

For Low-Income Americans, Living ≤ 1 Mile (≤ 1.6 km) from the Nearest Supermarket Is Not Associated with Self-Reported Household Food Security

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Abstract

Background: Motivated by concern over lack of access to nutritious food in low-income neighborhoods, healthy food financing initiatives have encouraged the introduction of new supermarkets. Extensive research on the association between the food retail environment and nutrition outcomes has shown mixed results. There has been less research specifically on food security outcomes.

Objective: We assessed the association between multiple food environment measures and food security for low-income US households.

Methods: By using the USDA's nationally representative 2012–2013 Food Acquisition and Purchase Survey (FoodAPS; $n = 4826$ households), which provides unique information about neighborhood- and household-level food retailer access, we quantified cross-sectional associations between food environment characteristics and household-level outcomes, with and without regression controls. Logistic regression analysis was used for binary household food security outcomes.

Results: Most households bypassed the nearest retailer to select a primary retailer farther from home. For low-income households, distance to the nearest supermarket and to the primary retailer was not associated with food security. In comparison to shopping with households' own automobile, the odds of being food secure were lower for households that used another automobile (OR: 0.59; 95% CI: 0.38, 0.90) or other transportation (OR: 0.32; 95% CI: 0.17, 0.61) to reach the primary retailer.

Conclusions: Having a closest supermarket ≤ 1 mile from home was not associated with household food security. In contrast, the mode of transportation used to access the primary retailer was associated with household food security. In future research, it may be valuable to not only focus on the distance to the nearest supermarket but to investigate the qualities of the food retail environment at distances > 1 mile that are most strongly associated with food security outcomes. *Curr Dev Nutr* 2017;1:e001446.

Introduction

An extensive research literature has investigated how local food retail access conditions in low-income US neighborhoods affect diet quality, diet-related health, and to a lesser extent, food insecurity (1–12). These concerns have risen to the level of policy makers, as federal, state, and local-level programs have been enacted to improve access to sources of healthful foods (13–15).

Much of the research and policy interest have focused on the lack of retailers selling healthful foods in low-income neighborhoods identified as “supermarket deserts.” Research and policy efforts have typically measured access by the presence or absence of supermarkets at very close distances, such as 0.8 km (0.5 miles) or 1.61 km (1 mile) from home (2, 4–7, 11, 12), especially in more-dense, urban areas. Sometimes greater distance



Keywords: food deserts, food retail access, household food security, nutrition assistance, Supplemental Nutrition Assistance Program (SNAP)

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Supplemental Tables 1–3 are available from the “Online Supporting Material” link in the online posting of the article and from the same link in the online table of contents at <http://cdn.nutrition.org>.

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benchmarks are used in less-dense rural areas and to account for greater access to automobiles (16). Other studies used density of stores within similar specific distances (3, 10). A few studies have also emphasized automobile access and their use for traveling to supermarkets regardless of proximity (6, 11, 17). Less healthful food selections have been associated with supercenter retail formats (18) and with higher monthly shopping frequency (19). Finally, a few studies focused on the importance of prices of food, in addition to proximity, as determinants of where households shop and what they purchase (20, 21). In sum, the existing studies have made different implicit assumptions about which features of the food retail environment matter, and they have reached different conclusions about the direction of likely effects.

This article sought to identify what qualities of the food retail environment are associated with household food security for low-income consumers. Rather than make assumptions about what distances are adequate or which retailers should be preferred, we took an empirical approach to identifying the qualities of the food retail environment that predict low-income consumers' choice of primary food retailer, their opinion about this primary retailer, and their experience of household food security.

