



United States Department of Agriculture

Economic
Research
Service

Economic
Information
Bulletin
Number 180

October 2017

The Influence of Foodstore Access on Grocery Shopping and Food Spending

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United States Department of Agriculture

Economic Research Service www.ers.usda.gov

Recommended citation format for this publication:

Ver Ploeg, Michele, Elizabeth Larimore, and Parke Wilde. *The Influence of Foodstore Access on Grocery Shopping and Food Spending*, EIB-180, U.S. Department of Agriculture, Economic Research Service, October 2017.

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Abstract

Low access to food retailers selling healthy and affordable foods may lead to reliance on food retail venues that carry a limited range of foods. Reliance on smaller retail stores and restaurants may result in a poor diet and diet-related health problems. The U.S. Department of Agriculture's National Household Food Acquisition and Purchase Survey contains abundant data for examining how access to food retailers influences where households get their food, including stores and restaurants, and how much they spend at each place. This research looks at households that do not use their own vehicle to travel to a store and live more than 0.5 mile from the nearest SNAP-authorized supermarket or superstore, likely barriers to accessing food. Using a national sample and a low-income subsample that includes participants of the Supplemental Nutrition Assistance Program (SNAP), the authors find evidence that access-burdened households have some distinct shopping patterns. They are less likely to visit a large store (supermarket, supercenter, or warehouse store) than households with a vehicle or close access (77 percent compared with 87 percent). While those with burdened access who do visit these venues do so less frequently, both groups average over two shopping events at these stores (2.4 events for access-burdened households compared with 2.8 for those with sufficient access). The differences in shopping frequency do not translate to less spending at these large stores as both access-burdened and sufficient-access households spend about 58 percent of their food budget there. Access-burdened households spend a greater share of their budget at food-at-home sources (73 percent) and a smaller percentage of their food at restaurants of all types (27 percent) than households with better access (63 and 37 percent, respectively). Overall spending patterns are similar for both SNAP-participating and low-income nonparticipating households that are access-burdened compared with those who have sufficient access.

Keywords: foodstore access, food expenditures, FoodAPS, food away from home, restaurants, Supplemental Nutrition Assistance Program (SNAP), low-income households

Acknowledgments

The authors thank Kristen Cooksey Stowers, Rudd Center for Food Policy and Obesity, University of Connecticut; Sara Bleich, Johns Hopkins University and Harvard T.H. Chan School of Public Health; Rosemarie Downer, USDA, Food and Nutrition Service; and Annemarie Kuhns, USDA, Economic Research Service (ERS) for their reviews. They also thank David Smallwood of ERS for his review of early drafts and ERS editor Courtney Knauth and Cynthia A. Ray.

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The Influence of Foodstore Access on Grocery Shopping and Food Spending

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What Is the Issue?

Researchers have hypothesized that poor access to food retailers that sell a wide range of healthy and affordable foods results in poorer diet and diet-related health problems. Lack of access to stores such as supermarkets may mean that households rely more heavily on nearby retailers, such as convenience stores or fast-food restaurants, which do not typically offer a wide variety of healthful foods.

Existing studies often use measures of neighborhood-level access to a healthy food retailer (or “presumed access”), assuming that households are limited to retailers in their neighborhoods. USDA’s National Household Food Acquisition and Purchase Survey (FoodAPS) contains abundant information on the food retail environment of neighborhoods where sampled households live and on household resources, such as vehicle ownership and income, that facilitate access to food retailers. These data enable a new analysis of how the local food environment and household resources are related to where households acquire food and how much of their food budget is spent at various types of retailers.

What Did the Study Find?

Six percent of U.S. households are access-burdened: they do not use their own vehicle to travel to the store for groceries and live more than 0.5 mile from the nearest SNAP-authorized supermarket or superstore (SM/SS), which we use to proxy the nearest source of healthy and affordable food. Further analysis showed that:

- Seventy-seven percent of access-burdened households reported a shopping event at a supermarket, superstore, large grocery store, or warehouse store during the survey week compared to 87 percent for households with sufficient access. Of those who visited these large stores during the survey week, sufficient-access households had 2.8 shopping events at such a store, while access-burdened households averaged 2.4 shopping events.
- Although they average fewer trips, access-burdened households spend almost the same percentage of their weekly food expenditures at large stores as households with sufficient access—57 percent of total spending for access-burdened households and 58 percent for sufficient-access households.
- The per capita spending of access-burdened households at such stores is slightly lower—\$28.77 on average for the survey week compared with \$29.97 for households

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with sufficient access. These findings suggest that access-burdened households overcome limited food retail options to spend similarly to sufficient-access households at large stores.

Access-burdened households have a median monthly income of \$1,240 compared to \$4,388 for sufficient-access households, which may account for some of the differences in spending patterns at restaurants and other types of stores. The analysis showed that:

- Access-burdened households are less likely to acquire food from a restaurant than households with sufficient access (69.5 percent compared with 85.8 percent).
- Access-burdened households spent less per capita (\$9.90) during the survey week at restaurants compared to households with sufficient access (\$19.56). Their spending was also a smaller percentage of their food expenditures (27 percent compared to 37 percent).
- Access-burdened and sufficient-access households are equally likely to visit convenience stores, dollar stores, or pharmacies to acquire food, although there are differences in their levels of spending at these locations.
- Access-burdened households spent \$1.32 more per capita during the survey week at convenience stores, dollar stores and pharmacies than those with sufficient access.

We conducted two additional, separate analyses to further interpret our findings. The first compared burdened-access and sufficient-access households in a subsample of SNAP and low-income nonparticipating households (households with income at or below 185 percent of Federal poverty guidelines for family size). We found the food acquisition patterns of this subsample similar to the patterns of access-burdened and sufficient-access households in the full sample.

The second analysis used an access measure based solely on distance to the nearest SNAP-authorized SM/SS, a typical measure of access in the literature, with our full sample. In this analysis, we found few differences in food acquisition patterns by distance to the nearest SNAP-authorized SM/SS, with one exception: households at least 10 miles from the nearest SNAP-authorized SM/SS are less likely to buy food at large stores and restaurants but more likely to buy at small grocery, ethnic, or specialty stores and convenience, dollar, and pharmacy stores than households within 0.5 miles of the nearest SNAP-authorized SM/SS.

How Was the Study Conducted?

This report uses data from the USDA's FoodAPS (conducted between April 2012 and January 2013) and the FoodAPS Geography Component (FoodAPS-GC). FoodAPS, a nationally representative USDA survey of U.S. households, collected detailed information about foods and beverages obtained over a 7-day period. Respondents reported where they obtained foods and how much they spent, along with information on their usual food shopping locations and typical travel mode. We appended data about the food retail environment, such as store proximity, indicators of limited foodstore access, and other food- and diet-related measures to the survey data. Our report uses measures of foodstore access to understand where access-burdened households acquire food and how much they spend at each food source (per capita and as a percentage of their total food expenditures) compared to households with sufficient access.

This analysis shows descriptive cross-tabulations and means, weighted to represent the national U.S. population. Standard errors and hypothesis tests are corrected for the complex survey design using the Taylor Series expansion method. Results reported are statistically significant at an alpha of 0.10.

The Influence of Foodstore Access on Grocery Shopping and Food Spending

Introduction

Household decisions on where to shop for food and how much to spend are influenced by the amount of resources available to the household (including income and food assistance benefits, but also sufficient time for shopping), and by food prices, household food preferences, household characteristics such as size and the level of education, and convenience (i.e., distance to nearest supermarket and access to a vehicle). (See Taylor and Villas-Boas (2016) for a summary of the foodstore-choice literature.) For some households, constraints in proximity to large grocery stores or lack of a vehicle may limit the ability to shop for food and could mean they are more reliant on smaller, more accessible sources such as convenience stores or fast-food restaurants, which typically do not offer the wide selections of food needed for a healthy diet and may have higher prices. Such access-burdened households have drawn the concern of policymakers because they may experience greater food insecurity.

The National Household Food Acquisition and Purchase Survey (FoodAPS), conducted from April 2012 to January 2013 (ERS, 2016a), and its geography component provide a unique opportunity to more clearly understand how access to large retailers is related to food shopping and spending. An advantage of FoodAPS is that it records all food acquisitions and purchases from grocery stores and other food retailers (food at home—FAH), as well as prepared food purchases from establishments such as restaurants and fast-food places (food away from home—FAFH). These data enable an analysis of how foodstore access affects purchases and acquisitions from FAFH sources and from smaller venues like convenience stores, and to understand if people who may struggle to access grocery stores are reliant on these alternative venues for a greater share of their food needs. FoodAPS data allow researchers to expand on previous studies that examine how food access impacts food consumption and diet in specific geographic areas (Dubowitz et al., 2015; Cummins et al., 2014), using data that are representative of low-income populations (Rahkovsky and Snyder, 2015). The FoodAPS data enable research into food-purchasing behaviors at a national level and for low-income and households participating in the Special Supplemental Nutrition Program (SNAP), and they provide a comprehensive picture of the food retail environment's effect on households.

In addition, the FoodAPS data and the geography component contain rich information on households' resources, such as access to a vehicle, and the local food retail environment for all surveyed areas. These data allow for the examination of whether limited access to healthy food sources affects where households shop and how much they spend at each location, instead of presuming that households are limited to the closest retailers.

This report provides a descriptive analysis and examines whether households classified as access-burdened are more likely to acquire foods—and spend more—at establishments that typically have fewer healthy options, such as convenience stores and fast-food restaurants. The analysis expands upon work done by Todd and Scharadin (2016), who examine the types of places that foods were acquired by FoodAPS households and expenditures at these places, overall and across urban and rural areas and regions of the United States. Our analysis examines many of the same outcomes as Todd and Scharadin, but we compare access-burdened households to those with sufficient access.

