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The Spatial Context of Food Shopping:

Understanding How Local Food Retailer Access and Pricing Affect Household Behavior

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Introduction

Rising rates of food insecurity have led research to examine how the local retail food environment affects household food purchases, consumption, and security. Particular attention has been given to identifying the presence of "food deserts," areas with low or no spatial access to retail stores that sell fresh food and groceries. Proximity to supermarkets or chain grocery stores is a primary concern because these stores carry more fresh food items and lower priced food than other types of retailers.[1] Neighborhoods with concentrations of racial and ethnic minorities and poor persons are found to have lower levels of access to food retailers than predominately white or more affluent neighborhoods, but more recent research suggests there may be less race or class inequality in access to food retailers than previously presumed.[2] There is evidence that households with greater access to food retailers and to more affordably priced food products report better household food outcomes than those with less access.[3] However, because few data sources link local food retailers and pricing,

[1] U.S. Department of Agriculture, Economic Research Service. 2009. "Access to Affordable and Nutritious Food: Measuring and Understanding Food Deserts and Their Consequences."; Fitzpatrick, Katie and Michele Ver Ploeg. 2010. "On the Road to Food Security? Vehicle Ownership and Access to Food." Paper presented at the Research on Connections between Health and SES Using Panel Study of Income Dynamics (PSID) Data Conference, September 2010.

[2] Gallagher, Mari. 2006. "Examining the Impact of Food Deserts on Public Health in Chicago." Chicago: Mari Gallagher Research & Consulting Group; Moore, Latetia and Ana V. Diez Roux. 2006. "Associations of Neighborhood Characteristics with the Location and Type of Food Stores." *American Journal of Public Health* 96(2): 1-7; Powell, Lisa M., Sandy Slater, Donka Mirtcheva, Yanjun Bao, Frank J. Chaloupka. 2007. "Food Store Availability and Neighborhood Characteristics in the United States." *Preventive Medicine* 44 (2007): 189–95; Raja, Samina, Changxing Ma, and Pavan Yadav. 2007. "Beyond Food Deserts: Measuring and Mapping Racial Disparities in Neighborhood Food Environments." *Journal of Planning Education and Research* 27: 469-82; U.S. Department of Agriculture, Economic Research Service. 2009. "Access to Affordable and Nutritious Food: Measuring and Understanding Food Deserts and Their Consequences."; Zenk, Shannon N. Amy J. Schulz, Barbara A. Isreal, Sherman A. James, Shuming Bao and Mark L. Wilson. 2005. "Neighborhood Racial Composition, Neighborhood Poverty, and the Spatial Accessibility of Supermarkets in Metropolitan Detroit." *American Journal of Public Health* 95(4): 660-67.

[3] Bartfeld, Judith S., Jeong-Hee Ryu, and Lingling Wang. 2010. "Local Characteristics Are Linked to Food Insecurity Among Households With Elementary School Children," *Journal of Hunger & Environmental Nutrition* 5(4): 471-83; Garasky, Steven, Lois Wright Morton, and Kimberly A. Greder. 2006. "The Effects of the Local Food Environment and Social Support on Rural Food Insecurity." *Journal of Hunger & Environmental Nutrition* 1(1): 83-103; Gibson, Diane M. 2012. "The Neighborhood Food Environment, Food Stamp Program Participation, and Weight-Related Outcomes of Low-Income Women." University of Wisconsin Institute for Research on Poverty

household food purchases, and food insecurity in space, too often we are limited in our ability assess the relationship between access to food retailers, pricing, and food security, especially for race and ethnic minorities, the poor, and other vulnerable households.[4]

To address these critical gaps in the literature, this paper will explore the relationships between household food security, food purchases, food pricing, and the geography of the local retail food infrastructure for households at or below 300% of federal poverty, using unique public and restricted use data files from the FoodAPS. Household shopping decisions will be modeled as a function of spatial access to retailers and the spatial contours of food pricing near respondents. We also will examine how food retailer access and food pricing are associated with household food security.