The article used data from the USDA's National Household Food Acquisition and Purchase Survey (FoodAPS), fielded in 2012–2013. FoodAPS was the first household survey to collect data on foods purchased or acquired during a survey week for a sample who is representative of Supplemental Nutrition Assistance Program (SNAP) participant households, low-income nonparticipating households, and all US households. The survey collected information related to food consumption and diet, including food shopping behavior and household food security. FoodAPS provided information not just about distance to the nearest supermarket but also about the distance to the primary food retailer where respondents actually shop. The USDA's first report that used these survey data found that, for SNAP households, the mean distance to the nearest supermarket was 3.2 km (2.0 miles), but the mean distance to the primary retailer actually used for food shopping was considerably greater, 5.5 km (3.4 miles) (21).

In our conceptual framework shown in **Figure 1**, the left side shows that our basic explanatory variables were the distance to the nearest supermarket and household resources, including SNAP benefits, cash income, and access to an automobile. The right side shows that our main outcome variable was household food security based on survey responses. For intermediate variables, we focused on consumers' choice of primary food retailer, including the mode of transportation used to reach the retailer and the consumers' stated reasons for choosing the retailer. The distance to nearest supermarket at the top left is a characteristic of a household's geographical location, whereas the intermediate variables in the center depend simultaneously on geographic location and on the household's own choice about where to shop.

Methods

FoodAPS included nationally representative samples of SNAP participants plus 3 income strata of nonparticipants. For brevity, we

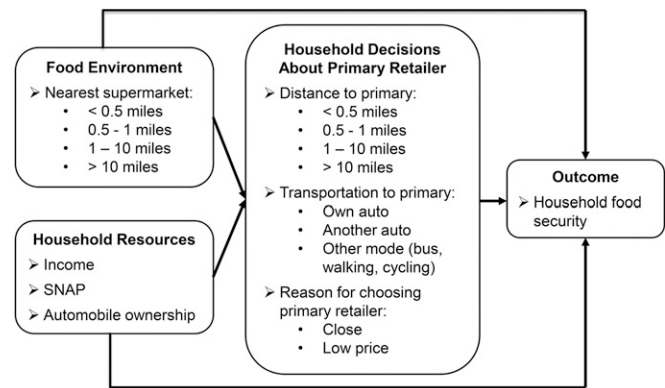


FIGURE 1 A conceptual framework for the relations between household resources, distance to nearest supermarket, distance to primary retailer, and household food security. SNAP, Supplemental Nutrition Assistance Program.

called these the 4 “household resource strata.” The sample design had 50 primary sampling units, which were counties or groups of contiguous counties. Each primary sampling unit contained 8 secondary sampling units, which were census block groups or groups of contiguous block groups. The sample size was 4826 households for FoodAPS overall and 2015 households for the 2 lowest-income strata (SNAP participants and the lowest-income nonparticipants).

Basic variables

SNAP participation status was determined on the basis of administrative records and on self-report from the survey questionnaire. If the administrative records indicated participation, but the self-report did not, the administrative record was accepted as correct. For 122 households that did not consent to have their records matched, SNAP participation status was determined by self-reported participation. The household income category was determined on the basis of household respondent answers to detailed questions about income sources. Supermarkets and supercenters were designated on the basis of their classification in SNAP's Store Tracking and Redemption System (STARS). The supermarket category is composed of supermarkets, food stores, grocery stores, and warehouses that typically have >10 checkout lanes with registers, bar code scanners, and conveyor belts. The supercenter category is composed of very large supermarkets, “big box” stores, superstores, and food warehouses that sell a wide variety of grocery and other store merchandise. Linear distance was calculated from each household home address to the nearest SNAP-authorized supermarket or superstore (henceforth “supermarkets” for brevity). We defined 4 distance categories to the nearest supermarket: ≤ 0.8 , > 0.8 and ≤ 1.61 , > 1.61 and ≤ 16.1 , and > 16.1 km (≤ 0.5 , > 0.5 to 1, > 1 to 10, and > 10 miles, respectively). For ease of comparison with the US literature, we referred to these distance boundaries in miles.

