



University of Kentucky  
UKnowledge

---

Dietetics and Human Nutrition Faculty  
Publications

Dietetics and Human Nutrition

---

9-2017


# Shopping Pattern and Food Purchase Differences Among Supplemental Nutrition Assistance Program (SNAP) Households and Non-Supplemental Nutrition Assistance Program Households in the United States

Alison A. Gustafson

University of Kentucky, [alison.gustafson@uky.edu](mailto:alison.gustafson@uky.edu)

**Right click to open a feedback form in a new tab to let us know how this document benefits you.**

Follow this and additional works at: [https://uknowledge.uky.edu/foodsci\\_facpub](https://uknowledge.uky.edu/foodsci_facpub)

 Part of the [Nutrition Commons](#), [Preventive Medicine Commons](#), and the [Public Health Commons](#)

---

## Repository Citation

Gustafson, Alison A., "Shopping Pattern and Food Purchase Differences Among Supplemental Nutrition Assistance Program (SNAP) Households and Non-Supplemental Nutrition Assistance Program Households in the United States" (2017). *Dietetics and Human Nutrition Faculty Publications*. 11.

[https://uknowledge.uky.edu/foodsci\\_facpub/11](https://uknowledge.uky.edu/foodsci_facpub/11)

This Article is brought to you for free and open access by the Dietetics and Human Nutrition at UKnowledge. It has been accepted for inclusion in Dietetics and Human Nutrition Faculty Publications by an authorized administrator of UKnowledge. For more information, please contact [UKnowledge@lsv.uky.edu](mailto:UKnowledge@lsv.uky.edu).

---

**Shopping Pattern and Food Purchase Differences Among Supplemental Nutrition Assistance Program (SNAP) Households and Non-Supplemental Nutrition Assistance Program Households in the United States**

**Notes/Citation Information**

Published in *Preventive Medicine Reports*, v. 7, p. 152-157.

© 2017 The Author. Published by Elsevier Inc.

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

**Digital Object Identifier (DOI)**

<https://doi.org/10.1016/j.pmedr.2017.06.005>



# Shopping pattern and food purchase differences among Supplemental Nutrition Assistance Program (SNAP) households and Non-supplemental Nutrition Assistance Program households in the United States

Alison Gustafson, PhD, MPH, RD

Department of Dietetics and Human Nutrition, University of Kentucky, 206 g Funkhouser, Lexington, KY 40506, United States

## ARTICLE INFO

Available online 20 June 2017

### 1. Introduction

In recent years the role of the food environment has been suggested to be a key determinant in diet and obesity rates (Larson et al., 2009). In particular the availability of food venues (grocery stores, farmers' markets) surrounding a home (An and Sturm, 2012; Black and Macinko, 2008; Block et al., 2011; Bodor et al., 2010; Jilcott et al., 2011a) are thought to play a key role in dietary intake and obesity rates. Research has suggested that the type and number of stores in a neighborhood may influence the type of stores residents choose to shop in, which in turn influence what is purchased and consumed (Yoo et al., 2006; Krukowski et al., 2012). In part due to the complexity of measuring the neighborhood food environment, studies reveal mixed results regarding the relationship between availability of food venues and diet and obesity status among various sub-populations (Bader et al., 2010; Babey et al., 2008; Casey et al., 2008; Dean and Sharkey, 2011; Zenk et al., 2009; Walker et al., 2010; Van Meter et al., 2011; Cobb et al., 2015). To these ends there is a lack of nationally representative data clearly depicting food shopping behaviors. This study provides key insight into shopping behaviors within a households neighborhood, highlighting how “place matters”, which in turn may help to lead policy efforts aimed at improving food assistance programs (Debono et al., 2012).

A sub population most affected by their neighborhood food environment is lower income households and those participating in the Supplemental Nutrition Assistance Program (SNAP), formerly Food Stamps. Many SNAP households are faced with challenges such as consistent and reliable transportation (Jilcott Pitts et al., 2015); longer travel times to stores (Jilcott et al., 2011b); limited stores accepting electronic benefit transfer (EBT) cards (McGuirt et al., 2014; Dimitri and O, 2015), among other financial and geographic constraints. Several studies have suggested that SNAP households shop outside their neighborhood for food at gas stations, convenience stores, and mid-size grocers a majority of the time (Jilcott et al., 2011b; McGuirt et al., 2014; Shannon, 2014),

regardless if a supermarket is available (Shannon, 2014). These results taken together highlight the complex way that SNAP households interact with their food environment which can have direct effects on food shopping behaviors and thus food purchases, such as less fruits and vegetables and more processed foods (Leung et al., 2012).