The report also builds upon other relevant work that has been conducted using FoodAPS data. For example, Ver Ploeg et al. (2015) examined the types of stores households usually frequent for food shopping, how they get there, and how far they travel. The study showed that about 90 percent of all households shop at large stores such as supermarkets and supercenters, and this percentage does not vary much by participation in SNAP or the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), or by income or by mode of travel to the store. FoodAPS respondents were asked to identify the store where they complete most of their grocery shopping, or their “primary store,” which is the store that Ver Ploeg et al. (2015) focused on. That study also suggested that a household’s primary store is not necessarily the closest large store—the average distance traveled to the store households usually use for grocery shopping is 3.8 miles, while the nearest SNAP-authorized supermarket or supercenter is, on average, 2.1 miles away. A key difference between the present study and the 2015 Ver Ploeg study is that the current analysis examines actual reported food-acquisition events and spending behavior, not only where respondents report their primary grocery store.

Gustafson et al. (2016) used FoodAPS to examine proximity to a supermarket and supercenter to examine whether SNAP and low-income households shop at these places, the types of foods purchased, and expenditures at both types of places. Although similar to our report, Gustafson’s report focuses on low-income and SNAP households and on differences in supercenter purchases compared with those at supermarkets, while this report incorporates analysis of all FAH and FAFH establishments. Another part of Gustafson’s study examined food venue choice and how SNAP participation and the food environment interact to affect that choice. This analysis expands upon the earlier work by examining food shopping and spending at different venues.

More generally, this research fits within several other studies of how foodstore access relates to food shopping and spending. Mabli (2014) used data on two SNAP entry cohorts from the SNAP Food Security Survey and found that SNAP participants tend to bypass the closest store, as the median distance traveled to the store where they shopped was 3.0 miles relative to a median distance of 0.7 miles to the nearest large grocery store. This study differs from Mabli by examining food acquisition and food spending at different types of stores and for a broader population.

Rahkovsky and Snyder (2015) used a national sample of proprietary data on food shopping behavior and found that households in low-income and low-supermarket-access census tracts purchase modestly less of some foods such as fruits and vegetables and modestly more of other foods such as red meat, diet soft drinks, and nondiet drinks. However, most of these households shopped for food more than a mile from their homes. When these households traveled farther to shop for food, they did not greatly change their purchasing habits. Handbury et al. (2016) use similar data to examine how much of the income differential in diet quality can be explained by differences in store access. The study finds that about half of the differences in diet quality between low- and high-income households can be explained by factors other than access and observed household characteristics. Further, the diet quality of household food purchases is not highly responsive to changes in the retail environment.

Two quasi-experimental studies examine how food shopping and diet quality changed when a new supermarket opened in low-income and low-access neighborhoods, one in Pittsburgh and one in Philadelphia (Dubowitz et al. (2015) and Cummins et al. (2014)). Neither study found much improvement in diet quality of residents near the new supermarkets relative to residents of a similar-income and low-access neighborhood that did not gain a new store. In the Philadelphia study, only

27 percent of households in the neighborhood used the new store as their main foodstore, which may partly explain the lack of improvement in the diet observed (Cummins et al.).

Our report adds to the body of results by examining individual-level measures of access (instead of neighborhood levels) with a dataset that represents low-income populations better than proprietary data.

FoodAPS and the Food Environment

USDA's National Household Food Acquisition and Purchase Survey (FoodAPS) is the first nationally representative survey of American households to collect comprehensive data about household food purchases and acquisitions. Data were collected from April 2012 to January 2013, with a total of 4,826 households, comprising 14,317 individuals participating. Participating households were asked to report all foods and beverages purchased from establishments that included grocery stores, convenience stores, bakeries, and restaurants, as well as foods obtained for free from sources such as family members and friends, gardens, work events, and food pantries over the course of 7 days. As defined above, foods purchased from establishments such as supermarkets, grocery stores, or farmers' markets for consumption at home are referred to as food-at-home (FAH), while prepared foods purchased from locations including restaurants (fast-food and non-fast-food) or vending machines are referred to as food-away-from-home (FAFH). Throughout the text, FAFH will be used to refer to food purchased from all restaurants, including fast-food and non-fast-food establishments.

FoodAPS oversampled SNAP and low-income households to collect a complete picture of food behaviors for these populations. The sampled households are split into four target groups comprising SNAP participants and three groups of non-SNAP-participating households: income less than the Federal poverty guidelines (FPG) for household size, between 100 and 184 percent of the FPG, and greater or equal to 185 percent of the FPG.

FoodAPS was designed in part to support research on how access to food retailers is related to food choices and measures of food security, health, and obesity. Accordingly, respondents were asked several questions about where they usually shop for groceries and to record information about the places where they acquired food during the survey week. Locations of places visited were geocoded, as were household addresses, so that the distance between the household address and the place food was acquired could be calculated. Households were asked for the usual way they traveled to get to the store where they do their primary food shopping. Response options included: Drive own car; Use someone else's car; Someone else drives me; Walk; Bus; Taxi; Ride bicycle; Other (specify). FoodAPS respondents were also asked if any household member owns a vehicle, leases one, or both. There is a high degree of consistency between these two measures, but a nontrivial number of households, about 300, say they own/lease a vehicle but do not use it to get to their primary store, or they report not owning/leasing a vehicle but using their own vehicle to get to the store. These responses are not necessarily errors—a household could own a vehicle that does not run or lack a license to drive, or a household may not own a vehicle but have regular access to one from a relative or friend to travel to a store. This analysis uses responses to the question about the actual method of travel because the goal is to evaluate access to grocery stores, so responses to “How do you usually get to the store where you do most of your food shopping?” are more relevant.

After data collection, additional information about the local food environment was appended to the FoodAPS data. A list of SNAP-authorized food retailers in the primary sampling units¹ (PSUs) was obtained from the USDA's Food and Nutrition Service's Store Tracking and Redemption System. The addresses of these retailers were geocoded so that distance to the nearest SNAP-authorized store (of different types) from the household could be calculated.

¹In FoodAPS, 50 PSUs were sampled across the United States. PSUs are counties or groups of contiguous counties in low-population areas.

Additional data on the food retail environment were also collected and attached to the main FoodAPS file through the FoodAPS Geography Component (FoodAPS-GC). This part of the FoodAPS study was conducted through a cooperative agreement with researchers at Tufts University and the University of Illinois Urbana-Champaign. Data on the local food environment in the 50 PSUs in the survey were compiled and created. Information collected through the FoodAPS-GC includes the location of different types of retailers and restaurants, neighborhood measures of access to these food venues, and information about the socio-demographic factors of the areas and food-related policies such as sales tax policies of foods. Data for all 50 FoodAPS PSUs are provided at different geographic levels—census block groups and census tracts and counties—depending upon the availability of data.

Defining Access-Burdened and Sufficient-Access Households

Store access burden is measured at the household level by combining a measure of proximity to a large store and the household's primary mode of transportation for food shopping.² Proximity to the nearest SNAP-authorized supermarket or superstore (SM/SS) is considered because these large stores have been widely used as proxy for sources of healthy and affordable food.³ Households that are far from such large stores and that do not use their own vehicle are hypothesized to face burdens in accessing large stores. The two variables are combined to classify households as either:

1. *Access-Burdened*: living farther than 0.5 mile from the nearest SM/SS *and* relying on a form of transportation (arranging rides with friends, public transportation, etc.) to get to the store other than their own vehicle, or
2. *Sufficient Access*: living within 0.5 mile of the nearest SM/SS *or* using their own vehicle to travel to the store.

Access-burdened households more than 0.5 mile from a SNAP-authorized SM/SS may struggle to arrange rides to the grocery store, take public transportation, or find another mode of transportation. These sufficient-access households are presumed to be able to overcome the local food environment to shop outside of their neighborhoods by taking their own car to the store *or* they live close enough to an SM/SS that the inability to take their own car to the store is not a barrier to accessing a store that sells healthy, affordable food. While this is not a typical measure of foodstore access, we use the classification because it is measured at the household-level (rather than assigning information at the census-tract level to all households in the tract) and because it allows for consideration of both distance and vehicle access, major determinants of store access. The ability to take one's own car expands the food environment by allowing households to travel outside of their immediate neighborhoods.

The second part of the report examines whether the estimates using the combined distance and vehicle access measure hold up when more common measures of foodstore access are used to understand food acquisition and spending outcomes.

To assess the influence of these access factors (distance, vehicle access, income), the report first examines the percent of households that visited different types of food retailers, restaurants, and other food establishments and the average number of events at each type of place. We use the same place-type categories as those used by Todd and Scharadin (2016), which sort FAH sources into three types of stores: (1) large stores comprised of supermarkets, supercenters, large grocery stores, and club stores ("large grocery stores");⁴ (2) small grocery and specialty stores such as seafood

²During the Initial Interview, households were asked to identify the store in which they complete most of their grocery shopping, referred to here as their "primary store." Households were also asked "How do you usually get to the store where you do most of your food shopping? Response options included: Drive own car; Use someone else's car; Someone else drive me; Walk; Bus; Taxi; Ride bicycle; Other (specify).

³Our report focuses on physically accessing stores that sell healthy and affordable food. We do not address the question of whether households have enough money to buy enough food for a healthy diet or examine the role of foodstore prices in obtaining a healthy diet.

⁴These stores typically offer a full range of grocery categories and have been used as proxies for healthy food retailers (USDA, 2009).

markets, bakeries, and ethnic grocery stores (“small grocery stores”); and (3) convenience stores, gas stations, pharmacies, and dollar stores (“convenience stores”). While healthy foods can often be found at each of these types of stores, in general, the range of healthy food is greater in SM/SS. And as in Todd and Scharadin (2016), other food acquisition places are broken into: (4) own production (hunt, fish, garden); (5) food pantries and Meals on Wheels; (6) restaurants and other eating places; (7) schools (including school meals and foods purchased at vending machines or snack bars in schools); (8) friends and family; and (9) work.

Second, per capita household spending and the percent of the household’s total food spending at each of the three FAH categories defined above and FAFH expenditures at restaurants and other eating places are examined.⁵ For FAH, the analysis sums the FoodAPS item-level data on the amount spent on each food item purchased⁶ by food retail venue type. This is a slightly different approach from Todd and Scharadin, which uses the total spent at the shopping “event-level” to measure expenditures and likely overestimates food spending due to the inclusion of nonfood items. However, our method may underestimate spending if respondents forget or neglect to report individual items purchased.⁷ We see our estimate on food spending as a lower bound estimate. No available approach simultaneously achieves complete coverage of all foods and zero overreporting of nonfood spending. Given the tradeoffs, we favor the approach that summarizes item-level expenditure data. Clay et al. (2016) use a similar method to aggregate total food spending and compare estimates for FoodAPS to the Consumer Expenditures (CE) survey. That report finds that FoodAPS estimates are about 5 percent higher than CE estimates for all food spending, which appears largely driven by FoodAPS capturing more food-away-from-home spending than the CE. For expenditures at restaurants and other eating places, the FAFH event-level data are used because there is less concern about the inclusion of nonfood items at restaurants.

