the United States are related to excess sugar consumption

(Natella et al., 2013). It is evident that SSBs are taking a toll on both the health and medical spending of Americans, particularly those of lower income (Healthy Food America, 2018).

Data from the 2005–2008 National Health and Nutrition Examination Survey demonstrated that individuals of lower income consume more sugary drinks in their diet compared to their higher income counterparts (NHANES, 2019). The prevalence of SSB consumption in low-income households or in households with low wage laborers has also been studied in metropolitan areas. For example, the *Healthy Aging in Neighborhoods of Diversity across the Lifespan* study found that 17-20% of low to middle income adults' daily caloric intake consisted of sweetened beverages in Baltimore (Kuczmarski et al., 2010). Meanwhile, in New York over 25% of residents consumed more than one can of soda per day. Socially disadvantaged demographic groups who are also heavily affected by obesity showed the greatest prevalence of SSB consumption (Rehm et al., 2008).

Detrimental health behaviors (e.g., frequent consumption of sugary beverages) are often correlated with factors outside of an individual's immediate control. Such factors, referred to as social determinants of health (SDoH), play key roles in the decisions that individuals make. They include five main domains that contribute to various health outcomes: (1) Health Care Access and Quality, (2) Economic Stability, (3) Education Access and Quality, (4) Neighborhood and Built Environment, and (5) Social and Community Context (U.S. Department of Health and Human Services, 2021). Access to healthy food options, attainment of higher education, safe housing, income, discrimination, and provider availability are just a few examples of social determinants that influence health outcomes. They have been shown to contribute to disparities, especially among minorities who reside in neighborhoods with low access to nutritious foods or healthcare (U.S. Department of Health and Human Services, 2020). In a report compiled by the

World Health Organization (WHO), researchers highlighted psychological, social, and economic factors that affect people over the span of their lives. Lifestyle and living conditions made up the largest percentage of social health determinants (Wilkinson & Marmot, 2003). They are also the most changeable factors given proper resource allocation and knowledge.

Theories and models such as Urie Bronfenbrenner's socio-ecological model (Bronfenbrenner, 1979) describe plausible reasons for engagement in unhealthy behaviors. It depicts systems at multiple levels extending outwards from the individual at the center. It starts at the microsystem, or the social network which includes direct interpersonal relationships. Next is the mesosystem, which includes interactions in the environment such as school or work. The exosystem exerts influence on the individual (E.g., the community or social networks). The macrosystem includes social norms and cultural values. Lastly the chronosystem describes changes over time and includes government policies. The microsystem is the strongest and closest system that influences individual behavior, regardless of age. When considering the immediate factors that fall into a microsystem, family and close friends tend to comprise this category. Therefore, household composition, a measure describing the characteristics of a household, is also a strong determinant of individual behavior. It can be defined as the presence of adults and children in a single dwelling. However, little research has been conducted on the relationship between household composition, particularly the presence of children in a household, and individual adult behavior. In the context of sugar sweetened beverages, little is known about the influence of household composition on individual adult consumption.

In contrast, several studies have explored the influence that children have on the household purchase of sugar sweetened beverages. Children are one of the most targeted audiences for sugary beverage companies. According to Healthy Food America (n.d.), as much

as \$1.8 billion is spent on marketing towards children. Children may be able to dictate the contents of a fellow household member's shopping cart, such that the food purchased reflects HH consumption rather than individual adult consumption. There is a high chance that children participate in activities or athletics and require beverages like Capri Sun or Gatorade to recharge their energy (Healthy Eating Research, 2021). Children also tend to request sweet drinks because of widespread availability and evolutionary preference starting from the prenatal environment (Mennella et al., 2016). The current food environment encourages a high sugar diet, but adults living in households with children may not be consuming all the sugary beverages they purchase.

A study conducted by Lora et al. (2016) sought to connect the feeding styles of low-income parents and children's influence on food purchases. Although the study highlights the influence of children on purchase behavior, it focuses on parental responsiveness rather than parental consumption. Parental responsiveness to the requests of children was associated with increased SSB purchases following a child's suggestion when co-shopping. The study contained several acknowledged weaknesses including a lack of objective measure for children's influence on SSB purchase, no calculations of sample size, and dietary recall based on one day of food intake. However, the use of empirical data as well as a validated measure of feeding style were strong suits. Overall, the study contributed to the topic of child influence on adult SSB purchase, but with little mention of adult consumption.

Choi et al. (2021) have also conducted research on the relationship between the presence of household children and sugary beverage purchases. They examined the purchases of specific SSBs such as flavored water, sweetened fruit drinks, and unsweetened fruit drinks as a comparison. They assessed purchase differences among households of differing income levels. The data showed that low-income Black and Hispanic families were more likely to purchase

SSBs. In addition, TV advertising disproportionately influenced SSB purchase in low-income households. Overall, households with young children purchased three times the number of ounces of fruit drinks as unsweetened fruit drinks. The study recruited a large sample and took detailed longitudinal data from 2006-2017. The study is important in that it references income and SSB purchase behaviors. Unfortunately, an indirect connection is made to the influence of children on SSB purchase behavior as it focuses on TV marketing. Furthermore, the researchers did not measure who consumed the marketed beverages within each household.

Prior literature has minimally explored the influence that children have on adult consumption. Murray (2017) is one of few researchers to question whether there is an association between dietary intake of SSBs, and the presence of children in a household. A cross-sectional study based on NHANES data using multistage probability samples showed a significant difference in dietary intake between adults in a household with children vs. without children. The presence of young children in the home resulted in higher adult intake of SSBs and lower intake of fruits compared to the presence of older children. Limitations include self-reported dietary intake subject to recall bias, nonstandard food categorization groups, potentially misreported demographic characteristics, and noncausal conclusions. Strengths of the study include a stratified sample that is representative to the U.S. adult population, and large data collected on subpopulations to examine differences between racial/ethnic groups. Similar research has delved into sugar sweetened beverage consumption by adults with children in the household (White et al., 2018). Figures showed that 44.1% of Oklahoman adults with at least one child under the age of 18 in their home consumed 1 or more SSBs daily. Low education attainment was strongly associated with increased SSB consumption. Despite the lack of comparison to adults without

household children and probability of recall bias, this study provides meaningful data that highlights the strength of interpersonal influence on individual behavior.

There is a lack of research studies on the topic of household composition and adult behaviors related to SSBs. Few have found notable differences between the two demographic groups. Additionally, the current literature possesses gaps in that limited connections have been made between the following variables: (1) Per person spending on SSBs and (2) Consumption of SSBs. Therefore, the purpose of this research is to investigate the association between household composition, household SSB purchases, and individual SSB consumption. The sample of interest consists of 434 low wage workers participating in the Wage\$ study, an observational cohort study conducted in the Twin Cities: Minneapolis, Minnesota and Raleigh, North Carolina. It is a natural experiment measuring changes in health outcomes as minimum wage incrementally rises to \$15/hour in Minneapolis, but not in Raleigh. Although this study is gathering data at 5 time points (T1-T5) for residents of both Minneapolis and Raleigh, our research will focus on the first time point (T1) because it was only in this year that participants saved and submitted two weeks' worth of household food receipts to the study team. We analyzed the per person amount spent on sugary beverages as well as the presence of children in the household. Participants also completed a survey on their dietary intake. This study focuses on the various sugary beverages purchased and consumed by low wage study participants and seeks to analyze differences in these behaviors across household types.