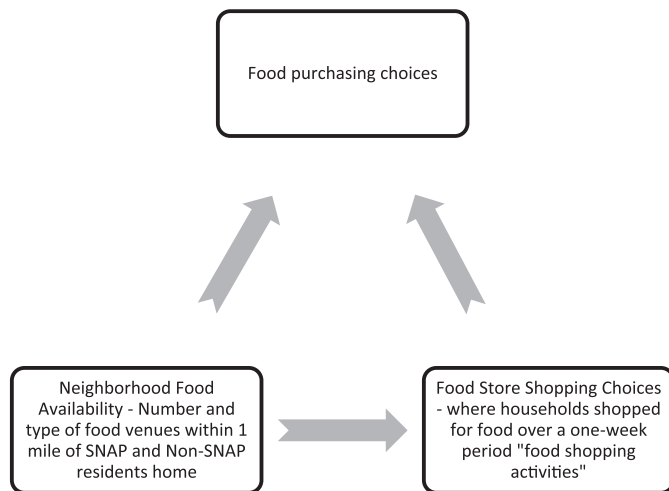
Households participating in SNAP may be disproportionately impacted by both the neighborhood food environment and factors affecting what stores they shop in (McGuirt et al., 2014). SNAP households of differing racial and rural composition report residing in areas with limited access to stores accepting SNAP benefits (Rigby et al., 2012). The overall synergistic effect of neighborhood environment, food purchases and dietary intake has led several studies to highlight the disparity in diet quality between SNAP and SNAP eligible households (Non-SNAP). SNAP eligible households are those households that meet poverty guidelines to participate in SNAP but select to not take advantage of the program. Studies to date have indicated that SNAP households relative to their eligible non-participating counterparts have lower diet quality (Nguyen et al., 2014; Andreyeva et al., 2015), higher intake of sugar sweetened beverages (SSB) (Bleich et al., 2013; Nguyen and Powell, 2015) and higher intake of high fat meats (Leung et al., 2012). What has been unequivocal is that SNAP could benefit by improving the overall program to promote healthful food choices, which provides both incentives for purchasing healthy foods and restrictions (Schwartz, 2017; Han et al., 2012; Leung et al., 2017; Klerman et al., 2017).

Policy and research have suggested that it may be cost effective by promoting more healthful nutritious food options, such as subsidies for fruits and vegetables, which may reduce the risk of diabetes and heart disease and improve quality life years (Choi et al., 2017; An, 2015). To move the conversation forward with regard to how SNAP could promote healthy food shopping, this paper provides insight into the distinct role that the neighborhood food environment plays in SNAP and Non-SNAP food purchasing habits. By comparing SNAP households to those that are eligible but not participating (Non-SNAP), we can better understand the relative influences of poverty and the SNAP program on food shopping and purchasing choices. What remains elusive is understanding how the actual SNAP benefit may promote making food store choices and food purchases that are different from Non-SNAP participants of similar income levels. Such information is critical for shaping SNAP policies to promote healthy food purchases (Yaktine and Caswell, 2014).

E-mail address: [Alison.gustafson@uky.edu](mailto:Alison.gustafson@uky.edu).

This study takes advantage of a unique data set, the FoodAPS data from United States Department of Agriculture (USDA). The aims of the study are to determine the association between 1) neighborhood food store availability and the outcome of primary food store choice; and 2) primary food store choice and the outcome of types of food purchase.

## 2. Conceptual model



## 3. Methods

### 3.1. Dataset

USDA's National Household Food Acquisition and Purchase Survey (FoodAPS) is the first nationally representative survey of American households to collect detailed and comprehensive data about household food purchases and acquisitions. Detailed information was collected about foods purchased or otherwise acquired for consumption at home and away from home. The survey includes nationally representative data from 4826 households, including Supplemental Nutrition Assistance Program (SNAP) households, low-income households (HHs) not participating in SNAP, and higher income households.

### 3.2. Survey

The primary respondent (PR) was identified as the primary food shopper for the household. The PR completed 2 in-person interviews and 3 brief telephone interviews. All household members were also asked to track and report food acquisitions during a 1-week period; scan barcodes on food products; save their store receipts; and write information in a food book. For a detailed description of the methods see <http://www.ers.usda.gov/data-products/foodaps-national-household-food-acquisition-and-purchase-survey/documentation.aspx>.

### 3.3. Sample

From the survey question asking "Has anyone in your household received SNAP in the past year" the SNAP variable was created with verification of date last received with state-level enrollment files for March through November 2012 ( $n = 1436$ ). To create the sub sample of SNAP eligible but not participating households, the poverty threshold of 185% was used. Different criteria were tested to create a unique SNAP eligible but not participating variable (i.e. poverty rates, household size, car ownership, median household income) with principal component analysis, however these tests were not more specific than just using the 185% poverty threshold. For ease and for comparisons across other

studies those households with poverty above 185% were used to create the Non-SNAP participating but eligible sample  $n = 1391$ .