This analysis shows descriptive cross-tabulations and means, which are weighted to represent the national U.S. population using the FoodAPS survey weights. Standard errors and hypothesis tests are corrected for the complex survey design using the Taylor Series expansion method. Results are reported that are statistically significant at an alpha of 0.10.

⁵We limit our analysis of spending outcomes to these three FAH place types and at restaurants and other eating places because these places are central to questions about how foodstore access affects food choices and because food is often acquired for free at the other place types.

⁶Item expenditure data are missing for just over 7 percent of items. This analysis uses imputed prices from ERS, 2016.

⁷We do not know the degree of any underreporting, but suspect that shopping trips with smaller levels of spending or numbers of items purchased may be more likely to be underreported. The ratio of total paid on food items to total paid including nonfood items is considerably lower at convenience, pharmacies, and dollar stores (45 percent) compared with large grocery stores (80 percent). This is not unexpected, given many visits to these stores to purchase gas and household and pharmacy items.

FoodAPS Food Access Measures and Sample Characteristics

Table 1 displays select characteristics of the primary FoodAPS respondent grouped by level of access to the nearest SNAP-authorized SM/SS.⁸ The primary respondent was identified during the initial interview as the main food shopper or meal planner. In addition to household characteristics, mean and median estimates of proximity to other food venues are compared between sufficient-access households and access-burdened households.

Comparisons of Household Characteristics

Overall, 94 percent of the sample is considered to have sufficient access, while 6 percent is access-burdened. This is higher than the estimate from the Food Access Research Atlas that 4.2 percent of U.S. households who are without a vehicle live more than 0.5 miles from the nearest SM/SS (Economic Research Service, 2017). Among households with an elderly (age 65 and over) reference person, over 11 percent are access-burdened compared with 6 percent of all households. Compared to White households, higher percentages of Black and Hispanic households are access-burdened: over 13 percent of Black households and almost 10 percent of Hispanic households are access-burdened, compared to 5 percent of White households. Not surprisingly, lower income and SNAP-participating households are more likely to be access-burdened than higher income households; about one in five SNAP-households are access-burdened. Approximately 11 percent of non-SNAP households with income below 185 percent of the Federal poverty guidelines (FPG) are access-burdened, compared to 2 percent of households with incomes above 185 percent of the FPG. Median household monthly income is also much lower for access-burdened households compared with sufficient-access households (\$1,240 compared with \$4,387.67).⁹

Comparison by Proximity to Food Venues

The bottom of Table 1 displays a household's proximity to other food venues, including distance to the nearest SNAP-authorized SM/SS, fast-food restaurant, non-fast-food restaurant, and SNAP-authorized convenience store. Notably, access-burdened households are closer to non-fast-food restaurants, although no differences were found in distance to the nearest fast-food restaurant. Access-burdened households are, on average, 1.11 miles from a SNAP-authorized convenience store, while sufficient-access households are 1.81 miles away. This may be counterintuitive, but it is consistent with previous research that finds that low-income households and those without vehicles tend to live in more densely populated areas (Wilde et al., 2014). Estimates of median distances to each of these food venue types are less than half the mean distance, indicating that some outlying households are very far from these venues relative to all other households.

⁸Appendix table 1 shows these characteristics across two other measures of access used later in this report—the distance to the nearest SNAP-authorized SM/SS and whether or not the household is in a low-income and low-access census tract as defined by the Economic Research Service's Food Access Research Atlas (ERS, 2016b).

⁹Among SNAP participating and nonparticipating households with incomes below 185 percent of FPG, those who are access-burdened have median monthly income of \$900 compared with \$1,486 for those with sufficient access.

FoodAPS asks households to identify the "primary" store in which they do their food shopping and to estimate the one-way travel time to that store. Straight-line distance from the household to this store is also measured. Table 1 shows estimates of distance to the primary store and the estimated one-way travel time for access-burdened and sufficient-access households. These estimates show that access-burdened households do not travel as far to their primary store as sufficient-access households do (2.95 miles on average compared with 3.85 miles). It takes access-burdened households about 3 more minutes, on average, to get to their primary store (13.46 minutes compared with 10.68 minutes). Median travel times, however, are equal between the two access groups at 10 minutes.

Table 1

Foodstore access, selected household characteristics, and proximity to food venues

Characteristics	Travel mode and distance to nearest SNAP-authorized SM/SS		
	All	Sufficient-access Uses own vehicle or is ≤ 0.5 mile to nearest store	Access-burdened Does not use own vehicle, is > 0.5 mile to nearest store
All households	4,826	93.80 <i>0.51</i>	6.24 <i>0.51</i>
Age (household reference person)			
Senior (age 65+)	710	88.47 <i>2.01</i>	11.53 <i>2.01</i>
Race (household reference person)			
White	3,371	94.71 <i>0.58</i>	5.29 <i>0.58</i>
Black	704	86.94 <i>1.98</i>	13.06 <i>1.98</i>
Asian, other race, or multiple race	745	94.99 <i>1.13</i>	5.01 <i>1.13</i>
Hispanic origin	938	90.26 <i>2.17</i>	9.74 <i>2.17</i>
SNAP/income group			
SNAP participant	1,581	79.82 <i>1.52</i>	20.18 <i>1.52</i>
Nonparticipant with income to poverty ratio ≤ 1.85	1,197	88.65 <i>1.64</i>	11.35 <i>1.64</i>
Nonparticipant with income to poverty ratio > 1.85	2048	97.82 <i>0.37</i>	2.2 <i>0.37</i>
Median monthly household income	4,826	4,387.67	1,240.00
Household size			
Mean household size	2.94 <i>0.06</i>	2.97 <i>0.06</i>	2.69 <i>0.09</i>
Proximity to food venues			
Distance in miles to the nearest SNAP-authorized SM/SS			
Mean	2.18 <i>0.28</i>	2.18 <i>0.27</i>	2.18 <i>0.46</i>
Median	0.90	0.90	0.89

Continued—

Table 1

**Foodstore access, selected household characteristics, and proximity to food venues—
continued**

Characteristics	Travel mode and distance to nearest SNAP-authorized SM/SS		
	All	Sufficient-access Uses own vehicle or is ≤0.5 mile to nearest store	Access-burdened Does not use own vehicle, is > 0.5 mile to nearest store
Distance in miles to the nearest fast-food restaurant			
Mean	2.43	2.46	2.01
	<i>0.37</i>	<i>0.37</i>	<i>0.62</i>
Median	0.65	0.66	0.60
Distance in miles to the nearest non-fast-food restaurant			
Mean	1.03	1.04	0.83
	<i>0.14</i>	<i>0.14</i>	<i>0.17</i>
Median	0.38	0.39	0.34
Distance in miles to the nearest SNAP-authorized convenience store			
Mean	1.77	1.81	1.11
	<i>0.19</i>	<i>0.2</i>	<i>0.22</i>
Median	0.74	0.74	0.55
Distance in miles to the household's 'primary' store for food purchases			
Mean	3.8	3.85	2.95
	<i>0.49</i>	<i>0.49</i>	<i>0.54</i>
Median	1.84	1.87	1.53
One-way travel time (in minutes) to household's primary store for food purchases			
Mean	10.85	10.68	13.46
	<i>0.5</i>	<i>0.5</i>	<i>0.89</i>
Median	10	10	10
Observations	4,826	4,374	452

Notes: Unless otherwise noted, values are percentages. These percentages across rows add to 100. **Bold** text indicates that Rao-Scott χ^2 tests are statistically significant for at least the 0.10 level. Age information is missing for eight observations. For age, the reference group is non-elderly primary respondents; for race, the reference is White; for SNAP/Income the reference is nonparticipants with income > 185 percent of Federal poverty guidelines for family size. For household size and distance to food venues, a t-test of differences in means across that access variable is tested where the reference is those who use their own vehicle or live within 0.5 mile of a store. SNAP=Supplemental Nutrition Assistance Program; SM/SS=Supermarket/Superstore; *Italicized numbers are standard error estimates.*

Source: USDA, Economic Research Service estimates using FoodAPS data.

Shopping Events at Different Types of Food Sources

To examine the impact of distance and vehicle access on shopping behaviors, table 2 shows the percentage of households with a reported food event for nine categories of foodstores, restaurants, and other food sources. The purpose of this analysis is to examine whether access-burdened households are less likely to visit large grocery stores, supermarkets, or superstores (“large grocery”) and more likely to visit retailers and nonretail sources that may not sell a wide array of healthful foods. First, the table displays this analysis for the entire FoodAPS sample, and then columns 3 and 4 show the analysis restricted to SNAP households and low-income non-SNAP households, to determine whether access differences in the full sample are driven by income differences.

Access-burdened households are equally likely to have a food acquisition event¹⁰ during the week they were surveyed as those with sufficient access, but the type of places where those events occur vary. Households that are access-burdened are less likely to shop at any FAH retailer, particularly at large stores and smaller grocery and specialty stores. Seventy-seven percent of access-burdened households report a food-shopping event at a large grocery store during the survey week compared with 87.5 percent of those with sufficient access. Furthermore, 10.6 percent of access-burdened households report a shopping event at a small grocery, compared to 18.5 percent of sufficient-access households. Access-burdened households are more likely to visit a food pantry or use Meals on Wheels—5.6 percent report an event at a food pantry, while only 1.2 percent of households with sufficient access report a visit. This sizable difference likely reflects the lower income levels of access-burdened households.

Access-burdened households are less likely to have food acquisition events at restaurants and other eating places than households with sufficient access—69.5 percent visited a restaurant or other eating place during the survey week compared with 85.8 percent of households with sufficient access. This finding about eating out may reflect income differences between access-burdened and sufficient-access households. Households with burdened access are also less likely to have acquired food at school or at work than those with better access. These differences likely reflect that access-burdened households are smaller on average, less likely to have school-aged children, and less likely to be employed.

