

Differences in Food Environment Perceptions and Spatial Attributes of Food Shopping Between Residents of Low and High Food Access Areas

Inderbir Sohi, MSPH¹; Bethany A. Bell, PhD²; Jihong Liu, ScD¹; Sarah E. Battersby, PhD³; Angela D. Liese, PhD^{1,4}

ABSTRACT

Objective: To explore potential differences in food shopping behaviors and healthy food availability perceptions between residents living in areas with low and high food access.

Design: A cross-sectional telephone survey to assess food shopping behaviors and perceptions. Data from an 8-county food environment field census used to define the Centers for Disease Control and Prevention (CDC) healthier food retail tract and US Department of Agriculture Economic Research Service food desert measure.

Participants: A total of 968 residents in 8 South Carolina counties.

Main Outcome Measures: Residents' food shopping behaviors and healthy food availability perceptions.

Analysis: Linear and logistic regression.

Results: Compared with residents in high food access areas, residents in low food access areas traveled farther to their primary food store (US Department of Agriculture Economic Research Service: 8.8 vs 7.1 miles, $P = .03$; CDC: 9.2 vs 6.1 miles, $P < .001$), accumulated more total shopping miles per week (CDC: 28.0 vs 15.4 miles; $P < .001$), and showed differences in perceived healthy food availability ($P < .001$) and shopping access ($P < .001$).

Conclusions and Implications: These findings lend support to ongoing community and policy interventions aimed at reducing food access disparities.

Key Words: healthy food access, food environment, food shopping behaviors, food access disparities (*J Nutr Educ Behav.* 2014;46:241-249.)

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INTRODUCTION

The rise in obesity rates in the US has been a driving force of research into "obesogenic environments."¹⁻³ Several studies have found that a large number of fast-food restaurants and few grocery stores in a resident's food environment were associated with a higher odds of obesity among area residents, although the relation-

ship varied between metro and non-metro areas.^{4,5} Policy makers in the US have questioned the extent to which healthy foods are easily accessible and available.⁶ The US Department of Agriculture (USDA) Economic Research Service (ERS) has reported that limited access to major food outlets such as grocery stores and supermarkets affects over 23.5 million people living in 6,529

different Census tracts.^{7,8} In an updated USDA ERS report based on 2010 Census and supermarket data, this statistic increased to 29.7 million people, who lived in a low-income area > 1 mile from a supermarket.⁹ Several community food access (CFA) measures have been created to identify and quantify areas that are considered to have low access to healthier food retailers. The 2009 and 2013 Centers for Disease Control and Prevention (CDC) *State Indicator Report on Fruits and Vegetables*^{10,11} categorized each state's Census tracts based on the presence or absence of retailers that are considered healthy: as a healthier food retail tract (HFRT) or non-healthier food retail tract (non-HFRT). The 2009 USDA ERS *Access to Affordable and Nutritious Food—Measuring and Understanding Food Deserts and Their Consequences: Report to Congress*¹² identified areas with limited access to nutritious foods and classified each Census tract

¹Department of Epidemiology and Biostatistics, Arnold School of Public Health, University of South Carolina, Columbia, SC

²College of Education, University of South Carolina, Columbia, SC

³Department of Geography, University of South Carolina, Columbia, SC

⁴Center for Research in Nutrition and Health Disparities, University of South Carolina, Columbia, SC

Address for correspondence: Angela D. Liese, PhD, Department of Epidemiology and Biostatistics, Center for Research in Nutrition and Health Disparities, Arnold School of Public Health, University of South Carolina, 915 Greene Street, Columbia, SC, 29208; Phone: (803) 777-9414; Fax: (803) 777-2524; E-mail: liese@sc.edu

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as a food desert (FD) or non-food desert (non-FD) based on its median family income and supermarket access. This was recently updated in the Food Access Research Atlas in March, 2013.⁸

To the authors' knowledge, these measures of CFA have not been studied with respect to food shopping behaviors or residents' perceptions of food retail access. The only descriptive study of USDA ERS FDs to date focused on socioeconomic characteristics.⁷ Understanding residents' perceptions of their food environment gives insights into their subjective attitudes and experiences, which in turn can influence shopping and ultimately health behaviors.¹³

The purpose of this study was to explore differences in healthy food availability perceptions and spatial attributes of food shopping between residents of low vs high food access areas. Shopping behaviors were defined as actions related to residents' food shopping travel and time, such as distance to the nearest shopping store and total number of shopping miles per week. This is different from in-store behaviors such as types of foods purchased and purchasing frequency, with which the study was not concerned. The hypotheses were that residents of low access areas would rate their healthy food availability and food shopping access as poorer, travel further distances to their primarily used food store, take fewer shopping trips per week, accrue more total shopping miles per week, and be more likely to shop at a supercenter and less likely to shop at the nearest store.

