



United States Department of Agriculture

*SNAP Participation, Food Security,
and Geographic Access to Food*

Nutrition Assistance Program Report
Food and Nutrition Service
Office of Policy Support

March 2014

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Food and Nutrition Service, Office of Policy Support

March 2014

SNAP Participation, Food Security, and Geographic Access to Food

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This study was conducted under Contract number GS-10F-0050L with the Food and Nutrition Service, United States Department of Agriculture.

This report is available on the Food and Nutrition website: <http://www.fns.usda.gov>

Suggested Citation:

Mabli, James. *SNAP Participation, Food Security, and Geographic Access to Food*. Prepared by Mathematica Policy Research for the U.S. Department of Agriculture, Food and Nutrition Service, March 2014.

ACKNOWLEDGEMENTS

This report was prepared for the U.S. Department of Agriculture, Food and Nutrition Service (FNS), Office of Policy Support by James Mabli of Mathematica Policy Research. Many individuals made important contributions to this study. The author thanks Aaron Marden for expert programming in geocoding, creating analysis variables, and generating study findings; Jim Ohls for reviewing the report; and Autumn Parker for preparing the manuscript. The author also thanks Sarah Zapolsky of FNS for her guidance and support throughout the entire study, and Anita Singh, Danielle Berman, and Sangeetha Malaiyandi of FNS and Mark Nord of ERS for their thoughtful review and critique.

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06801.750

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CONTENTS

ACKNOWLEDGEMENTS	V
EXECUTIVE SUMMARY.....	XVII
I. INTRODUCTION.....	1
II. DATA AND METHODOLOGY.....	5
A. Study Design	5
B. Outcome Measures and Explanatory Variables.....	6
1. Outcome Measures	6
2. Geocoding and Defining Food Access	7
3. Explanatory Variables	9
C. Analysis Methods.....	9
III. THE RETAIL FOOD ENVIRONMENT AND FOOD PURCHASE BEHAVIOR OF NEW-ENTRANT AND SIX-MONTH SNAP HOUSEHOLDS	11
A. Retail Food Environment for SNAP Households.....	11
1. How Far Are the Nearest SNAP Retailers?	11
2. How Many SNAP Retailers Are Located Where SNAP Households Live?	14
B. SNAP Households' Food Purchase Behavior	16
1. At What Types of Stores Do SNAP Households Buy Most of Their Groceries?.....	16
2. Reasons Why SNAP Households Shop at a Preferred Store.....	18
3. What Type of Transportation Do SNAP Households Take to the Food Store?.....	19
4. What Are the Typical Travel Time and Distance to the Food Store?.....	20
IV. ASSOCIATIONS BETWEEN GEOGRAPHIC FOOD ACCESS AND FOOD SECURITY.....	23
A. Food Insecurity of SNAP Households, by Geographic Access to Food Measured Using Distance to Nearest Supermarket.....	23

- B. Food Insecurity of SNAP Households, by Geographic Access to Food Measured Using Number of Supermarkets in the Area 25
 - 1. Comparing Food Insecurity in High- Versus Low-Access Areas 26
 - 2. Comparing Food Insecurity in Areas With and Without a Supermarket..... 27
- C. Food Insecurity of SNAP Households by Geographic Access to Food Measured Using Self-Reported Distance to Store at Which Most Food is Purchased..... 29
- V. SNAP AND FOOD INSECURITY, BY GEOGRAPHIC ACCESS TO FOOD..... 33
 - A. Associations Between SNAP and Household Food Insecurity, by Geographic Access to Food Measured Using Distance to Nearest Supermarket 33
 - B. Associations Between SNAP and Household Food Insecurity, by Geographic Access to Food Measured Using Number of Supermarkets in the Area 35
 - 1. SNAP and Food Insecurity in High- Versus Low-Access Areas 36
 - 2. SNAP and Food Insecurity in Areas with and Without Access to Food..... 38
 - C. Associations Between SNAP and Household Food Insecurity, by Geographic Access to Food Measured Using Self-Reported Distance to Store at Which Most Food is Purchased..... 41
- VI. CONCLUSIONS AND IMPLICATIONS FOR FUTURE RESEARCH 45
 - A. Research Objectives and Key Findings 45
 - 1. Retail Food Environment for SNAP Households 45
 - 2. SNAP Households’ Food Purchase Behavior..... 45
 - 3. Associations Between Geographic Food Access and Food Security 46
 - 4. SNAP and Food Insecurity, by Geographic Access to Food 46
 - B. Comparison of Findings to Related Studies..... 47
 - C. Implications for Future Research 48
- REFERENCES..... 49
- APPENDIX A: FINDINGS FOR VERY LOW FOOD SECURITY

APPENDIX B: DETAILS FOR FOOD INSECURITY AND URBANICITY
REGRESSIONS

APPENDIX C: DETAILS FOR FOOD INSECURITY AND SNAP
PARTICIPATION REGRESSIONS

APPENDIX D: ASSOCIATIONS BETWEEN GEOGRAPHIC ACCESS
TO FOOD AND FOOD SECURITY USING ALTERNATIVE
DEFINITIONS OF FOOD ACCESS

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TABLES

1	Median Number of Supermarkets Within Selected Distance from New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location	xxi
2	Typical Mode of Transportation to Food Store for New-Entrant and Six-Month SNAP Households	xxiii
3	Self-Reported Travel Time and Travel Distance of New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location.....	xxiv
4	Summary of Findings of Reductions in Food Insecurity Associated with SNAP in High- and Low-Access Areas	xxv
III.1	Quartiles of Distribution of Distance (in Miles) to Nearest Supermarket, Superstore, or Large Grocery Store for New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location.....	14
III.2	Median Number of SNAP Retailers Within Selected Distance from New-Entrant and Six-Month SNAP Households Living in Urban Areas, by Store Type.....	15
III.3	Median Number of SNAP Retailers Within Selected Distance from New-Entrant and Six-Month SNAP Households Living in Rural Areas, by Store Type.....	16
III.4	Food Shopping Preferences of New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location.....	18
III.5	Typical Mode of Transportation to Food Store for New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location.....	20
III.6	Travel Time and Self-Reported Travel Distance of New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location.....	21
VI.1	Percent Reductions in Food Insecurity Associated with SNAP Participation, by Geographic Access to Food.....	47
A.1	Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Distance to Nearest Supermarket, and Urban Versus Rural Location	A-3
A.2	Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Number of Supermarkets in Local Area, and Urban Versus Rural Location	A-4

A.3 Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Whether There Is a Supermarket in Local Area, and Urban Versus Rural Location.....A-5

A.4 Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Self-Reported Travel Distance to Store at Which Most Food Is PurchasedA-6

A.5 Percentage of Households in Urban Areas That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Distance to Nearest Supermarket, Number of Supermarkets in Local Area, Whether There Is a Supermarket in Local Area, and Self-Reported Travel Distance to StoreA-7

A.6 Percentage of Households in Rural Areas That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Distance to Nearest Supermarket, Number of Supermarkets in Local Area, Whether There Is a Supermarket in Local Area, and Self-Reported Travel Distance to StoreA-9

D.1 Percentage of Households That Are Food Insecure and Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Distance to Nearest Supermarket, and Urban Versus Rural Location..... D-5

D.2 Percentage of Households That Are Food Insecure and Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Self-Reported Travel Distance to Store at Which Most Food Is Purchased D-6

FIGURES

1	Study Design.....	xix
2	Median Distance in Miles to Nearest SNAP Retailer for New-Entrant and Six-Month SNAP Households, by Store Type	xxi
3	Types of Stores at Which New-Entrant and Six-Month SNAP Households Buy Most of Their Groceries.....	xxii
4	Reason for Shopping at Preferred Store, for New-Entrant and Six-Month SNAP Households.....	xxiii
5	Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Urban Areas That Were Food Insecure, for Households with High and Low Access to Food (Where Access Is Based on Number of Stores in Area) ^a	xxvi
II.1	Study Design.....	6
III.1	Median Distance in Miles to Nearest SNAP Retailer for New-Entrant and Six-Month SNAP Households, by Store Type	12
III.2	Median Distance in Miles to Nearest SNAP Retailer for New-Entrant and Six-Month SNAP Households in Urban Areas, by Store Type	13
III.3	Median Distance in Miles to Nearest SNAP Retailer for New-Entrant and Six-Month SNAP Households in Rural Areas, by Store Type.....	13
III.4	Types of Stores at Which New-Entrant and Six-Month SNAP Households Buy Most of Their Groceries.....	17
III.5	Reason for Shopping at Preferred Store, for New-Entrant and Six-Month SNAP Households.....	19
IV.1	Living in a High-Access Area Was Not Associated with the Percentage of Households in Urban Areas That Were Food Insecure (Where Access is Based on Distance to Stores) ^a	24
IV.2	Living in a High-Access Area Was Generally Not Associated with the Percentage of Households in Rural Areas That Were Food Insecure (Where Access is Based on Distance to Stores) ^a	25
IV.3	Living in a High-Access Area Was Not Associated with the Percentage of Households in Urban Areas That Were Food Insecure (Where Access is Based on Number of Stores in Area) ^a	26

IV.4 Living in a High-Access Area Was Not Associated with the Percentage of Households in Rural Areas That Were Food Insecure (Where Access is Based on Number of Stores in Area)^a 27

IV.5 Living in a High-Access Area Was Generally Not Associated with the Percentage of Households in Urban Areas That Were Food Insecure (Where Access is Based on Whether There Is a Supermarket in the Area)^a 28

IV.6 Living in a High-Access Area Was Generally Not Associated with the Percentage of Households in Rural Areas That Were Food Insecure (Where Access is Based on Whether There Is a Supermarket in the Area)^a 29

IV.7 Living in a High-Access Area Was Not Associated with the Percentage of Households in Urban Areas That Were Food Insecure^a 30

IV.8 Living in a High-Access Area Was Not Associated with the Percentage of Households in Rural Areas That Were Food Insecure^a 31

V.1 Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Urban Areas That Were Food Insecure, for Households with High and Low Access to Food (Where Access Is Based on Distance to Stores)^a 34

V.2 Participating in SNAP for Six Months Generally Was Not Associated with a Decrease in the Percentage of Households in Rural Areas That Were Food Insecure, for Households with High and Low Access to Food (Where Access Is Based on Distance to Stores)^a 35

V.3 Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Urban Areas That Were Food Insecure, for Households with High and Low Access to Food (Where Access Is Based on Number of Stores in Area)^a 37

V.4 Evidence Was Mixed as to Whether Participating in SNAP for Six Months Was Associated with a Decrease in the Percentage of Households in Rural Areas That Were Food Insecure, for Households with High and Low Access to Food (Where Access Is Based on Number of Stores in Area)^a 38

V.5 Participating in SNAP for Six Months Was Associated with a Decrease in the Percentage of Households in Urban Areas That Were Food Insecure, for Households in Areas with and Without Access to Food (Where Access Is Based on Whether There Is a Supermarket in the Area)^a 40

V.6 Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Rural Areas That Were Food Insecure, for Households in Areas with and Without Access to Food (Where Access Is Based on Whether There Is a Supermarket in the Area)^a 41

V.7 Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Urban Areas That Were Food Insecure, for Households with High- and Low-Access to Food (Where Access is Based on Self-Reported Travel Distance to Store at Which Most of Food is Purchased)^a 43

V.8 Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Rural Areas That Were Food Insecure, for Households with High- and Low-Access to Food (Where Access is Based on Self-Reported Travel Distance to Store at Which Most of Food is Purchased)^a 44

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EXECUTIVE SUMMARY

A. What Are the Objectives?

Ensuring that Americans have adequate access to food is an important policy goal. In the 2008 Farm Bill, the U.S. Congress directed the U.S. Department of Agriculture (USDA) Economic Research Service (ERS) to learn more about food access limitations. This request resulted in a comprehensive review of published research and new empirical work (ERS 2009). The study was updated in 2012 using new data (Ver Ploeg et al. 2012). Those two reports focused on geographic access to food, which is typically assessed by characterizing the food environment in which households purchase food, such as how many and what types of food stores are in the area, how far households travel to acquire food, and how households get to stores (by using public transportation, driving or walking).

ERS' Congressional report found that geographic access to a supermarket or large grocery store was a problem for a small percentage of U.S. households, with access limitations generally greater in low-income areas (ERS 2009). Although most U.S. households have adequate geographic access to food, many households—especially low-income households—do not have enough money or other resources available to obtain food and are described as being food insecure. In 2012, the USDA estimated that 14.5 percent of American households, or 17.6 million households, were food insecure at some point during the year, with a much higher prevalence (40.9 percent) among households with incomes below 100 percent of the federal poverty level (Coleman-Jensen et al. 2013).

The Supplemental Nutrition Assistance Program (SNAP) provides nutrition assistance benefits to low-income individuals and families in an effort to reduce hunger and improve the health and well-being of low-income people nationwide. Because SNAP has long been one of the largest and most important nutrition assistance programs for low-income households, policy researchers continually evaluate the program's effectiveness in meeting its objectives, typically using food insecurity as the outcome. Although the evidence that SNAP reduces food insecurity has been mixed,¹ studies with the strongest research designs²—including the most recent and largest national evaluation conducted for the USDA (Mabli, Ohls, et al. 2013)—have consistently shown that SNAP participation is associated with an improvement in food security.

Although a growing body of research is demonstrating the ameliorative effects of the program, less is known about SNAP participants' geographic access to food and how the association between SNAP and food security differs by households' levels of access. Studies examining geographic access to food have focused on broad groups such as all U.S. households or all low-income households; few have examined the food access environment of households participating in SNAP. Furthermore, no study has examined whether the effect of SNAP on food insecurity differs by households' geographic access to food. Differences in the effect of the program might exist, for example, because a SNAP household with greater geographic access to supermarkets where prices are generally lowest may be able to purchase more food with the same amount of SNAP benefits

¹ Recent reviews of the literature on the effects of SNAP on food security can be found in Mabli, Ohls, et al. (2013); Nord and Golla (2009); Ratcliffe et al. (2011); Wilde (2007); and Fox et al. (2004).

² Ratcliffe et al. (2011); Mykerezzi and Mills (2010); Nord and Golla 2009; Yen et al. 2008.

than a household with less geographic access to food, potentially alleviating food insecurity by a greater amount.

This report examines SNAP households' geographic access to food for two groups of households: those that recently entered the program, referred to as new-entrant households, and those that had participated in SNAP for about six to seven months, referred to as six-month households. It characterizes the retail food environment for new-entrant and six-month SNAP households and describes households' food purchase behavior, including type of stores shopped at most frequently and distance and travel time to those stores. It also examines differences in the prevalence of food security and in the improvement of food security associated with SNAP based on households' geographic access to food. All analyses separately consider households in urban and rural areas given their historical differences in demographic and economic characteristics.

The main objectives of this study were to:

- Characterize the retail food environment and food purchase behavior of new-entrant and six-month SNAP households in urban and rural areas.
- Compare the percentages of new-entrant and six-month households that are food insecure in urban and rural areas with greater geographic access to food to the percentages in areas with limited geographic access to food, after adjusting for differences in household characteristics and circumstances.
- Estimate how the association between SNAP and food insecurity differs according to whether a household lives in an area with greater geographic access to food, after adjusting for differences in household characteristics and circumstances.

We also examined household very low food security, which is a severe form of food insecurity.

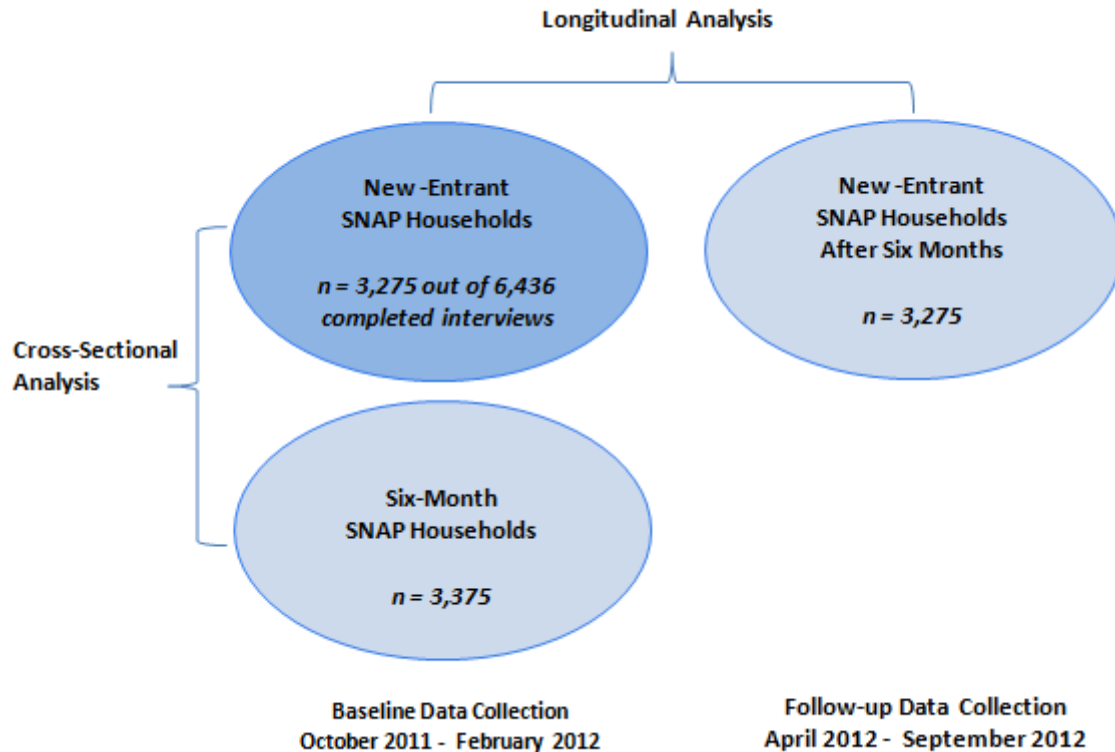
B. How Was the Study Conducted?

Data for this study come from the SNAP Food Security (SNAPFS) survey, which Mathematica Policy Research conducted for the Food and Nutrition Service of the USDA between October 2011 and September 2012, to assess the effect of SNAP participation on food security. SNAPFS is the largest survey of food security among SNAP participants to date.

As presented in Figure 1, the analysis is based on data from 3,275 new-entrant households that completed a baseline interview from October 2011 through February 2012 and a follow-up interview about six months later from April 2012 through September 2012, as well as from 3,375 six-month households that completed a single interview from October 2011 through February 2012.³

³ The analysis samples differed from the initial survey samples. The findings presented in this report are based on analyses in which the sample of new-entrant households was restricted to those that continued to participate six months later, at the time of the follow-up interview. This restriction increased the comparability of new-entrant and six-month households and helped decrease bias in comparing the food security of six-month and new-entrant households.

Figure 1. Study Design



Source: SNAP Food Security Survey 2012.

Note: Sample sizes denote numbers of households that completed the survey. In the analysis, the sample of new-entrant households was restricted to those households that also completed a follow-up interview six months later in order to improve the comparability between the new-entrant and six-month households.

The SNAPFS survey included an 18-item food security module with a 30-day reference period. Household food security status was measured using the 10 adult-referenced items of the module.

Geographic access to food was defined using four measures. First, we geocoded households' self-reported residential street address information and calculated distances to supermarkets in the area using a 2012 national database of SNAP-authorized retailers. We classified households as having a high level of access if they lived within the median distance to a supermarket, superstore, or larger grocery store (hereafter referred to as "supermarket") and a low level of access if they lived farther than the median distance to a supermarket. In urban areas, households living less than or equal to 0.6 miles (the median) from a supermarket were denoted as having "high" levels of access, and households living more than 0.6 miles from a supermarket were denoted as having "low" levels of access. Similarly, we denoted rural households as having a high level of access if they lived less than or equal to 3.9 miles from a supermarket.

The second measure of geographic access to food was the number of supermarkets in each household's local area, often described as a "density-based" measure. We defined local areas to be within one mile of the household's address in urban areas and within five miles of the household's address in rural areas. We calculated the number of supermarkets in the area for each household and estimated the median number across households. High-access areas were defined as those with

more than the median number of supermarkets, and low-access areas were defined as those with less than or equal to the median number of supermarkets. The median numbers were two supermarkets within one mile of the household's address in urban areas and one supermarket within five miles of the household's address in rural areas.

The third measure of geographic access to food was whether the local area in which a household lived contained at least one supermarket. This is a more traditional question in the food access literature that focuses on having or not having access to food, compared to our second measure, which examines the *level* of access.

The fourth measure of geographic access to food was a measure of “realized” access based on respondents' self-reported travel distance to the store at which they purchase most of their food. Thus, whereas the first three measures capture “potential” access to food by using the household's address and the addresses of the stores in the area, this measure captures information on where the household actually shops for food. We classified a household as having a high level of access if it reported traveling less than the median distance to the store at which it purchases most of its food, and as having a low level of access if it travels farther than the median distance to the store. These distances were 3 miles for households in urban areas and 10 miles for households in rural areas.

Food access measures were constructed differently in urban and rural areas. To determine whether a SNAP household lived in an urban or rural area, the census tract in which a household lives was identified using households' self-reported residential street address information. We obtained an indicator of urban/rural status for each census tract from the Economic Research Service's food environment atlas (Economic Research Service 2013), based on 2010 Census data, and merged this onto the SNAPFS data file using the tract identification number.

The findings in this study are based on descriptive and multivariate methods. We used descriptive, tabular analysis to characterize the retail food environment and food shopping behavior of SNAP households. Because the characteristics of households in areas with limited geographic access to food likely differ from those of households in areas with greater access, we used multivariate regression analysis to estimate the association between household food security and geographic access to food, while accounting for differences in household characteristics and circumstances. Separate models were estimated for new-entrant and six-month households in urban and rural areas.

We also used multivariate analysis to estimate the association between household food security and SNAP participation. These analyses were based on two sets of comparisons. Using a cross-sectional sample, we compared information collected from SNAP households within days of entering the program to information collected from a contemporaneous sample of households that had participated for about six months. Next, using a longitudinal sample, we compared the baseline information collected from the new-entrant SNAP households to information from those same households six months later. All analyses used weights to account for the survey's multistage sampling design and for nonresponse.

