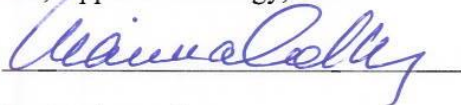


**Approval Sheet**

Title of Thesis: Analysis of Sugar-Sweetened Beverage Purchases by Supplemental  
Nutrition Assistance Program Participants

Name of Candidate: Andrés P. Romualdo

Master of Arts, Applied Sociology, 2016

Thesis and Abstract Approved: 

Dr. Marina Adler

Professor and Graduate Director

Department of Sociology, Anthropology and Health

Administration and Policy

Date Approved: 11-28-16

## **Abstract**

The Supplemental Nutrition Assistance Program (SNAP) provides millions of low-income households with much needed supplemental income to purchase food. Under current rules, SNAP allows the majority of food products, including sugar-sweetened beverages (SSBs), to be purchased using SNAP benefits. However, SSB consumption is linked to obesity, diabetes, and other negative health outcomes. Previous research shows that low-income households consume more SSBs than higher income households.

Research findings comparing SSB consumption and acquisition of SNAP participants and non-SNAP participants have been mixed. The current study examines differences in expenditures on SSBs among three groups: SNAP households using their SNAP benefits for SSP purchases, SNAP households not using their SNAP benefits, and non-SNAP households. The top ten beverage purchases were compared among the three types of households. SSBs made up the majority of purchases for SNAP households using and not using their SNAP benefits. The study also compares the two types of SNAP households directly, using data of point-of-sale (POS) beverage transactions. The data set includes transactions at various venues from nearly 26.5 million households captured from January 1 through December 31, 2011 across 32 states. Two sample t-tests were conducted to explore the differences in SSB acquisition across household and store level characteristics. Results show that SSB purchases differed significantly between the two types of SNAP household. Average SSB expenditures of SNAP households using SNAP benefits were statistically significantly higher than the average non-benefit transactions of SNAP households. This pattern remained the same when taking store location in various regions of the country, urbanicity, and high poverty areas into account. In addition, while the pattern held for poverty households, no difference in expenditures was found between

non-poverty SNAP households. The differences between households were also not statistically significant when the age of head of household is over 45 and when the presence of children was included. Policies that increase access to healthy food and incentivize the purchase of healthy foods and nutritional education are needed to reduce SSB consumption in the US regardless of SNAP status.

*Keywords:* Supplemental Nutrition Assistance Program, sugar-sweetened beverage consumption, healthy food access, point-of-sale, Universal Product Code

Andrés P. Romualdo

Analysis of Sugar-Sweetened Beverage Purchases by Supplemental Nutrition Assistance

Program Participants submitted to the Faculty of the Graduate School of the

University of Maryland, Baltimore County in partial fulfillment

of the requirements for the degree of

Masters of Arts in Applied Sociology

2016

© Copyright

2016



## **Dedication**

Dedicated to my beloved mother, Jean E. Romualdo (September 3, 1946 to January 31, 2016). She is my inspiration and guiding spirit.

## **Acknowledgements**

I would like to acknowledge my committee chair, Dr. Marina Adler and my committee members: Dr. Nicole Cousin-Gossett, Dr. Samuel Kofi Ampaabeng, and Dr. J. Kevin Eckert. I would also like to thank IMPAQ International, LLC for providing me support throughout my thesis development and post-graduate program.



## Table of Contents

Introduction.....	1
Literature Review.....	2
Inequality and Food Access and Insecurity .....	2
Sugar-Sweetened Beverages and Health .....	5
What is SNAP? .....	6
SNAP Participation and Sugar-Sweetened Beverage Research .....	8
Methodology .....	10
Data Sources .....	11
Variables and Measures .....	12
Analyses .....	14
Results.....	15
Conclusion .....	19
References.....	35

## **List of Tables**

Table 1. Total Annual Expenditure on All SNAP Eligible Food and Beverage Items Transactions on by Household Type in 2011 .....	26
Table 2. Total Annual Expenditure on All Beverage Items Transactions by Household Type in 2011 .....	26
Table 3. Summary Statistics of Expenditures for all Beverages by Transaction Type and Household Type for all Universal Product Codes (N= 1028).....	27
Table 4. Frequencies of Purchases of All Beverage Categories by Beverage Guidance Category, all Universal Product Codes (N=1028) .....	27
Table 5. Percentage of all Beverage Expenditure by Beverage Guidance Category and Household Type .....	28
Table 6a: Top 10 Beverage Purchases, All Households .....	29
Table 6b. Top 10 Beverage Purchases, SNAP Households, SNAP Purchases.....	30
Table 6c: Top 10 Beverage Purchases, SNAP Households, non-SNAP Purchases .....	31
Table 6d. Top 10 Beverage Purchases, Non-SNAP Households.....	32
Table 7. Comparison of Average SNAP Household Benefit Transactions on SSBs with that of SNAP Households Non-Benefit Transactions by Store Location and Household Characteristics (N=234 UPCs).....	33

## **List of Abbreviations**

Electronic Benefits Transfer (EBT)

Food and Nutrition Service (FNS)

National Health and Examination Survey (NHANES)

Point-of-Sale (POS)

Socioeconomic Status (SES)

Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)

Sugar-Sweetened Beverage (SSB)

Supplemental Nutrition Assistance Program (SNAP)

Thrifty Food Plan (TFP)

United States Department of Agriculture (USDA)

Universal Product Code (UPC)

## **Introduction**

Research shows large disparities in diet quality between individuals of higher socioeconomic status (SES) and lower SES (Brown & Brewster, 2015; Darmon & Drewnowski, 2008; Darmon & Drewnowski, 2015; Drewnowski, A., 2009; Drewnowski & Rehm, 2015; Ranjit et al., 2015; Walker et al., 2010; Wang et al., 2014). The Supplemental Nutrition Assistance Program (SNAP) has the ability to reduce this disparity by providing supplemental income to over 45 million Americans (USDA FNS, 2015b) every year for the purchase of foods. However, under current SNAP policy, participants can purchase the majority of food products including sugar-sweetened beverages (SSB) with benefits. The consumption of SSBs has been linked to obesity, diabetes, cardiovascular disease, and metabolic syndrome (Bermudez, & Gao, 2010; Bray & Popkin, 2013; Malik et al., 2006; Qi et al., 2012; Sharkey et al., 2011). The ability to purchase SSBs using SNAP benefits has received public attention (Barnhill 2011; Brownell & Ludwig, 2011; Cuffey et al., 2015), particularly in terms of tax implications (Andreyeva et al., 2011; Barnhill, 2011; Basu et al., 2014; Pomeranz, 2015).

Research on SNAP item level purchases is limited as currently only one published study (Andreyeva, et al., 2012) examines the item level purchases of SSBs amongst SNAP participants compared to the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) participants. The current study expands upon the research of SSB purchases and SNAP by examining SNAP household expenditures on beverages within a continuous year. Specifically, the study examines the point-of-sale (POS; examples are supermarkets and corner stores) transaction data of nearly 11 million SNAP households from over 2,200 stores across 32 states made between January 1, 2011 and

December 31, 2011. This study compares the item level transaction data of beverages among three groups: SNAP household expenditures using SNAP benefits, SNAP household expenditures but not using SNAP benefits, and non-SNAP household expenditures. Furthermore, based on previous literature it is expected that there will be a difference between SSB SNAP transactions and SSB non-SNAP transactions.

The research questions of study are:

- What are the top 10 purchased beverages among SNAP households using SNAP benefits, SNAP households not using SNAP benefits, and non-SNAP household?
- How do the three groups differ on the percentage of annual expenditures on SNAP eligible beverages and SSBs? What is the difference in average expenditures on SSBs of SNAP households using SNAP benefits and SNAP households not using SNAP benefits?
- Do household characteristics, such as poverty status, presence of a child and head of household age, affect the differences between the two types of expenditures?
- Do store location factors, such as are poverty level, region of the country, and urbanicity make a difference?

## **Literature Review**

This section summarizes literature on inequality, food access and insecurity, and the link between SSBs and health outcomes. It also presents an overview of SNAP and research on SSBs and SNAP participation.

### *Inequality and Food Access and Insecurity*

It is estimated that over 46 million people in the US are living in poverty (DeNavas-Walt & Proctor, 2015). Research links lower socio-economic status (SES) to

more sedentary lifestyles and poor dietary habits (Pettit & Nienhaus, 2010). The relationship between food access and SES is well documented (Darmon & Drewnowski, 2015; Handbury et al., 2015). One important factor in this association are food deserts. The USDA defines food deserts as areas with a low-income census tract and low access to supermarkets or large grocery stores (USDA, n.d.). However, different approaches relating to measuring distance, low-income, and low vehicle access produce varying food desert sizes and scopes (Wilde et al., 2014). Regardless of measurement, food deserts are characterized by a lack of access to healthy and affordable food (Beaulac et al., 2009; Camp, 2015).

The USDA (Ver Ploeg et al., 2012) estimates nearly 30 million people lived in food deserts in 2010. Food deserts are predominantly located in low-income and minority areas (Carter et al., 2013). In using the Census tract definition of food deserts, Chen, Jaenicke, and Volpe (2016) found a significant positive relationship between obesity/overweight status rates and low-income Census tract areas. However, the authors found no significant relationship between the neighborhood food environment, operationalized as average number of food stores or restaurants per 10,000 county residents (see Morland et al. (2001) and obesity or overweight status of residents. The mixture of findings on food environments, including food deserts, as they relate to health outcomes (Brown & Brewster, 2015; Widener & Shannon, 2014) suggests that residence in low-income communities and poor food access do not fully explain health outcomes.

