POTENTIAL AND REALIZED FOOD ENVIRONMENTS:

AN APPLICATION OF THE SOCIAL COGNITIVE

THEORY IN ALABAMA FOOD DESERTS

by

ALISHA GAINES

LINDA KNOL, COMMITTEE CO-CHAIR
LORI TURNER, COMMITTEE CO-CHAIR
JASON DECARO
JAMES LEEPER
STUART USDAN

A DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the Department of Health Science
in the Graduate School of
The University of Alabama

TUSCALOOSA, ALABAMA

2014

ABSTRACT

Evidence from the United States (US) suggests that low-income, racial/ethnic minority, and rural populations often live in food deserts – areas underserved by grocery stores. Food deserts increase risk for diet-related disease among already at-risk populations; however, food access research has often included limited types of food outlets and has made assumptions about individual food procurement patterns. Framed by the Social Cognitive Theory, this mixed methods study was conducted in two phases in order to investigate Greene County, Alabama food retailers (potential environment) and assess residents' food access patterns (realized environment).

In Phase One, all county food retailers were identified and classified in order to describe variances in distribution between the two census tracts considered a food desert (FDT) by the US Department of Agriculture (USDA) and the non-food desert tract (NFDT). USDA designations were confirmed, meaning FDT did not have grocery stores. However, the NFDT contained more of almost every store type, contrasting research suggesting increased presence of other retailers, such as convenience stores and fast food restaurants, in the absence of grocery stores.

In Phase Two, semi-structured interviews were conducted in order to describe household food procurement patterns of 30 Greene County Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) participants, highlighting differences based on whether or not participants lived in a food desert. Patterns identified did not vary significantly based on residential area. Participants were utilizing 59% of county stores, identifying NFDT grocers and dollar stores as more important to meeting household food needs than FDT outlets. However,

53% of participants were leaving the county to do the bulk of their food shopping, using local stores to top off monthly food supply. Participants used a variety of shopping strategies, encountering a range of monetary and opportunity costs. Though not assessed directly, perception of Greene County stores was generally poor. Results demonstrate the value of using USDA food desert designations with in-depth exploration of potential food environments to best describe area foodscapes. Additionally, resident-informed data describing realized food environments can support research about residential attitudes and perceptions to inform food desert solutions.

DEDICATION

This dissertation is dedicated to the women of Greene County, who were not only kind and generous project participants, but also courageous examples of strength, perseverance, and pride. May we always strive to include such voices in personal and professional perspectives.

LIST OF ABBREVIATIONS

AL – Alabama

ADPH – Alabama Department of Public Health

CDC – Centers for Disease Control and Prevention

BMI – Body mass index

BRFSS – Behavioral Risk Factor Surveillance Survey

ERS – United States Department of Agriculture Economic Research Service

FDT – Food desert tract

FNS – United States Department of Agriculture Food and Nutrition Service

FSS – Food Security Supplement

GPS – Global positioning system

HFFI – Health Food Financing Initiative

HFSSM – Household Food Security Survey Module

HP2020 – Healthy People 2020

LSRO – The Life Sciences Research Office of the Federation of American Societies for Experimental Biology

NAICS – North America Industry Classification System

NC – North Carolina

NFDT – Non-food desert tract

NHANES – National Health and Nutrition Examination Survey

NY – New York

MD – Maryland

PI – Principal investigator

SC – South Carolina

SCT – Social Cognitive Theory

SEDAC – Socioeconomic Data and Applications Center

SNAP – Supplemental Nutrition Assistance Program (formerly known as Food Stamps)

TX - Texas

UK – United Kingdom

US – United States

USDA – United States Department of Agriculture

USDHHS – United States Department of Health and Human Services

WIC – Special Supplemental Nutrition Program for Women, Infants, and Children

ACKNOWLEDGMENTS

I am grateful to have this opportunity to thank my committee members, Drs. Linda Knol, Lori Turner, Jason DeCaro, James Leeper, and Stuart Usdan for their expertise, feedback, and commitment to this dissertation. Thank you to my co-chairs, Dr. Linda Knol and Dr. Lori Turner, for their support and guidance throughout all phases of this project. Special thanks to Dr. Olivia Kendrick for serving as a constant source of encouragement and inspiration. Thank you also to Jasmine Bush for her help with unglamorous tasks that made the project function. I am indebted and forever grateful to Greene County Health Department Staff, including Rene Cole, Julia Henley, and Dorrinda Jones, without whom this project would have been impossible. Lastly, thank you to the unwavering faith of loved ones whose sacrifices and support I will strive to repay as best I can, for as long as I can.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Evidence suggests that population subgroups including racial/ethnic minorities, socioeconomically disadvantaged individuals, and residents of rural areas are at increased risk for health-threatening conditions such as overweight and obesity, cardiovascular disease, and diabetes, and are less likely to have health insurance (National Research Council, 2004; United States Department Health and Human Services Agency for Healthcare Research and Quality, 2011). With the increased attention to such national public health issues has come the recognition of the environmental impact on individual health status. Local food environments have been identified as a potential route through which environments may contribute to health disparities, propelling forward the issue of environmental or spatial disparities, specifically access to nutritious food, in research and policy agendas within the last few decades (Beaulac, Kristjansson, & Cummins, 2009; Dutko, Ver Ploeg, & Farrigan, 2012).

Food Deserts as a Public Health Problem

The Food, Conservation, and Energy Act of 2008 defined a food desert as an "area in the United States with limited access to affordable and nutritious food, particularly such an area composed of predominately lower income neighborhoods and communities" (The Food, Conservation, and Energy Act of 2008, 2008, p. 2039). The United States Department of Agriculture (USDA) defines a food desert as a low-income census tract in which a significant portion of residents has low access to a supermarket or grocery store (USDA Economic Research Service [ERS], 2012a, 2012b).

Food deserts may contribute to a dangerous complex of health, developmental, and social consequences, and are of particular concern for low-income individuals and racial/ethnic minorities due to "deprivation amplification," or the compounding of individual and area disadvantage (Beaulac et al., 2009). Regardless of location, households with constrained financial resources or unreliable sources of transportation may have difficulty accessing and purchasing nutritious food, which may translate into poor health outcomes. Poor food access and poor health could be amplified among these individuals living in disadvantaged neighborhoods with limited food retail outlets, particularly if there is also limited public transportation (Ver Ploeg et al., 2009).

In line with the concept of deprivation amplification, the bulk of United States (US) literature indicates that low-income persons and racial/ethnic minorities living in urban city centers or in rural areas are most often affected by limited access to large food retailers and healthful food (Beaulac et al., 2009; Cummins & Macintyre, 1999; Ford & Dzewaltowski, 2008; Larson, Story, & Nelson, 2009; Ver Ploeg et al., 2009; Ver Ploeg et al., 2012; Walker, Keane, & Burke, 2010). These data also suggest that better access to food retailers that provide healthful food is associated with healthier dietary intake. A review of food access literature can be found in Appendix A.

To date, food desert research has largely focused on objectively characterizing select aspects of food retail environments in socioeconomically disadvantaged and/or minority areas, or has attempted to link distance from local food retailers with health effects such as dietary quality. Unfortunately, extensive data requirements are associated with assessment of food access, and the current body of food access literature is plagued with ambiguously defined operational concepts (Rose, Bodor, Hutchinson, & Swalm, 2009a) or lacks consideration of the

interrelationship between the food environment and social and individual factors (Lytle, 2009). For example, objective investigations of food environments have included limited types of food outlets and made assumptions about individual food procurement patterns. While some studies have involved residents of food deserts, current research in the US lacks in-depth characterization of food deserts as the result of research with residents.

Purpose and Significance

Physical and psychosocial damage to health resulting from deprived access to food warrants further research that involves the community in the characterization of food deserts. At the state and national levels, food deserts represent economic and food policy issues. Food desert research and subsequent solutions have the ability to generate more balanced purchasing power, to support local food systems, and to inform policy decisions aimed at increasing residential health and food security (Rose et al., 2009a, 2010), defined as the "availability of nutritionally adequate and safe food and the ability to acquire it in socially acceptable ways" (Anderson, 1990, p. 1560). Finally, if spatially segregated, low-income households experience food access problems and suffer health-related consequences related to limited access, then the effectiveness of programs designed to increase nutrition of vulnerable populations (the Special Supplemental Nutrition Program for Women Infants and Children, better known as WIC) or increase purchasing power of low-income persons (the Supplement Nutrition Assistance Program, previously known as food stamps and often called SNAP) is uncertain (Rose et al., 2009a).

Limited food desert research has been conducted in rural areas and in the Southeastern US. To date, no peer-reviewed, published research has been conducted in Alabama, an area leading the nation in poverty, food insecurity, and chronic disease (Centers for Disease Control and Prevention [CDC], 2012a, 2012b; Coleman-Jensen, Nord, Andrews, & Carlson, 2012;

DeNavas-Walt, Proctor, & Smith, 2011; Ogden, Carroll, Kit, & Flegal, 2012). Specifically, Greene County, located in west Alabama, is an area in which most residents represent racial/ethnic minorities and are experiencing poverty rates above both national and state averages (US Census Bureau [Census], 2012a, 2012b). According to the USDA Food Access Research Atlas, two of the three census tracts in Greene County are food deserts (ERS, 2012a, 2012b). The purpose of this study was to provide insight into the link between individual and environmental health in Greene County, Alabama by evaluating the county food environment and assessing residents' food access patterns.

Food deserts have received increased attention from media, researchers, and governmental initiatives. For example, the *Let's Move* campaign initiated by First Lady Michelle Obama identifies access to nutritious foods one of five pillars to address childhood obesity (Let's Move, 2010). The plan includes the Healthy Food Financing Initiative to fund expansion of food availability within food deserts by developing (or equipping) grocery stores, small food retailers, corner and convenience stores, and farmers markets with fresh, healthful food. This organization was responsible for developing the definition of a food desert used by USDA. To date, no studies outside the agency have used this definition to investigate or compare areas of interest.

Additionally, national interest in eliminating health disparities and improving food security is highlighted in *Healthy People 2020* (US Department of Health and Human Services [USDHHS], 2012a). The US Surgeon General's 1979 report *Healthy People* initiated the release of ten-year national health objectives designed to identify the most significant, preventable threats to public health and to establish goals to reduce these threats. The overarching goals of the most recent report, *Healthy People 2020* (HP2020), build on initiatives of the past four *Healthy People* reports and include health equity and elimination of health disparities as well as

the creation of social and physical environments that enable good health. In fact, within HP2020, availability and access to nutritious food is identified as a determinant of health.

HP2020 includes 42 areas of focus and approximately 600 objectives (USDHHS, 2012a). Within the Nutrition and Weight topic area are several objectives related to food access, including a push to increase the number of Americans with access to a food retail outlet offering a variety of foods encouraged by the *Dietary Guidelines for Americans, 2005* (USDHHS & USDA, 2005) and a goal to have at least 18 states with state-level policies to incentivize food retail outlets in order to provide foods encouraged by the *Dietary Guidelines* (USDHHS, 2012b). Further, an objective to decrease hunger by reducing household food insecurity from 14.8% in 2008 to 6.0% by 2020 is included.

Lastly, local solutions to food desert issues have outpaced research-based evaluation of food desert needs and intervention outcomes. Attracting new grocery stores, mobile grocers, and farmer's markets are among strategies reported to alleviate poor food access in food deserts (Guzzardi, 2011; Horn, 2011; Public Health Law and Policy, 2009). However, research is needed to better inform current and future food desert interventions, especially in rural areas. Insight into life within a food desert, including resident perspective, would be a valuable addition to the knowledge base from which intervention and policy decisions can be made.

Research Questions

1. Does food retail density (the number of each type of food retail outlet per 1000 residents) in Greene County census tracts differ based on USDA food desert classification?
2. Does food retail density (the number of each type of food retail outlet per square mile) in Greene County census tracts differ based on USDA food desert classification?
3. What are the household food procurement patterns of Greene County WIC participants?
4. Do household food procurement patterns of Greene County WIC participants differ based on whether or not participants live in a food desert?

Theoretical Framework

The Social Cognitive Theory (SCT) is an interpersonal health behavior theory that includes an overarching concept called reciprocal determinism – a triadic model that posits a simultaneous, reciprocal interaction exists among a person's individual characteristics, their behaviors, and their environment (Bandura, 1986). Therefore, change in one component has implications for the other two components (McAlister, Perry, & Parcel, 2008). It can be hypothesized that individual and household characteristics, combined with the impact of the physical environment, determine food availability within the home and dietary decisions (Ver Ploeg et al., 2009). Individual characteristics include demographics such as age, gender, race/ethnicity; socioeconomic status, encompassing income, education, and employment status; and household characteristics like family size, composition, and presence of children. The environment may refer to the food environment (the presence of stores, restaurants, etc.).

The factors of reciprocal determinism are impacted by the many other constructs of theory. This study included only some of the SCT constructs, and when possible utilized valid, reliable instruments in measurement of the constructs. SCT has been used extensively to examine multiple aspects of health behaviors (Story, Neumark-Stzainer, & French, 2002) and is relevant for studying how the local food environment and personal characteristics impact dietary behavior (Smith & Morton, 2009). This is the only food access research to use SCT explicitly, though several researchers have recognized the between interplay individuals and environments (Glanz, 2009; Glanz, Sallis, Saelens, & Frank, 2005; Sharkey & Horel, 2008, 2009). Such ecological perspectives suggest that position within society has equal or greater effect on individual outcomes than individuals themselves (Freedman, 2009). SCT, however, balances the burden between the individual and the environment.

Overview of Methods

This cross-sectional, mixed methods project was conducted in two phases. In Phase 1, all food retailers in Greene County were located in order to describe the potential food environment in terms of food retail coverage and density – the number and type of stores in the county and within each census tract. Inter-tract data were also compared in order to describe differences based on food desert classification of the tracts. In Phase 2, semi-structured, qualitative interviews were conducted with adult women participating in WIC, a low-income population considered at increased risk for poor nutritional health (USDA Food and Nutrition Service, 2012a). Using a semi-structured interview schedule, these women described their realized food environment and food access patterns. Participants were asked specifically about sources of food for their household and foods obtained from those sources, and they were asked to describe typical trips to and from such sources. Immediately following the interview, several participants were also asked to review a paper-and-pencil survey created to assess food shopping patterns and associated sociodemographic characteristics. This review was conducted in order to evaluate face validity of the survey and help gauge logistics for future administration. A full description of methodology can be found in Appendix B.

Limitations

The cross-sectional nature of the project limits inferences about causality, a common problem of food desert literature (Beaulac et al., 2009; Cummins & Macintyre, 1999; Ford & Dzewaltowski, 2008; Larson & Story, 2009; Larson et al., 2009; Ver Ploeg et al., 2009; Walker et al., 2010). However, continued exploration of understudied aspects of food deserts can provide worthwhile insight and help fill knowledge gaps. Additionally, the sample size of 30 participants from a likely homogenous group of low-income females will limit generalizability of findings.

Despite this limitation, results are rich data that contribute to the literature and knowledge base and can inform future projects with larger, more heterogeneous samples.

This study incorporated an assessment of available food outlets in all three Greene County census tracts. Though in-store assessment of available goods is an ideal method of describing the food environment, resource restraints of the current study limited in-depth assessment. Moreover, staff limitations and the lack of standardized, validated tools has produced variation in methods of assessment. Therefore, the project relied on the presence of food outlet types as a proxy for the availability of food groups, as is common in food access literature. Many studies have used presence of grocery stores or supermarkets as a proxy for the availability of healthful foods and the presence of fast food restaurants or convenience stores to characterize a food environment with little variety and few fresh goods (Beaulac et al., 2009; Cummins & Macintyre, 2002a; Ford & Dzewaltowski, 2008; Larson et al., 2009; Ver Ploeg et al., 2009; Walker et al., 2010). These assumptions were maintained in the present study, and the availability and price of goods within food outlets were not directly assessed.

As with any project relying on a self-selected sample providing self-reported data, recall bias or intentional misreporting was possible, especially when reporting food acquisition patterns that may have broached sensitive issues such as household hunger. However, in this case, resident perceptions are valuable and underreported. Assuring participants that personal information will not be identifiable or shared may have helped alleviate some reporting concerns.

Results from the examination of traditional and nontraditional stores in rural areas add to the literature, and participants in the semi-structured interview were asked to expand on all potential sources of food, allowing some qualitative discussion of the contribution of retail and

non-retail food sources such as shared food, emergency food, donations, and food personally grown, raised, hunted, or fished.

Delimitations

The study was limited in scope by the sample research area and persons that were considered eligible for participation. The area of study contained two rural, USDA-identified food desert census tracts and one tract that was not a food desert. Perspective was limited to only one county and to boundaries imposed by the USDA food desert definitions. Future studies could benefit from including more areas for comparison.

As mentioned, the proposed incorporated an assessment of available food retail outlets. Food and nutrition environments are undoubtedly complex and encompass realms including information and media messages, economic effects, organizational influences of work or school, larger effects of state and national policies (Glanz, et al., 2005). It was, however, beyond the scope of the current study to assess all aspects of the food environment.

Only women participating in the WIC program (thus, low-income individuals with children) were eligible for participation. These individuals likely experience greater burdens in planning and executing food purchases (Coleman-Jensen et al., 2012). They, therefore, are expected to benefit more from food desert interventions, making their input especially valuable, despite limited generalizability to experiences of homes without children, homes of older adults only, or to households that do not receive federal food assistance.

Conceptual Definitions

- *Census tract* – A small, relatively permanent subdivision of a county generally containing 1,000-8,000 people (ERS, 2012b).
    - *Low-income census tract* – A census tract with a poverty rate of at least 20 %, or, for tracts not located within a metropolitan area, in which the median family income for the tract does not exceed 80 % of statewide median family income.
- *Deprivation amplification* – The process by which individual disadvantage is intensified by area disadvantage (Macintyre, 2007).
- *Foodscape* – A term used to refer to area food environments (Cummins & Macintyre, 2002b).
- *Food access* – A multicomponent concept broadly defined as the ability of an individual or household to find and acquire food. Food access has been interpreted various ways, i.e. the availability of food retailers in a given area, distance of retailers from residential areas, and the ability of individuals to access food retailers (physically, financially, or otherwise). However, no single measure can fully describe accessibility (Apparicio, Cloutier, & Shearmur, 2007; Rose et al., 2009a).
- *Food environment* – The availability of types of food or types of food retailers in individuals' external, physical environments (Sharkey & Horel, 2008, 2009).
    - *Potential food environment* –Shopping opportunities that are available.
    - *Realized food environment* – Shopping opportunities that are utilized.
- *Food retail coverage* – A dimension of accessibility to food stores. The number of each type of store within a specified area (Sharkey & Horel, 2008).

- *Food retail density* – A dimension of accessibility to food stores. The proportion or ratio of food stores per county, census tract, or census block group (Sharkey & Horel, 2008). In the present study, the number of each type of food retail outlet per 100 residents presented for each of the three census tracts.
- *Food retailer* – An entity that offers food to consumers at fixed point-of-sale locations. There are several varieties, defined by the types of foods available for purchase, the size of the physical store, or the volume of business conducted. (Sharkey, 2009; Sharkey & Horel, 2009; Census, 2012a).
    - *Large food retailer* – Supermarkets or grocery stores that carry a wide range of food items, often large in size and generating a large volume of sales.
    - *Small food retailer* – Stores that carry a limited range of goods, offered in small spaces, often at higher prices than large retailers, e.g. corner stores, bodegas, etc.
- *Food security* – Access by all people, at all times, to sufficient food for an active and healthy life. This includes, at minimum, the ready availability of nutritionally adequate and safe foods and an assured availability to acquire acceptable foods in socially acceptable ways (Anderson, 1990, p. 1560).
- *Food insecurity* – Limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways (Anderson, 1990, p. 1560).
- *Food desert* – An area in the United States with limited access to affordable and nutritious food, particularly such an area composed of predominately lower income neighborhoods and communities (The Food, Conservation, and Energy Act of 2008, 2008, p. 2039).

- *Free listing* – A qualitative technique used to get participants to list as many items they can in a particular domain, helpful when describing new domains (Bernard, 2011).
- *Grocery store gaps* or *grocery gaps* – The observed lack of supermarkets or grocery stores in urban city centers, used to highlight differences in retail environments that may contribute to or exacerbate health disparities (Alwitt & Donley, 1997; Cotterill & Franklin, 1995). The term "food desert" is now commonly used to describe this phenomenon in urban and rural areas (The Food, Conservation, and Energy Act of 2008, 2008, p. 2039).
- *Ground truthing* – Gathering data by direct, in-person observation within the area of interest (Glanz et al., 2005; Larson et al., 2009). In this study, street canvasing of food retailers, accomplished by systematically driving all national and state highways and city or town streets/roads within Greene County.
- *Health disparities* – "Differences in the incidence, prevalence, mortality and burden of diseases and other adverse health conditions that exist among specific populations in the United States" (National Institutes of Health, 2002).
- *Household food security status* – The food security status of each household lies somewhere along a continuum extending from high food security to very low food security (ERS, 2012c). This continuum is divided into four ranges, characterized as follows:
    - *High food security* – Households had no problems, or anxiety about, consistently accessing adequate food.
    - *Marginal food security* – Households had problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced.

    - *Low food security* – Households reduced the quality, variety, and desirability of their diets, but the quantity of food intake and normal eating patterns were not substantially disrupted.
    - *Very low food security* – Eating patterns of one or more household members were disrupted and food intake reduced because the household lacked money and other resources for food.

- *Hunger* – "An uneasy or painful sensation caused by a lack of food" (National Research Council, 2006). Hunger is a potential, but not necessary, consequence of food insecurity and is therefore not used synonymously with the term.
- *The Social Cognitive Theory* – An interpersonal health behavior theory that positions human behavior as a product of the dynamic, reciprocal interplay between personal, behavioral, and environmental influences (Bandura, 1986; McAlister et al., 2008).
- *Spatial inequalities or spatial disparities* – Terms are used in reference to the unequal geographic distribution of products or services, most often used in relation those that promote health, such as healthcare facilities, food retailers offering reasonably fruits and vegetables, etc. (Beaulac, et al., 2009).
- *Supermarket redlining* – Following economic decline of urban city centers and emigration of affluent households from these areas, the phenomenon of decreased food retail stores in inner city areas as city markets were forced to close or to follow the shift in customer base to suburban locations (Alwitt & Donely, 1997; Walker, et al., 2010).

CHAPTER 2

POTENTIAL FOOD ENVIRONMENTS: DISTRIBUTION OF FOOD RETAIL OUTLETS IN GREENE COUNTY, ALABAMA

Introduction

The Food, Conservation, and Energy Act of 2008 defined a food desert as an "area in the United States with limited access to affordable and nutritious food, particularly such an area composed of predominately lower income neighborhoods and communities" (The Food, Conservation, and Energy Act of 2008, p. 2039). Limited access to healthful foods could contribute to increased risk of nutrition-related disease among already at-risk populations, a phenomenon called deprivation amplification (Beaulac, Kristjansson, & Cummins, 2009; Dutko, Ver Ploeg, & Farrigan, 2012; Macintyre, 2007; Winkler, Turrell, & Patterson, 2006). In line with this concept, the bulk of United States (US) literature indicates that low-income persons and racial/ethnic minorities living in urban city centers or in rural areas are most often affected by limited access to large food retailers such as supermarkets, both in decreased numbers of stores and decreased proximity to these stores (Beaulac et al., 2009; Cummins & Macintyre, 1999; Ford & Dzewaltowski, 2008; Larson, Story, & Nelson, 2009; Ver Ploeg et al., 2009; Walker, Keane, & Burke, 2010). These populations may also have increased access to fast food restaurants and convenience stores, further increasing risk for poor dietary quality (Baker, Schootman, Barnidge, & Kelly, 2006; Block & Kouba, 2005; Galvez et al., 2007; Lewis et al., 2005; Powell, Slater, Mirtcheva, Bao, & Chaloupka, 2007).

Food access studies have largely been conducted in urban areas, though evidence suggests rural areas are heavily affected by spatial inequalities in food retailers (Bustillos, Sharkey, Anding, & McIntosh, 2009; Kaufman, MacDonald, Lutz, & Smallwood, 1997; Liese, Weis, Pluto, Smith, & Lawson, 2007; Sharkey & Horel, 2008, 2009). This problem is compounded by general lack of public transportation systems in rural communities (Blanchard & Lyson, 2003; Ohls, Ponza, Moreno, Zambrowski, & Cohen, 1999). Additionally, most access studies have included few store types, typically supermarkets/large grocery stores (Beaulac et al., 2009; Larson et al., 2009). Such assessments underestimate food availability and could misrepresent food significantly contributing to local diets, especially in rural areas where smaller retailers may meet residential food needs (Bodor Rose, Farley, Swalm, & Scott, 2007; Sharkey, 2009; Sharkey & Horel, 2008, 2009).

Further, food retail access can be affected by the availability of stores authorized to receive federal nutrition assistance benefits (Ohls, et al., 1999; Rose & Richards, 2004; Ver Ploeg et al., 2009) such as Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and the Supplemental Nutrition Assistance Program (SNAP). Therefore, including all available food retail outlets in investigations of rural food environments, with consideration of the distribution of SNAP and WIC stores, are important considerations for future food access research (Rigby et al., 2012).

There are many indicators of food access, though common measures include store coverage (the number of each type of store within a specified area) and density (the number of stores per geographic area or per number of residents) (Apparicio, Cloutier, & Shearmur, 2007; Moore, Diez Roux, Nettleton, & Jacobs, 2008; Morland, Wing, Diez Roux, & Poole, 2002; Sharkey & Horel, 2008). The US Department of Agriculture (USDA) Economic Research

Service (ERS) Food Access Research Atlas is a mapping tool that provides an overview of the location of food deserts throughout the US; however, no extra-agency studies have used the Atlas to characterize local food environments (Dutko, Ver Ploeg, & Farrington 2012; ERS, 2012, 2013). Lastly, there is a general consensus about the merit of combining secondary data with ground truthing to ensure accurate representation, especially in rural areas (Glanz, Sallis, Saelens, & Frank, 2005; Larson et al., 2009; Liese et al., 2010; Lucan et al., 2013; Rose, Bodor, Hutchinson, & Swalm, 2010). Ground truthing involves in-person street canvassing of food retailers. An investigation of all food retailer types, using ground truthing within Atlas-defined areas, could serve to further characterize food desert areas and provide insight into the value of the Atlas. Therefore, the purpose of this study was to investigate the food retail environment in one rural Alabama county by assessing food retail coverage (the number of food retailers) and density [the number of food retailers per square mile (mi^2) and per 1000 residents] in order to describe variances and confirm whether the food desert label is appropriate.

Methods

According to the Food Access Research Atlas, a food desert is a census tract that is both low-income (poverty rate ≥20%) and low-access. To qualify as low-access 500 residents (or 33% of the population) must live 'far' from a supermarket or large grocery store (Dutko, et al., 2012; ERS, 2012, 2013). The Atlas defines 'far' using 10- and 20-mile demarcations in rural areas, though the 10-mile measure was used in the present study. A full description of Atlas methodology can be found elsewhere (ERS, 2013a). Greene County, located in west Alabama, is an area in which most residents are racial/ethnic minorities and experience poverty rates above both national and state averages (US Census Bureau [Census], 2012a). Using Atlas criteria, two of the three census tracts in Greene County are considered food desert tracts (FDT1 and FDT2)

(ERS, 2012, 2013). The third tract was labeled a non-food desert tract (NFDT). This county is unique in that those living in FDTs have similar demographic profiles as those living in the NFDT, thus differences of focus include population density and food access (Table 1).

Table 1: Greene County Area and Population Characteristics

Characteristic	*Greene County*	*FDT1*	*FDT2*	*NFDT*
Land area (mi^2)	645.9	232.5	219.9	193.5
Population n (% Female)	9045 (52.8%)	1814 (53.4)	2821 (51.5)	4410 (53.3)
Median age (years)	41.8	43.2	40.9	42.1
Racial/Ethnic composition n (%)				
White:	1575 (17.4)	309 (17.0)	459 (16.3)	807 (18.3)
Black:	7370 (81.5)	1489 (82.1)	2337 (82.8)	3544 (80.4)
Native American:	17 (0.2)	9 (0.5)	4 (0.1)	4 (0.1)
Asian:	15 (0.2)	2 (0.1)	0 (0.0)	13 (0.3)
Hispanic/Latino, any race:	69 (0.8)	13 (0.7)	11 (0.4)	45 (1.0)
Education (%)				
<High school	27.4	21.9	25.8	30.7
High school/equivalent	36.9	42.6	41.0	32.1
>High school	35.7	35.5	33.2	37.2
Individuals in poverty (%) (% Families with children aged <5 years in poverty)	30.8 (58.6)	32.4 (*)	30.4 (51.6)	30.4 (66.7)
Unemployed (%)	21.9	24.7	23.2	20.1
Individuals with low income and low access n (%)	1895.3 (21.0)	861.4 (47.5)	762.2 (27.0)	271.7 (6.2)

(Census, 2012c; ERS, 2012, 2013)
*Data unavailable

An environmental audit in all three Greene County census tracts was conducted in order to locate and enumerate all food retail stores. The Food Access Research Atlas was used to gather information about the census tracts prior to the environmental audit (ERS, 2012, 2013). An Excel database (Version 14.4.1, Microsoft Corporation, Redmond, WA, 2010) of all food outlets was created by triangulating data from lists for food licenses from the Greene County Health Department, the telephone book and Yellow Pages, and data from ground truthing each census tract. Latitude and longitude of each location was determined by a handheld GPS device,

and the location photographed for documentation. This step eliminated duplicate visits to a single retailer, allowed for detailed documentation of locations with absent or poorly marked street addresses, and provided data used for geocoding. At each store visit, store contents were briefly examined to verify the presence of food and to assist with store classification. Store managers/staff were asked for permission to scan the store and photograph the storefront.

Each food retailer was classified according to adapted North America Industry Classification Systems (NAICS) codes for business establishments (Census, 2012b). A system created by Bustillos et al. (2009) and Sharkey and Horel (2008) in rural Texas (TX) was adapted to include five retail categories with various store types based on definitions provided by NAICS and USDA (Census, 2012b; Leibtag, 2005). (See Table 2.) Enumerated results (coverage) were used to create ten retail food outlet density variables – the number of each of the retailer categories within each tract, presented a) per square mile, as is common in food access literature, and b) per 1000 residents to account for differences in population density (Apparicio et al., 2007; Sharkey, 2009; Sharkey & Horel, 2009). Outlets were mapped using Google Fusion (Google, Inc., Mountain View, CA, 2014).