### 3.4. Independent variables

#### 3.4.1. Neighborhood availability of food venues

The first independent variable was availability of food venues within 1 mile of the home. This variable was categorized as a binary variable, indicated whether each type of food store was present in the neighborhood surrounding each SNAP and Non-SNAP household for the 1 mile buffer. The binary variable for each store type was coded as either the household did not have this store type within a 1 mile radius of their home (coded as "0") or they did have this store type within a 1 mile radius of their home (coded as "1"). The following types of food venues were used: 1) supermarkets (>50 employees but sells primarily food); 2) supercenters (>50 employees and sells food plus a significant amount of other items such as clothes, automotive, household, furniture); 3) convenience stores; 4) combination grocery stores (i.e. food is sold as well as prepared food items and household goods); and 5) medium and large grocery stores (<50 employees). First, each household was geocoded based on the latitude and longitude of FoodAPS households provided by Mathematica Policy Research. Then the USDA Economic Research Service (ERS) created point locations for the households. Block group, tract, county, and state FIPS code identifiers for both the 2000 and 2010 census geographies for the household points were obtained by using point-in-polygon geospatial analysis to identify in which 2000 and 2010 TIGER block group polygons each household was located utilizing network distance. Data from the FoodAPS Geography component are based on 2010 census geographies. Second, the categorization of the food stores used the STARS dataset. The types of stores are categorized based on industry standards. Place names were standardized through matching to the STARS database and then through a manual review and then a final place category and place type were assigned based on information from STARS, InfoUSA, Google, and keywords in the place names.

### 3.5. Dependent variables

Our first set of models examined the odds of shopping at a particular food venue during the week of data collection "food store shopping choices" given having a store within 1 mile of the respondents home. The second set of models assessed the odds of purchasing certain low energy density foods given shopping at certain types of food stores. These variables are described in detail below.

The variable "Food store shopping choices" was derived from participants keeping a log of all the locations they purchased food for the home in one week. The following categories were used for the type of food venues the PR shopped at during the 1-week period: 1) supermarkets; 2) supercenters; 3) medium/large grocery stores; 4) combination grocery (grocery store plus retail such as clothing); and 5) dollar stores/convenience/gas stations labeled "convenience". These "food store shopping choices" were categorized based on the type of food venue the PR purchased food from. There are 5 separate models for each type of food shopping activity. A binary variable was created to indicate if the PR shopped at this type of store (coded as "0" for not shopping at this store type and "1" for shopping at this type of store) over the one-week recorded period.

Our second set of models examines food purchases as the primary outcome. Food purchases were grouped in to the following categories 1) sugar-sweetened beverages (full calorie soda; sports drinks); and 2) low-calorie beverages and water. We chose these food categories given recent suggestions for policy implications in SNAP benefits and based on the percentage of SNAP dollars spent on SSB (Andreyeva et al., 2012). For each food category a binary variable was created if the household purchased the food category or if they did not purchase the food category during the one-week period (coded as "0" for not

purchasing the food category and “1” if they did purchase the food category). These groups are not mutually exclusive, such that a household can purchase SSB and water in the same one-week period. These Food purchases for home (FAH) were collected using three methods: 1) survey booklets complemented with telephone calls, 2) hand-held scanners, and 3) post-survey processing of saved receipts. Respondents were asked to record all acquisitions on the Daily List in the Primary Respondent's Book. PRs were asked to fill out a corresponding detailed page for each acquisition on pages which asked for details such as location, date, and payment types. PRs were asked to scan items purchased using the hand-held scanner and record details about items that could not be scanned. They also were asked to attach the receipt. On days 2, 5, and 7 of the reporting week, PRs were asked to report all acquisitions that had been written on the Daily List. For FAH purchases, the telephone interviews collected information on the Daily List as well as supplementary information about any problems respondents had in using the hand-held scanner. At this time, respondents were reminded to save their receipts.

To capture each FAH purchase at the item level there was coalescing of information from the Food Books, telephone interviews, scanners, and receipts by USDA. There was matching to phone reported events through a double entry process, where a second data entry person resolved any inconsistencies. Items that were scanned or written were matched to receipts, and prices were assigned using the receipts information. In addition, item descriptions were updated using receipt information if the description from the scanned barcode or written information was limited or incomplete. Lastly, the categorization of the food purchases was matched to the aisle.

### 3.6. Co-variables

Several key variables were collected to examine food shopping and neighborhood food venue availability. These include car ownership, primary reasons for choosing their primary store (prices of food, quality of food, location to home, good produce), household size, family size (the number of individuals who met the criteria for qualifying as being a legal relationship to the primary respondent). Household income (derived from asking the PR the household income including all assets) Additionally, distance from the respondent's home to each type of food store type (supercenter; supermarket; combination grocery; convenience; medium/large grocery) was used. Distance measures were obtained using Google Maps and the household's and place's geocoded addresses where the respondent acquired food. Lastly, to understand the differences between rural and urban counties interaction terms were tested to see if there was an effect. The interaction term was not significant but was retained in the model as cofounder, labeled as rural for census tract being in a rural area. All these covariates were included in the models below.

## 4. Analyses

To examine the association between neighborhood availability and food shopping activities and food shopping activities on food purchases logistic regression models were used, controlling for car ownership, household size, distance to store type that corresponded to neighborhood availability of that store (i.e. distance to supercenter in the model examining neighborhood availability of supercenter), rural county designation, and household income. All models used survey commands to account for clustering of households at the neighborhood level using primary sampling units. Taylor estimation was used for robust standard errors. All analyses were done using Stata 14.0 (Stata, 2009).