In addition, findings in Wilde et al. (2014) suggest that about 40% of low-income Americans live in neighborhoods not highly poverty stricken. Handbury et al. (2015) found that even controlling for food access, households with higher education and SES

purchase healthier foods in the same store compared to lower SES and educated households. This leads to another factor relevant to healthy food access, social class. Individuals within lower social classes have less access to resources and funds to purchase healthy foods. The concept of food insecurity clarifies this disparity. Food insecure households are defined as “uncertain of having, or unable to acquire, enough food because they had insufficient money or other resources” (Gundersen, 2013, p. 36). In 2013, it is estimated that 50 million Americans were food insecure (Gundersen & Ziliak, 2015).

In a literature review, Gundersen and Ziliak (2015) examine the research on food insecurity and health outcomes in children, adults, and seniors. The reviewed studies show that food-insecure children have lower nutrient intake, poorer general health, and exhibit more mental health problems than food-secure children. Similarly, research on food-insecure adults finds correlations with lower nutrient intake, mental health problems, poorer health, as well as hypertension and poorer sleep outcomes. Compared to food-secure seniors, food-insecure seniors were more likely to be in fair or poor health. Additionally, food-insecure households had higher rates of chronic disease, such as diabetes and dyslipidemia among women (Laraia, 2013) and a higher risk for obesity (Larson & Story, 2011). The overall findings of food insecurity and negative health outcomes suggest a link through lower nutrient intake.

It has been hypothesized that food insecurity leads to dependency on inexpensive and highly energy dense foods (Laraia, 2013). Food-insecure households are likely to purchase food in lower quantities and of lower quality (Laraia, 2013). The overall diet quality of adults and children is inversely associated with food insecurity; however, this

relationship is more prominent in adults than in children (Hanson & Connor, 2014).

Historically, U.S. diet quality modestly improved from 1999 to 2010, but this improvement was greater for persons with a higher SES and a healthier body mass index (BMI) level (Wang et al., 2014). This historical trend suggests an increase in diet quality disparities (Wang et al., 2014).

Drewnowski (2009) argues that high rates of obesity and type 2 diabetes among low-income individuals are a problem of economic rather than psychosocial factors. It is well established that healthier foods are more expensive than less healthier, higher energy dense foods (Darmon & Drewnowski, 2008; Darmon & Drewnowski, 2015; Drewnowski, 2009; Walker et al., 2010). However, Carlson and Frazão (2014) argue that healthier food is less expensive than less healthier foods and the overall obesity rate surpasses the poverty rate in the U.S. SNAP's role of providing supplemental income is limited by the Thrifty Food Plan's (TFP) use of an average national price in determining local benefit amounts (Food Research and Action Center [FRAC], 2013). In high living standard areas such as Boston and Philadelphia, the cost of food is higher compared to neighboring cities (FRAC, 2013). Lower income households tend to purchase less healthy foods and higher amounts of low cost high energy dense foods (Drewnowski & Specter, 2004) and are more likely to consume SSB (Han & Powell, 2013).

### *Sugar-Sweetened Beverages and Health*

Data from the National Health and Examination Survey (NHANES) identifies SSB consumption as the main source of dietary energy intake in the U.S. from 1999 to 2000 (Bermudez & Gao, 2010). Between 1970 and 2009, Carden and Carr (2013) found a significant positive relationship between the availability of high energy foods and rates of



obesity. The increase in consumption of SSBs parallels the increased prevalence of obesity in the United States within the past few decades (Bermudez, & Gao, 2010; Bleich et al. 2009; Bray & Popkin, 2013; Malik et al., 2006; Qi et al., 2012; Sharkey et al., 2011). A large body of research finds that consumption of SSBs is associated with obesity and diabetes (Bermudez, & Gao, 2010; Bray & Popkin, 2013; Han & Powell, 2013; Malik et al., 2006; Qi et al., 2012). Greater SSB consumption is correlated with less healthy eating behaviors (Sharkey et al., 2011). When controlling for metropolitan status, rural adults consume significantly more SSBs than urban adults (Sharkey et al., 2011). Findings from randomized control trials suggest lower negative health outcomes and BMI levels when SSBs are replaced by water or other low-calorie beverages in children (de Ruyter et al., 2012; Zheng et al., 2015) and adults (Zheng et al., 2015).

#### *What is SNAP?*

As the United States' second largest safety net program (Office of Budget and Management, 2015), SNAP plays an important role in alleviating hunger by providing access to healthy foods for millions of low-income households. Despite providing supplemental income, low-income households still face barriers to accessing healthy foods.

In 2015, 45.7 million people (22.5 million households) participated in SNAP with a total benefit cost of \$69.6 billion (USDA FNS, 2015a). Despite nearly 14% of the U.S. population being on SNAP (FRAC, 2016), only 85% of eligible beneficiaries actually participate (Eslami, 2015). Regulated and funded through the United States Department of Agriculture (USDA) Food and Nutrition Service (FNS; Supplemental Nutrition Assistance Program, 2009), SNAP is open to all U.S. citizens and non-citizens meeting

specific income eligibility standards (USDA FNS, 2015b). SNAP participants are allotted benefits based on household composition (i.e. head of household, children, elderly parent, etc.) and the USDA's TFP. TFP estimates the cost to prepare nutritious food at home, uses a national average of food prices for allocation, and changes every year to adjust for inflation (Carlson et al., 2007). Benefit levels do not take regional variation in standard of living or food prices. Household gross and net monthly incomes must be 130% and 100% below the poverty line, respectively (USDA FNS, 2015c). The actual benefit amount is affected by deductions such as income and other household resources (i.e. owning a car) (USDA FNS, 2015c).

During the recession of 2012, an estimated 5 million (including 2.2 million children) people, who would have been below the poverty line, were kept above the poverty line by participating in SNAP (Executive Office of the President, 2013). In fact, more than 91% of SNAP benefits go to households below the poverty line (Executive Office of the President, 2013). During economic downturns, participation in the SNAP program increases, but at the same time SNAP expenditures stimulate the economy (Hanson, 2015). The influx of SNAP dollars affects stores, transportation systems, producers, and farms (Hanson, 2015). It is estimated that a \$1 billion increase in SNAP expenditures increases economic activity by \$1.79 billion (Hanson, 2015).

Through the usage of Electronic Benefit Transfer (EBT) cards, SNAP participants are able to purchase food at authorized stores (USDA FNS, 2015d). The Food and Nutrition Act of 2008 defines SNAP eligible foods as any food or food product for home consumption, as well as seeds and plants which produce food for consumption (Food and

Nutrition Act of 2008, 2014). Alcoholic beverages, tobacco, hot foods and any foods sold for on-premises consumption are ineligible from purchase with SNAP benefits.

#### *SNAP Participation and Sugar-Sweetened Beverage Research*

As shown above, lower-income households face physical and economic barriers in obtaining healthy and nutritious food and greater negative health outcomes. SNAP provides lower-income households the opportunity to purchase healthy foods and become more food secure. Research on SNAP participation shows its effectiveness in reducing food insecurity (Nord & Golla, 2009) and the likelihood of being food-insecure (Ratcliffe et al., 2011). SNAP participants who are at risk for food insecurity have better diet quality and lower BMI compared to non-SNAP participants (Nguyen et al., 2015). Additionally, SNAP participants have fewer doctor visits and spend fewer days in bed due to illness (Gregory & Deb, 2015). Although SNAP is meeting its goals in reducing food insecurity, the inclusion of SSBs in SNAP remains controversial (Barnhill 2011; Brownell & Ludwig, 2011; Cuffey et al., 2015; Leung et al., 2013).

The USDA describes SSBs as having minimal nutritional value (Categories of Foods of Minimal Nutritional Value, 2013). Proponents of excluding SSBs from SNAP argue that allowing SNAP participants to purchase SSBs with SNAP benefits worsens their diet given the minimal nutritional value and adverse health outcomes associated with SSB consumption (Barnhill, 2011). Opponents to the exclusion reason that this would be patronizing and create embarrassment, stigma, and reduced participation (Barnhill, 2011). Several states, most notably New York, requested permission from the USDA for greater control over SNAP benefit usage (Brownell & Ludwig, 2011). New York was denied the permission to conduct a demonstration project on the exclusions of

SSB in SNAP (Barnhill & King, 2013). The USDA justified the denial with methodological and feasibility issues of the project (Barnhill & King, 2013; Brownell & Ludwig, 2011).

Unlike WIC's prescriptive restrictions, current SNAP regulations and policies place few limitations on food purchases, Bleich et al. (2013) found that SNAP adult participants consumed a higher percentage of SSBs compared to ineligible adults. However, Todd and Ver Ploeg (2014) found no difference in consumption of SSBs between SNAP participants and non-SNAP participants. In examining trends of SSB consumption among SNAP participants, eligible non-SNAP participants, and ineligible adults, Nguyen, and Powell (2015) found SSB consumption remained relatively flat from 2003-2004 and 2009-2010 for SNAP participants, but eligible non-SNAP participants and ineligible nonparticipants had significant drops in consumption.

Among rural adults, neither SNAP nor WIC participation is related to meeting SSB or water intake recommendations (Davy et al., 2015). Similarly, SNAP status among youths does not have an impact on SSB, fruit juice, or milk consumption (Fernandes, 2012). SNAP participation among Hispanic women is significantly associated with higher consumption of SSBs (Hilmers et al., 2014; Terling Watt et al., 2013) and Hispanic mothers' consumption of SSBs is significantly associated with infant weight (Terling Watt et al., 2013).

Andreyeva et al. (2012) examined the beverage purchases of SNAP and WIC participants in a large supermarket chain store in several New England states. Beverages were identified by Universal Product Code (UPC) and the analyses included all beverages. WIC and SNAP households were identified by benefit and loyalty card usage

at the time of transaction. Non-food assistance households were excluded from the analyses. The results show that SNAP households purchased greater amounts of SSBs than WIC-only households. Based on their findings, WIC-only households have similar patterns of SSB consumption as the general public. The authors postulated that SNAP households appear to consume more SSBs than the general public based on separate analyses. The work of Andreyeva et al. (2012) is the only published study examining actual POS data of SSBs by SNAP households. However, it is limited to food assistance program recipients, a single supermarket chain, and region. In a report to USDA FNS, Garasky et al. (2013) found no difference in expenditure patterns between SNAP and non-SNAP households.