Intermediate variables

Respondents were asked, “Where [do you/does your household] do most of your food shopping?” Major food retail outlets near each secondary sampling unit were identified in advance of the survey,

and this list was available to interviewers administering the household questionnaires. If the household reported a primary food retailer that was not identified in advance, the interviewer recorded the name and approximate address, and the location was determined later. Linear distance from the home address to the primary retailer was also calculated. For a question about the mode of transportation to the primary retailer, we categorized responses as the respondent's own automobile, somebody else's automobile, and other (including bus, walking, and cycling). The respondent was asked the reason for choosing the primary retailer, and on the basis of the 2 most frequently given responses, we defined 4 response categories (because it is close to home, because of low prices, both reasons, and neither reason).

Just over two-thirds of low-income households (69%) leased or owned an automobile; of these, as one would expect, a large fraction (88%) used their own automobile as their transportation mode to the primary retailer (**Supplemental Table 1**). The remaining low-income households (31%) did not own or lease an automobile; of these, nonetheless, 20% reported using their "own" automobile as the mode of transportation to the primary retailer. Respondents may experience a range of access rights to automobiles (e.g., automobiles owned by relatives or close friends in the same household or neighborhood). We used the direct question about transportation mode to the primary retailer as the clearest statement of the respondents' perceived access to transportation for grocery shopping.

Control variables

We included an indicator for residence in a metropolitan statistical area, sex of respondent, completion of high school and college or beyond, and race and ethnicity of the respondent (white non-Hispanic, black non-Hispanic, other non-Hispanic, or Hispanic). Due to an insufficient sample size for some races, the other non-Hispanic category included respondents identifying with American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, >1 race, or other race.

Outcome variable

Household food security was defined by using the 10 adult-referenced items in the USDA's household food security survey module, with a reference period of the previous month. Households that gave ≤ 2 affirmative responses were classified as food secure.

Statistical analyses

Cross-tabulations showed the association between the basic explanatory variables and intermediate variables, and also between the distance to the primary retailer (an intermediate variable) and the household food security outcome. In the main multivariate analysis, logistic regression models expressed the binary food security outcome variable as a function of the food retail environment, household resources, and decisions about the chosen primary retailer simultaneously. Recognizing that none of the explanatory variables was randomly assigned, the cross-sectional associations were not interpreted as causal. Because the households' choice of primary retailer in particular was endogenous to their own preferences and decisions, alternative specifications available in **Supplemental Table 2**

expressed the outcome variables as a function of just the basic explanatory variables. All of the logistic regression analyses included separate specifications for the full sample and for just the 2 lowest-income strata.

All of the analyses were weighted to represent the national US population with the use of survey weights provided by the USDA on the FoodAPS household data set. SEs and hypothesis tests were corrected for the survey design by using the Taylor Series expansion method, as implemented in the "svy" procedures of Stata 12.0 (StataCorp). Estimated associations were deemed significant based on an α of 0.05. The Tufts University Institutional Review Board granted exemption from review under category 4, for analysis of secondary data.

Results

Descriptive statistics

For the full sample, the nearest supermarket was located ≤ 0.5 miles from home for 26% of households, and another 29% had a nearest supermarket between 0.5 and 1 mile from home (**Table 1**). Access to a nearby supermarket was better for the 2 lowest-income resource strata. For SNAP participants, 33% had a nearest supermarket within 0.5 miles from home, and another 35% had a nearest supermarket between 0.5 and 1 mile from home.

In all 4 resource strata, households commonly traveled farther than the closest supermarket (**Table 1**), usually accessing the primary retailer by automobile. Depending on the resource stratum, 81–97% of households used an automobile as their mode of transportation. For the highest-income stratum of non-SNAP households, 95% used their own automobile. For SNAP participants, by contrast, 66% used their own automobile and another 21% used somebody else's automobile.

The frequency of citing "low prices" as a reason for choosing the primary retailer ranged from 50% in the highest-income non-SNAP stratum to 60% in the SNAP stratum (**Table 1**; summing the response frequencies for "low prices" and "both" reasons). The frequency of citing proximity as a reason had the opposite correlation with income. It ranged from 56% for the highest-income non-SNAP stratum to 40% for the lowest non-SNAP stratum (**Table 1**; summing the response frequencies for "close" and "both" reasons).