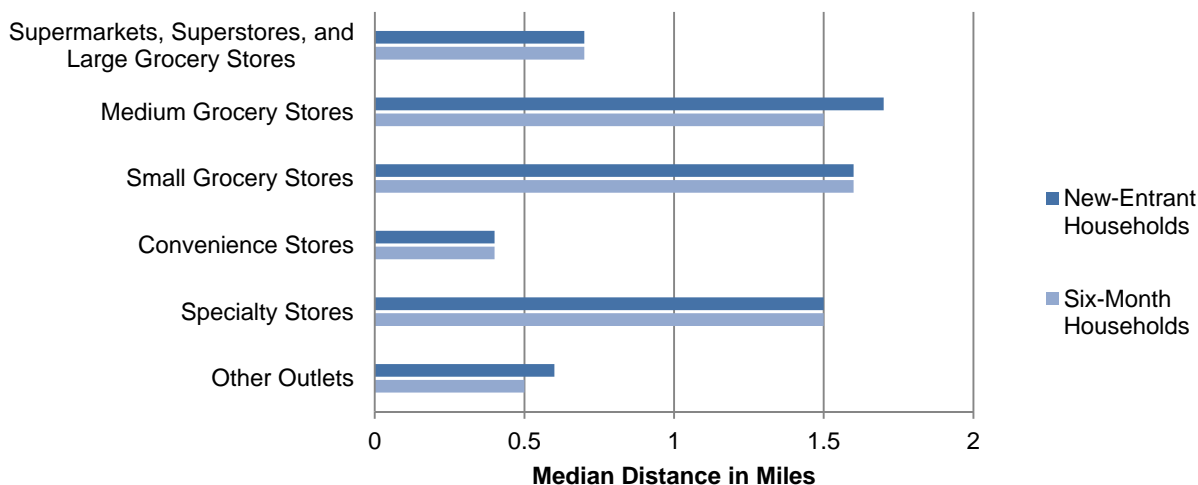
C. What Did the Study Find?

1. Retail Food Environment for SNAP Households

At least half of new-entrant and six-month SNAP households lived within 0.7 miles of a supermarket (Figure 2). Among all store types, households lived closest to convenience stores, with

the nearest store within 0.4 miles from home, on average. The median distance to each type of store for new-entrant households was nearly identical to that for six-month households. The median distance to SNAP retailers differed according to whether a household lived in an urban or rural area. The median distance to a supermarket was 0.6 miles for urban households and about 4.0 miles for rural households (not shown in figure).

Figure 2. Median Distance in Miles to Nearest SNAP Retailer for New-Entrant and Six-Month SNAP Households, by Store Type



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and 3,375 six-month households at baseline.

“Specialty food stores” comprise stores classified as selling one of the following specialized items: baked goods/bread, fruits/vegetables, meat/poultry products, or seafood products.

“Other outlets” comprise stores classified as a combination grocery/other store, delivery route, farmers’ market, nonprofit food buying cooperative, wholesaler, or meal service provider.

In urban areas, at least half of the new-entrant and six-month households had no supermarkets within 0.5 miles of where they live and one supermarket from 0.5 miles to less than 1 mile (Table 1). In rural areas, at least half of the new-entrant households had one supermarket within 5 miles of where they live and two supermarkets from 5 miles to less than 10 miles. Six-month households generally had similar counts.

Table 1. Median Number of Supermarkets Within Selected Distance from New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location

	New-Entrant Household (Baseline)	Six-Month Households
Number of Supermarkets for Households in Urban Areas		
Less than 0.5 mile	0	0
0.5 to less than 1 mile	1	1
Number of Supermarkets for Households in Rural Areas		
Less than 5 miles	1	1
5 to less than 10 miles	2	3

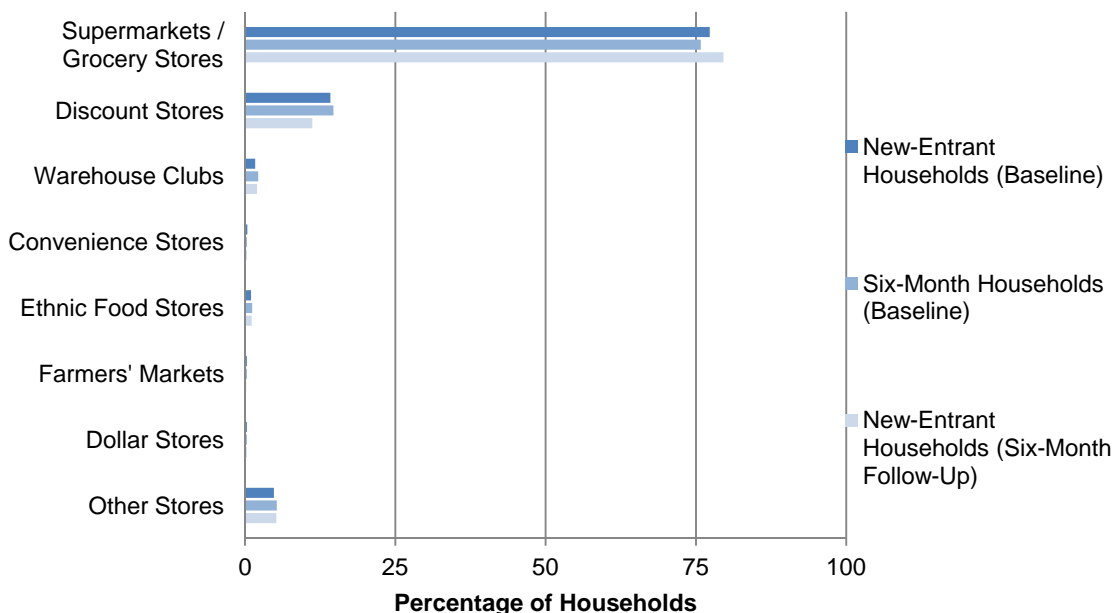
Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and 3,375 six-month households at baseline.

2. SNAP Households' Food Purchase Behavior

About three-quarters of new-entrant and six-month households reported buying most of their groceries at supermarkets or grocery stores (Figure 3). The next most popular store type was discount stores such as Walmart, Target, or Kmart, reported by 11 to 14 percent of households. Less than one percent of households (0.3 to 0.4 percent) purchase most of their groceries at convenience stores.

Figure 3. Types of Stores at Which New-Entrant and Six-Month SNAP Households Buy Most of Their Groceries

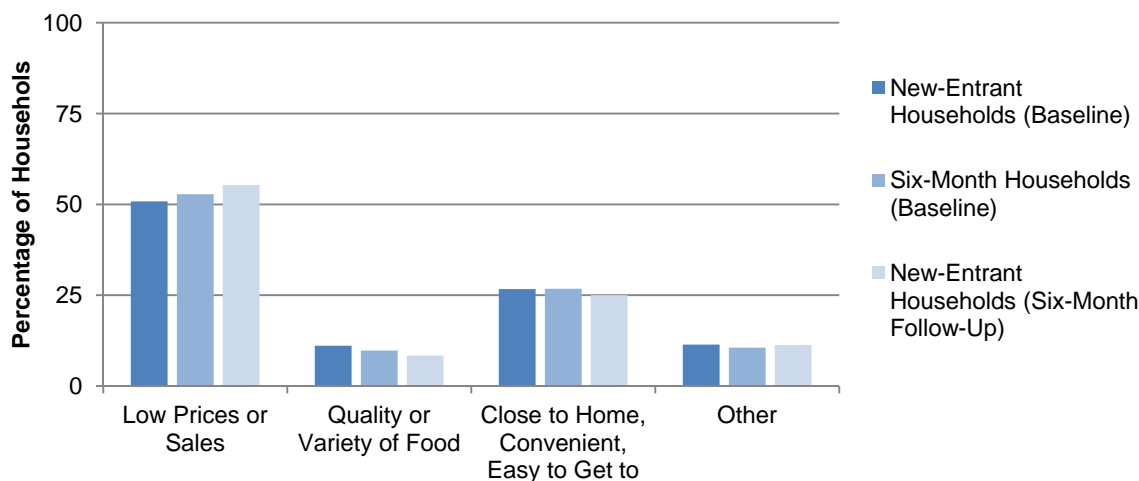


Source: SNAP Food Security Survey 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and again at follow-up six months later, and 3,375 six-month households at baseline.

More than half (51 to 55 percent) of new-entrant SNAP households reported shopping at a specific type of food store because of low prices or sales (Figure 4). About one-quarter shop at a store because it is close to home, convenient, or easy to get to. Eleven percent shop at a store because of the quality or variety of food. Responses were generally similar between new-entrant and six-month households. They were also similar in urban and rural areas (not shown on figure).

Figure 4. Reason for Shopping at Preferred Store, for New-Entrant and Six-Month SNAP Households



Source: SNAP Food Security Survey 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and again at follow-up six months later, and 3,375 six-month households at baseline.

As Table 2 shows, 56 percent of new-entrant SNAP households usually get to the food store by driving their own car (46 percent) or someone else’s car (10 percent). Thirty-five percent are driven by someone else. In urban areas, 20 percent of households walk to the store, compared to 4 percent in rural areas (not shown on table). Responses were generally similar between new-entrant and six-month households.

Table 2. Typical Mode of Transportation to Food Store for New-Entrant and Six-Month SNAP Households

	New-Entrant Households (Baseline)	Six-Month Households (Baseline)	New-Entrant Households (Six-Month Follow-Up)
Drive Own Car	46	47	47
Drive Someone Else’s Car	10	9	9
Someone Else Drives	35	37	36
Walk	16	14	16
Bus	10	10	10
Taxi	2	2	2
Ride Bicycle	2	1	2
Other	2	2	2

Source: SNAP Food Security Survey 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and again at follow-up six months later, and 3,375 six-month households at baseline.

Percentages sum to more than 100 percent since multiple responses were allowed.

About 94 percent of new-entrant and six-month households reported shopping for food by leaving directly from their home. Among those households, the median self-reported travel time was 10 minutes for households in urban areas, with half of households ranging from 5 to 15 minutes (Table 3). In rural areas, the median self-reported travel time was 15 minutes, with half of households ranging from 10 to about 25 minutes.

Table 3. Self-Reported Travel Time and Travel Distance of New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location

	Households in Urban Areas		Households in Rural Areas	
	New-Entrant Households (Baseline)	Six-Month Households (Baseline)	New-Entrant Households (Baseline)	Six-Month Households (Baseline)
Travel Time (Minutes One Way from Home)				
25th Percentile	5	5	10	10
50th Percentile	10	10	15	15
75th Percentile	15	15	22	25
Travel Distance (Miles One Way from Home)				
25th Percentile	1	1	5	4
50th Percentile	3	3	10	10
75th Percentile	5	6	15	19

Source: SNAP Food Security Survey 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and 3,375 six-month households at baseline.

The median self-reported distance to the store from which households buy most of their groceries was three miles for new-entrant and six-month households in urban areas (Table 3). A quarter of households typically traveled at least one mile, and another quarter traveled at least five to six miles. In rural areas, the median self-reported distance was ten miles for new-entrant households. A quarter of rural households typically traveled at least four to five miles, and another quarter traveled at least 15 to 19 miles.

3. SNAP and Food Insecurity, by Geographic Access to Food

Geographic access to food was generally not associated with the percentage of households that were food insecure. This was true for new-entrant households and six-month households; for households living in urban areas and in rural areas; and for each of the four measures of food access. The percentage of new-entrant households in urban areas that were food insecure, for example, was statistically the same for households in high- and low-access areas.

Next, we discuss whether the improvement in food insecurity associated with participating in SNAP differed by households' geographic access to food. For households in urban areas, participating in SNAP for six months was associated with reductions in food insecurity in both high- and low-access areas (Table 4). This was generally true across each of the four measures of geographic access to food and across both the cross-sectional and longitudinal samples. For three of the four food access measures (the two measures based on number of supermarkets in the area and the measure based on self-reported travel distance), the reduction in food insecurity associated with SNAP was statistically larger for households in high-access areas than for households in low-access areas. That is, SNAP reduced food insecurity by a greater amount for households that had a greater number of supermarkets in the area, compared to fewer supermarkets; for households that had at least one supermarket in the area, compared to no supermarkets; and for households that reported traveling shorter distances to the food store, compared to longer distances. For households in rural areas, evidence was mixed as to whether SNAP participation was associated with reduced food insecurity. For some samples and access measures, there was no association. For others, SNAP was associated with a reduction in food insecurity.

Table 4. Summary of Findings of Reductions in Food Insecurity Associated with SNAP in High- and Low-Access Areas

How Geographic Access to Food Is Measured	SNAP Reduces Food Insecurity in High-Access Areas? ^a	SNAP Reduces Food Insecurity in Low-Access Areas? ^a	Reduction in High-Access Areas is Larger than Reduction in Low-Access Areas? ^b
Households in Urban Areas			
Distance from Household Address to Nearest Supermarket	Yes	Mixed	No
Number of Supermarkets Near Household Address	Yes	Mixed	Yes
Whether There is a Supermarket Near Household Address	Yes	Yes	Yes
Self-Reported Travel Distance to Store at which Most Food is Purchased	Yes	Mixed	Yes
Households in Rural Areas			
Distance from Household Address to Nearest Supermarket	No	Mixed	No
Number of Supermarkets Near Household Address	Mixed	Mixed	No
Whether There is a Supermarket Near Household Address	Mixed	Yes	Yes
Self-Reported Travel Distance to Store at which Most Food is Purchased	Mixed	Yes	No

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

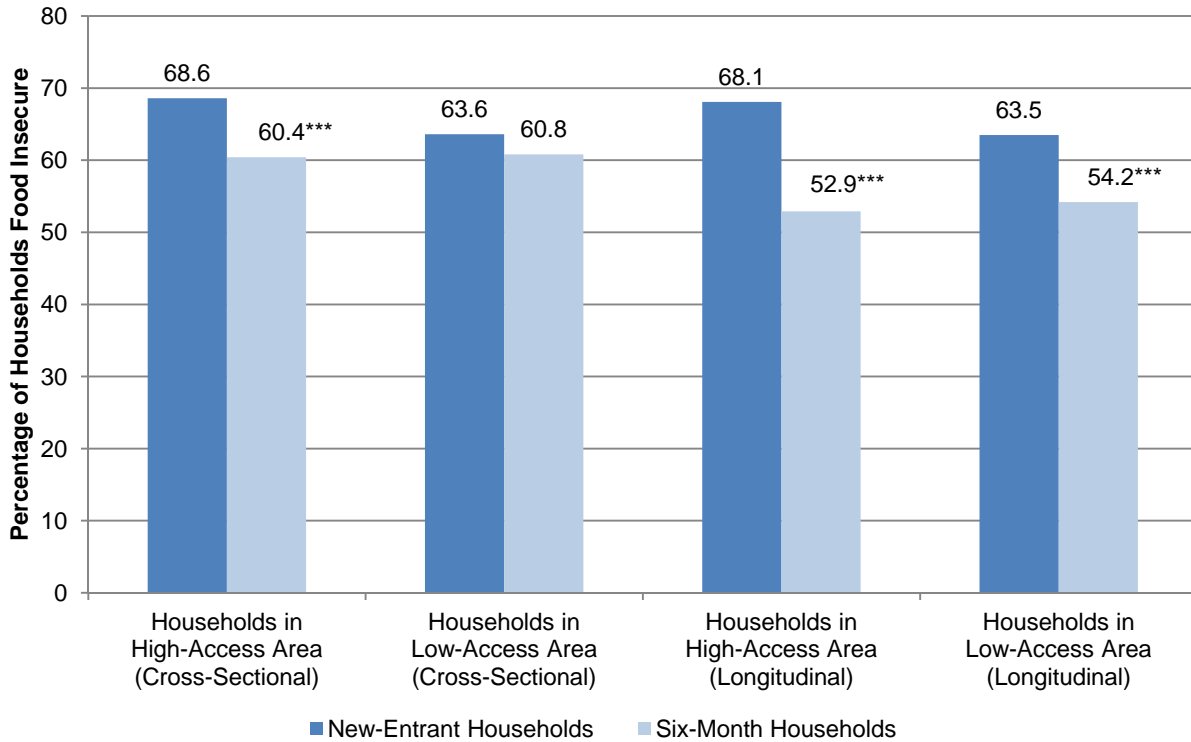
Note: Findings reflect regression-adjustment for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II.

^a“Yes” denotes that SNAP was associated with a reduction in food insecurity in both the cross-sectional and longitudinal samples; “mixed” denotes that SNAP was associated with a reduction in food insecurity in either the cross-sectional or longitudinal sample, but not both; and “no” denotes that SNAP was not associated with a reduction in food insecurity in the cross-sectional and longitudinal samples.

^b“Yes” denotes that the reduction in food insecurity associated with SNAP was statistically larger in high-access areas than in low-access areas. “No” denotes that the reductions were statistically indistinguishable across access areas.

Using a measure of access based on the number of supermarkets in the area and focusing on urban households, for example, participating in SNAP for six months was associated with a decrease in the percentage of households that were food insecure (Figure 5). This was true both in high- and low-access areas in the longitudinal sample and only in high-access areas in the cross-sectional sample, where access was based on the number of supermarkets within one mile in urban areas and five miles in rural areas. The magnitudes of the reductions for households in high-access areas were statistically greater than those for households in low-access areas. In the cross-sectional sample, the reduction was -8.2 percentage points for households in high-access areas, compared to -2.8 percentage points for households in low-access areas. In the longitudinal sample, the reductions were -15.2 and -9.2 percentage points, respectively. Similar figures are presented in the report for both urban and rural areas and all four food access measures.

Figure 5. Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Urban Areas That Were Food Insecure, for Households with High and Low Access to Food (Where Access Is Based on Number of Stores in Area)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II.

For SNAP households in high-access areas, the cross-sectional estimates compare the sample of 1,142 new-entrant households to the sample of 1,213 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 1,213 and 1,261 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 1,156 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 1,199 households.

The associations for households in high-access areas were significantly different from the associations for households in low-access areas at the 0.10 level in the cross-sectional sample and the 0.05 level in the longitudinal sample.

^aHouseholds living in an area with more than the median number of supermarkets (two stores) within one mile are referred to as living in a high-access area. Households living in an area with less than the median number of supermarkets are referred to as living in a low-access area.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 levels, respectively.

I. INTRODUCTION

Ensuring that Americans have adequate access to food is an important policy goal. In the 2008 Farm Bill, the U.S. Congress directed the U.S. Department of Agriculture (USDA) Economic Research Service (ERS) to learn more about food access limitations. This request resulted in a comprehensive review of published research and new empirical work (ERS 2009). The study was updated in 2012 using new data (Ver Ploeg et al. 2012). Those two reports focused on geographic access to food, which is typically assessed by characterizing the food environment in which households purchase food, such as how many and what types of food stores are in the area, how far households travel to acquire food, and how households get to stores (by using public transportation, driving or walking).

ERS' Congressional report found that geographic access to a supermarket or large grocery store was a problem for a small percentage of U.S. households, with access limitations generally greater in low-income areas (ERS 2009). Although most U.S. households have adequate geographic access to food, many households—especially low-income households—do not have enough money or other resources available to obtain food and are described as being food insecure. In 2012, the USDA estimated that 14.5 percent of American households, or 17.6 million households, were food insecure at some point during the year, with a much higher prevalence (40.9 percent) among households with incomes below 100 percent of the federal poverty level (Coleman-Jensen et al. 2013).

The Supplemental Nutrition Assistance Program (SNAP) provides nutrition assistance benefits to low-income individuals and families in an effort to reduce hunger and improve the health and well-being of low-income people nationwide. It is the largest federal nutrition assistance program, providing benefits to more than 46 million Americans per month, on average, in Fiscal Year 2012.⁴

Given the size and importance of the program, policy researchers continually evaluate the program's effectiveness in meeting its objectives. An outcome that many studies have used is food insecurity. Although the evidence supporting the hypothesis that SNAP reduces food insecurity has been mixed,⁵ studies with the strongest research designs (Ratcliffe et al. 2011; Mykerezzi and Mills 2010; Nord and Golla 2009; Yen et al. 2008), including the most recent and largest national evaluation (Mabli, Ohls, et al. 2013), have consistently shown that SNAP is associated with an improvement in food security.

Although a growing body of research is demonstrating the ameliorative effects of the program, less is known about SNAP participants' geographic access to food and how the association between SNAP and food security differs by households' levels of access. Studies examining geographic access to food have focused on broad groups such as all U.S. households or all low-income households; few have examined the food access environment of households participating in SNAP. Furthermore, no study has examined whether the effect of SNAP on food insecurity differs by households' geographic access to food. Differences in the effect of the program might exist, for example, because a SNAP household with greater geographic access to supermarkets where prices

⁴ Data were obtained from <http://www.fns.usda.gov/pd/SNAPsummary.htm>.

⁵ Recent reviews of the literature of the effects of SNAP on food security can be found in Mabli, Ohls, et al. (2013); Nord and Golla (2009); Ratcliffe et al. (2011); Wilde (2007); and Fox et al. (2004).

are generally lowest may be able to purchase more food with the same amount of SNAP benefits than a household with less geographic access to food, potentially alleviating food security by a greater amount.

This report examines SNAP households' geographic access to food. It characterizes the retail food environment for new-entrant and six-month SNAP households and describes households' food purchase behavior, including type of stores shopped at most frequently and distance and travel time to those stores. It also examines differences across households' geographic access to food in the prevalence of food security and in the improvement of food security associated with SNAP.

The main objectives of this study were to:

- Characterize the retail food environment and food purchase behavior of new-entrant and six-month SNAP households in urban and rural areas.
- Compare the percentage of new-entrant and six-month households that are food insecure in areas with greater geographic access to food to the percentage in areas with limited geographic access to food, after adjusting for differences in household characteristics and circumstances.
- Estimate how the association between SNAP and food insecurity differs according to whether a household lives in an area with greater geographic access to food, after adjusting for differences in household characteristics and circumstances.

We also examined household very low food security, which is a severe form of food insecurity.

We use recently collected, nationally representative data from the SNAP Food Security (SNAPFS) survey conducted by Mathematica Policy Research for the Food and Nutrition Service (FNS) of the USDA from October 2011 to September 2012. The study's quasi-experimental research design consisted of two sets of comparisons. Using a cross-sectional sample, we compared information collected from SNAP households within days of entering the program to information collected from a contemporaneous sample of households that had participated for about six months. We refer to this as a cross-sectional analysis. Next, using a longitudinal sample, we compared the baseline information collected from the new-entrant SNAP households to information from those same households six months later. We refer to this as a longitudinal analysis.⁶ We addressed the first research objective using descriptive tabulations and the second and third objectives using multivariate regression models. The details of the analysis are presented in Chapter II.