### **Methodology**

Based on the findings of SSB expenditures differences between SNAP households and WIC households (Andreyeva et al. 2012), it is hypothesized that there would be a difference of expenditures between SNAP households using SNAP benefits and SNAP households not using SNAP benefits. WIC requires similar income standards as SNAP and dual participation is highly likely between the programs.

The expenditure on SSBs will be influenced not only by the type of transaction (SNAP/non-SNAP). It is expected that store location at the county level, and household characteristics are important factors to take into account. It is possible that store location in urban areas or areas with high poverty rates or in specific regions of the country affect any observed differences in average transactions. Similarly, the presence of children in the household, poverty status of the household, and the age of the head of household may affect the transaction patterns.

### *Data Sources*

Research on SNAP participation and SSB consumption is derived largely from the NHANES. The NHANES is a yearly cross-sectional survey of a nationally representative sample of about 5,000 persons across the country (National Center for Health Statistics, 2015). The 24 hour dietary recall survey component of NHANES is frequently used in analyses of dietary consumption of SNAP participants. It should be noted that food consumption and food purchase, also known as food acquisition, data are not synonymous. Food consumption statistics are based on the data of actual consumption of a food product during a specific timeframe regardless of date of purchase (Martirosova, 2008). Food acquisition statistics are based on the purchases of food products within a specific timeframe without regards to consumption (Martirosova, 2008). Food acquisition data provides more utility in policy and planning than examining food deprivation because its ability to capture large amounts of data and is a cheaper option (Martirosova, 2008).

The beverage data were acquired through project work from USDA FNS. It contains POS transactions from January 1, 2011 through December 31, 2011 across approximately 11 million SNAP households. Similar to Andreyeva et al. (2012), the data were collected through the usage of loyalty cards and usage of SNAP benefits. A loyalty card is store specific and provides opportunities for sales and discounts. At the time of transaction, a loyalty card is swiped alongside the swipe of an EBT card, identifying a household as a SNAP household. All other baskets purchased during that month with that loyalty card were flagged as transactions by that SNAP household. All remaining baskets purchased with a loyalty card by other households were flagged as being bought by non-

SNAP beneficiaries. The dataset contains information regarding the commodity and subcommodity classification of the beverage, UPC (Unique Product Code) description, a UPC, and grams of sugar per 100 milliliters for 1,028 unique beverages. UPCs are unique numbers that are assigned to products. However, the same products in different quantities will have different UPCs. For example, a 12 pack of canned Coke will have a different UPC than a 32 pack of canned Coke, but the nutritional content would be the same for each individual item. The unit of analysis for this study is transaction dollar amounts spent on the item-level UPC code. Thus, the study compares monetary transactions in dollars for 234 SSB UPCs by households.

Specifically, the data is compared by transaction type used by households: SNAP households using SNAP benefits for the transactions, SNAP households that do not use SNAP benefits for the transactions, and non-SNAP household transactions. SNAP transactions are operationalized as those for which a SNAP EBT card was the majority tender. Non-SNAP transactions are identified by usage of another form of payment for at least half of the purchases.

#### *Variables and Measures*

For the descriptive analysis SNAP participation includes SNAP households using SNAP benefits for SSB purchases, SNAP households that do not use SNAP benefits for SSB purchases, and non-SNAP households. SNAP households are operationalized as a household that made at least one SNAP transaction in the month. For the statistical comparison only the two types of SNAP households are used.

SSBs are defined by Popkin et al. (2006) as “[a]ny beverage to which a caloric sweetener has been added, including carbonated or noncarbonated soft drinks, fruit

punch, fruit drinks, lemonade, sweetened powder drinks, or any other nonartificially sweetened beverages. Excluded from this definition are sugars naturally present in fluids and that are not added in processing, in preparation, or at the table” (p. 531). Beverage guidance categories were predetermined in the data set. Table 4 provides a description of beverage guidance categories.

Household characteristics are presence of a child, age of head of household and poverty status. Store location variables were measured at the county level and include poverty level, urbanicity and region of the country. Specifically, the characteristics of households and store locations are measured as follows:

*Age group of household head.* Households in the data were classified according to the age of the household head into three age groups: 19–44, 45–64, and 65 and over.

*Presence of children in household.* Households were classified as having children or not.

*Household poverty status:* Each household was classified as being either in poverty or not in poverty based on defined poverty thresholds, based on income brackets and family size.

- Income of \$ 0 - \$14,999 for households with 1 to more than 5 members is in Poverty
- Income of \$15,000 – \$24,000 for households with 4 or more members is in Poverty
- Income of \$15,000 - \$24, 000 for households with 3 or less household members is not in Poverty
- Income of \$25,000+ for all household sizes is not in Poverty

*Store location in regions of the country.* Each store was classified as being in the South, Midwest, or West using U.S. Census Bureau categories. Data from the East were not available.



*Store location in terms of county urbanicity.* The county urbanicity is defined by the location of the store. Each store was classified as belonging to a metropolitan county of 1 million or more residents, a metropolitan county of fewer than 1 million residents, a micropolitan area, or a noncore area.

*Store location in terms of county poverty level.* Each store was classified as being located in a county with a poverty rate of less than 10%, 10–20%, or more than 20%, using Census Bureau data.

### *Analyses*

First, the descriptive analysis of the data involving all three household types are presented in Tables 1, 2, and 3. Means and standard deviations of expenditures for all beverages by the three household types for all UPC's (N=1028) are presented in Table 3. Next, frequencies and percentages of all 6 beverage categories are described (Table 4) in general and by household type (Table 5). Tables 6a through d show the summary statistics and frequency counts of the top 10 beverages among the household types are presented. Table 7 through 9 present the independent means tests for SSB transaction expenditures for the 3 household types (see details below).

The data set used for the present study has a number of limitations. First, due to the aggregation format based on expenditures rather than households, it is impossible to control for number of households included. That prevents a direct comparison of the three groups – the non-SNAP transaction group constitutes 88% of all SNAP eligible transactions (see Table 1) and covers \$3.5 million of the \$4.4 million spent on beverages (see Table 2). Thus, in order to compare the three groups directly they would have to be standardized by population size. Another major drawback of the data used for this

analysis is that the characteristics of households and stores, and the SNAP transaction status are collapsed into expenditures. This means that individual characteristics could not be controlled for in analysis. Therefore it was not possible to perform ANOVA or multivariate analyses on the data.

To examine the differences between SNAP household SNAP benefit transactions and SNAP household non-SNAP benefit transactions for total SSB purchases, independent t-tests were performed. First, differences in overall average SSB expenditures between SNAP household benefit transactions and SNAP household non-benefit transactions were tested and then the two groups were compared taking the various characteristics (urbanicity, region, area poverty rate, head of household age, child presence, and household poverty) into account. The levels of significance  $p < .05$ ,  $p < .01$ , and  $p < .001$  will be used to determine statistically significant differences.

## **Results**

Table 1 shows the percentage of all SNAP eligible items, food and beverages, transactions made in 2011. Non-SNAP household transactions account for 88% of transactions made in 2011. SNAP household SNAP transactions and SNAP household non-SNAP transactions only account for 7% and 5% of total transactions, respectively. The total annual expenditure on all SNAP eligible items in 2011 was about \$39.3 billion. Non-SNAP households account for the majority of expenditures (83.97%) and the number of transactions (88%). Table 2 shows that of all SNAP eligible items, SNAP eligible beverages account for 11.26% of total expenditures in 2011. SNAP households using non-SNAP transactions spent slightly more on SNAP eligible beverages (14.06%) than SNAP households using SNAP benefits (11.66%) and non-SNAP households

(10.99%). Table 3 provides means, standard deviations, and confidence intervals for each transaction type. The data contains a large sample size and this is reflected in the small confidence interval ranges. There is a 95% confidence level that the true population mean of beverages purchases is between less than \$100 thousand for SNAP households using SNAP benefits and not using SNAP benefits. Similarly, the true population mean beverage purchases for non-SNAP households is between less than \$500 thousand.

Table 4 displays the beverage guidance categories of the 1028 beverages in the dataset. Of those beverages, the majority (36.67%) were caloric beverages with some nutrients. These beverages include whole milk, 100% orange juice, and 100% apple juice. The second largest category (22.76%) was calorically sweetened beverages or SSBs, the category of interest to this study. Beverages in this category include sodas and sugar sweetened juices. As shown in Table 5, the percentage of SNAP household benefit transactions on SSBs was higher (38.86%) than that of SNAP household non-SNAP transactions (31.12%) and non-SNAP households (20.75%). Caloric beverages with some nutrients was the second highest expenditure for SNAP households SNAP transactions; however, it was also the most frequently purchased beverage across all households (last column, 31.86%). SNAP household non-benefit transactions were higher on low fat milk and soy beverages (19.28%) than SNAP household benefit transactions (12.79%). SNAP household non-benefit transactions had a higher percentage of expenditures on noncalorically sweetened beverages (9.88%) than SNAP household benefit transactions (6.83%), but non-SNAP households spent much more than either group (15.3%).

Tables 6a through 6d describe the top ten beverage purchases for all households and by subgroup. Overall, the most frequently purchased beverage was low fat 2% milk

at \$188.3 million. The difference between the most frequently purchased, vitamin D milk and second frequently purchased beverage, low fat 2% milk, for SNAP household benefit transactions was marginal, a little more than \$100 thousand. SSBs were the 4<sup>th</sup>, 9<sup>th</sup>, and 10<sup>th</sup> most frequent purchase in general (see Table 6a). For SNAP households benefit transactions, the most purchased beverage in 2011 is vitamin D milk at \$22.8 million, followed by 2% milk and water. SSBs were the 4<sup>th</sup> through 10<sup>th</sup> ranked beverage purchases (see Table 6.b). For SNAP households non-SNAP transactions, low fat 2% milk was the most purchased beverage, followed by Vitamin D milk and water. SSBs were at rank 4, 5, 7, and 8 (see Table 6c.). At rank 1-3 for non-SNAP households are 2% milk, water, and a SSB. For this group SSBs were at rank 3, 9, and 10. The most frequent beverage guidance category among the top ten beverages of SNAP household benefit and non-benefit transactions was calorically sweetened beverages. Nonfat or low fat or milk substitutes was the most frequent beverage guidance category for non-SNAP households.