We evaluated the following descriptive hypotheses:

1. A participant living in a household with children would spend a greater amount on sugary beverages, per household member, compared to a participant living in a household without children.
2. A participant living in a household with children would show lower individual consumption of sugary beverages than a participant living in a household without children.
3. A participant living in a household with children would have a greater percentage of their receipt cost due to SSB purchases compared to a participant living in a household without children.

METHODS

Research design

The primary aim of this research was to investigate whether household composition was associated with both sugary beverage purchase and consumption amongst low wage workers from Minneapolis, MN and Raleigh, NC. I utilized baseline secondary data at one timepoint (T1 = 2018) from the ongoing observational Wage\$ study to conduct a quantitative analysis of the subset of participants who provided food receipts. Based on the results, I sought to determine which household type would be in greater need of tailored approaches for health promotion regarding sugary beverage intake. The Wage\$ study was approved by the Institutional Review Boards at the University of Minnesota and University of North Carolina in 2018. All participants provided verbal and written consent for participation in the Wage\$ study.

Participants

Wage\$ Study. Participants were all part of the larger Wage\$ Study (2018-present), which is testing whether minimum wage policy, as a social determinant of health, affects a range of health outcomes, with BMI as the primary outcome variable (Caspi et al., 2021). The Wage\$ Study follows a cohort of 974 low wage workers from two U.S. cities: Minneapolis, Minnesota (treatment condition, N = 495) and Raleigh, North Carolina (conceptualized control, N = 479). Researchers recruited this community-based sample of workers based on the following eligibility criteria: participants worked within one of the two cities that the study is conducted in, earned an hourly wage \leq \$11.50, worked \geq 10 hours a week, spoke English or Spanish as a primary language, and were at least 18 years of age. Participants were able to participate even if they were currently unemployed, as long as they provided proof of working at \leq \$11.50 in the 6 months prior and were actively looking for work at the study sites. Participants received \$70 in compensation for the completion of four tasks: a general participant survey, an objective height and weight measure, providing a verified pay stub or letter of employment (\$15) and submitting two weeks of household food receipts. Because only a subset of participants provided receipts, the current study drew upon the information provided by participants who had completed data on all key variables.

Sample Characteristics. The current study sample consisted of 235 participants from Raleigh and 199 participants from Minneapolis (N = 434). Participants from T1 were excluded under the following conditions: did not provide food receipts, did not complete a Food Frequency Questionnaire, did not list the presence or absence of children in their households, did not provide their household size, and did not provide responses about government assistance. Eligibility criteria matched the Wage\$ study such that all participants were at least 18 years old and were likely to be affected by a minimum wage increase in 2018.

Measures

Household composition. Participants from the sample of combined cities were stratified into one of two household type categories based on individual survey responses: HH without children, and HH with children. It is important to note that the presence of children did not always signify parenthood.

Food purchases. Participants were instructed to submit two weeks' worth of food receipts during T1, which served as a measure of the first primary variable: SSB purchase. The locations of food purchases were not limited to grocery stores, but also included gas stations, restaurants, pharmacies (e.g., Walgreens), and superstores (e.g., Walmart). After the Wage\$ research team uploaded and organized the receipt data into a secure database (REDCap), I coded over 14,790 food items purchased by individual participants as a summer intern at the UConn Rudd Center for Food Policy and Health in 2021. The 2017-2018 What We Eat in America (WWEIA) food categories fact sheet served as a guide for the coding project (Food Surveys Research Group, n.d.).

I used three main levels of categorization from WWEIA to separate other food items from the main category of interest: Beverages. The category consists of 100% Fruit Juice (Citrus Juice, Apple Juice, Other fruit Juice, Vegetable Juice), Coffee & Tea, Diet Beverages (Diet Soft drinks, Diet Sports and Energy Drinks, Other diet drinks), and Sweetened Beverages (Soft Drinks, Fruit Drinks, Sport and Energy Drinks, Nutritional Beverages, Smoothies and Grain drinks). I identified all Sweetened Beverages and Sweetened Coffee/Tea based on the product's sugar content. The AHA recommends no more than 36g and 24g of added sugars per day for men and women (Boston & Ma, 2013). Yet SSBs tend to contain an average of 35g of sugar per

12 oz serving (Malik et al., 2010). Consequently, beverages like Starbucks Frappuccino, Pepsi, and Kool-Aid were grouped together.

I summed the price of sweetened beverage items purchased by participants that provided receipts to obtain the per household sum. The per household sum was divided by the number of individuals living in the participant's household to determine the per person sum.

Occurrence of Consumption. Participants completed a 22-item Dietary Screener Questionnaire that inquired about foods or drinks that were consumed in a 30-day period. This served as a measure of the second primary variable: sum of SSB consumption. They were encouraged to include snacks or meals at home, work, and school. The screener was modified from 22 items to 3 items for the current study to specifically highlight sugar sweetened beverage consumption. Thus, they responded to the questions: (1) "During the past month (30 days), how often did you drink coffee or tea that had sugar or honey added to it? Include coffee and tea you sweetened yourself and presweetened tea and coffee drinks such as Arizona Iced Tea and Frappuccino. Do not include artificially sweetened coffee or diet tea." (2) During the past month (30 days), how often did you drink sweetened fruit drinks, sports or energy drinks, such as Kool-Aid, lemonade, Hi-C, cranberry drink, Gatorade, Red Bull or Vitamin Water? Include fruit juices you made at home and added sugar to. Do not include diet drinks or artificially sweetened drinks." (3) During the past month (30 days), how often did you drink regular soda or pop that contains sugar? Do not include diet soda. To which participants responded with "Never," "2 times per week," "4-5 times per day," or other options that best described their intake. Responses were linked to an 11-point scale, starting with "Never" = 1 and ending with " ≥ 6 times a day" = 11 as described in *Figure 2*.

I calculated the daily consumption of sugary beverages by converting the 11 Likert responses to daily values. Never was coded as 0. One-time last month, or 1 day out of 30, was coded as 0.03. In the case of a range, I divided the midpoint by 30. For example, 2-3 times last month = $2.5/30 = 0.083$. 1 time per week = 0.143, 2 times per week = 0.286, 3-4 times per week = 0.50, 5-6 times per week = 0.786, 1 time per day = 1, 2-3 times per day = 2.5, 4-5 times per day = 4.5, ≥ 6 times per day = 6. After assigning values, I summed the total consumption of SSBs per participant.

Proportion of receipt cost attributed to SSBs. I calculated the dollar amount spent on SSBs for each participant from the receipt data. Afterwards, I computed the percentage of the total receipt cost due to purchased SSBs.

Statistical approach

I conducted analyses using SPSS 28 Statistical Software. Baseline demographic statistics were collected from 434 participants stratified into HH with no children (N = 262) and HH with children (N = 172). We examined frequencies and percentages for household size, number of household adults, number of household children, sex, marital status, SNAP receipt, amount in SNAP benefits, income, race, and education, while age, BMI (kg/m^2), and verified hourly are presented as means and standard deviations. Medians are presented for SSB outcomes given the distributions, including many zeros and some high values for the SSB purchase variable.

The Kolmogorov-Smirnov and Shapiro-Wilk tests of normality determined that the distributions of ordinal-interval outcomes were not normal ($p < 0.001$) and thus required a nonparametric alternative. Although, the shapes of both groups were similar enough to perform a comparison of medians. For the primary analysis, I utilized the Mann Whitney U test to

determine group differences for the primary variables: per person SSB purchase and sum of SSB consumption. For the secondary analysis, I repeated the same approach to identify group differences for the secondary variable titled percent of receipt cost due to SSBs, due to abnormal distribution of the data. P-values that were below the alpha level of 0.05 were deemed statistically significant.