METHODS

Study Area and Food Environment Database

To recreate the food access measures in the sample, the researchers used data from a previously conducted field census of retail food outlets in 8 South Carolina counties, covering 169 Census tracts.¹⁴ This dataset was managed with ArcGIS 10.1 (Esri, Redlands, CA, 2012) and included geospatial information and store type attributes on all retail food outlets located in 1 urban and 7 rural counties. Of the 2,208 total food

outlets, 102 supermarkets and large grocery stores were used to derive the CFA measures.

Community Food Access Measures

Using the data described above¹⁴ and 2010 US Census data,¹⁵ the 2 measures of CFA were replicated for the study area.

The CDC HFRT measure identifies whether a Census tract has a supermarket, large grocery store, warehouse club, or fruit and vegetable market within the tract or within 0.5 miles of the boundary.¹⁰ Supermarkets are defined as food stores with ≥ 50 annual payroll employees, whereas large grocery stores have 10–49 employees. To compare the CDC definition with the USDA ERS definition described subsequently, the focus was on non-HFRTs. The replication of this measure relied on supermarkets, large grocery stores, and fruit and vegetable markets, and used 2010 Census geographies, identifying 49 of 169 Census tracts as non-HFRTs.

For the USDA ERS FD measure, a Census tract was identified as a low-income tract if it met the US Treasury Department's New Market Tax Credit program eligibility criteria (ie, a poverty rate of at least 20%, a median family income $< 80\%$ of the statewide median family income for tracts in non-metropolitan areas, or a median family income $< 80\%$ of the metropolitan area median family income for tracts in metropolitan areas).^{8,12} The Census tract also had to be low-access, such that at least 500 residents or 33% of the tract population resided > 1 mile from a supermarket in an urban tract or > 10 miles in a rural tract, based on Euclidean distance. The USDA ERS defined a supermarket as a retailer that must have at least \$2 million in annual sales and contain the major food departments.^{8,12} To evaluate the access and income criterion, population and economic data were derived from the 0.5×0.5 -km gridded population estimates. The replication of this measure identified 38 of 169 Census tracts as FDs and relied on supermarkets, large grocery stores, and warehouse clubs and 2010 census geographies.

Both CFA measures were replicated based on accurate ground-truthed data^{14,16} instead of using the secondary commercial databases underlying the agency publications.^{9,10} This was because the food environment data were more accurate^{14,17} and collected closer in time (ie, 2009) to the point of data collection on the study sample (ie, 2010). In addition, a 10-mile buffer corridor was created around the study area, using InfoUSA (Papillion, NE) and Dun & Bradstreet (Short Hills, NJ) commercial data, to account for edge effects owing to food stores that could lie outside the boundaries of the study area.

Study Sample

The University of South Carolina Institutional Review Board reviewed and approved the study's protocol. Data on residents' perceptions and shopping behaviors were obtained via telephone interviews of 968 residents of the 8 counties. The University of South Carolina Survey Research Laboratory sampled 2,477 phone numbers, which were a simple random sample of publicly available listed phone numbers, representing households of 64 zip codes in the 169 Census tracts. Respondents had to be ≥ 18 years of age and the primary food shopper of the household, speak English, and reside within the study area boundaries. The estimated response rate, after using American Association for Public Opinion Research Response Rate Formula 4,¹⁸ was 47.1%. Respondent data were geocoded and linked to the geo-spatial data, so that each participant was assigned to her or his residential Census tract's designation according to the USDA ERS⁸ and CDC.¹⁰

Assessment of Food Shopping Behaviors and Perceptions of Healthy Food Availability

Study respondents were asked to name their primary food store and describe the store type, their reasons for shopping at that store, and how often they shopped. The primary food stores were identified in a

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