The top three beverage purchases account for 56% of the total of the top ten purchases for SNAP household benefit transactions, for 60% for SNAP household non-benefit transactions, and for 47% for non-SNAP households. Among the top ten beverages, the average grams of sugar per 100ml for SNAP household benefit transactions was 9.12 grams, 6.86 grams for SNAP household non-benefit transactions, and 5.71 grams for non-SNAP households and all transactions.

Independent t-tests were performed to explore differences in expenditure on SSBs between the two SNAP household transaction groups. Table 7 provides means, standard deviations, t-statistics, and significance levels for SNAP household benefit transactions and non-benefit transactions for SSBs, Table 7 shows that the average expenditure on

SSBs for SNAP transactions was \$809,438.14 ( $SD = \$1,332,398.34$ ) compared to \$471,379.09 ( $SD = \$803,474.45$ ). This difference indicates that average benefit transactions used for SSB are statistically significantly higher than non-benefit transactions ( $p < .001$ ). This supports the hypothesis posed by this study. It is important to note that both groups show a very high standard deviation, an indication that the data is quite spread out. Across store location characteristics, average benefit transactions are statistically significantly higher than non-benefits transactions. Regardless of urbanicity status, region of the country, and area poverty rate, ETB card use for SSB purchases is higher than non-benefit purchases. However, in areas with a poverty rate less than 10%, the difference in expenditure was only marginally significant ( $t = 1.99, p < .05$ ). Similarly, in the West of the US, the difference in expenditures also was smaller ( $t = 2.17, p < .05$ ).

In contrast to store location factors, several household characteristics do affect the observed patterns. In terms of the age of the head of household, the pattern of significant mean difference between the two groups only held for the youngest age group - between 19 and 44 ( $t(395.68) = 3.04, p < .01$ ). Households headed by individuals over age 45 did not vary in the average transaction amount for SSB. Surprisingly, the presence of children in the household also negated the initial pattern. Thus, average benefit and non-benefit transactions were not statistically significantly different for households with or without children.

The pattern of difference between the two groups is only partially replicated in terms of the poverty status of the household. Among SNAP households in poverty, those with SNAP benefit transactions have significantly higher average expenditures on SSBs

than those not using their SNAP benefits,  $t(363.50) = 3.83, p < .001$ . However, among SNAP households that are not in poverty, there is no statistically significant difference between the two groups.

## **Conclusion**

This study was conducted to examine the differences in transaction data for purchases on SSBs among SNAP household expenditures using SNAP benefits, SNAP household expenditures but not using SNAP benefits, and non-SNAP household expenditures. The focus of the statistical comparison was on the first two groups. In order to accomplish this aim, I examined the transaction data from over 2,200 stores across 32 states made in 2011. Specifically, the research questions posed related to the top 10 purchased beverages among the groups, and on how the three groups differ on the percentage of annual expenditures on SNAP eligible SSBs. In terms of the two SNAP groups, the difference in average expenditures on SSBs of SNAP households using SNAP benefits and SNAP households not using SNAP benefits was of interest, as was whether store location and household characteristics affect the observed differences. It was hypothesized that there will be a difference in SSB SNAP transactions and SSB non-SNAP transactions.

The findings suggest in fact there are significant differences in SSB expenditures by household type. Non-SNAP households accounted for a significant portion of the number of transactions made and expenditure on all SNAP eligible food and beverage items in 2011. Regardless of transaction type, SNAP households account for about 12% of the total number of transactions made. This is close to the estimated percentage (14%) of the U.S. population on SNAP (FRAC, 2016). Of the 1028 beverage codes, SSBs

account for nearly a quarter of beverage choices. This is troubling because SSB availability has been linked to diet quality (Duran et al., 2015; Gustafson et al., 2013).

SNAP households using their benefits purchased more SSBs (38.86%) than SNAP households not using their benefits and non-SNAP households. This finding is similar to the results of Andreyeva et al. (2012). However, Andreyeva et al. (2012) found that SSBs accounted for nearly 60% of beverage purchases among SNAP households. The results from this study suggest it is a little more than half that in a full continuous year. An interesting note is that SNAP households not using their benefits spent more on low fat (1.5% or 1%) and skim (nonfat) milk and soy beverages than SNAP households using their benefits. One explanation could be attributed to the usage of WIC benefits. Unlike SNAP, WIC is prescriptive in the food choices (USDA FNS, 2016a). The category low fat (1.5% or 1%) and skim (nonfat) milk and soy beverages falls into the prescriptive food choices. Pregnant women or women with infants or children under the age of five who are eligible to receive SNAP benefits qualify for WIC (USDA FNS, 2016b). Instead of using SNAP benefits to purchase low fat (1.5% or 1%) and skim (nonfat) milk and soy beverages, it would be likely WIC was used to purchase these beverages, leaving more SNAP benefits to purchase other items.

The data is compiled from a large grocery retailer operating different family chain stores across 32 states. SNAP households and non-SNAP households have access to these varying family chain stores. Each family chain store varies by sales, size, and stock. Results in Handbury et al. (2015) suggest differences in healthy food purchases are correlated with varying SES levels while controlling for food access. The differences in expenditure across beverage guidance categories reflect these results as non-SNAP

households purchased more low fat (1.5% or 1%) and skim (nonfat) milk and soy beverages and water than SNAP households, regardless of ETB usage.

SSBs accounted for the majority of the top ten beverages purchased via SNAP household SNAP transactions and non-SNAP transactions and about a third for non-SNAP households. Regardless of SNAP benefit usage, SNAP households purchased more SSB items than non-SNAP households. However, SSBs are a staple in shopping carts across all households.

The independent t-test results show that significant SSB differences occurred between the two SNAP household expenditure groups. The null hypothesis is rejected that SSB expenditure between SNAP household benefit transactions and non-benefit transaction are the same; they are significantly different. There is a statistically significant differences in average SSB expenditures between the two SNAP household groups: overall, benefit transaction expenditures were higher than non-benefit transaction purchases of SSBs. These findings support the hypothesis posed and are consistent with Bleich et al. (2013) and Andreyeva et al. (2012).

The observed differences between the two SNAP groups are replicated when store location factors are taken into account. Hence, neither urbanicity, poverty level of area, or region affected the persistently higher average benefit transactions for SSBs than non-benefit transactions. Nevertheless, household characteristics, such as head of household age above 44, presence of children and household non-poverty status negate the observed differences. This means that older SNAP households have similar expenditures on SSBs, whether with or without EBTs. There is good news in terms of children in the household – both SNAP groups have lower SSB transactions when children are present. However,



this could be an artifact of having fewer households with children. In addition, the presence/absence of children reduces the difference in expenditures to non-significance. Lastly, when SNAP households are not in poverty (possibly because of the SNAP benefits), the difference between the two groups also disappears.

The majority of SSB expenditure by SNAP household benefit transactions were made in areas with poverty less than 10% and poverty rates between 10 and 20%. This does not support findings of Wilde et al. (2014) that 40% of low-income people do not live in high poverty areas. SNAP participants must meet a specific level of poverty before receiving SNAP benefits (USDA FNS, 2015c). These findings suggest that more low-income households made SSB purchases and subsequently live in these areas than in a poverty area greater than 20%.

No significant differences exist in SSB expenditure between non-SNAP households with children and SNAP households using and not using their SNAP benefits with children in the household. A survey of 9 - 17-year-olds suggests that low-income families are particularly at risk for sweetened beverage consumption and obesity (Pinard et al., 2011). Importantly, the study also found a correlation between the consumption patterns of parents and their children, indicating there is meaningful parental influence on beverage consumption decisions. An experiment on SSB health warning labels showed promising results as warning labels reduced the likelihood parents chose a SSB for children consumption (Roberto et al., 2016). Reducing parental SSB consumption and increasing awareness of the negative health impacts can have positive effects on children.

Within regions, household types had significantly different SSB expenditures. The South region spent more on SSBs than West and Midwest regions across SNAP

household benefit transactions and non-benefit transactions. Findings in Park et al. (2015) report higher odds of drinking a SSB in the South region compared to Midwest and West regions. More research is needed to explore regional differences in SSB consumption.

Research demonstrates that healthier diets are higher in cost than unhealthy diets (Darmon & Drewnowski, 2015; Horning & Fulkerson, 2014; Rogus, 2015). Access to affordable healthier foods is very limited in low-income neighborhoods (Handbury et al., 2015), further exasperating diet disparities. The current study finds that SSBs remain a common staple in food baskets, regardless of SNAP status. Even with additional funds, SNAP households purchased more SSBs than SNAP households not using their benefits. Rather than pointing to low-income households making poor choices, future research should investigate access to and availability of healthy food options in terms of distance to supermarkets and price and selection of available foods (corner stores). While the Healthy Incentives Pilot provided randomized SNAP participants in Massachusetts an opportunity to earn more SNAP benefits by purchasing selected fruits and vegetables, this pilot study was only marginally successful in increasing SNAP participant consumption of fruits and vegetables (Barlett et al., 2014). Low-income households continue to face structural and educational barriers in accessing healthy diets. The specific issues these households deal with should be investigated via qualitative research that examines respondents' experiences in their own neighborhoods.