In this report, we discuss the methodology used in the analysis and present findings. Chapter II provides an overview of the study design and the data and methodology used in the analysis. In Chapter III, we characterize the retail food environment and food purchase behavior of new-entrant and six-month SNAP households. Chapter IV discusses whether household food insecurity is associated with geographic access to food, and Chapter V presents estimates of the associations

⁶ The sample of new-entrant households used in both analyses was considerably smaller than the initial survey samples. As discussed in Chapter II, the findings presented in this report are based on analyses in which the sample of new-entrant households was restricted to those that continued to participate six months later, at the time of the follow-up interview. This restriction increased the comparability of new-entrant and six-month households and helped decrease bias in comparing the food security of six-month and new-entrant households.

between SNAP and household food insecurity, by geographic access to food. We conclude, in Chapter VI, by discussing implications for future research.

The appendices of the report provide supporting and additional tables. Because the findings for food insecurity were similar to those for very low food security, we present findings for food insecurity in the body of the report and present tables for very low food security in Appendix A. Appendices B and C contain examples of detailed regression findings related to the food security analyses in Chapters IV and V, respectively. Finally, Appendix D presents food insecurity and very low food security findings using alternative distances to define geographic access to food.

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II. DATA AND METHODOLOGY

This chapter describes the study design underlying the SNAPFS survey. It also describes the outcome measures, definitions of the food access variables, definitions of urban and rural areas, other analysis variables, analytic methods, and construction of survey weights. Further details of the SNAPFS survey can be found in Appendix A of Mabli, Ohls, et al. (2013).

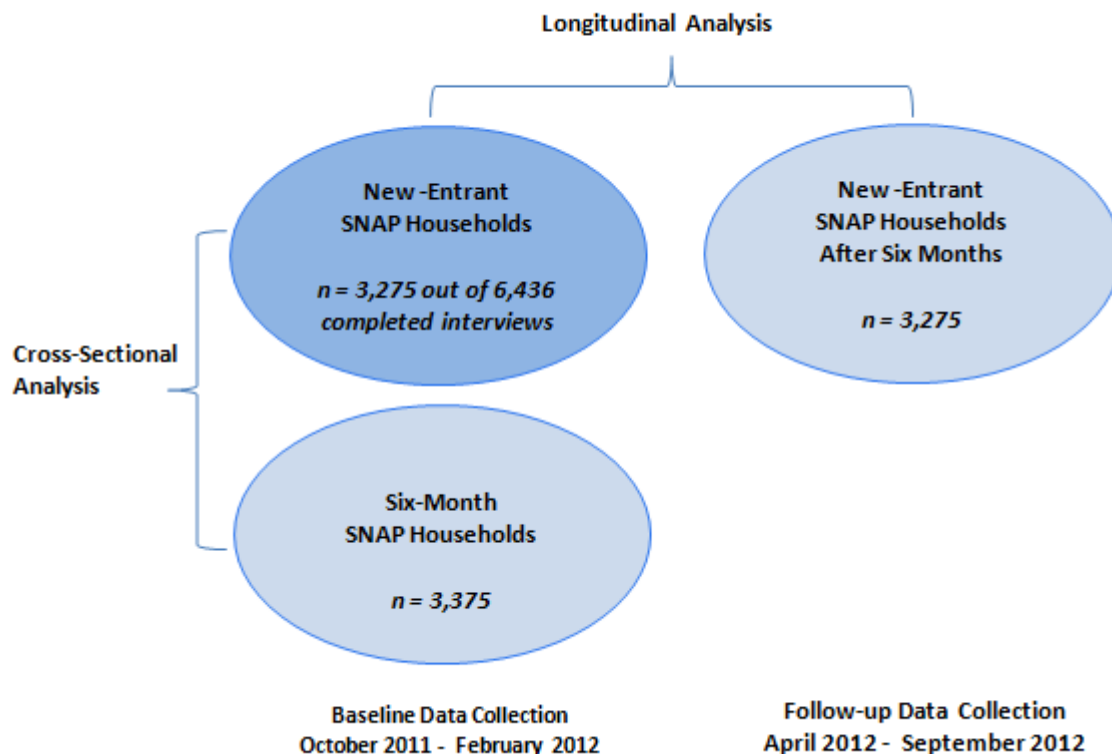
A. Study Design

The SNAPFS survey was designed to compare the food security levels of households that have applied for and been accepted into SNAP, but that are not yet receiving SNAP benefits, to the food security levels of households that have been receiving benefits for several (six to seven) months.

Because households were not randomly assigned to SNAP versus non-SNAP status, this raises the issue of “self-selection”: the possibility that members of the two groups being compared may differ in characteristics (such as underlying need) other than the defining characteristic—in this case, SNAP benefit receipt. For example, if households that have been receiving benefits for six months are different from a comparison group that has just entered the program in some unobserved aspect that caused them to remain on the program for six months, the six-month group could possibly have lower food security because of the unobserved factor.

For the analysis in this report, we sought to minimize selection bias by comparing existing SNAP participant households (six-month households) to households that had just entered SNAP (new-entrant households). By doing so, a major source of selection bias in previous studies borne from comparing program participants to nonparticipants—many of whom do not eventually even enter SNAP—was avoided by interviewing new-entrant households and obtaining information from the month before entering SNAP. As shown in Figure II.1, the first design was a cross-sectional comparison group design made up of new-entrant households, defined as households that had been certified for SNAP in the five days prior to the sample date, and a group of participants who had been in the program for the previous six to seven months. The second design was a longitudinal comparison of the new-entrant households at program entry and that same group of participants six or seven months later. This second design minimizes the bias associated with self-selection that exists when comparing different households at a point in time (as in the cross-sectional design), but it may introduce biases due to changes in external factors over time. By using both quasi-experimental designs, we sought to address the weaknesses inherent in each design to obtain the most definitive possible estimates of the association between SNAP participation and child food security.

Figure II.1. Study Design



Source: SNAP Food Security Survey 2012.

Note: Sample sizes denote numbers of households that completed the survey. In the analysis, the sample of new-entrant households was restricted to those households that also completed a follow-up interview six months later in order to improve the comparability between the new-entrant and six-month households.

B. Outcome Measures and Explanatory Variables

1. Outcome Measures

The SNAPFS survey included the 18-item food security module used in the Current Population Survey Food Security Supplement (CPS-FSS). As in the CPS-FSS, we administered the 18 core items of the food security module for assessing the food security of households with children and the 10 items for households without children. The questionnaire was based on a 30-day recall period.

We defined two outcome measures for the food security analyses:

1. **Household food insecurity.** This is a binary variable indicating whether a household was food insecure. Household food security status can be measured using the 10 adult-referenced items for households without children and the full 18 items (the 10 adult-referenced items plus the 8 child-referenced items) for households with children. In this study, we measured food security using the 10 adult-referenced items for all households to minimize any measurement effects associated with the presence and ages of children (Nord and Golla 2009; Nord and Bickel 2002). Households that affirmed three or more items were classified as food insecure.

2. **Household very low food security.** This is a binary variable indicating whether a household experienced very low food security. We measured this variable using the 10-item adult scale of the food security module. Households that affirmed six or more items were classified as having very low food security.

2. Geocoding and Defining Food Access

Household locations. To determine the food access environment of SNAP households and whether a household lives in an urban or rural area, we identified households' residential locations using their street address. We located the addresses using the geocoding tool in version 10 of ESRI ArcMap software. This process converted the address information to latitude and longitude coordinates and stored them in a newly created file.

The household address information was collected from new-entrant and six-month households at the baseline interview, and was collected a second time for new-entrant households six months later at the follow-up interview. Although the data is available for new-entrant households at both the baseline and follow-up interviews, 96 percent of new-entrant households had the same address at each point in time. Consequently, we used the baseline address for new-entrant households at both the baseline interview and at the six-month follow-up interview. Households that moved between interviews were not excluded from the sample.

Store locations. We obtained the location of SNAP retailers from the 2012 Store Tracking and Redemption System (STARS). We overlaid the map of household residential locations with the map of SNAP retailers and calculated distances from each household to each store in the area. For each household, we estimated the minimum distance to each store type and stored that on the household-level data file. We used these minimum distances to characterize the food access environment, described in Chapter III.

Food Access. Geographic access to food was defined using four measures. First, we classified households as having a high level of access if they lived within the median distance to a supermarket, superstore, or larger grocery store (hereafter referred to as "supermarket") and a low level of access if they lived farther than the median distance to a supermarket. In urban areas, households living less than or equal to 0.6 miles (the median) from a supermarket were denoted as having "high" levels of access, and households living more than 0.6 miles from a supermarket were denoted as having "low" levels of access. Similarly, we denoted rural households as having a high level of access if they lived less than or equal to 3.9 miles from a supermarket.

The second measure of geographic access to food was the number of supermarkets in each household's local area, often described as a "density-based" measure (Economic Research Service 2009; Mabli, Jones, et al. 2013). We defined local areas to be within one mile of the household's address in urban areas and within five miles of the household's address in rural areas. We calculated the number of supermarkets in the area for each household and estimated the median number across households. High-access areas were defined as those with more than the median number of supermarkets, and low-access areas were defined as those with less than or equal to the median number of supermarkets. The median numbers were two supermarkets within one mile of the household's address in urban areas and one supermarket within five miles of the household's address in rural areas.

The third measure of geographic access to food was whether the local area, one mile in urban areas and 5 miles in rural areas, in which a household lived contained at least one supermarket. This

is a more traditional question in the food access literature that focuses on having or not having access to food, compared to our second measure, which examines the *level* of access.

The fourth measure of geographic access to food was a measure of “realized” access based on respondents’ self-reported travel distance to the store at which they purchase most of their food. Thus, whereas the first three measures capture “potential” access to food by using the household’s address and the addresses of the stores in the area, this measure captures information on where the household actually shops for food. We classified a household as having a high level of access if it reported traveling less than the median distance to the store at which it purchases most of its food, and as having a low level of access if it travels farther than the median distance to the store. These distances were 3 miles for households in urban areas and 10 miles for households in rural areas.

For both the first and fourth measures of food access, we defined high and low levels of access by dividing the sample of households using the median distance. This differs from definitions used in other studies which measure access according to whether a household lives beyond a specific distance from a store, such as 1 mile in urban areas or 10 miles in rural areas. For example, ERS’ Food Access Research Atlas defines access limitations in several ways, one of which is whether a low-income area has at least one-third of its population living more than 1 mile from the nearest supermarket, superstore, or large grocery store in urban areas (10 miles in rural areas) (Economic Research Service 2013).⁷ In the SNAPFS data, because the median distance from a household to the nearest supermarket and the median self-reported travel distance to the store each differed from the typical thresholds used in the literature, we chose to use the median to divide the sample. This ensured adequate sample sizes to produce reliable estimates for households in high- and low-access areas.

Urban/rural areas. We overlaid the map of household residential locations and SNAP retailers with a U.S. Census Bureau geographic boundaries file and identified the census tract in which each household is located. Census tracts are geographic boundaries developed by the U.S. Census Bureau. Because they are drawn to encompass similar population sizes, they vary in spatial size depending on whether they are in a metropolitan or nonmetropolitan area. Census tracts are the largest geographic areas defined by the Census Bureau and generally contain 1,500 to 8,000 people and have a target size of 4,000. In 2010, the United States was divided into more than 73,000 census tracts.

Next, we merged a binary indicator of urban/rural status onto the SNAP household-level data file using the census tract identification number. Using the Economic Research Service (ERS) food environment atlas (Economic Research Service 2013), we obtained a variable that indicates whether the population-weighted centroid of a census tract is in an urban or rural area. The atlas states: “Urban and rural are defined in the Census Bureau’s urbanized area definitions, where rural areas are sparsely populated areas with fewer than 2,500 people, and urban areas are areas with more than 2,500 people. A census tract is urban if the geographic centroid of the tract is in an area with more than 2,500 people; all other tracts are rural.” Urban/rural status in the ERS atlas was based on the 2010 Census.

⁷ Although Ver Ploeg et al. (2012) do not formally define high- and low-access areas, the authors characterize access by presenting the percentages of households that live less than 0.5 miles, 0.5 miles to 1 mile, and greater than 1 mile from a supermarket or grocery store in urban areas and less than 10 miles, 10 to 20 miles, and greater than 20 miles in rural areas.

We also created a measure of population density, equal to the area population divided by the area size in miles squared. We obtained population and total area for each census tract from the Bureau's geographic boundary file. For households in urban areas, we calculated the population within one mile of the household's location by taking a weighted sum of the population across tracts within a one-mile radius. The weights were equal to the percentage of the census tract contained within the one-mile buffer.⁸ The population and total area of the five-mile buffers in rural areas were calculated similarly.

3. Explanatory Variables

All food security regression models included the following set of explanatory variables measuring household characteristics and circumstances: gender of household head; race and ethnicity of household head; highest grade completed by household head; employment status of household head; depression status of household head; household income-to-poverty ratio; household size; household composition; prior SNAP participation status; participation in federal or state programs; changes in household size, housing status, employment, pay, or hours worked; region of residence; state wage and unemployment rate; state SNAP policies; and population density in the local area.

Appendix A of Mabli, Ohls, et al. (2013) describes how these variables were constructed. In addition to these explanatory variables, the binary indicators of food access (distance-based and density-based) were the main independent variables in the regressions in Chapter IV, and the binary indicator of whether a household was a new-entrant or six-month SNAP household was the main independent variable in the regressions in Chapter V.

C. Analysis Methods

The analysis consisted of a mix of descriptive and multivariate methods. We used descriptive, tabular analysis to characterize the retail food environment and food purchase behavior of new-entrant and six-month SNAP households discussed in Chapter III. Next, because the characteristics of households in areas with high levels of geographic access to food likely differ from those of households with low levels, we used multivariate logistic regression analysis to estimate the association between household food insecurity and food access, while accounting for compositional and other differences between households. Separate models were estimated for new-entrant and six-month households. Finally, we used multivariate logistic analysis to estimate the association between household food insecurity and SNAP participation. For all multivariate analyses, separate models were estimated for the outcome of household very low food security.

We transformed the raw logistic regression coefficients of the food access and SNAP participation variables into "marginal effects" to measure the association of food access (and SNAP participation) with the probability of being food insecure (or, in alternate specifications, the probability of experiencing very low food security). Appendices B and C present the raw regression coefficients and standard errors for several regressions. In the main text, we present tables that

⁸ For example, if the one-mile buffer fully contained tract A, but contained only half of tract B, then the population of the one-mile area was calculated as (population of tract A)+0.5*(population of tract B).

summarize the associations and compare the rates of food insecurity across groups after accounting, or adjusting, for compositional differences across groups.

The summary tables have the regression-adjusted percentage of new-entrant households that are food insecure; the regression-adjusted percentage of six-month households that are food insecure; the difference in these percentages, which is the marginal effect; and the standard error of the marginal effect. Mabli, Ohls, et al. (2013) describe the steps used to produce regression-adjusted percentages of households that are food insecure.

Figures in Chapter IV present findings from three samples: new-entrant households at the baseline interview, six-month households at the baseline interview, and new-entrant households at the six-month follow-up interview. We use the following terminology to reflect the consistency of findings across the three samples: “was associated” if there was a significant association in all three samples; “was generally associated” if there was a significant association in two out of three samples; “was generally not associated” if there was a significant association in one out of three samples; and “was not associated” if there was not a significant association in any of the three samples.

Similarly, figures in Chapter V present findings from four samples: urban households in high- and low-access areas and rural households in high- and low-access areas. We use the following terminology to reflect the consistency of findings across the four samples: “was associated” if there was a significant association in all four samples; “was generally associated” if there was a significant association in three out of four samples; “evidence was mixed regarding whether there was an association” if there was a significant association in two out of four samples; “was generally not associated” if there was a significant association in one out of four samples; and “was not associated” if there was not a significant association in any of the four samples.

Standard errors were estimated using a variance estimator based on a first-order Taylor series approximation. We accounted for the complex survey design of the SNAPFS survey when estimating standard errors using the Stata software’s “svy” commands.

We used sampling weights for all analyses to account for the complex survey design and to adjust for the potential effects of differential nonresponse. Based on weighted data, the findings in this study are nationally representative of new-entrant and six-month SNAP households at the time of the baseline interviews. The findings are not representative of all SNAP households.

III. THE RETAIL FOOD ENVIRONMENT AND FOOD PURCHASE BEHAVIOR OF NEW-ENTRANT AND SIX-MONTH SNAP HOUSEHOLDS

In this chapter, we describe the types and numbers of SNAP retailers to which new-entrant and six-month SNAP households have access. Next, we describe households' food purchase behavior, including type of stores shopped at most frequently and distance and travel time to those stores. We present information for all households and separately for households in urban areas and rural areas. Tables describing geographic access to food present findings separately for new-entrant households at the baseline interview and six-month households at the baseline interview.⁹ Tables describing households' food purchase behavior present findings separately for three samples: (1) new-entrant households at the baseline interview, (2) six-month households at the baseline interview, and (3) new-entrant households at the six-month follow-up interview.¹⁰

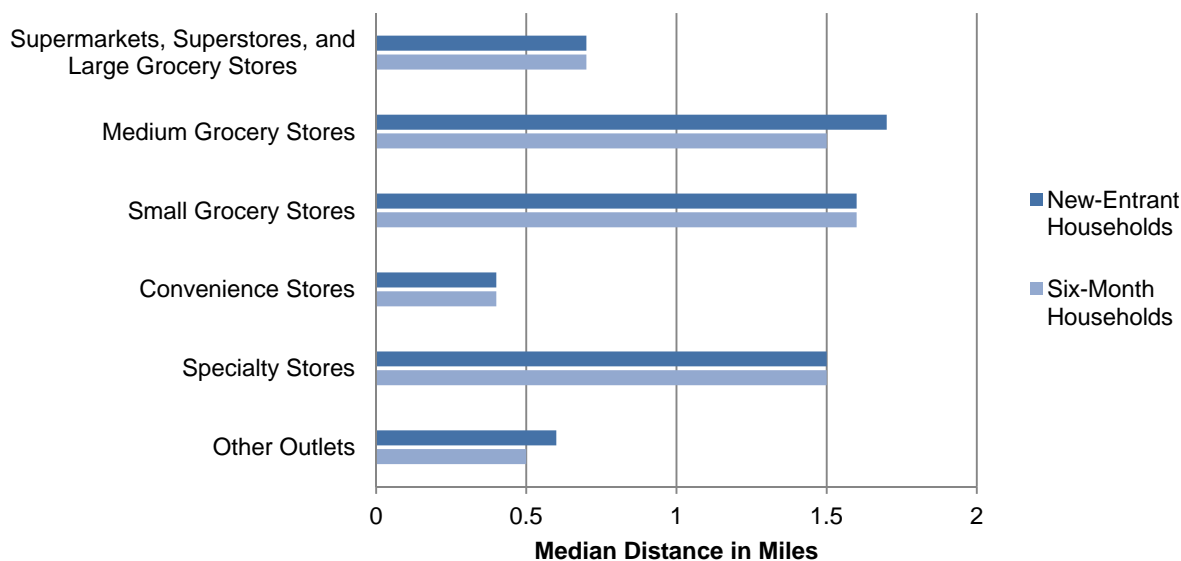
A. Retail Food Environment for SNAP Households

1. How Far Are the Nearest SNAP Retailers?

At least half of new-entrant and six-month SNAP households lived within 0.7 miles of a supermarket, superstore, or large grocery store (Figure III.1). Among all store types, households lived closest to convenience stores, with the nearest store within 0.4 miles from home, on average. Other grocery stores and specialty stores were located within 1.5 to 1.7 miles from SNAP households, on average. The median distance to each type of store for new-entrant households was nearly identical to that for six-month households.

⁹ Because new-entrant households' residential locations were identical at the baseline and follow-up interview for nearly the entire sample, we characterize access areas for new-entrant households at the time of the baseline interview only.

¹⁰ All tables restrict the sample of new-entrant households to those that continued to participate six months later, at the time of the follow-up interview. The findings for this sample are nearly identical to those for the unrestricted sample.

Figure III.1. Median Distance in Miles to Nearest SNAP Retailer for New-Entrant and Six-Month SNAP Households, by Store Type

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

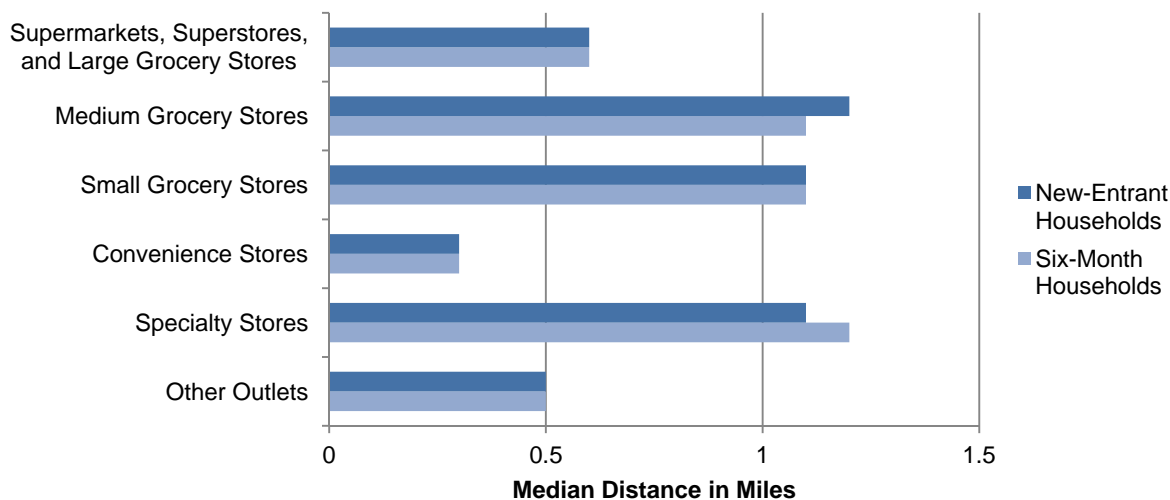
Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and 3,375 six-month households at baseline.

“Specialty food stores” comprise stores classified as selling one of the following specialized items: baked goods/bread, fruits/vegetables, meat/poultry products, or seafood products.

“Other outlets” comprise stores classified as a combination grocery/other store, delivery route, farmers’ market, nonprofit food buying cooperative, wholesaler, or meal service provider.