## 5. Results

There are key differences between SNAP and SNAP eligible households (HHs) as indicated in Table 1. SNAP eligible have smaller

**Table 1**

Descriptives of neighborhood, food store choice, and purchasing habits among SNAP and Non-SNAP households, USDA FoodAps 2012

	SNAP (n = 1581)	Non-SNAP (n = 1382)
	Mean (SE)/percentage	
Family size	2.78 (0.09)	2.11 (0.9)
Household size	3.10 (0.09)	2.20 (0.09)
English as primary language	90%	91%
Household Receiving USDA food from local program	90%	97%
Car ownership	60%	80%
Perception of household diet		
Excellent	5%	8%
Very good	18%	22%
Good	44%	46%
Fair	20%	23%
Poor	4%	4%
Reasons for not buying healthy food (% agree)		
Costs too much	47%	40%
Too busy to prepare food	19%	20%
Household doesn't think healthy food tastes good	26%	31%
Family is eating enough healthy food	37%	41%
Primary shopper reports eating right amount of F/V		
Eat right amount	23%	27%
Eat more	77%	72%
Eat less	<1%	<1%
Reads the nutrition facts panel		
Always	12%	15%
Most of the time	15%	20%
Sometimes	30%	28%
Rarely	13%	16%
Never	28%	20%
Never seen panel	1%	1%
Distance to food venues in neighborhood (miles)		
Super center	3.20 (0.61)	3.00 (0.51)
Super market	2.65 (0.67)	3.0 (0.73)
Convenience store	1.14 (0.17)	1.42 (0.23)
Grocery store	3.89 (0.68)	4.39 (0.58)
Shopping characteristics		
Travel Time to primary store self-report (minutes)	11.36 min	11.96 min
Travel Cost to store (self-report)	\$2.79	\$1.93
Neighborhood characteristics		
No SNAP retailers in 0.25 miles	53%	57%
No SNAP retailers in 0.50 miles	30%	35%
No SNAP retailers in 1 mile	16%	21%
No super center in 0.5 miles	80%	81%
No super center in 1 mile	55%	56%
No super market in 0.5 mile	79%	79%
No super market in 1 mile	49%	54%
Primary store (self-report)		
Super center	49%	48%
Super market	48%	48%
Reasons for primary store		
Low prices	61%	55%
Good produce	12%	13%
Good quality	16%	18%
Close to where I live	47%	47%
Shopping choices 1-week period		
Super center	37%	38%
Super market	32%	29%
Convenience	8%	10%
Grocery	4%	7%
Farmers market	3%	1%
Other (dollar, club)	1%	1%
Food buying choices (1-week period)		
Fruits and vegetable	85%	78%
Snacks and candy	73%	75%
Sugar-sweetened beverages	62%	41%
Milk	54%	60%
Water/low-calorie beverages	21%	19%
Juice	23%	20%

household size and smaller family size. Additionally, a higher percentage of SNAP eligible HHs own a car (80% vs 60%). There are a greater percentage of SNAP eligible HHs with no SNAP retailers within 1 mile of their home (21% vs 16%), and no supermarket within 1 mile (54% vs 49%) relative to SNAP households. Food Shopping activities reveal SNAP participants and non-participants are similar; the greatest percentage shopping at supercenters (37% and 38%) followed by supermarkets (32% and 29%). The food items purchased the most over the one week data collection period were fruits and vegetables, followed by snacks and candy for both groups. SNAP households purchased more sugar-sweetened beverages compared to Non-SNAP households (62% and 41%). While SNAP households purchased less milk compared to Non-SNAP (54% and 60%).

Results for assessing how the neighborhood food environment is associated with food shopping activities (Table 2) points to distinct patterns between SNAP and SNAP eligible HHs. Among SNAP households those with a supermarket within 1 mile of their home report lower odds of shopping at a supercenter (0.44 OR 95% CI 0.29, 0.67) and higher odds of shopping at a supermarket (2.05 OR 95% CI 1.34, 3.15) relative to not having a supermarket within 1 mile of their home. Additionally, those with a supercenter within 1 mile of their home report higher odds of shopping at a supercenter (2.14 OR 95% CI 1.30, 3.52) and lower odds of shopping at supermarket (0.50 OR 95% CI 0.37, 0.95) relative to not having a supercenter within 1 mile. Among SNAP eligible HHs proximity to stores was not as influential. The only instance where proximity was relevant was having a grocery store within 1 mile of their home and higher odds of shopping at that store type (2.09 OR 95% CI 1.16, 3.74) relative to not having a grocery store within 1 mile.