Results

Forty-seven food retail outlets were identified in Greene County: five traditional stores (10.6% of all stores), 20 convenience stores (42.3%), four non-traditional stores (8.5%), and 18 restaurants (38.3%). Area density was 0.07 store/mi^2, and per capita density was 5.2 stores/1000 residents. Two of the five traditional stores were grocery stores (4.3% of all stores). Ten of the 18 restaurants in the county (55.6% of restaurants, 21.3% of total stores) were limited service outlets, including two national chains.

Table 2: Adapted NAICS Food Retailer Classification System

Category	*Type*	*Description*	*Examples*
Traditional	Grocery Stores, Supermarkets, and Superstores	Full line of groceries, meat, and produce and frequently include a deli and bakery. Superstores are larger versions of conventional supermarkets with increased selling area and increased number of items. Offer an expanded selection of non-food items and general merchandise.	Piggly Wiggly Winn-Dixie, Publix, Bruno's
	Specialty Stores	Specific food category, such as organic, locally grown or produced, ethnic/international, or health-focused.	Meat markets, fish and seafood markets, fruit and vegetable markets,
Convenience Store	Convenience Stores	Small stores retailing a limited line of goods that generally includes milk, bread, soda, and snacks.	Corner stores, gasoline stations with food marts
Non-traditional	Dollar stores	Limited assortment stores with a variety of general merchandise, including some food products, at low prices.	Dollar General, The Dollar Store, Family Dollar, Super Dollar Store
	Pharmacies/Drug stores	Retailing prescription or nonprescription drugs and medicines, and, increasingly, food products.	Walgreens, CVS, Rite Aid
Mass merchandiser	Mass merchandisers	Primarily sell household items, electronic goods, and apparel, but also offer packaged foods.	K Mart, Wal-Mart
	Supercenters	Combinations of large food-drug stores and mass merchandisers. Offer a wide variety of food and nonfood merchandise.	Wal-Mart Supercenter, Super Target
	Wholesale clubs	Membership retail/wholesale hybrids with a limited variety of products in a warehouse-type environment with large sizes and bulk packaging.	Sam's Club, BJ's Wholesale Club, Costco
Restaurant	Limited service	Patrons select items and pay before eating. Meals may be consumed on premises, taken out, or delivered. Includes snack bars.	McDonald's Subway, food trucks
	Full-service	Patrons order and pay after eating. Servers are generally present. Includes cafeterias and buffets.	Pizza Hut, Applebee's, Ryan's

Adapted from Leibtag (2005) and Census (2012a).

The distribution of all store types, with SNAP-authorized vendors highlighted, is depicted in Figure 1 (Alabama Department of Public Health, 2013 [ADPH]; USDA Food and Nutrition Service [FNS], 2013). Many stores were located along interstates and important county roads, and/or were located in major cities. Table 3 includes coverage and density results for each individual store type, by census tract. Because there were no mass merchandisers in the county, the category was excluded from further discussion. Only one food retail outlet – a produce and meat market – was located in FDT1. FDT2 had 13 stores (27.7% of county stores); however, no grocery stores were present, and the tract included only restaurants, convenience stores, and specialty stores - two small fish markets. The NFDT included 70.2% of all county food retail outlets. With the exception of traditional stores, this tract had more of each store category, compared with the FTDs. However, both grocery stores were located in the NFDT, and specialty stores accounted for this exception.

There was also variation in the distribution of retailers authorized to accept federal food assistance benefits (ADPH, 2013; FNS, 2013). The NFDT contained the only WIC vendors in the county (grocery stores), and 12 of the 16 (75%) SNAP-authorized stores. Ten of the county's SNAP-authorized stores were convenience stores, and eight (80%) were located in the NFDT. (Two of the three dollar stores and both grocery stores in the NFDT accounted for the other four SNAP stores in NFDT.) The other four SNAP retailers in the county were two convenience stores located in FDT2 and two specialty stores, one in each of the FDTs.

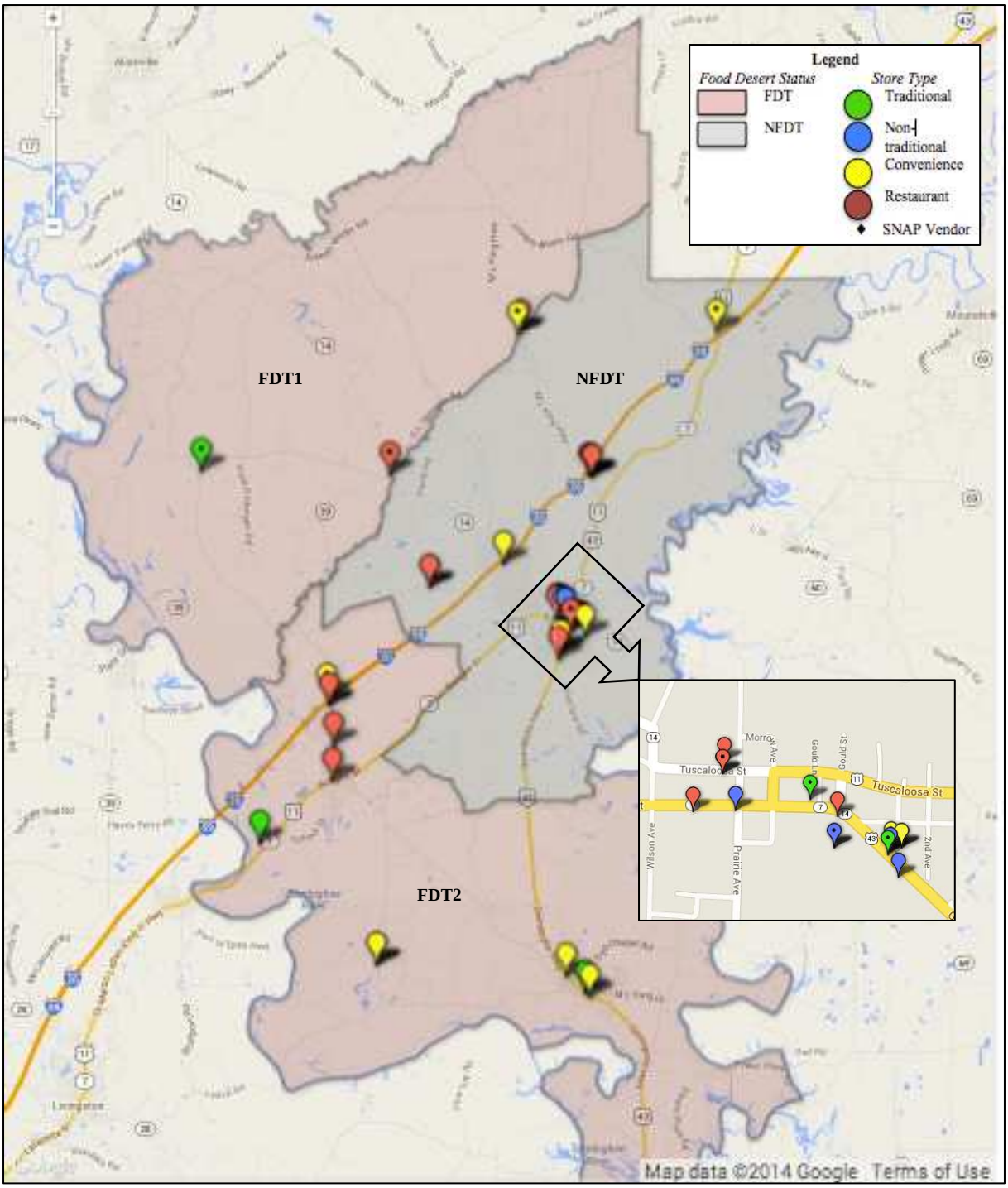

Figure 1: Distribution of Store Types

Table 3: Food Retail Outlet Coverage and Densities, by Census Tract

	Store Coverage (n Stores)			*Area Density (Stores/Tract mi^2)*			*Per Capita Density (Stores/1000 residents)*		
	FDT1	*FDT2*	*NFDT*	*FDT1*	*FDT2*	*NFDT*	*FDT1*	*FDT2*	*NFDT*
Traditional	*1*	*2*	*2*	*0.004*	*0.01*	*0.01*	*0.55*	*0.71*	*0.45*
Grocery	0	0	2	0.00	0.00	0.01	0.00	0.00	0.45
Specialty	1	2	0	0.004	0.01	0.00	0.55	0.71	0.00
Convenience	*0*	*6*	*14*	*0.00*	*0.03*	*0.07*	*0.00*	*2.13*	*3.17*
Nontraditional	*0*	*0*	*4*	*0.00*	*0.00*	*0.03*	*0.00*	*0.00*	*0.91*
Dollar Stores	0	0	3	0.00	0.00	0.02	0.00	0.00	0.68
Pharmacies	0	0	1	0.00	0.00	0.01	0.00	0.00	0.23
Restaurants	*0*	*5*	*13*	*0.00*	*0.02*	*0.07*	*0.00*	*1.77*	*2.94*
Limited svc.	0	2	8	0.00	0.01	0.04	0.00	0.71	1.81
Full-service	0	3	5	0.00	0.01	0.03	0.00	1.06	1.13
Total	*1*	*13*	*33*	*0.004*	*0.06*	*0.17*	*0.55*	*4.61*	*7.48*

Discussion

Ground truthing helped verify USDA food desert designations in this rural area. Little is known about the degree public data within a rural area may misrepresent the food environment (Sharkey & Horel, 2008), and combinations of Health Department licensing data with ground truthing was essential in identifying retailers often listed at various addresses and often operating within poorly identified buildings. This method also helped to describe the severity of the problem. In this study, approximately 18% of low-income Greene County residents lived at least 10 miles from a grocery store, and 20% of the total population lived in an area served only by a fruit, vegetable, and meat market.

Total area density of Greene County stores was low, similar to that of a study completed in a rural South Carolina (SC) county (Liese et al., 2007), though both were low compared with densities reported in predominately urban census tracts in North Carolina, Maryland, and New York[1] (Moore & Diez Roux, 2006). Per capita density of grocery stores was also lower in Greene County. Grocery stores accounted for 6.9% of retailers with restaurants excluded, lower than

[1] Food access research lacks density reports from rural areas similar to Greene County, thus available data were used for comparisons.

previous reports of 10.8-26.0% in rural counties of SC and Texas (TX) (Liese et al. 2007; Sharkey & Horel, 2008; Bustillos et al., 2009). Data from this study align with research that has demonstrated rural areas are frequently underserved by grocery stores (Beaulac et al., 2009; Kaufman et al., 1997; Larson et al., 2009; Morris, Bellinger, & Haas, 1990; Powell et al., 2007).

Though store type and distribution varied, per capita density of other store types was substantially higher than literature findings, pointing to the importance of considering population density (Liese et al., 2007; Moore & Diez Roux, 2006). Convenience stores accounted for the bulk of this difference, though the total percentage of outlets that were convenience stores was similar to other reports (69.0% vs. 70-74% in rural areas of SC and TX) (Bustillos et al., 2009; Liese et al., 2007; Sharkey & Horel, 2008). Results of this study support research that has suggested that rural areas often have a larger number of nontraditional food stores, due in part to lower population densities (Hale, 2004; Sharkey, 2009).

In addition, brief observation during ground truthing revealed variation in products offered. For example, several convenience stores also served fast food-type products. Creel et al. (2008) and Sharkey et al. (2011) were the first to document multiple retail sources of fast food in a large rural area of TX, including convenience stores. Hale (2004) has called these muddled lines among foodservice venues “channel blurring,” though no studies have incorporated this phenomenon into an NAICS system. In the present study, seven channel-blurring outlets in which the limited service area had a separate food license were counted twice (i.e., once as a convenience store and once as a limited service restaurant).

Intra-county comparisons contrasted literature suggesting increased presence of smaller, non-traditional stores and fast food restaurants in FDTs (Lewis et al., 2005; Powell et al., 2007). Convenience stores and limited service restaurants (often the same locations) and non-traditional

outlets accounted for the larger differences among tracts, though most were located in the NFDT. The NFDT contained more of each store subcategory, with the exception of specialty stores and full-service restaurants, and it was the exclusive location for grocery stores and dollar stores, store types most used for household food shopping (Ohls et al., 1999). Additionally, the specialty stores (fish and produce markets) would likely not be sufficient for household food shopping. Rose et al. (2009) have suggested the metaphor "food swamp" instead of "food desert" for low-income areas in which convenience stores and fast food restaurants are disproportionately located, as foods of low nutritional value "swamp out" any healthful choices in these areas. Data from the present study suggest that "food desert" is appropriate for some rural areas, and highlight the concept that all food deserts are not equal.

Many food retailers were located along major interstates and highways, or within larger cities. The most populated city and county seat was located in the NFDT, was home to all grocery and dollar stores, and was located on a well-traveled state highway. Future research and food desert solutions may benefit from analysis of roadways and travel patterns throughout the county.

Lastly, disparate distribution of stores was accompanied by variance in the distribution of retailers authorized to accept SNAP and WIC benefits (ADPH, 2013; FNS 2013). Residents of NFDT had access both to a higher number and increased variety of stores authorized to accept benefits, including grocery stores, convenience stores, and dollar stores. Food retail access can be affected by the availability of SNAP- and WIC-authorized stores (Ver Ploeg et al., 2009), and Ohls et al. (1999) reported that over one-third of SNAP recipients shop outside their neighborhoods, in part due to lack of local SNAP-authorized stores.

Limitations

Results are representative of one rural Alabama county, thus the ability to generalize is limited. However, the Food Access Research Atlas defines food deserts using the presence of grocery stores alone, reflective of the limited ability to fully characterize local food environments at the national level and pointing to the importance of more localized investigations, especially when considering area efforts to address limited food access. Additionally, content of food retail outlets was not assessed. Multidimensional measures, such as combinations of enumeration and location of food stores with in-store assessments, are generally preferable (Rose et al., 2010). However, considering staff limitations and the general lack of valid instrumentation (Glanz, 2009, Glanz et al., 2005; Ohri-Vachaspati & Leviton, 2010; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008), a more thorough investigation of the local food environment was beyond the scope of the current study. Also, the presence of food retailers is often used as a proxy for the availability and price of food because there is reasonable correlation between store type, food offered, and food price (Larson et al., 2009; Ver Ploeg et al., 2009; Walker et al., 2010).

Conclusions and Implications

The present study aligns with previous research that has demonstrated low access to supermarkets and high access to convenience stores in low-income rural counties. Intra-county comparisons indicated the NFDT encompassed more stores and store types than FDTs. Increased limited service/fast food outlets were not found in FDTs, though channel blurring convenience stores may increasingly act as fast food stand-ins in all areas of study. Investigation of the availability and variety of foods with all area stores should acknowledge changing store types and utilize multiple methods including ground truthing. This disparate distribution of food stores

was accompanied by disparate distribution of WIC vendors and SNAP-authorized retailers. FDTs embodied the food desert concept and demonstrated the need to consider unique food access solutions in such areas. For effective interventions, a critical next step in food desert research includes the pairing of food environment data with information regarding residential food access patterns. Research involving area residents is warranted, and is further described in Chapter 3.

References

Alabama Department of Public Health. (2013). Alabama Vendor List. Retrieved August 11, 2013 from http://www.adph.org/wic/assets/AlabamaVendorListbyCity.pdf.

Apparicio, P., Cloutier, M. S., & Shearmur, R. (2007). The case of Montreal's missing food deserts: Evaluation of accessibility to food supermarkets. *International Journal of Health Geographics, 6(4).* http://www.ij-healthgeographics.com/content/6/4.

Baker, E. A., Schootman, M., Barnidge, E., & Kelly, C. (2006) The role of race and poverty in access to foods that enable individuals to adhere to dietary guidelines. *Preventing Chronic Disease* [serial online]. Retreived January 21, 2012 from http://www.cdc.gov/pcd/issues/2006/ jul/05_0217.htm.

Beaulac, J., Kristjansson, E., & Cummins, S. (2009). A systematic review of food deserts, 1966-2007. *Preventing Chronic Disease* [serial online]. Retrieved January 21, 2012 from http://www.cdc.gov/pcd/issues/2009/jul/08_0163.htm.

Block, D., & Kouba, J. (2005). A comparison of the availability and affordability of a market basekt in two communities in the Chicago area. *Public Health Nutrition, 9(7),* 837-845.

Bodor, J. N., Rose, D., Farley, T. A., Swalm, C., & Scott, S. K. (2007). Neighbourhood fruit and vegetable availability and consumption: the role of small food stores in an urban environment. *Public Health Nutrition, 11(4),* 413-420.

Bustillos, B., Sharkey, J. R., Anding, J., & McIntosh, A. (2009). Availability of more healthful food alternatives in traditional, convenience, and nontraditional types of food stores in two rural Texas counties. *Journal of the American Dietetic Association, 109,* 883-889.

Creel, J. S., Sharkey, J. R., McIntosh, A., Anding, J., & Huber, J. C. (2008). Availability of healthier options in traditional and nontraditional rural fast-food outlets. *BMC Public Health, 8, 395*

Cummins, S. & Macintyre, S. (1999). The location of food stores in urban areas: a case study in Glasgow. *British Food Journal, 101(7),* 545 – 553

Dutko, P., Ver Ploeg, M., & Farrigan, T. (2012). Characteristics and influential factors of food deserts. Washington, DC: US Department of Agriculture Economic Research Service. Economic Research Report 140.

The Food, Conservation, and Energy Act of 2008. Public Law 110-246, 122 Stat. 1651 (2008).

Ford, P. B., & Dzewaltowski, D. A. (2008). Disparities in obesity prevalence due to variation in the retail food environment: three testable hypotheses. *Nutrition Reviews, 66(4),* 216-228.

Galvez, M. P., Morland, K., Raines, C., Kobil, J., Siskind, J., Godbold, J., et al. (2007). Race and food store availability in an inner-city neighborhood. *Public Health Nutrition, 11(6),* 624-631.

Glanz, K. (2009). Measuring food environments: a historical perspective. (2009). *American Journal of Preventive Medicine, 36(4S),* S93-S98.

Glanz, K., Sallis, J. F., Saelens, B. E., Frank, L. D. (2005). Healthy nutrition environments: concepts and measures. *American Journal of Health Promotion, 19(5),* 330-333.

Hale, T. (2004). Dollar store, no frills: the new retail landscape. *Consumer Insight, 11,* 13-42.

Kaufman, P. R., MacDonald, J. M., Lutz, S. M., & Smallwood, D. M. (1997). Do the poor pay more for food? Item selection and price differences affect low-income household food costs. US Department of Agriculture Economic Research Service Agricultural Economic Report No. 759. Washington, D.C.

Larson, N. I., Story, M. T., & Nelson, M. C. (2009). Neighborhood environments: disparities in access to health foods in the U.S. *American Journal of Preventive Medicine, 36(1),* 74-81.

Leibtag, E. S. (2005). Where you shop matters: store formats drive variation in retail food prices. *Amber Waves, 3(5),* 13–18.

Lewis, L. B., Sloane, D. C., Nascimento, L. M., Diamant, A. L., Guinyard, J. J., Yancey, A. K., et al. (2005). African Americans' access to health food options in South Los Angeles Restaurants. *American Journal of Public Health, 95(4),* 668-673.

Liese, A. D., Colabianchi, N., Lamichhane, A. P., Barnes, T. L., Hibbert, J. D., Porter, D. E., et al. (2010). Validation of 3 food outlet databases: Completeness and geospatial accuracy in rural and urban food environments. *American Journal of Epidemiology, 172(11),* 1324-1333.

Liese, A. D., Weis, K. E., Pluto, D., Smith, E., & Lawson, A. (2007). Food store types, availability, and cost of foods in a rural environment. *Journal of the American Dietetic Association, 107,* 1916-1923.

Lucan, S. C., Maroko, A. R., Bumol, J., Torrens, L., Varona, M., & Berke, E. M. (2013). Business list vs ground observation for measuring a food environment: saving time or waste of time (or worse)? *Journal of the Academy of Nutrition and Dietetics, 113,* 1332-1339.

Macintyre, S. (2007). Deprivation amplification revisited; or is it always true that poorer places have poorer access to resources for healthy diets and physical activity? *International Journal of Behavioral Nutrition and Physical Activity, 4(32).* http://www.ijbnpa.org/content/4/1/32.

Moore, L. V., & Diez Roux, A. V. (2006). Associations of neighborhood characteristics with the location and type of food stores. *American Journal of Public Health, 96(2),* 325-331.

Moore, L. V., Diez Roux, A. V., Nettleton, J. A., & Jacobs, D. R. (2008). Associations of the local food environment with diet quality – a comparison of assessments based on surveys and geographic information systems. *American Journal of Epidemiology, 167(8),* 917-924.

Morland, K., Wing, S., Diez Roux, A., & Poole, C. (2002). Neighborhood characteristics associated with the location of food stores and food service places. *American Journal of Preventive Medicine, 22(1),* 23-29.

Morris, P. M., Bellinger, M., & Haas, E. (1990). Higher prices, fewer choices: shopping for food in rural America. Public Voice for Food and Health Policy, Washington, DC.

Ohls, J. C., Ponza, M., Moreno, L., Zambrowski, A., & Cohen, R. (1999). Food stamp participants access to food retailers. Report submitted to USDA, Food and Nutrition Service by Mathematica Policy research, Inc. http://www.fns.usda.gov/Ora/menu/Published/snap/FILES/ProgramOperations/retailer.pdf

Ohri-Vachaspati, P., & Leviton, L. C. (2010). Measuring Food Environments - A critique. *American Journal of Health Promotion, 24(6), 410-426.*

Powell, L. M., Slater, S., Mirtcheva, D., Bao, Y., & Chaloupka, F. J. (2007). Food store availability and neighborhood characteristics in the United States. *Preventive Medicine, 44,* 189-195.

Rigby, S., Leone, A. F., Hwahwan, K., Betterley, C., Johnson, M. A., Kurtz, H., et al. (2012). Food deserts in Leon County, FL: Disparate Distribution of Supplemental Nutrition Program Assistance Program-accepting stores by neighborhood characteristics. *Journal of Nutrition Education and Behavior, 44(6),* 539-547.

Rose, D., & Richards, R. (2004). Food store access and household fruit and vegetable use among participants in the US Food Stamp Program. *Public Health Nutrition, 7(8),*1081-1088.

Rose, D., Bodor, J. N., Hutchinson, P. L., & Swalm, C. M. (2010). The importance of a multi-dimensional approach for studying the links between food access and consumption. *Journal of Nutrition, 140,* 1170-1174.

Rose, D., Bodor, J. N., Swalm, C. M., Rice, J. C., Farley, T. A., & Hutchison, P. L. (2009). Deserts in New Orleans? Illustrations of urban food access and implications for policy. Retrieved January 21, 2012 from http://www.npc.umich.edu/news/events/food-access/rose_et_al.pdf. (Paper prepared for University of Michigan National Poverty Center/USDA Economic Research Serve "Understanding the Economic Concepts and Characteristics of Food Access" February 2009.)

Sharkey, J. R. (2009). Measuring potential access to food stores and food-service places in rural areas in the U.S. *American Journal of Preventive Medicine, 36(4S),* S151-S155.

Sharkey, J. R., & Horel, S. (2008). Neighborhood socioeconomic deprivation and minority composition are associated with better potential spatial access to the ground-truthed food environment in a large rural area. *Journal of Nutrition, 138,* 620-627.

Sharkey, J. R., & Horel, S. (2009). Characteristics of potential spatial access to a variety of fruits and vegetables in a large rural area. (Prepared for the January 23, 2009 National Poverty Center/Economic Research Service, USDA conference "Understanding the economic concepts and characteristics of food access")

Sharkey, J. R., Johnson, C. M., Dean, W. R., & Horel, S. A. (2011). Focusing on fast food restaurants alone underestimates the relationship between neighborhood deprivation and exposure to fast food in a large rural area. *Nutrition Journal* [serial online]. Retrieved May 12, 2013 from http://www.nutritionjournal.com/content/10/1/10.

Story, M., Kaphingst, K. M., Robinson-O'Brien, R., & Glanz, K. (2008). Creating healthy food and eating environments: Policy and environmental approaches. *Annual Review of Public Health, 29,* 253-272.

US Census Bureau. (2012a). Greene County, Alabama QuickLinks: Census 2000 population, demographic, and housing information. Retrieved August 18, 2012 from http://quickfacts.census.gov/qfd/states/01/01063lk.html.

US Census Bureau. (2012b). North American Industry Classification System. Retrieved September 18, 2012 from http://www.census.gov/eos/www/naics/.

US Census Bureau (2012c). American Fact Finder. Profile of General Population and Housing Characteristics: 2010 Demographic Profile Data. Retrieved September 18, 2012 from 4

US Department of Agriculture Economic Research Service. (2012). The Food Access Research Atlas: Go to the Atlas. Retrieved April 24, 2013 from http://www.ers.usda.gov/data-products/food-access-research-atlas/go-to-the-atlas.aspx#.UXf8qVsiBDg

US Department of Agriculture Economic Research Service. (2013). Download the data: Food Access Research Atlas data file. Retrieved May 8, 2013 from http://www.ers.usda.gov/data-products/food-access-research-atlas/download-the-data.aspx#.U2vO515DdG4.

US Department of Agriculture Food and Nutrition Service. (2013). SNAP Retailer Locator. Retrieved August 11, 2013 from http://www.snapretailerlocator.com/.

Ver Ploeg, M., Breneman, V., Farrigan, B. T., Hamarick, K., Hopkins, D., Kaufman, P., et al. (2009). Access to affordable and nutritious food - measuring and understanding food deserts and their consequences: report to Congress. Washington, DC: US Department of Agriculture Economic Research Service. Administrative Publication AP-036.

Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and access to healthy food in the United States: a review of food deserts literature. *Health & Place, 16,* 876-884.

Winkler, E., Turrell, G., & Patterson, C. (2006). Does living in a disadvantaged area mean fewer opportunities to purchase fresh fruit and vegetables in the area? Findings from the Brisbane food study. *Health & Place, 12,* 306-319.

CHAPTER 3

REALIZED FOOD ENVIRONMENTS OF GREENE COUNTY, ALABAMA WIC PARTICIPANTS

Local food environments have been increasingly recognized as important determinants of health (US Department of Health and Human Services [USDHHS], 2012a). A food desert is an "area in the United States with limited access to affordable and nutritious food, particularly such an area composed of predominately lower income neighborhoods and communities" (The Food, Conservation, and Energy Act of 2008, 2008, p. 2039). Poor access to retail food stores such as supermarkets and increased access to convenience stores and fast food restaurants contributes to poor dietary quality and nutrition-related disease among at-risk populations (Forsythe, Macintyre, & Anderson, 1994; Winkler, Turrell, & Patterson, 2006). The process by which individual disadvantage is intensified by area disadvantage has been called 'deprivation amplification' (Macintyre, 2007).

The bulk of US food access literature supports this concept, suggesting that low-income persons and racial/ethnic minorities living in urban city centers or in rural areas are most often affected by limited access to supermarkets (Beaulac et al., 2009; Cummins & Macintyre, 1999; Ford & Dzewaltowski, 2008; Larson, Story, & Nelson, 2009; Ver Ploeg et al., 2009; Walker, Keane, & Burke, 2010). Deprivation amplification is further compounded with decreased number and poor distribution of stores that accept Federal nutrition assistance benefits, such as the Special Supplemental Nutrition Program for Women Infants and Children (WIC) and the Special Nutrition Assistance Program (SNAP) (Rigby et al., 2012; Rose & Richards, 2004).

WIC provides medical referrals, nutrition education, and vouchers for healthful foods to nine million low-income pregnant or nursing women or children below the age of five (USDA Food and Nutrition Service [FNS], 2012h; FNS 2102f). Therefore, WIC participants with limited access to affordable, fresh foods may be unable to maximize WIC benefits (Laraia et al., 2004).

Because of the range of potential food sources and the complexity of shopping decisions, it is difficult to fully measure or completely characterize food access (Ver Ploeg et al., 2009). Specifically, investigations of food environments have been conducted in predominately urban areas, have included limited types of food retailers, and often make assumptions about individual food acquisition patterns (Beaulac et al., 2009; Larson et al., 2009; Ver Ploeg et al., 2009; Walker et al., 2010). Due to lower population densities, rural areas often contain fewer supermarkets and instead have a larger number of small grocers and other nontraditional food stores, including convenience and dollar stores (Block & Kouba, 2006; Bodor et al., 2008; Sharkey, 2009). Environmental studies that limit store types or exclude non-retail food sources may underestimate potential food availability (Bustillos et al., 2009; Sharkey, 2009; Sharkey & Horel, 2008; Sharkey & Horel, 2009). Finally, while some studies have involved residents of food deserts (Coveney & O'Dwyer, 2009; Freedman, 2009; Smith & Morton, 2009), current US research lacks documented experiences of limited food access produced through research with residents.

Theoretical Framework

The Social Cognitive Theory (SCT), a health behavior theory that stresses the interplay between personal factors, environmental factors, and behavior (Bandura, 1986), offers a valuable approach to food access research. An overarching concept of SCT is reciprocal determinism, a triadic model that posits a simultaneous, reciprocal interaction among an individual's

characteristics, their behaviors, and their environment (Baranowski, Perry, & Parcel, 2002). Figure 2 depicts this construct and potential interrelationships of factors investigated (McAlister, Perry, & Parcel, 2008; Smith & Morton, 2009).

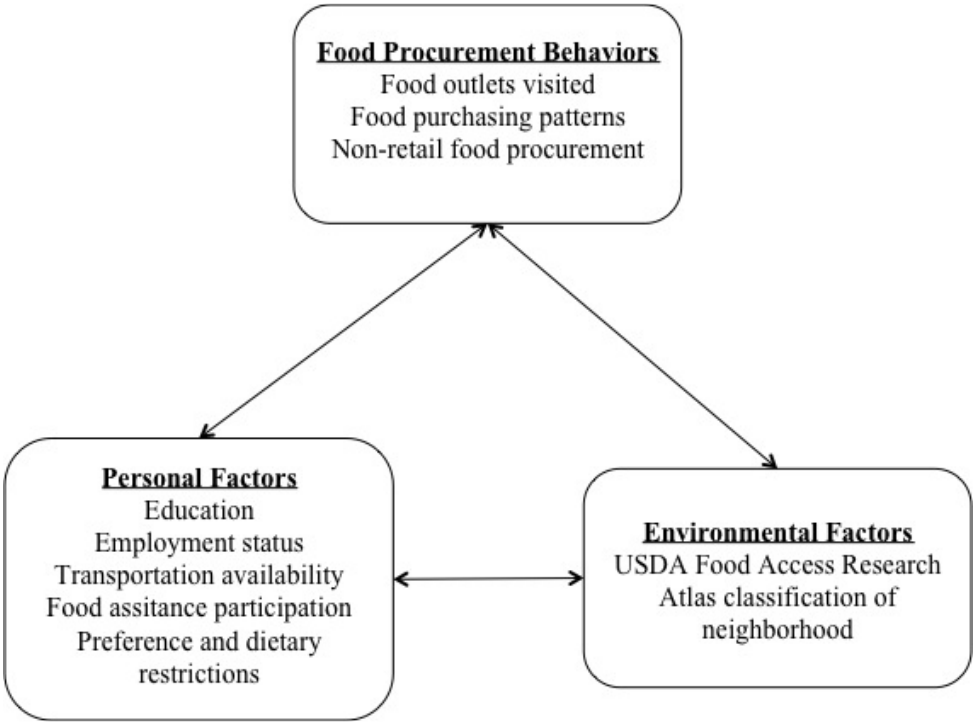

Figure 2: Application of Research Variables to the Reciprocal Determinism Framework Adapted from Parajes (2002)

This study responds to the need to investigate the complex intersection between individuals and their environments (Lytle, 2009), specifically to distinguish available retailers (potential access) and consumers' usual patterns of food procurement (realized access) (Sharkey & Horel, 2008; Sharkey & Horel, 2009). Further, there is a call for investigation of how people organize food shopping within daily activity and consideration of how this expands food environments (Sharkey, 2009; Ver Ploeg et al., 2009.) Therefore, the purpose of this qualitative study was to describe household food procurement patterns of Greene County WIC participants, highlighting differences based on whether or not participants lived in a food desert.