The median distance to SNAP retailers differed according to whether a household lived in an urban or rural area. The median distance to a supermarket, superstore, or large grocery store was 0.6 miles for urban households (Figure III.2) and about 4.0 miles for rural households (Figure III.3). For convenience stores, the median distances were 0.3 miles for urban households and 1.6 to 1.8 miles for rural households.

Figure III.2. Median Distance in Miles to Nearest SNAP Retailer for New-Entrant and Six-Month SNAP Households in Urban Areas, by Store Type



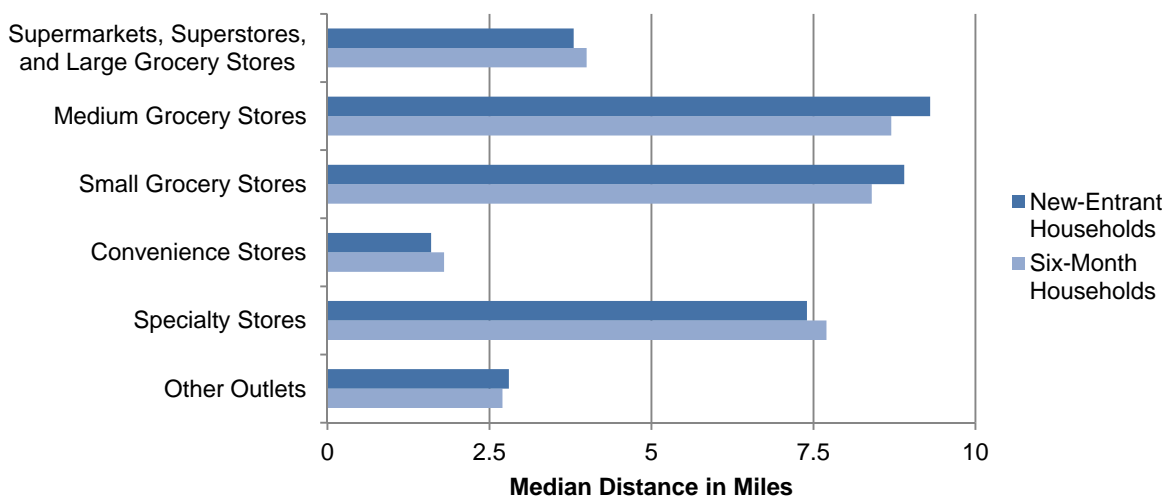
Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and 3,375 six-month households at baseline.

“Specialty food stores” comprise stores classified as selling one of the following specialized items: baked goods/bread, fruits/vegetables, meat/poultry products, or seafood products.

“Other outlets” comprise stores classified as a combination grocery/other store, delivery route, farmers’ market, nonprofit food buying cooperative, wholesaler, or meal service provider.

Figure III.3. Median Distance in Miles to Nearest SNAP Retailer for New-Entrant and Six-Month SNAP Households in Rural Areas, by Store Type



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and 3,375 six-month households at baseline.

“Specialty food stores” comprise stores classified as selling one of the following specialized items: baked goods/bread, fruits/vegetables, meat/poultry products, or seafood products.

“Other outlets” comprise stores classified as a combination grocery/other store, delivery route, farmers’ market, nonprofit food buying cooperative, wholesaler, or meal service provider.

Table III.1 presents the distribution of distances to the nearest supermarket, superstore, or large grocery store for all new-entrant and six-month households, and according to whether the household lives in an urban or rural area. A quarter of new-entrant and six-month SNAP households live within 0.4 miles of a store, and another quarter live at least 1.4 miles from a store. For new-entrant households, these distances are 0.3 and 1.0 miles in urban areas and 1.4 and 7.1 miles in rural areas. The distributions for six-month households are similar to those for new-entrant households.

Table III.1. Quartiles of Distribution of Distance (in Miles) to Nearest Supermarket, Superstore, or Large Grocery Store for New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location

	All Households		Households in Urban Areas		Households in Rural Areas	
	New-Entrant Households (Baseline)	Six-Month Households (Baseline)	New-Entrant Households (Baseline)	Six-Month Households (Baseline)	New-Entrant Households (Baseline)	Six-Month Households (Baseline)
25th Percentile	0.4	0.4	0.3	0.3	1.4	1.6
50th Percentile	0.7	0.7	0.6	0.6	3.8	4.0
75th Percentile	1.4	1.4	1.0	0.9	7.1	7.0

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and 3,375 six-month households at baseline.

2. How Many SNAP Retailers Are Located Where SNAP Households Live?

The previous section characterized geographic access to food using estimates of the distance from where SNAP participants live to the nearest SNAP retailer. In this section, we characterize food access using an alternative measure by counting the number of stores within selected distances of participants' homes. In urban areas, we use areas of "less than 0.5 miles," "0.5 to less than 1 miles," and "1 to 3 miles." In rural areas, we use areas of "less than 5 miles," "5 to less than 10 miles," and "10 to 20 miles."¹¹ We present the median number of stores in all figures and tables.

In urban areas, at least half of the new-entrant and six-month households had no supermarkets, superstores, or large grocery stores within 0.5 miles of where they live, one store from 0.5 miles to less than 1 mile, and four stores from 1 to 3 miles (Table III.2). Convenience stores were more common, with SNAP households having one store within 0.5 miles and three stores within 1 mile.

In rural areas, at least half of the new-entrant households had one supermarket, superstore, or large grocery store within 5 miles of where they live, two stores from 5 to less than 10 miles, and 11 stores from 10 to 20 miles (Table III.3). Six-month households generally have similar counts. As in urban areas, there are more convenience stores than supermarkets.

¹¹ These breakpoints are similar to those used in Ver Ploeg et al. (2012), with two exceptions. First, in rural areas, that study used "less than 10 miles", "10 to 20 miles" and "greater than 20 miles" as the three areas. Because 90 percent of rural households in that study were concentrated in the first area, we decided to make two smaller areas of "less than 5 miles" and "5 to less than 10 miles". Second, because we are presenting the number of stores in area, we defined a maximum distance on each area and chose 3 miles and 20 miles in urban and rural areas, respectively.

Table III.2. Median Number of SNAP Retailers Within Selected Distance from New-Entrant and Six-Month SNAP Households Living in Urban Areas, by Store Type

	New-Entrant Households (Baseline)	Six-Month Households (Baseline)
Supermarkets, Superstores, and Large Grocery Stores		
Less than 0.5 mile	0	0
0.5 to less than 1 mile	1	1
1 to 3 miles	4	4
Medium Grocery Stores		
Less than 0.5 mile	0	0
0.5 to less than 1 mile	0	0
1 to 3 miles	1	1
Small Grocery Stores		
Less than 0.5 mile	0	0
0.5 to less than 1 mile	1	1
1 to 3 miles	0	0
Convenience Stores		
Less than 0.5 mile	1	1
0.5 to less than 1 mile	3	3
1 to 3 miles	11	10
Specialty Stores		
Less than 0.5 mile	0	0
0.5 to less than 1 mile	0	0
1 to 3 miles	1	1
Other Outlets		
Less than 0.5 mile	1	1
0.5 to less than 1 mile	2	2
1 to 3 miles	6	6

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and 3,375 six-month households at baseline.

“Specialty food stores” comprise stores classified as selling one of the following specialized items: baked goods/bread, fruits/vegetables, meat/poultry products, or seafood products.

“Other outlets” comprise stores classified as a combination grocery/other store, delivery route, farmers’ market, nonprofit food buying cooperative, wholesaler, or meal service provider.

Table III.3. Median Number of SNAP Retailers Within Selected Distance from New-Entrant and Six-Month SNAP Households Living in Rural Areas, by Store Type

	New-Entrant Households (Baseline)	Six-Month Households (Baseline)
Supermarkets, Superstores, and Large Grocery Stores		
Less than 5 miles	1	1
5 to less than 10 miles	2	3
10 to 20 miles	11	11
Medium Grocery Stores		
Less than 5 miles	0	0
5 to less than 10 miles	0	0
10 to 20 miles	2	2
Small Grocery Stores		
Less than 5 miles	0	0
5 to less than 10 miles	3	2
10 to 20 miles	0	0
Convenience Stores		
Less than 5 miles	3	3
5 to less than 10 miles	8	8
10 to 20 miles	40	37
Specialty Stores		
Less than 5 miles	0	0
5 to less than 10 miles	1	1
10 to 20 miles	3	3
Other Outlets		
Less than 5 miles	2	2
5 to less than 10 miles	5	5
10 to 20 miles	23	22

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and 3,375 six-month households at baseline.

“Specialty food stores” comprise stores classified as selling one of the following specialized items: baked goods/bread, fruits/vegetables, meat/poultry products, or seafood products.

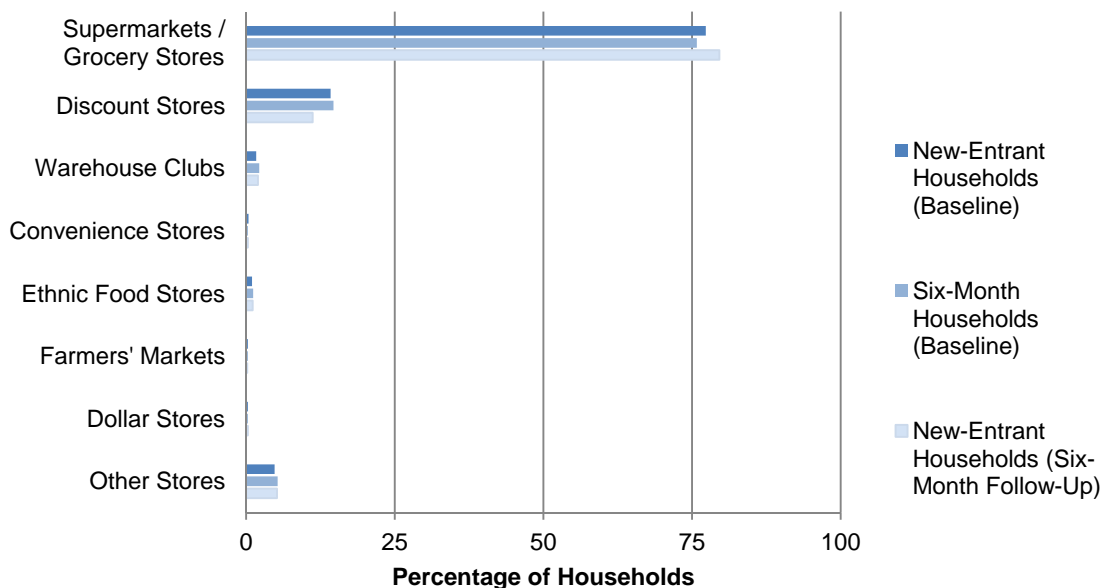
“Other outlets” comprise stores classified as a combination grocery/other store, delivery route, farmers’ market, nonprofit food buying cooperative, wholesaler, or meal service provider.

B. SNAP Households’ Food Purchase Behavior

1. At What Types of Stores Do SNAP Households Buy Most of Their Groceries?

About three-quarters of new-entrant and six-month households buy most of their groceries at supermarkets or grocery stores (Figure III.4). The next most popular store type was discount stores such as Walmart, Target, or Kmart, reported by 11 to 14 percent of households. Less than one percent of households (0.3 to 0.4 percent) purchase most of their groceries at convenience stores.

Figure III.4. Types of Stores at Which New-Entrant and Six-Month SNAP Households Buy Most of Their Groceries



Source: SNAP Food Security Survey 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and again at follow-up six months later, and 3,375 six-month households at baseline.

Urban households are more likely than rural households to purchase their groceries at a supermarket and less likely to shop at a discount store. This was true for new-entrant households and six-month households (Table III.4).

Table III.4. Food Shopping Preferences of New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location

	New-Entrant Households (Baseline)	Six-Month Households (Baseline)	New-Entrant Households (Six-Month Follow-Up)
Urban Households			
Purchase Most of Their Groceries at			
Supermarkets/grocery stores	78.7	77.6	81.4
Discount stores	13.4	12.8	9.7
Warehouse clubs	1.8	2.3	2.2
Convenience stores	0.4	0.4	0.3
Ethnic food stores	1.1	1.3	1.1
Farmers' markets	0.4	0.3	0.3
Dollar stores	0.3	0.3	0.3
Other stores	3.9	4.9	4.8
Rural Households			
Purchase Most of Their Groceries at			
Supermarkets/grocery stores	72.5	68.7	73.3
Discount stores	16.9	21.9	16.6
Warehouse clubs	1.4	1.7	1.1
Convenience stores	0.5	0.1	0.4
Ethnic food stores	0.6	0.6	1.3
Farmers' markets	0.1	0.1	0.1
Dollar stores	0.3	0.3	0.5
Other stores	7.7	6.7	6.7

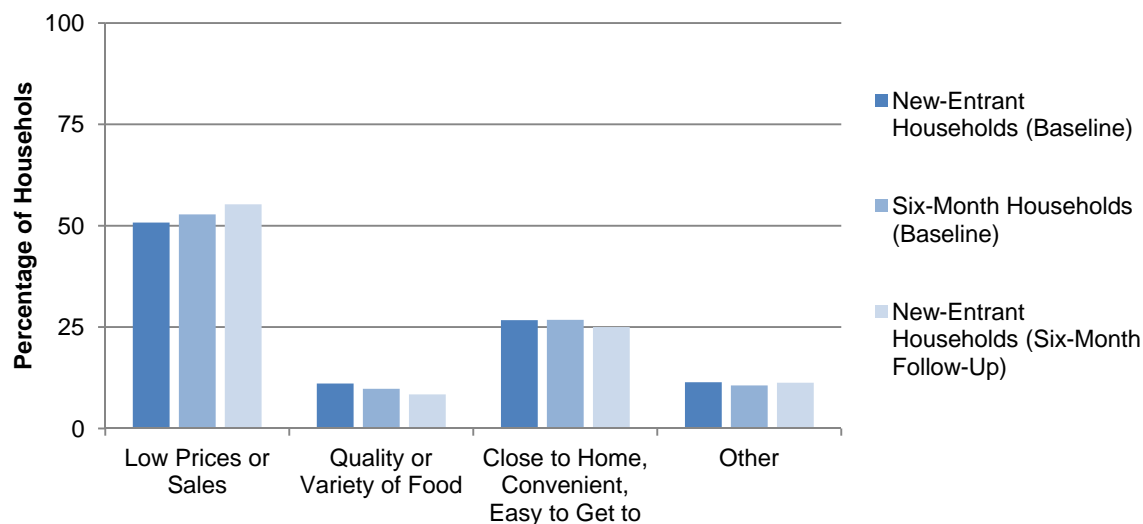
Source: SNAP Food Security Survey 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and again at follow-up six months later, and 3,375 six-month households at baseline.

2. Reasons Why SNAP Households Shop at a Preferred Store

More than half (51 to 55 percent) of new-entrant SNAP households shop at a specific type of food store because of low prices or sales (Figure III.5). About one-quarter shop at a store because it is close to home, convenient, or easy to get to. Eleven percent shop at a store because of the quality or variety of food.¹² Responses were generally similar between new-entrant and six-month households. They were also similar in urban and rural areas (not shown on figure).

¹² About 15 percent of households selected "other" as a reason.

Figure III.5. Reason for Shopping at Preferred Store, for New-Entrant and Six-Month SNAP Households

Source: SNAP Food Security Survey 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and again at follow-up six months later, and 3,375 six-month households at baseline.

3. What Type of Transportation Do SNAP Households Take to the Food Store?

Table III.5 presents typical modes of transportation to food stores for new-entrant and six-month SNAP households. About 56 percent of new-entrant SNAP households usually get to the food store by driving their own car (about 46 percent) or someone else's car (about 10 percent). Thirty-five percent are driven by someone else. In urban areas, 20 percent of households walk to the store, compared to 4 percent in rural areas. Responses were generally similar between new-entrant and six-month households.

Table III.5. Typical Mode of Transportation to Food Store for New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location

	New-Entrant Households (Baseline)	Six-Month Households (Baseline)	New-Entrant Households (Six-Month Follow-Up)
All Households			
Mode of Transportation			
Drive own car	45.7	47.3	47.0
Drive someone else's car	9.5	9.1	9.0
Someone else drives	35.0	36.8	36.3
Walk	16.0	14.3	15.8
Bus	10.1	10.2	9.8
Taxi	1.8	2.1	2.1
Ride bicycle	1.8	1.3	2.0
Other	1.6	2.0	1.5
Urban Households			
Mode of Transportation			
Drive own car	41.7	44.3	44.4
Drive someone else's car	9.4	8.9	8.9
Someone else drives	34.8	37.4	35.1
Walk	19.5	17.1	19.0
Bus	12.7	12.5	12.0
Taxi	2.2	2.4	2.5
Ride bicycle	2.2	1.5	2.5
Other	1.9	2.2	1.7
Rural Households			
Mode of Transportation			
Drive own car	59.2	58.7	56.4
Drive someone else's car	9.7	9.9	9.4
Someone else drives	35.6	34.2	40.6
Walk	4.0	3.7	4.6
Bus	1.3	1.7	1.9
Taxi	0.4	0.9	0.3
Ride bicycle	0.4	0.6	0.2
Other	0.7	1.0	0.7

Source: SNAP Food Security Survey 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and again at follow-up six months later, and 3,375 six-month households at baseline.

Percentages sum to more than 100 percent since multiple responses were allowed.

4. What Are the Typical Travel Time and Distance to the Food Store?

About 94 percent of new-entrant and six-month households reported shopping for food by leaving directly from their home. Among those households, the median self-reported travel time was 10 minutes for households in urban areas, with most households ranging from 5 to 15 minutes (these are the 25th and 75th percentiles of the distribution of travel time) (Table III.6). In rural areas, the median self-reported travel time was 15 minutes, with most households ranging from 10 to 25 minutes (25th and 75th percentiles).

Table III.6. Travel Time and Self-Reported Travel Distance of New-Entrant and Six-Month SNAP Households, by Urban Versus Rural Location

	All Households		Households in Urban Areas		Households in Rural Areas	
	New-Entrant Households (Baseline)	Six-Month Households (Baseline)	New-Entrant Households (Baseline)	Six-Month Households (Baseline)	New-Entrant Households (Baseline)	Six-Month Households (Baseline)
Travel Time (Minutes One Way from Home)						
25th Percentile	5	6	5	5	10	10
50th Percentile	10	10	10	10	15	15
75th Percentile	20	20	15	15	22	25
Travel Distance (Miles One Way from Home)						
25th Percentile	2	2	1	1	5	4
50th Percentile	4	4	3	3	10	10
75th Percentile	8	8	5	6	15	19

Source: SNAP Food Security Survey 2012.

Note: Descriptive tabulations are based on 3,275 new-entrant households observed at baseline and 3,375 six-month households at baseline.

The median self-reported distance to the store from which they buy most of their groceries was three miles for new-entrant and six-month households in urban areas (Table III.6). A quarter of households typically traveled at least one mile, and another quarter traveled at least five to six miles. In rural areas, the median self-reported distance was 10 miles for new-entrant households. A quarter of rural households typically traveled at least four to five miles, and another quarter traveled at least 15 to 19 miles.

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IV. ASSOCIATIONS BETWEEN GEOGRAPHIC FOOD ACCESS AND FOOD SECURITY

In this chapter, we present regression-adjusted percentages of household food insecurity, by SNAP households' geographic access to food. All tables present separate findings for three samples: (1) new-entrant households at the baseline interview, (2) six-month households at the baseline interview, and (3) new-entrant households at the six-month follow-up interview. All tables present separate estimates for urban and rural households. In addition, all tables restrict the sample of new-entrant households to those that continued to participate six months later, at the time of the follow-up interview.

A. Food Insecurity of SNAP Households, by Geographic Access to Food Measured Using Distance to Nearest Supermarket

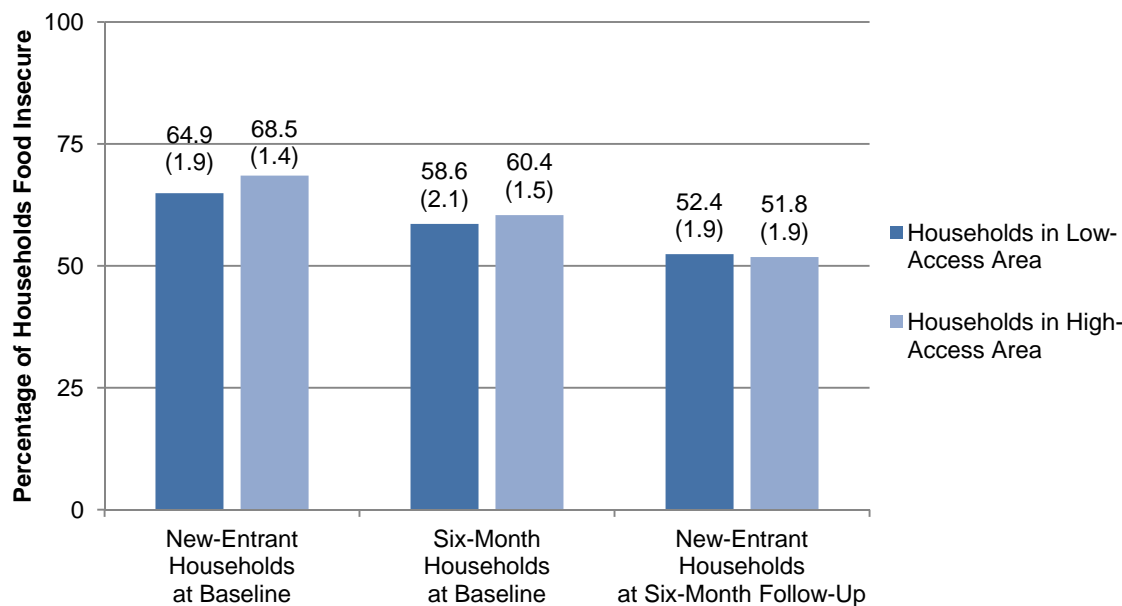
In this section, we present regression-adjusted percentages of households that were food insecure according to whether households have “high” or “low” levels of geographic access to food. As described in Chapter II, a household has a high level of access if it lives within the median distance to a supermarket and has a low level of access if it lives farther than the median distance to a supermarket.¹³ In urban areas, households living less than or equal to 0.6 miles (the median) from a supermarket are denoted as having high levels of access. Households living more than 0.6 miles from a supermarket are said to have low levels of access. Similarly, we denoted rural households as having a high level of access if they lived less than or equal to 3.9 miles from a supermarket. The percentages of households that are food insecure account for differences between households that have high access levels, compared to those that have low levels, in a set of observable household characteristics. Appendix A presents findings from a similar analysis based on very low food security.¹⁴

For households in urban areas, living in a high-access area, relative to living in a low-access area, was not associated with the percentage of households that were food insecure (Figure IV.1). The percentage of households that were food insecure was generally higher for households in high-access areas than in low-access areas, but the difference was not statistically significant for any sample.