RESULTS

BASELINE DESCRIPTIVE STATISTICS

Within HH with no children, participants (N = 262) were 33.1% female, 26.2% male, and 0.2% nonbinary. The predominant race within the sample was Non-Hispanic Black (N = 179, 41.1%), followed by Non-Hispanic White (N = 63, 14.5%), Non-Hispanic Other (N = 9, 2.1%), Hispanic (N = 5, 1.1%), and Non-Hispanic Asian (N = 2, 0.5%). Most participants received a High School Diploma or GED (N = 92, 21.1%) with 15.2% receiving an Associate's/Technical degree (N = 66), 32 completing less than high school (7.4%), 32 receiving a bachelor's degree or higher (7.4%), and 38 completing some college (8.7%). The average monthly income of 62 participants amounted to less than \$500 (14.3%). While 167 made \$501 to \$1500 (38.4%), 29 made \$1501 to \$2500 (6.6%) and 2 made over \$2500. More than half (52.6%) of the group was single (N = 229), while 6.9% were married or partnered (N = 30). In total, 121 reported receiving government aid in the form of SNAP benefits in the past 30 days (27.8%), while 138 did not receive assistance (31.7%). Roughly one third of the group (30.1%) received \$0 in benefits, 4.6% received \$1-25, 8.0% received \$26-150, and 72.0% received \geq \$151. Over a third (33.6%) of HH with no children contained 1 adult (N = 146), 25.7% contained 2 to 4 (N = 112), and 0.9% contained \geq 5 (N = 4).

EXAMINING SSB INTAKE VS. PURCHASE IN ADULTS BY HH

Within HH with children, participants (N = 172) were 29.0% female, 10.0% male, and 0.2% nonbinary. The group was predominantly Non-Hispanic Black (N = 121, 27.8%), followed by Non-Hispanic White (N = 19, 4.4%), Non-Hispanic Other (N = 16, 3.7%), Hispanic (N = 15, 3.4%), and Non-Hispanic Asian (N = 1, 0.2%). Most participants received a High School Diploma or GED (N = 69, 15.9%) with 11.5% receiving an Associate's/Technical degree (N = 50), 28 completing less than high school (6.4%), 13 receiving a bachelor's degree or higher (3.0%), and 10 completing some college (2.3%). The average monthly income of 39 participants was less than \$500 (9.0%). In addition, 107 made \$501 to \$1500 (24.6%), 23 made \$1501-2500, and 1 made more than \$2500 (0.2%). Over one third (31.7%) of the group was single (N = 128), while 7.6% were married or partnered (N = 33). In total, 110 reported receiving public assistance in the form of snap benefits in the past 30 days (25.3%), while 58 did not receive assistance (13.3%). The percentage of those who received \$0 in benefits was 14.9% (N = 65). While 1.1% received \$1-25 (N = 5), 5.7% received \$26-150 (N = 25) and 17.2% received \geq \$151. There were 52 participants (12.0%) who lived in a HH with no other adults, 117 (26.9%) in a HH containing 2 to 4 adults, and 3 (0.7%) in a household containing \geq 5 adults. There were 156 households with 1 to 3 children present (35.8%), and 15 with 4 or more (3.4%).

The mean ages for HH with no children (N = 262) and HH with children (N = 172) were respectively 46 (SD = 13.5) and 37 (SD = 11.9). The average BMI (kg/m²) was 30.5 (SD = 7.5) for those in HH with no children (N = 262) and 31.5 (SD = 8.7) for those in HH with children (N = 172). Lastly, 233 participants in HH with no children reported a verified hourly wage of \$9.88 (SD = 1.9), while 148 participants in HH with children reported a verified hourly wage of \$9.95 (N = 1.17). Descriptive statistics for the enrolled sample are listed in *Table 1*.

Primary outcomes. The median per person SSB expenditures for HH with and without children were respectively \$1.58 and \$3.27. The average per person SSB expenditure for HH with and without children were respectively \$3.36 and \$5.77. The means were expectedly higher than the medians because few people spent a large amount on SSBs. A total of 14.1% of adults in HH without children spent \$0 on SSBs and the same is true for 12.8% of adults in HH with children. There was a statistically significant difference between the two groups ($U = 17454$, $Z = -3.98$, $p < 0.001$). Those in HH without children spent \$1.69 more on SSBs. The median daily serving of SSBs consumed for HH with and without children were respectively 1.22 and 0.98, while the average daily servings consumed were 1.75 and 1.50. However, there was no significant difference between the groups ($U = 24893.5$, $Z = 1.85$, $p = 0.07$).

Secondary outcome. The median percent of receipt total due to SSBs was 4.91% for HH without children and 2.75% for HH with children. While the averages for HH with and without children were respectively 5.10% and 8.88%. The means were also higher than the medians for this outcome due to few people spending large amounts on SSBs. There was a statistically significant difference between groups ($U = 17385.5$, $Z = -4.03$, $p < 0.001$). Refer to *Table 4* and *Figures 7 to 11*.

DISCUSSION

This study tested the hypothesis that a participant living in a household with children would spend a greater amount on sugary beverages, per household member, compared to a participant living in a household with no children. The results did not support this hypothesis. There was a statistically significant difference between the household composition groups such

that participants in HH with children spent an average of \$2.41 less on SSBs. Additionally, the proportion of each receipt total due to SSBs was smaller among those with no children.

This study also tested the hypothesis that participants living in a household with children would show lower individual consumption of sugary beverages than a participant living in a household without children, because an individual could be purchasing for others when children are present compared to when they are absent. This was unsupported by the findings. Although participants in HH with children consumed 0.24 more daily servings than HH without children, there was no statistically significant difference between the groups.

IMPLICATIONS

Households with no children. In terms of the implications of households with no children, it is evident that, on a per-person basis, they spend a greater dollar amount and proportion of their total food budget on sugar sweetened beverages compared to those with children. This could be due to less emphasis placed on couponing (Noble et al., 2017), and the frequent purchase of drinks marketed to adults (E.g., customized coffees from chain stores). It is unclear why those who spend more money on sugary beverages consume slightly less than those who spend less on sugary beverages. One potential reason could be purchasing brand name items rather than store brand items, which tend to be cheaper.

Households with children. In terms of the implications of the results found for households with children, they spent less on SSBs per person than those without children. The case could be that these individuals purchased more bulk items on sale and thus spent a smaller dollar amount per person (Food Surveys Research Group, n.d.). Coupon clipping is also known to be a popular practice among this household composition group. However, the number of

beverages purchased was not examined through statistical analysis (only the dollar amount). It is only known that per-person spending on SSBs was higher among those living in households without children.

Households with and without children. Considering that there were no major differences in consumption of SSBs, but that sugary drink spending comprised a relatively high proportion of total food spending, this suggests the need for approaches for reducing SSB intake that address those with and without children. The study sample's consumption behaviors fell in line with the national average of drinking at 1+ SSB per day. Thus, highlighting the importance and necessity of a universal approach to reducing SSB consumption across all low-income American household types. It appears that the impact would be equal. For example, cities like Philadelphia, Pennsylvania have implemented 1-2% taxes on sugary beverages (per oz) to improve the nation's health outcomes (Bleich et al., 2020). Findings showed a significant decline in the volume (8.5oz) of taxed sugar sweetened beverage purchase per shopping trip regardless of household composition.