Methods

Methodology described herein was approved by the University of Alabama Institutional Review Board and the Alabama Department of Public Health Review Board. Approval certificates can be found in Appendix C. Greene County, located in west Alabama, is an area in which most residents represent racial/ethnic minorities and are experiencing poverty rates above both national and state averages (US Census Bureau, 2012a). According to the USDA Food Access Research Atlas, a mapping tool that allows users to investigate multiple indicators of food access, a food desert is a census tract that is both low-income (poverty rate ≥20%) and low-access. To qualify as low-access 500 residents (or 33% of the population) must live 'far' from a supermarket or large grocery store (Dutko et al., 2012; ERS, 2012; ERS, 2013). The Atlas defines 'far' using 10- and 20-mile demarcations in rural areas; the 10-mile measure was used in the present study. A full description of Atlas methodology can be found elsewhere (ERS, 2012b). Using Atlas criteria, two of the three census tracts in Greene County are considered food desert tracts (FDT1 and FDT2) (ERS, 2012; ERS, 2013). The third tract was labeled a non-food desert tract (NFDT). These designations were confirmed using ground truthing in a previous study.

Sample

One-on-one interviews were conducted with Greene County WIC participants in order to provide insight into realized food environments and investigate food procurement patterns. WIC clients or proxies periodically visit the Health Department for check-ups or nutrition education, and the county Health Department was the site for all interviews. Demographically, eligible participants exhibited a degree of homogeneity; therefore, purposive sampling was used in order to include women of various ages and census tracts.

Eligibility criteria for this sample were:

1. Female gender, professed to be non-pregnant
2. A minimum age of 19 years
3. Residence within a household receiving WIC benefits
4. Professed responsibility for (or with reasonable knowledge of) household food management, including grocery shopping

Extending eligibility to household members allowed grandparents or other common proxies often responsible for grocery shopping in homes with young mothers to participate. Eligibility was limited to only one representative per household. Participant addresses were obtained and checked in order to avoid oversampling one household and to determine the food desert status of the residence.

Data Collection

All interviews were administered orally in a private conference room, and participants received $10 cash after completing the interview. The interview was conducted either while the participant was waiting for their appointment or following their appointment at the clinic. All participants were assigned pseudonyms. With permission, the exchange was documented using a digital voice recorder. If participants refused recording, note taking was offered as an alternative. Participants verified note content in a debriefing session following the interview.

Interviews were administered in a semi-structured format using the guide found in Appendix B, pages 139-140. Following sociodemographic questions, a qualitative technique called free listing (Bernard, 2011) was used to gather lists of all locations from which participants usually acquired food, including any non-retail sources. Probing was used to aid participant recall and to clarify outlet identification.

From the free list of food sources, participants identified the outlet(s) from which they obtained the bulk of food for their household (termed “bulk store”). Participants were also asked which outlet(s) they visited the most number of times each month (“most often store”). (Bulk and

most often stores are collectively termed "most important stores.") The researcher noted relative frequency of using each bulk and most often source(s) identified. Lastly, using an open-ended question, participants were asked to describe their usual grocery shopping trips. Probing was used to ask about shopping preparation and execution.

Data Analysis

Interviews were transcribed verbatim (Sound Organizer Version 1.2.0, Sony Corporation, 2011) and imported into MaxQDA (Version 11, VERBI GmbH, Berlin, Germany, 2014) for coding and analysis. Answers to free lists were cleaned – responses that were phrased differently but referenced the same food outlet were combined. All retail outlets were classified using the adapted NAICS system described in Table 4. Targeted, selective coding was used to identify, classify, and enumerate all outlets and outlet types. Open-ended answers were coded in an iterative process, and themes identified using directed content analysis[2] (Hesh & Shannon, 2005). The codebook can be found in Appendix D.

An Excel database (Version 14.4.1, Microsoft Corporation, Redmond, WA, 2010) of all Greene County food outlets was updated to include name and location of all extra-county stores identified in participants' free lists. The frequency in which all outlets were named was added to the database, as was the number of times each outlet was identified as a bulk store and a most often store. Distance between participants' most important stores and their shopping points of origin (either home or work) was calculated using Google Earth (Version 7.1.1.1888, Google, Inc., Mountain View, CA, 2013).

[2] The author acknowledges potential misinterpretations due to cultural differences, recognizing that results are translations of participant views and behaviors.

Sociodemographic information collected was entered into Excel (Version 14.4.1, Microsoft Corporation, Redmond, WA, 2010) and imported into IBM SPSS Statistics (Version 22.0.0, IBM Corporation, Armonk, NY, 2013). Independent samples t-tests/median tests and Fisher's Exact Tests (α=0.05) were used to compare sociodemographic characteristics of FDT residents and NFDT residents (FDTR and NFDTR, respectively). (When medians are listed in text and tables, median tests were performed. Otherwise, t-tests were used.) Information about food sources was compared using SPSS. Independent samples t-tests/median tests were used to compare shopping frequency and distances traveled to most important stores, while proportions of FDTR and NFDTR accessing various food sources were compared using Fisher's Exact Tests.

Table 4: Summarized NAICS Food Retailer Classification System

Category	*Type*	*Examples*
Traditional	Grocery stores, supermarkets	Piggly Wiggly, Bruno's, Winn-Dixie
	Specialty stores	Meat, seafood, or produce markets
Convenience Store	Convenience stores	Gas station food marts, corner stores
Non-traditional	Dollar stores	Family Dollar, Dollar General
	Pharmacies	CVS, Walgreens
Mass merchandiser	Mass merchandisers	K Mart, Wal-Mart
	Supercenters	Super Target, Wal-Mart Supercenter
	Wholesale clubs	Sam's Club, Costco
Restaurant	Limited service	McDonald's, Subway, Church's
	Full-service	Applebee's, Pizza Hut, Ryan's

Adapted from Leibtag (2005) and Census (2012b).

Results

Sample Characteristics

Thirty WIC participants (6% of Greene County WIC clients) were interviewed over the course of six weeks from May-June 2013. Average interview length was 18 minutes. Of the 30 women interviewed, 14 (46.7%) lived in a FDT, 13 of those in FDT2. Therefore, for the purposes of this study, all FDTR are discussed collectively. Remaining participants (16, 53.3%) lived in the NFDT. All participants self-identified as Black, and the majority (86.7%) were

single, did not work outside the home (80.0%), and had at least a high school education (83.3%). Sample characteristics are presented in Table 5.

Table 5: Sample Characteristics, by Food Desert Classification of Residence

Sample Characteristic	*FDTR (n=14)* *n (% FDTR)*	*NFDTR (n=16)* *n (% NFDTR)*	*p value for residential comparison*
Marital Status			
Currently single	11 (78.6)	15 (93.8)	0.32
Married or living with partner	3 (21.4)	1 (6.2)	
Education			
< High school	0 (0.0)	5 (31.2)	0.05*
≥ High school	14 (100.0)	11 (68.8)	
Employment Status			
Unemployed	11 (78.6)	13 (81.2)	1.00
Employed	3 (21.4)	3 (18.8)	
Food Assistance			
SNAP	13 (92.9)	14 (87.5)	1.00
Head Start	4 (28.6)	9 (56.3)	0.16
Free/reduced-price school meals (of eligible)	7 (87.5)	9 (90.0)	1.00
Emergency food assistance	2 (14.3)	3 (18.8)	1.00
Special Shopping Conditions			
Yes	2 (14.3)	3 (18.8)	0.57
No	12 (85.7)	13 (81.2)	
	Mean±SD	*Mean±SD*	
Age	30.4±7.5 (Median = 29.0)	31.5±12.1 (Median = 27.5)	0.72
Household size	4.2±1.9	4.8±1.8	1.00
n household members ≤18 years	2.6±1.6	2.8±1.3	0.72
Years at current residence	9.8±11.5	7.6±8.8	0.27
Most recent continuous stretch of WIC participation in months	23.3±16.4 (Median = 20.0)	37.4±17.6 (Median = 36.0)	0.06

*Statistically significant at α=0.05

With the exception of education, groups were sociodemographically similar. All FDTR completed high school, and five FTDR had attended some college. Participation in federal food assistance programs was used as a proxy for income, and participants were accessing available food assistance programs. In addition to WIC, 90.0% of interviewees were also enrolled in SNAP. Of households with children of eligible program age, 13/30 (43.3%) and 16/17 (94.1%)

were participating in Head Start and free-and reduced-cost school meals, respectively. (Lower Head Start participation was likely a reflection of enrollment limitations mentioned by several participants.) Five participants (16.7%) cited conditions such as food preferences and health or disease states requiring special diets or supplements. However, several participants believed eating healthfully in Greene County was difficult. Most participants had lived in Greene County several years and had been participating in the WIC program for about one year, suggesting participants knew the area well enough and were familiar enough with WIC that their grocery shopping patterns were reflective of an average resident of the same status.

Non-Retail Food Sources

Proportions of FDTR and NFDTR accessing emergency food sources ($p=0.64$) and using other non-retail food sources did not differ significantly ($p=0.08$). Five participants (16.7%) were occasionally receiving food from emergency service organizations, often traveling out of the county for these services. Ten (30.0%) participants reported using some form of non-retail food, such as gardening or fishing, though most were receiving food from family or friends. Types of food received and frequency varied, and most participants were not relying heavily on these sources.

Retail Stores Included in Free lists

A total of 109 unique stores in several locations were included in participants' free lists. Table 6 demonstrates that all participants were visiting grocery stores and most were using each of the other store types, with the exception of pharmacies. There were no differences in the proportions of NFDTR and FDTR using any store type.

Table 6: Proportion of Participants Using Each Store Type

Store Type	*n (%) total participants using n=30*	*n (%) NFDTR using n=16*	*n (%) FDTR using n=14*	*p-value for residential % comparisons*
Traditional				
Grocery stores	30 (100.0)	16 (100.0)	14 (100.0)	-
Specialty stores	15 (50.0)	9 (56.2)	6 (42.9)	p=0.72
Convenience	20 (66.7)	12 (75.0)	8 (57.1)	p=0.44
Nontraditional				
Dollar Stores	29 (96.7)	16 (100.0)	13 (92.9)	p=0.47
Pharmacies	0 (0.0)	0 (0.0)	0 (0.0)	-
Mass merchandisers				
Supercenters	29 (96.7)	16 (100.0)	13 (92.9)	p=0.47
Wholesale stores	16 (53.3)	8 (50.0)	8 (57.1)	p=0.73
Restaurants				
Limited service	27 (90.0)	15 (93.8)	12 (85.7)	p=0.59
Full-service	20 (66.7)	11 (68.8)	9 (64.3)	p=1.00

Table 7 presents the number of stores available in Greene County and its census tracts, as well as the number and proportion of available store types being used by all participants. Because there were no mass merchandisers in Greene County, that category was excluded. With the exception of specialty stores, the pharmacy, and full-service restaurants, residents were visiting most area stores. Greene County food retailers excluded from free lists included 19 stores: 8 convenience stores, 1 pharmacy, 6 full-service restaurants, 1 limited service restaurant and all 3 specialty stores. Excluding restaurants, which do not accept WIC or SNAP benefits, half (6/12) of the unused Greene County stores listed were neither WIC nor SNAP vendors.

Table 7: Greene County Store Availability and Use

	Greene County		*NFDT*		*FDT1*		*FDT2*	
Store Type	*n available*	*n in free lists (% of available)*	*n available*	*n in free lists (% of available)*	*n available*	*n in free lists (% of available)*	*n available*	*n in free lists (% of available)*
Traditional								
Grocery	2	2 (100.0)	2	2 (100.0)	0	NA	0	NA
Specialty	3	0 (0.0)	0	NA	1	0 (0.0)	2	0 (0.0)
Convenience	20	12 (60.0)	14	8 (57.1)	0	NA	6	4 (66.7)
Nontraditional								
Dollar Stores	3	3 (100.0)	3	3 (100.0)	0	NA	0	NA
Pharmacies	1	0 (0.0)	1	0 (0.0)	0	NA	0	NA
Restaurants								
Limited svc	10	5 (50.0)	8	4 (50.0)	0	NA	2	1 (50.0)
Full-svc	8	2 (25.0)	5	2 (40.0)	0	NA	3	0 (0.0)
Total	*47*	*24 (58.5)*	*29*	*19 (65.5)*	*1*	*0 (0.0)*	*12*	*5 (41.7)*

Frequency Mentioned

Data above demonstrate the variety of stores used by participants, but fail to capture the frequency with which individual stores were included across all free lists, an indicator of store popularity or importance. The most frequently mentioned outlets were the two SNAP-accepting Greene County dollar stores and the two Greene County grocery stores (SNAP and WIC stores), included by 73.3-93.3% of participants. Wal-Mart supercenters (60-66.7% of participants), Sam's Club wholesale stores (46.7%), and a McDonald's restaurant (46.7%), all located in surrounding counties, were the next most frequently mentioned outlets.

Bulk and Most Often Stores

Most participants (93%) identified one to three bulk stores, and two bulk stores was most common (40.0% of participants). All participants listed one to three most often stores, with 46.7% identifying only one. Eighty percent of participants listed a grocery store as a bulk store, while supercenters were the second most common bulk store. For 70% of participants, grocery stores were also outlets they visited the most often each month. NFDTR residents alone were relying on wholesale stores, and they tended to list dollar stores as most often stores more frequently; however, there were no significant differences among proportions of FDTR and NFDTR listing any store type as a bulk or most often store (data not shown).

Because there were no differences in the types of stores identified as most important, store location was investigated. No participant's total free list was limited to stores in one city or county alone. However, when examining only bulk and most often stores, seven participants (4 NFDTR, 3 FDTR) were shopping exclusively in Greene County[3], while seven (5 NFDTR, 2

[3] Participants did not list stores located in FDT1 or FDT2 as their most important stores, so when discussing bulk and most often outlets, if participants were shopping within Greene County, they were shopping in the NFDT.

FDTR) were shopping exclusively in other counties. The remaining 16 participants were traveling both in and out of the county for their household food.

Figures 3 and 4 depict the number of participants that reported each store type as a bulk or most often store, with columns divided to represent those shopping in and out of the county. Considering bulk stores, 14 participants (46.7%) were shopping in Greene County, and most participants (21, 70%,) listed Greene County stores exclusively as their most often stores. There were no significant differences in proportions of FDTR and NFDTR shopping in or outside Greene County for each bulk store type. However, considering most often stores, a higher proportion of FDTR were using Greene County grocers ($p=0.03$), and a higher proportion of NFDTR were using Greene County dollar stores ($p=0.03$).

Figures 3 and 4 also suggest within group differences between bulk and most often stores. Compared to their bulk shopping patterns, the stores FDTR identified as their most often stores were less likely to be specialty stores or supercenters. Compared with their bulk patterns, it appeared that NFDTR most often stores included fewer grocery stores outside the county, more Greene County dollar stores, and fewer supercenters and wholesale stores.

Shopping Frequency

Frequency of shopping did not significantly vary based on area residence. Participants shopped at their bulk stores 1-18 times a month (median=2); 82% were shopping less than three times a month, and 36.7% were shopping once monthly. Participants visited their most often stores 1-30 times a month (median=3) and about 60% were shopping less than three times a month.

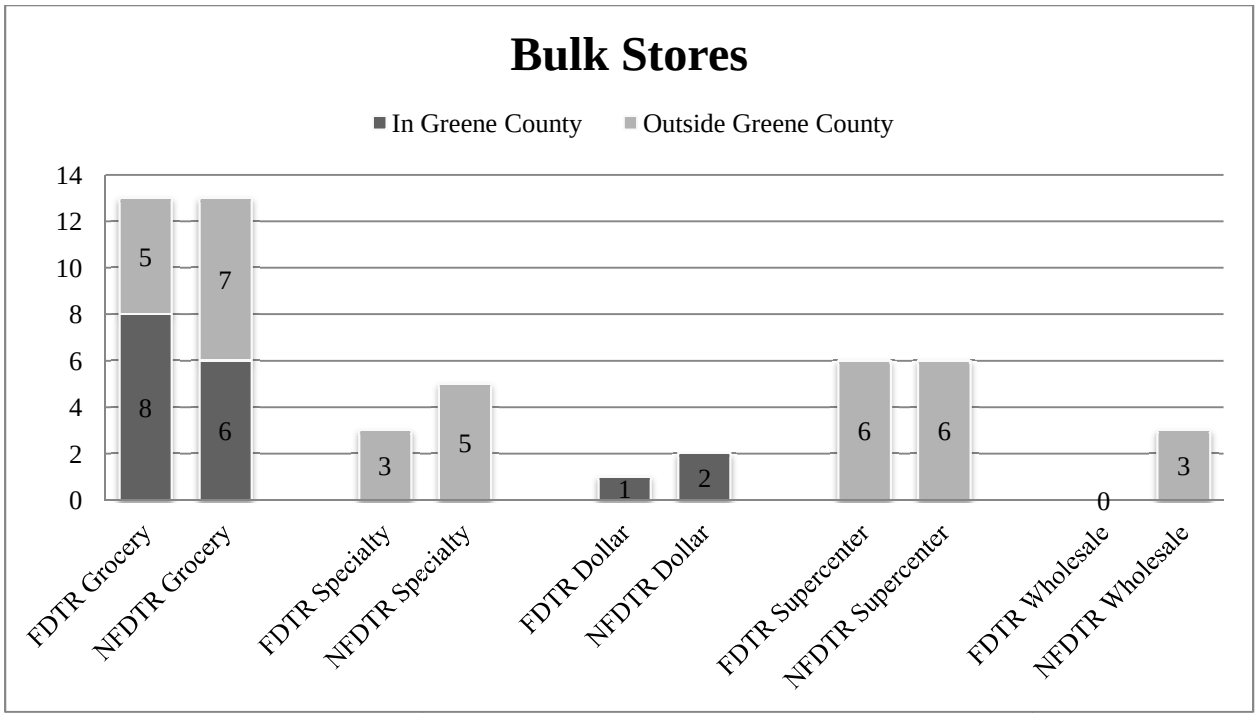

Figure 3: Number of Participants Reporting Shopping at Store Types Visited for the Bulk of Household Food, by Location

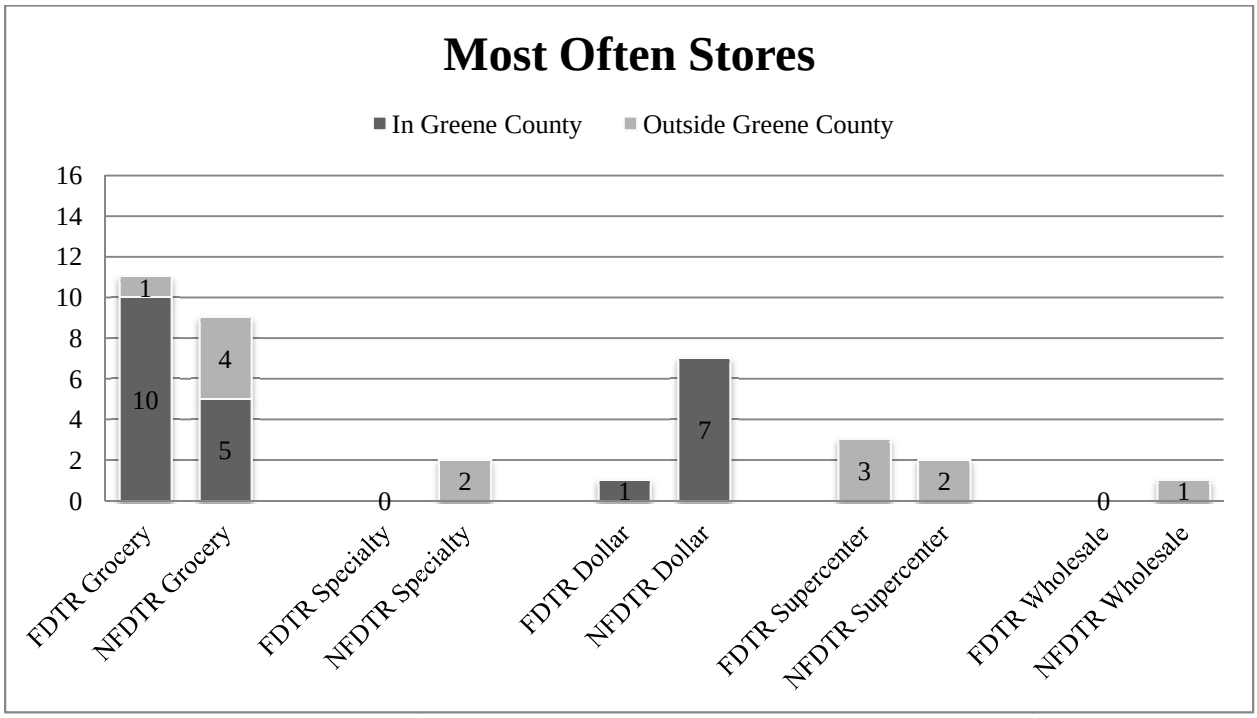

Figure 4: Number of Participants Reporting Shopping at Store Types Visited the Most Number of Times Each Month, by Location

Women used most often stores to fill in with items they needed throughout the month. One participant called this "go back shopping" and tried to save SNAP dollars for such trips. Another participant without consistently reliable sources of transportation was limited in shopping capabilities, and therefore shopped in intervals throughout the month. However, 37% made large shopping trips only once a month, usually when they received SNAP benefits.

> Amelia: When I go to Food Fare I get enough meats to last through the whole month until I go grocery shopping again. And I go to Sam's to get my canned goods, the cereal, the snacks that'll last up until I get my Stamps again. And then, see, when I come outta there it be so much stuff. I be comin' out there with like six buggies.
>
> Olivia: I mean, it's best to buy it like that in bulk than to try to, you know… 'Cause I be back in the store…tryin' to, um, you know, find somethin' for those children.

Storage capabilities were particularly important among women who made large trips. While bulk shoppers purchased food to fill their refrigerators and freezers, two participants explicitly mentioned separate deep freezers that expanded purchasing capabilities. Conversely, two women mentioned refrigerator capacity limited food storage abilities, thus limited food shopping.

Travel

Point of Origin.

The majority of participants reported beginning their shopping trips from home, though four of the six employed women usually shopped after work. For these women, distance from work to their most important stores was often shorter than the distance from their home to these stores. Their points of origin were altered to reflect these distances in the calculations below.

Distance Traveled.

Participants traveled 0.4-45.6 miles one way, though average mileage to bulk stores was significantly higher than mileage to most often stores (21.4 and 13.4, respectively, $p=0.001$). As described in Table 8, FDTR were traveling about 4.5 more miles to their bulk stores and about 8

miles more to their most often stores, compared with NFDTR, though differences were not statistically significant,. Also, the average distance traveled to most often stores was 10 miles less than to bulk stores among NFDTR and about 6 miles for FDTR. The importance of residential location beyond food desert designations was also clear. One participant lived within the NFDT, though outside the city, and was traveling a distance comparable to FDTR to reach grocery stores located in her census tract. Additionally, two FDTR lived nearly equidistant from Greene County grocers and extra-county stores, while two lived closer to the extra-county stores.

Table 8: Comparison of Bulk and Most Often Travel Distances

	NFDTR Mean±SD	*FDTR Mean±SD*	*Row p-value*
Bulk	19.4±12.1	23.8±11.8	*0.33*
Most often	9.9±12.1	17.7±10.0	*0.08*
Column p-value	*0.007*	*0.06*	

Mode of Transportation.

Most participants (n=23, 76.7%) had their own vehicles and used them to travel to preferred stores. [The proportion of participants with their own cars was not significantly different between FDTR and NFDTR (p=1.00).] Rides from family or friends were the most common solutions among participants of all areas, followed by borrowing cars. Only one participant, a NFDTR, mentioned walking, and even then, neighbors occasionally picked her up mid-trip.

> Clara: …I walk…if it's something light I can carry. But if…I got to get a group of meats or something like that, I generally get a neighbor or someone I know, or call someone, and they'll take me… Or sometime I can be walking and they'll stop.

Transportation Cost.

Participants often encountered monetary and opportunity costs associated with relying on others for rides. Number of stores and their respective locations dictated cost, and participants paid anywhere from $3-$30 to compensate drivers. Time spent securing rides, relying on others'

schedules, being limited in shopping time and location, and being limited in purchasing due to shared car space were other problems mentioned. These issues were dependent on the relationship with the driver. Four participants had standing arrangements with family that allowed them to shop freely.

> Emma: I was desperate because it was wastin' my money, my food stamps up here in town. …I was tryin' not to go spend uptown at the grocery store so I would buy little by little at these stores up there daily... So I ended up payin' somebody thirty dollars. That was so terrible.

> Rosalyn: …Paying other people, you know, to take me this place and that place…. I know I can't go everywhere that I really want to go because that would be more money out my pocket.

Monetary and opportunity costs associated with travel made extra-county shopping infeasible or unappealing to the seven participants shopping strictly within Greene County; however, the 23 women traveling out of the county for at least some of their shopping believed advantages outweighed costs.

> Amelia: …Once I get there, I get my money's worth. So it don't bother me.

Shopping Schedules and Structure

Participants often designed trips to best fit their needs and abilities. Patterns discussed below often varied based on whether the excursion was a bulk or most often trip. In general, trips to most often stores were prepared for and executed more quickly than trips to bulk stores. Work schedules of four working participants dictated their shopping time and locations, though for several participants others' work schedules played a role. If participants shopped with partners that worked, or borrowed cars from working family, shopping schedule was necessarily adjusted. When more than one store was visited in a day, order of stores visited was based on a variety of factors. Time of day was often an important consideration. Several participants (n=3) preferred

shopping early in the morning, and others (n=7) mentioned shopping while children were in school.

> Amelia: …If I go to Aliceville, I leave around eight (8:00 am). I make it back to the house around eleven (11:00 am), eleven thirty (11:30 am). So, if I go to Sam's in that same day, I leave probably around twelve thirty (12:30 pm). Give me time to fix the kids something to eat. I leave around twelve thirty (12:30 pm). I make it back 'round...four (4:00 pm).

> G: I do early mornin' shoppin'. That the best time. You can catch all the good sales and all the fresh food early in the mornin'.

Participants also reported structuring trips based on distance traveled/location of the store and on food safety (i.e., meat last). There were also in-store preferences for the order in which participants approached aisles. In fact, one woman mentioned adjusting the order of aisles visited within her chosen location to keep children content.

> Julia: If I go to, um, Sam's Club first, I can keep him content 'cause he got his fruits. So, versus when I go to Wal-Mart to hit the cereal aisle first, because they want cereal.

Childcare.

Whether or not children accompanied parents shopping was largely dependent on the child's age and the availability of family members – the most common form of childcare. Children usually accompanied 18 participants (10 NFDTR, 8 FDTR). Some of these women (n=5) described increased shopping difficulty if their children were involved, while six stated that children were manageable in stores. However, these women had often made efforts such as packing snacks or bringing family members to watch children in the store to encourage smoother shopping trips.

> Emma: So we have to mentally – I do – prepare myself to deal with her on the shoppin' trip. …Yeah, it's a – it's a process.

> Victoria: Well, of course I have her (referencing daughter), so had to stop, give her her bottle…

Trip-chaining.

Many participants, especially those who shopped infrequently, dedicated trips solely to grocery shopping. However, nine women (7 NFDTR, 7 car owners) reported intentional trip-chaining, or pairing grocery shopping with other errands in an effort to conserve resources. Specifically, it was common for women to use WIC vouchers in Greene County stores when they were in the area for doctor's appointments or other errands.

> Chloe: When we go grocery shoppin' it's basically an errand run. We're knocking out everything, like doctor's appointments, getting prescriptions, grocery shoppin'… It's very busy. It's a lot…sometimes it's a lot of stuff forgotten along the way because there's so much to do.
>
> Grace: Yes, we try… everything at one time so that way we won't have to come back and waste gas, make an extra trip and stuff.

Cost-Saving Strategies.

A few participants used coupons (n=6), though more (n=17) consulted newspaper inserts and/or in-store circulars to guide store choice and food purchases. Two participants also relied on friends or family members that were avid sales watchers. Fifteen participants explicitly mentioned price comparison among stores, though most were shopping at multiple stores and likely performed comparisons naturally. Grocery lists were used by 20 women in order to make efficient use of time and SNAP/money, and if lists were not used, they were generally relying on mental lists or on habitual purchasing patterns. In-store price comparisons and brand-based shopping were also mentioned. The use of any careful shopping strategy did not vary based on participant residence. Such strategies generally added time to preparation and shopping trips, though most participants found monetary savings necessary, thus a worthwhile tradeoff for time and convenience. Only one participant, a women working outside of the county who shopped on her way home, regularly chose convenience over cost savings.

Shopping Decision Drivers

Though not specifically addressed in this study, participants frequently discussed rationale behind shopping decisions and expressed opinions about area stores. Considerations included work schedule, store hours, weather, and habit. More salient considerations are briefly addressed below.

Price.

Food price, including sales, was the most important determinant of food shopping location, regardless of residential location. Specifically, 12 women identified Greene County grocery store prices as unreasonable, thereby driving them travel outside the county to bigger volume/lower price stores and to meat markets with unique sales, or to small grocery stores with better sales.

> Amelia: I mean, if I wanna come up here and get something…it's easier because…the grocery store right here. But I don't want….a lot of people don't wanna go uptown and shop, you know… They not getting' they money worth. 'Cause you go in there with like one hundred dollars, you come out there with like two, three bags.

Even among women that shopped within Greene County, food price determined which grocery store they frequented.