Even for the 2 lowest-income resource strata, many households bypassed the nearest retailer to use a primary food retailer at a greater distance (**Table 2**). For example, among households that had a nearest supermarket within 0.5 miles from home, 19% chose a primary retailer between 0.5 and 1 mile from home, and fully 44% chose a primary food retailer at a distance >1 mile from home. Conversely, among low-income households whose nearest supermarket was >1 mile from home, few simply made do with a nearby retailer: 1.3% of these households chose a primary retailer (a non-supermarket) that was ≤ 1 mile from home.

For low-income households whose nearest supermarket was >1 mile from home, only 1.7% used a transportation mode other than an automobile to reach their primary food retailer (**Table 2**). For low-income households that had a nearest supermarket at closer distances, the relative frequency of using a non-automobile

TABLE 1 Characteristics of the food retail environment for FoodAPS households in the United States, by household resource strata¹

Food environment indicators	Total, %	Household resource strata, %			F-statistic	P
		SNAP	Non-SNAP (<100% FPL)	Non-SNAP (100 to <185% FPL)		
Population, ² %		13.6	4.9	12.7		
Distance to nearest retailer, miles					4.5	<0.001
≤0.5	25.5	32.5	35.8	25.7		
>0.5 to 1	29.2	34.5	31.7	25.3		
>1 to 10	41.3	28.8	—	—		
>10	3.9	4.2	32.5 ³	48.9 ³		
Distance to primary retailer, miles					1.3	0.25
≤0.5	10.5	14.2	12.2	10.9		
>0.5 to 1	17.5	20.7	19.6	15.2		
>1 to 10	57.1	50.7	55.7	59.0		
>10	14.9	14.4	12.5	14.9		
Transportation mode to primary retailer					45.5	<0.001
Own auto	87.8	65.8	62.0	83.9		
Another auto	6.5	21.2	18.9	9.1		
Other mode	5.7	13.0	19.2	7.1		
Reason for choosing primary retailer					4.8	<0.001
Neither	17.3	14.6	18.9	19.1		
Low prices	30.0	38.5	41.0	34.9		
Close	30.1	25.1	23.6	24.6		
Both	22.7	21.8	16.5	21.4		

¹ Values are population-weighted percentages unless otherwise indicated; *n* = 4824 households. FoodAPS, Food Acquisition and Purchasing Survey; FPL, federal poverty level; SNAP, Supplemental Nutrition Assistance Program.

² Values are row percentages.

³ The 1 to ≤10- and >10-mile estimates were combined for nondisclosure purposes.

mode of transportation was much higher. Yet, even for low-income households with nearby supermarkets ≤0.5 miles from home, fully 71% used an automobile to reach their primary food retailer.

Approximately half of low-income households that had access to a nearby supermarket at a distance of ≤0.5 miles said they chose their primary retailer because it was “close” (Table 2; summing the response frequencies for “close” and “both” reasons). In places where the nearest supermarket was >1 mile away, only 41% of households gave “close” as a reason for choosing the primary retailer.

The distance to the primary food retailer was strongly associated with the mode of transportation, in the direction one would expect (Table 3). Of low-income households that traveled between 1 and 10 miles to the primary food retailer, 6.8% used a transportation mode other than automobile. By contrast, of low-income households that traveled ≤0.5 miles to the primary food retailer, almost 40% used a transportation mode other than automobile (although this still leaves more than half of these households using an automobile). In addition, traveling longer distances to the primary retailer was associated with a higher probability of citing “low prices” as a reason and a lower probability of citing “close” proximity as a reason for choosing the primary retailer (Table 3).