Study strengths and weaknesses

Areas of strength include the usage of objective measures such as food receipts submitted by participants, as well as sampling a unique set of participants at risk of chronic disease (Caspi et al., 2021). Limitations to the study include a lack of causation due to the quantitative nature. Based on the grounds that correlation does not imply causation, it would be inaccurate to claim that household composition causes unhealthy purchasing behaviors. There are also several uncontrolled confounding variables that could have contributed to the results, such as access to food pantries. Those in households with children may have obtained sugar sweetened beverages

without needing to pay assuming that they were eligible for local food shelves or pantries. This could have driven the low per person expenditure compared to participants in households without children. A second confounding variable might have been free national school breakfast and lunch programs for participants in households with children. A third confounding variable could have been proximity to independent small stores or bodegas with limited varieties of healthy drink alternatives. Depending on state and city, some schools provide households with bags of food including nutritional juices and similar beverages. Thus, eliminating the need for purchase of sugar sweetened beverages at stores. Another limitation includes social desirability bias. It is acknowledged that asking participants to present evidence of purchase or consumption may influence their habits. It is also important to note that participants could have felt pressured to provide a daily value that researchers would like to hear. One method to mitigate this includes conducting a follow up questionnaire and taking the average of the two responses. Moreover, I did not analyze coupons applied to the receipt costs which would have provided evidence for the claim that households with children save more when buying in bulk.

CONCLUSION

In summary, our predominantly Black sample of low-wage workers showed divergent consumption patterns from my hypothesis and from some lines of research in the marketing and nutritional world. In example, some suggested that the presence of young children increases adult SSB consumption (Murray, 2017). Spending patterns also deviated from expectations in that those with HH children spent less on SSBs than those without. Additionally previous research has posited that this demographic is more likely to purchase SSBs (Choi et al., 2021), likely due to targeted marketing towards minoritized youth.

To improve this public health concern, future research should study the effects of policies, such as long term SSB tax implementation, on individual health. Individuals who typically spend more on SSBs could choose to increase their expenditure to keep up with their former purchasing habits or turn to healthier alternatives with lower taxes. It is also necessary to continue investigating the habits of those in varying household compositions to implement better programs and policies addressing the problem of SSB consumption and its effects on health. Although this sample did not present with significant group differences for consumption, it is possible that other samples will. Through repetition of procedures, and the creation of reproducible results, we may achieve preventing the chronic illnesses associated with SSBs in low-income adults.

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Figure 1.

Theorized model of household composition's interactive flow

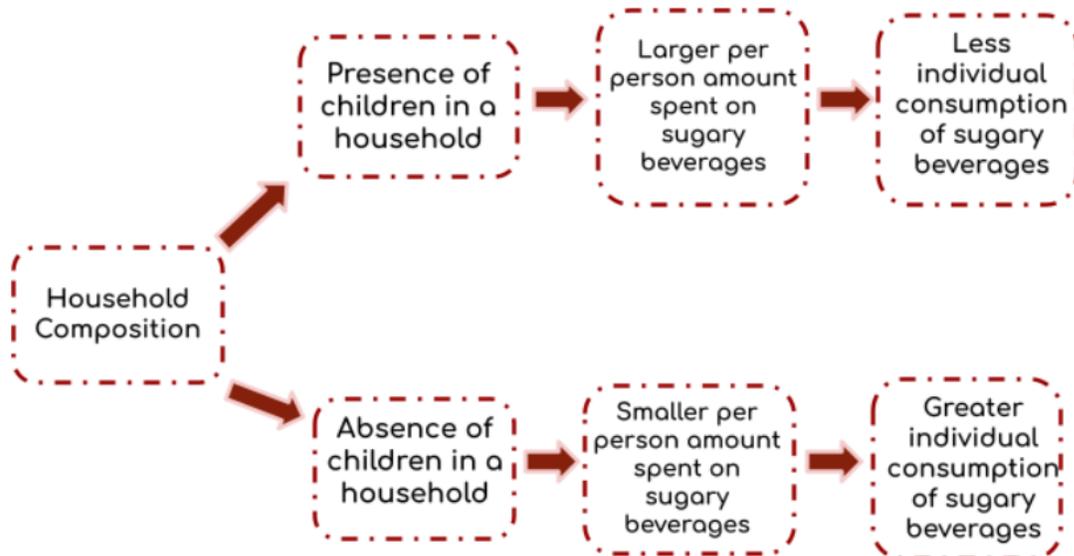


Figure 1. Diagram of proposed hypotheses relating household composition to SSB purchases and intake among study participants

Figure 2.

Modified 3-Item FFQ conducted at timepoint 1 (T1)

During the past month (30 days), how often did you drink regular soda or pop that contains sugar? Do not include diet soda.

- Never 1 time last month
 - 2-3 times last month
 - 1 time per week 2 times per week
 - 3-4 times per week 5-6 times per week
 - 1 time per day
 - 2-3 times per day 4-5 times per day
 - 6 or more times per day
-

Figure 2. Dietary Screener Questionnaire using an 11-point Likert Scale denoting occurrence of consumption.

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Table 1.

Descriptive statistics on basic characteristics of the combined study sample (Raleigh and Minneapolis)

Sample Characteristics	HH without children		HH with children	
	Frequency (N)	Percent (%)	Frequency (N)	Percent (%)
Sex				
Male	114	26.2	45	10.3
Female	144	33.1	126	29.0
Nonbinary	1	0.2	1	0.2
Marital Status				
Married/Partnered	30	6.9	33	7.6
Single	229	52.6	128	31.7
Average monthly Income (\$)				
Less than \$500	62	14.3	39	9.0
\$501 to \$1,500	167	38.4	107	24.6
\$1,501 to \$2,500	29	6.6	23	5.3
More than \$2,500	2	0.5	1	0.2
Race				
Hispanic	5	1.1	15	3.4
Non-Hispanic White	63	14.5	19	4.4
Non-Hispanic Black	179	41.1	121	27.8
Non- Hispanic Asian	2	0.5	1	0.2
Non-Hispanic other	9	2.1	16	3.7
Education				
Less than high school	32	7.4	28	6.4
High School Diploma/GED	92	21.1	69	15.9
Some college	38	8.7	10	2.3
Associate's/Technical degree	66	15.2	50	11.5
Bachelor's degree or higher	32	7.4	13	3.0
SNAP Amount (\$)				
\$0	131	30.1	65	14.9
\$1-25	20	4.6	5	1.1
\$26-150	35	8.0	25	5.7

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\$≥151	72	72.0	75	17.2
SNAP Receipt				
Yes	121	27.8	110	25.3
No	138	31.7	58	13.3
Household size				
1	139	32.0	5	1.1
2-4	113	26.1	123	28.3
≥5	10	2.2	43	9.9
Household adults				
1	146	33.6	52	12.0
2 to 4	112	25.7	117	26.9
5 or more	4	0.9	3	0.7
Household children				
0	262	60.3	0	0
1 to 3	0	0	156	35.8
4 or more	0	0	15	3.4

Note. The percentages displayed in this table incorporate the missing values of each characteristic and therefore do not total 100.

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Table 2.

Means of the described sample's age, BMI (kg/m²), and verified hourly wage (\$).

Variables	HH without children			HH with children		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Age	262	46	13.50	172	37	11.86
BMI (kg/m ²)	262	30.48	7.52	172	31.49	8.74
Verified Hourly wage (\$)	233	9.88	1.89	148	9.95	1.17

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Table 3.