Results for assessing the odds of purchasing certain food items given shopping at certain store types among SNAP households compared to SNAP eligible HHs (Table 3) highlights how these two sub samples are more similar than dissimilar. Among SNAP households results indicate higher odds of purchasing SSB when shopping at a supercenter (1.60 OR 95% CI 1.06, 2.41), convenience store (1.59 OR 95% CI 1.02, 2.49), and grocery store (1.93 OR 95% CI 1.06, 2.31) relative to not purchasing SSB. Additionally, those who shop at supercenter or supermarket report higher odds of purchasing water or low-calorie drinks (2.01 OR supercenter 95%CI 1.27, 3.16) and (1.69 supermarket OR 95% CI 1.12, 2.54) respectively compared to not purchasing water or low-calorie drinks. A similar pattern, yet not exact, of food purchasing habits is seen among SNAP eligible HHs. Among SNAP eligible HHs there is higher odds of purchasing SSB when shopping at a supercenter (1.51 OR 95% CI 1.02, 2.23) and convenience store (1.60 OR 95% CI 1.07, 2.40) relative to not purchasing SSB. Also higher odds of purchasing water when shopping at a supercenter (1.51 OR 95% CI 1.08, 2.12) relative to not purchasing water. These results suggest interventions and strategies aimed at improving the consumer food environment can benefit both groups, with concentrated efforts on smaller grocery stores among SNAP recipients.

## 6. Discussion

This study is one of the first to utilize a comprehensive dataset examining purchasing habits at the individual level, which helps elucidate the relationship between neighborhood food availability, shopping activity, and purchasing habits. The relationships described here are meant to be descriptive only, and do not suggest that SNAP itself is driving these store choice and purchasing decisions. But rather, there are distinct behavioral patterns that SNAP households make as a result of stores that are available to them which are distinct relative to Non-SNAP households.

First, neighborhood availability of stores was associated with the type of stores that SNAP household members shop in over a one-week period. These data demonstrate that neighborhood availability of supercenters is associated with shopping at this type of store, while this pattern was not reported among SNAP eligible HHs. These results are situated within a growing body of research finding that neighborhoods with high access to supercenters is associated with higher body mass index (BMI) (Courtemanche and Carden, 2010; Yan et al., 2015). There is some suggestion that the behavior of shopping at supercenters is related to shopping once a month among SNAP household and buying foods in bulk that will last (Jilcott et al., 2011b; Yaktine and Caswell, 2014). This type of shopping behavior may lead to lower odds of purchasing healthier items such as milk and instead purchasing more shelf-stable items such as high calorie snack items (Bleich et al., 2013). Policies aiming to improve neighborhoods for SNAP residents need to consider where SNAP residents reside (Gustafson et al., 2013); their unique shopping practices as it evolves into online retail (C SSaG, 2017); and how to create a consumer food environment which supports healthy shopping practices (Shannon, 2014). These results are not suggesting that supercenters cause poor food purchases or obesity, but rather this result is one example of many complicated pathways which helps to explore the role of the food environment among low income and SNAP households.

A second key insight is found in the unique role that supermarket availability and shopping activity at this venue has among SNAP households. Previous literature has suggested that access to supermarkets may be a piece in improving healthful diet (Pearce et al., 2008) and lower odds of obesity (Bodor et al., 2010; Cobb et al., 2015; Chaix et al., 2012). Given, that although supermarkets carry a variety of unhealthy items they also stock a variety of healthy items at fair prices (Liese et al., 2007). We are not suggesting the proximity is the only factor in store choice but rather that when policies are addressing improving food access for vulnerable populations addressing restructuring of the environment (such as moving stores where SNAP residents reside) or providing tax incentives such as transportation vouchers for those living farther away from stores (Prevention CfDCA, 2009), may be an effective strategy for improving diets (Bowen et al., 2015). Additionally, further promotion of the SNAP program among Non-SNAP but eligible

**Table 2**

Odds Ratio of food shopping activities in 1-week in relation to the type of food stores within a 1 mile buffer of the household among SNAP and Non-SNAP households, USDA FoodAps 2012.

Food Store Shopping Choices (Reference is not shopping at this type of food venue)	SNAP participating households				Non-SNAP participating households			
	Supercenter	Supermarket	Grocery	Convenience	Supercenter	Supermarket	Grocery	Convenience
Food Venues (1 mile buffer reference is not having store type within 1 mile)								
Supermarkets	<b>0.44 (0.29, 0.67)*</b>	<b>2.05 (1.34, 3.15)*</b>	0.77 (0.50, 1.19)	1.45 (0.74, 2.84)	0.68 (0.45, 1.04)	1.65 (0.97, 2.82)	0.91 (0.49, 1.70)	0.84 (0.52, 1.38)
Super centers	<b>2.14 (1.30, 3.52)*</b>	<b>0.59 (0.37, 0.95)*</b>	1.53 (0.81, 2.91)	0.85 (0.55, 1.31)	1.42 (0.91, 2.19)	0.91 (0.55, 1.52)	0.82 (0.50, 1.29)	0.95 (0.56, 1.61)
Grocery stores	1.14 (0.75, 1.75)	0.64 (0.42, 1.00)	1.83 (0.85, 3.98)	0.76 (0.41, 1.43)	1.27 (0.78, 2.07)	1.01 (0.57, 1.79)	<b>2.09 (1.16, 3.74)*</b>	0.60 (0.23, 1.56)
Convenience stores	1.05 (0.65, 1.75)	0.86 (0.52, 1.43)	0.45 (0.20, 1.01)	1.33 (0.54, 3.28)	1.13 (0.60, 2.10)	1.10 (0.51, 2.40)	0.78 (0.41, 1.49)	0.71 (0.39, 1.29)
Combination grocery	0.82 (0.50, 1.36)	1.05 (0.60, 1.87)	1.54 (0.64, 3.72)	0.93 (0.38, 2.26)	1.26 (0.74, 2.13)	1.08 (0.59, 2.00)	0.62 (0.39, 1.00)	0.89 (0.53, 1.48)

\* P<0.05.