With regard to the main outcome variable, 55.5% of low-income households were food secure, which left 44.5% with reported food insecurity in the previous month (Table 3). Low-income households that traveled a longer distance to the primary food retailer were not more likely to be food insecure. The null hypothesis of no association between proximity and food security could not be rejected (*P* = 0.22).

Logistic regression analysis

The logistic regression analysis allowed us to measure the associations between the several intermediate and basic explanatory variables and the household food security outcome. We first report results for the 2 lowest-income resource strata (Table 4, left column) and then report results for the full sample with all 4 strata (Table 4, right column).

For the 2 lowest-income resource strata, compared with the omitted category of using one’s own automobile, the use of somebody else’s automobile and the use of some other transportation mode to reach the primary food retailer were associated with lower odds of being food secure (Table 4, left column). Reporting low prices as the reason for choosing the primary retailer was associated with lower odds of being food secure.

For the full sample of all 4 resource strata, compared with using one’s own automobile, the use of a non-automobile transportation mode was again associated with lower odds of a household being food secure (Table 4, right column). For the full sample, as with the low-income sample, no distance variable showed any significant association with food security. By contrast, having higher income was associated with greatly increased odds of a household being food secure (OR: 5.7; 95% CI: 3.75, 8.73). Having a college education was associated with greatly increased odds of a household being food secure.

As a robustness check, we also conducted the logistic regression analysis by using only the basic explanatory variables that describe household resources and distance to the nearest supermarket, and then again by using only the intermediate variables (Supplemental Tables 2 and 3). Most of the results of these 2

TABLE 2 Factors related to supermarket choice for low-income FoodAPS households in the United States, by distance to nearest supermarket¹

Food environment indicators	Total, %	Distance to nearest supermarket, %			F-statistic	P
		≤0.5 miles	>0.5 to 1 miles	>1 mile ²		
Population, ³ %		33.3	33.8	32.9		
Distance to primary retailer, miles					51.5	<0.001
≤0.5	13.5	37.5	—	—		
>0.5 to 1	19.0	18.6	39.7 ⁴	1.3 ⁴		
>1 to 10	53.0	33.6	52.4	73.3		
>10	14.5	10.4	7.9	25.4		
Transportation mode to primary retailer					15.5	<0.001
Own auto	64.8	53.7	61.9	79.0		
Another auto	20.6	17.4	25.1	19.3		
Other mode	14.6	28.9	13.0	1.7		
Reason for choosing primary retailer					1.4	0.25
Neither	15.7	17.2	17.6	12.3		
Low prices	39.2	34.1	37.0	46.5		
Close	24.7	26.7	24.3	23.2		
Both	20.4	22.0	21.1	18.0		

¹Values are population-weighted proportions unless otherwise indicated; n = 2014 households. FoodAPS, Food Acquisition and Purchasing Survey.

²The 1 to ≤10- and >10-mile distance categories were combined for disclosure purposes.

³Values are row percentages.

⁴The ≤0.5- and 0.5 to ≤1-mile estimates were combined for nondisclosure purposes.

separate analyses mirrored the results of the full model. One exception is that automobile ownership had a significant and positive association with food security in the model with the use of only the basic explanatory variables (Supplemental Table 3), whereas the corresponding coefficient had been insignificant in our full model (Table 4). Automobile ownership was nonsignificant in models that also included mode of transportation to the primary retailer.

Discussion

First, we found that the distance to the nearest supermarket had surprisingly little association with some household decisions about the primary food retailer. Most low-income respondents were not

trapped into using a very close retailer at walking or bus distances of 0.5 or 1 mile. Instead, low-income households most commonly used automobiles to reach primary food retailers at distances of 1–10 miles. Even among low-income households whose nearest supermarket was close to home, 64% bypassed their closest supermarket to choose a primary food retailer at a greater distance, and 70% reached their primary food retailer by automobile. For SNAP participants and for nonparticipants in all 3 income strata, a common reason for choosing the primary food retailer was “low prices.” For SNAP participants and low-income nonparticipants, it was less common to choose the primary food retailer because it was “close.”