Test of significance between Household Composition Groups for the primary SSB variables:

Per person SSB expenditure & Sum of SSB consumption

Household Type	Per person SSB expenditure in U.S. dollars		Sum of SSB consumption in servings per day	
	No children	Children	No children	Children
N	262	172	262	172
25 th Percentile	1.00	0.55	0.29	0.50
Median	3.27	1.58	0.98	1.22
75 th Percentile	7.84	4.46	2.03	2.56
P Value	< 0.001		0.065	

Table 4.

*Test of significance between household composition groups for the secondary SSB variable:
percent of receipt cost due to SSBs*

Percent of receipt cost due to SSBs, in U.S. dollars		
Household Type	No Children	Children
N	262	172
25 th Percentile	1.80	1.04
Median	*4.91	*2.75
75 th Percentile	11.26	6.00
P Value	< 0.001	

Note. The asterisk indicates a significant difference between the medians of those in households without children, and those in households with children.

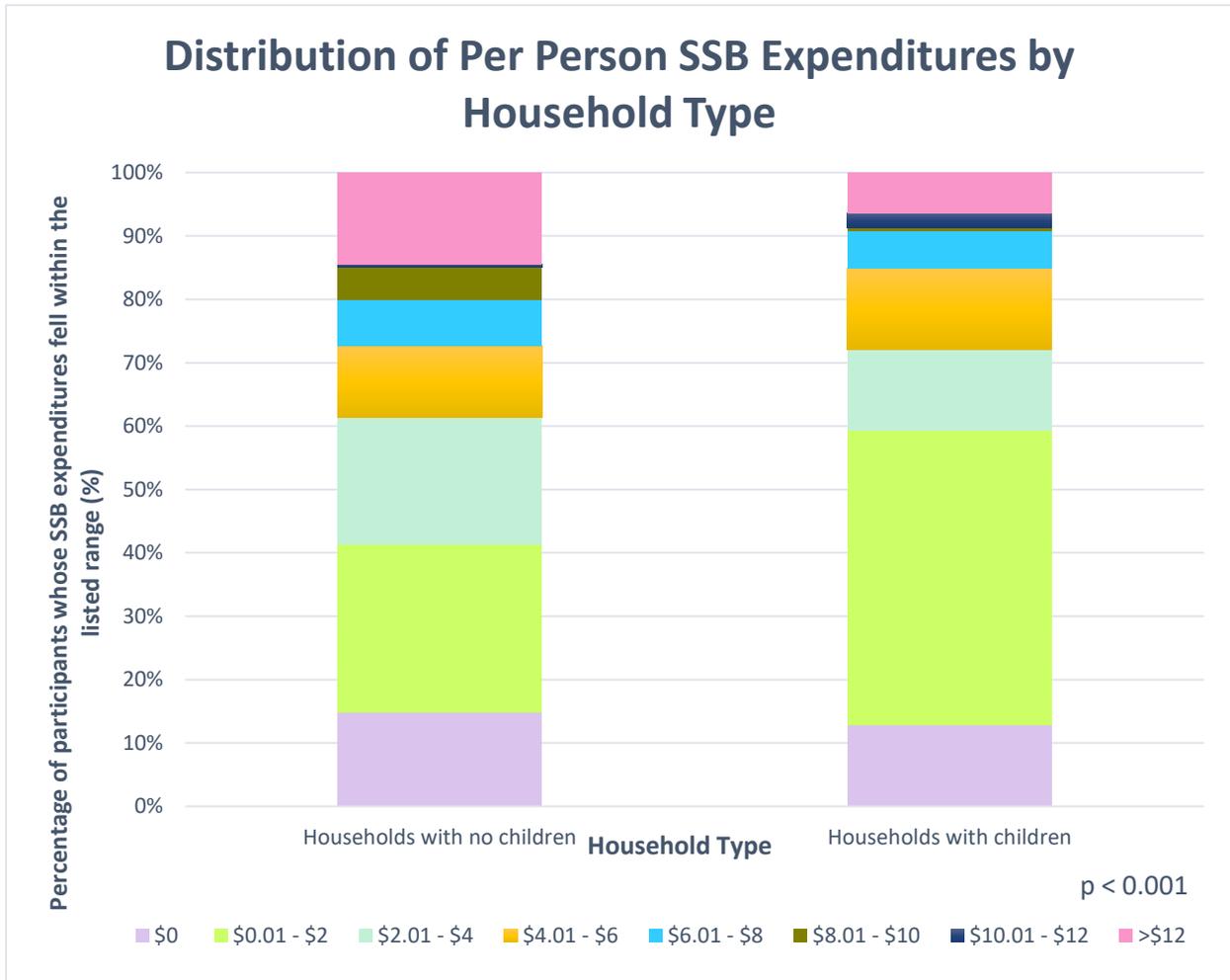


Figure 3. Per person spending accounting for household size from 2 weeks of food shopping receipts. The percent of participants who fell within each spending category are listed on the y-axis, while household type is listed on the x-axis.

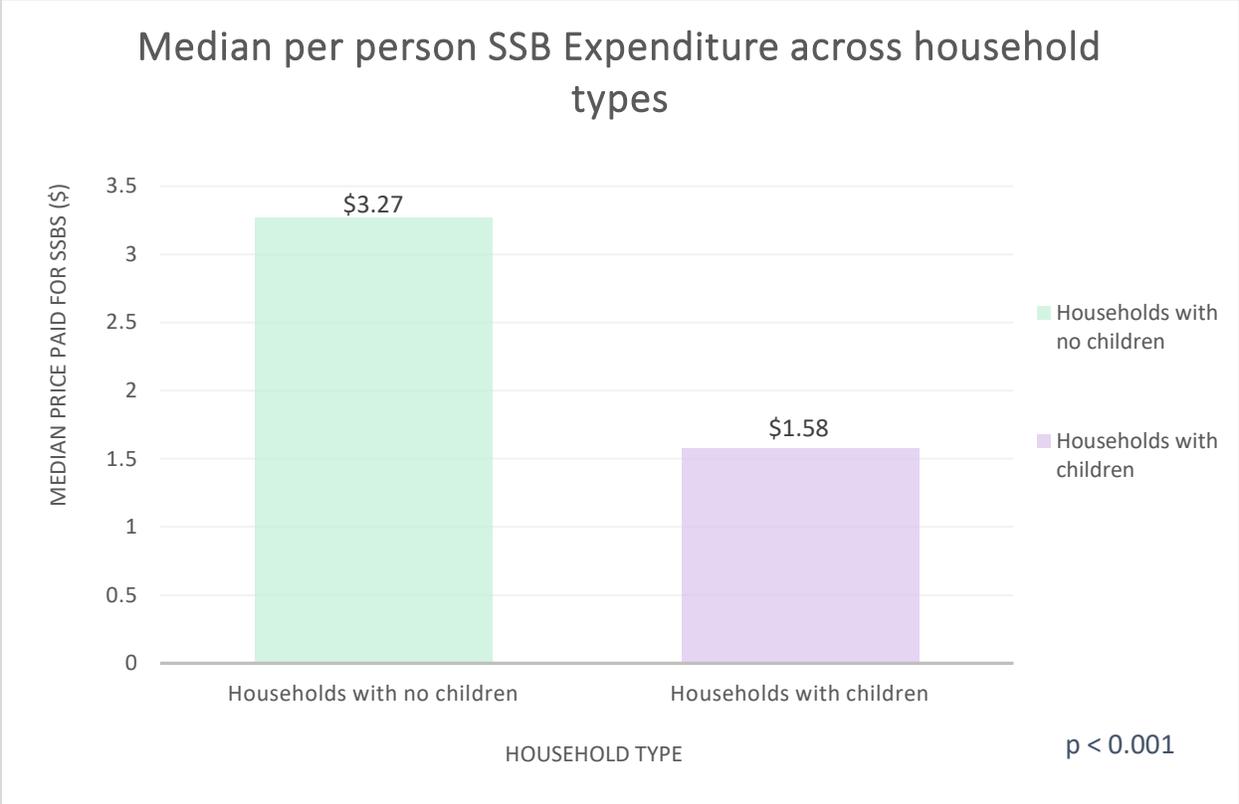


Figure 4. Median spending amount for the sum of SSBs purchased by study participants according to household type.