This proposed research improves upon existing work in a number of ways. First, the FoodAPS contains geographically sensitive information about store pricing and sales, food purchases, and respondent households necessary to develop more precise measures of food retailer access and local food pricing than is possible with other data sources. The FoodAPS also will permit us to examine relationships between place, food shopping, and food security among particularly vulnerable populations (e.g., households without a car, individuals with physical limitations, the elderly, poor rural and suburban residents). Finally, in addition to large chain supermarkets, our analyses will include a range of stores households frequent (e.g., small or non-chain grocery stores, specialty stores, convenience stores).

Discussion Paper, No. 1406-13; Leibtag, Ephraim and Aylin Kumcu. 2011. "The WIC Fruit and Vegetable Cash Voucher: Does Regional Price Variation Affect Buying Power?" U.S. Department of Agriculture, Economic Research Service, Economic Information Bulletin, Number 75; Morrissey, Taryn W., Alison Jacknowitz, and Katie Vinopal. 2012. "Food Assistance and Children's Eating Patterns, Food Insecurity, and Overweight: The Influence of Local Food Prices." University of Wisconsin, Institute for Research on Poverty Discussion Paper, No 1409-13; Rose, Donald and Rickelle Richards. 2004. "Food Store Access and Household Fruit and Vegetable Use Among Participants in the US Food Stamp Program.' *Public Health Nutrition* 7(8): 1081-88.

[4] Allard, Scott W. 2013. "Placing Food Security in a Spatial Context." Paper presented at the Workshop on Research Gaps and Opportunities on the Causes and Consequences of Child Hunger, Committee on National Statistics, National Academy of Sciences Food and Nutrition Board, Institute of Medicine, April 8-9, 2013.

Apart from their scholarly value, findings from this project will be of use to an array of policymakers, advocates, and program executives. Future development of interventions to enhance food security will benefit from clearer evidence on the roles of local retail food availability and pricing in determining food purchases and food security. Improved understanding of how spatial context shapes food insecurity could translate into more efficient and effective allocation of public program dollars, private capital, and philanthropic resources. In addition, this proposed project connects closely to Economic Research Service Strategic Goal Number 4, to improve the nation's nutrition and health through research that examines access to nutritious food and food choices that shape the dietary quality of household food choices.

Research Design

This project will explore four key questions: How does spatial access to food retailers vary across poor and near-poor households? How does food pricing and product availability vary across types of food retailers? How is spatial access to food retailers and spatial variation in food pricing associated with household decisions about shopping venues, food purchases, and food expenditures? When controlling for relevant household characteristics and food assistance receipt, what is the relationship between local food pricing, the availability of food retailers, and household food security?

We will explore three key hypotheses: First, poor persons and other vulnerable populations will have less spatial access to food retailers than more affluent or mobile populations. Next, lower levels of spatial access to food retailers will correspond with less access to affordably priced food items, particularly fresh fruit and vegetables. Third, household food shopping venue decisions, purchase choices, and food security are a function of spatial access to different types of retailers and local food prices, even when controlling for personal and family characteristics such as income, labor force participation, race, ethnicity, health limitations, and household composition.

The National Household Food Acquisition and Purchase Survey (FoodAPS) is a nationally representative survey of American households conducted by the USDA that collected unique and comprehensive information about household food purchases, household demographic and employment characteristics, food assistance receipt, and the contours of local food resource infrastructures from April 2012 to January 2013. FoodAPS includes nationally representative data from 4,826 households, including oversamples of those participating in SNAP and low-income households not participating in SNAP. In this paper, we are particularly interested in FoodAPS data about foods purchased for consumption in the home across the entire sample and a sample of households with income at or below 300 percent of the federal poverty line.

FoodAPS data are based on two in-person surveys conducted with households at the start and end of a seven day period, complemented by data drawn from three telephone interviews and household tracking of food purchases during that seven day period. Information about race, ethnicity, gender, age, marital status, work status, and health are gathered for all individuals in the household. For each household, FoodAPS has information about food purchase or shopping "events" during the week of observation, including store type, products purchased, and pricing. Household measures of program participation, food security, and income are also gathered.