Second, we found that distance variables had surprisingly small associations with food security outcomes. In the descriptive analyses, the distance to the primary food retailer had no significant association with household food security. In the logistic regression

TABLE 3 Factors related to supermarket choice and both food security and diet quality for low-income FoodAPS households in the United States, by distance to primary supermarket¹

Food environment indicators	Total, %	Distance to primary supermarket, %				F-statistic	P
		≤0.5 miles	>0.5 to 1 miles	>1 to 10 miles	>10 miles		
Population ²		13.5	19.0	53.0	14.5		
Transportation mode to primary retailer						12.7	<0.001
Own auto	64.8	48.0	57.6	70.2	70.1		
Another auto	20.6	12.1	19.3	23.0	21.5		
Other mode	14.6	39.9	23.1	6.8	8.5		
Reason for choosing primary retailer						6.2	<0.001
Neither	15.7	11.2	14.4	17.4	15.6		
Low prices	39.2	20.6	25.3	46.5	48.1		
Close	24.7	45.7	33.8	17.3	20.4		
Both	20.4	22.5	26.5	18.8	15.9		
Household food security						1.5	0.22
Not food secure	44.5	44.5	50.9	42.7	42.8		
Food secure	55.5	55.6	49.1	57.3	57.2		

¹Values are population-weighted proportions unless otherwise indicated; n = 2014 households. FoodAPS, Food Acquisition and Purchasing Survey.

²Values are row percentages.

TABLE 4 Logistic regression of food environment factors associated with food security for FoodAPS households in the United States¹

Food environment indicators	Low-income groups (n = 1918)	All income groups (n = 4809)
Distance to nearest retailer, miles		
≤0.5	Reference	Reference
>0.5 to 1	0.86 (0.66, 1.11)	0.91 (0.67, 1.23)
>1 to 10	0.83 (0.54, 1.27)	1.08 (0.79, 1.50)
>10	1.39 (0.43, 4.49)	0.72 (0.33, 1.53)
Car ownership	1.06 (0.75, 1.50)	0.96 (0.68, 1.34)
SNAP/income group		
Non-SNAP		Reference
<100% FPL	—	1.74* (1.19, 2.53)
100 to <185% FPL	—	5.72* (3.75, 8.73)
≥185% FPL	—	—
SNAP	0.82 (0.57, 1.17)	0.85 (0.59, 1.21)
Distance to primary retailer, miles		
≤0.5	Reference	Reference
>0.5 to 1	0.73 (0.46, 1.17)	0.93 (0.62, 1.39)
>1 to 10	0.97 (0.60, 1.58)	1.25 (0.75, 2.07)
>10	0.89 (0.39, 2.06)	1.75 (0.89, 3.43)
Transportation mode to primary retailer		
Own auto	Reference	Reference
Another auto	0.59* (0.38, 0.90)	0.56* (0.40, 0.80)
Other mode	0.32* (0.17, 0.61)	0.47* (0.32, 0.69)
Reason for choosing primary retailer		
Low prices	0.62* (0.41, 0.93)	0.72 (0.50, 1.04)
Close	1.04 (0.64, 1.67)	0.97 (0.64, 1.47)
Both	0.90 (0.52, 1.58)	0.94 (0.64, 1.37)
Neither	Reference	Reference
Race/ethnicity		
White, non-Hispanic	Reference	Reference
Black, non-Hispanic	1.19 (0.85, 1.66)	0.77 (0.55, 1.06)
Other, non-Hispanic	1.05 (0.55, 2.02)	0.61* (0.61, 0.92)
Hispanic	1.07 (0.80, 1.43)	0.68* (0.49, 0.94)
Metropolitan	1.06 (0.84, 1.33)	1.00 (0.76, 1.31)
Female sex	0.86 (0.62, 1.19)	1.04 (0.81, 1.34)
High school graduate	1.40 (0.94, 2.08)	1.44* (1.11, 1.86)
College graduate	1.70 (0.92, 3.15)	2.82* (1.77, 4.50)

¹Values are ORs (95% CIs). *P < 0.05. FoodAPS, Food Acquisition and Purchasing Survey; FPL, federal poverty level; SNAP, Supplemental Nutrition Assistance Program.

analysis, although higher income and education were associated as expected with much greater odds of a household being food secure, the distance to the nearest supermarket had no significant association with food security, in any specification, for either the low-income or the full sample. This seems like an important null result: favorable food security outcomes were associated with many economic and transportation constraints, but they were not associated with the distance to the nearest supermarket.