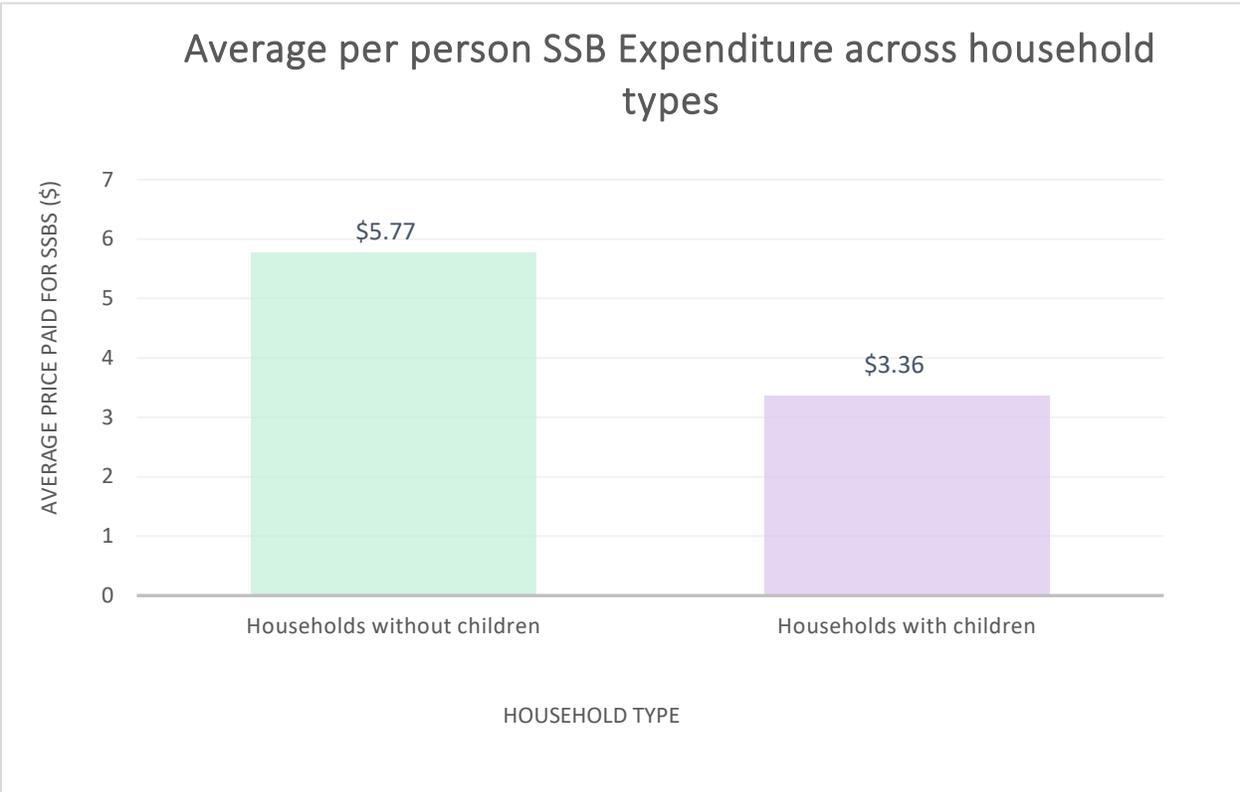


Figure 5. Average price amount for the sum of SSBs purchased by study participants according to household type.

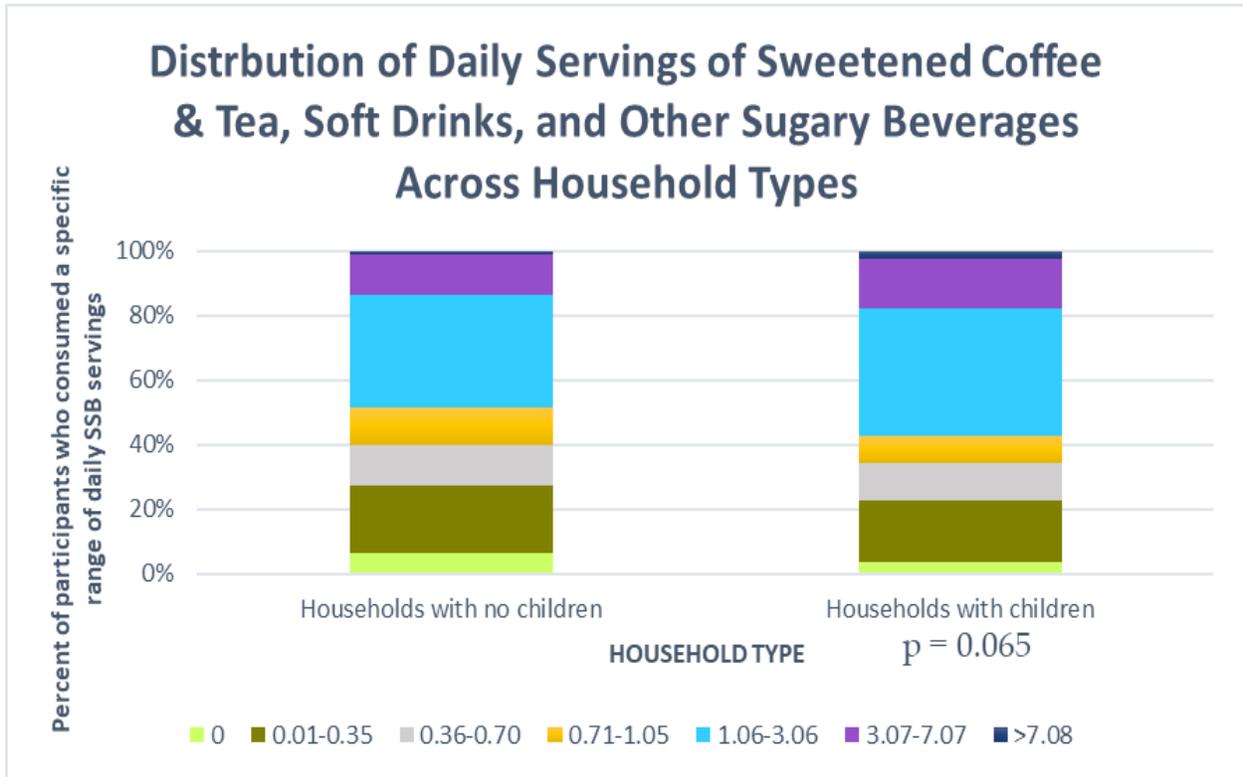


Figure 6. Percent who report consuming each range of SSB servings across households with and without children.