> Chloe: …Our budget decided that for us… Piggly Wiggly is higher, I guess 'cause it's a name brand. So, like, things that you would get for three dollars, you get for like a dollar fifty at Foodland. Like half the price.

Because participants were shopping with WIC (100%) and SNAP benefits (90%), benefit acceptance was an important determinant of store choice. All but one of participants' bulk and most used stores were WIC and/or SNAP vendors, and maximizing SNAP dollars was explicitly cited as a reason why Greene County stores were avoided.

> Emma: …Anything else is just a waste… You know, it's a waste of money, Food Stamps.

> Layla: I'm not satisfied with the prices… You would think that the amount of Food Stamps that I get would really feed you for a whole month. You would think that. But, with you not bein' able to go and bargain shop, it's not, because you're payin' a whole lot more money for your groceries here than goin' somewhere else and grocery shoppin'.

Food Quality, Appearance, Variety, And Quantity.

While poor quality was not limited to Greene County stores, group opinion leaned toward increased quality in extra-county stores. Participants associated appearance with quality and healthfulness, though appearance (e.g., attractive, organized displays) was also important independently.

> Elizabeth: It seems like their meat be old... …like, a different color. …Their foods don't be fresh at all... I don't go over there at all. Like, they will sell you somethin' that's expired.

> Lillian: And then they have like a fresh fruit, like, um combination of fruits and vegetables. Like, it's very fresh. You can tell it's like so neat and, you know, so in order. You wanna see those things... See, it's different up here. Like, some…fruits and vegetables look so old.

Nine participants specifically mentioned product variety, or lack thereof, as a contributor to store decision. In addition to limited variety, limited quantity of stocked items was another drawback of Greene County stores; running out of stock and limitations on sale items were among complaints voiced.

> Chloe: I'm lactose intolerant, so you have to go out of town for Silk milk. And, let's see what else? Certain yogurts. It's a lot of stuff. I wanna make, like, a very different sort of dish, like a lasagna, they don't carry lasagna noodles or things like that. It's very difficult to find, like, specific things in a small town.

Location.

Location (or distance and travel time) were either attractive or unattractive aspects of particular stores, identified directly or indirectly by participants. For example:

> Researcher: So you go here, you think, most often out of all this list?
> Elizabeth: Yeah, 'cause it's a little closer.

> Layla: I go there most often ‘cause of transportation. If I can get anywhere else, I wouldn’t go there.

Items Needed.

As mentioned, 70% of participants used Greene County stores as most often stores, visiting if items ran low, if unexpected needs arose, or if there were specific items they liked at local stores. For example, it was easy to use WIC vouchers in NFDT local stores if they were already in town, and it was impractical to purchase items like ice cream at stores a long distance from home.

Satisfaction with Area Stores

Seventeen participants expressed dissatisfied by area food stores, and the strongest negative opinions seemed to be expressed by NFDRT. Overcrowding, increased wait time, and poor staff attitude were among problems encountered, as well as perceived price, variety, quality, and quantity problems previously mentioned.

> Mia: But, you know, if I’m gonna try to eat healthy, I gotta go to way into Tuscaloosa every month.

> Rosalyn: …By it being small, once it’s packed, you be waitin’ forever in line. Then a lot people have a lot of, you know, food in buggies. …It’s only like three registers…and it’s, like, maybe say fifty peoples in this small grocery store.

> Zoe: And some of the people that work in the store got attitude problems. So that’s why I don’t really care for goin’ shoppin’ down here.

Two participants spoke well of Greene County grocers (1 NFDTR, 1 FDTR), though both women were older and identified relationships with the employees, which may heavily influence perspective, compared with other participants.

> Cara: In the store it’s good. …I never had a problem with any of these grocery stores. Never… I try to get along. Speak to ‘em. Most all of ‘em really know me point blank.

> Stella: …They'll just stop if they don't have anybody and just go take you straight to it… And see, I've gotten kinda familiar with the people at the store. Like sometimes if I don't have some money, I'll just go ask Ms. Edgar's 'Hey, I don't have any money. Can I put this on a ticket?' And see, I been knowin' her so long and, you know, since they treat me nice, then I try to do business with them.

Discussion

Stores Used

As found previously, investigations of the potential food environment confirmed USDA food desert designations were valid. However, results from this study suggest they are not always practically useful designations, as evidenced by participant shopping patterns. While exchange of food through personal connections and community organizations has been reported in rural areas with few or no grocery stores (Bodor et al., 2008; Molnar, Duffy, Claxton, & Bailey, 2001), non-retail food was not a consistently significant contributor to any participants' household food supply. The majority of food for participants' households came from several stores and store types, though grocery stores were both the primary bulk and most often store types. Ohls et al. (1999) reported that the majority of Food Stamp recipients shopped in supermarkets, though households often shopped at three or four different types of stores. In this study, apart from grocery stores, dollar stores were visited most often, especially among NFDTR, likely due to low cost and relative proximity. Dollar stores have been one of the fastest growing food retailers and are often overlooked when considering area food availability (Block & Kouba, 2005).

Approximately 53% of the participants bulk shopped outside the county, while 70% shopped in the county for most often trips. Surprisingly, these patterns did not vary based on food desert status. Similar to an Australian study (Coveney & O'Dwyer, 2009), many participants lived closer to the small local grocery stores but used only them when visiting the area, in emergency situations, or when making 'go back' shopping trips to top off household food supply. In Nashville, Tennessee, about a third of participants in a qualitative study did not

use their local food store (Freedman, 2009), and Ohls et al. (1999) reported over one-third of participants shopped outside their neighborhoods citing high prices and the lack of local SNAP-authorized stores.

Other studies have also reported that households regularly use supermarkets or grocery stores located considerable distances from their homes, highlighting the importance of obtaining data on shopping behaviors (Coveney & O'Dwyer; 2009; Drenowski et al., 2012). In this study, travel distance did not significantly differ between residential groups, and participants traveled at least 13 miles one way to their most important stores – farther for the bulk of their food. Over 20% of residents in rural Texas lived in neighborhoods at least 11 miles from the nearest grocery store (Bustillos et al., 2009), and Kaufman (1998) found that residents of rural Southeastern counties traveled at least 30 miles to the nearest supermarket. FDTR were traveling a bit further to their preferred stores, and it was expected that living in a food desert would impose greater food access hardships. However, as also reported by Conveney & O'Dwyer (2009), the degree to which households are able to travel for food was more influential than living in a food desert.

Shopping Costs

In this study, 77% of participants had access to their own vehicle for grocery shopping. Ver Ploeg et al. (2009) estimated that rates of car ownership were higher among rural populations (94.6%), compared with urban populations (87.8%), but noted that low-income households are less likely to be vehicle owners. Getting rides or borrowing cars, both usually from family members, were the primary mobility strategies used by those without vehicle access. Some studies have reported alternate mobility strategies, including purchasing a vehicle, getting rides from family or friends, public transportation, taxis, and walking (Clifton, 2004; Coveney & O'Dwyer, 2009). Many of these options were unavailable or unfeasible given the distance from

participants' homes to nearest stores, highlighting the importance of family, friends, and neighbors in meeting food needs and echoing sentiments of Whelan et al. (2002) who stressed the importance of family in managing food shopping and easing burdens of limited food access.

While out-of-pocket food shopping expenses for those without a car were 2.7 times higher than cost estimates for car owners in one study (Rose et al., 2009), Ohls et al. (1999) reported all residents of rural areas were more likely report higher out-of-pocket expenses. Compared to their counterparts, Rose et al. (2009) estimated those with poor access encounter increased expense of $11 per month. Coveney & O'Dwyer (2009) reported convenience, location, and, to a lesser extent, price influenced shopping decisions. Higher cost of food from smaller stores was understood, though trade off for convenience of the local stores was reported. Most participants in the present study were unable or unwilling to trade monetary savings for increased convenience. The majority were traveling for food and thus experienced monetary and opportunity costs associated with infrequent, though often arduous grocery shopping trips intricately planned around SNAP balances, schedules, sales, transportation availability, household food needs, and storage capabilities.

Shopping Decisions

Price worked in tandem with other store/product characteristics to influence shopping patterns. There is evidence to support increased prices in rural areas (Kaufman, MacDonald, Lutz, & Smallwood, 1997; Morris, Bellinger, & Hass, 1990). Low population densities combined with large distances between population centers generally means that stores reasonably accessible to rural residents are smaller and face reduced competition (Dunn et al., 2011). Rural supermarket prices were approximately 4% higher than suburban supermarkets in one study (Kaufman et al., 1997). Lack of stores has led some SNAP recipients to shop in smaller stores

with higher prices and decreased variety, leaving them unable to get the best value for their benefits (Rigby et al., 2012). In fact, several participants in the present study viewed shopping in local food stores as a "waste" of SNAP benefits.

The majority of residents voiced dissatisfaction with area stores. A few evaluations have suggested that residents of areas with low food retail access viewed local markets and convenience stores as inadequate to meet their food needs and believed there was limited variety and low quality of goods in their neighborhoods, suggesting dissatisfaction with their local food environment (Freedman, 2009; Freedman & Bell, 2009; Giskes et al., 2007). Also, perception of food availability and price was associated with food purchasing patterns, but not objective measures of food availability, affordability, accessibility, (Freedman, 2009; Giskes, et al., 2007). In addition to food price and variety, participants reported negative experiences associated with food quality, overcrowding, wait time, and staff attitude. Such perceptions should be considered if solutions to increase access in this area include work with existing stores.

The Social Cognitive Theory

SCT provided a useful context for examining how the potential food environment and personal factors shaped participants' realized food environments. Several variables uncovered within participant interviews can be placed within the reciprocal determinism framework, identifying opportunities for targeted intervention, as well as potential areas in which other supporting constructs can be incorporated. The application of study data to the original reciprocal determinism figure is pictured in Figure 5.

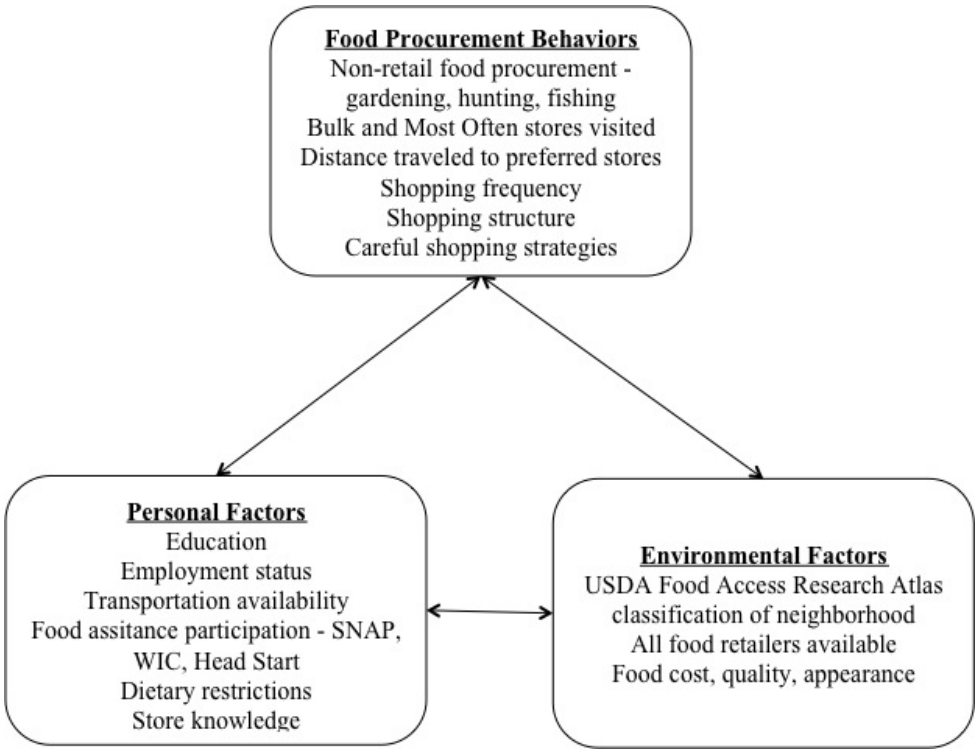

Figure 5: Applied Reciprocal Determinism Framework
Adapted from Parajes (2002)

Limitations

Geographically-imposed boundaries used in the definition of food access that are based on the presence of grocery stores are not comprehensive reflections of area food availability and overshadow individual variation in food access patterns. However, because there is no standardized definition of poor access, using a tool such as the USDA Food Access Research Atlas was justified and, combined with interview data, could provide further insight into the value of the tool. Intercoder agreement/reliability was not assessed in the present study, given staff limitations.

Participants were a purposively approached, self-selecting group. Though results are representative of only rural food desert residents of one county, they provide a unique opportunity for comparison among various food desert classifications. Additionally, despite

limited generalizability, results describe shopping patterns of individuals using SNAP and WIC benefits, thereby representing an important group in terms of food policy discourse.

Conclusions and Implications

The majority of participants reported shopping in traditional food outlets for the bulk of their household food needs, though non-traditional stores were also important sources of food in this rural area. Many participants traveled for food, regardless of residential area, demonstrating limitations of geographically-based assessments. Personal and/or area constraints limited the range of shopping destinations, thereby limiting food choices and prohibiting these women from maximizing food assistance benefits, including WIC benefits. Even when healthful foods were physically available, participants identified barriers in purchasing and subsequent intake that is required to improve health status of such nutritionally vulnerable populations. If spatially segregated, low-income households continue to experience food access problems and suffer health-related consequences related to limited access, then the effectiveness of programs such as SNAP or WIC is uncertain. Solutions such as healthy food financing initiatives may be useful in such areas, though interventions must consider residential perception when addressing area food problems. Health behavior theories may have merit in narrowing focus of future investigations and interventions. The Social Cognitive Theory provided a useful framework for initial examination of the interaction of residents and their environments, and further application of the theory is warranted. Lastly, continuing to involve communities in food access problems discourse is vital to effective interventions. Community-based participatory research may be an avenue through which future research and solutions could be better explored.

References

Bandura, A. (1986). *Social Foundations of Thoughts and Actions: A Social Cognitive Theory.* Englewood Cliffs: Prentice-Hall.

Baranowski, T., Perry, C., & Parcel, G. (2002). How Individuals, Environments, and Health Behavior Interact. In: Glanz, K., Rimer, B.K., Lewis, F.M., editors. Health Behavior and Health Education: Theory, Research, and Practice. (3rd Edition.) (pp. 165-184). San Francisco, CA: Jossey-Bass.

Beaulac, J., Kristjansson, E., & Cummins, S. (2009). A systematic review of food deserts, 1966-2007. *Preventing Chronic Disease* [serial online]. Retrieved January 21, 2012 from http://www.cdc.gov/pcd/issues/2009/jul/08_0163.htm.

Bernard, H. R. (2011). Sampling III: nonprobability samples and choosing informants. In *Research Methods in Antropology 5th ed. 143-155 AltaMira Press: Plymouth, United Kingdom.*

Block, D., & Kouba, J. (2005). A comparison of the availability and affordability of a market basekt in two communities in the Chicago area. *Public Health Nutrition, 9(7),* 837-845.

Bodor, J. N., Rose, D., Farley, T. A., Swalm, C., & Scott, S. K. (2007). Neighbourhood fruit and vegetable availability and consumption: the role of small food stores in an urban environment. *Public Health Nutrition, 11(4),* 413-420.

Bustillos, B., Sharkey, J. R., Anding, J., & McIntosh, A. (2009). Availability of more healthful food alternatives in traditional, convenience, and nontraditional types of food stores in two rural Texas counties. *Journal of the American Dietetic Association, 109,* 883-889.

Clifton, K. J. (2004). Mobility strategies and food shopping for low-income families: a case study. *Journal of Planning Education and Research, 23,* 402-413.

Coveney, J., & O'Dwyer, L. A. (2009). Effects of mobility and location on food access. *Health & Place, 15,* 45-55.

Cummins, S., & Macintyre, S. (1999). The location of food stores in urban areas: a case study in Glasgow. *British Food Journal, 101(7),* 545-553.

Drenowski, A., Aggarwal, A., Hurvitz, P., Monslvais, P., & Moudon, A. V. (2012). Obesity and supermarket access: proximity or price? *American Journal of Public Health, 22(8),* e74-e80.

Dunn, R. A., Sharkey, J. R., Lotade-Manje, J., Bouhlal, Y., & Nayga, R. M. (2011). Socio-economic status, racial composition and the affordability of fresh fruits and vegetables in neighborhoods of a large rural region in Texas. *Nutrition Journal* [serial online]. Retrieved May 12, 2013 from http://www.nutritionj.com/content/10/1/6.

The Food, Conservation, and Energy Act of 2008. Public Law 110-246, 122 Stat. 1651 (2008).

Ford, P. B., & Dzewaltowski, D. A. (2008). Disparities in obesity prevalence due to variation in the retail food environment: three testable hypotheses. *Nutrition Reviews, 66(4),* 216-228.

Forsyth, A., Macintyre, S., & Anderson, A. (1994). Diets for disease? Intraurban variation in reported consumption in Glasgow. *Appetite, 22,* 259-274.

Freedman, D. A. (2009). Local food environments: they're all stocked differently. *American Journal of Community Psyschology, 44,* 382-393.

Freedman, D. A., & Bell, B. A. (2009). Access to healthful foods among an urban food insecure population: Perceptions versus reality. *Journal of Urban Health, 86(6),* 825-838.

Giskes, K., Van Lenthe, F. J., Brug, J., Mackenbach, J. P., & Turrell, G. (2007). Socioeconomic inequalities in food purchasing: The contribution of respondent-perceived and actual (objectively measured) price and availability of foods. *Preventive Medicine, 45,* 41-48.

Glanz, K. (2009). Measuring food environments: a historical perspective. (2009). *American Journal of Preventive Medicine, 36(4S),* S93-S98.

Glanz, K., Sallis, J. F., Saelens, B. E., & Frank, L. D. (2005). Healthy nutrition environments: concepts and measures. *American Journal of Health Promotion, 19(5),* 330-333.

Hesh, H., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15(9),* 1277-1288.

Horowitz, C. R., Colson, K. A., Herbert, P. L., & Lancaster, K. (2004). Barriers to buying healthy foods for people with diabetes: Evidence of environmental disparities. *American Journal of Public Health, 94(9),* 1549-1554.

Kaufman, P. R. (1998) Rural poor have less access to supermarkets, large grocery stores. *Rural Development Perspectives, 13(3),* 19-26.

Kaufman, P. R., MacDonald, J. M., Lutz, S. M., & Smallwood, D. M. (1997). Do the poor pay more for food? Item selection and price differences affect low-income household food costs. US Department of Agriculture Economic Research Service Agricultural Economic Report No. 759. Washington, D.C.

Laraia, B., Siega-Riz, A. M., Kaufman, J. S., & Jones, S. J. (2004). Proximity of supermarkets is positively associated with diet quality index for pregnancy. *Preventive Medicine, 2004, 39,* 869-875.

Larson, N. I., & Story, M. T. (2009). A review of environmental influences on food choices. *Annals of Behavioral Medicine, 38(S1),* S56-S73.

Larson, N. I., Story, M. T., & Nelson, M. C. (2009). Neighborhood environments: disparities in access to health foods in the U.S. *American Journal of Preventive Medicine, 36(1),* 74-81.

Leibtag, E. S. (2005). Where you shop matters: store formats drive variation in retail food prices. *Amber Waves, 3(5),* 13–18.

Lytle, L. A. (2009). Measuring the food environment: state of science. *American Journal of Preventive Medicine, 36(4S),* S134-S144.

Macintyre, S. (2007). Deprivation amplification revisited; or is it always true that poorer places have poorer access to resources for healthy diets and physical activity? *International Journal of Behavioral Nutrition and Physical Activity, 4(32).* http://www.ijbnpa.org/content/4/1/32.

McAlister, A. L., Perry, C. L., & Parcel, G. S. (2008). How individuals, environments, and health behaviors interact: Social Cognitive Theory. In: Glanz K., Rimer B. K., Viswanath K., editors. Health behavior and health education: Theory, research, and practice (4th ed.) (pp. 169-88). San Francisco: Jossey-Bass.

Molnar, J. J., Duffy, P. A., Claxton, L. & Bailey, C. (2001). Private food assistance in a small metropolitan area: Urban resources and rural needs. *Journal of Sociology & Social Welfare, 28(3),* 187-209.

Morris, P. M., Bellinger, M., & Haas, E. (1990). Higher prices, fewer choices: shopping for food in rural America. Public Voice for Food and Health Policy, Washington, DC.

National Restaurant Association. (2012). 2012 Restaurant and industry forecast. Retrieved September 14, 2012 from http://www.restaurant.org/pdfs/research/forecast_2012.pdf.

Ohls, J. C., Ponza, M., Moreno, L., Zambrowski, A., & Cohen, R. (1999). Food stamp participants access to food retailers. Report submitted to USDA, Food and Nutrition Service by Mathematica Policy research, Inc. http://www.fns.usda.gov/Ora/menu/Published/snap/FILES/ProgramOperations/retailer.pdf

Ohri-Vachaspati, P., & Leviton, L. C. (2010). Measuring Food Environments - A critique. *American Journal of Health Promotion, 24(6), 410-426.*

Parajes, F. (2002). Overview of Social Cognitive Theory and self-efficacy. Retrieved September 18, 2012 from http://130.18.140.19/persuasion/eff.html.

Rigby, S., Leone, A. F., Hwahwan, K., Betterley, C., Johnson, M. A., Kurtz, H., et al. (2012). Food deserts in Leon County, FL: Disparate Distribution of Supplemental Nutrition Program Assistance Program-accepting stores by neighborhood characteristics. *Journal of Nutrition Education and Behavior, 44(6),* 539-547.

Rose, D., Bodor, J. N., Hutchinson, P. L., & Swalm, C. M. (2010). The importance of a multi-dimensional approach for studying the links between food access and consumption. *Journal of Nutrition, 140,* 1170-1174.

Rose, D., Bodor, J. N., Swalm, C. M., Rice, J. C., Farley, T. A., Hutchison, P. L. (2009). Deserts in New Orleans? Illustrations of urban food access and implications for policy. Retrieved January 21, 2012 from http://www.npc.umich.edu/news/events/food-access/rose_et_al.pdf. (Paper prepared for University of Michigan National Poverty Center/USDA Economic Research Serve "Understanding the Economic Concepts and Characteristics of Food Access" February 2009.)

Rose, D., & Richards, R. (2004). Food store access and household fruit and vegetable use among participants in the US Food Stamp Program. *Public Health Nutrition, 7(8),*1081-1088.

Sallis, J. F. (1986). San Diego surveyed for heart-healthy foods and exercise facilities. *Public Health Reports, 101(2),* 216-218.

Sharkey, J. R. (2009). Measuring potential access to food stores and food-service places in rural areas in the U.S. *American Journal of Preventive Medicine, 36(4S),* S151-S155.

Sharkey, J. R., & Horel, S. (2008). Neighborhood socioeconomic deprivation and minority composition are associated with better potential spatial access to the ground-truthed food environment in a large rural area. *Journal of Nutrition, 138,* 620-627.

Sharkey, J. R., & Horel, S. (2009). Characteristics of potential spatial access to a variety of fruits and vegetables in a large rural area. (Prepared for the January 23, 2009 National Poverty Center/Economic Research Service, USDA conference "Understanding the economic concepts and characteristics of food access")

Smith, C., & Morton, L. W. (2009). Rural food deserts: low-income perspectives on food access in Minnesota and Iowa. *Journal of Nutrition Education and Behavior, 41,* 176-187.

Story, M., Kaphingst, K. M., Robinson-O'Brien, R., & Glanz, K. (2008). Creating healthy food and eating environments: Policy and environmental approaches. *Annual Review of Public Health, 29,* 253-272.

US Census Bureau. (2012a). Greene County, Alabama QuickLinks: Census 2000 population, demographic, and housing information. Retrieved August 18, 2012 from http://quickfacts.census.gov/qfd/states/01/01063lk.html.

US Census Bureau. (2012b). North American Industry Classification System. Retrieved September 18, 2012 from http://www.census.gov/eos/www/naics/.

US Department of Agriculture Economic Research Service. (2013). Download the data: Food Access Research Atlas data file. Retrieved May 8, 2013 from http://www.ers.usda.gov/data-products/food-access-research-atlas/download-the-data.aspx#.U2vO515DdG4.

US Department of Agriculture Economic Research Service. (2012a). The Food Access Research Atlas: Go to the Atlas. Retrieved April 24, 2013 from http://www.ers.usda.gov/data-products/food-access-research-atlas/go-to-the-atlas.aspx#.UXf8qVsiBDg

US Department of Agriculture Economic Research Service. (2012b). The Food Access Research Atlas: Documentation.Rhttp://www.ers.usda.gov/data-products/food-access-research-atlas/documentation.aspx#.UXgJkVsiBDg.

US Department of Agriculture Food and Nutrition Service. (2012a). WIC program and participation costs. Retrieved July 26, 2012 from http://www.fns.usda.gov/pd/wisummary.htm.

US Department of Agriculture Food and Nutrition Service. (2012b). Frequently asked questions about WIC. Retrieved July 26, 2012 from http://www.fns.usda.gov/wic/FAQs/faq.htm.

US Department of Health and Human Services. (2012). About Healthy People. Retrieved March 31, 2012 from http://www.healthypeople.gov/2020/about/default.aspx.

US Social Security Administration. (2013). Popular birth names by year. Retrieved May 10, 2013 from http://www.ssa.gov/OACT/babynames/#ht=1.

Ver Ploeg, M., Breneman, V., Dutko, P., Williams, R., Snyder, S., Dicken, C., et al. (2012). Access to affordable and nutritious food: updated estimates of distance to supermarkets using 2010 data. Washington, DC: US Department of Agriculture Economic Research Service. Economic Research Report 143.

Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and access to healthy food in the United States: a review of food deserts literature. *Health & Place, 16*, 876-884.

Whelan, A., Wrigley, N., Warm, D., and Cannings, E. (2002). Life in a 'food desert.' *Urban Studies, 39(11),* 2083-2100.

Winkler, E., Turrell, G., & Patterson, C. (2006). Does living in a disadvantaged area mean fewer opportunities to purchase fresh fruit and vegetables in the area? Findings from the Brisbane food study. *Health & Place, 12*, 306-319.

CHAPTER 4

OVERALL CONCLUSIONS

The purpose of this study was to provide insight into the link between individual and environmental health in Greene County, Alabama by evaluating the county food retail environment and assessing residents' food access patterns. The Social Cognitive Theory constructs provided a useful framework through which realized food environments and associated shopping patterns could be examined in relation to the potential food environment and personal characteristics. The following conclusions are arranged by each component of the reciprocal determinism construct.

Food Retail Environments

Results from the present study align with previous research that has demonstrated decreased access to supermarkets and increased access to convenience stores in low-income rural counties. United States Department of Agriculture (USDA) food desert designations were confirmed, meaning census tracts considered food deserts did not have a supermarket or grocery store. However, intra-county comparisons indicated the non-food desert census tract (NFDT) encompassed more stores and store types than did the food desert tracts (FDT), contrasting research suggesting increased presence of other food retailers, such as convenience stores and fast food restaurants, in the absence of grocery stores. While increased limited service/fast food outlets were not found in FDT, channel blurring convenience stores may increasingly act as fast food stand-ins in all areas of study. The disparate distribution of food stores was accompanied by disparate distribution of WIC vendors and SNAP-authorized retailers.

Food Procurement Behaviors

For effective food desert interventions, a critical component of food desert research is the pairing of food environment data with information regarding residential food access patterns. Results from interviews with 30 participants of the Greene County Special Supplemental Program for Women, Infants, and Children (WIC) indicated that food shopping patterns did not vary significantly based on residential area. Participants were utilizing about 53% of area stores, identifying grocers and dollar stores in the NFDT as important to meeting household food needs. However, while the majority of participants reported shopping in traditional food outlets for the bulk of their household food needs, 77% of participants were leaving the county to visit grocers outside the county to purchase what they believed to be cheaper, better quality food. This echoes research that has found many travel long distances to access preferred food stores, and contrast assumptions that people use the food outlet closest to their home (Coveney & O'Dwyer, 2009; Freedman, 2009; Ohls, Ponza, Moreno, Zambrowski, & Cohen, 1999). Many used local food stores only to top off monthly food supply.

Participants used a variety of shopping strategies and encountered a range of opportunity and monetary costs for their food shopping decisions. Participants without cars were more restricted in food shopping ability and often incurred increased time and money costs. However, because many participants were traveling, most incurred these costs regardless of vehicle ownership, suggesting increased difficult of food shopping regardless of area food desert designations.

Personal Factors

Despite overarching similarity in patterns of food shopping, there was some variation in shopping behaviors at the individual level dictated by sociodemographic factors of the individual and their household. For example, employment status, transportation availability, number and age of children in the household, and dietary restrictions impacted food shopping location, frequency, and structure. Additionally, though not directly assessed, attitudes and perceptions of local food stores seemed to be important determinants of food shopping behaviors. It is also likely that social norms impact store use and food purchasing, an important focus for future research addressing food shopping behaviors.

Implications

Healthy food purchasing and subsequent intake can only occur if the food environment is supportive, meaning, at minimum, healthy choices are accessible and affordable. Some participants reported barriers to accessing food retailers, thereby limiting food choices and prohibiting these women from maximizing food assistance benefits, including WIC benefits. Even when healthful foods were physically available, high prices and poor quality limited ability to purchase healthful foods required to improve health status of such nutritionally vulnerable populations. If spatially segregated, low-income households continue to experience food access problems and suffer health-related consequences related to limited access, then the effectiveness of programs such as SNAP or WIC is uncertain.

Additionally, results demonstrate the value of multidimensional measures to provide nuanced descriptions of potential food environments (Rose, Bodor, Hutchinson, & Swalm, 2010). For example, USDA food desert designations can be paired with in-depth exploration of retail food outlets to best describe area foodscapes. In this study, FDTs embodied the food desert

concept and demonstrated the need to consider unique food access solutions in such areas. Investigation of the availability and variety of foods within area stores is an important next step in food access research and will further understanding of changing store types. Lastly, resident-informed data describing realized food environments should accompany potential food environment data and should include attitude and perception assessment in order to best inform food desert solutions, especially if solutions involve currently operating local stores. Results from the current study can be used to generate alternate forms of assessment, including surveys, to reduce time- and cost-intensity. A survey, like that discussed in Appendix E, could serve as a worthwhile tool with which food shopping behaviors and personal factors can be further examined.

REFERENCES

Alabama Department of Public Health (2013a). Alabama WIC approved foods. Retrieved May 24, 2014 from http://www.adph.org/wic/assets/WICApprovedFoodsBrochureEN.pdf.

Alabama Department of Public Health. (2013b). Alabama Vendor List. Retrieved August 11, 2013 from http://www.adph.org/wic/assets/AlabamaVendorListbyCity.pdf.