Figure 1 shows that these results are similar when the sample is limited to only SNAP and low-income households. SNAP and low-income households in the access-burdened category are about 10 percent less likely than sufficient-access households to have a food event at a large grocery store. The SNAP and low-income access-burdened households are more likely to report an event at a food pantry (7 percent versus 3 percent of SNAP and low-income sufficient-access households) and are less likely to have events at restaurants and other eating places. Sixty-three percent of access-burdened SNAP and low-income households reported an event at an FAFH eating place, compared to 77.8 percent of sufficient-access SNAP/low-income households.

¹⁰Food acquisition event refers to any FAH or FAFH event where a respondent bought or received food for free. The term “shopping event” is used to refer to FAH purchases.

Table 2

Percent of FoodAPS households with a reported event by place type, by access-burdened and sufficient-access status

	Percent visited, all households		Percent visited, SNAP or low-income households	
	Sufficient-access households	Access-burdened households	Sufficient-access households	Access-burdened households
Food acquisition events				
All places ¹	98.69 <i>0.24</i>	98.11 <i>0.62</i>	97.05 <i>0.46</i>	97.51 <i>0.80</i>
All Food-at-Home places (1-3)	93.19 <i>0.53</i>	89.32 <i>2.38</i>	91.34 <i>1.04</i>	89.47 <i>1.90</i>
1) Large grocery stores, supermarkets, supercenters, warehouse ²	87.45 <i>0.80</i>	76.96 <i>3.12</i>	84.81 <i>1.29</i>	74.38 <i>3.32</i>
2) Small grocery, ethnic, and specialty stores	18.49 <i>1.56</i>	10.57 <i>1.65</i>	14.77 <i>1.79</i>	12.13 <i>2.07</i>
3) Convenience, dollar, pharmacy, and other stores	41.88 <i>1.44</i>	45.16 <i>3.98</i>	43.27 <i>1.87</i>	48.93 <i>3.84</i>
4) Own production	6.08 <i>0.79</i>	6.23 <i>2.30</i>	5.81 <i>1.18</i>	4.52 <i>2.18</i>
5) Food pantry or Meals on Wheels	1.18 <i>0.21</i>	5.61 <i>1.65</i>	3.33 <i>0.69</i>	7.00 <i>2.06</i>
6) Restaurants and other eating places	85.82 <i>1.04</i>	69.46 <i>3.60</i>	77.75 <i>1.71</i>	63.00 <i>4.13</i>
7) Schools	14.78 <i>1.06</i>	8.79 <i>1.55</i>	16.55 <i>1.01</i>	8.78 <i>1.44</i>
8) Family, friends, etc.	36.83 <i>1.40</i>	35.32 <i>2.98</i>	35.51 <i>1.59</i>	36.25 <i>4.21</i>
9) Work	22.95 <i>0.95</i>	8.30 <i>2.40</i>	14.34 <i>1.57</i>	5.88 <i>1.50</i>
Observations	4,374	452	2,374	404

¹Subsequent rows of different place types (1-9) show which places were visited by those who visited any place.

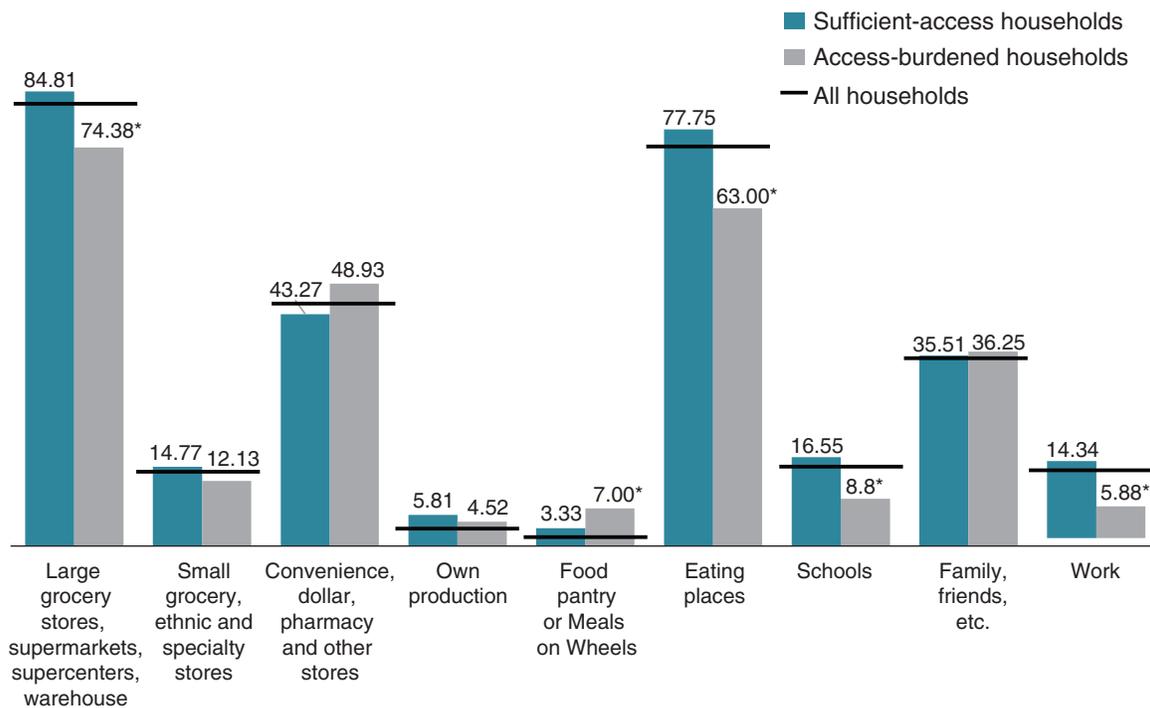
²Percentages do not add to 100 percent because most households visit more than one type of place.

Notes: **Bold** indicates estimate is statistically different from sufficient-access households. Access-burdened households are those who live more than 0.5 mile from the nearest SNAP-authorized supermarket or superstore and do not usually use their own vehicle to shop for groceries. Sufficient-access households live within 0.5 mile of the nearest store or use their own vehicle to shop for food. SNAP=Supplemental Nutrition Assistance Program; *italicized numbers are standard error estimates*.

Source: USDA, Economic Research Service estimates using FoodAPS data.

Figure 1

Percent of SNAP and low-income non-SNAP households visiting different place types during the survey week, by access category



Note: SNAP = Supplemental Nutrition Assistance Program. SM/SS = Supermarket/Superstore. Asterisk indicates estimate is statistically different from households who either take their own vehicle to their primary store or are within 0.5 mile of the nearest SNAP-authorized SM/SS with $p < 0.10$.

Source: USDA, Economic Research Service estimates using FoodAPS data.

Number of Events by Place Type

Table 3 shows estimates of the number of events overall and at each of the nine place categories for the overall FoodAPS sample and a subsample of SNAP and low-income non-SNAP households. The number of events was calculated for those who visited that place type (or any place) during the survey week.

The analysis finds that access-burdened households have fewer food acquisition events overall than households with sufficient access. The difference is considerable, with an average of 7.5 food acquisition events for access-burdened households compared with 11.5 for households with sufficient access. Access-burdened households had fewer events at both large stores (2.4 on average compared with 2.8 for households with sufficient access) and at restaurants and other eating places (3.2 on average compared with 5.6).¹¹ Estimated numbers of food acquisition events at different food venues for SNAP and low-income households reflect the differences for all households. Access-burdened SNAP and low-income households report fewer events overall, at large grocery stores and supermarkets, and at restaurants and other eating places.

Although access-burdened households have fewer events at large stores on average, it is still striking that access-burdened households that visit these stores, average over two shopping events at such stores, both for all households and for SNAP and low-income households. Data on SNAP redemption patterns also suggest that most SNAP households are redeeming their benefits at multiple stores (USDA, 2011).

The estimates from tables 2 and 3 suggest that those with burdened access may be less likely to visit a large store, and if they do, to have fewer shopping events at those types of stores. They are also less likely to acquire food at restaurants. It may be that households with burdened access rely on smaller stores for more of their food needs or that they shop less frequently. To investigate this result further, the next table examines food spending and percent of weekly food expenditures at different food retailers.

¹¹We also examined the average number of unique FAH stores and large stores visited by access-burdened households compared with those with sufficient access. We found that those with burdened access on average, were not reliant on a single store—they visited 2.3 unique FAH stores of all types and 1.7 unique large stores. These averages are lower than those with sufficient access (2.6 FAH stores and 2.0 large stores on average).

