

The Association between Food Security and Store-Specific and Overall Food Shopping Behaviors

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ABSTRACT

Background Food security is a severe problem in the United States. Few studies have examined its relationship with food shopping behaviors.

Objective This study aimed to examine the association between food security and store-specific and overall food shopping among residents of low-income neighborhoods.

Design We conducted a cross-sectional study.

Participants/setting Five hundred twenty-seven households were recruited from two counties in South Carolina from November 2013 to May 2014, and 474 households were included in the final analysis.

Main outcomes measures Food security was assessed using the 18-item US-Household Food Security Module questionnaire, and classified into three categories: high or marginal food security (FS), low food security (LFS), and very low food security (VLFS). Store-specific shopping behaviors including frequency, store type, and transportation were queried via in-person interview for the three most-frequented grocery stores. Distance from participants' homes to their reported stores was calculated using Geographic Information Systems.

Statistical analyses Multivariate linear regression for analyses of distance and frequency and multinomial/ordinary logistic regression for analyses of store type and transportation were used.

Results Compared to FS participants, a significantly higher proportion of VLFS participants reported a convenience/dollar store as their most-frequented store (odds ratio [OR] 2.31, 95% CI 1.08 to 4.95) or a lack of transportation (OR 2.04, 95% CI 1.25 to 3.33). They also shopped less frequently ($b = -.31$, $P = 0.03$) at their third most-frequented store and traveled fewer total miles for shopping ($b = -4.71$, $P = 0.04$). In analyses considering all stores jointly, LFS participants had lower odds of shopping at both supermarkets and convenience/dollar stores (OR 0.44, 95% CI 0.21 to 0.91) compared to food-secure residents.

Conclusions The current findings suggest that households with VLFS tend to shop more frequently in stores that have less-healthy options, such as convenience/dollar stores. These findings lend support to ongoing community and policy interventions aimed at improving food access among food-insecure populations.

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IN THE UNITED STATES, APPROXIMATELY 14% OF households were food insecure at some time during 2014, meaning that 17.4 million US households were uncertain of having, or were unable to acquire, enough food to meet the needs of their members because they had insufficient money or other resources for food.¹ Among these households, 8.4% (10.5 million) and 5.6% (6.9 million) experienced low food security or very low food security, respectively.¹

Previous studies have shown that low-income households have lower consumption of fruits and vegetables and lower intake of nutrients (eg, calcium, vitamins).²⁻¹⁰ A number of factors contribute to poor dietary quality among low-income populations beyond economic constraints, and food shopping

choices could be one of these. In addition to in-store food purchasing behaviors, store utilization behaviors are of interest as well. Review of previous studies focusing specifically on food shopping behaviors suggests that low-income populations may grocery shop less frequently because of the timing of food-assistance benefits, which would affect perishable items such as fresh fruits and vegetables^{4,5,16,18-21}; they may have insufficient spatial access (living further away from a grocery store) to supermarkets and grocery stores selling healthful foods^{4,5,16,18-21}; and they may lack transportation to facilitate food shopping.^{4,22}

The few studies that have focused on a particular low-income group, Supplemental Nutrition Assistance Program

(SNAP) recipients (previously called the Food Stamp Program),²⁻¹⁰ generally support these findings. Specifically, the studies show that SNAP recipients usually use a supermarket as their main food store,^{4,7} they do not usually shop at the nearest store because of the relatively high prices or lack of a store in their neighborhoods,^{3,8-10} and 68% of SNAP recipients drive themselves to shop for food.⁷

Although income/poverty and food-security status are not perfectly correlated, households with poverty-level incomes are more likely to experience lower food security.²³ To our knowledge, only two studies exist on household food-security status and food shopping.^{24,25} Kirkpatrick and Tarasuk²⁴ found that food-security status was not associated with proximity to food retail outlets in Canadian families. However, in another Canadian study, Sadler and colleagues²⁵ found that food-insecure respondents lived significantly closer to nutritious food sources and grocery stores than food-secure respondents. Of note, both studies characterized the food environment (availability of retail outlets in the neighborhood) instead of actual store utilization behaviors,^{24,25} and we do not know whether these findings would generalize to communities of high poverty, mainly African-American households in the southeastern United States.