Alaimo, K. (2005). Food insecurity in the United States – An overview. *Topics in Clinical Nutrition, 20(4),* 281-298.

Alcaly, R. E., & Klevorick, A. K. (1971). Food prices in relation to income levels in New York City. *Journal of Business, 44(4)r,* 380-397.

Alwitt, L. F., & Donley, T. D. (1997). Retail stores in poor urban neighborhoods. *The Journal of Consumer Affairs, 31(1),* 139-164.

Ambrose, D. M. (1979). Retail grocery pricing: Inner city, suburban and rural comparisons. *Journal of Business, 52(1),* 95-102.

Anderson, S. A. (1990). Core indicators of nutritional state for difficult-to-sample populations. *The Journal of Nutrition,120(S11),* S1559-S1560.

Andrews, M., Kantor, L. S., Lino, M., & Ripplinger, D. (2001). Using USDA's Thrifty Food Plan to assess food availability and affordability. *FoodReview, 24(2),* 45-53.

Andreyeva, T., Luedicke, J., Middleton, A. E., Long, M. W., & Schwartz, M. B. (2012). Positive influence of the revised Special Supplemental Nutrition Program for Women, Infants, and Children food packages on access to healthy foods. *Journal of the Academy of Nutrition and Dietetics, 112,* 850-858.

Apparicio, P., Cloutier, M. S., & Shearmur, R. (2007). The case of Montreal's missing food deserts: Evaluation of accessibility to food supermarkets. *International Journal of Health Geographics, 6(4).* http://www.ij-healthgeographics.com/content/6/4.

Arcia, G. T., Crouch, L. A., & Kulka, R. A. (1990). Impact of the WIC program on food expenditures. *American Journal of Agricultural Economics, 72,* 218-226.

Auchincloss, A. H., & Hadden, W. (2002). The health effects of rural-urban residence and concentrated poverty. *Journal of Rural Health, 18(2),* 319-36.

Baker, E. A., Schootman, M., Barnidge, E., & Kelly, C. (2006) The role of race and poverty in access to foods that enable individuals to adhere to dietary guidelines. *Preventing Chronic Disease* [serial online]. Retrieved January 21, 2012 from http://www.cdc.gov/pcd/issues/2006/ jul/05_0217.htm.

Bandura, A. (1986). *Social Foundations of Thoughts and Actions: A Social Cognitive Theory.* Englewood Cliffs: Prentice-Hall.

Baranowski, T., Perry, C., & Parcel, G. (2002). How Individuals, Environments, and Health Behavior Interact. In: Glanz, K., Rimer, B.K., Lewis, F.M., editors. Health Behavior and Health Education: Theory, Research, and Practice. (3rd Edition.) (pp. 165-184). San Francisco, CA: Jossey-Bass.

Beaulac, J., Kristjansson, E., & Cummins, S. (2009). A systematic review of food deserts, 1966-2007. *Preventing Chronic Disease* [serial online]. Retrieved January 21, 2012 from http://www.cdc.gov/pcd/issues/2009/jul/08_0163.htm.

Beaumont, J., Lang, T., Leather, S., & Mucklow, C. (1995). Report from the Policy Sub-group to the Nutrition Task Force: Low Income Project Team. Watford: Institute of Grocery Distribution.

Bernard, H. R. (2011). Sampling III: nonprobability samples and choosing informants. In: Research Methods in Anthropology. (5th Edition.) (pp. 143-155). Plymouth, United Kingdom: AltaMira Press.

Bickel, G., Nord, M., Price, C., Hamilton, W., & Cook, J. (2000). Guide to measuring household food security. Washington, DC: United States Department of Agriculture, Food and Nutrition Service, Office of Nutrition, Analysis and Evaluation.

Blanchard, T. C., & Lyson, T. A. (2006). Food availability and food deserts in the nonmetropolitan South. Food Assistance Needs of the South's Vulnerable Populations, No.12, Southern Rural Development Center, April 2006. Retrieved April 11, 2013 from http://srdc.msstate.edu/ridge/publications/archive/fa/fa_12.pdf.

Block, D., & Kouba, J. (2005). A comparison of the availability and affordability of a market basket in two communities in the Chicago area. *Public Health Nutrition, 9(7),* 837-845.

Block, J. P., Scribner, R. A., & DeSalvo, K. B. (2004). Fast food, race/ethnicity, and income. *American Journal of Preventive Medicine, 27(3),* 211-217.

Bodor, J. N., Rose, D., Farley, T. A., Swalm, C., & Scott, S. K. (2007). Neighbourhood fruit and vegetable availability and consumption: the role of small food stores in an urban environment. *Public Health Nutrition, 11(4),* 413-420.

Bustillos, B., Sharkey, J. R., Anding, J., & McIntosh, A. (2009). Availability of more healthful food alternatives in traditional, convenience, and nontraditional types of food stores in two rural Texas counties. *Journal of the American Dietetic Association, 109,* 883-889.

Centers for Disease Control and Prevention (2011). National Health and Nutrition Examination Survey: 2007 - 2008 data documentation, codebook, and frequencies: Consumer behavior. Retrieved February 18, 2012 from http://www.cdc.gov/nchs/nhanes/nhanes2007-2008/CBQ_E.htm.

Centers for Disease Control and Prevention (2012a). Overweight and obesity: Adult obesity facts. Retrieved August 18, 2012 from http://www.cdc.gov/obesity/data/adult.html.

Centers for Disease Control and Prevention. (2012b). National Diabetes Surveillance System. Retrieved August 18, 2012 from http://www.cdc.gov/diabetes/statistics.

Centers for Disease Control and Prevention. (2013). 2011-2012 National Health and Nutrition Examination Survey (NHANES): Survey Questionnaires, Examination Components and Laboratory Components 2011-2012. Retrieved April 24, 2013 from http://www.cdc.gov/nchs/nhanes/nhanes2011-2012/questexam11_12.htm.

Centers for Disease Control and Prevention Office of Minority Health & Health Disparities. (n.d.). Eliminating racial & ethnic health disparities. Retrieve August 18, 2012 from http://www.cdc.gov/omhd/about/disparities.htm.

Charmaz, K. (2006). Constructing grounded theory: A practical guide through qualitative analysis. Thousand Oaks, CA: Sage.

Cheadle, A., Psaty, B. M., Curry, S., Wagner, E., Diehr, P., Koepsell, T., et al. (1991). Community-level comparisons between the grocery store environment and individual diet practices. *Preventive Medicine, 20, 2*50-261.

Chriqui, J. F., Thrun, E., Rimkus, L., Barker, D. C., & Chaloupka, F. J. (2012). Zoning for health food access varies by community income – A BTG Research Brief. Chicago, IL: Bridging the Gap Program, Health Policy Center, Institute for Health Research and Policy, University of Illinois at Chicago.

Chung, C., & Meyers, S. L. (1999). Do the poor pay more for food? An analysis of grocery store availability and food price disparities. *The Journal of Consumer Affairs, 33(2),* 276-296.

Clarke, G., Eyre, H., & Guy, C. (2002). Deriving indicators of access to food retail provision in British cities: Studies of Cardiff, Leeds and Bradford. *Urban Studies, 39(11),* 2041-2060.

Clifton, K. J. (2004). Mobility strategies and food shopping for low-income families: A case study. *Journal of Planning Education and Research, 23,* 402-413.

Clifford, D., Anderson, J., Auld, G., & Champ, J. (2009). Good grubbin': Impact of a TV cooking show for college students living off campus. Journal of Nutrition Education and Behavior, 41, 194-200.

Coleman-Jensen, A., Nord, M., Andrews, M., & Carlson, S. (2012). Household food security in the United States in 2011. Washington, DC: US Department of Agriculture Economic Research Service. Economic Research Report ERR-141.

Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care. (2003). "Front Matter." Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care (with CD). Washington, DC: The National Academies Press, 2003.

Cotterill, R.W., & Franklin, A.W., 1995. The urban grocery store gap. Food Marketing Policy Issue Paper No. 8. Storrs, C.T. (Ed.), Food Marketing Policy Center, Department of Agricultural and Resource Economics, University of Connecticut.

Coveney, J., & O'Dwyer, L. A. (2009). Effects of mobility and location on food access. *Health & Place, 15,* 45-55.

Creel, J. S., Sharkey, J. R., McIntosh, A., Anding, J., & Huber, J. C. (2008). Availability of healthier options in traditional and nontraditional rural fast-food outlets. *BMC Public Health, 8, 395*

Crockett, E. G., Clancy, K. L., & Bowering, J. (1992). Comparing the cost of a Thrifty Food Plan market basket in three areas of New York State. *Journal of Nutrition Education, 24(1),* 72S-79S.

Cummins, S., Findlay, A., Petticrew, M., & Sparks, L. (2005a). Healthy cities: The impact of food retail-led regeneration on food access, choice, and retail structure. *Built Environment, 31(4),* 288-301.

Cummins, S. & Macintyre, S. (1999). The location of food stores in urban areas: A case study in Glasgow. *British Food Journal, 101(7),* 545 – 553

Cummins, S., & Macintyre, S. (2002a). "Food deserts": Evidence and assumption in health policy making. *The British Medical Journal, 325(7361),* 436-438.

Cummins, S., & Macintyre, S. (2002b). A systematic study of an urban foodscape: The price and availability of food in greater Glasgow. *Urban Studies, 39,* 2115-2130.

Cummins, S., & Macintyre, S. (2006). Food environments and obesity - Neighbourhood or nation? *International Journal of Epidemiology, 35,* 100-104.

Cummins, S., & Macintyre, S. (2009). Are secondary data sources on the neigbourhood food environment accurate? Case-study in Glasgow, UK. *Preventive Medicine, 49,* 527-528.

Cummins, S., McKay, L., & MacIntyre, S. (2005b). McDonald's restaurants and neighborhood deprivation in Scotland and England. *American Journal of Preventive Medicine, 29(4),* 308-310.

Cummins, S., Petticrew, M., Findlay, A., Higgins, C., & Sparks, L. (2005). Large-scale food retailing as health intervention: Quasi-experimental evaluation of a natural experiment. *Journal of Epidemiology and Community Health. 59,* 1035-1040.

Darmon, N., & Drenowski, A. (2008). Does social class predict diet quality? *The American Journal of Clinical Nutrition, 87(5),* 1107-1117.

DeNavas-Walt, C., Proctor, B. D., & Smith, J. C. (2011). U.S. Census Bureau, Current Population Reports, P60-239, Income, Poverty, and Health Insurance Coverage in the United States: 2010, U.S. Government Printing Office, Washington, DC, 2011.

Drenowski, A., Aggarwal, A., Hurvitz, P., Monslvais, P., & Moudon, A. V. (2012). Obesity and supermarket access: Proximity or price? *American Journal of Public Health, 22(8),* e74-e80.

Dobson, B., Beardsworth, A., Keil, T., & Walker, R. (1994). Diet, choice and poverty: Social cultural and nutritional aspects of food consumption among low-income families. Family Policy Studies Centre, Loughborough.

Dunn, R. A., Sharkey, J. R., Lotade-Manje, J., Bouhlal, Y., & Nayga, R. M., Jr. (2011). Socio-economic status, racial composition and the affordability of fresh fruits and vegetables in neighborhoods of a large rural region in Texas. *Nutrition Journal* [serial online]. Retrieved May 12, 2013 from http://www.nutritionj.com/content/10/1/6.

Dutko, P., Ver Ploeg, M., & Farrigan, T. (2012). Characteristics and influential factors of food deserts. Washington, DC: US Department of Agriculture Economic Research Service. Economic Research Report 140.

Edmonds, J., Baranowski, T., Baranowski, J., Cullen, K. W., & Myers, D. (2001). Ecological and socioeconomic correlates of fruit, juice, and vegetable consumption among African-American boys. *Preventive Medicine, 32(6),* 476–481.

Finke, M. S., Chern, W. S., & Fox, J. S. (1997). Do the urban poor pay more for food? Issues in measurement. *Advancing the Consumer Interest, 9,* 13-17.

The Food, Conservation, and Energy Act of 2008. Public Law 110-246, 122 Stat. 1651 (2008).

Ford, P. B., & Dzewaltowski, D. A. (2008). Disparities in obesity prevalence due to variation in the retail food environment: three testable hypotheses. *Nutrition Reviews, 66(4),* 216-228.

Forsyth, A., Macintyre, S., & Anderson, A. (1994). Diets for disease? Intraurban variation in reported consumption in Glasgow. *Appetite, 22,* 259-274.

Freedman, A. M. (1991). The poor pay more for food in New York, survey finds. *The Wall Street Journal, B1, B5.*

Freedman, D. A. (2009). Local food environments: They're all stocked differently. *American Journal of Community Psychology, 44,* 382-393.

Freedman, D. A., & Bell, B. A. (2009). Access to healthful foods among an urban food insecure population: Perceptions versus reality. *Journal of Urban Health, 86(6),* 825-838.

French, S. A., Shimotsu, S. T., Wall, M., & Gerlach, A. F. (2008). Capturing the spectrum of household food and beverage purchasing behavior: A review. *Journal of the American Dietetic Association, 108,* 2051-2058.

Fruits & Veggies More Matters. (2012). Fresh, frozen, canned, dried and 100% juice: All forms of fruits & vegetables matter! Retrieved November 14, 2012 from http://www.fruitsandveggiesmorematters.org/fresh-frozen-canned-dried-and-100-juice.

Galvez, M. P., Morland, K., Raines, C., Kobil, J., Siskind, J., Godbold, J., et al. (2007). Race and food store availability in an inner-city neighborhood. *Public Health Nutrition, 11(6),* 624-631.

Garasky, S., Morton, L. W., & Greder, K. A. (2006). The effect of the local food environment and social support on rural food insecurity. *Journal of Hunger & Environmental Nutrition. 1(1),* 83-103.

Giskes, K., van Lenthe, F. J., Brug, J., Mackenbach, J. P., & Turrell, G. (2007). Socioeconomic inequalities in food purchasing: The contribution of respondent-perceived and actual (objectively measured) price and availability of foods. *Preventive Medicine, 45,* 41-48.

Gittelsohn, J., & Sharma, S. (2009) Physical, consumer and social aspects of measuring the food environment among diverse low-income populations. *American Journal of Preventive Medicine, 36(4S),* S161-S165.

Glanz, K. (2009). Measuring food environments: A historical perspective. (2009). *American Journal of Preventive Medicine, 36(4S),* S93-S98.

Glanz, K., Sallis, J. F., Saelens, B. E., & Frank, L. D. (2005). Healthy nutrition environments: Concepts and measures. *American Journal of Health Promotion, 19(5),* 330-333.

Glanz, K., Sallis, J. F., Saelens, B. E., & Frank, L. D. (2007). Nutrition environment measures survey in stores (NEMS-S): Development and evaluation. *American Journal of Preventive Medicine, 32(4),* 282-289.

Glaser, B. & Strauss, A. (1967). *The discovery of grounded theory: strategies for qualitative research.* New York: Aldine Publishing Company.

Gorton, D., Bullen, C. R., & Ni Mhurchu, C. (2009). Environmental influences on food security in high-income countries. *Nutrition Reviews, 68(1),* 1-29.

Graddy, K. (1997). Do fast-food chains price discriminate on the race and income characteristics of an area? *Journal of Business and Economic Statistics, 15,* 391-401.

Guy, C., Clarke, G., & Eyre, H. (2004). Food retail change and the growth of food deserts: A case study of Cardiff. *International Journal of Retail & Distribution Management, 34(4),* 72-88.

Guy, C. M., & David, G. (2004). Measuring physical access to 'healthy foods' in areas of social deprivation: A case study in Cardiff. *International Journal Of Consumer Studies, 28(3),* 222-234.

Guzzardi, W. (2011, June 16). Fresh Moves mobile grocery store an innovative solution to food deserts. *The Huffington Post.* Retrieved September 18, 2011 from http://www.huffingtonpost.com/2011/06/16/fresh-moves-mobile-grocer_n_878414.html.

Hale, T. (2004). Dollar store, no frills: The new retail landscape. *Consumer Insight, 11,* 13-42.

Hamelin, A. M., Mercier, C., & Bédard, A. (2008). Perception of needs and responses in food security: Divergence between households and stakeholders. *Public Health Nutrition, 11(12),* 1389-1396.

Hamilton, W. L., Cook, J. T., Thompson, W. W., Buron, L. F., Frongillo, E. A., Olson, C. M., et al. (1997). Household Food Security in the United States in 1995: Summary report of the Food Security Measurement Project. Washington, DC: US Department of Agriculture Food and Consumer Service Office of Analysis and Evaluation. Retrieved May 6, 2014 from http://www.fns.usda.gov/sites/default/files/SUMRPT.PDF.

Hendrickson, D., Smith, C., & Eikenberry, N. (2006). Fruit and vegetable access in four low-income food deserts communities in Minnesota. *Agriculture And Human Values, 23(3),* 371-83.

Hesh, H., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15(9),* 1277-1288.

Hillier, A., McLaughlin, J., Cannuscio, C. C., Chilton, M., Krasny, S., & Karypyn, A. (2012). The impact of WIC food package changes on access to healthful food in 2 low-income urban neighborhoods. *Journal of Nutrition and Behavior, 44,* 210-216.

Horn, J. (2011, September 12). Southwest Fresh Market brings options to Birmingham food desert. *Magic City Post.* Retrieved September 18, 2011 from http://magiccitypost.com/tag/urban-food-project/.

Horowitz, C. R., Colson, K. A., Herbert, P. L., & Lancaster, K. (2004). Barriers to buying healthy foods for people with diabetes: Evidence of environmental disparities. *American Journal of Public Health, 94(9),* 1549-1554.

Hosler, A. S., Varadarajulu, D., Ronsani, A. E., Fredrick, B. L., & Fisher, B. D. (2006). Low-fat milk and high-fiber bread availability in food stores in urban and rural communities. *Journal of Public Health Management, 12(6),* 556-562.

Inglis, V., Ball, K., & Crawford, D. (2008). Socioeconomic variations in women's diets: What is the role of perceptions of the local food environment? *Journal of Epidemiology and Community Health, 62,* 191-197.

Jetter, K. M., & Cassady, D. L. (2006). The availability and cost of healthier food alternatives. *American Journal of Preventive Medicine, 30(1),* 38–44.

Kaufman, P. R. (1998) Rural poor have less access to supermarkets, large grocery stores. *Rural Development Perspectives, 13(3),* 19-26.

Kaufman, P. R., MacDonald, J. M., Lutz, S. M., & Smallwood, D. M. (1997). Do the poor pay more for food? Item selection and price differences affect low-income household food costs. US Department of Agriculture Economic Research Service Agricultural Economic Report No. 759. Washington, D.C.

Kayani, N. (1998). Food deserts: A practical guide. London, UK: Chadwick. House Publishing.

Kersten, E., Laraia, B., Kelly, M., Adler, N., & Yen, I. H. (2012). Small food stores and availability of nutritious foods: A comparison of database and in-store measures, Northern California, 2009. *Preventing Chronic Disease, 9:120023. http://www.cdc.gov/pcd/issues/2012/12_0023.htm*

Khan, A. A., & Bhardwaj, S. M. (1994). Access to health care: A conceptual framework and its relevance to health care planning. *Evaluation & The Health Professions, 17(1),* 60-76.

Kieffer, E. C., Willis, S. K., Odoms–Young, A. M., Guzman, J. R., Allen, A. J., et al. (2004). Reducing disparities in diabetes among African–American and Latino residents of Detroit: The essential role of community planning focus groups. *Ethnicity & Disease, 14(3 Suppl 1),* S27–37.

Kirkpatrick, S. I., & Tarasuk, V. (2010). Assessing the relevance of neighbourhood characteristics to the household food security of low-income Toronto families. *Public Health Nutrition, 13(7),* 1139-1148.

Kunreuther, H. (1973). Why the poor pay more for food: Theoretical and emprirical evidence. *Journal of Business, 46,* 368-383.

Laraia, B., Siega-Riz, A. M., Kaufman, J. S., & Jones, S. J. (2004). Proximity of supermarkets is positively associated with diet quality index for pregnancy. *Preventive Medicine, 2004, 39,* 869-875.

Larson, N. I., Perry, C. L., Story, M., & Neumark-Sztainer, D. (2006). Food preparation by young adults is associated with better diet quality. *Journal of the American Dietetic Association, 106(12),* 2001-2007.

Larson, N. I., & Story, M. T. (2009). A review of environmental influences on food choices. *Annals of Behavioral Medicine, 38(S1),* S56-S73.

Larson, N. I., Story, M. T., & Nelson, M. C. (2009). Neighborhood environments: Disparities in access to health foods in the U.S. *American Journal of Preventive Medicine, 36(1),* 74-81.

Larsen, K., & Gilliland, J. (2008). Mapping the evolution of 'food deserts' in a Canadian city: Supermarket accessibility in London, Ontario, 1961–2005. *International Journal of Health Geographics, 7,* 16. doi:10.1186/1476-072X-7-16

Latham, J., & Moffat, T. (2007). Determinants of variation in food cost and availability in two socioeconomically contrasting neighbourhoods of Hamilton, Ontario, Canada. *Health & Place, 13,* 273-287.

Lee, A. J., Darcy, A. M., Leonard, D., Groos, A. D., Stubbs, C. O., Lowson, S. K., et al. (2002). Food availability, cost disparity and improvement in relation to accessibility and remoteness in Queensland. *Australia and New Zealand Journal of Public Health, 26(3),* 266-272.

Leibtag, E. S. (2005). Where you shop matters: Store formats drive variation in retail food prices. *Amber Waves, 3(5),* 13–18.

Let's Move. (2010). Opening Near You! New Food Markets and The Healthy Food Financing Initiative. Retrieved April 25, 2012 from http://www.letsmove.gov/blog/2010/10/15/opening-near-you-new-food-markets-and-healthy-food-financing-initiative.

Lewis, L. B., Sloane, D. C., Nascimento, L. M., Diamant, A. L., Guinyard, J. J., Yancey, A. K., et al. (2005). African Americans' access to health food options in South Los Angeles Restaurants. *American Journal of Public Health, 95(4),* 668-673.

Liese, A. D., Colabianchi, N., Lamichhane, A. P., Barnes, T. L., Hibbert, J. D., Porter, D. E., et al. (2010). Validation of 3 food outlet databases: Completeness and geospatial accuracy in rural and urban food environments. *American Journal of Epidemiology, 172(11),* 1324-1333.

Liese, A. D., Weis, K. E., Pluto, D., Smith, E., & Lawson, A. (2007). Food store types, availability, and cost of foods in a rural environment. *Journal of the American Dietetic Association, 107,* 1916-1923.

Lopez, R. P. (2007). Neighborhood risk factors for obesity. *Obesity, 15(8),* 2111-2119.

Lucan, S. C., Maroko, A. R., Bumol, J., Torrens, L., Varona, M., & Berke, E. M. (2013). Business list vs ground observation for measuring a food environment: Saving time or waste of time (or worse)? *Journal of the Academy of Nutrition and Dietetics, 113,* 1332-1339.

Lytle, L. A. (2009). Measuring the food environment: State of science. *American Journal of Preventive Medicine, 36(4S),* S134-S144.

Macintyre, S. (2007). Deprivation amplification revisited; or is it always true that poorer places have poorer access to resources for healthy diets and physical activity? *International Journal of Behavioral Nutrition and Physical Activity, 4(32).* http://www.ijbnpa.org/content/4/1/32.

Maddock, J. (2004). The relationship between obesity and the prevalence of fast food restaurants: State-level analysis. *American Journal of Health Promotion, 19(2),* 137-143.

Marcus, B. H. (1969). Similarity of ghetto and nonghetto food costs. *Journal of Marketing Research, 6,* 365-368.

Marshall, C., & Rossman, G. B. (2011). Designing qualitative research (5th ed.). Thousand Oaks, CA: Sage.

McAlister, A. L., Perry, C. L., & Parcel, G. S. (2008). How individuals, environments, and health behaviors interact: Social Cognitive Theory. In: Glanz K., Rimer B. K., Viswanath K., editors. Health behavior and health education: Theory, research, and practice (4th ed.) (pp. 169-88). San Francisco: Jossey-Bass.

Michimi, A., & Wimberly, M. C. (2010). Associations of supermarket accessibility with obesity and fruit and vegetable consumption in the conterminous United States. *International Journal of Health Geographics, 9:49. http://www.ij-healthgeographics.com/content/9/1/49.*

Molnar, J. J., Duffy, P. A., Claxton, L. & Bailey, C. (2001). Private food assistance in a small metropolitan area: Urban resources and rural needs. *Journal of Sociology & Social Welfare, 28(3),* 187-209.

Moore, L. V., & Diez Roux, A. V. (2006). Associations of neighborhood characteristics with the location and type of food stores. *American Journal of Public Health, 96(2),* 325-331.

Moore, L. V., Diez Roux, A. V., Nettleton, J. A., & Jacobs, D. R. (2008). Associations of the local food environment with diet quality – A comparison of assessments based on surveys and geographic information systems. *American Journal of Epidemiology, 167(8),* 917-924.

Morland, K., Diez Roux, A. V., & Wing, S. (2006). Supermarkets, other food stores, and obesity: The Atherosclerosis Risk in Communities Study. *American Journal of Preventive Medicine, 30(4),* 333-339.

Morland, K., & Filomena, S. (2007). Disparities in the availability of fruits and vegetables between racially segregated urban neighborhoods. *Public Health Nutrition, 10(12),* 1481-1489.

Morland, K., Wing, S., Diez Roux, A., & Poole, C. (2002a) Neighborhood characteristics associated with the location of food stores and food service places. *American Journal of Preventive Medicine, 22(1),* 23-29.

Morland, K., Wing, S., & Diez Roux, A. (2002b). The contextual effect of the local food environment on residents' diets: The Atherosclerosis Risk in Communities Study. *American Journal of Public Health, 92(11),* 1761-1767.

Morse, J. M. (1994). Designing funded qualitative research. In Norman K. Denzin & Yvonna S. Lincoln (Eds.), Handbook of qualitative research (2nd ed.). (pp.220-35). Thousand Oaks, CA: Sage.

Morton, L. W., Bitto, E. A., Oakland, M. J., & Sand, M. (2005). Solving the problems of Iowa food deserts: Food insecurity and civic structure. *Rural Sociology, 70(1),* 94-112.

Morton, L. W., & Blanchard, T. C. (2007). Starved for access: Life in rural America's food deserts. *Rural Realities, 1(4),* 1-10.

Morris, P. M., Bellinger, M., & Haas, E. (1990). Higher prices, fewer choices: Shopping for food in rural America. Public Voice for Food and Health Policy, Washington, DC.

Morris, P. M., Neuhauser, L., & Campbell, C. (1992). Food security in rural America: A study of the availability and costs of food. *Journal of Nutrition Education, 24(1),* 52S-58S.

Mhurchu, C. (2010). Food costs and healthful diets: The need for solution-oriented research and policies. *American Journal of Clinical Nutrition, 92,* 1007-1008.

Mujahid, M. S., Diez Roux, A. V., Morenoff, J. D., & Raghunathan, T. (2007). Assessing the measurement properties of neighborhood scales: from psychometrics to econometrics. *American Journal of Epidemiology, 165(8),* 858-867.

Mulhall, A. (2003). In the field: Motes on observation in qualitative research. *Journal of Advanced Nursing, 41(3),* 306-313.

National Institutes of Health. (2002). NIH Strategic Research Plan and Budget to Reduce and Ultimately Eliminate Health Disparities, Vol. 1, Fiscal Years 2002–2006. Retrieved April 5, 2013 from http://www.nimhd.nih.gov/our_programs/strategic/pubs/VolumeI_031003EDrev.pdf.

National Research Council. (2004) Eliminating health disparities: Measurement and data needs. Washington, DC: The National Academies Press.

National Research Council. (2006). Food insecurity and hunger in the United States: An assessment of the measure. Washington, DC: The National Academies Press.

National Restaurant Association. (2012). 2012 Restaurant and industry forecast. Retrieved September 14, 2012 from http://www.restaurant.org/pdfs/research/forecast_2012.pdf.

Neckerman, K. M., Lovasi, L., Yousefzadeh, P., Sheehan, D., Milinkovic, K., Baecker, A., et al. (2014). Comparing nutrition environments in bodegas and fast-food restaurants. *Journal of the Academy of Nutrition and Dietetics, 114,* 595-602.

Nord, M., & Prell, M. (2007). Struggling to feed the family: what does it mean to be food insecure? *Amber Waves, 5,* 32-39.

Ogden, C. L., Carroll, M. D., Kit, B.K., & Flegal, K. M. (2012). Prevalence of obesity and trends in body mass index among U.S. children and adolescents, 1999-2010. *Journal of the American Medical Association, 307(5),* 483-490.

Ohls, J. C., Ponza, M., Moreno, L., Zambrowski, A., & Cohen, R. (1999). Food stamp participants' access to food retailers. Report submitted to USDA, Food and Nutrition Service by Mathematica Policy research, Inc. http://www.fns.usda.gov/Ora/menu/Published/snap/FILES/ProgramOperations/retailer.pdf

Ohri-Vachaspati, P., & Leviton, L. C. (2010). Measuring Food Environments - A critique. *American Journal of Health Promotion, 24(6), 410-426.*

Parajes, F. (2002). Overview of Social Cognitive Theory and Self-efficacy. Retrieved September 18, 2012 from http://130.18.140.19/persuasion/eff.html.

Paquet, C., Daniel, M., Kestens, Y., Léger, K., & Gauvin, L. (2008). Field validation of listings of food stores and commercial physical activity establishments from secondary data. *International Journal of Behavioral Nutrition and Physical Activity, 5,* 8.

Pearson, T., Russell, J., Campbell, M. J., & Barker, M. E. (2005). Do 'food deserts' influence fruit and vegetable consumption? - a cross-sectional study. *Appetite, 45,* 195-197.

Pincus, T., Esther, R., DeWalt, D. A., & Callahan, L. F. (1998). Social conditions and self management are more powerful determinants of health than access to care. *Annals of Internal Medicine, 129,* 406-411.

Powell, L. M., Slater, S., Mirtcheva, D., Bao, Y., & Chaloupka, F. J. (2007). Food store availability and neighborhood characteristics in the United States. *Preventive Medicine, 44,* 189-195.

Public Health Law and Policy. (2009) Getting to the grocery: Tools for attracting healthy food retail to underserved neighborhoods. Retrieved September 18, 2011 from http://www.phlpnet.org/healthy-planning/products/getting-to-grocery.

Raja, S., Ma, C., & Yadav, P. (2008). Beyond food deserts: Measuring and mapping racial disparities in neighborhood food environments. *Journal of Planning Education and Research, 27,* 469-482.

Richards, R., & Smith, C. (2007). Environmental, parental, and personal influences on food choice, access, and overweight status among homeless children. *Social Science & Medicine, 65,* 1572-1583.