¹³ For brevity, we use “supermarket” to refer to supermarket, superstore, or large grocery store.

¹⁴ Because access limitations may be an issue for a small proportion of households, characterizing access using the median distance to stores or the median number of stores in the area might underestimate the association between geographic access and food insecurity for those households with the poorest access. In Appendix D, we show that the findings from Chapter IV in which the median distance is used to define access are similar to the findings when measures of access are based on the 95th percentile distance.

Figure IV.1. Living in a High-Access Area Was Not Associated with the Percentage of Households in Urban Areas That Were Food Insecure (Where Access is Based on Distance to Stores)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

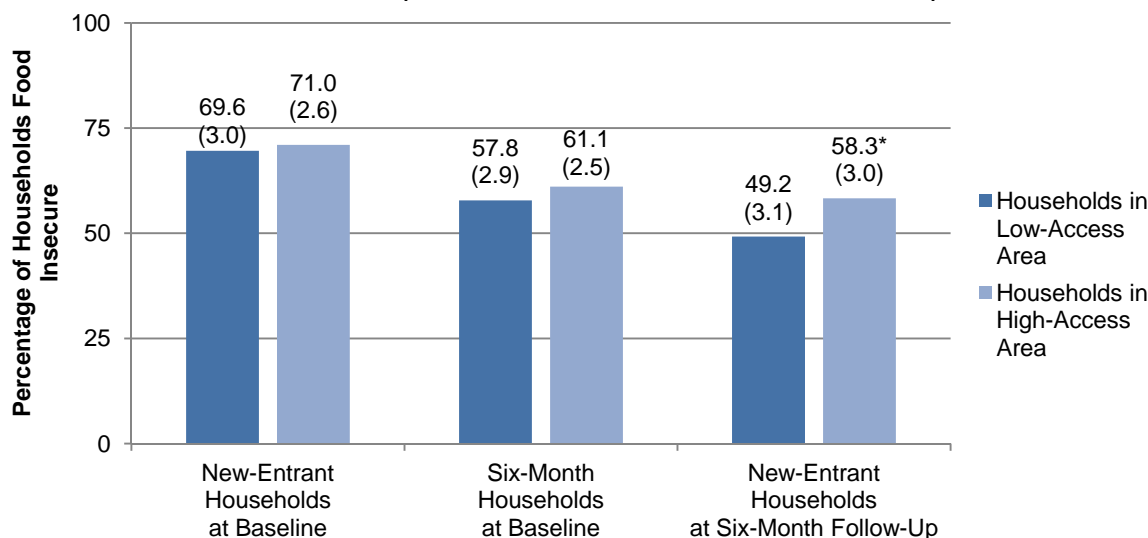
Estimates are based on 2,355 new-entrant households in urban areas observed at baseline and again at follow-up six months later, and 2,474 six-month households at baseline.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

^aHouseholds living within the median distance to the nearest supermarket (0.6 miles) are referred to as living in a high-access area. Households living farther than the median distance to the nearest supermarket are referred to as living in a low-access area.

For households in rural areas, living in a high-access area, relative to living in a low-access area, was, for the most part, not associated with the percentage of households that were food insecure (Figure IV.2). The exception was for new-entrant households at the six-month follow-up interview. For those households, the percentage that were food insecure was 9.2 percentage points higher for households that lived in a high-access area than for those that lived in a low-access area (58.3 and 49.2 percent, respectively).

For households in urban areas and households in rural areas, very low food security was not associated with whether a household lives in a high- or low-access area (Appendix A).

Figure IV.2. Living in a High-Access Area Was Generally Not Associated with the Percentage of Households in Rural Areas That Were Food Insecure (Where Access is Based on Distance to Stores)^a

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

Estimates are based on 700 new-entrant households in rural areas observed at baseline and again at follow-up six months later, and 692 six-month households at baseline.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

^aHouseholds living within the median distance to the nearest supermarket (3.9 miles) are referred to as living in a high-access area. Households living farther than the median distance to the nearest supermarket are referred to as living in a low-access area.

B. Food Insecurity of SNAP Households, by Geographic Access to Food Measured Using Number of Supermarkets in the Area

In this section, we present regression-adjusted percentages of households that were food insecure according to whether households have high or low geographic access to food. Instead of using the distance-based measure of food access from the previous section, we use a density-based measure of food access that is defined by the number of supermarkets in the area.

The percentages account for differences in a set of observable household characteristics between households that live in areas with high-access areas and households that live in low-access areas.¹⁵ We calculated the number of supermarkets in the area for each household and estimated the median number across households. High-access areas were defined as those with more than the median number of supermarkets, and low-access areas were defined as those with less than or equal to the median number of supermarkets. We counted the number of supermarkets within one mile in urban areas and within five miles in rural areas. In urban areas, the median was two supermarkets, so households that live in areas with more than two supermarkets are said to have high access to food

¹⁵ As in the previous section, for brevity, we use “supermarket” to refer to supermarket, superstore, or large grocery store.

and households that live in areas with, at most, two supermarkets are said to have low access to food. In rural areas, the median was one supermarket, so households that live in areas with more than one supermarket are said to have high access to food and households that live in areas with no supermarket or one supermarket are said to have low access to food.

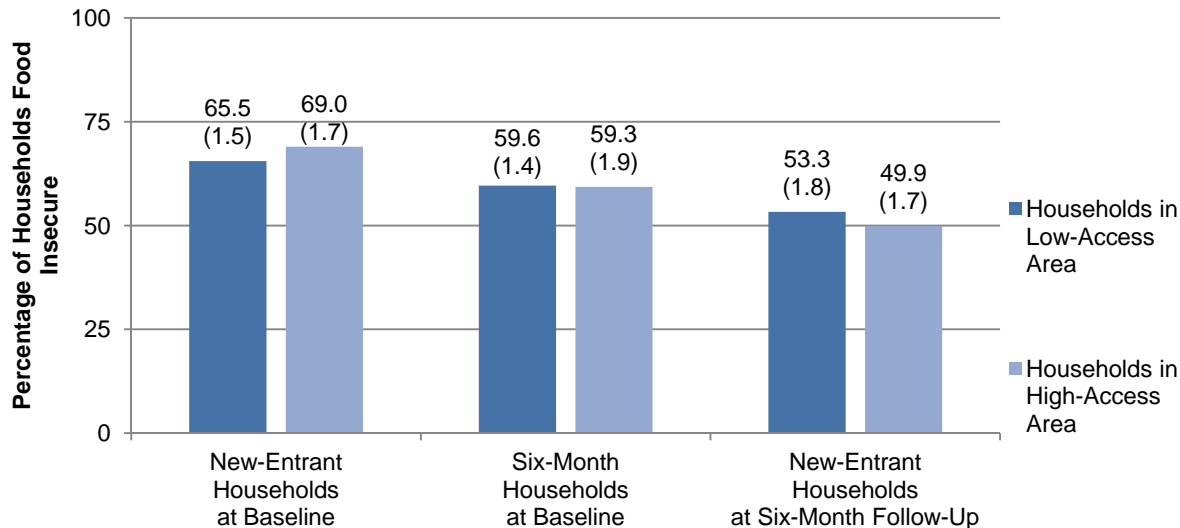
As an auxiliary analysis, we also examined areas that lack access to a supermarket compared to areas that have at least one supermarket. This is a more traditional question in the food access literature that focuses on having or not having access to food, compared to our first research question of the *level* of access.

Finally, in addition to using food insecurity in this chapter, we present findings from similar analyses based on very low food security in Appendix A.

1. Comparing Food Insecurity in High- Versus Low-Access Areas

For urban households, living in a high-access area was not associated with the percentage of households that were food insecure (Figure IV.3). Similarly, for both sets of six-month households that live in rural areas, there were no associations between food insecurity and living in a high-access area, relative to a low-access area (Figure IV.4). For new-entrant households in rural areas, however, the percentage of households that were food insecure was 7.2 percentage points higher for households living in a high-access area, compared to households in low-access areas (74.6 versus 67.4 percent).

Figure IV.3. Living in a High-Access Area Was Not Associated with the Percentage of Households in Urban Areas That Were Food Insecure (Where Access is Based on Number of Stores in Area)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

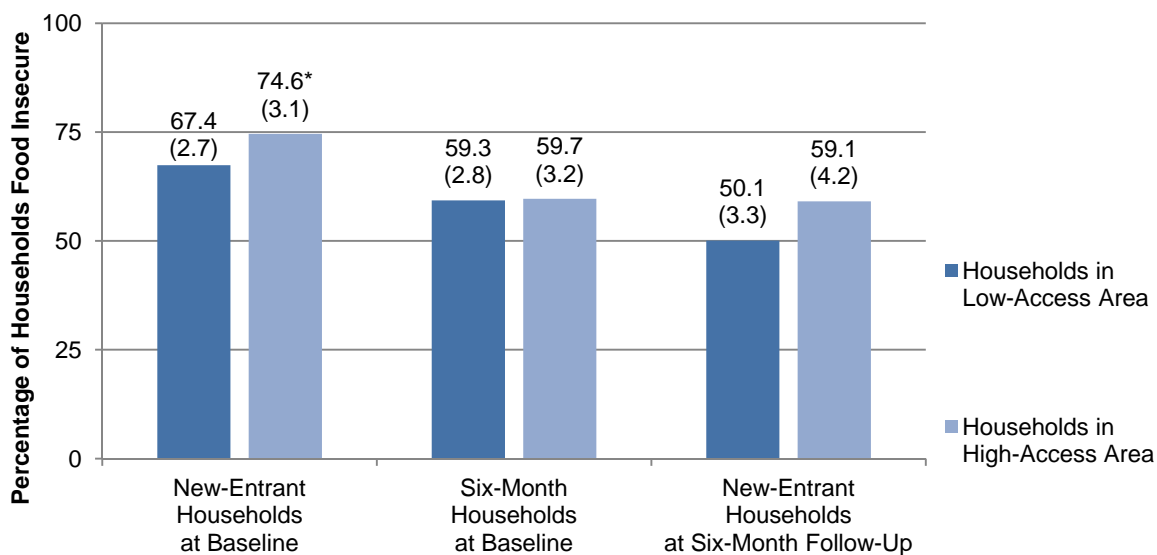
Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

Estimates are based on 2,355 new-entrant households in urban areas observed at baseline and again at follow-up six months later, and 2,474 six-month households at baseline.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

^aHouseholds living in an area with more than the median number of supermarkets (two stores) within one mile are referred to as living in a high-access area. Households living in an area with less than the median number of supermarkets are referred to as living in a low-access area.

Figure IV.4. Living in a High-Access Area Was Not Associated with the Percentage of Households in Rural Areas That Were Food Insecure (Where Access is Based on Number of Stores in Area)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

Estimates are based on 700 new-entrant households in rural areas observed at baseline and again at follow-up six months later, and 692 six-month households at baseline.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

^aHouseholds living in an area with more than the median number of supermarkets (one store) within five miles are referred to as living in a high-access area. Households living in an area with less than the median number of supermarkets are referred to as living in a low-access area.

For households in urban areas and households in rural areas, very low food security was not associated with whether a household lives in a high- or low-access area (Appendix A).

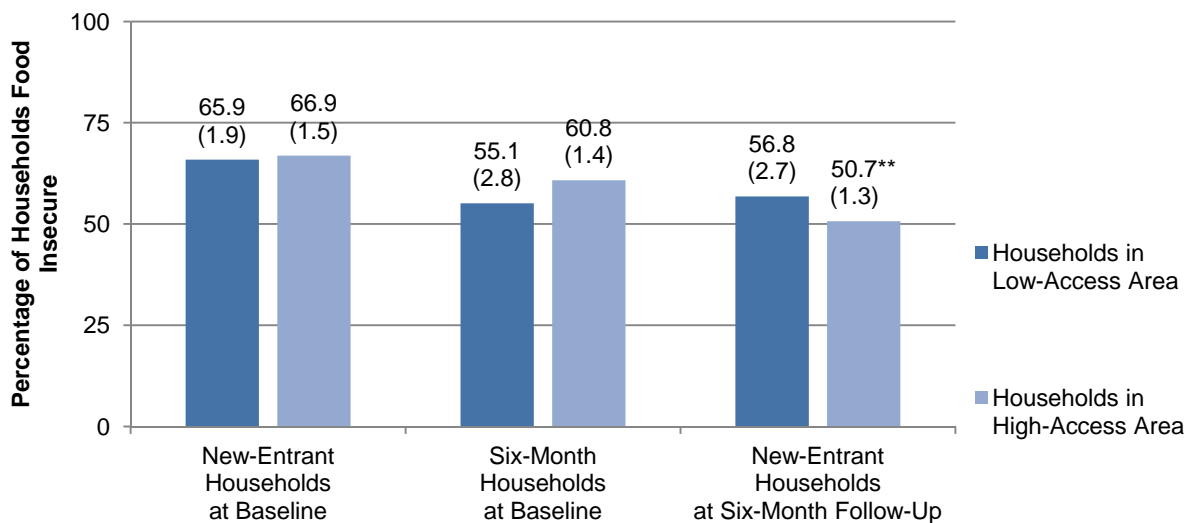
2. Comparing Food Insecurity in Areas With and Without a Supermarket

The previous section examined whether living in an area with high access to a supermarket, relative to low access, was associated with the percentage of households that were food insecure. In those analyses, whether an area was characterized as high or low access depended on whether the area had more than the median number of supermarkets (more than two in urban areas and more than one in rural areas) or less than or equal to the median number (two or fewer in urban areas and one or fewer in rural areas). Some analyses of food access (for example, ERS 2009; Mabli, Jones, et al. 2013) compare outcomes in areas with no access at all (zero supermarkets) to those in areas with at least some access (at least one supermarket). In this section, we replicate those analyses by comparing food insecurity in areas with and without a supermarket.

The findings were mixed for urban households. Food insecurity was not associated with food access for new-entrant households and six-month households at baseline (Figure IV.5). For new-entrant households interviewed six months after entering the program, however, living in a high-access area was associated with lower food insecurity. The percentage of households that were food

insecure was 6.1 percentage points lower for households in areas with a supermarket than in areas without one. There were no associations for any sample in the analysis of rural households (Figure IV.6).

Figure IV.5. Living in a High-Access Area Was Generally Not Associated with the Percentage of Households in Urban Areas That Were Food Insecure (Where Access is Based on Whether There Is a Supermarket in the Area)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

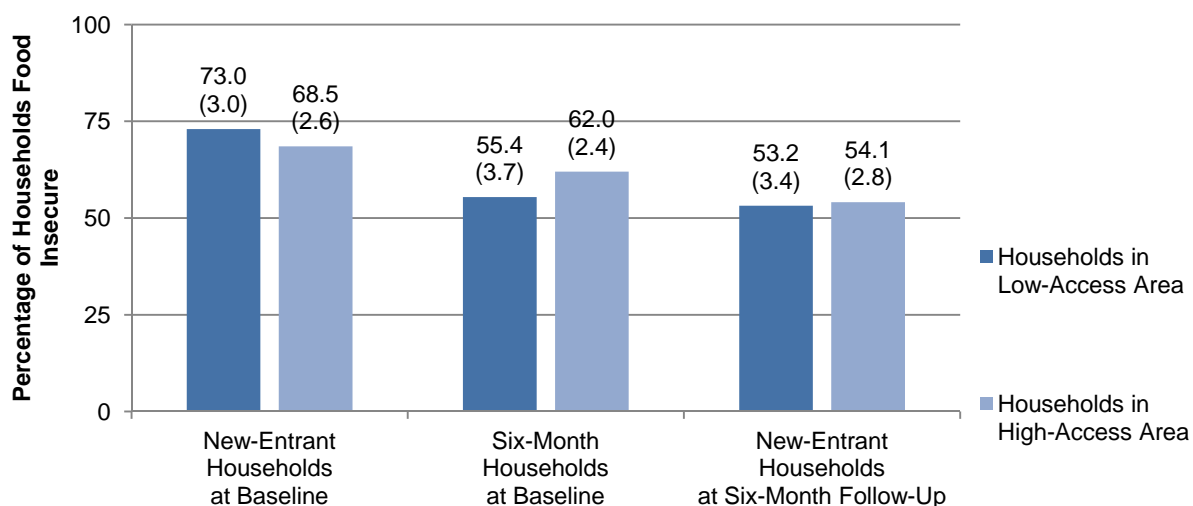
Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

Estimates are based on 2,355 new-entrant households in urban areas observed at baseline and again at follow-up six months later, and 2,474 six-month households at baseline.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

^aHouseholds living in an area with at least one supermarket within one mile of the household's address areas are referred to as living in a high-access area. Households living in an area with no supermarkets are referred to as living in a low-access area.

Figure IV.6. Living in a High-Access Area Was Generally Not Associated with the Percentage of Households in Rural Areas That Were Food Insecure (Where Access is Based on Whether There Is a Supermarket in the Area)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

Estimates are based on 700 new-entrant households in rural areas observed at baseline and again at follow-up six months later, and 692 six-month households at baseline.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

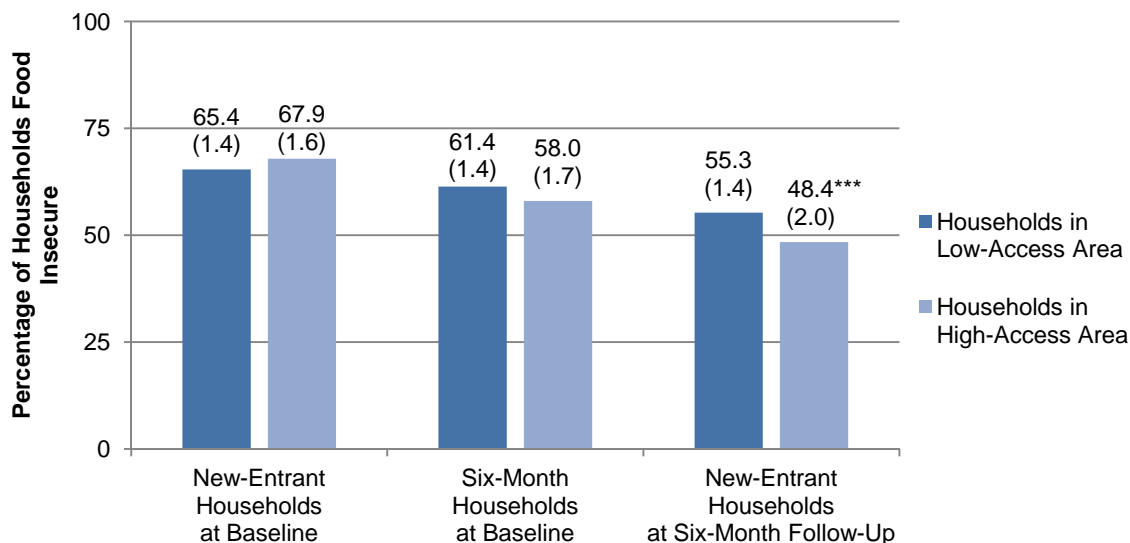
^aHouseholds living in an area with at least one supermarket within five miles of the household's address areas are referred to as living in a high-access area. Households living in an area with no supermarkets are referred to as living in a low-access area

C. Food Insecurity of SNAP Households by Geographic Access to Food Measured Using Self-Reported Distance to Store at Which Most Food is Purchased

The previous three sections used measures of “potential” access to food in that food access was measured using the household’s address and the addresses of the stores in the area. In contrast, this section uses a measure of “realized” access to food based on respondents’ self-reported travel distance to the store at which it purchases most of its food. We present regression-adjusted percentages of households that were food insecure according to whether households have high or low levels of geographic access to food. As described in Chapter II, a household has a high level of access if it reports traveling less than the median distance to the store at which it purchases most of its food, and has a low level of access if it travels farther than the median distance to the store. In urban areas, households that reported traveling less than or equal to 3 miles (the median) to the store at which it purchases most of its food are denoted as having high levels of access. Households traveling more than 3 miles to the store are said to have low levels of access. Similarly, we denote rural households traveling less than or equal to 10 miles as having high levels of access and more than 10 miles as low levels of access. The percentages of households that are food insecure account for differences between households that have high access levels, compared to those have low levels, in a set of observable household characteristics.

For households in urban areas, self-reported travel distance was not associated with the percentage of households that were food insecure (Figure IV.7). The same was true for households in rural areas (Figure IV.8).

Figure IV.7. Living in a High-Access Area Was Not Associated with the Percentage of Households in Urban Areas That Were Food Insecure^a



Sources: SNAP Food Security Survey 2012. Store Tracking and Redemption System 2012.

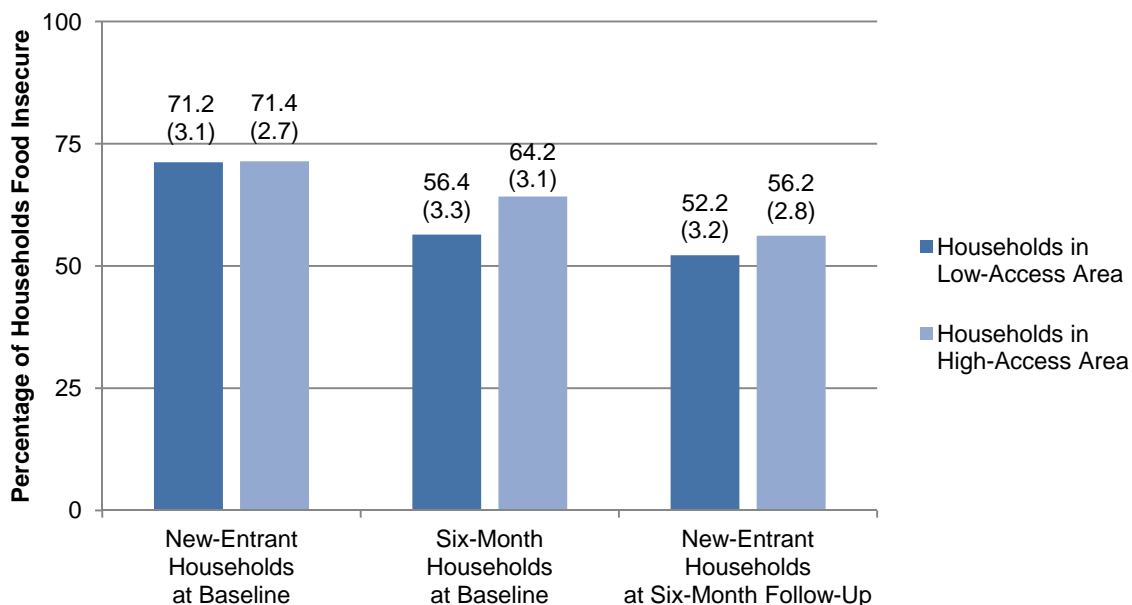
Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

Estimates are based on 2,355 new-entrant households in urban areas observed at baseline and again at follow-up six months later, and 2,474 six-month households at baseline.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

^aHouseholds that reported traveling less than or equal to three miles (the median) to the store from which they purchase most of their food are denoted as living in a high-access area, compared to households traveling more than three miles, which live in a low-access area.