Table 3

Average number of events by place type for FoodAPS households by access-burdened and sufficient-access status

	Number of events, all households			Number of events, SNAP or low-income households		
	All households	Sufficient-access households	Access-burdened households	All SNAP and low-income households	Sufficient-access households	Access-burdened households
Food acquisition events						
All places ¹	11.21 <i>0.19</i>	11.46 <i>0.21</i>	7.47 <i>0.32</i>	9.79 <i>0.25</i>	10.23 <i>0.27</i>	7.36 <i>0.26</i>
All Food-at-Home places (1-3)	3.91 <i>0.06</i>	3.94 <i>0.06</i>	3.48 <i>0.18</i>	3.92 <i>0.10</i>	3.97 <i>0.10</i>	3.64 <i>0.20</i>
1) Large grocery stores, supermarkets, supercenters, warehouse	2.81 <i>0.05</i>	2.84 <i>0.05</i>	2.40 <i>0.15</i>	2.79 <i>0.06</i>	2.85 <i>0.07</i>	2.43 <i>0.15</i>
2) Small grocery, ethnic, and specialty stores	1.44 <i>0.06</i>	1.43 <i>0.06</i>	1.87 <i>0.18</i>	1.63 <i>0.10</i>	1.57 <i>0.12</i>	2.00 <i>0.10</i>
3) Convenience, dollar, pharmacy and other stores	2.22 <i>0.06</i>	2.21 <i>0.06</i>	2.35 <i>0.16</i>	2.31 <i>0.08</i>	2.27 <i>0.08</i>	2.47 <i>0.22</i>
4) Own production	1.93 <i>0.13</i>	1.92 <i>0.14</i>	2.03 <i>0.06</i>	1.87 <i>0.09</i>	1.80 <i>0.11</i>	2.50 <i>0.01</i>
5) Food pantry or Meals on Wheels	1.71 <i>0.10</i>	1.64 <i>0.08</i>	1.94 <i>0.13</i>	1.71 <i>0.14</i>	1.70 <i>0.10</i>	1.78 <i>0.19</i>
6) Restaurants and other eating places	5.44 <i>0.09</i>	5.56 <i>0.09</i>	3.22 <i>0.20</i>	4.21 <i>0.13</i>	4.40 <i>0.15</i>	3.21 <i>0.20</i>
7) Schools	6.29 <i>0.29</i>	6.30 <i>0.30</i>	6.00 <i>0.62</i>	7.42 <i>0.35</i>	7.75 <i>0.34</i>	6.53 <i>0.67</i>
8) Family, friends, etc.	2.68 <i>0.09</i>	2.68 <i>0.09</i>	2.74 <i>0.41</i>	2.83 <i>0.15</i>	2.86 <i>0.16</i>	2.64 <i>0.41</i>
9) Work	3.52 <i>0.15</i>	3.53 <i>0.16</i>	3.01 <i>0.38</i>	3.13 <i>0.20</i>	3.39 <i>0.22</i>	2.27 <i>0.22</i>
Observations	4,826	4,374	452	2,778	2,374	404

¹Subsequent rows of different place types (1-9) show which places were visited by those who visited any place.

Notes: **Bold** indicates estimate is statistically different from sufficient-access households. Access-burdened households are those who live more than 0.5 mile from the nearest SNAP-authorized supermarket or superstore and do not usually use their own vehicle to shop for food. Sufficient-access households are within 0.5 mile of the nearest store or use their own vehicle to shop for food. SNAP=Supplemental Nutrition Assistance Program; *italicized numbers are standard error estimates*.

Source: USDA, Economic Research Service estimates using FoodAPS data.

Expenditures at FAH Retailers and Restaurants and Other Eating Places

Table 4 shows average per capita household expenditures at each of the three FAH place types and restaurants and other eating places, with overall spending in each venue for access-burdened households and households with sufficient access. The table includes only SNAP households and low-income nonparticipating households.¹² We exclude any food acquired for free and also exclude food venues for which households often do not pay for food, such as at food pantries or social events.

Access-burdened households spend similar amounts on food to households with sufficient access, although the types of places where that money is spent varies. Households with burdened access spent slightly more per capita at FAH stores, \$34.22 compared with \$30.24, and less at FAFH venues (\$9.33 per capita) compared to households with sufficient access (\$12.77 per capita). Access-burdened households also spent slightly more per capita at convenience stores, although the absolute difference is quite small—\$3.22 compared with \$1.93. Note that these patterns across access status are quite similar for the full sample (Appendix table 2).

These differences are largely consistent with food spending as shown in figure 2 (and in the three right-side columns of table 4). Households with burdened access spend a larger percentage of their budget at FAH food venues (74 percent) than households with sufficient access (67 percent). Most of this difference is due to a smaller percentage spent at restaurants and other eating places (26 percent for access-burdened households compared to 33 percent for households with sufficient access). Households with burdened access spent a greater percentage of their budget at convenience stores—11 percent versus 5 percent. Again, the patterns by access status for the full sample, regardless of income or SNAP participation, are similar (Appendix table 2).

In previous literature, it has been hypothesized that households with low access will rely more on food retail venues that do not offer as wide of an array of healthful foods, such as restaurants and small food retailers. This analysis finds that access-burdened households visit large stores less frequently, but they have similar spending (overall and as a percentage of total food spending) at large stores. Further, although households with burdened access are closer, on average, to restaurants, we find that they spend less of their food budget at these venues than households with sufficient access, contrary to one hypothesis of the food-store-access research. They do spend more—and a greater percentage of their budget—at convenience stores, but the difference in the amount spent is small, less than \$2 per week. These data do not show what is purchased at each of these food retail venues, and so we cannot gauge potential differences in diet quality. But differences in access do not translate into major differences in where and how much is spent on FAH and suggest that those with burdened access are less reliant on FAFH sources than households with sufficient access. That households with burdened access can overcome these barriers to shop at stores outside their immediate neighborhoods is consistent with previous quantitative studies (Rahkovsky and Snyder, 2015; Ver Ploeg et al, 2015; and Wilde et al., 2014) and with data from qualitative interviews (MacNell et al., 2017).

¹²Appendix table 2 shows the same estimates for the full sample.

Table 4

Food expenditures for SNAP and low-income FoodAPS households by place type and by access-burdened or sufficient-access status

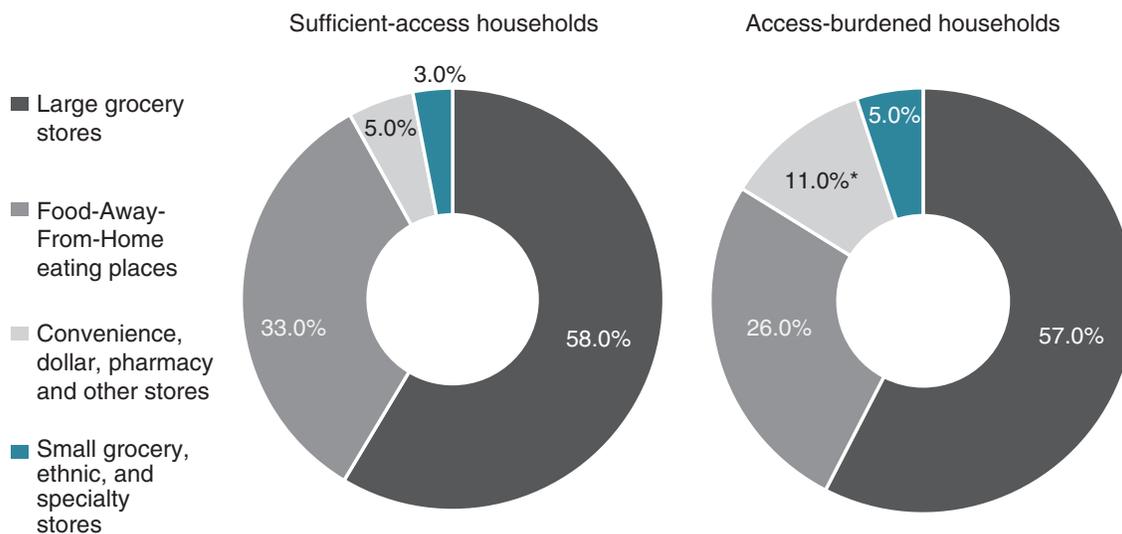
Food acquisition events	Per capita weekly expenditures			Percent of weekly food expenditures		
	All households	Sufficient-access households	Access-burdened households	All households	Sufficient-access households	Access-burdened households
All places	43.09 <i>0.92</i>	43.01 <i>0.91</i>	43.55 <i>2.13</i>			
All Food-at-Home places (1-3)	30.80 <i>0.81</i>	30.24 <i>0.77</i>	34.22 <i>2.01</i>	68.0 <i>0.01</i>	67.0 <i>0.01</i>	74.0 <i>0.02</i>
1) Large grocery stores	27.05 <i>0.70</i>	26.86 <i>0.70</i>	28.22 <i>1.94</i>	58.0 <i>0.01</i>	58.0 <i>0.01</i>	57.0 <i>0.02</i>
2) Small grocery, ethnic, and specialty stores	1.63 <i>0.33</i>	1.44 <i>0.27</i>	2.79 <i>0.58</i>	4.0 <i>0.01</i>	3.0 <i>0.01</i>	5.0 <i>0.01</i>
3) Convenience, dollar, pharmacy, and other stores	2.11 <i>0.20</i>	1.93 <i>0.20</i>	3.22 <i>0.57</i>	6.0 <i>0.04</i>	5.0 <i>0.00</i>	11.0 <i>0.01</i>
FAFH restaurants and other eating places	12.29 <i>0.38</i>	12.77 <i>0.38</i>	9.33 <i>0.66</i>	32.0 <i>0.01</i>	33.0 <i>0.01</i>	26.0 <i>0.02</i>
Observations	2,607	2,242	365	2,607	2,242	365

Notes: FAFH is food away from home acquired at restaurants and other eating places. Food acquired for free is excluded as is food acquired at school, work, or from family or friends. **Bold** indicates that access-burdened households are statistically different from access-sufficient households. Access-burdened is defined as living more than 0.5 mile from the nearest SNAP-authorized supermarket or superstore and not using one's own vehicle to shop for food. Sufficient access is defined as living within 0.5 mile of the nearest store or using one's own vehicle to shop for food.

SNAP=Supplemental Nutrition Assistance Program; *italicized numbers are standard error estimates.*

Source: USDA, Economic Research Service estimates using FoodAPS data.

Figure 2

SNAP and low-income household percentage of weekly food expenditures by place type and by sufficient-access or access-burdened household status


Note: SNAP = Supplemental Nutrition Assistance Program. SM/SS = Supermarket/Superstore. Asterisk indicates that access-burdened households—those that do not use their own vehicle and that are more than 0.5 mile from the nearest SNAP-authorized SM/SS are statistically different from those who have sufficient access—they use their own vehicle or live within 0.5 mile of the nearest store with $p < 0.10$.

Source: USDA, Economic Research Service estimates using FoodAPS data.

Do More Traditional Measures of Access Show Differences in Food Venue Choices and Food Spending?