This study has several strengths compared to previous research. First, POS data expands across a full, continuous year (January 1 to December 31). Second, this study examined all beverage purchases made by SNAP household benefit transactions, SNAP household non-benefit transactions, and non-SNAP household transactions. Third, the

data expands across 32 states in three different regions. This study offers stronger generalizability of results due to its large sample size, continuous full year of data, and item level granularity. Previous research supports the usage of POS purchases as it compares to national nutrition and food expenditure survey data (Hamilton et al., 2007) and provides utility in examining nationally representative shoppers across time (Van Wave & Decker, 2003).

The data also had several limitations. It was limited to three regions. Although 20 states were not included, more than half of the United States was included in the analyses. This study compliments Andreyeva et al. (2012) study by examining the regions not included in their analyses. The data was limited to one grocery retailer. However, it includes over 15 family chain stores under its operations. Due to the data structure, analyses were limited to comparison of differences. The data could not be controlled for the number of households. Additionally, characteristics were collapsed into expenditure, limiting the ability to create predictive modelling. Future research can shed light on the factors that affect purchasing an SSB.

As noted above, future research should be focused on predicting SSB expenditure through usage of multivariate analysis. Regional differences and child presence should be further investigated based on the results of this study. Using POS data offers expansive and generalizable results which can explore differences between SNAP households and non-SNAP households. Data collection should be expanded to include more chain stores and states. Future analyses should include a geocoding component to explore the effect of food deserts and specific store location on SSB purchases. The current study only describes observed differences in transactions. Researchers have to explore why these

differences are occurring. Studies involving interviews and participant observation would serve to inform educational and policy efforts in this area.

The results can be used to modify or focus nutritional efforts on the reduction of SSB intake, regardless of SNAP status. Led by the Department of Health and Human Services, Healthy People 2020 is a national agenda to improve the health of the United States and achieve health equity (The Secretary's Advisory Committee, 2008). Understanding the amount of SSBs purchased by U.S. households can address health and nutrition goals of Healthy People 2020.

SSB consumption remains a major public health issue, regardless of SNAP participation. Nutritional education has a positive impact on healthy eating behaviors. Gase et al. (2014) found that nutritional knowledge is correlated with reduced SSB consumption in Los Angeles County. The USDA FNS provides states grant funding for nutritional education programs, SNAP-Ed, specifically focused on SNAP participants and low-income households (USDA FNS, 2016b). Evaluations of state run SNAP-Ed programs show its effectiveness in intention to change (Savoie et al., 2015) and increased consumption of fruits and vegetables among children (Gabor et al., 2012; Long et al., 2013). Nationwide policies and educational efforts provide promising results in the reduction of SSB consumption. Further expanding these can prevent public health issues.

**Table 1. Total Annual Expenditure on All SNAP Eligible Food and Beverage Items Transactions on by Household Type in 2011**

<b>Household Type</b>	<b>Percentage of Annual Number of Transactions on SNAP Eligible Food and Beverages</b>	<b>Total Annual Expenditures on all SNAP Eligible Items Transactions for Food and Beverages</b>	<b>Percentage of Annual Expenditures on SNAP Eligible Food and Beverages</b>
SNAP Household, SNAP Transactions	7%	\$4,179,956,669	10.63%
SNAP Household, Non-SNAP Transactions	5%	\$2,520,563,306	6.41%
Non-SNAP Household	88%	\$32,636,725,210	83.97%
<b>Total</b>	<b>100%</b>	<b>\$39,337,245,186</b>	<b>100%</b>

**Table 2. Total Annual Expenditure on All Beverage Items Transactions by Household Type in 2011**

<b>Household Type</b>	<b>Total Annual Expenditures on Beverage item transactions</b>	<b>Percentage of Total Annual Expenditures on Beverage Items</b>
SNAP Household, SNAP Transactions	\$487,417,121.98	11.66%
SNAP Household, Non-SNAP Transactions	\$354,428,222.06	14.06%
Non-SNAP Household	\$3,586,060,971.23	10.99%
<b>Total</b>	<b>\$4,427,906,315.27</b>	<b>11.26%</b>

**Table 3. Summary Statistics of Expenditures for all Beverages by Transaction Type and Household Type for all Universal Product Codes (N= 1028)**

<b>Transactions by Type of Household</b>	<b>Observations (UPCs)<sup>1</sup></b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Confidence Interval</b>
SNAP Households, SNAP Transactions	1,028	\$474,141.17	\$1,335,991.35	(\$392,376.19, \$555,906.14)
SNAP Households, non-SNAP Transactions	1,028	\$344,774.54	\$1,013,421.25	(\$282,751.41, \$406,797.66)
Non-SNAP Households	1,028	\$3,488,386.16	\$7,471,544.23	(\$3,031,114.77, \$3,945,657.55)
<b>Total Transactions</b>	<b>1,028</b>	<b>\$4,307,301.86</b>	<b>\$9,578,159.11</b>	<b>(\$3,721,102.01, \$4,893,501.72)</b>

**Table 4. Frequencies of Purchases of All Beverage Categories by Beverage Guidance Category, all Universal Product Codes (N=1028)**

<b>Category</b>	<b>Description</b>	<b>Frequency</b>	<b>Percent</b>
1	Water	77	7.49%
2	Tea and Coffee	4	0.39%
3	Low fat (1.5% or 1%) and Skim (nonfat) Milk and Soy Beverages	184	17.90%
4	Noncalorically Sweetened Beverages	152	14.79%
5	Caloric Beverages with Some Nutrients	337	36.67%
<b>6</b>	<b>Calorically Sweetened Beverages<sup>2</sup></b>	<b>234</b>	<b>22.76%</b>
	<b>Total</b>	<b>1,028</b>	<b>100%</b>

<sup>1</sup> The observations are Universal Product Codes (UPCs) of beverages.

<sup>2</sup> Bolded category is the focus of this study.

**Table 5. Percentage of all Beverage Expenditure by Beverage Guidance Category and Household Type**

Category	Description	SNAP Households SNAP Transactions Expenditures	SNAP Households Non-SNAP Transactions Expenditures	Non-SNAP Households Expenditures	All Households Expenditures
1	Water	7.95%	7.72%	8.50%	8.38%
2	Tea and Coffee	0.09%	0.10%	0.16%	0.15%
3	Low fat (1.5% or 1%) and Skim (nonfat) Milk and Soy Beverages	12.79%	19.28%	23.65%	22.11%
4	Noncalorically Sweetened Beverages	6.83%	9.88%	15.30%	13.93%
5	Caloric Beverages with Some Nutrients	33.47%	31.90%	31.63%	31.86%
<b>6</b>	<b>Calorically Sweetened Beverages<sup>3</sup></b>	<b>38.86%</b>	<b>31.12%</b>	<b>20.75%</b>	<b>23.57%</b>
	<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

---

<sup>3</sup> Bolded category is the focus of this study

**Table 6a: Top 10 Beverage Purchases, All Households**

Rank	Subcommodity	Description	Total Dollar Amount	Grams of Sugar per 100 ml	Beverage Guidance Category
1	FLUID MILK/WHITE ONLY	STORE GENERIC LOWFAT 2% PLAS	\$188,300,000.00	4.65	Nonfat or Low Fat or Milk Substitutes
2	FLUID MILK/WHITE ONLY	STORE GENERIC VITAMIN D MILK	\$103,100,000.00	4.65	Caloric Beverages with some nutrients
3	STILL WATER DRINKING/MNRL WATER	STORE GENERIC PUR WTR-24PK/16.9 OZ	\$101,100,000.00	0.00	Water
4	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>COKE CLSC FRIDGE 12PK CAN</b>	<b>\$98,162,564.00</b>	<b>10.99</b>	<b>Calorically Sweetened Beverages</b>
5	FLUID MILK/WHITE ONLY	STORE GENERIC SKIM-PLAS	\$74,694,559.00	4.65	Nonfat or Low Fat or Milk Substitutes
6	SOFT DRINKS 12/18&15PK CAN CAR	DIET COKE FRIDGE 12PK	\$65,858,143.00	0.00	Noncalorically Sweetened Beverages
7	FLUID MILK/WHITE ONLY	STORE GENERIC LWFT MLK 1%	\$53,012,146.00	4.65	Nonfat or Low Fat or Milk Substitutes
8	FLUID MILK/WHITE ONLY	STORE GENERIC LOW FAT MILK 2% PLSTC	\$49,842,651.00	4.65	Nonfat or Low Fat or Milk Substitutes
9	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>PEPSI-COLA FRIDGE MATE</b>	<b>\$43,204,791.00</b>	<b>11.55</b>	<b>Calorically Sweetened Beverages</b>
10	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>DR PEPPER CAN 12PK</b>	<b>\$33,917,767.00</b>	<b>11.27</b>	<b>Calorically Sweetened Beverages</b>

Note: Bolded categories are the focus of this study.



**Table 6b. Top 10 Beverage Purchases, SNAP Households, SNAP Purchases**

<b>Rank</b>	<b>Subcommodity</b>	<b>Description</b>	<b>Total Dollar Amount</b>	<b>Grams of Sugar per 100 ml</b>	<b>Beverage Guidance Category</b>
1	FLUID MILK/WHITE ONLY	STORE GENERIC VITAMIN D MILK	\$22,753,388.93	4.65	Caloric Beverages with some nutrients
2	FLUID MILK/WHITE ONLY	STORE GENERIC LOWFAT 2% PLAS	\$22,645,064.55	4.65	Nonfat or Low Fat or Milk Substitutes
3	STILL WATER DRINKING/MNRL WATER	STORE GENERIC PUR WTR-24PK/16.9 OZ	\$14,692,765.20	0.00	Water
4	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>COKE CLSC FRIDGE 12PK CAN</b>	<b>\$12,976,373.73</b>	<b>10.99</b>	<b>Calorically Sweetened Beverages</b>
5	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>PEPSI-COLA FRIDGE MATE</b>	<b>\$8,658,085.88</b>	<b>11.55</b>	<b>Calorically Sweetened Beverages</b>
6	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>MOUNTAIN DEW FRDG MT 12PK</b>	<b>\$6,960,516.28</b>	<b>13.52</b>	<b>Calorically Sweetened Beverages</b>
7	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>DR PEPPER CAN 12PK</b>	<b>\$5,777,076.38</b>	<b>11.27</b>	<b>Calorically Sweetened Beverages</b>
8	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>SPRITE FRIDGE 12PK</b>	<b>\$4,998,225.06</b>	<b>11.17</b>	<b>Calorically Sweetened Beverages</b>
9	<b>SFT DRNK 2 LITER BTL CARB INCL</b>	<b>PEPSI 2LT</b>	<b>\$4,744,356.01</b>	<b>11.83</b>	<b>Calorically Sweetened Beverages</b>
10	<b>SOFT DRINKS 20PK&amp;24PK CAN CARB</b>	<b>PEPSI CAN 24PK</b>	<b>\$4,047,474.63</b>	<b>11.55</b>	<b>Calorically Sweetened Beverages</b>

Note: Bolded categories are the focus of this study.