Figure IV.8. Living in a High-Access Area Was Not Associated with the Percentage of Households in Rural Areas That Were Food Insecure^a



Sources: SNAP Food Security Survey 2012. Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

Estimates are based on 700 new-entrant households in rural areas observed at baseline and again at follow-up six months later, and 692 six-month households at baseline.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

^aHouseholds that reported traveling less than or equal to 10 miles (the median) to the store from which they purchase most of their food are denoted as living in a high-access area, compared to households traveling more than 10 miles, which live in a low-access area.

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V. SNAP AND FOOD INSECURITY, BY GEOGRAPHIC ACCESS TO FOOD

This chapter describes the estimates of the associations between SNAP and household food insecurity, by SNAP households' geographic access to food. We also examine whether statistical differences exist in the associations between high- and low-access levels. Because the associations are based on comparing outcomes of new-entrant and six-month households, the findings in this chapter are presented by cross-sectional and longitudinal analyses, and are identical to the layout of the figures in Mabli, Ohls, et al. (2013). All analyses restrict the sample of new-entrant households to those that continued to participate six months later, at the time of the follow-up interview.

A. Associations Between SNAP and Household Food Insecurity, by Geographic Access to Food Measured Using Distance to Nearest Supermarket

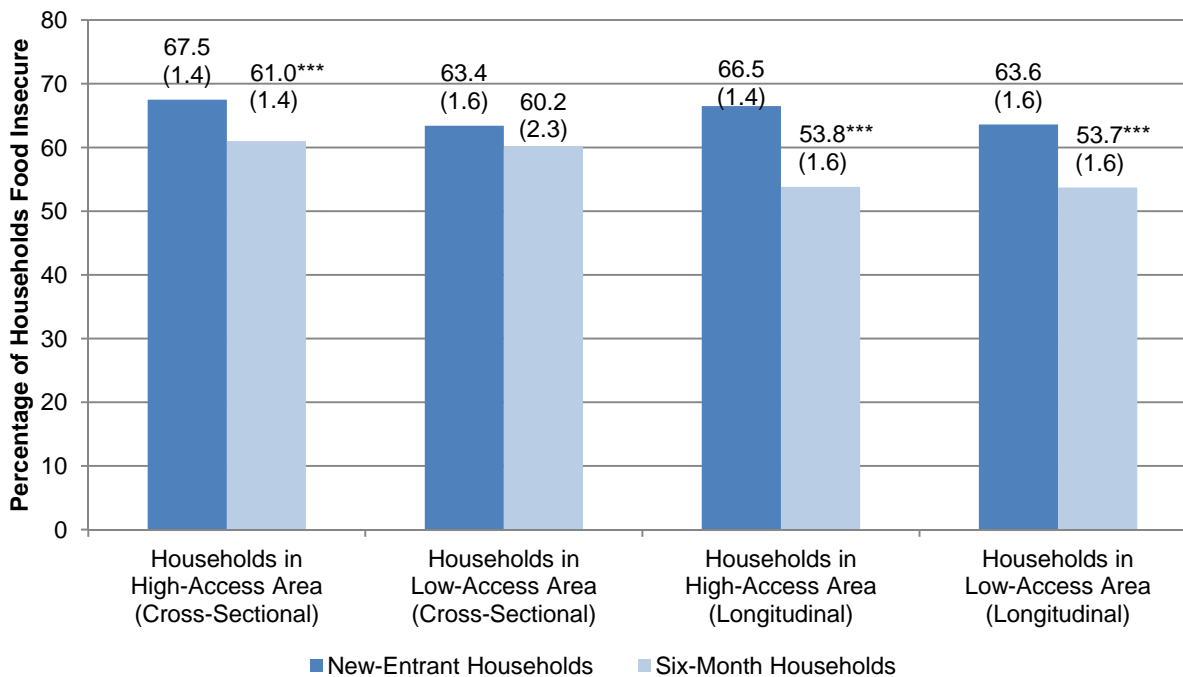
In this section, we present regression-adjusted percentages of new-entrant and six-month households that were food insecure according to whether households live in a high- or low-access area. As described in Chapters II and IV, a household lives in a high-access area if it lives within the median distance to a supermarket and in a low-access area if it lives farther than the median distance to a supermarket.¹⁶ The medians are 0.6 miles in urban areas and 3.9 miles in rural areas.¹⁷ The percentages of households that are food insecure account for differences between new-entrant and six-month SNAP households in a set of observable household characteristics.

For urban households, participating in SNAP for about six months was associated with a decrease in the percentage of households that were food insecure (Figure V.1). This was true both in high- and low-access areas in the longitudinal sample and only in high-access areas in the cross-sectional sample. The magnitudes of the reductions for households that live in high-access areas were not statistically different from those for households that live in low-access areas. The reductions ranged from -3.3 percentage points for urban households in low-access areas in the cross-sectional sample to -12.7 percentage points for urban households in high-access areas in the longitudinal sample.

¹⁶ For brevity, we use “supermarket” to refer to supermarket, superstore, or large grocery store.

¹⁷ In urban areas, households living less than or equal to 0.6 miles (the median) from a supermarket are denoted as having “high” levels of access. Households living at least 0.6 miles from a supermarket are said to have “low” levels of access. Similarly, we denote rural households living close to a supermarket if they live less than or equal to 3.9 miles from the store.

Figure V.1. Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Urban Areas That Were Food Insecure, for Households with High and Low Access to Food (Where Access Is Based on Distance to Stores)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

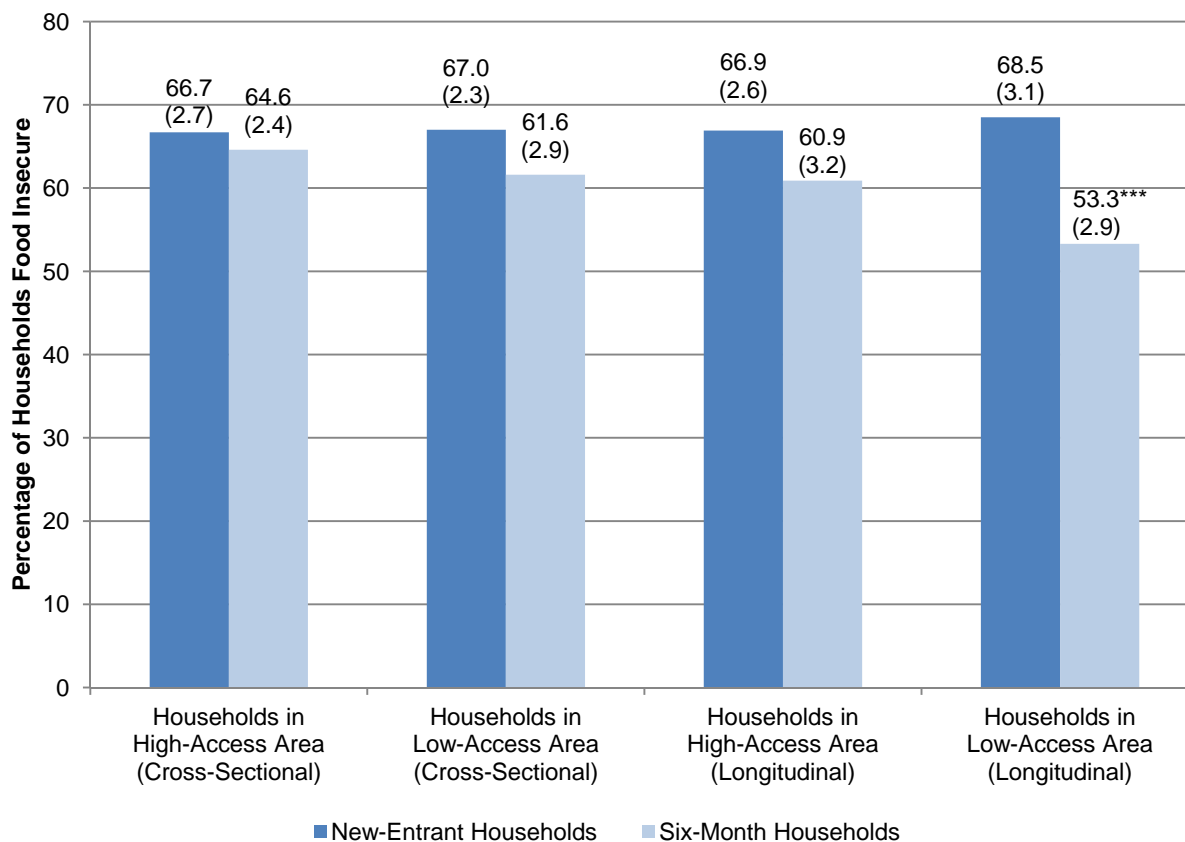
For SNAP households in high-access areas, the cross-sectional estimates compare the sample of 1,142 new-entrant households to the sample of 1,213 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 1,213 and 1,261 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 1,156 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 1,199 households.

^aHouseholds living within the median distance to the nearest supermarket (0.6 miles) are referred to as living in a high-access area. Households living farther than the median distance to the nearest supermarket are referred to as living in a low-access area.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

For rural households, participating in SNAP for about six months generally was not associated with the percentage of households that were food insecure (Figure V.2). The exception was for households living in low-access areas in the longitudinal sample (a 15.2 percentage point reduction).

Figure V.2. Participating in SNAP for Six Months Generally Was Not Associated with a Decrease in the Percentage of Households in Rural Areas That Were Food Insecure, for Households with High and Low Access to Food (Where Access Is Based on Distance to Stores)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For SNAP households in high-access areas, the cross-sectional estimates compare the sample of 353 new-entrant households to the sample of 341 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 347 and 351 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 351 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 349 households.

^aHouseholds living within the median distance to the nearest supermarket (3.9 miles) are referred to as living in a high-access area. Households living farther than the median distance to the nearest supermarket are referred to as living in a low-access area.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

The findings for very low food security were similar to those for food insecurity (Appendix A).

B. Associations Between SNAP and Household Food Insecurity, by Geographic Access to Food Measured Using Number of Supermarkets in the Area

In this section, we present regression-adjusted percentages of new-entrant and six-month households that were food insecure according to whether households live in a high- or low-access area. Instead of the distance-based measure of food access from the previous section, we use a

density-based measure of food access that is defined by the number of supermarkets in the area. As described in Chapters II and IV, high-access areas were defined as those with more than the median number of supermarkets, and low-access areas were defined as those with less than or equal to the median number of supermarkets. We counted the number of supermarkets within one mile in urban areas and within five miles in rural areas. In urban areas, the median was two supermarkets, so households that live in areas with more than two supermarkets are said to have high access to food, and households that live in areas with, at most, two supermarkets are said to have low access to food. In rural areas, the median was one supermarket, so households that live in areas with more than one supermarket are said to have high access to food, and households that live in areas with no supermarkets or one supermarket are said to have low access to food.

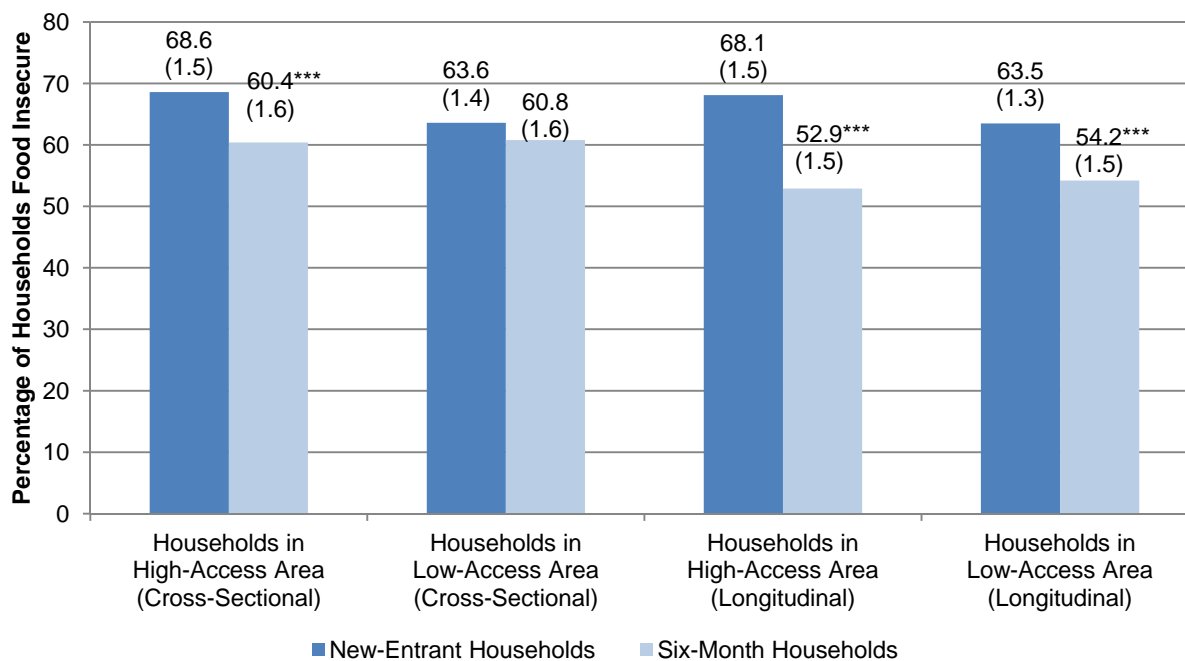
As an auxiliary analysis, we also examined areas that lack access to a supermarket compared to areas that have at least one supermarket. This is a more traditional question in the food access literature that focuses on having or not having access to food, compared to our first research question of the *level* of access.

Finally, in addition to using food insecurity in this chapter, we present findings from similar analyses based on very low food security in Appendix A.

1. SNAP and Food Insecurity in High- Versus Low-Access Areas

For urban households, participating in SNAP for six months was associated with a decrease in the percentage of households that were food insecure (Figure V.3). This was true both in high- and low-access areas in the longitudinal sample and only in high-access areas in the cross-sectional sample. In the cross-sectional sample, the reduction was -8.2 percentage points for households in high-access areas, compared to -2.8 percentage points for households in low-access areas. In the longitudinal sample, the reductions were -15.2 and -9.2 percentage points, respectively. The magnitudes of the reductions for households that live in high-access areas were statistically greater than those for households that live in low-access areas.

Figure V.3. Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Urban Areas That Were Food Insecure, for Households with High and Low Access to Food (Where Access Is Based on Number of Stores in Area)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For SNAP households in high-access areas, the cross-sectional estimates compare the sample of 781 new-entrant households to the sample of 830 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 1,574 and 1,644 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 781 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 1,574 households.

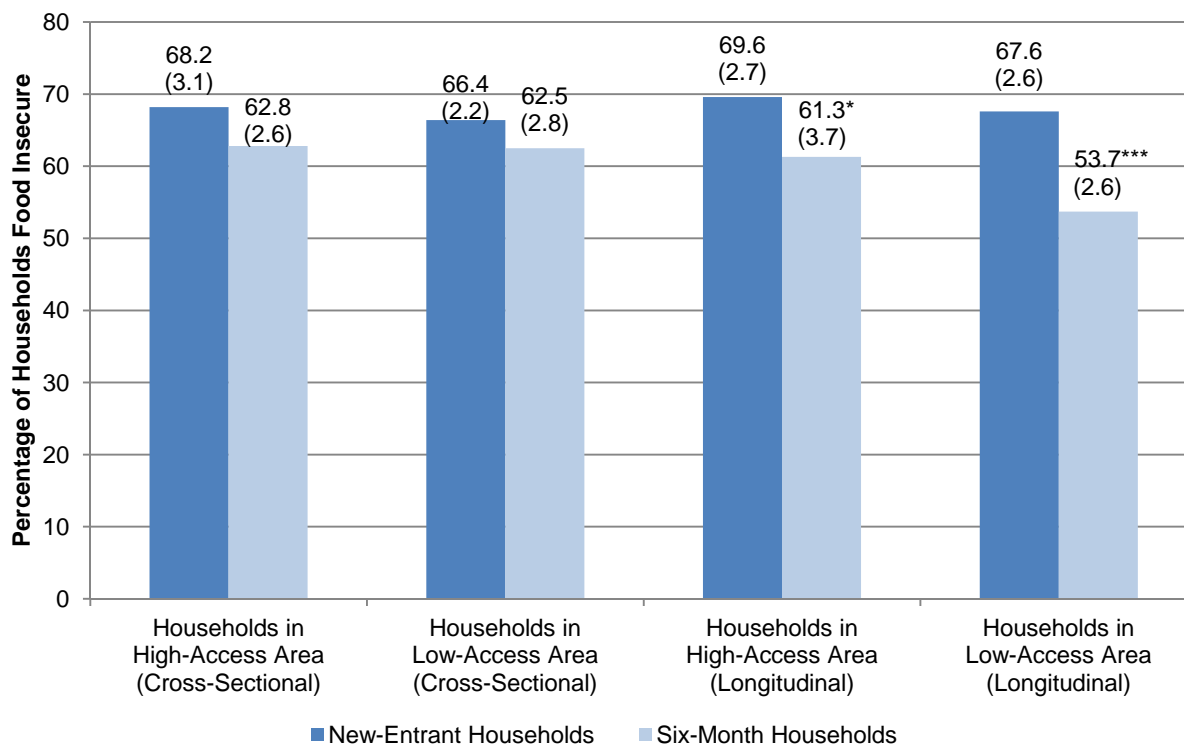
The associations for households in high-access areas were significantly different from the associations for households in low-access areas at the 0.10 level in the cross-sectional sample and the 0.05 level in the longitudinal sample.

^aHouseholds living in an area with more than the median number of supermarkets (two stores) within one mile are referred to as living in a high-access area. Households living in an area with less than the median number of supermarkets are referred to as living in a low-access area.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

For rural households, participating in SNAP for six months was associated with a decrease in the percentage of households that were food insecure in the longitudinal sample only (Figure V.4). The reductions were -8.3 percentage points in high-access areas and -13.8 percentage points in low-access areas. The reductions were not statistically different from one another.

Figure V.4. Evidence Was Mixed as to Whether Participating in SNAP for Six Months Was Associated with a Decrease in the Percentage of Households in Rural Areas That Were Food Insecure, for Households with High and Low Access to Food (Where Access Is Based on Number of Stores in Area)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For SNAP households in high-access areas, the cross-sectional estimates compare the sample of 271 new-entrant households to the sample of 277 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 429 and 415 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 271 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 429 households.

^aHouseholds living in an area with more than the median number of supermarkets (one store) within five miles are referred to as living in a high-access area. Households living in an area with less than the median number of supermarkets are referred to as living in a low-access area.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

The findings for very low food security were similar to those for food insecurity. In urban areas, SNAP was associated with a decrease in very low food security in both high- and low-access areas (Appendix A). Although each reduction was statistically significant, they did not differ statistically across access areas. In rural areas, SNAP was generally not associated with a change in very low food security.

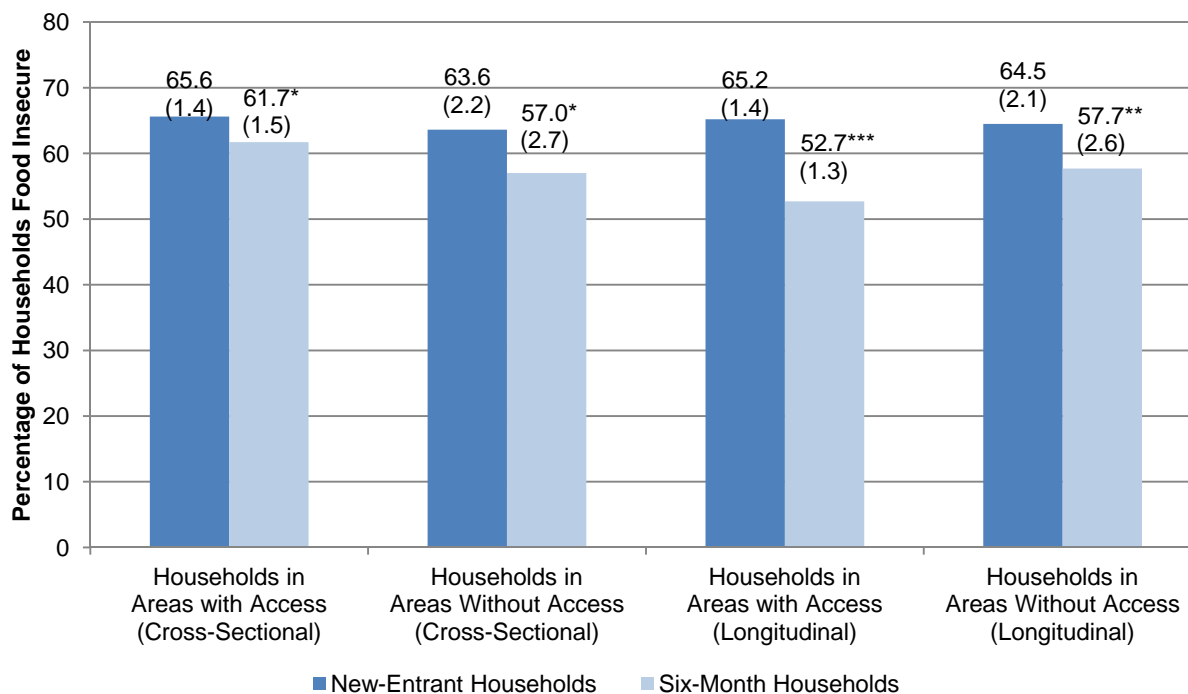
2. SNAP and Food Insecurity in Areas with and Without Access to Food

The previous section examined whether the effect of SNAP on food insecurity differed for households living in an area with a high level of access to a supermarket, relative to a low level. In those analyses, whether an area was characterized as high or low access depended on whether the

area had more than the median number of supermarkets (more than two in urban areas and more than one in rural areas) or less than or equal to the median number (two or fewer in urban areas and one or fewer in rural areas). Some analyses of food access (for example, Economic Research Service 2013; Mabli, Jones, et al. 2013) compare outcomes in areas with no access at all (zero supermarkets) to those in areas with at least some access (at least one supermarket). In this section, we replicate those analyses by comparing the reduction in food insecurity associated with SNAP in areas with and without a supermarket.