This report has so far used a measure of foodstore access that uses the rich data of FoodAPS to measure household proximity to the nearest SM/SS and whether the household uses its own vehicle to shop for food. To gauge distance, many studies of supermarket access rely on neighborhood measures of store access or simply measures of proximity to a supermarket. In this section, we use two of these more traditional types of store access measures to examine food acquisition venues and food expenditures. First, we use distance from the household to the nearest SNAP-authorized SM/SS. Then we use a neighborhood-level measure of whether the household is in a low-income and low-access census tract, as defined by the Economic Research Service's (ERS) Food Access Research Atlas (ERS, 2016b). Distance to the nearest SNAP-authorized SM/SS using Euclidean distance measured from the household to the nearest store is analyzed categorically: (1) less than 0.5 miles; (2) 0.5 to 1.0 miles; (3) 1.0 miles to 10.0 miles; and (4) greater than 10 miles. This measure is based on a directory of supermarkets and superstores authorized to accept SNAP benefits. Proximity to a large store is often used in food-store-access research, but calculating proximity from each household is less frequent—more often, proximity is measured from a central place in a geographic unit (e.g., the population-weighted centroid of a census tract).

Using ERS' Food Access Research Atlas, neighborhood access is measured using the low-income and low-access vehicle and 20-mile (LILA-vehicle) measure. For this measure, low-income census tracts are defined by one of three criteria: as those where at least 20 percent of the population has income below FPG; those where median incomes are at or below 80 percent of the larger Metropolitan Statistical Area's (MSA) median income if situated in an MSA; or those where median income is at or below 80 percent of the State-level median income if situated in a nonmetro area. Low-access tracts are those where at least 100 households do not have a vehicle and are more than 0.5 miles from a store, or tracts where at least 500 people or one-third of the tract population are more than 20 miles from a large grocery store. Shopping behavior and expenditures of households in these low-income and low-access census tracts are compared to households outside of these tracts. This is a fairly typical neighborhood-level measure used in studies of the food environment in that it focuses on low-income areas and takes store proximity into consideration.¹³

Table 5 shows the percentage of households that acquired food at different venues by distance to the nearest SNAP-authorized SM/SS and by whether the household lives in a low-income/low-access census tract. For brevity, the number of food acquisition events is not reported in this table but is available as Appendix table 3.

Two general findings are worth noting. First, households that live farthest from the nearest SNAP-authorized SM/SS are more likely to acquire food from smaller FAH venues (small grocery and convenience stores) than households living close to the nearest large store. These distant households were more likely to have acquired food through their own production (hunting, fishing, or gardening; 13 percent for households more than 10 miles from a SM/SS compared with almost 3 percent for households within 0.5 mile of an SM/SS) and from family and friends (46 percent compared with almost 30 percent for closer households). This result is likely driven by households in rural areas—

¹³We also examined food venues visited and spending by using the Food Access Research Atlas Low-Income and Low-Access 1- and 10-mile definition. Results were not much different using that measure instead of the Vehicle Access and 20-mile measure.

Table 5

Place types visited by FoodAPS households during survey week, by distance to nearest SNAP-authorized supermarket or superstore and by census tract-level food desert measure

Food acquisition events	Percent of households with any event					Percent of households with any event	
	Distance to nearest SM/SS in miles					HHs not in low-income & low-access tracts	HHs in low-income & low-access tracts
	All distances	< 0.5	0.5 to 1	1 to 10	10+		
All places ¹	98.65 <i>0.24</i>	98.42 <i>0.56</i>	98.75 <i>0.48</i>	98.65 <i>0.34</i>	99.36 <i>0.24</i>	99.02 <i>0.20</i>	96.38 <i>1.23</i>
All Food-at-Home places (1–3)	92.95 <i>0.58</i>	91.42 <i>1.5</i>	92.96 <i>0.97</i>	93.91 <i>0.64</i>	99.36 <i>0.24</i>	93.35 <i>0.65</i>	90.43 <i>1.92</i>
1) Large grocery stores, supermarkets, supercenters, warehouse ²	86.79 <i>0.80</i>	84.65 <i>2.07</i>	86.68 <i>1.52</i>	89.11 <i>0.88</i>	77.24 <i>7.00</i>	87.22 <i>0.93</i>	84.17 <i>2.17</i>
2) Small grocery, ethnic, and specialty stores	17.99 <i>1.45</i>	15.90 <i>2.13</i>	15.80 <i>1.53</i>	19.96 <i>2.31</i>	27.23 <i>4.28</i>	18.47 <i>1.62</i>	15.65 <i>2.17</i>
3) Convenience, dollar, pharmacy, and other stores	42.08 <i>1.38</i>	40.11 <i>2.43</i>	40.79 <i>1.79</i>	42.64 <i>2.17</i>	58.63 <i>2.64</i>	42.17 <i>1.42</i>	41.53 <i>2.97</i>
4) Own production	6.08 <i>0.74</i>	2.75 <i>0.77</i>	5.23 <i>0.78</i>	8.06 <i>1.29</i>	13.33 <i>1.38</i>	6.04 <i>0.86</i>	6.35 <i>1.20</i>
5) Food pantry or Meals on Wheels	1.46 <i>0.27</i>	2.13 <i>0.45</i>	1.37 <i>0.46</i>	1.13 <i>0.29</i>	1.25 <i>0.67</i>	1.49 <i>0.32</i>	1.26 <i>0.51</i>
6) Restaurants and other eating places	84.80 <i>0.92</i>	87.41 <i>1.60</i>	87.38 <i>1.34</i>	82.48 <i>1.36</i>	72.92 <i>10.60</i>	85.84 <i>0.88</i>	78.37 <i>1.89</i>
7) Schools	14.40 <i>1.00</i>	14.39 <i>1.69</i>	16.20 <i>1.41</i>	14.12 <i>1.18</i>	4.07 <i>2.09</i>	14.39 <i>1.17</i>	14.49 <i>1.41</i>
8) Family and friends	36.74 <i>1.32</i>	29.50 <i>1.95</i>	37.94 <i>2.22</i>	39.44 <i>1.64</i>	46.45 <i>6.80</i>	37.44 <i>1.48</i>	32.41 <i>3.35</i>
9) Work	22.04 <i>0.94</i>	21.76 <i>1.90</i>	22.18 <i>2.70</i>	21.66 <i>1.97</i>	26.73 <i>1.90</i>	22.93 <i>0.95</i>	16.53 <i>2.68</i>
Observations	4,826	1,390	1,501	1,831	104	3,966	860

¹Subsequent rows of different place types (1-9) show which places were visited by those who visited any place.

²Percentages do not add to 100 because households visit more than one type of place during the week-long period for which they were surveyed.

Note: **Bold** indicates that estimate is statistically different from reference group (<0.5 mile from nearest SM/SS (Supermarket/Superstore) or not in a low-income, low-access area) with $p < 0.10$; SNAP=Supplemental Nutrition Assistance Program; *italicized numbers are standard error estimates*.

Source: USDA, Economic Research Service estimates using FoodAPS data.

all households more than 10 miles from the nearest SNAP-authorized SM/SS are in rural census tracts (tracts where the population-weighted centroid is in an area with fewer than 2,500 people) and 55 percent of households 1-10 miles are in rural areas. These findings reflect those from Todd and Scharadin (2016), which show that rural residents are more likely than urban residents to have acquired foods from friends and family and from own production. Overall, the farther households are from the nearest supermarket, the more likely they are to rely on their own food production sources and friends and family. Also, there is a decrease in the number acquiring food at restaurants and other eating places as distance to the nearest supermarket increases, although the difference is only significant for those households between 1 to 10 miles from the nearest SM/SS.

The two right-most columns of table 5 show that living in a low-income and low-access census tract has almost no association with where food is acquired. The only two differences are that those in low-income and low-access census tracts are less likely to acquire food at a restaurant or other eating place and less likely to acquire food from work than those who live in higher income or higher access tracts.

Tables 6a and 6b show expenditure totals and percentages by distance to the nearest SNAP-authorized SM/SS (table 6a) and by whether the household lives in a low-income and low-access census tract (table 6b). Table 6a shows that there are very few differences in total spending or percentages of food expenditure across distance to the nearest supermarket. The one consistent exception is for households that are at least 10 miles from the nearest large store. These households spend more at FAH venues and less at restaurants and other eating places, both overall and as a percentage of total spending. They also spend a larger percentage of their food budget at small grocers (14 percent compared with 4 percent for households within 0.5 mile of a SM/SS) and at convenience stores (6 percent compared with 4 percent). Households that are 1 to 10 miles from the nearest SNAP-authorized SM/SS also spend less and a smaller percentage at restaurants and other eating places than households within 0.5 mile of the nearest SM/SS.

Table 6b shows no differences in food spending patterns for those in low-income, low-access areas compared with those who live in areas with higher incomes or better access. This finding suggests that access measured at the neighborhood level is not associated with food-shopping-behavior outcomes, at least when each household's personal access and resources are not considered.

Table 6a

Household food expenditures by source and by distance to nearest SNAP-authorized supermarket/superstore

	Per capita weekly expenditures					Percent of weekly expenditures				
	<i>Distance to nearest SNAP-Authorized SM/SS</i>					<i>Distance to nearest SNAP-Authorized SM/SS</i>				
	All dis- tances	< 0.5	0.5 to 1	1 to 10	10+	All dis- tances	< 0.5	0.5 to 1	1 to 10	10+
Food acquisition events										
Food at-Home retailers and restaurants and other eating places	52.33 <i>1.06</i>	52.09 <i>2.18</i>	52.23 <i>1.39</i>	52.16 <i>1.53</i>	60.04 <i>3.83</i>					
All Food-at-Home places (1-3)	33.64 <i>0.71</i>	32.01 <i>1.35</i>	33.16 <i>0.81</i>	34.60 <i>0.94</i>	45.55 <i>2.49</i>	64.0 <i>0.01</i>	61.1 <i>0.01</i>	63.0 <i>0.01</i>	66.6 <i>0.01</i>	70.1 <i>0.01</i>
1) Large grocery stores	29.87 <i>0.63</i>	28.54 <i>1.28</i>	29.66 <i>0.76</i>	30.73 <i>0.93</i>	35.55 <i>4.08</i>	55.7 <i>0.01</i>	53.6 <i>0.01</i>	55.5 <i>0.01</i>	57.7 <i>0.01</i>	50.1 <i>0.07</i>
2) Small grocery, ethnic, and specialty stores	1.89 <i>0.29</i>	1.63 <i>0.32</i>	1.71 <i>0.34</i>	1.99 <i>0.41</i>	6.41 <i>2.81</i>	3.6 <i>0.00</i>	3.6 <i>0.01</i>	3.0 <i>0.01</i>	3.4 <i>0.01</i>	13.8 <i>0.08</i>
3) Convenience, dollar, pharmacy, and other stores	1.88 <i>0.13</i>	1.85 <i>0.19</i>	1.79 <i>0.17</i>	1.88 <i>0.15</i>	3.58 <i>0.93</i>	4.7 <i>0.00</i>	4.0 <i>0.00</i>	4.5 <i>0.00</i>	5.4 <i>0.00</i>	6.1 <i>0.01</i>
All FAFH (restaurants and other eating places)	18.70 <i>0.57</i>	20.08 <i>1.22</i>	19.08 <i>0.87</i>	17.56 <i>1.01</i>	14.50 <i>1.82</i>	36.0 <i>0.01</i>	38.9 <i>0.01</i>	37.0 <i>0.01</i>	33.4 <i>0.01</i>	29.9 <i>0.01</i>
Observations	4,611	1,332	1,442	1,737	100	4,611	1,332	1,442	1,737	100

Notes: **Bold** indicates estimate is statistically different from estimate for households residing within 0.5 mile of the nearest Supermarket/Superstore (SM/SS) with $p < 0.10$. SNAP=Special Supplemental Nutrition Assistance; FAFH=Food Away from Home; excludes food acquired at work, school, or from family and friends. *Italicized numbers are standard error estimates.*

Source: USDA, Economic Research Service estimates using FoodAPS data.