**Table 6c: Top 10 Beverage Purchases, SNAP Households, non-SNAP Purchases**

<b>Rank</b>	<b>Subcommodity</b>	<b>Description</b>	<b>Total Dollar Amount</b>	<b>Grams of Sugar per 100 ml</b>	<b>Beverage Guidance Category</b>
1	FLUID MILK/WHITE ONLY	STORE GENERIC LOWFAT 2% PLAS	\$21,945,189.75	4.65	Nonfat or Low Fat or Milk Substitutes
2	FLUID MILK/WHITE ONLY	STORE GENERIC VITAMIN D MILK	\$14,927,422.17	4.65	Caloric Beverages with some nutrients
3	STILL WATER DRINKING/MNRL WATER	STORE GENERIC PUR WTR-24PK/16.9 OZ	\$9,367,748.50	0.00	Water
4	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>COKE CLSC FRIDGE 12PK CAN</b>	<b>\$8,244,027.95</b>	<b>10.99</b>	<b>Calorically Sweetened Beverages</b>
5	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>PEPSI-COLA FRIDGE MATE</b>	<b>\$4,631,954.53</b>	<b>11.55</b>	<b>Calorically Sweetened Beverages</b>
6	FLUID MILK/WHITE ONLY	STORE GENERIC LOW FAT MILK 2% PLSTC	\$4,140,168.69	4.65	Nonfat or Low Fat or Milk Substitutes
7	<b>SFT DRNK 2 LITER BTL CARB INCL</b>	<b>PEPSI 2LT</b>	<b>\$3,955,739.45</b>	<b>11.83</b>	<b>Calorically Sweetened Beverages</b>
8	<b>SFT DRNK 2 LITER BTL CARB INCL</b>	<b>COKE CLASSIC CONT BTL 2LT</b>	<b>\$3,473,331.31</b>	<b>10.99</b>	<b>Calorically Sweetened Beverages</b>
9	FLUID MILK/WHITE ONLY	MTN DAIRY 2% RED FAT MILK	\$3,394,275.95	4.65	Nonfat or Low Fat or Milk Substitutes
10	FLUID MILK/WHITE ONLY	STORE GENERIC VIT D MILK	\$3,249,156.61	4.65	Caloric Beverages with some nutrients

Note: Bolded categories are the focus of this study.

**Table 6d. Top 10 Beverage Purchases, Non-SNAP Households**

Rank	Subcommodity	Description	Total Dollar Amount	Grams of Sugar per 100 ml	Beverage Guidance Category
1	FLUID MILK/WHITE ONLY	STORE GENERIC LOWFAT 2% PLAS	\$143,663,217.21	4.65	Nonfat or Low Fat or Milk Substitutes
2	STILL WATER DRINKING/MNRL WATER	STORE GENERIC PUR WTR-24PK/16.9 OZ	\$77,048,490.46	0.00	Water
3	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>COKE CLSC FRIDGE 12PK CAN</b>	<b>\$76,942,161.95</b>	<b>10.99</b>	<b>Calorically Sweetened Beverages</b>
4	FLUID MILK/WHITE ONLY	STORE GENERIC SKIM-PLAS	\$69,424,751.49	4.65	Nonfat or Low Fat or Milk Substitutes
5	FLUID MILK/WHITE ONLY	STORE GENERIC VITAMIN D MILK	\$65,382,704.59	4.65	Caloric Beverages with some nutrients
6	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>DIET COKE FRIDGE 12PK</b>	<b>\$60,325,053.36</b>	<b>0.00</b>	<b>Noncalorically Sweetened Beverages</b>
7	FLUID MILK/WHITE ONLY	STORE GENERIC LWFT MLK 1%	\$48,376,285.27	4.65	Nonfat or Low Fat or Milk Substitutes
8	FLUID MILK/WHITE ONLY	STORE GENERIC LOW FAT MILK 2% PLSTC	\$42,048,789.35	4.65	Nonfat or Low Fat or Milk Substitutes
9	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>PEPSI-COLA FRIDGE MATE</b>	<b>\$29,914,750.88</b>	<b>11.55</b>	<b>Calorically Sweetened Beverages</b>
10	<b>SOFT DRINKS 12/18&amp;15PK CAN CAR</b>	<b>DR PEPPER CAN 12PK</b>	<b>\$25,329,284.87</b>	<b>11.27</b>	<b>Calorically Sweetened Beverages</b>

Note: Bolded categories are the focus of this study.

**Table 7. Comparison of Average SNAP Household Benefit Transactions on SSBs with that of SNAP Households Non-Benefit Transactions by Store Location and Household Characteristics (N=234 UPCs)**

<b>Household Characteristic</b>	<b>SNAP Households, SNAP Transactions</b>	<b>SNAP Households, Non-SNAP Transactions</b>	<b>T-Statistic</b>
<b>Total Expenditure on Sugar Sweetened Beverages</b>	<b>\$809,438.14</b> <b>(\$1,332,398.34)</b>	<b>\$471,379.09</b> <b>(\$803,474.45)</b>	<b>3.32***</b>
<b>Store Location County Urbanicity</b>			
Greater than 1 million residents	\$415,300.73 (\$684,906.42)	\$257,861.63 (\$449,278.09)	2.94**
Less than 1 million resident	\$269,726.03 (\$455,785.24)	\$146,703.89 (\$250,443.50)	3.62***
Micropolitan Areas	\$95,868.63 (\$168,969.84)	\$49,841.90 (\$86,373.24)	3.71***
Non-Core Areas	\$28,542.75 (\$54,973.58)	\$16,971.67 (\$30,902.07)	2.81**
<b>Store Location County Poverty Rates</b>			
Less than 10%	\$43,600.73 (\$79,389.28)	\$30,883.22 (\$57,069.85)	1.99*
Between 10 and 20%	\$603,310.82 (\$992,766.91)	\$357,999.79 (\$611,898.70)	3.22**
Greater than 20%	\$162,526.59 (\$265,648.71)	\$82,496.08 (\$137,260.18)	4.09***
<b>Store Location Region</b>			
Midwest	\$298,542.05 (\$544,686.37)	\$157,247.39 (\$289,555.94)	3.50***
South	\$327,038.75 (\$539,590.65)	\$189,164.60 (\$319,294.19)	3.36***
West	\$183,857.35 (\$339,643.92)	\$124,967.10 (\$238,207.03)	2.17*

Note \* $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Characteristic	SNAP Households, SNAP Transactions	SNAP Households, Non- SNAP Transactions	T-Statistic
<b>Household Level</b>			
<b>Head of Household Age</b>			
Age 19 to 44	\$121,965.67 (\$197,262.37)	\$75,460.02 (\$125,832.76)	3.04**
Age 45 to 64	\$142,778.12 (\$237,787.70)	\$122,117.53 (\$214,056.18)	0.99
Age 65 & Up	\$40,535.15 (\$68,824.35)	\$34,165.51 (\$61,906.03)	1.05
<b>Household Level</b>			
<b>Presence of Children</b>			
Yes	\$121,501.78 (\$199,516.10)	\$91,436.42 (\$156,517.65)	1.81
No	\$183,777.15 (\$304,024.79)	\$140,306.64 (\$244,041.69)	1.71
<b>Household Level</b>			
<b>Poverty Status</b>			
In Poverty	\$55,222.85 (\$88,231.74)	\$29,972.70 (\$48,833.88)	3.83***
Not in Poverty	\$250,056.09 (\$416,162.05)	\$201,770.36 (\$352,186.99)	1.35

Note \* $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

## References

- Andreyeva T., Luedicke, J. Henderson, K. E., & Tripp, A. S. (2012). Grocery store beverage choices by participants in federal food assistance and nutrition programs. *American Journal of Preventive Medicine*, 43(4), 411-418.
- Andreyeva, T., Chaloupka, F. J., & Brownell, K. D. (2011). Estimating the potential taxes on sugar-sweetened beverages to reduce consumption and generate revenue. *Preventive* 52, 413-416.
- Barnhill, A., 2011. Impact and ethics of excluding sweetened beverages from the SNAP Program. *American Journal of Public Health*, 101(11), 2037-2043.
- Barnhill, A. & King, K. F., (2013). Evaluating equity critiques in food policy: The case of sugar-sweetened beverages. *Journal of Law, Medicine & Ethics*, 41(1), 301-309.
- Bartlett, S., Klerman, J., Olsho, L., Logan, C., Blocklin, M., Beauregard, M., ... Melhem, M. (2014). *Evaluation of the Healthy Incentives Pilot (HIP): Final report*. Prepared by Abt Associates for the U.S. Department of Agriculture, Food and Nutrition Service.
- Basu, S., Seligman, H. K., Gardner, C., & Bhattacharya, J. (2014). Ending SNAP subsidies for sugar-sweetened beverages could reduce obesity and type 2 diabetes. *Health Affairs*, 33(6), 1032-1039.
- Bermudez, O. I. & Gao, X. (2010). Greater consumption of sweetened beverages and added sugars is associated with obesity among US young adults. *Annals of Nutrition & Metabolism*, 57,211-218.
- Beaulac, J., Kristjansson, E., & Cummins, S. (2009). A systematic review of food deserts, 1966-2007. *Preventing Chronic Disease*, 6(3).