Rigby, S., Leone, A. F., Hwahwan, K., Betterley, C., Johnson, M. A., Kurtz, H., et al. (2012). Food deserts in Leon County, FL: Disparate Distribution of Supplemental Nutrition Program Assistance Program-accepting stores by neighborhood characteristics. *Journal of Nutrition Education and Behavior, 44(6),* 539-547.

Rose, D. (2010). Access to healthy food: A key focus for research on domestic food insecurity. *The Journal of Nutrition, 40,* 1167-1169.

Rose, D., Bodor, J. N., Hutchinson, P. L., & Swalm, C. M. (2010). The importance of a multi-dimensional approach for studying the links between food access and consumption. *Journal of Nutrition, 140,* 1170-1174.

Rose, D., Bodor, J. N., Swalm, C. M., Rice, J. C., Farley, T. A., & Hutchison, P. L. (2009a). Deserts in New Orleans? Illustrations of urban food access and implications for policy. Retrieved January 21, 2012 from http://www.npc.umich.edu/news/events/food-access/rose_et_al.pdf. (Paper prepared for University of Michigan National Poverty Center/USDA Economic Research Serve "Understanding the Economic Concepts and Characteristics of Food Access" February 2009.)

Rose, D., Hutchinson, P. L., Bodor, J. N., Swalm, C. M., Farley, T. A., Cohen, D. A., et al. (2009b). Neighborhood food environments and body mass index: the importance of in-store contents. *American Journal of Preventive Medicine, 37,* 214-219.

Rose, D., & Rice, J. C. (2009). Deserts in New Orleans? Illustrations of urban food access and implications for policy. (Paper prepared from University of Michigan National Poverty Center/USDA Economic Research Service "Understanding the Economic Concepts and Characteristics of Food Access")

Rose, D., & Richards, R. (2004). Food store access and household fruit and vegetable use among participants in the US Food Stamp Program. *Public Health Nutrition, 7(8),*1081-1088.

Sallis, J. F. (1986). San Diego surveyed for heart-healthy foods and exercise facilities. *Public Health Reports, 101(2),* 216-218.

Sharkey, J. R. (2009). Measuring potential access to food stores and food-service places in rural areas in the U.S. *American Journal of Preventive Medicine, 36(4S),* S151-S155.

Sharkey, J. R., & Horel, S. (2008). Neighborhood socioeconomic deprivation and minority composition are associated with better potential spatial access to the ground-truthed food environment in a large rural area. *Journal of Nutrition, 138,* 620-627.

Sharkey, J. R., & Horel, S. (2009). Characteristics of potential spatial access to a variety of fruits and vegetables in a large rural area. Prepared for the January 23, 2009 National Poverty Center/Economic Research Service, USDA conference "Understanding the economic concepts and characteristics of food access".

Sharkey, J. R., Horel, S., & Dean, W. R. (2010). Neighborhood deprivation, vehicle ownership, and potential spatial access to a variety of fruits and vegetables in a large rural area in Texas. *International Journal of Health Geographics* [serial online]. Retrieved May 12, 2013 from http://www.ij-healthgeographics.com/content/9/1/26.

Sharkey, J. R., Johnson, C. M., Dean, W. R., & Horel, S. A. (2011). Focusing on fast food restaurants alone underestimates the relationship between neighborhood deprivation and exposure to fast food in a large rural area. *Nutrition Journal* [serial online]. Retrieved May 12, 2013 from http://www.nutritionjournal.com/content/10/1/10.

Sloane, D. C., Diamant, A. L., Lewis, L. B., Yancy, A. K., Flynn, G., Nascimento, L. M., et al. (2003). Improving the nutritional resource environment for healthy living through community-based participatory research. *Journal of General and Internal Medicine, 18,* 568-575.

Smith, C., & Morton, L. W. (2009). Rural food deserts: low-income perspectives on food access in Minnesota and Iowa. *Journal of Nutrition Education and Behavior, 41,* 176-187.

Smoyer-Tomic, K. E., Spence, J. C., & Amrhein, C. (2006). Food deserts in the Prairies? Supermarket accessibility and neighborhood need in Edmonton, Canada. *The Professional Geographer, 58(3),* 307-326.

Stone, K. E., & Artz, G. M. (2003). Trends for Iowa retail businesses. Retrieved August 18, 2012 from http://www2.econ.iastate.edu/faculty/stone/Trends03.pdf.

Story, M., Kaphingst, K. M., Robinson-O'Brien, R., & Glanz, K. (2008). Creating healthy food and eating environments: Policy and environmental approaches. *Annual Review of Public Health, 29,* 253-272.

Story, M., Neumark-Sztainer, D., & French, S. (2002). Individual and environmental influences on adolescent eating behaviors. *Journal of the American Dietetic Association, 102(S1),* 40-S51.

Sturm, R., & Cohen, D. (2009). Zoning for health? The year-old ban on new fast-food restaurants in south LA. *Health Affairs, 28(6),* 1088-1097,

Tarasuk, V. S., & Beaton, G. H. (1999). Household food insecurity and hunger among families using food banks. *Canadian Journal of Public Health, 90(2),* 109-13.

Ternier, S. (2010.) Understanding and measuring cooking skills and knowledge as factors influencing convenience food purchases and consumption. *Studies by Undergraduate Researchers at Guelph, 3(2),* 69-76.

Travers, K. D., Cogdon, A., McDonald, W., Wright, C., Anderson, B., & Maclean, D. R. (1997). Availability and cost of heart healthy dietary changes in Nova Scotia. *Journal of the Canadian Dietetic Association, 58,* 176-183.

Turrell, G., Blakely, T., Patterson, C., & Oldenburg, B. (2004). A multilevel analysis of socioeconomic (small area) differences in household food purchasing behavior. *Journal of Epidemiology and Community Health, 58,* 208-215.

US Census Bureau. (2010). Model-based small area income & poverty estimates (SAIPE) for school districts, counties, and states. Retrieved September 19, 2011 from http://www.census.gov//did/www/saipe.

US Census Bureau. (2012a). Greene County, Alabama QuickLinks: Census 2000 population, demographic, and housing information. Retrieved August 18, 2012 from http://quickfacts.census.gov/qfd/states/01/01063lk.html.

US Census Bureau. (2012b). American Fact Finder. Profile of General Population and Housing Characteristics: 2010 Demographic Profile Data. Retrieved September 18, 2012 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_DPDP1&prodType=table

US Census Bureau. (2012c). North American Industry Classification System. Retrieved September 18, 2012 from http://www.census.gov/eos/www/naics/.

US Department of Agriculture. (n.d.) ChooseMyPlate: Food groups overview. Retrieved November 14, 2012 from http://www.choosemyplate.gov/food-groups/.

US Department of Agriculture Center for Nutrition Policy and Promotion. (2012a). Dietary Guidelines for Americans, 2010. http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/PolicyDoc/PolicyDoc.pdf.

US Department of Agriculture Center for Nutrition Policy and Promotion. (2012b). 2000 Guidelines. Retrieved September 18, 2012 from http://www.cnpp.usda.gov/DGAs2000Guidelines.htm.

US Department of Agriculture Economic Research Service. (2011). Rural income, poverty, and welfare: Summary of conditions and trends. Retrieved July 26, 2012 from http://webarchives.cdlib.org/sw1rf5mh0k/http://www.ers.usda.gov/Briefing/IncomePovertyWelfare/Overview.htm.

US Department of Agriculture Economic Research Service. (2012a). The Food Access Research Atlas: Go to the Atlas. Retrieved April 24, 2013 from http://www.ers.usda.gov/data-products/food-access-research-atlas/go-to-the-atlas.aspx#.UXf8qVsiBDg

US Department of Agriculture Economic Research Service. (2012b). The Food Access Research Atlas: Documentation. Retrieved April 24, 2013 from http://www.ers.usda.gov/data-products/food-access-research-atlas/documentation.aspx#.UXgJkVsiBDg.

US Department of Agriculture Economic Research Service. (2012c). Food Security in the United States: Definitions of Hunger and Food Security. Retrieved January 21, 2012 from http://www.ers.usda.gov/Briefing/FoodSecurity/labels.htm#lab.

US Department of Agriculture Economic Research Service. (2012d). Food expenditures. Retrieved August 18, 2012 from http://www.ers.usda.gov/data-products/food-expenditures.aspx#26634.

US Department of Agriculture Economic Research Service. (2014). U.S. Household Food Security Survey Module. Retrieved May 6, 2014 from http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools.aspx#household.

US Department of Agriculture Food and Nutrition Service. (2012a). Frequently asked questions about WIC. Retrieved July 26, 2012 from http://www.fns.usda.gov/wic/FAQs/faq.htm.

US Department of Agriculture Food and Nutrition Service. (2012b). WIC program: Total participation. Retrieved August 18, 2012 from http://www.fns.usda.gov/pd/26wifypart.htm.

US Department of Agriculture Food and Nutrition Service. (2013). SNAP Retailer Locator. Retrieved August 11, 2013 from http://www.snapretailerlocator.com/.

US Department of Health and Human Services. (2012a). About Healthy People. Retrieved March 31, 2012 from http://www.healthypeople.gov/2020/about/default.aspx.

US Department of Health and Human Services. (2012b). 2020 topics and objectives: Nutrition and weight status. Retrieved March 31, 2012 from http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=29.

US Department of Health and Human Services. (2012c). Foundation Health Measures: About. Retrieved March 31, 2012 from http://www.healthypeople.gov/2020/about/DisparitiesAbout.aspx.

US Department of Health and Human Services Agency for Healthcare Research and Quality. (2011). National Healthcare Disparities Report 2011. Retrieved July 26, 2012 from http://www.ahrq.gov/qual/nhdr11/nhdr11.pdf.

US Department of Health and Human Services, & US Department of Agriculture. (2005) Dietary Guidelines for Americans, 2005. 6th Edition, Washington, DC: U.S. Government Printing Office.

US Social Security Administration. (2013). Popular birth names by year. Retrieved May 10, 2013 from http://www.ssa.gov/OACT/babynames/#ht=1.

van Lenthe, F. J., Brug, J., & Mackenbach, J. P. (2005). Neighbourhood inequalities in physical inactivity: The role of neighbourhood attractiveness, proximity to local facilities and safety in the Netherlands. *Social Science & Medicine, 60(4),* 763-775.

Ver Ploeg, M., Breneman, V., Dutko, P., Williams, R., Snyder, S., Dicken, C., et al. (2012). Access to affordable and nutritious food: updated estimates of distance to supermarkets using 2010 data. Washington, DC: US Department of Agriculture Economic Research Service. Economic Research Report 143.

Ver Ploeg, M., Breneman, V., Farrigan, B. T., Hamarick, K., Hopkins, D., Kaufman, P., et al. (2009). Access to affordable and nutritious food – Measuring and understanding food deserts and their consequences: report to Congress. Washington, DC: US Department of Agriculture Economic Research Service. Administrative Publication AP-036.

Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and access to healthy food in the United States: A review of food deserts literature. *Health & Place, 16,* 876-884.

Wang, M. C., Kim, S., Gonzalez, A. A., MacLeod, K. E., & Winkleby, M. A. (2007). Socioeconomic and food-related physical characteristics of the neighbourhood environment are associated with body mass index. *Journal of Epidemiology and Community Health, 61,* 491-498.

Weinburg, Z. (1995). No place to shop: The lack of supermarkets in low-income neighborhoods. Washington, DC: Public Voice for Food and Health Policy; 1995:3.

Whelan, A., Wrigley, N., Warm, D., & Cannings, E. (2002). Life in a 'food desert.' *Urban Studies, 39(11),* 2083-2100.

Williams, D. R. (1990). Socioeconomic differentials in health: a review and redirection. *Social Psychology Quarterly,* 53, 81-89.

Willis, G. B. (2004). Cognitive interviewing: A tool for improving questionnaire design. Thousand Oaks, CA: Sage.

Winkler, E., Turrell, G., & Patterson, C. (2006). Does living in a disadvantaged area mean fewer opportunities to purchase fresh fruit and vegetables in the area? Findings from the Brisbane food study. *Health & Place, 12*, 306-319.

Wrigley, N. (2002). 'Food deserts' in British cities: Policy context and research priorities. *Urban Studies, 39(11),* 2029-2040.

Wrigley, N., Guy, C.. & Lowe, M. (2002). Urban regeneration, social inclusion and large store development: The Seacroft development in context. *Urban Studies, 39(11),* 2101-2114.

Wrigley, N., Warm, D., & Margetts, B. (2003). Deprivation, diet, and food-retail access: Findings from the Leeds 'food deserts' study. *Environment and Planning, 35,* 151-188.

Wrigley, N., Warm, D., Margetts, B., & Whelan, A. (2002). Assessing the impact of improved retail access on diet in a 'food desert': A preliminary report. *Urban Studies, 39(11),* 2061-2082.

Zick, C., Smith, K. R., Fan, J. X., Brown, B. B., Yamada, I., & Kowaleski-Jones, L. (2009). Running to the store? The relationship between neighborhood environments and the risk of obesity. *Social Science & Medicine, 69(10),* 1493-1500.

Zenk, S. N., Schulz, A. J., Israel, B. A., James, S. A., Boa, S., & Wilson, M. L. (2005a). Neighborhood racial composition, neighborhood poverty, and the spatial accessibility of supermarkets in metropolitan Detroit. *American Journal of Public Health, 95(4),* 660-667.

Zenk, S. N., Schulz, A. J., Hollis-Neely, T., Campbell, R. T., Holmes, N., Watkins, G., et al. (2005b). Fruit and vegetable intake in African Americans: Income and store characteristics. *American Journal of Preventive Medicine, 29(1),* 1-9.

APPENDIX A

REVIEW OF THE LITERATURE

The following review introduces the concept of food deserts, framing them as spatial disparities with the potential to contribute to health disparities. The definition and respective prevalence are presented in order to demonstrate the extent of the problem in the United States (US). Alongside a discussion of methodological concerns, this information will establish the need for further study.

Introduction to Spatial Disparities in Food Access

Health disparities have been recognized among several population subgroups (National Institutes of Health, 2002; US Department of Health and Human Services [USDHHS], 2012c). Specifically, residents of rural areas and racial/ethnic minorities (comprising 20% and over 30% of the US population, respectively) tend to be more socioeconomically disadvantaged and were identified as priority populations in the 2011 National Healthcare Disparities Report (Pincus, Ester, DeWalt, & Callahan, 1998; USDHHS Agency for Healthcare Research and Quality, 2011; Williams, 1990). For example, infant mortality rates and risk for obesity, cardiovascular disease, diabetes, and cancer are higher among racial/ethnic minorities and residents of rural areas (Auchincloss & Hadden, 2002; Centers for Disease Control and Prevention Office of Minority Health & Health Disparities, n.d.; Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care, 2003; National Research Council, 2004; US Department of Agriculture Economic Research Service [ERS], 2011). Furthermore, both residents of rural areas and racial/ethnic minorities are increasingly uninsured and experience disparities in healthcare delivery (UDHHS Agency for Healthcare Research and Quality, 2011; Auchincloss & Hadden, 2002; National Research Council, 2004).

Individual behavioral factors explaining health and socioeconomic inequalities are well investigated; however, a more recent approach expands this focus to include social and environmental factors affecting diet and health (Winkler, Turell, & Patterson, 2006). While social health disparities are not a new problem, discourse regarding spatial disparities has emerged only in the last decade (Beaulac, Kristjansson, & Cummins, 2009; Macintyre, 2007). Variations in health outcomes are dependent on compositional factors including age, gender, race, and socioeconomic status as well as contextual factors such as the nature of one's environment. Deprivation amplification has been described as the process by which individual disadvantage is intensified by area disadvantage (Macintyre, 2007).

It has been suggested that the effects of area disadvantage are unlikely direct and could be mediated by differences in the food supply (Forsythe, Macintyre, & Anderson, 1994; Winkler et al., 2006). Specifically, poor access to retail food stores such as supermarkets, and increased access to convenience stores and fast food restaurants in low-income areas could contribute to poor dietary quality and nutrition-related disease among already at-risk populations. Additionally, limited food access is an important determinant of food insecurity (Alaimo, 2005; Latham & Moffat, 2007), the "uncertain availability of nutritious food accessible in socially acceptable ways" (Anderson, 1990, p. 1560). Disadvantaged populations including the poor, unemployed, disabled, older adults, and single-parent households could be particularly vulnerable to limited food access. In fact, socioeconomic variation in food purchasing and dietary intake has been observed, in general with higher socioeconomic status related to consumption of higher quality diets (Darmon & Drenowski, 2008). Variations in food availability and food cost have been investigated as contributors to this disparity, and researchers from multiple disciplines have investigated the link between area characteristics and food access.

Food Deserts

Definition and Terminology

Beginning in the 1960s, US researchers identified "grocery store gaps" in poor inner cities (Alwitt & Donely, 1997; Cotterill & Franklin, 1995). This was followed by a number of studies in the United Kingdom (UK) that further refined the concept of "food deserts" (Clarke, Eyre, & Guy, 2002; Whelan, Wrigley, Warm, & Cannings, 2002; Wrigley, 2002; Wrigley, Guy, & Lowe, 2002; Wrigley, Warm, and Margetts, 2003). The Low Income Project Team of the British Department of Health used the term in government publications beginning in 1995 (Cummins & Macintyre, 2002a; Beaumont, Lang, Leather, & Mucklow, 1995), and food deserts were loosely defined as areas of cities in which inexpensive, healthy foods were unobtainable (Wrigley, 2002). Despite the imprecise definition of food deserts and the initial mixed results of UK food access research, food deserts were assumed to exist.

Blanchard & Lyson (2006) were among the first to apply the term in the US, in reference to areas in rural Mississippi outside of supermarket service. Contrasting much of the UK research, there has been consistent evidence of disparities in food access within the US. In 2008 the Food, Conservation, and Energy Act of 2008, defined a food desert as an "area in the United States with limited access to affordable and nutritious food, particularly such an area composed of predominately lower income neighborhoods and communities" (The Food, Conservation, and Energy Act of 2008, p. 2039). Though the operational definition has varied by study (leaving questions about the true existence and pervasiveness of food deserts), the US Department of Agriculture (USDA) has acknowledged food access inequities and defined a food desert using low-income and low food access criteria (Dutko, Ver Ploeg, & Farrigan, 2012).

The Healthy Food Financing Initiative (HFFI), part of Michelle Obama's *Let's Move* campaign (Let's Move, 2010), is an interagency workgroup including ERS, the US Treasury Department, and the USDHHS and was responsible for developing the definition of food deserts to be used to determine Federal funding eligibility (Dutko et al., 2012). According to the HFFI workgroup, a food desert is a low-income census tract in which a significant portion of residents has low access to a supermarket or grocery store. Supermarkets and large grocery stores were used as proxies for sources of healthy and affordable foods.

This definition has been operationalized in the USDA Food Access Research Atlas (USDA Economic Research Servce [ERS], 2012a, 2012b). The Atlas is a mapping tool that allows users to investigate multiple, updated indicators of food access, expanding upon the original Food Desert Locator, which defined food deserts using distance from supermarkets alone. The Atlas provides an overview of the location of food deserts throughout the US, thereby identifying areas that may need improved food access (Dutko et al., 2012; ERS 2012a, 2012b).

Any census tract may be considered "low-access" if a significant portion of the residents (500 people or 33% of the population) live far from a supermarket or grocery store, using various distance thresholds: ½-mile or 1-mile in urban areas and 20-mile demarcations in rural areas (ERS, 2012b). The Atlas also incorporates estimates of vehicle accessibility. A tract is has low vehicle access if at least 100 households are more than ½ mile from the nearest supermarket and have no access to a vehicle, or if at least 500 people (or 33%) live more than 20 miles from the nearest supermarket, regardless of vehicle access. Using the Atlas, a food desert is a census tract that is both low-income and low-access, with low-access now defined in one of three ways: original one- and 10-mile demarcations, new one-half- and 20-mile demarcations, or vehicle accessibility.

Origins of US Food Deserts

Population and income declines in US inner cities were as a result of economic segregation in which affluent households emigrated from inner city areas to suburban neighborhoods (Walker, Keane, & Burke, 2010). This economic decline of US urban city centers during the 1960s and 1970s likely contributed to fewer retail stores in these areas (Alwitt & Donely, 1997). While some markets were forced to close, other retailers, including supermarkets, followed the shift in customer base from city centers to suburbs. This phenomenon has been referred to as supermarket redlining.

Suburban locales allowed for increased store size (increased amount and variety of stock and ample parking (Larsen & Gilliland, 2008). [Kayani (1998) has pointed out that these grocery superstores were typically inaccessible by walking, thereby making them available only to those with automobiles or other forms of transportation.] Inner city retailers, however, were faced with increased cost of doing business as they experienced fewer customers, increased stock loss, higher crime rates, increased security costs, increased insurance premiums, higher labor costs, and increased rent (Alwitt & Donely, 1997; Ver Ploeg et al., 2009, Walker et al., 2010).

Space for larger stores was difficult to find within a city center, and zoning and building permits proved to be additional barriers. Residents of inner-city areas, therefore, were forced to choose from a smaller number of stores to complete food purchases or were forced to rely on public or private transportation to and from more distal stores, creating restricted availability, variety, and price of nutritious foods (Clarke et al., 2002). This pattern paralleled changes in the UK (Wrigley, 2002) and Canada (Smoyer-Tomic, Spence, & Amrhein, 2006), and barriers to market operation in inner cities are still encountered by businesses today.

Initial food access research explored the impact of retail flight from urban city centers, but has since expanded to include rural areas that have also experienced population reductions and associated declines in food retail (Ford & Dzewaltowski, 2008). For example, Stone and Artz (2003) noted that Iowa lost approximately 45% of its grocery stores from 1976-2003, with an average loss of 35 stores per year. Many of these stores were located in small, rural towns (Morton, Bitto, Oakland, & Sand, 2005). Such changes within the food retail industry often force new consumer travel patterns, having potentially severe implications for food access and food security among low-income individuals in rural areas (Morton et al., 2005).

Access Studies

Investigation of variations in food store locations in Canada and Australia has produced mixed results (Apparicio, Cloutier, & Shearmur, 2007; Coveney & O'Dwyer, 2009; Larsen & Gilliland, 2008; Latham & Moffat, 2007; Lee, et al., 2002; Smoyer-Tomic et al., 2006; Winkler et al., 2006.) Early UK research supported the association of higher food prices and poor food retail accessibility with area deprivation; however findings were based on small surveys, and policy makers have since been criticized for misinterpreting and generalizing results (Cummins & Macintyre, 2002a). More recent studies in large urban centers have generally found no association between neighborhood food retail provision and area socioeconomic deprivation (Clarke et al., 2002; Cummins & Macintyre, 1999; Cummins & Macintyre, 2002b; Guy & David, 2004; van Lenthe, Brug, & Mackenbach, 2005).

While overseas results have helped fuel debates about the existence or pervasiveness of food deserts, US research largely contrasts findings from other developed nations, generally finding poorer access to supermarkets and large grocery stores[4] for residents of rural areas, urban inner cities, and low-income populations, particularly Black communities (Beaulac et al., 2009; Larson et al., 2009; Walker et al., 2012). The following discussion of US results is organized as follows: investigations of food store availability, investigations of the availability of specific foods, investigations of restaurant availability, and investigations of food price. When possible, results are discussed separately according to findings regarding socioeconomic status, racial/ethnic composition, and urbanicity.

Food store availability.

The influence of socioeconomic status.

In an examination of socioeconomic and demographic characteristics of census tracts considered food deserts by the USDA, Dutko et al. (2012) found areas with higher levels of poverty were more likely to be food deserts. Multi-state studies have often found differing market structures between low-income areas and their counterparts, with most suggesting lack of supermarkets and large grocers and an aggregation of small grocers and convenience stores in inner city and low-income neighborhoods (Cotterill & Franklin, 1995; Powell, Slater, Mirtcheva, Bao, & Chaloupka, 2007; Moore & Diez Roux, 2006; Morland, Wing, Diez Roux, & Poole, 2002a; Weinburg, 1995). In 28,050 US zip codes, Powell et al. (2007) reported the lowest income quintile had only 75% of the chain supermarkets available in middle-income areas.

[4] Though researchers define food stores differently, in general, supermarkets and large chain grocery stores refer to large retailers with all major food departments. Convenience stores, bodegas, corner markets, and the like describe smaller stores with limited variety of packaged food.

Low-income areas had more non-chain supermarkets, non-chain grocery stores, and more convenience stores compared with the middle-income areas.

Similar results were found in a study of 216 selected census tracts of Mississippi, North Carolina, Maryland and Minnesota in which over three times as many supermarkets were found in wealthier neighborhoods compared with lowest-income areas (Morland et al., 2002a). This trend has also been documented in smaller areas, including Chicago (Alwitt & Donely, 1997; Block & Kouba, 2005), Minneapolis-St. Paul, Minnesota (Chung & Meyers, 1999), Washington, D.C. (Andrews, Kantor, Lino, & Ripplinger, 2001), California (Wang, Kim, Gonzalez, MacLeod, & Winkleby, 2007), Los Angeles (Sloane, et al., 2003) and New York (Galvez et al., 2007).

The influence of area racial/ethnic composition.

A few studies have highlighted the influence of racial/ethnic composition in the location of food retailers. While Powell et al. (2007) warned that many studies reporting racial/ethnic disparities in food retail access have confounded income and racial effects (Cotterill & Franklin, 1995; Morland et al., 2002a; Moore & Diez Roux, 2006), some researchers have controlled for income in their analyses. Powell et al. (2007) reported that predominately Black zip codes across the nation had only half of the chain supermarkets of their White counterparts, while Hispanic neighborhoods had a third of the chain supermarkets than non-Hispanic areas. Similar results were reported in urban New York (Galvez et al., 2007; Morland & Filomena, 2007). Lastly, in Detroit, Michigan, Zenk and colleagues (2005a) reported distance to the nearest supermarket was similar among affluent neighborhoods, regardless of racial/ethnic composition. However, among lowest-income neighborhoods, predominately Black areas were 1.1 miles further from the nearest supermarket compared with predominately White areas.

The influence of urbanicity.

Examining characteristics of USDA-defined food deserts across the US, Dutko et al. (2012) found that demographic and socioeconomic differences among census tracts considered food deserts were consistent regardless of tracts' rural or urban designation: lower income, greater concentration of racial/ethnic minorities, decreased levels of education, increased unemployment, and smaller populations. However, most studies have not directly compared rural and urban areas. Powell et al. (2007) offered one of the few exceptions, finding significantly fewer food retail stores in a national survey of rural zip codes compared with urban zip codes. Controlling for covariates including population size, the number of chain supermarkets was over seven times greater in urban areas.

Despite a general lack of inter-area comparisons, the growing body of food access research has consistently demonstrated that rural areas are frequently underserved by food retailers (Blanchard & Lyson, 2003; Kaufman, 1998; Morris, Bellinger, & Haas, 1990). In a study of 36 high-poverty, rural counties in Arkansas, Mississippi, and Louisiana, Kaufman (1998) found many households experienced low accessibility to supermarkets and large grocery stores and that accessibility was lowest for low-income households, 70% of which experienced accessibility problems. Findings were echoed by Blanchard and Lyson (2003) in 2,275 rural areas of the US.

Kaufman (1998) found that the rural southeastern counties investigated averaged only one supermarket per nearly 191 square miles (mi^2). There were only 0.07 stores/mi^2 in a rural South Carolina county (Liese, Weis, Pluto, Smith, & Lawson, 2007), a relatively low number considering those reported by Moore and Diez Roux (2006) for predominately urban census tracts in North Carolina (1/mi^2), Maryland (3/mi^2), and New York (67/mi^2). [However, the

number of stores per 10,000 residents was comparable between both studies, pointing to differences in population concentration (Liese et al., 2007; Moore & Diez Roux, 2006).]

Liese et al. (2007) reported supermarkets and grocery stores accounted for only 26% of the food retailers in a rural South Carolina county. About 74% of stores were convenience stores, which were also the least physically accessible, with limited off-street parking and few handicap-accesible design considerations. In six rural Texas counties, Sharkey and Horel (2008) reported 72.3% of stores were convenience stores, while only 10.8% were supermarkets or grocery stores. In other rural Texas areas, 84% of all food stores were nontraditional (e.g., convenience stores, dollar stores) (Bustillos, Sharkey, Anding, & McIntosh, 2009).

Differences in US and overseas findings.

Most US studies have demonstrated that residents of rural, low-income, and minority areas are most often affected by poor access to supermarkets, large grocery chains and often have increased access to convenience stores (Larson et al., 2009; Sharkey & Horel, 2008; Block & Kouba, 2006; Morton & Blanchard, 2007; Kaufman, 1998; Liese et al., 2007; Bustillos et al., 2009). The most common explanations for differences among US and foreign findings highlight international differences in sociocultural, economic, and regulatory processes that determine provision, purchase, and consumption, which manifest as inequalities observable at the neighborhood level (Alwitt & Donely, 1997; Cummins & Macintyre, 2006; Smoyer-Tomic et al., 2006; Wrigley, 2002). Deprivation amplification may be more problematic in the US than in the UK or other developed nations.

For example, planning regulations within the US may be less focused on compensating for segregation in food retail, compared with areas of Europe or Australia. Local UK governments have forced central city development by limiting edge of the city development. In

the US, however, lower income communities have been less likely to enact such ordinances (Chriqui, Thrun, Rimkus, Barker, & Chaloupka, 2012), though cities are beginning adopting zoning laws to regulate establishment of fast food restaurants (Sturm & Cohen, 2009). Only recently have US policymakers begun to address food access, most notably with a federal initiative designed to bring healthful food retailers to underserved communities (Let's Move, 2010).

Residential segregation along socioeconomic and racial/ethnic lines may be more pronounced in the US (Cummins & Macintyre, 2006). The gap in socioeconomic status between rural, inner city, and minority communities and their more affluent counterparts seems to be extreme compared with gradients seen in the UK (Cummins & Macintyre, 2006), Canada (Smoyer-Tomic et al., 2006), and Australia (Turrell et al., 2004), suggesting a relatively equal shopping infrastructure in these areas. Following in-depth interviews with residents of urban Nashville communities, Freedman (2009) reported residents were aware of the intersectionality between food access and larger social issues such as racism or classism. A quarter of participants believed that segregation of food stores was a byproduct of these issues.

Finally, it has been suggested that the presence (or absence) of food retailers or particular foods for sale within a geographic area is, in part, reflective of demand (Ver Ploeg, et al. 2009). Consideration of demand or of choices involved in residential location and food purchasing is a gap in food desert literature. However, it is worthwhile to note that, in addition to personal preference, price of foods, transportation, and time costs also drive demand; therefore the choices of the poor are constrained. Additionally, a few evaluations of residential perception of the food environment suggested that residents of areas with low food retail access viewed local markets and convenience stores as inadequate to meet their food needs and believed there was limited

variety and low quality of goods in their neighborhoods, suggesting dissatisfaction with their local food environment (Freedman, 2009; Freedman & Bell, 2009; Giskes, van Lenthe, Brug, Mackenbach, & Turrell, 2007).