Along with FoodAPS measures of household demographics, employment, earnings, and program participation, we draw upon restricted-use data to calculate households food shopping measures, including the type of retail food store most frequented, total weekly food expenditures, percent of weekly food purchases at supermarkets, and percent of weekly food expenditures on fruits and vegetables. Further, in addition to the household cost of the Thrifty Food Plan, we will calculate local food price indices using information about the retail pricing of key food products (e.g., milk, seasonal fruits and vegetables) from different types of food retailers. We will adjust for differences in prices across different data collection dates using Bureau of Labor Statistics (BLS) seasonal adjustment factors

for food at home.[5]

Restricted use information about the spatial location of respondents and food retailers will be used to calculate textured distance- and store feature-weighted measures of food resource access for each respondent. One set of measures will calculate distance to the nearest food retailer by type (e.g., supermarket, convenience store). Next, we will calculate the presence of different types of retail food stores within different distance bands of each respondent (e.g., ½, 1, 2, 3 miles). A set of measures will calculate the number of retailers within 5-, 10-, 20-, and 30-minute drives using a least cost driving time calculations.[6] Finally, we will create a set of access measures that combine distance or commute time with store-level information about total sales, total sales of fruits and vegetables, as well as food pricing for specific items.

Methods

Descriptive analyses will compare food resource access and food pricing across different population subgroups (e.g., race, poverty status, elderly) and geographic locations (e.g., urban, suburban, or rural tract, high or low poverty tract) for households within 300% of federal poverty. We will estimate a series of multivariate models across households within 300% of federal poverty that explore factors associated with different household food shopping outcomes (*Y*) for household *h* in PSU *j:*

$$SNAP_{h,j} = \beta X_{h,j} + \theta Emp_{h,j} + \sigma Price_{h,j} + \gamma Access_{h,j} + \varphi FoodAsst_{h,j} + \varepsilon_{h,j}$$

Food shopping outcomes will include the type of store most frequented and measures of

[5] Bureau of Labor Statistics. 2013. "Seasonal Data and Techniques for Data for January 2008-December 2012, Issued Feb. 2013."

[6] Allard, Scott, Sandra Danziger, and Maria Wathen. 2014. "Food Assistance Receipt and Food Resource Access During and After the Great Recession in Detroit." Paper presented at the APPAM Annual Meeting, November 7-10, 2013, Washington, DC. See also, Neckerman, Kathryn M., Michael Bader, Marnie Purciel, Paulette Yousefzadeh. 2009. "Measuring Food Access in Urban Areas." Paper presented at the National Poverty Center conference on Understanding the Economic Concepts and Characteristics of Food Access, January 2009.

household food expenditures briefly described above. *X* represents household demographic and census tract characteristics. *Emp* contains measures of employment/work earnings in the previous week. *Price* is a vector of local food price measures and indices. *Access* is a vector of food retail access measures that reflect proximity to different store types, as well as proximity to stores selling fresh fruits and vegetables. *FoodAsst* will capture household participation in public and charitable food assistance programs, such as SNAP or food pantries, which can shape household food and non-food expenditure patterns. In addition, we will estimate a similar set of multivariate models to examine factors associated with both dichotomous and categorical measures of food security. If possible, we will explore using access to food assistance resources (e.g., SNAP offices, USDA commodities programs) to address selection into food assistance.[7]

Results

Work in progress and awaiting disclosure review from the USDA.

[7] Allard, Scott, Sandra Danziger, and Maria Wathen. 2014. "Food Assistance Receipt and Food Resource Access During and After the Great Recession in Detroit." Paper presented at the APPAM Annual Meeting, November 7-10, 2013, Washington, DC; Daponte, Beth Osborne, Seth Sanders, Lowell Taylor. 1999. "Why Do Low-Income Households not Use Food Stamps? Evidence from an Experiment." *The Journal of Human Resources* 34(3): 612-28; Gibson-Davis, Christina M. and E. Michael Foster. 2006. "A Cautionary Tale: Using Propensity Scores to Estimate the Effect of Food Stamps on Food Insecurity." *Social Service Review* 80(2006): 93-126; Gundersen, Craig and Victor Oliveira. 2001. "The Food Stamp Program and Food Insufficiency." *American Journal of Agricultural Economics*. 83(4): 875-87; Nord, Mark and Anne Marie Golla. 2009. "Does SNAP Decrease Food Insecurity?" U. S. Department of Agriculture, Economic Research Service. Economic Research Report No. 85; Shaefer, H.Luke. and Italo Gutierrez. 2012. "The Supplemental Nutrition Assistance Program and Material Hardships among Low-Income Households with Children." National Poverty Center Working Paper, #11-18.