- Bleich, S. N., Vine, S. & Wolfson, J. A. (2013). American adults eligible for the Supplemental Nutritional Assistance Program consume more sugary beverages than ineligible adults. *Preventive Medicine*, 57(6), 894 – 899.
- Bleich, S. N., Wang, Y. C., Wan, Y., & Gortmaker, S. L. (2009). Increasing consumption of sugar-sweetened beverages among US adults: 1988–1994 to 1999–2004. *American Journal of Clinical Nutrition*, 89, 372-381.
- Bray, G. A. & Popkin, B. M. (2013). Calorie-sweetened beverages and fructose: what have we learned 10 years later. *Pediatric Obesity*, 8, 242-248.
- Brown, R. D. & Brewster, L. G. (2015). The food environment is a complex social network. *Social Science & Medicine*, 133, 202-204.
- Brownell, K. D. & Ludwig, D. S. (2011). The Supplemental Nutrition Assistance Program, soda, and USDA policy. Who benefits? *The Journal of the American Medical Association*, 306(12), 1370-1371.
- Camp, N. L. (2015). Food insecurity & food deserts. *Nurse Practitioner*, 40(8), 32-36.
- Carden, T. J. & Carr, T. P. (2013). Food availability of glucose and fat, but not fructose, increased in the US between 1970 and 2009: analysis of the USDA food availability data system. *Nutrition Journal*, 12(130).
- Carlson, A., Lino, M., Juan, W-Y., Hanson, K., & Basiotis, P.P. (2007). *Thrifty Food Plan, 2006*. (CNPP-19). U.S. Department of Agriculture, Center for Nutrition Policy and Promotion.
- Carlson, A. & Frazão, E. (2014). Food costs, diet quality, and energy balance in the United States. *Physiology & Behavior*, 134, 20-31.

- Carter, M. A., Dubois, L., & Tremblay, M. S. (2013). Place and food insecurity: a critical review and synthesis of the literature. *Public Health Nutrition*, 17(1), 94-112.
- Categories of Foods of Minimal Nutritional Value, 7 C.F.R. § 210 Appendix B (2013).
- Chen, D., Jaenicke, E. C., & Volp, R. J. (2016). Food environments and obesity: Household diet expenditure versus food deserts. *American Journal of Public Health*, 106(5), 881-888.
- Cuffey, J., Bearry, T. K., & Harnack, L. (2015). The potential impact of Supplemental Nutrition Assistance Program (SNAP) restrictions on expenditures: a systematic review. *Public Health Nutrition*, 1-16.
- Darmon, N. & Drewnowski, A. (2008). Does social class predict diet quality? *American Journal of Clinical Nutrition*, 87(1), 1107-1117.
- Darmon, N. & Drewnowski, A. (2015). Contribution of food prices and diet cost to socioeconomic disparities in diet quality and health: A systematic review and analysis. *Nutrition Reviews*, 73(10), 643-660.
- Davy, B. M., Zoellner, J. M., Waters, C. N., Bailey, A. N., & Hill, J. L. (2015). Associations among chronic disease status, participation in federal nutrition programs, food insecurity, and sugar-sweetened beverage and water intake among residents of a health-disparate region. *Journal of Nutrition Education and Behavior*, 47(3), 196-205.
- DeNavas-Walt, C. & Proctor, B. D. (2015). *Income and Poverty in the United States: 2014*. U.S. Census Bureau, Current Population Reports, P60-252. U.S. Government Printing Office: Washington, D.C.



- de Ruyter, J. C., Olthof, M., Jan Kuijper, L. D., & Katan, M. B. (2012). Effect of sugar-sweetened beverages on body weight in children: Design and baseline characteristics of the Double-blind, Randomized INtervention study in Kids. *Contemporary Clinical Trials*, 33, 247-257.
- Drewnowski, A. (2009). Obesity, diets, and social inequalities. *Nutrition Reviews*, 67(1), 536–539.
- Drewnowski, A. & Rehm, C. D. (2015). Socioeconomic gradient in consumption of whole fruit and 100% fruit juice among US children and adults. *Nutrition Journal*, 14(1), 1-9.
- Drewnowski, A. & Specter, S. E. (2004). Poverty and obesity: the role of energy density and energy costs. *American Journal of Clinical Nutrition*, 79, 6-16.
- Duran, A. C., Luna de Almeida S., DO Latorre M. d. R., & Jaime, P. C. (2015). The role of the local retail food environment in fruit, vegetable and sugar-sweetened beverage consumption in Brazil. *Public Health Nutrition*, 19(6), 1093–1102.
- Eslami, E. (2015). *Trends in Supplemental Nutrition Assistance Program participation rates: Fiscal year 2010 to fiscal year 2013*. Prepared by Mathematica Policy Research for the U.S. Department of Agriculture, Food and Nutrition Service, Office of Policy Support.
- Executive Office of the President (2013). *Supporting families, strengthening communities: The economic importance of nutrition assistance*. Washington, D.C.
- Fernandes, M. M. (2012). Effect of the Supplemental Nutrition Assistance Program (SNAP) on frequency of beverage consumption among youth in the United States *Journal of the Academy of Nutrition and Dietetics*, 112(8), 1241-1246.

- Food and Nutrition Act of 2008. 7 U.S.C. §§ 2011–2036a (2014).
- Food Research and Action Center [FRAC] (2013). *A Review of Strategies to Bolster SNAP's Role in Improving Nutrition as well as Food Security*. Washington, D.C.
- Garasky, S., Mbwana K., Romualdo, A. P., Tenaglio, A. & Roy, M. (2013). *Foods typically purchased by SNAP households*. Prepared for the U.S. Department of Agriculture, Food and Nutrition Service – Office of Policy Support.
- Gabor, V., Cates, S., Gleason, S., Long, V., Aponte Clark, G., Blitstein, J., ... Ball, M. (2012). *SNAP Education and evaluation study (Wave I): Final report*. Prepared for the U.S. Department of Agriculture, Food and Nutrition Service – Office of Policy Support.
- Gase, L. N., Robles, B., Barragan, N. C., & Kuo, T. (2014). Relationship between nutritional knowledge and the amount of sugar-sweetened beverages consumed in Los Angeles County. *Health Education & Behavior*, 41(4) 431-439.
- Gregory, C. A. & Deb, P. (2015). Does SNAP improve your health? *Food Policy*, 50, 11-19.
- Gundersen, C. (2013). Food insecurity is an ongoing national concern. *Advances In Nutrition*, 4(1), 36-41.
- Gundersen, C. & Ziliak, J. P. (2015). Food insecurity and health outcomes. *Health Affairs*. 34(11), 1830-1839.
- Gustafson, A., Christian, J. W., Lewis, S., Moore, K., & Jilcott, S. (2013). Food venue choice, consumer food environment, but not food venue availability within daily travel patterns are associated with dietary intake among adults, Lexington Kentucky 2011. *Nutrition Journal*, 12(17), 1-11.

- Hamilton, S., Mhurchu, C. N., & Priest, P. (2007). Food and nutrient availability in New Zealand: An analysis of supermarket sales data. *Public Health Nutrition*, 10(12): 1448–1455.
- Han, E. & Powell, L. M. (2013). Consumption patterns of sugar-sweetened beverages in the United States. *Journal of the Academy of Nutrition and Dietetics*, 113(1), 43-53.
- Handbury, J., Rahkovsky, I., & Schnell, M. (2015). *What drives nutritional disparities? Retail access and food purchases across the socioeconomic spectrum*. Kilts Booth Marketing series, Paper No. 1-055. Chicago: Marketing Data Center at the Chicago Booth Kilts Center for Marketing.
- Hanson, K. (2015). Supplemental Nutrition Assistance Program (SNAP) linkages with the general economy. Retrieved from [http://www.ers.usda.gov/topics/food-nutrition-assistance/supplemental-nutrition-assistance-program-\(snap\)/economic-linkages.aspx](http://www.ers.usda.gov/topics/food-nutrition-assistance/supplemental-nutrition-assistance-program-(snap)/economic-linkages.aspx).
- Hanson K. L. & Connor, L. M. (2014). Food insecurity and dietary quality in U.S. adults and children: A systematic review. *American Journal of Clinical Nutrition*, 100, 684-692.
- Hilmers, A., Chen, T.–A., Dave, J. M., Thompson, D., & Cullen, K. W., (2014). Supplemental Nutrition Assistance Program participation did not help low income Hispanic women in Texas meet the dietary guidelines. *Preventative Medicine*, 62, 44-48.

- Horning, M. L. & Fulkerson, J. A. (2014). A systematic review on the affordability of a healthful diet for families in the United States. *Public Health Nursing*, 32(1), 68-80.
- IOM (Institute of Medicine) & NRC (National Research Council) (2013). *Supplemental Nutrition Assistance Program: Examining the evidence to define benefit adequacy*. Washington, DC: The National Academies Press.
- Laraia, B. A. (2013). Food insecurity and chronic disease. *Advances in Nutrition*, 4, 203-212.
- Larson, N. I. & Story, M. T. (2011). Food insecurity and weight status among U.S. children and families: A review of the literature. *American Journal of Preventative Medicine*, 40(2), 166-173.
- Lebo, M. J. & Weber, C. (2015). An effective approach to the repeated cross-sectional design. *American Journal of Political Science*, 59(1), 242-258.
- Leung, C. W., Hoffnagle, E. E., Lindsay, A. C., Lofink, H. E., Hoffman, V. A., Turrell, S. ... Blumenthal, S. J. (2013). A Qualitative study of diverse experts' views about barriers and strategies to improve the diets and health of Supplemental Nutrition Assistance Program (SNAP) beneficiaries. *Journal of the Academy of Nutrition and Dietetics*, 113(1), 70-76.
- Long, V., Cates, S., Blitstein, J., Deehy, K., Williams, P., Morgan, R., ... Hersey, J. (2013). *Supplemental Nutrition Assistance Program Education and evaluation study (Wave II)*. Prepared for the U.S. Department of Agriculture, Food and Nutrition Service – Office of Policy Support.