An additional consideration is that the majority of studies on food shopping (unrelated to food security) have focused on a single store only, either the primarily utilized or the nearest store.^{5,12-15,19,26-31} Studies rarely capture the entire range of food shopping in a specified time period or assess shopping at multiple stores. A recent exception was the Food Acquisition and Purchase Survey, which surveyed food shopping at two stores (primary and alternative).⁷ This study found that food-insecure households were less likely to use a car of their own to conduct their primary food shopping. However, this report was descriptive and did not control for potential confounders.

The goal of this study was to examine the association between food-security status of residents of low-income communities and store-specific and overall food shopping behaviors (ie, type of store utilized, distance traveled to shop, shopping frequency, and transportation).

METHODS

Study Population and Data Collection

The Food Access and Family Food Shopper study recruited primary grocery shoppers (defined as the person shopping for at least half of the household's food) from 527 households between November 2013 and May 2014 in two South Carolina counties (2.77 and 6.80 square miles of study area in each county). Recruitment focused on seven census tracts (six of which were US Department of Agriculture [USDA]-designated food deserts, defined as a low-income population having low access to a supermarket or supercenter),³² with a combined population of 19,117 individuals and 6,459 households at the time of participant recruitment.³³ To accommodate local community definitions of their neighborhoods, which extend beyond geographic boundaries of census tracts, we extended the boundaries for eligibility to 1 mile past the seven recruitment tract boundaries into adjacent tracts, but only if an adjacent tract had a poverty level greater than or equal to that of the state ($\geq 16\%$ of households below the federal poverty level). Although recruitment

focused on seven tracts, the final sample included residents of 18 tracts, of which 12 tracts were food-desert tracts. Using purchased address lists from a survey sampling firm, letters addressed to the "family food shopper" were mailed to all residential addresses inviting them to call for information about a study of food access and food shopping. Multiple recruitment strategies (in-person, printed, and electronic) followed this initial letter and resulted in 527 participants. In-person interviews were conducted with the primary grocery shoppers after obtaining written informed consent. The interview included sociodemographic, attitudinal, behavioral, and health-related questions.

Data for the present, cross-sectional analysis study were from the baseline interviews of the Food Access and Family Food Shopper study, the overarching purpose of which was to evaluate a food hub intervention to increase healthy food access with a longitudinal, quasi-experimental study. The data presented in this analysis predated the opening of the food hub. The study was reviewed and approved by the Institutional Review Board of the University of South Carolina.

Food Shopping

Store-specific food shopping behaviors were queried for each participant's three most-frequented grocery stores (eg, "what is the name of the store or market where you shopped the most often [store 1], the second most often [store 2], and the third most often [store 3] for food?"). Food shopping behaviors queried about included type of stores 1 to 3 (convenience stop, drugstore/pharmacy, dollar variety store, farmers' market, food bank or food pantry, supermarket, supercenter, smaller grocery store, specialty store, warehouse club, or other type of food store, such as a military commissary); shopping frequency at each (eg, for store 1: "over the past year, how often did you usually shop at [name of primary store answered before]?") Respondent could answer in their preferred units of times per day, week, month, or year. All responses were converted to times per month.; and transportation used (ie, drive your own car, van, truck, or motorcycle; ride in the car, van, truck, or motorcycle of family or friends; ride the bus; take a taxi; walk; or ride a bicycle) to store 1 only.

Stores' and participants' home addresses were geocoded according to Topologically Integrated Geographic Encoding and Referencing road files for 2013 using ArcGIS 10.2.³⁴ Network distances from participants' homes to stores 1 to 3 were calculated using ArcGIS 10.2.³⁴ Shopping frequency was expressed as the number of shopping occasions per week and per month. For stores 1 and 2, weekly shopping frequency was dichotomized into two categories: ≤ 1 time per week or >1 time per week. Store 3 shopping frequency is presented as a frequency per month because few residents shopped more than once per week at this store. Store type was classified into supermarkets, supercenters (including supercenters and warehouse clubs), and other (including smaller grocery stores, convenience stores, dollar variety stores, drug/pharmacy stores, and specialty stores).

Considering stores 1 to 3 jointly, several overall food shopping patterns were calculated. Total round-trip shopping miles per week were computed by multiplying store-specific shopping frequencies per week with distance to the three stores, multiplying this product by two and summing all

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