For urban households, participating in SNAP for six months was associated with a decrease in the percentage of households that were food insecure both in areas with access and areas without access (Figure V.5). The reduction were statistically greater in areas with access (-12.5 percentage points) than in areas without access (-6.8 percentage points) in the longitudinal sample. The reductions did not statistically differ across access areas in the cross-sectional sample.

Figure V.5. Participating in SNAP for Six Months Was Associated with a Decrease in the Percentage of Households in Urban Areas That Were Food Insecure, for Households in Areas with and Without Access to Food (Where Access Is Based on Whether There Is a Supermarket in the Area)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For SNAP households in high-access areas, the cross-sectional estimates compare the sample of 1,780 new-entrant households to the sample of 1,878 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 575 and 596 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 1,780 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 575 households.

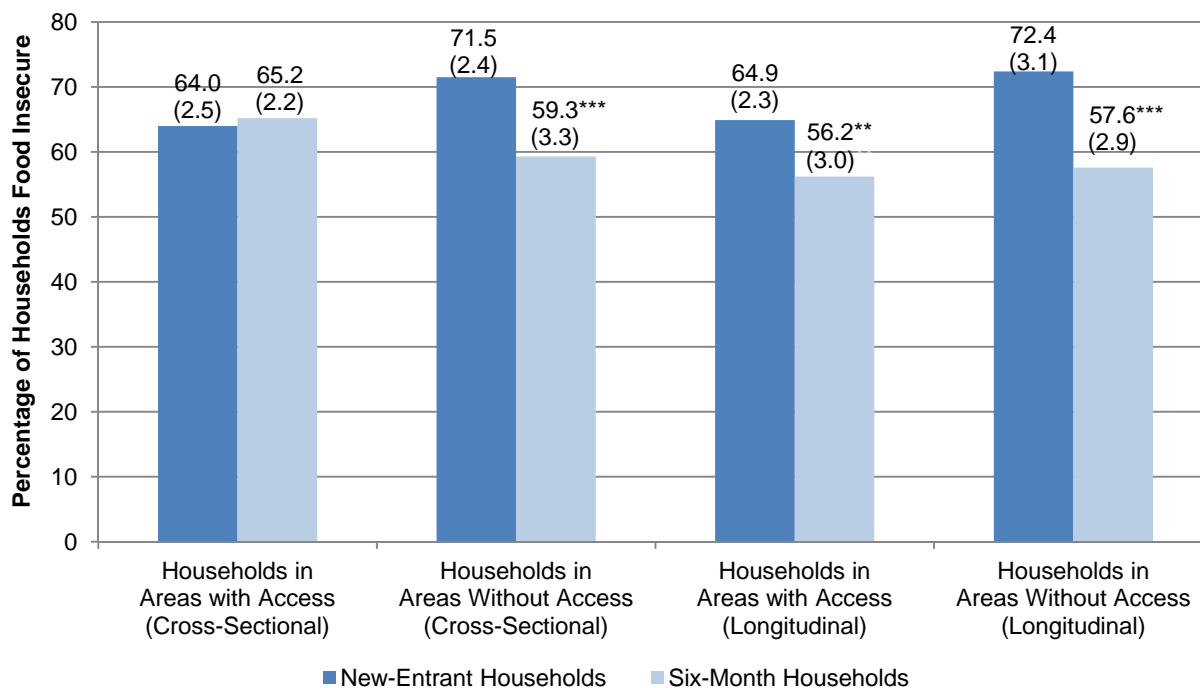
The association for households in high-access areas was significantly different from the association for households in low-access areas at the 0.10 level in the longitudinal sample.

^aHouseholds living in an area with at least one supermarket within one mile of the household's address areas are referred to as living in a high-access area. Households living in an area with no supermarkets are referred to as living in a low-access area

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

The opposite was true in rural areas. SNAP was associated with larger reductions in food insecurity in areas without access than in areas with access. In the longitudinal sample, the reductions were 14.8 percentage points in areas without a supermarket, compared to 8.6 percentage points in areas with at least one supermarket (Figure V.6). In the cross-sectional sample, there was a reduction in food insecurity only in areas without access.

Figure V.6. Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Rural Areas That Were Food Insecure, for Households in Areas with and Without Access to Food (Where Access Is Based on Whether There Is a Supermarket in the Area)^a



Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For SNAP households in high-access areas, the cross-sectional estimates compare the sample of 429 new-entrant households to the sample of 425 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 271 and 267 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 429 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 271 households.

The association for households in high-access areas was significantly different from the association for households in low-access areas at the 0.05 level in the cross-sectional sample.

^aHouseholds living in an area with at least one supermarket within five miles of the household's address areas are referred to as living in a high-access area. Households living in an area with no supermarkets are referred to as living in a low-access area

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

SNAP was generally associated with a reduction in very low food security in areas with and without access in urban areas, but not in rural areas (Appendix A).

C. Associations Between SNAP and Household Food Insecurity, by Geographic Access to Food Measured Using Self-Reported Distance to Store at Which Most Food is Purchased

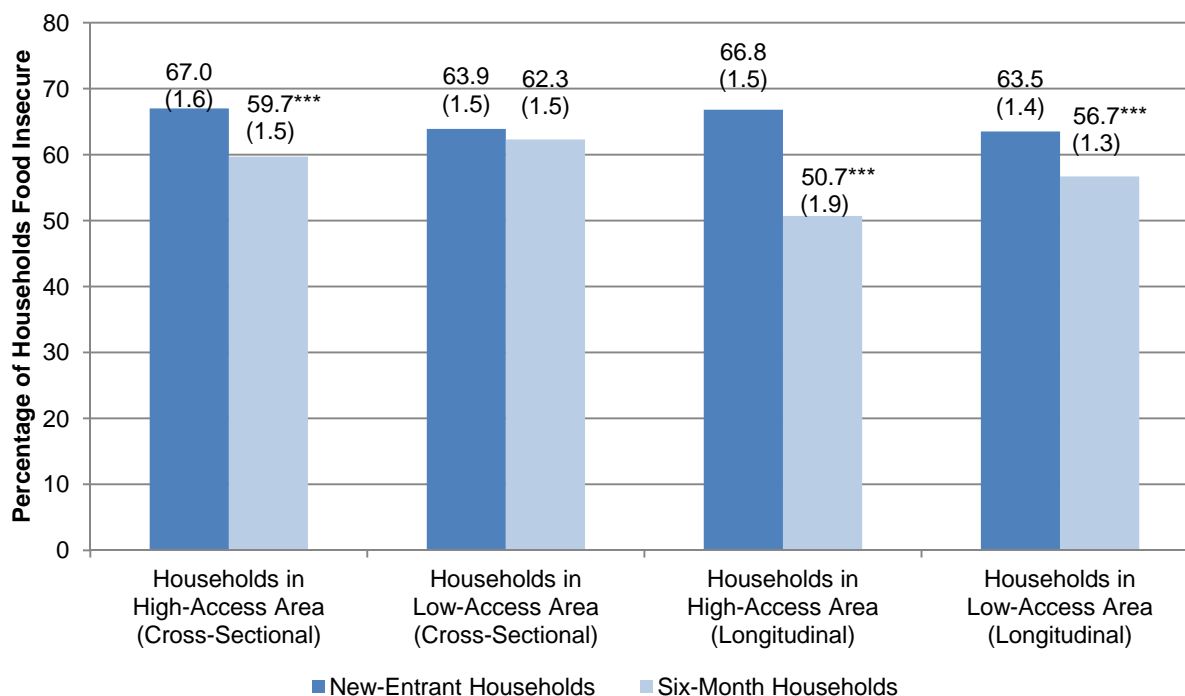
The previous three sections used measures of “potential” access to food in that food access was measured using the household's address and the addresses of the stores in the area. In contrast, this

section uses a measure of “realized” access to food based on respondents’ self-reported travel distance to the store at which it purchased most of its food.

We present regression-adjusted percentages of new-entrant and six-month households that were food insecure according to whether households live in a high- or low-access area. As described in Chapter II, a household has a high level of access if it reports traveling less than the median distance to the store at which it purchases most of its food, and has a low level of access if it travels farther than the median distance to the store. In urban areas, households that reported traveling less than or equal to 3 miles (the median) to the store at which it purchases most of its food are said to have high levels of access. Households traveling more than 3 miles to the store are said to have low levels of access. Similarly, we denote rural households traveling less than or equal to 10 miles as having high levels of access and more than 10 miles as low levels of access. The percentages of households that are food insecure account for differences between households that have high access levels, compared to those have low levels, in a set of observable household characteristics. We present findings from a similar analysis based on very low food security in Appendix A.

For households in urban areas, participating in participating in SNAP for about six months was associated with a decrease in the percentage of households that were food insecure (Figure V.7). This was true both in high- and low-access areas in the longitudinal sample and only in high-access areas in the cross-sectional sample. The magnitudes of the reductions for households that live in high-access areas were larger than the reductions for households that live in low-access areas in both the cross-sectional and longitudinal samples. The reductions ranged from 6.8 percentage points for urban households in low-access areas to 16.1 percentage points for urban households in high-access areas in the longitudinal sample.

Figure V.7. Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Urban Areas That Were Food Insecure, for Households with High- and Low-Access to Food (Where Access is Based on Self-Reported Travel Distance to Store at Which Most of Food is Purchased)^a



Source: SNAP Food Security Survey 2012. Store Traffic and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For SNAP households in high-access areas, the cross-sectional estimates compare the sample of 921 new-entrant households to the sample of 977 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 1,191 and 1,227 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 921 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 1,191 households.

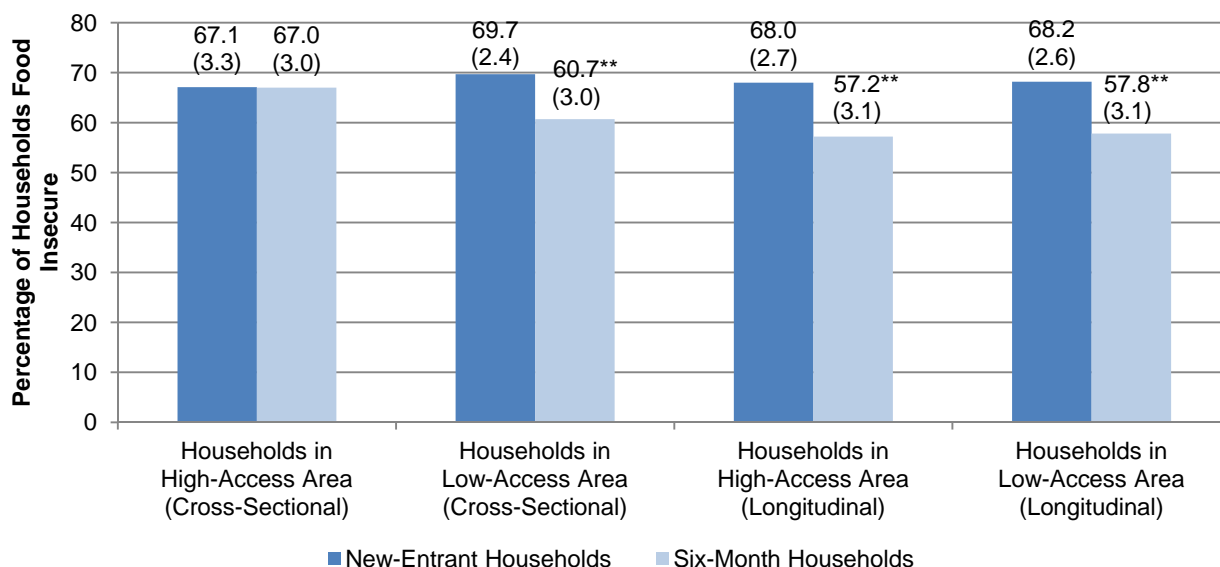
The associations for households in high-access areas were significantly different from the associations for households in low-access areas at the 0.10 level in the cross-sectional sample and the 0.01 level in the longitudinal sample.

^aHouseholds that reported traveling less than or equal to three miles (the median) to the store from which they purchase most of their food are denoted as living in a high-access area, compared to households traveling more than three miles, which live in a low-access area.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

For rural households, participating in SNAP for about six months generally was associated with a decrease in the percentage of households that were food insecure (Figure V.8). The magnitudes of the reductions for households in high-access areas were not statistically different from the reductions for households in low-access areas.

Figure V.8. Participating in SNAP for Six Months Generally Was Associated with a Decrease in the Percentage of Households in Rural Areas That Were Food Insecure, for Households with High- and Low-Access to Food (Where Access is Based on Self-Reported Travel Distance to Store at Which Most of Food is Purchased)^a



Source: SNAP Food Security Survey 2012. Store Traffic and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For SNAP households in high-access areas, the cross-sectional estimates compare the sample of 326 new-entrant households to the sample of 306 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 341 and 353 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 326 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 341 households.

^aHouseholds that reported traveling less than or equal to 10 miles (the median) to the store from which they purchase most of their food are denoted as living in a high-access area, compared to households traveling more than 10 miles, which live in a low-access area.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 level, respectively.

VI. CONCLUSIONS AND IMPLICATIONS FOR FUTURE RESEARCH

This chapter reviews the study objectives and the main findings. It also compares these findings to those of related studies of urban and rural food security. It then describes ideas for future research.

A. Research Objectives and Key Findings

The main research objectives of the study were to characterize the retail food environment for new-entrant and six-month SNAP households and describe households' food purchase behavior; to examine whether the prevalence of food insecurity differs according to households' geographic access to food; and to assess whether the association between SNAP and food insecurity differs by households' geographic access to food. The following are the study's key findings.

1. Retail Food Environment for SNAP Households

- At least half of new-entrant and six-month SNAP households lived within 0.7 miles of a supermarket.¹⁸ The median distance to a supermarket was 0.6 miles for urban households and about 4.0 miles for rural households.
- In urban areas, new-entrant and six-month households had, on average, no supermarkets within 0.5 miles of where they live and one supermarket from 0.5 miles to less than 1 mile. In rural areas, new-entrant households had, on average, one supermarket within 5 miles of where they live and two supermarkets from 5 miles to less than 10 miles. Six-month households generally had similar counts.

2. SNAP Households' Food Purchase Behavior

- About three-quarters of new-entrant and six-month households reported buying most of their groceries at supermarkets or grocery stores.¹⁹ The next most popular store type was discount stores such as Walmart, Target, or Kmart, reported by 11 to 14 percent of households. Less than one percent of households purchase most of their groceries at convenience stores.
- More than half of new-entrant and six-month SNAP households reported shopping at a specific type of food store because of low prices or sales. About one-quarter shop at a store because it is close to home, convenient, or easy to get to. Eleven percent shop at a store because of the quality or variety of food.
- Over half of new-entrant SNAP households usually get to the food store by driving their own car (46 percent) or someone else's car (10 percent). Thirty-five percent are driven by someone else. Responses were generally similar between new-entrant and six-month households.

¹⁸ Findings describing geographic access to food refer to new-entrant households at the baseline interview and six-month households at the baseline interview.

¹⁹ Findings describing households' food purchase behavior refer to for new-entrant households at the baseline interview, six-month households at the baseline interview, and new-entrant households at the follow-up interview.

- About 94 percent of new-entrant and six-month households reported shopping for food by leaving directly from their home. Among those households, the median self-reported travel time was 10 minutes for households in urban areas and 15 minutes in rural areas.
- The median self-reported distance to the store from which households buy most of their groceries was three miles for new-entrant and six-month households in urban areas. In rural areas, the median self-reported distance was five miles for new-entrant households. Distances for six-month households in rural areas were similar to those for new-entrant households.

3. Associations Between Geographic Food Access and Food Security

- Geographic access to food was generally not associated with the percentage of households that were food insecure. This was true for new-entrant households and six-month households; for households living in urban areas and in rural areas; and for each of the four measures of food access.

4. SNAP and Food Insecurity, by Geographic Access to Food

- For households in urban areas, participating in SNAP for six months was associated with reductions in food insecurity in both high- and low-access areas. This was generally true across each of the four measures of geographic access to food and across both the cross-sectional and longitudinal samples.
- For three of the four food access measures (the two measures based on number of supermarkets in the area and the measure based on self-reported travel distance), the reduction in food insecurity associated with SNAP was statistically larger for households in high-access areas than for households in low-access areas. That is, SNAP reduced food insecurity by a greater amount for households that had a greater number of supermarkets in the area, compared to fewer supermarkets; for households that had at least one supermarket in the area, compared to no supermarkets; and for households that reported traveling shorter distances to the food store, compared to longer distances.²⁰
- For households in rural areas, the evidence was mixed as to whether SNAP participation was associated with reduced food insecurity. Participating in SNAP for six months was generally associated with reductions in food insecurity in the longitudinal sample, but not in the cross-sectional sample. In the longitudinal sample, there were reductions in food insecurity in both high- and low-access areas for each of the geographic access measures except distance to the supermarket. There were generally no differences in the size of the reductions for households in high-access areas and households in low-access areas.

²⁰ The findings from Chapter V are generally consistent with those in Chapter IV. Chapter V showed that in urban areas there were larger reductions in food insecurity associated with SNAP in high-access areas than low-access areas. Chapter IV showed that food insecurity was not *statistically* different in high- and low-access areas for new-entrant and six-month households. However, food insecurity rates were *qualitatively* higher in high-access areas than in low-access areas among new-entrant households and were qualitatively similar in high- and low-access areas among six-month households for several food access measures, reflecting the larger reduction in food insecurity when comparing six-month and new-entrant households in high-access areas than in low-access areas.

These findings provide strong evidence that SNAP is associated with an improvement in food security for households in urban areas, regardless of whether a household lives in a high- or low-access area. The findings suggest that SNAP may be more effective, in terms of having a larger ameliorative effect on food insecurity, in areas in which households have greater geographic access to food.

B. Comparison of Findings to Related Studies

To the best of our knowledge, there are no other studies estimating the effect of SNAP on food insecurity according to whether a household lives in a high- or low-access area. Because this is the first study to examine the reduction in food insecurity by level of geographic access, we have compared our findings to those in the broader literature estimating the effect of SNAP on household food insecurity. To make these comparisons, we translated our percentage point changes in Chapter V to percentage changes.²¹

Mabli, Ohls, et al. (2013) found that SNAP participation was associated with a reduction in food insecurity of 7 percent in the cross-sectional sample and 16 percent in the longitudinal sample. Mabli, Ohls, et al. (2013) use the same data as we use in this report, but they did not restrict by urban/rural status or by geographic access to food. These reductions were smaller than those found in other studies, which typically range from 20 to 30 percent (Ratcliffe et al. 2011; Mykerezzi and Mills 2010; Nord 2012; and Nord and Golla 2009).

Examining the association between SNAP and food insecurity by geographic access to food, we found reductions in high-access areas that were generally larger than those found in Mabli, Ohls, et al. (2013), ranging from 6 to 12 percent in the cross-sectional sample and from 19 to 24 percent in the longitudinal sample (Table VI.1). The reductions in low-access areas were generally smaller than those in Mabli, Ohls, et al. (2013).

Table VI.1. Percent Reductions in Food Insecurity Associated with SNAP Participation, by Geographic Access to Food

Measure of Geographic Access	High-Access Areas		Low-Access Areas	
	Cross-sectional Analysis	Longitudinal Analysis	Cross-sectional Analysis	Longitudinal Analysis
Distance to Nearest Supermarket	-9.6%	-19.1%	-5.2%	-15.6%
Number of Supermarkets in Area	-12.0%	-22.3%	-4.4%	-14.5%
Whether There is a Supermarket in Area	-5.9%	-19.2%	-10.4%	-10.5%
Self-Reported Travel Distance to Store at Which Most Food is Purchased	-10.7%	-24.3%	-2.5%	-10.6%

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

²¹ For the cross-sectional analysis of households in high-access areas in Figure V.1, for example, the percentage change is computed as the decrease in the percentage of new-entrant households that are food insecure (-6.5 percentage points) divided by the percentage of new-entrant households that are food insecure (67.5 percent), or -9.6 percent.

C. Implications for Future Research

There is a growing body of research demonstrating the ameliorative effects of SNAP, but less is known about SNAP participants' geographic access to food and how the association between SNAP and food security differs by households' levels of access. The findings of this study suggest several substantive research directions. These include:

- Why is the effect of SNAP on food insecurity larger for urban households with greater geographic access to food than for households with lower levels of access? Are food prices generally lower in high-access areas, allowing the same amount of SNAP benefits to purchase a greater amount of food? Or does greater geographic access give households flexibility in the types of stores at which to shop, allowing them to find deals at different stores in different weeks of the month? More research is needed to identify whether and how household coping strategies differ in high- and low-access areas.
- Why was SNAP associated with a reduction in food insecurity in urban areas across both samples and most measures of geographic access, but in rural areas the evidence was mixed? Do household coping strategies differ in rural areas compared to urban areas?
- Households in urban areas reported travelling a median distance of 3 miles to purchase food from the store at which they obtained most of their food. Given that many researchers consider smaller access areas for urban households, what are the implications of this for how food access measures are typically defined in urban areas?
- Do improvements in food security for SNAP households differ by geographic access to food according to household characteristics, such as income or benefit size? Do geographic variations in living costs affect the adequacy of SNAP benefits in reducing food insecurity? This study examined household food security for all new-entrant and six-month SNAP households by geographic access to food; examining differences across household subgroups such as household composition, income, and benefit size might reveal interesting differences.
- How do other dimensions of food access affect the food insecurity of SNAP households? In this study, food access was characterized by distance to stores and number of stores in the area. Other characteristics of food access such as food quality, selection, prices, and store hours of operation are also important to consider.