- Mabli, J. Ohls, J. Dragoset, L., Castner, L., & Santos, B. (2013) *Measuring the effect of Supplemental Nutrition Assistance Program (SNAP) Participation on food security*. Prepared by Mathematica Policy Research for the U.S. Department of Agriculture, Food and Nutrition Service.
- Malik, V. S., Schulze, M. B., & Hu, F. B. (2006). Intake of sugar-sweetened beverages and weight gain: a systematic review. *American Journal of Clinical Nutrition*, 84, 274-288.
- Martirosova, D. (2008). Food data collected using acquisition and consumption approaches with daily diaries in Armenia's ILCS 2004. In Sibrian, R. (Ed.), *Deriving food security information from national household budget surveys: Experiences, achievements, challenges* (pp. 59-89). Food and Agriculture Organization of the United Nations, Rome, Italy.
- Miller, P. E., Mckinnon, R. A., Krebs-Smith, S. M., Subar, A. F., Chiqui, J., Kahle, L., & Reedy, J. (2013). Sugar-sweetened beverage consumption in the U.S.: Novel assessment methodology. *American Journal of Preventive Medicine*, 45(4), 416-421.
- Morland, K., Wing, S., Roux, A. D., & Poole, C. (2001). Neighborhood characteristics associated with the location of food stores and food service places. *American Journal of Preventative Medicine* 22(1), 23-29.
- National Center for Health Statistics, Centers for Disease Control and Prevention (2015). About the National Health and Nutrition Examination Survey. Retrieved from [http://www.cdc.gov/nchs/nhanes/about\\_nhanes.htm](http://www.cdc.gov/nchs/nhanes/about_nhanes.htm)

- Nord, M. & Golla, A. M. (2009). Does SNAO decrease food insecurity? Untangling the self-selection effect. United States Department of Agriculture, Economic Research Service. Alexandria, VA.
- Nguyen, B. T. & Powell, L. M. (2015). Supplemental Nutrition Assistance Program participation and sugar-sweetened beverage consumption, overall and by source. *Preventative Medicine*, 81, 82-86.
- Nguyen, B. T., Shuval, K., Bertmann, F. & Yaroch, A. L. (2015). The Supplemental Nutrition Assistance Program, food insecurity, dietary quality, and obesity among U.S. adults. *American Journal of Public Health*, 105(7). 1453-1459.
- Office of Budget and Management (2015). *Fiscal Year 2016: Historical Tables*. Washington, D.C.
- Park, S., McGuire, L. C., & Galuska, D. A. (2015). Regional differences in sugar-sweetened beverage intake among US adults. *Journal of the Academy of Nutrition and Dietetics*, 115(12), 1996-2002.
- Pettit, M. L. & Nienhaus, A. R. (2010). The current scope of health disparities in the U.S.: A review of literature. *The Health Educator*, 42(2), 47-55.
- Pinard, C. A., Davy, B. M., & Estabrooks, P. A. (2011). Beverage intake in low-income parent-child dyads. *Eating Behaviors*, 12, 313–316.
- Pomeranz, J. L. (2015). Implications of Supplemental Nutrition Assistance Program tax exemption on sugar-sweetened beverage taxes. *American Journal of Public Health*, 105(11), 2191-2193.

- Popkin, B. M., Armstrong, L., Bray, G. M., Caballero, B., Frei, B., & Willett, W. C., (2006). A new proposed guidance system for beverage consumption in the United States. *American Journal of Clinical Nutrition*, 83(3), 529-542.
- Qi, Q., Chu, A. C., Kang, J. H., Jensen, M. K., Curhan, G. C., Pasquale, L. R., ... Qi, L. (2012). Sugar-sweetened beverages and genetic risk of obesity. *The New England Journal of Medicine*, 367(15), 1387-1396.
- Ranjit, N., Wilkinson, A. V., Lytle, L. M., Evans, E. A., Saxton, D., & Hoelscher, D. M. (2015). Socioeconomic inequalities in children's diet: the role of the home food environment. *Physical Activity*, 12(1), S4.
- Ratcliffe, C., McKernan, S.-M., & Zhang, S. (2011). How much does the Supplemental Nutrition Assistance Program reduce food insecurity? *American Journal of Agricultural Economics*, 93(4), 1082-1098.
- Roberto, C. A., Wong, D., Musicus, A., & Hammond, D. (2016). The influence of sugar-sweetened beverage health warning labels on parents' choices. *Pediatrics*, 137(2), doi: e20153185.
- Rogus, S. (2015). Do the poor pay more for food? A review of food price disparities in urban environments. *Journal of Hunger & Environmental Nutrition*, 10(4), 549-566.
- Savoie, M. R., Mispireta, M., Rankin, L. L., Neil, K., LeBlanc, H., & Christofferson, D. (2015). Intention to change nutrition-related behaviors in adult participants of a Supplemental Nutrition Assistance Program–Education. *Journal of Nutrition Education and Behavior*, 47(1), 81-85.

Sharkey, J. R., Johnson, C. M., & Dean W. R. (2011). Less-healthy eating behaviors have a greater association with a high level of sugar-sweetened beverage consumption among rural adults than among urban adults. *Food & Nutrition Research*, 55.doi: 10.3402/fnr.v55i0.5819.

Supplemental Nutrition Assistance Program. 7 U.S.C. §§ 2011–2036 (2009).

Terling Watt, T., Appel, L., Roberts, K., Flores, B., & Morris, S., (2013). Sugar, stress, and the Supplemental Nutrition Assistance Program: Early childhood obesity risks among a clinic-based sample of low-income Hispanics. *Journal of Community Health*, 28, 513-520.

The Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for (2008). *Phase I Report: Recommendations for the Framework and Format of Healthy People 2020*. Washington, D.C.: U.S. Department of Health and Human Services.

Todd, J. E. & Ver Ploeg, M. (2014). Caloric beverage intake among adult Supplemental Nutrition Assistance Program participants. *American Journal of Public Health*, 104(9), 80-85.

United States Department of Agriculture. (n.d.) Food deserts. Retrieved from:

[http://www.ers.usda.gov/dataFiles/Food\\_Access\\_Research\\_Atlas/Download\\_the\\_Data/Archived\\_Version/archived\\_documentation.pdf](http://www.ers.usda.gov/dataFiles/Food_Access_Research_Atlas/Download_the_Data/Archived_Version/archived_documentation.pdf)

United States Department of Agriculture, Food and Nutrition Service (2015d). EBT:

General Electronic Benefit Transfer (EBT) information. Retrieved from

<http://www.fns.usda.gov/ebt/general-electronic-benefit-transfer-ebt-information>.



- United States Department of Agriculture, Food and Nutrition Service (2016a). *Special Supplemental Nutrition Program for Woman, Infants, and Children (WIC): Food Package Policy and Guidance. A guide for FNS regional offices and WIC state and local agencies*. Alexandria, VA.
- United States Department of Agriculture, Food and Nutrition Service (2016b). *Supplemental Nutrition Assistance Program education plan guidance: FY 2017 nutrition education & obesity prevention grant program*. Alexandria, VA.
- United States Department of Agriculture, Food and Nutrition Service (2015c). Supplemental Nutrition Assistance Program (SNAP): Eligibility. Retrieved from <http://www.fns.usda.gov/snap/eligibility>.
- United States Department of Agriculture, Food and Nutrition Service (2015b). Supplemental Nutrition Assistance Program (SNAP): Facts about SNAP. Retrieved from <http://www.fns.usda.gov/snap/facts-about-snap>.
- United States Department of Agriculture, Food and Nutrition Service (2015a). Supplemental Nutrition Assistance Program (SNAP): National, annual data. Retrieved from <http://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap>.
- United States Department of Agriculture, Food and Nutrition Service (2016b). Women, Infants and Children (WIC): WIC eligibility requirements. Retrieved from <http://www.fns.usda.gov/wic/wic-eligibility-requirements>.
- Van Wave, T. W., & Decker, M. (2003). Secondary analysis of a marketing research database reveals patterns in dairy product purchases over time. *Journal of American Dietetic Association*, 103(4), 445–453.

- Ver Ploeg, M., Breneman, V., Dutko, P., Williams, R., Snyder, S., Dicken, C., & Kaufman, P. (2012). *Access to Affordable and Nutritious Food: Updated Estimates of Distance to Supermarkets Using 2010 Data*. ERR-143. Alexandria, Virginia: U.S. Department of Agriculture, Economic Research Service.
- Walker, R. E., Keane, C. R., & Burke, J.G. (2010). Disparities and access to healthy food in the United States: A review of food deserts literature. *Health & Place*, 16, 876-884.
- Wang, D. D., Leung, C. W., Li, Y., Ding, E. L., Chiuve, S. E., Hu, F. B., & Willett, W. C. (2014). Trends in dietary quality among adults in the United States, 1999 through 2010. *Journal of the American Medical Association Internal Medicine* 174(10), 1587-1595.
- Widener, M. J. & Shannon, J. (2014). When are food deserts? Integrating time into research on food accessibility. *Health & Place*, 30, 1-3.
- Wilde, P., Llobrera, J., & Ver Ploeg, M. (2014). Population density, poverty, and food retail access in the United States: An empirical approach. *International Food and Agribusiness Management Review*, 17(A), 171-186.
- Zheng, M., Allman-Farinelli, M., Heitmann, B. L., & Rangan, A. (2015). Substitution of sugar-sweetened beverages with other beverage alternatives: A review of long-term health outcomes. *Journal of the Academy of Nutrition and Dietetics*, 115(5), 767-779.