**Table 3**  
Odds of purchasing Sugar-Sweetened Beverages or water and low calorie beverages when shopping at various food venues over a 1-week period among SNAP and Non-SNAP Households, USDA FoodAps 2012.

Food shopping activities 1-week period	SNAP participating households		Non-SNAP participating households	
	SSB (REF is not purchasing SSB)	Water/low calorie beverages (REF is not purchasing water/low calorie)	SSB (REF is not purchasing SSB)	Water/low calorie Beverages (REF is not purchasing water/low calorie)
Super center	1.60 (1.06, 2.41) <sup>a</sup>	2.01 (1.27, 3.16) <sup>a</sup>	1.51 (1.02, 2.23) <sup>a</sup>	1.51 (1.08, 2.12) <sup>a</sup>
Super market	1.22 (0.82, 1.83)	1.69 (1.12, 2.54) <sup>a</sup>	0.84 (0.56, 1.27)	1.26 (0.89, 1.78)
Convenience	1.59 (1.02, 2.49) <sup>a</sup>	1.39 (0.87, 2.22)	1.60 (1.07, 2.40) <sup>a</sup>	1.06 (0.49, 2.29)
Grocery	1.93 (1.06, 3.51) <sup>a</sup>	0.85 (0.48, 1.53)	1.57 (0.87, 2.85)	1.09 (0.63, 1.89)

<sup>a</sup> Logistic model adjusted for households size, income, distance to store, car ownership.

households may help to increase participation in the program. With an increase in participation and redeeming of benefits at more stores, there may be economic incentives for stores to provide a variety of healthful items to meet a variety of customer needs. Policies aiming to improve food purchases among all low-income households may direct their efforts at making SNAP an automatic opt-out program rather than a self driven opt-in. This type of programmatic shift may in turn promote improved shopping choices among all residents.

Lastly our results point to the unique role of venue type on purchasing decisions among both SNAP and SNAP eligible HHs. Our findings are consistent, relative to other research indicating that there are no differences in purchasing patterns of SSB between SNAP and SNAP eligible HHs (Todd and Ver, 2014). Although others have found that among SNAP there is a higher intake of calories from SSB relative to Non-SNAP (Nguyen and Powell, 2015), our finding focused on a direct measure of purchasing habits and not self-report as previous work has utilized. This finding highlights that perhaps SNAP itself is not driving the purchasing of SSB but rather the unique factors of being low-income with varying neighborhood level determinants to purchasing habits in the United States (Shannon, 2014). Rather than focusing on how to change SNAP benefits, research may be better served in understanding how to improve store types that are available in communities for all low income households (Basu et al., 2013).

There are several important limitations of this study that need to be addressed. Although the USDA FoodAPS data is the most extensive collection of food purchasing acquisitions to date, the data collection period was only over a one-week time period. While this one-week period may not reflect all the food purchases in a given month, the highly detailed data provided compensates somewhat for the limited time period covered. Extensive efforts were taken with collection of receipts however it is always possible that some food was not recorded in the food book or through the scanners. As with any self-report survey there can be over or under reporting. The neighborhood boundaries do not necessarily reflect each households true operational neighborhood and thus these are investigator defined boundaries. While the 1 mile radius was used, it does not account for ease of transport such as traffic patterns, barriers to walking, and other traffic pattern measures.

## 7. Conclusion

This study provides a unique contribution to the literature about understanding how there are distinct differences in neighborhood influence among SNAP and SNAP eligible households with regard to store proximity. Yet, with regard to purchases of sugar-sweetened beverages our findings point to how both groups make similar purchases at similar store types. Utilizing individual level purchasing data, findings suggest there are similar shopping practices among both low-income groups. Rather than singling out one group for policy change, interventions and policies are better served directing efforts to improve neighborhoods which can facilitate healthy choices among all low-income households.

## Conflict of interest

The authors report no conflict of interest.

Research involving human subjects was met with approval from Internal Review Board at the University of Kentucky.