Table 6b

Food expenditures by source and by low-income and low-access census tract status

Food acquisition events	Per capita weekly expenditures			Percent of weekly expenditures		
	All house-holds	HH does not live in low-income and low-access census tract	HH lives in low-income and low-access census tract	All house-holds	HH does not live in low-income and low-access census tract	HH lives in low-income and low-access census tract
All places	52.33 <i>1.06</i>	51.43 <i>1.10</i>	46.63 <i>1.92</i>			
All Food-at-Home places (1-3)	33.64 <i>0.71</i>	32.79 <i>0.76</i>	31.27 <i>1.29</i>	64.4 <i>0.01</i>	63.7 <i>0.01</i>	65.1 <i>0.01</i>
1) Large grocery stores	29.87 <i>0.63</i>	29.09 <i>0.66</i>	27.88 <i>1.27</i>	55.7 <i>0.01</i>	55.4 <i>0.01</i>	57.1 <i>0.01</i>
2) Small grocery, ethnic, and specialty stores	1.89 <i>0.29</i>	2.00 <i>0.32</i>	0.99 <i>0.29</i>	3.6 <i>0.00</i>	3.9 <i>0.01</i>	2.2 <i>0.01</i>
3) Convenience, dollar, pharmacy, and other stores	1.88 <i>0.13</i>	1.70 <i>0.13</i>	2.41 <i>0.28</i>	4.7 <i>0.00</i>	4.5 <i>0.00</i>	5.9 <i>0.01</i>
All FAFH (restaurants and other eating places)	18.70 <i>0.57</i>	18.63 <i>0.59</i>	15.36 <i>1.07</i>	36.0 <i>0.01</i>	36.3 <i>0.01</i>	34.9 <i>0.01</i>
Observations	4,611	3,966	801	4,611	3,810	801

Notes: **Bold** indicates that estimate is statistically different from estimate for households that do not live in a low-income, low-access census tract with $p < 0.10$. Low-income census tract defined as poverty rate ≥ 20 percent or median tract income at or below 80 percent of Metropolitan Statistical Area or State median income. Low access defined as at least 100 households without a vehicle and > 0.5 mile or a tract with at least 500 people or one-third of the tract population farther than 20 miles from the nearest supermarket, supercenter, or large grocery store. Excludes food acquired at work, school, or from family or friends. HH=Household; FAFH=Food Away From Home; *Italicized numbers are standard error estimates.*

Source: USDA, Economic Research Service estimates using FoodAPS data.

Summary and Conclusions

We feature a measure of foodstore access that combines proximity to a large supermarket or supercenter and access to a household vehicle to measure foodstore access. The vast majority of households visited a large grocery store (supermarket, superstore, or warehouse store) during the survey week. This is, however, 4 percentage points lower for households with burdened access, and they have fewer shopping events at large grocery stores. When we examine food spending at different food venues, we find that access-burdened households are not different from households with sufficient access in the percentage of their food expenditures at these large stores, even though they are less likely to visit them.

We find mixed evidence that households with burdened access are more reliant on less healthful types of food retailers. Contrary to hypotheses of how access to a supermarket affects food shopping behavior, we find that access-burdened households are less likely to visit restaurants and other eating places, and they spend less per capita and less of their total budget at these eating places. This is despite being closer, on average, to non-fast-food restaurants than households with sufficient access.

We find similar results when we examine only households participating in SNAP or nonparticipating households with incomes below 185 percent of FPG—those with burdened access purchase less FAFH than those with sufficient access. On the other hand, we find that access-burdened households spend a greater percentage of their food budget at convenience stores. The nominal amount is small, but reaches 11 percent of total food expenditures for SNAP and low-income access-burdened households compared with 5 percent for SNAP and low-income households with sufficient access. These estimates can begin to inform debates about how stringent stocking requirements for SNAP authorization among stores may affect participant shopping, although much more research is needed to understand the impact of requirements on retailers and participants.

These findings have mixed implications for nutrition and diet quality. FAFH tends to be higher in saturated fat and sodium and is more cholesterol-dense and lower in dietary fiber than FAH (Lin and Guthrie, 2012). In that sense, less reliance on FAFH for access-burdened households could benefit their diets. However, greater reliance on convenience stores, which usually carry very limited supplies of healthful foods, may decrease diet quality, although the total amount spent at these stores is negligible, so any effect on diet may be minimal. Less frequent shopping events at large stores could be negatively related to diet quality if that reduces the quantities of perishable foods purchased. Future work could examine differences in the types (bulk, perishables) and healthfulness of foods purchased when households with burdened access shop at different retail venues.

We examine food shopping and spending outcomes for two more traditional measures of foodstore access—one based solely on proximity to a supermarket or superstore and one based on neighborhood level of access. We find differences in shopping behaviors only for households that are more than 10 miles from the nearest supermarket or superstore. These households also had fewer shopping events at large stores and at restaurants and other eating places, and spent slightly more at small grocery and convenience stores. We do not find many differences for neighborhood-access measures.

Results presented here are descriptive and do not account for other differences in households with burdened or sufficient access to a large store. Given previous research, it is also likely that food prices play a major role in where people shop for food, as influential as store access (see Lin et al., 2014), which we do not address here. Further, we have not investigated which products are being purchased at

each store type and for what prices, so we cannot rule out that higher expenditures at some venues (for example, convenience stores) are due to purchasing foods at higher prices. Future multivariate work can more extensively model how food-acquisition behavior is impacted by foodstore access and price. As noted, we also do not know the extent to which food spending may be underreported by survey respondents. Thus, our estimates of food spending are likely lower bound estimates.

In conclusion, we find some differences between access-burdened and sufficient-access households in terms of their food shopping and spending patterns, with access-burdened households spending less at restaurants and eating places than sufficient-access households, but slightly more at convenience and small foodstores. It might be expected that access-burdened households would have lower spending at SM/SS because they have poorer access to these stores. However, this analysis finds that access-burdened households have spending at these stores similar to that of households with sufficient access. Further, most access-burdened households visited a large store at some point during the week, and those who did averaged at least two shopping events at such a store during the survey week. These findings suggest that households are able to overcome their access barriers to shop at stores that typically carry a wide variety of healthful foods.

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Appendix

This appendix includes tables that supplement the primary analysis in the text. Each table in the appendix has a matching companion table in the main text, but the samples over which estimates are made differ: Appendix tables 1 and 3 focus only on individuals and households that participate in SNAP or have incomes below 185 percent of poverty instead of all households, and Appendix table 2 uses all households instead of SNAP and low-income households.

Appendix table 1

Household characteristics by distance to nearest SNAP-authorized supermarket or superstore (SM/SS) and by low-income/low-access tract status

	Distance to nearest SNAP-authorized SM/SS (miles)				Census tract low-income and low-access status (LILA)	
	<0.5	0.5 to 1	1 to 10	>10	Not LILA Tract	LILA Tract
All households	25.54 <i>2.51</i>	29.22 <i>2.30</i>	41.33 <i>3.03</i>	3.92 <i>1.50</i>	86.07 <i>2.35</i>	13.93 <i>2.35</i>
Age (household reference person)						
Senior (age 65+)*	18.93 <i>3.14</i>	27.25 <i>4.36</i>	49.40 <i>4.62</i>	4.42 <i>1.74</i>	87.26 <i>3.02</i>	12.74 <i>3.02</i>
Race (household reference person)						
White	20.15 <i>2.44</i>	27.67 <i>2.84</i>	47.25 <i>3.27</i>	4.93 <i>1.88</i>	87.32 <i>2.64</i>	12.68 <i>2.64</i>
Black	34.97 <i>3.66</i>	40.09 <i>5.29</i>	23.66 <i>4.08</i>	1.27 <i>0.19</i>	77.39 <i>4.47</i>	22.61 <i>4.47</i>
Asian, other race, or multiple race	51.79 <i>6.16</i>	27.69 <i>3.59</i>	20.49 <i>3.59</i>	0.04 <i>0.04</i>	87.27 <i>3.07</i>	12.73 <i>3.07</i>
Hispanic origin	37.84 <i>7.19</i>	41.97 <i>7.27</i>	20.19 <i>3.22</i>	NA	74.23 <i>4.92</i>	25.77 <i>4.92</i>
SNAP/income group						
SNAP participant	32.49 <i>2.53</i>	34.52 <i>2.86</i>	28.74 <i>3.23</i>	4.24 <i>1.98</i>	76.03 <i>4.14</i>	23.97 <i>4.14</i>
Nonparticipant with income to poverty ratio ≤ 1.85	28.50 <i>3.74</i>	27.10 <i>2.80</i>	41.06 <i>3.81</i>	3.33 <i>1.89</i>	78.98 <i>3.49</i>	21.02 <i>3.49</i>
Nonparticipant with income to poverty ratio > 1.85	23.40 <i>2.69</i>	28.70 <i>2.35</i>	43.89 <i>3.29</i>	4.00 <i>1.38</i>	89.86 <i>2.23</i>	10.14 <i>2.23</i>
Median household income	3,936.98	4,120.00	4,560.00	3,693.33	4,387.67	2,613.17
Household size						
Mean household size	3.01 <i>0.10</i>	2.94 <i>0.08</i>	2.93 <i>0.07</i>	2.49 <i>0.20</i>	2.94 <i>0.06</i>	2.96 <i>0.10</i>
Proximity to other food venues						
Distance in miles to the nearest SNAP-authorized supermarket or superstore						
Mean	0.30 <i>0.01</i>	0.72 <i>0.01</i>	3.23 <i>0.22</i>	14.21 <i>0.39</i>	2.28 <i>0.31</i>	1.55 <i>0.25</i>
Median	0.30	0.71	2.21	12.26	0.93	0.77