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APPENDIX A
FINDINGS FOR VERY LOW FOOD SECURITY

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Table A.1. Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Distance to Nearest Supermarket, and Urban Versus Rural Location

	Households That Live Far from Supermarket ^a	Households That Live Close to Supermarket ^a	Difference
Households in Urban Areas			
New-entrant households at baseline	35.7 (1.8)	37.7 (2.0)	2.0 (2.8)
Six-month households at baseline	29.2 (1.7)	31.7 (1.5)	2.6 (2.7)
New-entrant households at six-month follow-up	26.0 (1.5)	28.3 (2.0)	2.3 (2.9)
Households in Rural Areas			
New-entrant households at baseline	37.4 (2.7)	41.9 (3.6)	4.5 (5.4)
Six-month households at baseline	29.0 (3.0)	26.3 (2.7)	-2.7 (4.7)
New-entrant households at six-month follow-up	26.6 (2.7)	29.7 (3.20)	3.1 (4.7)

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For households in urban areas, estimates are based on 2,355 new-entrant households observed at baseline and again at follow-up six months later, and 2,474 six-month households at baseline. For households in rural areas, estimates are based on 700 new-entrant households observed at baseline and again at follow-up six months later, and 692 six-month households at baseline.

*, **, ***Significantly different from zero at the 0.10, 0.05, and 0.01 levels, respectively.

^aHouseholds living within the median distance to the nearest supermarket (0.6 miles in urban areas and 3.9 miles in rural areas) are referred to as living close to a supermarket. Households living farther than the median distance to the nearest supermarket are referred to as living far from a supermarket.

Table A.2. Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Number of Supermarkets in Local Area, and Urban Versus Rural Location

	Households with Fewer Supermarkets in Local Area ^a	Households with Greater Number of Supermarkets in Local Area ^a	Difference
Households in Urban Areas			
New-entrant households at baseline	35.9 (1.3)	38.3 (2.7)	2.4 (3.0)
Six-month households at baseline	29.8 (1.3)	31.7 (1.7)	1.9 (2.4)
New-entrant households at six-month follow-up	25.8 (1.2)	29.6 (1.9)	3.8 (2.4)
Households in Rural Areas			
New-entrant households at baseline	37.0 (2.2)	43.7 (4.5)	6.7 (5.7)
Six-month households at baseline	27.9 (2.2)	27.4 (2.9)	-0.5 (4.0)
New-entrant households at six-month follow-up	26.5 (2.3)	30.5 (3.4)	4.0 (4.4)

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For households in urban areas, estimates are based on 2,355 new-entrant households observed at baseline and again at follow-up six months later, and 2,474 six-month households at baseline. For households in rural areas, estimates are based on 700 new-entrant households observed at baseline and again at follow-up six months later, and 692 six-month households at baseline.

*, **, ***Significantly different from zero at the 0.10, 0.05, and 0.01 levels, respectively.

^aHouseholds living in an area with more than the median number of supermarkets (two stores within one mile in urban areas and one store within five miles in rural areas) are referred to as living in an area with a greater number of supermarkets. Households living in an area with less than the median number of supermarkets are referred to as living in an area with fewer supermarkets.

Table A.3. Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Whether There Is a Supermarket in Local Area, and Urban Versus Rural Location

	Households with No Supermarkets in Local Area ^a	Households with at Least One Supermarket in Local Area ^a	Difference
Households in Urban Areas			
New-entrant households at baseline	39.0 (3.1)	36.0 (1.3)	-3.0 (3.3)
Six-month households at baseline	27.6 (2.0)	31.3 (0.9)	3.7* (2.1)
New-entrant households at six-month follow-up	28.5 (2.1)	26.7 (1.0)	-1.7 (2.4)
Households in Rural Areas			
New-entrant households at baseline	41.0 (3.5)	38.7 (3.2)	-2.4 (5.9)
Six-month households at baseline	28.2 (3.3)	27.3 (2.4)	-0.9 (4.7)
New-entrant households at six-month follow-up	31.9 (2.7)	25.6 (2.4)	-6.3* (3.7)

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For households in urban areas, estimates are based on 2,355 new-entrant households observed at baseline and again at follow-up six months later, and 2,474 six-month households at baseline. For households in rural areas, estimates are based on 700 new-entrant households observed at baseline and again at follow-up six months later, and 692 six-month households at baseline.

*, **, ***Significantly different from zero at the 0.10, 0.05, and 0.01 levels, respectively.

^aThe number of supermarkets was calculated within one mile of households' locations in urban areas and within five miles of households' locations in rural areas.

Table A.4. Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Self-Reported Travel Distance to Store at Which Most Food Is Purchased

	Households That Travel Longer Distance to Store ^a	Households That Travel Shorter Distance to Store ^a	Difference
Households in Urban Areas			
New-entrant households at baseline	36.2 (2.0)	38.7 (1.7)	2.5 (2.8)
Six-month households at baseline	35.3 (1.5)	27.7 (1.9)	-7.5*** (2.9)
New-entrant households at six-month follow-up	29.4 (1.5)	25.7 (1.8)	-3.8 (2.7)
Households in Rural Areas			
New-entrant households at baseline	41.3 (2.9)	38.3 (3.7)	-3.1 (5.6)
Six-month households at baseline	27.6 (2.4)	29.7 (3.1)	2.1 (4.4)
New-entrant households at six-month follow-up	27.0 (2.6)	29.0 (3.1)	2.0 (4.1)

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For households in urban areas, estimates are based on 2,355 new-entrant households observed at baseline and again at follow-up six months later, and 2,474 six-month households at baseline. For households in rural areas, estimates are based on 700 new-entrant households observed at baseline and again at follow-up six months later, and 692 six-month households at baseline.

*, **, ***Significantly different from zero at the 0.10, 0.05, and 0.01 levels, respectively.

^aIn urban areas, households that reported traveling less than or equal to three miles (the median) to the store from which they purchase most of their food are denoted as traveling a “shorter” distance to the store, compared to households traveling more than three miles, which travel a “longer” distance. Households in rural areas were classified similarly, using a median of 10 miles.

Table A.5. Percentage of Households in Urban Areas That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Distance to Nearest Supermarket, Number of Supermarkets in Local Area, Whether There Is a Supermarket in Local Area, and Self-Reported Travel Distance to Store

	Cross-Sectional Estimates			Longitudinal Estimates		
	New-Entrant Households (Baseline)	Six-Month Households	Difference	New-Entrant Households (Baseline)	New-Entrant Households (Six-Month Follow-Up)	Difference
Households that Live Close to Supermarket ^a	36.2 (2.5)	31.2 (1.5)	-5.1* (3.0)	35.9 (2.1)	29.4 (1.9)	-6.5*** (1.7)
Households that Live Far from Supermarket ^a	35.0 (1.7)	31.3 (1.4)	-3.7* (2.2)	34.2 (1.9)	27.4 (1.5)	-6.8*** (2.2)
Households with Greater Number of Supermarkets in Local Area ^b	36.4 (3.0)	30.1 (1.4)	-6.3* (3.3)	36.6 (2.7)	29.8 (1.6)	-6.8** (2.7)
Households with Fewer Supermarkets in Local Area ^b	35.0 (1.2)	32.1 (1.1)	-2.9* (1.6)	34.2 (1.4)	27.6 (1.3)	-6.7*** (1.9)
Households with at Least One Supermarket in Local Area ^c	35.5 (1.4)	31.9 (0.9)	-3.7** (1.7)	35.0 (1.3)	28.5 (1.0)	-6.5*** (1.5)
Households with no Supermarkets in Local Area ^c	34.7 (2.9)	29.6 (2.1)	-5.0 (3.2)	35.3 (2.7)	28.3 (2.0)	-7.0** (3.2)
Households that Travel Shorter Distance to Store ^d	38.7 (1.5)	28.8 (2.0)	-9.9*** (2.7)	37.9 (1.5)	27.4 (1.6)	-10.5*** (2.1)
Households that Travel Longer Distance to Store ^d	34.5 (1.9)	35.6 (1.4)	1.1 (2.6)	33.8 (1.8)	30.6 (1.3)	-3.2* (1.9)

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For the distance to store measure, for SNAP households in high-access areas, the cross-sectional estimates compare the sample of 1,142 new-entrant households to the sample of 1,213 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 1,213 and 1,261 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 1,156 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 1,199 households.

For the number of supermarkets in area measure, for SNAP households in high-access areas, the cross-sectional estimates compare the sample of 781 new-entrant households to the sample of 830 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 1,574 and 1,644 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 781 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 1,574 households.

For the measure of whether there is at least one supermarket in the area, for SNAP households in high-access areas, the cross-sectional estimates compare the sample of 1,780 new-entrant households to the sample of 1,878 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 575 and 596 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 1,780 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 575 households.

Table A.5 (continued)

For the self-reported travel distance measure, for SNAP households in high-access areas, the cross-sectional estimates compare the sample of 921 new-entrant households to the sample of 977 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 1,191 and 1,227 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 921 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 1,191 households.

^aHouseholds living within the median distance to the nearest supermarket (0.6 miles) are referred to as living close to a supermarket. Households living farther than the median distance to the nearest supermarket are referred to as living far from a supermarket.

^bHouseholds living in an area with more than the median number of supermarkets (two stores) within one mile are referred to as living in an area with a greater number of supermarkets. Households living in an area with less than the median number of supermarkets are referred to as living in an area with fewer supermarkets.

^cThe number of supermarkets was calculated within one mile of the household's address in urban areas.

^dIn urban areas, households that reported traveling less than or equal to three miles (the median) to the store from which they purchase most of their food are denoted as traveling a "shorter" distance to the store, compared to households traveling more than three miles, which travel a "longer" distance.

*, **, *** Significantly different from zero at the 0.10, 0.05, and 0.01 levels, respectively.

Table A.6. Percentage of Households in Rural Areas That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Distance to Nearest Supermarket, Number of Supermarkets in Local Area, Whether There Is a Supermarket in Local Area, and Self-Reported Travel Distance to Store

	Cross-Sectional Estimates			Longitudinal Estimates		
	New-Entrant Households (Baseline)	Six-Month Households	Difference	New-Entrant Households (Baseline)	New-Entrant Households (Six-Month Follow-Up)	Difference
Households that Live Close to Supermarket ^a	35.5 (2.7)	28.8 (3.2)	-6.7 (4.4)	36.3 (3.3)	30.3 (3.3)	-6.0 (5.6)
Households that Live Far from Supermarket ^a	34.9 (2.4)	34.0 (3.0)	-0.9 (4.3)	37.0 (2.3)	28.7 (2.5)	-8.3** (3.3)
Households with Greater Number of Supermarkets in Local Area ^b	36.1 (3.1)	29.9 (3.5)	-6.2 (5.2)	37.0 (3.5)	29.6 (3.6)	-7.4 (5.8)
Households with Fewer Supermarkets in Local Area ^b	34.8 (2.3)	32.7 (2.0)	-2.1 (3.2)	37.3 (2.0)	29.6 (2.1)	-7.6*** (2.7)
Households with at Least One Supermarket in Local Area ^c	33.7 (2.4)	30.2 (2.5)	-3.5 (3.7)	34.8 (2.9)	26.8 (2.9)	-8.0* (4.7)
Households with no Supermarkets in Local Area ^c	38.2 (2.7)	32.9 (3.4)	-5.3 (4.9)	40.1 (2.7)	33.9 (3.2)	-6.1 (4.5)
Households that Travel Shorter Distance to Store ^d	33.6 (2.8)	31.3 (3.0)	-2.3 (4.6)	34.1 (3.5)	28.9 (3.4)	-5.2 (5.6)
Households that Travel Longer Distance to Store ^d	37.3 (3.0)	32.4 (2.8)	-4.9 (4.7)	38.9 (2.3)	31.2 (2.1)	-7.7** (3.3)

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between new-entrant and six-month households in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For the distance to store measure, for SNAP households in high-access areas, the cross-sectional estimates compare the sample of 353 new-entrant households to the sample of 341 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 347 and 351, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 351 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 349.

For the number of supermarkets in area measure, for SNAP households in high-access areas, the cross-sectional estimates compare the sample of 271 new-entrant households to the sample of 277 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 429 and 415 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 271 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 429 households.

For the measure of whether there is at least one supermarket in the area, for SNAP households in high-access areas, the cross-sectional estimates compare the sample of 429 new-entrant households to the sample of 425 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 271 and 267 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 429 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 271 households.

Table A.6 (continued)

For the self-reported travel distance measure, for SNAP households in high-access areas, the cross-sectional estimates compare the sample of 326 new-entrant households to the sample of 306 households who had been receiving SNAP for about six months as of the baseline data collection. The analogous sample sizes for households in low-access areas are 341 and 353 households, respectively. For SNAP households in high-access areas, the longitudinal estimates compare the 326 new-entrant SNAP households at baseline to the same households about six months later. The analogous sample size for households in low-access areas is 341 households.

^aHouseholds living within the median distance to the nearest supermarket (3.9 miles) are referred to as living close to a supermarket. Households living farther than the median distance to the nearest supermarket are referred to as living far from a supermarket.

^bHouseholds living in an area with more than the median number of supermarkets (one store) within five miles are referred to as living in an area with a greater number of supermarkets. Households living in an area with less than the median number of supermarkets are referred to as living in an area with fewer supermarkets.

^cThe number of supermarkets was calculated within five miles of the household's address in rural areas.

^dIn rural areas, households that reported traveling less than or equal to 10 miles (the median) to the store from which they purchase most of their food are denoted as traveling a "shorter" distance to the store, compared to households traveling more than 10 miles, which travel a "longer" distance.

*, **, ***Significantly different from zero at the 0.10, 0.05, and 0.01 levels, respectively.

APPENDIX B

DETAILS FOR FOOD INSECURITY AND URBANICITY REGRESSIONS

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APPENDIX C

DETAILS FOR FOOD INSECURITY AND SNAP PARTICIPATION REGRESSIONS

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APPENDIX D

**ASSOCIATIONS BETWEEN GEOGRAPHIC ACCESS TO FOOD AND FOOD
SECURITY USING ALTERNATIVE DEFINITIONS OF FOOD ACCESS**

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As described in Chapter II, geographic access to food is defined in this study using four measures according to whether:

- A household lives within the median distance to the nearest supermarket
- A household lives in a local area with more than the median number of supermarkets²²
- A household lives in a local area with at least one supermarket
- A household reported travelling less than the median distance to the store at which it purchases most of its food

For all four measures, we used the median to divide the sample evenly into households living in high-access areas and households living in low-access areas. This ensured adequate sample sizes to produce reliable estimates for households in high- and low-access areas.

Based on these measures, geographic access to food was generally not associated with the percentage of households that were food insecure (Chapter IV) or that had very low food security (Appendix A). This was true for new-entrant households and six-month households; for households living in urban areas and in rural areas; and for each of the four measures of food access. The percentage of new-entrant households in urban areas that were food insecure, for example, was statistically the same for households in high- and low-access areas.

Because access limitations may be an issue for a small proportion of households, characterizing access using the median distance to stores or the median number of stores in the area might underestimate the association between geographic access and food insecurity for those households with the poorest access. In this appendix, we test whether our findings from Chapter IV are different when measures of access are based on the 95th percentile distance, rather than the median distance. The two measures we considered were both distance-based.²³ First, we classified households as having a high level of access if they lived within the 95th percentile distance to a supermarket and a low level of access if they lived farther than the 95th distance to a supermarket. The 95th percentile distances were 1.9 miles in urban areas and 12.3 miles in rural areas. This compares to the medians, 0.6 miles in urban areas and 3.9 miles in rural areas, used in Chapter IV.

Next, we used respondents' self-reported travel distance to the store at which they purchase most of their food. We classified a household as having a high level of access if it reported traveling less than the 95th percentile distance to the store at which it purchases most of its food, and as having a low level of access if it travels farther than the 95th percentile distance to the store. These distances were 15 miles for households in urban areas and 35 miles for households in rural areas. This compares to the medians of 3 and 10 miles, respectively, used in Chapter IV.

²² A local area is defined to be one mile in radius in urban areas and five miles in radius in rural areas.

²³ We did not include the food access measures based on the number of supermarkets in the area in this sensitivity analysis because the third food access measure in the main analysis—whether a household lives in an area with at least one supermarket—describes differences in food insecurity for households with the poorest access (no supermarkets in the area) and households with at least some access (at least one supermarket in the area).

Using the access measures based on the 95th percentile distances, we find that geographic access to food was generally not associated with the percentage of households that were food insecure or that had very low food security (Tables D.1 and D.2).

Table D.1 presents the findings for geographic access measured using the calculated distance between a household's residential address and the nearest supermarket. For households in urban areas, living in a high-access area, relative to living in a low-access area, was not associated with the percentage of households that were food insecure for two out of the three samples. The percentage of households that were food insecure was lower for households in high-access areas than in low-access areas only for new-entrant households at the six-month follow-up interview. The opposite was true for households in rural areas. There was no association for new-entrant households at the six-month follow-up interview, but living in a high-access area was associated with reduced food insecurity for new-entrant households at baseline and was associated with higher food insecurity for six-month households at baseline. For very low food security, there were no statistically significant associations with geographic access for households in urban areas and only one significant association for households in rural areas.

Table D.2 presents the findings for geographic access measured using households' reported travel distance to the store at which it purchases most of its food. For six-month households at baseline in urban areas, food insecurity was lower for households in high-access areas than in low-access areas. For all other samples in both urban and rural areas, there were no associations between geographic access to food and both food insecurity and very low food security.

As was the case when defining food access based on the median distance, defining geographic access using the 95th percentile distances leads to the same conclusion that geographic access to food was generally not associated with food insecurity and very low food security. When there were associations, such as using the calculated distance to the nearest supermarket for households in rural areas, there was generally no consistency in the sign of the association across samples.

Table D.1. Percentage of Households That Are Food Insecure and Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Distance to Nearest Supermarket, and Urban Versus Rural Location

	Households in Low-Access Area ^a	Households in High-Access Area ^a	Difference
Food Insecurity			
Households in Urban Areas			
New-entrant households at baseline	72.0 (4.7)	66.4 (1.2)	-5.5 (4.9)
Six-month households at baseline	57.3 (6.2)	59.6 (1.1)	2.3 (6.5)
New-entrant households at six-month follow-up	62.0 (4.8)	51.6 (1.3)	-10.4** (5.1)
Households in Rural Areas			
New-entrant households at baseline	80.0 (5.7)	69.9 (2.1)	-10.1* (6.1)
Six-month households at baseline	43.6 (9.8)	60.6 (1.6)	16.9* (10.2)
New-entrant households at six-month follow-up	53.0 (10.0)	53.8 (2.0)	0.9 (10.3)
Very Low Food Security			
Households in Urban Areas			
New-entrant households at baseline	43.7 (5.1)	36.3 (1.4)	-7.4 (5.5)
Six-month households at baseline	31.1 (5.2)	30.4 (0.9)	-0.7 (5.6)
New-entrant households at six-month follow-up	27.2 (4.2)	27.1 (1.0)	-0.1 (4.3)
Households in Rural Areas			
New-entrant households at baseline	54.7 (9.1)	39.0 (1.8)	-15.7* (9.5)
Six-month households at baseline	31.4 (9.6)	27.4 (1.6)	-4.0 (9.9)
New-entrant households at six-month follow-up	28.9 (10.3)	28.1 (1.8)	-0.8 (10.6)

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For households in urban areas, estimates are based on 2,355 new-entrant households observed at baseline and again at follow-up six months later, and 2,474 six-month households at baseline. For households in rural areas, estimates are based on 700 new-entrant households observed at baseline and again at follow-up six months later, and 692 six-month households at baseline.

*, **, ***Significantly different from zero at the 0.10, 0.05, and 0.01 levels, respectively.

^aHouseholds living within the 95th percentile distance to the nearest supermarket (1.9 miles in urban areas and 12.3 miles in rural areas) are referred to as living in a high-access area. Households living farther than the 95th percentile distance to the nearest supermarket are referred to as living in a low-access area.

Table D.2. Percentage of Households That Are Food Insecure and Percentage of Households That Had Very Low Food Security, by New-Entrant and Six-Month SNAP Participation Status, Self-Reported Travel Distance to Store at Which Most Food Is Purchased

	Households in Low-Access Area ^a	Households in High-Access Area ^a	Difference
Food Insecurity			
Households in Urban Areas			
New-entrant households at baseline	71.5 (6.4)	66.2 (1.1)	-5.3 (6.7)
Six-month households at baseline	71.3 (4.9)	59.1 (1.0)	-12.2** (5.0)
New-entrant households at six-month follow-up	54.4 (5.4)	52.2 (1.2)	-2.2 (5.4)
Households in Rural Areas			
New-entrant households at baseline	79.8 (6.6)	70.8 (2.1)	-8.9 (6.6)
Six-month households at baseline	59.6 (13.9)	60.0 (1.7)	0.3 (14.5)
New-entrant households at six-month follow-up	58.6 (9.1)	53.9 (2.3)	-4.7 (10.0)
Very Low Food Security			
Households in Urban Areas			
New-entrant households at baseline	39.7 (5.0)	37.1 (1.3)	-2.6 (4.9)
Six-month households at baseline	35.4 (4.2)	31.8 (1.0)	-3.6 (4.4)
New-entrant households at six-month follow-up	27.7 (5.6)	27.8 (1.0)	0.2 (5.8)
Households in Rural Areas			
New-entrant households at baseline	49.7 (9.8)	39.3 (1.7)	-10.4 (9.9)
Six-month households at baseline	31.1 (10.2)	28.4 (1.7)	-2.7 (10.4)
New-entrant households at six-month follow-up	30.0 (8.1)	27.9 (2.0)	-2.1 (8.3)

Sources: SNAP Food Security Survey 2012; Store Tracking and Redemption System 2012.

Note: Percentages shown are regression-adjusted for differences between households living in high- and low-access areas in demographic, economic, and household characteristics. See Chapter II. Standard errors in parentheses.

For households in urban areas, estimates are based on 2,355 new-entrant households observed at baseline and again at follow-up six months later, and 2,474 six-month households at baseline. For households in rural areas, estimates are based on 700 new-entrant households observed at baseline and again at follow-up six months later, and 692 six-month households at baseline.

*, **, ***Significantly different from zero at the 0.10, 0.05, and 0.01 levels, respectively.

^a In urban areas, households that reported traveling less than or equal to the 95th percentile reported distance (15 miles) to the store from which they purchase most of their food are referred to as living in a higher-access area, compared to households traveling more than 15 miles, which are referred to as living in a low-access area. Households in rural areas were classified similarly, using a 95th percentile distance of 35 miles.