Availability of specific food products.

The described research has used the presence of food stores alone as a proxy for the availability of foods, relying on the assumption that supermarkets and large grocers carry a wide range of most food groups, while smaller stores have less stock and generally carry few perishable items (Ver Ploeg et al., 2009). Some researchers, however, have examined the contents of food stores. Findings mirrored those of food store availability, with poor communities, communities of color, and rural areas having decreased access to fewer healthful food products within available stores (Baker, Schootman, Barnidge, &Kelly, 2006; Horowitz, Colson, Herbert, & Lancaster, 2004; Morland & Filomena, 2007; Sallis, 1986).

For example, Sloane et al. (2003) reported decreased availability of healthful foods such as fruits, vegetables, low-fat meat and dairy products, and whole grains in a Black community of metropolitan Los Angeles, compared with a wealthier, predominately White neighborhood. (Additionally, using community and student surveyors, stores in the minority area were found to provide poorer customer service and appeared less clean than stores in the more affluent neighborhood.) Sharkey and Horel (2008) reported that distance to the nearest opportunity to obtain fruits and vegetables decreased with increasing socioeconomic deprivation, minority composition, and population density in six rural Texas counties. Others have documented higher prices, decreased variety, and lower quality of food, specifically fresh meat and fresh produce, among rural areas (Kaufman, 1998; Morris, Neuhauser, & Campbell, 1992).

Restaurant availability.

Nearly half of all food expenditures are spent on food away from the home, making restaurants and other food service establishments a significant contributor to the American diet (National Restaurant Association, 2012). Therefore, assessing access to such establishments has been a valuable contribution to food desert literature. Though results pertaining to full-service restaurants are mixed (Powell et al., 2007; Lewis et al., 2005), studies at the national and state or community level have often found variation in fast food restaurants availability by area income and racial/ethnic composition (Glavez et al., 2007; Graddy, 1997).

Lewis et al. (2005) found poorer communities with higher percentages of Black residents had more fast food restaurants, and Baker et al. (2006), found fewer healthy menu options in fast food restaurants compared with restaurants found in predominately White areas. After controlling for environmental confounders such as commercial activity, median home value, and highway location, increased density of fast food outlets was found in predominately Black and low-income census tracts of New Orleans, Louisiana (Block, Scribner, & DeSalvo, 2004). Interestingly, significant increases in mean number of McDonald's restaurants per 1000 residents have been observed in more deprived areas of England and Scotland (Cummins, McKay, & Macintyre, 2005).

Disparities in Food Price

Because already marginalized populations, including those of low income, are affected by limited access to large grocers and healthful foods, food affordability has often been considered. Studies reporting on the prices of goods available in low-income or minority areas actually preceded most food access research and began the 1960s (Chung & Meyers, 1999). The results of this body of research, however, are mixed, with some studies reporting increased prices

in lower-income areas, while others maintain the poor do not pay more for food (Alcaly & Klevorick, 1971; Beaulac et al., 2009; Kunreuther 1973; Marcus, 1969; Walker et al., 2010). More recent evidence has documented higher food prices in low-income areas with large racial/ethnic minority populations (Finke et al., 1997, Freedman, 1991; Smith, & Eikenberry, 2006), though recent evidence to the contrary has also surfaced (Andrews et al, 2001; Block & Kouba, 2005; Chung & Meyers, 1999; Horowitz et al., 2004).

The influence of urbanicity.

Findings have also been documented based on geographic location. For example, supermarkets in central city areas may carry higher priced goods than do supermarkets in suburban areas, likely due to higher operating costs, decreased product availability, and limited competition (Andrews et al., 2001; Crockett, Clancy, Bowering, 1992; Hendrickson et al., 2006; Kaufman, MacDonald, Lutz, & Smallwood, 1997). Some evidence also points toward higher prices in rural areas of the US (Ambrose, 1979; Crockett et al., 1992; Morris et al., 1990), compared with suburban or urban neighborhoods. In a survey of 33 low-income, rural counties across the US, Morris et al. (1990) reported residents were dependent on fewer, higher priced stores. Rural areas also often lacked public transportation services, and residents were forced to travel greater distances using personal transportation to preferred stores.

The influence of store type.

The most consistently observed price differentials were based on store type, regardless of area sociodemographic/socioeconomic characteristics. Results of several studies indicated that cost of food was lower in large grocers and supermarkets than in medium and small stores such as bodegas or convenience stores in the US and Canada (Andrews et al., 2001; Crockett et al., 1992; Horowitz et al., 2004; Jetter & Cassady, 2006; Kaufman et al., 1997; Morris et al., 1992;

Travers et al., 1997). In fact, Kaufman et al. (1997) estimated an average 10% price difference between supermarkets and smaller stores. Furthermore, in two rural Texas counties, Bustillos et al. (2009) found the widest selection of healthful food items in the less available traditional food stores such as supermarkets. While convenience stores and dollar stores carried a variety of canned fruits and vegetables, canned meat, milk, as well as some whole grains, these stores also had a greater variety of unhealthful food products compared with traditional stores. Similarly, Liese et al. (2007) reported convenience stores in rural South Carolina carried a limited range of target items and generally charged higher prices than both supermarkets and grocery stores.

It is generally agreed that supermarkets or large chain grocery stores offer the greatest variety of high quality foods, at lower costs, while small stores have limited shelf space and generally stock prepared, ready-to-eat foods with low nutrient-density but high caloric density and little fresh, perishable goods such as fruits, vegetables, whole grains, and milk (Glanz, Sallis, Saelens, & Frank, 2007; Horowitz et al., 2004; Larson & Story, 2009; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). Because a large proportion of the US poor live in central city and rural areas, poor consumers encounter a retail mix that includes more small stores than larger grocers and supermarkets (Alwitt & Donley, 1997; Kaufmann, 1998). Therefore, low-income households may experience higher average prices for food if patronizing local stores, or may experience increased transportation costs when accessing more distant supermarkets (Alwitt & Donley, 1997; Kaufmann, 1998).

Food Procurement Patterns

Physical access to food retailers is a problem for those living in underserved urban and rural communities, especially low-income households and racial/ethnic minorities (Kaufman, et al., 1997; Liese et al., 2007; Powell, et al., 2007; Sharkey & Horel, 2008). Residents of rural

areas are heavily affected by spatial inequalities in food retailers, as distance and transportation become an even bigger factor for food procurement (Blanchard & Lyson, 2003; Sharkey & Horel, 2008, 2009).

Bustillos et al. (2009) reported that over 20% of the rural Texas population investigated lived in neighborhoods ≥24 kilometers (km) from the nearest supermarket, ≥17.7 km from the nearest full-line grocery store, and ≥7.6 km from the nearest convenience store. Median distance to the nearest supermarket was 14.9 km (8.7 miles) one way. Kaufman (1998) reported that residents of rural counties often traveled at least 30 miles to the nearest supermarket. Using data from the American Time Use Survey, Ver Ploeg et al. (2009) estimated the average time spent traveling one way to the grocery store was approximately 15 minutes. Time spent was greater (19.5 minutes) for those in low-income areas with low-access to supermarkets and large grocers. Average round trip travel time for participants of the 1996 National Food Stamp Program Survey was approximately 23 minutes (Ohls, Ponza, Morena, Zambrowski, & Cohen, 1999), with those in rural areas reporting longer travel times.

By considering cost per kilometer traveled, time per kilometer traveled, distance to the nearest supermarket, and minimum wage, Rose, et al. (2009a) estimated out-of-pocket food shopping expenses for those without a car were 2.7 times higher than cost estimates for car owners. Authors also compared mean differences in travel costs between census tracts with good supermarket access (<2 km to the nearest supermarket) and poor access (>2 km), and estimated those with poor access encounter increased expense of $11 per month. Over 20% of participants in the National Food Stamp Program Survey reported encountering transportation costs, with average cost per trip $6.54 (Ohls et al., 1999). Rural participants were more likely to report higher out-of-pocket expenses. Additionally, it has been suggested that residents of rural areas

shop less frequently and, as a result, purchase fewer perishable items and more convenience or processed foods (Michimi & Wimberly, 2010).

Approximately 91% of US households own a car, and the rates are higher among rural populations (94.6%), compared with urban populations (87.8%) (Ver Ploeg et al., 2009, 2012). However, low-income households are less likely to be vehicle owners. Using semi-structured interviews with metro Austin, Texas residents, Clifton (2004) was able to describe mobility constraints that low-income families face when acquiring food and associated coping strategies. Income, mobility, and time constraints limited the range of destinations for the low-income consumer, thereby limiting food choices.

Four primary mobility strategies were reported if households did not own a car: purchasing a vehicle, getting rides from family or friends, walking, and using public transportation (Clifton, 2004). Participants preferred having access to their own vehicle in order to increase flexibility in the scope and time for shopping, link trips and add destinations, easily transport groceries, and reduce travel time. However, purchasing a car requires resources often unavailable to low-income families. Less frequent and less preferred was borrowing a car from a friend or relative. Though Clifton reported that it was uncommon for carless households to ask for rides from others for all non-work transportation needs, getting rides was an important part of food shopping activity. Friends, family, and coworkers were the primary sources of rides. Participants noted that having access to a car was advantageous for purchasing considerations, but advantages were often offset by depending on others (e.g., effort involved in arranging rides, rides' failure to show or tardiness, others' car trouble, and inability to control destination and timing). Taxis were sometimes used on return trips if consumers walked to the store, or if they did not want to rely on a ride for the journey home.

Public transit systems are not free of obstacles (Clifton, 2004). Door-to-door service is not guaranteed, so several stops may be necessary to go to and from a desired location. Planning to avoid peak transit hours, and managing small children on buses or trains can be problematic. Consumers are also limited by what can be transported, also true for those who must walk. In fact, walkers often reported choosing their destination based on transportation limitations alone, not price, quality, or variety of goods sold. Purchasing smaller amounts of items results not only in more frequent trips, but can have cost consequences as small unit quantities of goods are often more expensive. Clifton (2004) concluded that public transportation is generally ill-suited for household provisioning activities and that walking is only an option for those living in areas with relatively good local store access.

Whelan et al. (2002) found similar results in focus groups with women in Leeds, England. Coping mechanisms included not shopping at all, making small shopping trips or relying on others to shop for them, traveling to stores by foot, relying on friends or family with a car and adjusting shopping accordingly, or using taxis or public transportation. Authors stressed the importance of familial connections in managing food shopping and easing the burden of limited accessibility.

Prevalence of Limited Food Access

Measuring access is a task that requires information on all food retailers within a designated area, the types and prices of food sold within stores, and a measure of the food quality (Ver Ploeg et al., 2009). National-level estimates of limited food access have been difficult to generate due in part to large data requirements, the expansive and ever-changing nature of local food environments, and the complexity of food-based decisions. Additionally, the number of

people with poor food access depends on the measures employed, and there is no universally accepted definition of food deserts.

Using measures of food desert created by the HFFI workgroup, the USDA estimated that there are 8,959 food-desert census tracts in the continental US (Ver Ploeg et al., 2012). Roughly 75 % of these food-desert tracts are urban, while the remaining 25 % are rural (Ver Ploeg et al., 2009). An estimated total of 15.4 million low-income people in low-income census tracts have limited access to a supermarket or large grocery store, that is, they live more than 1 mile in urban areas or 10 miles in rural areas from a supermarket or large grocery store. Limited supermarket access affects 1,073,837 low-income Alabamians. Of those, 5, 205 live more than 10 miles from a store. It is estimated that there are 227 food deserts (low-income, low access census tracts) in Alabama. Most (185 or 81.5%) are urban, and 42 (18.5%) are rural.

While 93% of the US rural population lived within 10 miles of a supermarket, a larger share of low-income individuals and those living in low-income areas were among the 7% that traveled further distances to supermarkets (Ver Ploeg et al., 2009, 2012). Approximately 1.8% of households lived more than one mile from a supermarket and lacked vehicle access, with the majority of these households being low-income households.

Nationwide, median distance to the nearest supermarket was 0.7 miles (mi), 0.6 mi in urban areas and 4.1 mi in rural areas. Nearly 13 million people in low-income urban areas (17% of this population) and 1.8 million people in low-income rural areas (9.0%) live more than one mile or more than 10 miles from the nearest grocery store, respectively (Ver Ploeg et al., 2009, 2012). Further, in rural areas, 0.3 million people (1.4%) live more than 20 miles from a supermarket.

Consequences of Limited Food Access

Food deserts were identified as public health threats based on the idea that restricted access to health-promoting foods decreases diet quality and is potentially damaging to health (Wrigley, 2002). Following a study of Mississippi food deserts, Blanchard & Lyson (2003, p.15), noted that the larger implication of "the food desert dynamic is that populations already at risk of poor dietary intake and nutrition related illness, such as the poor and those without a high school diploma, experience an even greater risk of poor dietary intake when living in a food desert. Food deserts may compound severe nutritional problems and further exacerbate the socioeconomic gradient in health." In fact, access to food sources within the built environment has been shown to effect individual diet, body weight, and other health outcomes (Drenowski, Aggarwal, Hurvitz, Monslvai, & Moudon, 2012; Lopez, 2007; Maddock, 2004).

Diet.

Results from a qualitative study with residents in Detroit, Michigan, suggested that poor access to supermarkets was a barrier to healthy eating (Kieffer, et al, 2004). This represents a growing body of cross-sectional evidence that supports an association between the food environment (various types of food stores and the physical availability of food in stores) and dietary intake (Larson & Story, 2009; Larson et al., 2009). Such investigations have suggested that limited access to food stores with healthful foods at affordable prices is associated with decreased diet quality (Laraia, Siega-Riz, Kaufman, & Jones 2004; Moore, Diez Roux, Nettleton, & Jacobs, 2008; Rose & Richards, 2004). For example, Moore and coworkers (2008) reported participants without supermarkets within one mile of their home were 25% less likely to have a healthy diet, assessed by the Alternate Healthy Eating Index, than participants living within a mile of a supermarket.

In rural Mississippi, Blanchard and Lyson (2003) estimated that residents of food deserts were 23.4% less likely to consume the recommended five or more servings of fruits and vegetables each day, compared with residents of counties that were not considered food deserts. Conversely, an increased number of food stores near places of residence has translated into increased fruit and vegetable intake (Blanchard & Lyson, 2003; Bodor, Rose, Farley, Swalm, & Scott, 2007; Michimi & Wimberly, 2010; Morland et al., 2002b; Rose & Richards, 2004; Zenk et al., 2005b). Examining the relationship between living in a census tract with at least one grocery store and meeting fruit and vegetable consumption guidelines outlined in the Dietary Guidelines for Americans, 2000 (USDA Center for Nutrition Policy and Promotion, 2012), Morland et al. (2002b) found the presence of each additional supermarket was related to a 32% increase in likelihood of meeting intake recommendations for Black participants after controlling for income and education. Also, increases in physical availability of items sold (i.e., increases in dedicated shelf space in food retail outlets) have been related to increased intake of those items (Bodor et al., 2007; Cheadle et al., 1991).

Pre-post studies.

Wrigley et al. (2002; 2003) conducted the first longitudinal study in which consumption patterns of 1000 low-income households in Leeds were analyzed five months before and seven months after the opening of a large superstore in the area. Using household surveys and food intake diaries, researchers reported that fruit and vegetable consumption increased slightly (approximately one-third serving) as residents' shopping patterns shifted away from small, local markets and toward the newly constructed supermarket.

In another pre-post study using a control area for comparison, Cummins and colleagues (2006) found that there was no significant evidence of improved fruit and vegetable intake. This and another UK study (Pearson, Russell, Campbell, & Barker, 2005) do not support an association between the local food environment and diet, and similar studies highlight potential issues with boundaries and food resource ownership accompanying the introduction of new food retail outlets. For example, many families were not using better quality retail outlets, citing not only the temptation to spend beyond their means in larger stores and the inability buy in bulk, but also the idea that the news stores were provided for more affluent customers, not for them (Cummins, Findlay, Petticrew, & Sparks, 2005a; Cummins, Petticrew, Findlay, Higgins, & Sparks, 2005b; Dobson, Beardsworth, Keil, & Walker, 1994; Guy, Clarke, & Eyre, 2004; Wrigley, warm, Margetts, & Whelan, 2002).

Some literature has suggested that the presence of a food store did not ensure accessibility or enhanced perception of accessibility or availability, and that perceptions of local food availability, affordability, accessibility, and quality have been linked with consumption (Freedman, 2009; Giskes, et al., 2007). Food retail interventions and associated longitudinal studies of intake may therefore benefit from concurrent assessment of residential perception and longer periods of observation post intervention. Assessing and addressing residents' nutritional knowledge and cooking skills may also be of importance for future investigations.

Body weight.

Apart from the influence of individual lifestyle choices, several studies have investigated the association between the food retail environment and obesity. Despite consistent empirical support of a positive relationship between supermarket access and dietary intake, the evidence supporting the relationship between supermarket access and obesity is less clear.

Several studies have reported that the presence of grocery stores is associated with decreased body mass index (BMI) (Michimi & Wimberly, 2010; Morland, Diez Roux, & Wing, 2006; Zick et al., 2009). Morland et al. (2006) found that living in a census tract with at least one supermarket was associated with 6% lower prevalence of overweight and 17% lower prevalence of obesity. The highest levels of obesity were found in tracts without supermarkets, and the presence of convenience stores increased risk for both overweight and obesity. However, Wang and colleagues (2007) found increased BMI among women living in close proximity to chain supermarkets and in areas with higher densities of small grocery stores. Living closer to food retail stores of any kind created greater exposure to all foods, including unhealthful foods, making healthy decisions more difficult.

Food security status.

According to the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology food insecurity is defined as "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (Anderson, 1990, p. 1560). Limited food availability and accessibility have been identified as risk factors for food insecurity (Alaimo, 2005; Gorton, Bullen, & Ni Murchu, 2009; Rose, 2010), and food insecurity in some US households may be linked to residence in an area with constrained access to food outlets that provide options to enable healthy food choices (Ver Ploeg, et al., 2009). Additionally, food insecure individuals have reported food access was an unmet need, and suggested that even a combination of community food programs such as food kitchens or community gardens was insufficient to meet these needs (Hamelin, Mercier, & Bédard, 2008).

Disadvantaged populations including low-income, minority households and already food insecure households could be particularly vulnerable to limited food access, and evidence suggests that households at the greatest risk for food insecurity are seemingly exposed to relatively limited food environments (Freedman & Bell, 2009; Garasky, Morton, & Gereder, 2006). Although such sociodemographic characteristics of food insecure households have been documented, examination of neighborhood environmental characteristics, specifically the local food environment, as potential contributors is limited (Kirkpatrick & Tarasuk, 2010). Only one recent report has directly examined the association between food retail access and food security. In Toronto, Canada Kirkpatrick and Tarasuk (2010) reported that food security was not mitigated by proximity to food retail outlets or community food programs, and high rates of food insecurity were reported among those with good geographic food access. Authors suggested that it was unclear whether food access can offset problems of food insecurity rooted in resource constraints.

Availability and acceptability of food procurement and coping strategies are mediating factors, or determinants, of whether food insecurity is resolved, maintained, or worsened (Alaimo, 2005). While food deserts may not be the source of food insecurity, they frame conditions under which disadvantaged communities and households must expend greater resources to obtain food (Morton, et al., 2005). Low-income, rural households are affected by spatial distribution of the food supply, and it has been suggested that rural food deserts perpetuate the cycle of inequity.

Ver Ploeg et al. (2009) noted that the causal pathways linking food access to shopping and consumption behavior and the effects of these behaviors on diet-related conditions like body weight or disease are not well understood. Despite this, cross-sectional evidence has been used to

create theories about potential pathways through which the environment can impact individual outcomes. One of the challenges of assessing the relationship between the local food environment and health outcomes is the shortage of valid and reliable measures for assessing the food environment (Freedman & Bell, 2009). These and other methodological considerations for future research are discussed below.

Methodological Inconsistencies and Consideration for Future Research

Measuring access to nutritious, affordable food is a task that requires a large amount of information. The difficulty in accessing a food retailer depends on the location of the store in relation to the consumer, the consumer's travel patterns, consumer characteristics such as income, car ownership, disability, and neighborhood characteristics including availability of public transportation, presence of sidewalks, etc. Researchers must consider all the food retailers accessible to the population of interest, types and prices of food available within the stores, and measures of food quality (Ver Ploeg et al., 2009).

Despite the increasing body of access literature, there have been variations in the definition and assessment of (or failure to assess) each of these aspects. Using a general method for identifying food deserts (Rose & Rice, 2009; Rose et al., 2009a), the remainder of the discussion of methodological considerations will be framed around this four-step process: characterizing the food environment, generate measures of access, define thresholds, and determine area disadvantage.

Step 1: Characterizing the Food Environment

Characterizing the food environment involves defining the area(s) of interest and choosing specifically what aspect of the local food environment will be measured and assessed.

Defining the area of interest.

Though Ver Ploeg et al. (2009, 2012) were able to estimate national access to supermarkets, studies of smaller areas can be beneficial in order to further characterize food desert environments. Areas chosen are typically defined geographical areas such as counties, census tracts, census block groups, or zip codes (Lewis et al., 2005). In San Diego, Sallis (1986) was among the few to use residents' definitions of neighborhoods – up to a one-mile radius around local elementary schools.

While helpful for researchers, imposed geographic boundaries narrowly define residents' marketplace without knowledge if these boundaries match the boundaries residents use to define their local food environment (Sharkey, 2009). Also, the geographic scale of a census tract may be too large in urban areas (Raja, Ma, & Radav, 2008), while other researchers have suggested the census tract was too small an aggregation level in Houston, Texas (Edmonds, Baranowski, Baranowski, Cullen, & Myers, 2001). Some data have suggested that there is better survey response agreement across individuals within census tracts compared to larger units, and use of census tracts allowed for a larger number of neighborhoods to be included in study samples, increasing power to detect health effects (Mujahid, Diez Roux, Morenoff, & Raghunathan, 2007).

Lastly, using geographically designated areas such as census tracts inherently assumes all residents of the area have the same level of access to food outlets; therefore, relying solely on a sample of residents may unintentionally exclude some of the area poor while including those

with adequate resources that may be living in poorer areas. Gittelsohn & Sharma (2009) call for further qualitative research investigating the spatial boundaries community members use to define their local food environment, while Ver Ploeg et al. (2009) suggest assessing individual consumer food procurement patterns, including mobility limitations.

Measuring the Local Food Environment.

Lack of standardized, validated tools for measuring the food environment has produced variation in method of environmental assessment and has prevented detailed assessment of food access at the national level. The need to validate existing nutrition environment measures has been recognized (Glanz, 2009, Glanz et al., 2005; Story et al., 2008; Ohri-Vachaspati and Leviton, 2010). Valid measures of the food environment should be based soundly on conceptual models of the interplay between the environmental and individual factors. For example, the ecological model of community nutrition environments proposed by Glanz and colleagues (2005) is presented below in Figure 6.

The model suggests two mechanisms through which food environments affect individual food procurement and consumption: the physical environment and/or individual factors such as demographics (Glanz et al., 2005; Story et al., 2008). Specifically, four types of environments are identified, which are affected by governmental and industrial policies: community nutrition environments; organizational nutrition environments; consumer nutrition environments; and informational environments (Glanz, et al., 2005). The bulk of food access literature has not included measures at the organizational and individual levels. The importance of considering individual factors is stressed not only within the model (Glanz, 2009; Glanz, et al., 2005), but also within the Social Cognitive Theory (Bandura, 1986).

Glanz suggests that, because of the large number of variables that could be measured and because of their potentially broad impact, the community and consumer nutrition environments are of highest priority (Glanz et al., 2005). Within a geographic area defined by a food access study, variables of interest have varied depending on the purpose of the research, though the most commonly assessed outcomes are availability of specific foods or food groups, food prices, and the presence, number, and type of food stores, indicating that the majority of food access research has focused on the realms of the community nutrition environment and the consumer nutrition environment.

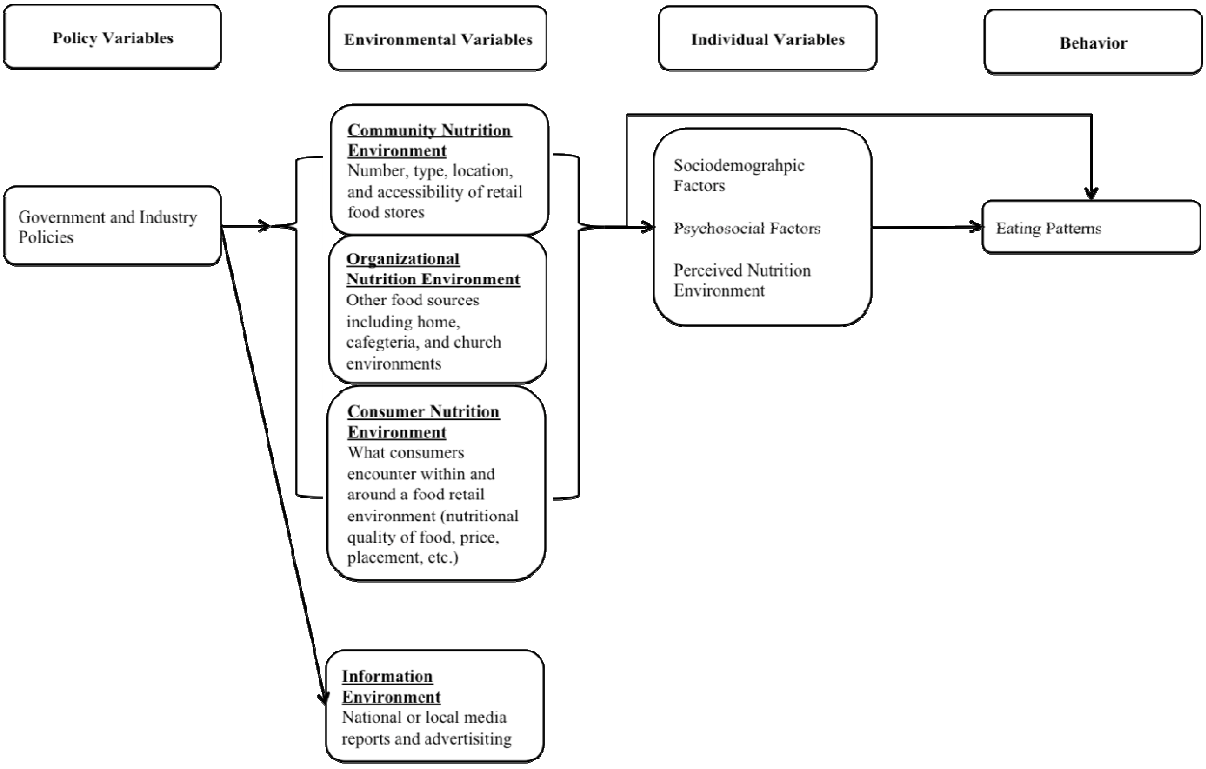

Figure 6: Model of Community Nutrition Environments
Adapted from Glanz, et al. (2005)

Food access studies have often used the presence of food retailers as a proxy for the availability and price of food because there is reasonable correlation between store type, food offered, and food price (Larson et al., 2009; Ver Ploeg et al., 2009; Walker et al., 2010). For

example, grocery stores or supermarkets are used as a proxy for the availability of healthful foods and reasonable prices and the presence of convenience stores to characterize a food environment with little variety and few fresh goods (Beaulac et al., 2009; Cummins & Macintyre, 2002a; Ford & Dzewaltowski, 2008; Larson et al., 2009; Ver Ploeg et al., 2009; Walker et al., 2010).

Food retailers.

Identification.

Locating and geocoding (finding geographic coordinates and identifiers for listing or mapping purposes) food retail outlets such as supermarkets is the most commonly used method of characterizing local food environments (Rose et al., 2009b). Food outlets have been identified in a variety of ways: obtaining lists from food sales and food service license data, internet searches, phone books, and census data (Cummins & Macintyre, 2009; Glanz et al., 2005; Larson et al., 2009; Paquet, Daniel, Kestens, Léger, & Gauvin, 2008).

More research is needed to establish the validity of secondary data when investigating the relationship between food environments and health (Cummins & Macintyre, 2009; Paquet et al., 2008). Little is known about the degree to which the use of public data within a rural area may misrepresent the food environment (Sharkey & Horel, 2008). Also, public or commercially available data often uses commercial vendor software with street databases, which can result in greater positional areas and address inaccuracies, especially in rural and poor areas. Therefore, there is a general consensus about the merit in combining secondary data with "ground truthing," or gathering data by observation, to ensure accurate representation of the area of interest (Glanz et al., 2005; Larson et al., 2009; Sharkey & Horel, 2008).

Retailers Included in Investigation.

Investigation of food stores has frequently been limited to supermarkets and large or chain grocers. Larger food retailers often include departments for all major food types and offer a variety of brands and package sizes at the lowest prices, and purchases from these stores represent the bulk of national food sales (ERS, 2012d). However, limiting assessment to supermarkets underestimates food availability and could misrepresent food significantly contributing to local diets (Sharkey, 2009). The importance of smaller retailers in meeting resident food needs has been highlighted (Block & Kouba, 2005; Bodor et al., 2007). Due to lower population densities, rural areas often contain fewer supermarkets and instead have a larger number of small grocers and other nontraditional food stores, including convenience stores, making the foodscape similar to poor, urban inner-cities (Sharkey, 2009).

Nontraditional food stores have become increasingly common in both rural areas and urban city centers, and by offering food in traditionally non-food venues, they have effectively muddled the lines among foodservice venue types, called “channel blurring” (Hale, 2004). Such retailers include drug stores or pharmacies with food, dollar stores, or mass merchandisers such as Target or Wal-Mart. For example, dollar stores are the second fastest growing format of food retailer and are often overlooked when considering area food availability (Block & Kouba, 2005). A growing body of work has included these and other small stores such as independent grocers, discount stores, convenience stores or bodegas.

The increase in dollar stores, mass merchandisers, and other nontraditional food sources suggests increased food availability (both healthful and non-healthful) in rural and urban areas (Bustillos et al, 2009). However, increased opportunities for healthful foods are not necessarily implied (Sharkey & Horel, 2009). An understanding of the food environment in rural areas

demands knowledge of availability and variety of foods within all area food stores and a recognition of the emergence of new and changing stores (Bustillos et al., 2009; Sharkey, 2009; Sharkey & Horel, 2008, 2009). Including retail outlets such as farmers' markets, butchers or meat markets, bakeries, and produce carts is an important consideration for future research. Non-retail food procurement (donations, family meals, emergency food support, and foods from hunting, fishing, or gardening activities) may also be significant contributors to household food supplies and is a poorly investigated component of the food environment.