Continued—

Appendix table 1

Household characteristics by distance to nearest SNAP-authorized supermarket or superstore (SM/SS) and by low-income/low-access tract status—continued

	Distance to nearest SNAP-authorized SM/SS (miles)				Census tract low-income and low-access status (LILA)	
	<0.5	0.5 to 1	1 to 10	>10	Not LILA Tract	LILA Tract
Distance in miles to nearest fast-food restaurant						
Mean	0.43	1.23	3.32	15.11	2.61	1.32
	<i>0.09</i>	<i>0.63</i>	<i>0.42</i>	<i>0.51</i>	<i>0.43</i>	<i>0.32</i>
Median	0.25	0.56	1.87	13.71	0.69	0.54
Distance in miles to nearest non-fast-food restaurant						
Mean	0.24	0.37	1.7	4.00	1.05	0.90
	<i>0.03</i>	<i>0.02</i>	<i>0.2</i>	<i>0.26</i>	<i>0.14</i>	<i>0.25</i>
Median	0.18	0.31	0.99	3.78	0.4	0.34
Distance to in miles nearest SNAP-authorized convenience store						
Mean	0.56	0.99	2.53	7.48	1.93	0.77
	<i>0.09</i>	<i>0.28</i>	<i>0.22</i>	<i>0.23</i>	<i>0.22</i>	<i>0.14</i>
Median	0.36	0.57	1.79	6.65	0.81	0.42
Distance in miles to primary foodstore						
Mean	1.55	1.81	5.19	18.11	3.96	2.73
	<i>0.14</i>	<i>0.1</i>	<i>0.55</i>	<i>0.57</i>	<i>0.55</i>	<i>0.33</i>
Median	0.7	1.04	3.34	15.75	1.88	1.73
One-way travel time (in minutes) to primary foodstore						
Mean	8.61	8.02	12.72	26.81	11.05	9.63
	<i>0.48</i>	<i>0.21</i>	<i>0.64</i>	<i>0.85</i>	<i>0.57</i>	<i>0.36</i>
Median	5.0	5	10.0	25.0	10	10
Observations	1,390	1,501	1,831	104	3,966	860

¹Includes three household reference persons under age 18.

²Households between 1 to 10 miles were combined with households farther than 10 miles due to small sample size.

Notes: **Bold** text indicates that Rao-Scott χ^2 tests are statistically significant for at least the 0.10 level. For two-category variables, the reference is the excluded category (e.g., nonelderly versus elderly). For race, the reference is White; for SNAP/income the reference is nonparticipants with income > 185 percent of Federal poverty guidelines for family size. For household size and mean distance to each food venue, a t-test of differences in means across those access variables is done where the reference is either less than 0.5 mile from the nearest SNAP-authorized store or not in a low-income/low-access census tract.

SNAP=Supplemental Nutrition Assistance Program; SM/SS=Supermarket/Superstore; *Italicized numbers are standard error estimates.*

Source: USDA, Economic Research Service estimates using FoodAPS data.

Appendix table 2

Food expenditures by access-burdened and sufficient-access status, all households

	Per capita weekly expenditures			Percent of weekly expenditures		
	All house- holds	Sufficient- access households	Access- burdened households	All house- holds	Sufficient- access households	Access- burdened households
Food acquisition events						
All places	52.33 <i>1.06</i>	53.12 <i>1.06</i>	44.32 <i>1.94</i>			
All Food-at-Home places (1-3)	33.64 <i>0.71</i>	33.56 <i>0.70</i>	34.42 <i>1.85</i>	64.0 <i>0.01</i>	63.1 <i>0.01</i>	73.1 <i>0.02</i>
1) Large grocery stores	29.87 <i>0.63</i>	29.97 <i>0.64</i>	28.77 <i>1.80</i>	55.7 <i>0.01</i>	55.4 <i>0.01</i>	58.1 <i>0.02</i>
2) Small grocery, ethnic, and specialty stores	1.89 <i>0.29</i>	1.82 <i>0.25</i>	2.57 <i>0.54</i>	3.6 <i>0.00</i>	3.4 <i>0.00</i>	4.9 <i>0.01</i>
3) Convenience, dollar, pharmacy, and other stores	1.88 <i>0.13</i>	1.76 <i>0.12</i>	3.08 <i>0.51</i>	4.7 <i>0.00</i>	4.2 <i>0.00</i>	10.1 <i>0.01</i>
FAFH: Restaurants and other eating places	18.70 <i>0.57</i>	19.56 <i>0.61</i>	9.90 <i>0.61</i>	36.0 <i>0.01</i>	36.9 <i>0.01</i>	26.9 <i>0.02</i>
Observations	4,611	4,198	413	4,611	4,198	413

Notes: FAFH is food away from home acquired at restaurants and other eating places. Food acquired for free is excluded as is food acquired at school, work, or from family or friends. **Bold** indicates that households that do not use their own vehicle and are more than 0.5 mile from the nearest SNAP-authorized SM/SS. Access-burdened households are statistically different from those who use their own vehicle or live within 0.5 mile of the nearest store (sufficient access) with $p < 0.10$. The analysis excludes 215 households who had zero total spending over all of these places.

SNAP=Supplemental Nutrition Assistance Program; SM/SS=Supermarket/Superstore; *italicized numbers are standard error estimates.*

Source: USDA, Economic Research Service estimates using FoodAPS data.

Appendix table 3

Number of food acquisition events by source, by distance to nearest SNAP-authorized SM/SS and low-income/low-access census tract status

Food acquisition events	Number of events for those using place type					Number of events for those using place type	
	<i>Distance to nearest SNAP-authorized SM/SS, miles</i>					HHs not in low-income and low-access tract	HHs in low-income and low-access tract
	All distances	< 0.5	0.5 to 1	1 to 10	10+		
All places ¹	11.21 <i>0.19</i>	10.99 <i>0.29</i>	11.24 <i>0.30</i>	11.46 <i>0.38</i>	9.84 <i>1.49</i>	11.41 <i>0.22</i>	9.89 <i>0.38</i>
All Food-at-Home places (1-3)	3.91 <i>0.06</i>	3.87 <i>0.12</i>	3.97 <i>0.12</i>	3.89 <i>0.11</i>	4.08 <i>0.08</i>	3.92 <i>0.06</i>	3.86 <i>0.24</i>
1) Large grocery stores, SM/SS, warehouse ²	2.81 <i>0.05</i>	2.92 <i>0.10</i>	2.93 <i>0.10</i>	2.70 <i>0.07</i>	2.47 <i>0.11</i>	2.83 <i>0.04</i>	2.72 <i>0.20</i>
2) Specialty stores	1.44 <i>0.06</i>	1.59 <i>0.13</i>	1.37 <i>0.06</i>	1.42 <i>0.07</i>	1.43 <i>0.06</i>	1.45 <i>0.06</i>	1.43 <i>0.14</i>
3) Convenience, dollar, pharmacy, and other stores	2.22 <i>0.06</i>	2.01 <i>0.08</i>	2.30 <i>0.10</i>	2.25 <i>0.10</i>	2.54 <i>0.14</i>	2.22 <i>0.07</i>	2.23 <i>0.09</i>
4) Own production	1.93 <i>0.13</i>	1.63 <i>0.12</i>	1.75 <i>0.17</i>	2.14 <i>0.16</i>	1.54 <i>0.02</i>	1.99 <i>0.13</i>	1.65 <i>0.37</i>
5) Food pantry or Meals on Wheels	1.71 <i>0.10</i>	1.86 <i>0.15</i>	2.03 <i>0.14</i>	1.35 <i>0.05</i>	1.00 <i>.</i>	1.72 <i>0.07</i>	1.63 <i>0.06</i>
6) Restaurants and other eating places	5.44 <i>0.09</i>	5.45 <i>0.24</i>	5.12 <i>0.17</i>	5.78 <i>0.20</i>	4.26 <i>0.07</i>	5.61 <i>0.12</i>	4.29 <i>0.29</i>
7) Schools	6.29 <i>0.29</i>	6.29 <i>0.54</i>	5.92 <i>0.39</i>	6.58 <i>0.52</i>	6.34 <i>0.47</i>	6.41 <i>0.31</i>	5.49 <i>0.38</i>
8) Family, friends, etc.	2.68 <i>0.09</i>	2.59 <i>0.13</i>	2.78 <i>0.17</i>	2.68 <i>0.13</i>	2.44 <i>0.51</i>	2.68 <i>0.10</i>	2.66 <i>0.21</i>
9) Work	3.52 <i>0.15</i>	3.49 <i>0.28</i>	3.61 <i>0.19</i>	3.33 <i>0.18</i>	4.78 <i>1.48</i>	3.39 <i>0.11</i>	4.78 <i>1.09</i>
Observations	4,826	1,390	1,501	1,831	104	3,966	860

¹Subsequent rows of different place types (1-9) show which places were visited by those who visited any place.

Note: **Bold** indicates that estimate is statistically different from reference group (<0.5 mile from the nearest SM/SS or not in a low-income, low-access area) with p < 0.10.

SNAP=Supplemental Nutrition Assistance Program; SM/SS=Supermarket/Superstore; *italicized numbers are standard error estimates.*

Source: USDA, Economic Research Service estimates using FoodAPS data.