## References

- An, R., 2015. Nationwide expansion of a financial incentive program on fruit and vegetable purchases among Supplemental Nutrition Assistance Program participants: a cost-effectiveness analysis. *Soc. Sci. Med.* 147, 80–88.
- An, R., Sturm, R., 2012. School and residential neighborhood food environment and diet among California youth. *Am. J. Prev. Med.* 42 (2), 129–135.
- Andreyeva, T., Luedicke, J., Henderson, K.E., Tripp, A.S., 2012. Grocery store beverage choices by participants in federal food assistance and nutrition programs. *Am. J. Prev. Med.* 43 (4), 411–418.
- Andreyeva, T., Tripp, A.S., Schwartz, M.B., 2015. Dietary quality of Americans by Supplemental Nutrition Assistance Program participation status: a systematic review. *Am. J. Prev. Med.* 49 (4), 594–604.
- Babey, S.D.A., Hastert, T., Harvey, S., et al., 2008. Designed for Disease: The Link Between Local Food Environments and Obesity and Diabetes. 8. UCLA Center for Health Policy Research, pp. 12–17.
- Bader, M.D., Purciel, M., Yousefzadeh, P., Neckerman, K.M., 2010. Disparities in neighborhood food environments: implications of measurement strategies. *Econ. Geogr.* 86 (4), 409–430.
- Basu, S., Seligman, H., Bhattacharya, J., 2013. Nutritional policy changes in the supplemental nutrition assistance program: a microsimulation and cost-effectiveness analysis. *Med. Decis. Mak.* 33 (7), 937–948.
- Black, J.L., Macinko, J., 2008. Neighborhoods and obesity. *Nutr. Rev.* 66 (1), 2–20.
- Bleich, S.N., Vine, S., Wolfson, J.A., 2013. American adults eligible for the Supplemental Nutrition Assistance Program consume more sugary beverages than ineligible adults. *Prev. Med.*
- Block, J.P., Christakis, N.A., O'Malley, A.J., Subramanian, S.V., 2011. Proximity to food establishments and body mass index in the Framingham heart study offspring cohort over 30 years. *Am. J. Epidemiol.*
- Bodor, J.N., Rice, J.C., Farley, T.A., Swalm, C.M., Rose, D., 2010. The association between obesity and urban food environments. *J. Urban Health* 87 (5), 771–781.
- Bowen, D.J., Barrington, W.E., Beresford, S.A., 2015. Identifying the effects of environmental and policy change interventions on healthy eating. *Annu. Rev. Public Health* 36, 289–306.
- CSSaG, 2017. Sorry, WalMart. Amazon Wants Your Food Stamp Customers as Well. [cited 2017 4/10/2017]. Available from: <https://www.bloomberg.com/news/articles/2017-01-12/sorry-wal-mart-amazon-wants-your-food-stamp-customers-as-well>.
- Casey, A.A., Elliott, M., Glanz, K., et al., 2008. Impact of the food environment and physical activity environment on behaviors and weight status in rural U.S. communities. *Prev. Med.* 47 (6), 600–604.
- Chaix, B., Bean, K., Daniel, M., et al., 2012. Associations of supermarket characteristics with weight status and body fat: a multilevel analysis of individuals within supermarkets (RECORD study). *PLoS One* 7 (4), e32908.
- Choi, S.E., Seligman, H., Basu, S., 2017. Cost effectiveness of subsidizing fruit and vegetable purchases through the Supplemental Nutrition Assistance Program. *Am. J. Prev. Med.*
- Cobb, L.K., Appel, L.J., Franco, M., Jones-Smith, J.C., Nur, A., Anderson, C.A., 2015. The relationship of the local food environment with obesity: a systematic review of methods, study quality, and results. *Obesity* 23 (7), 1331–1344.
- Courtemanche, C., Carden, A., 2010. Supersizing Supercenters? The Impact of Wal-Mart Supercenters on Body Mass Index and Obesity. SSRN eLibrary.
- Dean, W.R., Sharkey, J.R., 2011. Rural and urban differences in the associations between characteristics of the community food environment and fruit and vegetable intake. *J. Nutr. Educ. Behav.* 17, 34–48.
- Debono, N.L., Ross, N.A., Berrang-Ford, L., 2012. Does the Food Stamp Program cause obesity? A realist review and a call for place-based research. *Health Place*.
- Dimitri, C., O, L., 2015. Potential National Economic Benefits of the Food Insecurity and Nutrition Incentives Program of the U.S. Agricultural Act of 2014. *J. Agric. Food Syst. Community Dev.* 49–61.
- Gustafson, A., Lewis, S., Perkins, S., Wilson, C., Buckner, E., Vail, A., 2013. Neighbourhood and consumer food environment is associated with dietary intake among