Third, mode of transportation was associated with household food security. In the logistic regression analysis, for the low-income sample, households that used their own automobile to reach the primary food retailer had the highest odds of being food secure. By comparison to this “own automobile group,” significantly lower odds of being food secure were observed for low-income households that used other people’s automobiles or no automobile. As noted in Methods, we cannot necessarily conclude that owning an automobile caused the positive food security outcome. It may be that owning an automobile was beneficial or it may just be that having an automobile was associated with unobserved financial assets, economic resources, human capital, or budgeting practices, which also could affect household food security directly. One possible interpretation

is that favorable outcomes were linked to being able to break out of the most immediate food retail environment to reach a primary food retailer whose low prices and other qualities are most important for household food security.

Most low-income shoppers had access to automobiles and to supermarkets within short driving distances, but it is still worthwhile to consider the populations who face greater food retail access challenges. First, we found that 3.7% of all households lacked a nearest supermarket located ≤10 miles, a distance beyond which food retail access may be impaired even for households that travel by automobile. Second, a small share of households that were located far from the nearest retailer may have faced considerable hardship because they lacked convenient access to an automobile. Of the low-income households with a nearest supermarket between 1 and 10 miles away (30% of all low-income households), 18% used somebody else’s automobile and 2% used no automobile at all. We noted earlier that the distance to the nearest supermarket had no association with our main food security outcomes, but that the lack of association may be attributable to the effort—perhaps burdensome effort—that low-income households may exert to gain access to an automobile for grocery shopping.

Our results may be surprising, because much of the literature has focused on the absence of supermarkets or long distance to the nearest supermarket in some neighborhoods. But some research, including both older (22) and more recent (17, 23) research, has also found that distance to the nearest supermarket is not the most important determinant of where households shop for food. Other recent research suggests that the opening of a new supermarket in a neighborhood that was previously without one may not necessarily change store choice (5, 6).

This research has several limitations. Because the design was cross-sectional, the model may exhibit reverse causality or have omitted confounding variables. This may be especially true for intermediate variables describing the households' own decisions about the primary food retailer. Our main results merely identified associations. It remains for future work to measure the impact of decisions about the primary food retailer with the use of instrumental variables approaches or other research designs capable of identifying cause and effect.

This article sought to identify the features of the food retail environment that are most strongly associated with low-income households' own experiences of food security. In particular, we moved beyond distance to the nearest supermarket and focused instead on access to an automobile and being able to choose a primary retailer whose low prices and other qualities were important for consumer shopping choices.

It will be valuable in future research to develop more robust information about the range of competitive prices and other retail characteristics available in the food retail environment faced by low-income Americans and to measure the impacts on food-spending outcomes beyond the broad measure of self-reported food security studied here. Healthy food financing initiatives have identified neighborhoods to target for investments, on the basis of distance to nearest supermarket and poverty status. This study contributes to a body of research that suggests that such initiatives could reduce emphasis on distance to the nearest supermarket and consider several additional factors, including the distance to the primary retailer, reasons for choosing the primary retailer, mode of transportation to the primary retailer, frequency of lack of access to an automobile, and self-reported satisfaction with the food retail environment. With this approach, it is possible that somewhat fewer neighborhoods would be identified as supermarket deserts and that healthy food financing efforts can be targeted to the particular food retail characteristics that are most salient to residents' self-reported experience.

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