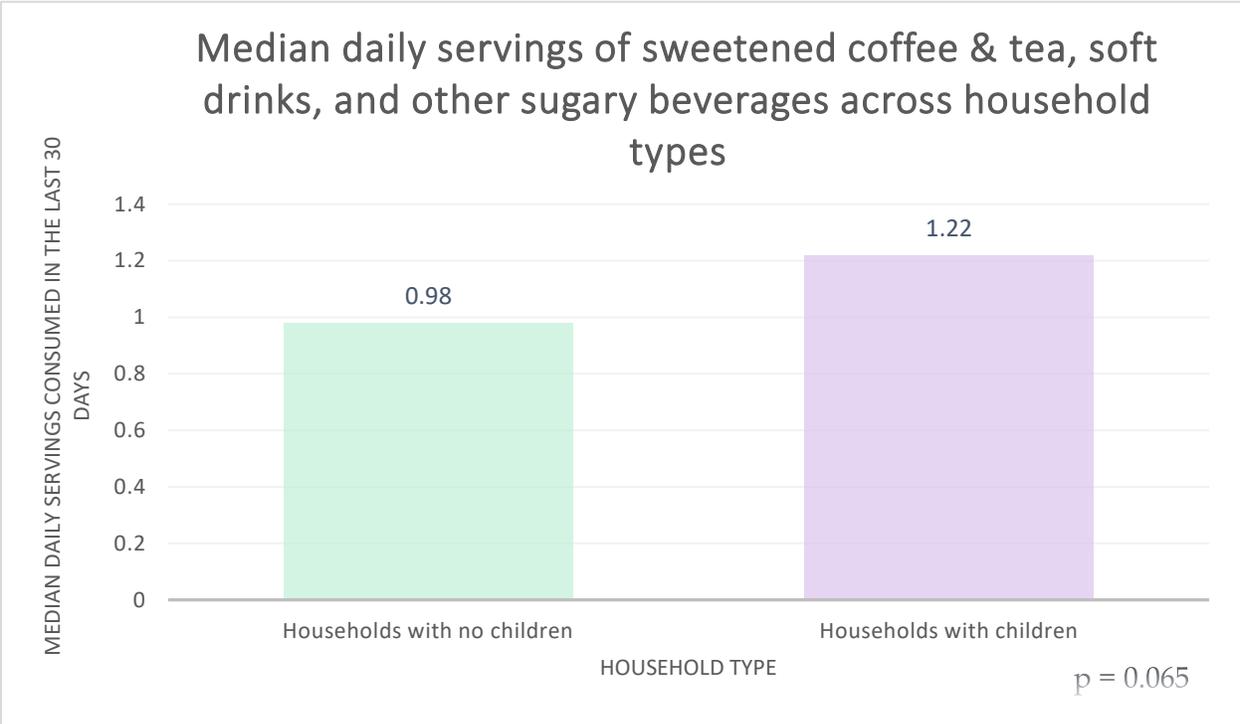


Figure 7. Median consumption of SSBs by individual participants over a 30-day period.

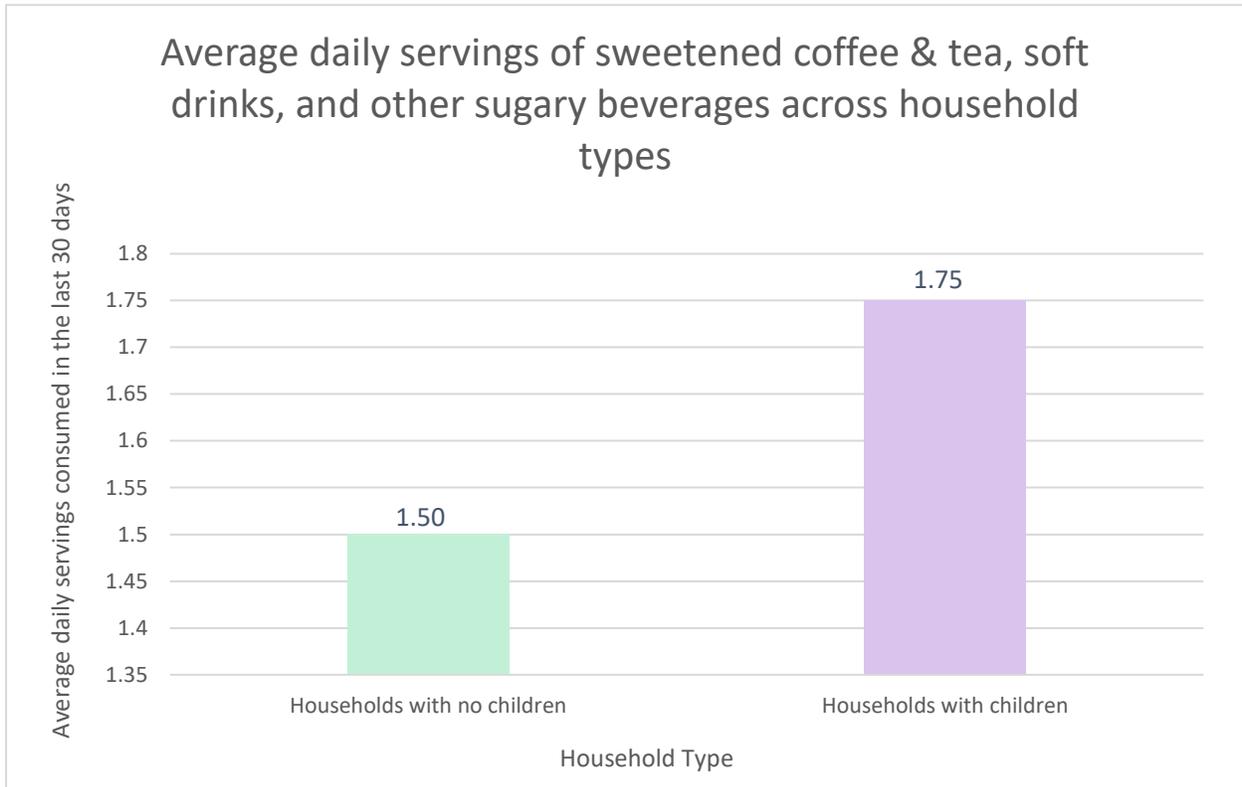


Figure 8. Average consumption of SSBs by individual participants over a 30-day period.

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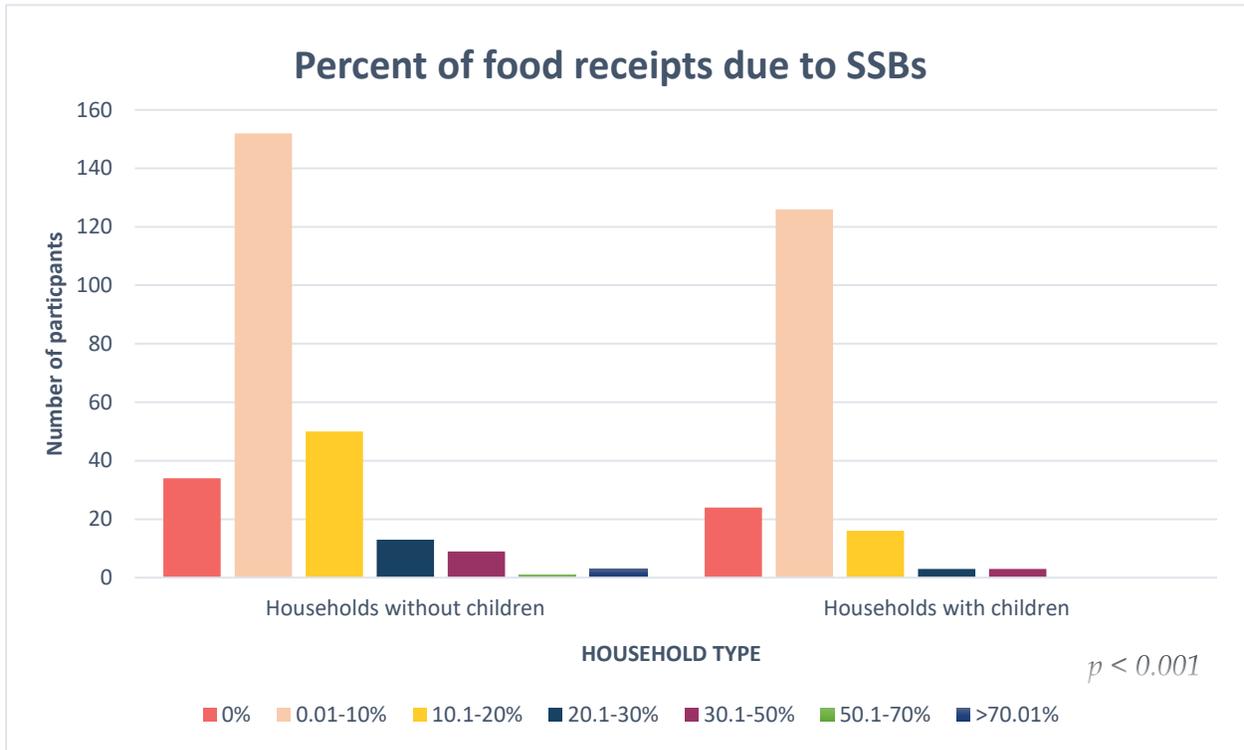