- Supplemental Nutrition Assistance Program (SNAP) participants in Fayette County, Kentucky. *Public Health Nutr.* 16 (7), 1229–1237.
- Han, E., Powell, L.M., Isgor, Z., 2012. Supplemental nutrition assistance program and body weight outcomes: the role of economic contextual factors. *Soc. Sci. Med.* 74 (12), 1874–1881.
- Jilcott Pitts, S.B., Wu, Q., Demarest, C.L., et al., 2015. Farmers' market shopping and dietary behaviours among Supplemental Nutrition Assistance Program participants. *Public Health Nutr.* 1–8.
- Jilcott, S.B., Keyserling, T., Crawford, T., McGuirt, J.T., Ammerman, A.S., 2011a. Examining associations among obesity and per capita farmers' markets, grocery stores/supermarkets, and supercenters in US counties. *J. Am. Diet. Assoc.* 111 (4), 567–572.
- Jilcott, S.B., Moore, J.B., Wall-Bassett, E.D., Liu, H., Saelens, B.E., 2011b. Association between travel times and food procurement practices among female supplemental nutrition assistance program participants in eastern North Carolina. *J. Nutr. Educ. Behav.* 43 (5), 385–389.
- Klerman, J.A., Collins, A.M., Olsho, L.E., 2017. Improving nutrition by limiting choice in the Supplemental Nutrition Assistance Program. *Am. J. Prev. Med.* 52 (S2) S171–S18.
- Krukowski, R.A., McSweeney, J., Sparks, C., West, D.S., 2012. Qualitative study of influences on food store choice. *Appetite* 59 (2), 510–516.
- Larson, N.I., Story, M.T., Nelson, M.C., 2009. Neighborhood environments: disparities in access to healthy foods in the U.S. *Am. J. Prev. Med.* 36 (1), 74–81.
- Leung, C.W., Ding, E.L., Catalano, P.J., Villamor, E., Rimm, E.B., Willett, W.C., 2012. Dietary intake and dietary quality of low-income adults in the Supplemental Nutrition Assistance Program. *Am. J. Clin. Nutr.* 96 (5), 977–988.
- Leung, C.W., Musicus, A.A., Willett, W.C., Rimm, E.B., 2017. Improving the nutritional impact of the Supplemental Nutrition Assistance Program: perspectives from the participants. *Am. J. Prev. Med.* 52 (S2) S193–S198.
- Liese, A.D., Weis, K.E., Pluto, D., Smith, E., Lawson, A., 2007. Food store types, availability, and cost of foods in a rural environment. *J. Am. Diet. Assoc.* 107 (11), 1916–1923.
- McGuirt, J.T., Ward, R., Elliott, N.M., Bullock, S.L., Jilcott Pitts, S.B., 2014. Factors influencing local food procurement among women of reproductive age in rural eastern and western North Carolina, USA. *J. Agric. Food Syst. Community Dev.* 4 (4), 143–154.
- Nguyen, B.T., Powell, L.M., 2015. Supplemental nutrition assistance program participation and sugar-sweetened beverage consumption, overall and by source. *Prev. Med.* 81, 82–86.
- Nguyen, B.T., Shuval, K., Njike, V.Y., Katz, D.L., 2014. The Supplemental Nutrition Assistance Program and dietary quality among US adults: findings from a nationally representative survey. *Mayo Clin. Proc.* 89 (9), 1211–1219.
- Pearce, J., Hiscock, R., Blakely, T., Witten, K., 2008. The contextual effects of neighbourhood access to supermarkets and convenience stores on individual fruit and vegetable consumption. *J. Epidemiol. Community Health* 62 (3), 198–201.
- Prevention CfDca, 2009. Recommended Community Strategies and Measurements to Prevent Obesity in the United States. 58 pp. 1–32.
- Rigby, S., Leone, A.F., Kim, H., et al., 2012. Food deserts in Leon County, FL: disparate distribution of Supplemental Nutrition Assistance Program-accepting stores by neighborhood characteristics. *J. Nutr. Educ. Behav.* 44 (6), 539–547.
- Schwartz, M.B., 2017. Moving beyond the debate over restricting sugary drinks in the Supplemental Nutrition Assistance Program. *Am. J. Prev. Med.* 52 (S2), S199–S205.
- Shannon, J., 2014. What does SNAP benefit usage tell us about food access in low-income neighborhoods? *Soc. Sci. Med.* 107, 89–99.
- Stata, 2009. College Station.
- Todd, J.E., Ver, Ploeg M., 2014. Caloric beverage intake among adult supplemental nutrition assistance program participants. *Am. J. Public Health* 104 (9), e80–e85.
- Van Meter, E., Lawson, A.B., Colabianchi, N., et al., 2011. Spatial accessibility and availability measures and statistical properties in the food environment. *Spat. Spatio-temporal Epidemiol.* 2 (1), 35–47.
- 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 (5), 876–884.
- Yaktine, A.L., Caswell, J.A., 2014. SNAP benefits: can an adequate benefit be defined? *Adv. Nutr.* 5 (1), 21–26.
- Yan, R., Bastian, N.D., Griffin, P.M., 2015. Association of food environment and food retailers with obesity in US adults. *Health Place* 33, 19–24.
- Yoo, S., Baranowski, T., Missaghian, M., et al., 2006. Food-purchasing patterns for home: a grocery store-intercept survey. *Public Health Nutr.* 9 (3), 384–393.
- Zenk, S.N., Lachance, L.L., Schulz, A.J., Mentz, G., Kannan, S., Ridella, W., 2009. Neighborhood retail food environment and fruit and vegetable intake in a multiethnic urban population. *AJHP* 23 (4), 255–264.