Figure 9. Percent of food receipt cost prompted by the purchase of sugar sweetened beverages.

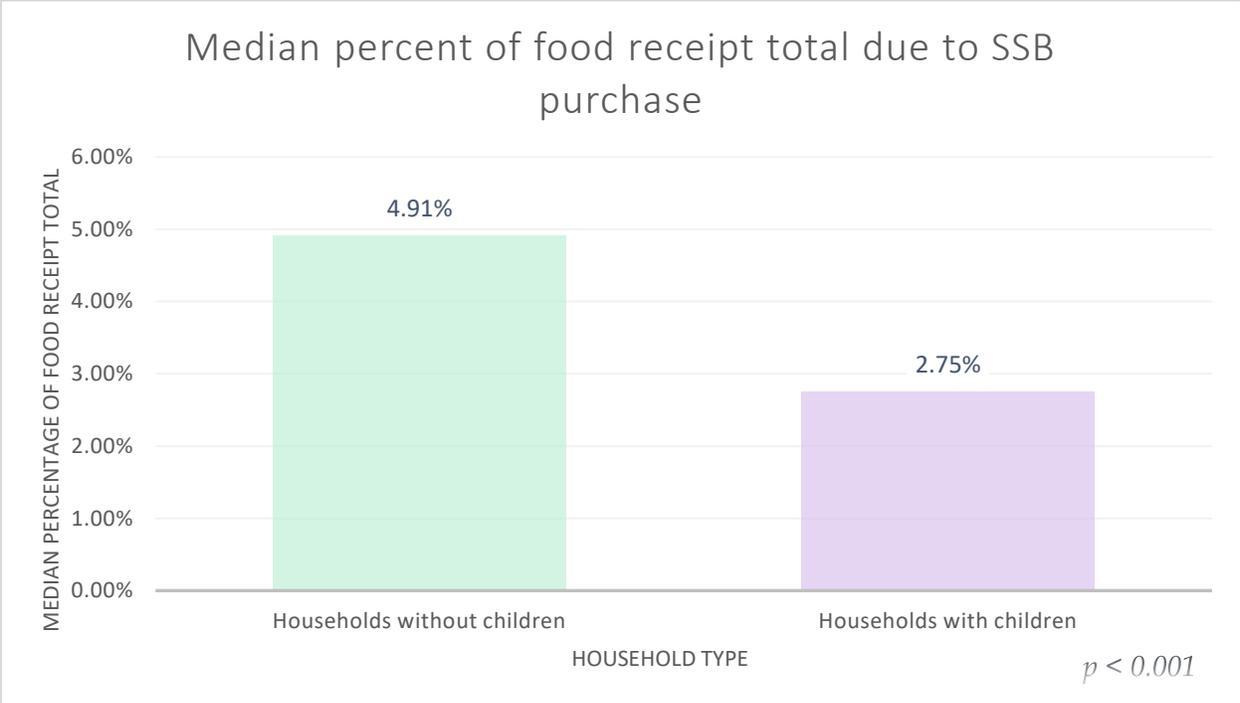


Figure 10. Median percent of food receipt total due to SSB purchase by household participants.

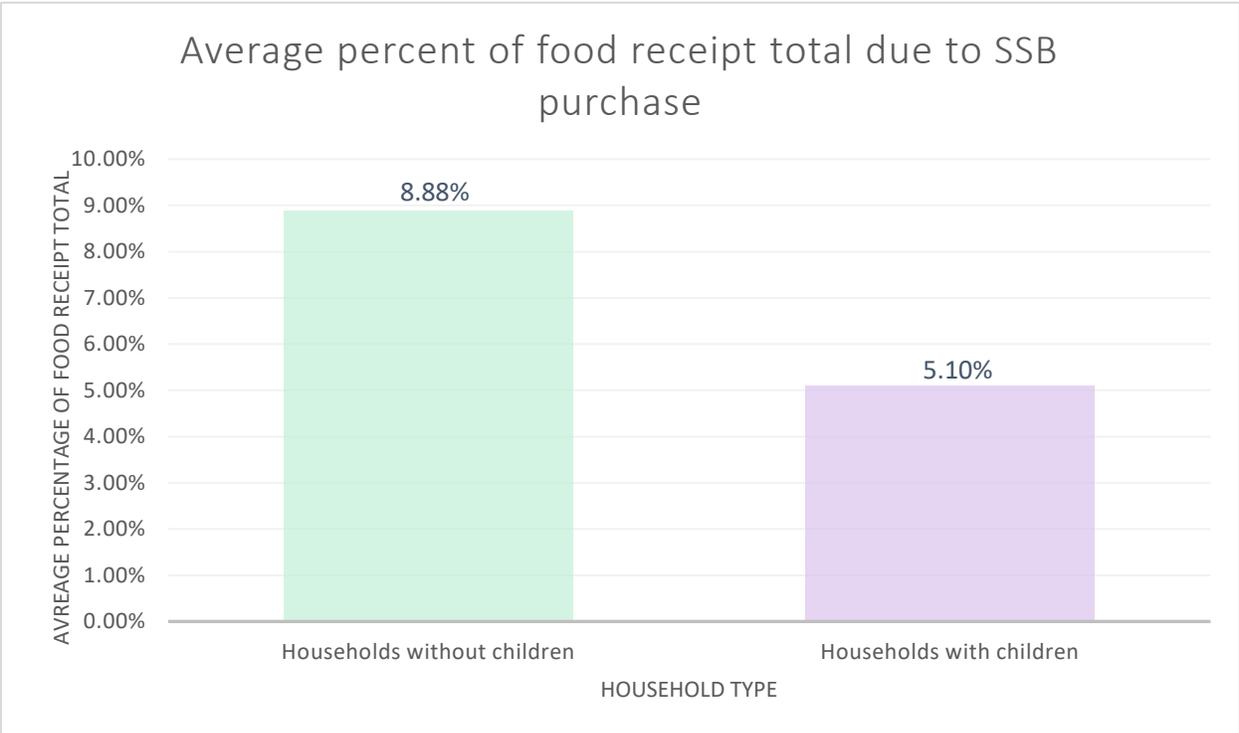


Figure 11. Average percent of food receipt total due to SSB purchase by household participants.