Definition of Food Retailers.

The definition of food retailers within access literature varies, though the majority of US studies use North America Industry Classification Systems (NAICS) codes (US Census Bureau, 2012c), allowing for replication and comparison across studies (e.g., Galvez, et al., 2007; Laraia et al., 2004; Moore & Diez Roux, 2006; Moore et al., 2008; Morland et al., 2002a; Sharkey, 2009; Sharkey & Horel, 2008). NAICS codes are the standard used by Federal statistical agencies in classifying business establishments when collecting, analyzing, and reporting data related to the North American business economy.

Using this system, identification of larger stores, especially chain grocers, has proved fairly straightforward. However, the classification of smaller or independently owned food stores has presented a challenge (Kersten, Laraia, Kelly, Adler, & Yen, 2012). Such stores account for an increasing number of food retail establishments and their proper categorization is important for studies on community nutrition environments. Such stores have been excluded by researchers at both national and local levels (Ver Ploeg et al., 2009; Zenk et al., 2005a) or distinguished from supermarkets and convenience stores using NAICS codes (Powell et al., 2007), according to the number of cash registers (Glanz et al., 2007), store name (Laraia et al., 2004; Morland et al.,

2002a), number of employees (Moore & Diez Roux, 2006), or annual sales volume (Wang et al., 2007). For this reason, modifications of NAICS codes are common throughout NAICS literature (Bustillos et al., 2009).

Step 2: Generate Measures of Access

The second step in identifying food deserts is to generate measures of access in an attempt to link individuals and their larger food environments.

Types of measures.

Variation in the definition of access can produce results that describe different dimensions of the food desert concept, and no single measure can fully describe accessibility (Apparicio et al., 2007). The most common measures are area-based, with straight line or network distance calculated most often (Sharkey & Horel, 2008). Access is typically measured as the distance between a food retailer and an aggregated, administrative area such as a census tract or from more disaggregated units such as place of residence, neighborhood, or census block group. Other methods include assessing store coverage (the number of each type of store within a specified area) and store density (the number of stores per geographic area or per resident) (Apparicio et al., 2007; Moore et al., 2008; Morland et al, 2002a).

Points of origin and destination.

Changing origin and destination points chosen to measure access can produce varied pictures of access (Rose et al., 2009b). Access is typically measured from a residence, neighborhood, or center of an administrative area like a census tract or census block group (Sharkey, 2009). However, area-based measures overshadow individual variation. Food shopping trips may not originate from these points, and this method effectively underestimates access available for consumers traveling from work, school, etc. (Sharkey, 2009; Ver Ploeg et

al., 2009). For most shoppers (92%), time distance from home to the grocery store is shorter than the time distance from work to the grocery store (Ver Ploeg, et al., 2009). Persons in low-income areas with low access were more likely to access grocery stores from work, or grouped with other activities (trip chaining) (Ver Ploeg et al., 2009). Additionally, it has been reported that many people generally do not shop in their immediate neighborhood, indicating the importance of obtaining data on shopping behaviors (Drenowski et al., 2012). In Nashville, Tennessee, about a third of participants in a qualitative study did not use their local food store (Freedman, 2009).

Sharkey and Horel (2008, 2009) have identified the need to distinguish "potential access" and "realized access," or the need to assess not only available food retailers, but also consumers' usual patterns of food procurement. [This concept is well described in healthcare access literature (Khan & Bhardwaj, 1994).] Sharkey (2009) and VerPloeg et al. (2009) call for further investigation of how people organize food shopping within daily travel and activities and consideration of how such activities expand the consumers' food environments.

Step 3: Define Thresholds

The third step in this process involves classifying measures of access (e.g., distance from home to supermarket) in terms of acceptability. There are not agreed upon standards for the definition of poor access, but to account for differences in population density it is generally accepted that measures of access in urban or suburban areas are considered separately from measures of access in rural areas.

Threshold Variations within the literature.

It has been suggested that a 1-km (0.5 mi) distance from a food retailer is walkable; therefore distances greater than 1-km have been used to define inadequate access in urban areas (Apparicio et al., 2007; Larsen & Gilliland, 2008; Sharkey & Horel, 2008; Zenk et al., 2005a).

Some departments of the UK government adopted a definition of a food desert as an area lacking retail services within a 500-meter radius (Wrigley et al., 2003). Coveney and O'Dwyer (2009) have used a 2.5-km threshold in Australia, and Freedman and Darcy (2009) used a 1-mi radius in Tennessee. Additionally, Kirkpatrick and Tarasuk (2010) explored associations between household food security and distance to the nearest retail or charity food providers based on thresholds of 1- and 2-km. In rural or less densely populated areas, 10 miles from a supermarket has been identified as a food desert (Morton & Blanchard, 2007; Ver Ploeg et al., 2009).

The USDA Food Access Research Atlas.

Because the definition of food deserts is the topic of debate, using an accepted, government-defined method for food desert identification is justified. As described, the USDA Food Access Research Atlas defines a food desert as a low-income census tract in which a substantial portion (500 people or 33% of the population) of residents of low income census tracts has low access to a supermarket or grocery store (ERS, 2012a, 2012b). USDA has defined low access living more than 0.5 mile or one mile from such stores in an urban area, with 10- and 20-mile demarcations in rural areas. These thresholds were identified as time-based measures of reasonably walkable or driveable distances.

Step 4: Determining Area Disadvantage

Rose et al. (2009b) note that poor spatial access to food retailers has typically not been a concern among populations with adequate resources because transportation is likely available and affordable. Therefore, identification of food deserts lastly involves recognition of area disadvantage. Some studies have used singular measures, such as area income, to identify disadvantage, while others have combined factors (income, education, unemployment rates, car ownership, etc.) to create social deprivation indexes (Apparicio et al., 2007; Cummins &

Macintyre, 1999). The USDA Food Access Research Atlas considers both distance and area disadvantage to create food desert classifications (ERS, 2012a, 2012b). Specifically, in addition to being low-access, a food desert is a community in which the poverty rate is at least 20% or the median family income is less than or equal to 80 % of the census tract's median family income. Using the Atlas, food deserts can also be identified according to measures of vehicle ownership.

Theoretical Framework

The proposed study responds to the need to investigate the complex intersection between individuals and their environments within the arena of food environment research (Lytle, 2009) and is unique within the body of food desert literature in that it will be theoretically based. The Social Cognitive Theory (SCT) is an interpersonal health behavior theory that includes an overarching concept called reciprocal determinism: a triadic model that posits a simultaneous, reciprocal interaction exists among a person's individual characteristics, their behaviors, and their environment (Bandura, 1986; McAlister, Perry, & Parcel, 2008). Therefore, change in one component has implications for the other two components (Baranowski, Perry, & Parcel, 2002).

For example, an individual's food choices result from (and impact) personal characteristics like culture or preference and the individual's subjective and objective environments. Conceptually, it can be hypothesized that individual and household characteristics, combined with the impact of the physical environment, determine food availability within the home and dietary decisions (Ver Ploeg et al., 2009). Individual characteristics include demographics such as age, gender, race/ethnicity; socioeconomic status, encompassing income, education, and employment status; and household characteristics like family size, composition, and presence of children. The environment may refer to the food environment (the presence of stores, restaurants, and other outlets). Reciprocal determination,

however, posits that the interaction is not unidirectional; an individual is impacted by their larger physical environment, but also impacts their environment.

The factors of reciprocal determinism are impacted by the many other constructs of theory. The theory has not been tested comprehensively; therefore investigators employing SCT should specify the range of application (Baranowski et al., 2002) and focus closely on measurement and analysis of concepts (McAllister, Perry, & Parcel, 2008). To address these concerns, the proposed study will include only some of the SCT constructs, and when possible will utilize valid, reliable instruments in measurement of the constructs. Operationalization of selected constructs is further described in Chapters 2-3.

SCT has been used extensively in nutrition research in order to study multiple aspects of health behaviors (Story, Neumark-Stzainer, & French, 2002) and is relevant for studying how the local food environment and personal characteristics impact dietary behavior among consumers (Smith & Morton, 2009). In fact, SCT was used to design questionnaires in qualitative studies investigating food access and food choice (Richards & Smith, 2007; Smith & Morton, 2009). This is the only food access research to use SCT explicitly, though several publications reference general ecological perspectives of health, some recognizing the interplay among personal and environmental factors (Glanz, 2009; Glanz et al., 2005; Sharkey & Horel, 2008, 2009). However, ecological perspectives of health shift the burden of health concerns onto places rather than individuals in an effort to move beyond individually-oriented understanding of health, suggesting that position within society has equal or greater effect on individual outcomes than individuals themselves (Freedman, 2009). The SCT, however, balances the burden between the individual.

Conclusions

US literature indicates that low-income persons and racial/ethnic minorities living in urban city centers or in rural areas are most often affected by limited access to large food retailers and healthful food, which can have a detrimental impact on diet and health. However, most research has not been grounded in theory, therefore applying a theory such as SCT that stresses the significance the interplay between personal factors, environmental factors, and behavior, is a valuable approach (Bandura, 1986).

In-depth research in rural areas and with low-income or minority participants is warranted. No published access studies have been conducted in Alabama. In Greene County, located in west Alabama, the majority of residents are racial/ethnic minorities experiencing poverty rates above national and state averages (Census, 2012a). Because there are not agreed upon standards for the definition of poor access, using the Food Atlas Research Atlas was justified and provided insight into the value of the tool. According to the Atlas, two of the three census tracts in the county as food deserts (ERS, 2012b), making Greene County an ideal place to further characterize life in food deserts.

A theoretically-based project combining assessment of residential food procurement patterns (realized access) and thorough objective measures of local food environments using government-definitions of food deserts (potential access) allowed for extended characterization of food deserts. Involving low-income, racial/ethnic minorities, like WIC participants, provided data about a nutritionally vulnerable group at increased risk if also living in a food desert (Laraia et al., 2004). The studies described in Chapters 2-3 were part of a cross-sectional, mixed methods investigation of potential and realized food environments of Greene County, Alabama WIC participants.

APPENDIX B

METHODOLOGY

Introduction and Purpose

Evidence from studies in the United States (US) suggests that access to supermarkets and grocery stores is limited for low-income and minority individuals living in urban city centers or in rural areas. In fact, the US Department of Agriculture (USDA) has identified food deserts - low-income census tracts in which a substantial portion of the population has limited access to a supermarket or grocery store – affecting 15.4 million low-income Americans (USDA Economic Research Service [ERS], 2012a ,2012b). Resulting disparities in food choice and price are of particular concern for individuals at increased risk for diet-related disease due to the concept of deprivation amplification, or compounding of individual and area disadvantage (Cummins & Macintyre, 2006).

To date, food access research has largely focused on objectively characterizing select aspects of primarily urban food retail environments in socioeconomically disadvantaged and/or minority areas, or has attempted to link distance from local food retailers with health effects such as dietary quality. Objective investigation of food environments has frequently been limited to supermarkets and large or chain grocery stores, thereby underestimating food availability, especially in rural areas in which the contribution of small stores may be significant (Bustillos et al., 2009; Sharkey, 2009; Sharkey & Horel, 2008, 2009).

Limited food desert research has been conducted in rural areas and in the Southeastern US, an area leading the nation in poverty, food insecurity, and chronic disease (Centers for Disease Control and Prevention [CDC], 2012a 2012b; Coleman-Jensen, Nord, Andrews, & Carlson, 2012; DeNavas-Walt, Proctor, & Smith, 2011; Ogden, Carroll, Kit, & Flegal, 2012). Residents of rural areas are heavily affected by spatial inequalities in food retailers, as distance and transportation become an even bigger factor for food procurement (Sharkey & Horel, 2008,

2009). For low-income individuals in rural areas, the spatial inequalities in food retailers and the loss of rural grocery stores have severe implications for food access (Morton, Bitto, Oakland, & Sand, 2005).

Though some studies have involved residents of food deserts, current food access research in the US also lacks in-depth characterization of food deserts as the result of research with residents. Food desert research and subsequent solutions have the ability to generate more balanced purchasing power, to support local food systems, to maximize the effectiveness of federal food and nutrition assistance programs such as the Special Supplemental Nutrition Program for Women Infants and Children (WIC) and the Supplement Nutrition Assistance Program (SNAP, previously known as Food Stamps), and to inform policy decisions aimed at increasing residential health (Rose, et al., 2009a). In order for these food desert solutions to be most effective, they should be informed by residential perspective.

The present study responds to the need to investigate the complex intersection between individuals and their environments within the arena of food environment research (Lytle, 2009). Sharkey and Horel (2008, 2009) have identified the need to distinguish "potential access" and "realized access," or the need to assess not only available food retailers, but also consumers' usual patterns of food procurement. Therefore, the purpose of this study was to further characterize life in a food desert and provide insight into the link between individual and environmental health by assessing the local food environment (potential access) and by investigating differences in residential food access patterns (realized access) based on the USDA food desert classification of their neighborhoods (Sharkey, 2009; Sharkey & Horel, 2008, 2009). Using selected constructs from the Social Cognitive Theory (Bandura, 1986), this cross-sectional study incorporated a mixed method approach, executed in two phases. Phase 1 involved an

objective audit of the Greene County food retail environment. Phase 2 included one-on-one qualitative interviews with adult WIC participants, a low-income population considered at increased risk for poor nutritional health (USDA Food and Nutrition Service [FNS], 2012a). Lastly, immediately following their interviews, a subgroup of participants completed a review of a paper and pencil survey to be used in future assessments of realized food environments. Methodology described herein was approved by the University of Alabama Institutional Review Board and the Alabama Department of Public Health Review Board.

Research Questions

Questions addressed by the present research included:

1. Does food retail density (the number of each type of food retail outlet per 1000 residents) in Greene County census tracts differ based on USDA food desert classification?
2. Does food retail density (the number of each type of food retail outlet per square mile) in Greene County census tracts differ based on USDA food desert classification?
3. What are the household food procurement patterns of Greene County WIC participants?
4. Do household food procurement patterns of Greene County WIC participants differ based on whether or not participants live in a food desert?

Research Site

This study included an audit of food retail stores in all three Greene County, Alabama census tracts, as well as semi-structured interviews with low-income WIC participants residing in the county. Greene County was chosen based on its rural classification and the large number of low-income residents. The Greene County Health Department, located in the county seat and largest city of Eutaw, was the site for qualitative interviews.

The USDA Food Access Research Atlas

The Healthy Food Financing Initiative (HFFI), part of Michelle Obama's *Let's Move* campaign (Let's Move, 2010), is an interagency workgroup including USDA, the US Treasury Department, and the US Department of Health and Human Services and was responsible for developing the definition of food deserts to be used to determine Federal funding eligibility (Dutko, Ver Ploeg, & Farrigan, 2012; ERS, 2012a, 2012b). According to the HFFI workgroup, a food desert is a low-income census tract in which a significant portion of residents have low access to a supermarket or grocery store. Supermarkets and large grocery stores were used as proxies for sources of healthy and affordable foods.

With this definition in mind, the USDA Food Desert Locator was created to provide an overview of the location of food deserts throughout the US, thereby identifying areas that may need improved food access (Dutko, et al., 2012; ERS, 2012a, 2012b). The Food Access Research Atlas has since replaced the Locator. Built using Environmental Systems Research Inc. ArcGIS Server technology, the Food Access Research Atlas is a mapping tool that allows users to investigate multiple indicators of food access, expanding upon the original Food Desert Locator, which defined food deserts using distance from supermarkets alone. The Atlas uses the definitions of a low-income, low-access census tract further described below.

Socioeconomic and demographic data from the 2010 Census and the 2006-2010 American Community Survey were allocated to ½- square kilometer (km^2) grids from the Socioeconomic Data and Applications Center (SEDAC) (ERS, 2012b). The distance from the geographic center of each grid to the center of the nearest grid with a supermarket or large grocer was used as the measure of access for residents of the grid. Supermarkets, supercenters, and large grocery stores (termed "supermarkets") were defined as food stores containing all major food

departments (fresh produce, fresh meat and poultry, dairy, dry and packaged foods, and frozen foods) with at least $2 million in annual sales. Data about location of these food stores were collected from a 2010 list of stores authorized to receive SNAP benefits and from TDLinx, a proprietary source of store listings from 2010. This combined list was converted into a GIS format by geocoding street addresses into point locations.

Once the distance to the nearest supermarket or large grocery store is calculated for each grid cell, the estimated number of people or housing units more than one mile from a supermarket or large grocery store in urban tracts (or 10 miles for rural census tracts) is aggregated to the census tract level (ERS, 2012a, 2012b). (A census tract is considered rural if the centroid of that tract is located in an area with a population of less than 2,500, and all other tracts are considered urban tracts.) The process is also completed for alternative distance thresholds included in the Atlas: ½ mile, 1 mile, 10 miles, and 20 miles. For these distance measures, if the aggregate number of people in the census tract with low access is at least 500 or the percentage of people in the census tract with low access is at least 33%, then the census tract is considered low access. For the measure using vehicle availability, a tract is low vehicle access if at least 100 households are more than ½ mile from the nearest supermarket and have no access to a vehicle, or if at least 500 people or 33 percent of the population live more than 20 miles from the nearest supermarket, regardless of vehicle access.

Poor spatial access to food retailers has typically not been a concern among populations with adequate resources because transportation is likely available and affordable (Rose et al., 2009a). Therefore, identification of food deserts involves recognition of area disadvantage. In the Food Access Research Atlas, to qualify as low-income, a census tract must meet the US Department of Treasury New Markets Tax Credit program criteria, meaning the poverty rate for

the tract is greater than 20%, or that the median family income for the tract does not exceed 80 % of median family income (ERS, 2012a, 2012b). (Statewide median income is used for non-metropolitan areas and area median income is used for metropolitan areas.)

Atlas data are credible estimates of the extent of limited access to healthy food in the US (ERS, 2012b). Use of the 1/2-km^2 grids provides consistency in defining geographic areas across the nation and allows for greater accuracy in estimating location. However, it is difficult to link SEDAC grids with other geocoded data, therefore the USDA assigns food desert status to broader, numbered census tracts meeting low food access and low income criteria.

A food desert, then, is a census tract that is both low-income and low-access, with low-access now defined in one of three ways: original one- and 10-mile demarcations, new one-half- and 20-mile demarcations, or vehicle accessibility. Several different combinations of these data provide Atlas users various ways to examine important characteristics of food deserts. For the present study, only the original 10-mile thresholds for rural areas were used.

Greene County Characteristics

Using the Food Access Research Atlas criteria, two of the three census tracts in Greene County are considered food deserts (ERS, 2012a, 2012b). Figure 7 depicts Greene County, with its three census tracts labeled 600, 601, and 602 (US Census Bureau [Census], 2010). Tracts 600 and 602 are food deserts using distance criteria, while tract 601, in which the health department is located, is not (ERS, 2012a, 2012b). Because the definition of food deserts is the topic of debate, using a government-defined method for food desert identification was justified. Data from the present study are representative of food desert residents and provide a unique opportunity for comparison among various food desert classifications.

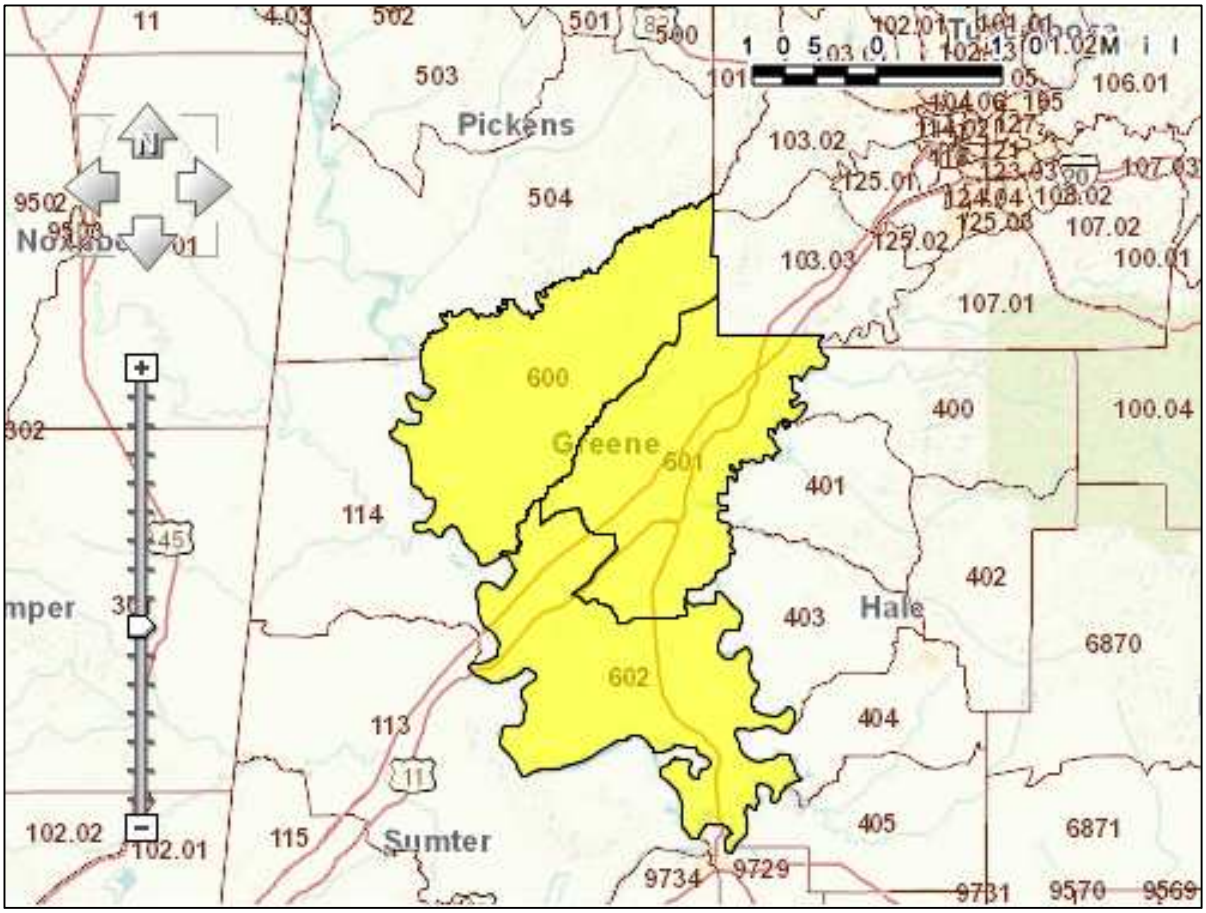

Figure 7: Census Tract Reference Map for Greene County, Alabama

Phase 1: Objective Food Retail Audit

Data Collection

An environmental audit in all three Greene County census tracts was conducted in order to locate and enumerate all food retail stores. The food retail audit began by mapping the boundaries of three census tracts. Using methodology similar studies conducted in other rural areas (Bustillos, Sharkey, Anding, & McIntosh, 2009; Liese, Weis, Pluto, Smith, & Lawson, 2007), a database of all food outlets was created by triangulating data from lists for food licenses from the Greene County Health Department, the telephone book and Yellow Pages, and general internet searches. Each census tract was then ground truthed in order to verify the location and operation of the outlets and to identify unlisted outlets. Ground truthing involved in-person,

street canvasing of food retailers, and was accomplished by systematically driving all national and state highways and city or town streets/roads within Greene County. Little is known about the degree public data within a rural area may misrepresent the food environment (Sharkey & Horel, 2008), and there is general consensus about the merit in combining secondary data with data gathered by observation to ensure accurate area representation (Glanz, Sallis, Saelens, & Frank, 2005; Larson & Story, 2009; Larson, Story, & Nelson, 2009).

In order to keep an accurate log of retailers, the latitude and longitude for the store location in the present study was determined by a handheld GPS device and recorded, and the location was photographed for documentation. This helped the researcher avoid duplicate visits to a single retailer, allowed for detailed documentation of locations with absent or poorly marked street addresses, and provided data used for geocoding. Following identification, the contents of the store were briefly examined to verify the presence of food and to assist with store classification.

Store managers/staff were briefed on the purpose of the visit and were offered a one-page description of the study. Managers/staff were asked for permission to scan the store and photograph the storefront. They were ensured that the scan was observational and would not interfere with the store's operation. Each food retailer was then classified according to adapted North America Industry Classification Systems (NAICS) codes (Census, 2012c). Stores that were not entered due to inaccessible hours of operation or because of safety concerns were classified based on the appearance of the store and the nature of the foodservice license issued by the local health department (i.e. restaurant, etc.).

The definition of food retailers within access literature varies, though the majority of US studies use adaptations of the NAICS codes (Census, 2012c), allowing for some replication and comparison across studies (Galvez, et al., 2007; Laraia, Siega-Riz, Kaufman, & Jones, 2004; Moore & Diez Roux, 2006; Moore et al., 2008; Morland, Wing, Diez Roux, & Poole, 2002a; Sharkey, 2009; Sharkey & Horel, 2008). NAICS codes, retrieved from the US Census Bureau webpage, are the standard used by federal statistical agencies in classifying business establishments when collecting, analyzing, and reporting data related to the North American business economy (Census, 2012c). Modifications of NAICS codes are common throughout NAICS literature (Bustillos et al., 2009).

This study utilized a classification system based on the models used by Bustillos et al. (2009) and Sharkey and Horel (2008) in rural Texas. The system includes three broad categories: traditional food stores such as grocery stores and supermarkets, convenience stores, and non-traditional food stores including dollar stores, based on definitions provided by NAICS (Census, 2012c) and Leibtag (2005) in a USDA publication.

Both traditional and nontraditional retail formats contain a variety of store types; however, the aforementioned studies did not incorporate specialty stores, pharmacies, mass merchandisers, or restaurants. Given the range of stores providing food in rural areas (Kersten, Laraia, Kelly, Adler, & Yen, 2012; Sharkey, 2009), specialty stores were included and considered traditional outlets, and, due to the limited volume and variety of food products offered, pharmacies were classified as non-traditional outlets. This study included a fourth category (mass merchandisers) to encompass mass merchandisers, supercenters, and wholesale clubs. Restaurants were included as the final category and subcategorized according to collapsed NAICS codes (Census, 2012c).

Methodological note about "channel blurring."

Using the NAICS system, identification of larger grocers, especially chain grocers, has proved fairly straightforward. However, the classification of smaller or independently owned food stores has presented a challenge (Kersten et al., 2012). Though store contents were not extensively assessed, from brief observation of store environments in Greene County, there were variations in products offered that differ from what may be traditionally expected based on NAICS classification. Hale (2004) has called these muddled the lines among foodservice venues "channel blurring" (Hale, 2004). For example, there were multiple retail sources of fast food in a large rural area of Texas, including: restaurants, convenience stores, and supermarkets or grocery stores (Creel, Sharkey, McIntosh, Anding, & Huber, 2008; Neckerman et al., 2014; Sharkey, Johnson, Dean, & Horel, 2011). The same was true in several Greene County convenience stores.

No studies have attempted to incorporate this phenomenon into an NAICS system. In the present study, some outlets were counted twice (once as a convenience store and once as a restaurant), while others were classified as convenience stores alone. For example, a few convenience stores housed national fast food chains like Subway. Others offered fresh food, prepared on-site, including cooked meats like chicken tenders or pork. These instances varied, though when channel blurring was observed the researcher classified the establishment with the assistance of the type of foodservice license issued. The aforementioned stores were classified as convenience stores because the bulk of the food was shelf-stable canned goods or snack-type items, as well as limited service/fast food restaurants because the store was licensed as such.

Data Analysis

An Excel database (Version 14.4.1, Microsoft Corporation, Redmond, WA, 2010) of all food outlets identified was created. The outlets were then mapped using Google Fusion (Google, Inc., Mountain View, CA, 2014). Enumerated results (coverage) were used to create ten retail food outlet density variables – the number of each of the five retailer categories (traditional, convenience, non-traditional, mass merchandiser, and restaurant) within each tract, presented a) per square mile, as is common in food access literature, and b) per 1000 residents to account for differences in population density (Apparicio et al., 2007; Sharkey, 2009; Sharkey & Horel, 2009). County results and descriptive comparisons among tracts were generated. These data were used to address Research Questions 1 and 2 and are valuable for further describing USDA food deserts, which are identified using proximity measures for traditional food stores alone.

Phase 2: Semi-Structured Interview with WIC Participants

Sample

In order to provide insight into realized food environments and shopping patterns of WIC participants, this study included one-on-one, semi-structured interviews. WIC is designed to provide medical referrals, nutrition education, and vouchers for healthful foods to low-income pregnant or nursing women and to children (FNS, 2012a). WIC clients have been identified as a nutritionally vulnerable population, and are thus particularly vulnerable to consequences of deprivation amplification. Thus, results of the present research were limited to households with constrained resources but with federal assistance that encourages purchasing perishable items such as fresh fruits and vegetables that are, in theory, of limited availability within a food desert.

To be eligible for WIC, applicants must be pregnant or nursing women, infants or children below the age of five and must meet a state residency requirement (FNS, 2012a). Income guidelines require that applicants' gross income must fall at or below 185% of Federal Poverty Income Guidelines. Those eligible for other benefit programs like SNAP, Medicaid, or Temporary Assistance for Needy Families (TANF), automatically meet the income eligibility requirement. (However, some WIC participants may not be eligible for SNAP or TANF due to other enrollment requirements.) WIC applicants must also be at "nutritional risk," (e.g., inadequate diet pattern, etc.), as determined by a health professional (FNS, 2012a). As of August 2013, WIC was serving nearly nine million American women and children, 141,900 of those in Alabama (FNS, 2012b). According to WIC nutritionists in Greene County, 2011 data indicated average participation was 488 clients (R. Cole, personal communication, October 18, 2012).

In most WIC agencies, participants receive cash-value vouchers each month for the purchase of specific foods designed to supplement their diets with specific nutrients (FNS, 2012a). In general, WIC foods include infant formula and infant cereal, baby food, iron-fortified adult cereal, low sugar or whole grain cereals, fruits and vegetables and their juices, eggs, milk, cheese, peanut butter, whole wheat bread and other whole grains, dried and canned beans/peas, and canned fish. Soy-based foods and beverages, such as soy milk are also included. WIC clients use vouchers purchase WIC-approved foods at retailers registered to accept these benefits, called WIC vendors.

Greene County WIC clients periodically visit the health department for check-ups or nutrition education. Though a proxy may bring a child to the clinic for an appointment, the likelihood that adults visiting the health department are women is high. The primary food shopper and food preparer influences dietary intake of other household members (Glanz et al.,

2005), and women remain largely responsible for domestic duties such as the provision of food (Inglis, Ball, & Crawford, 2008). Women therefore represent an ideal population for research investigating food procurement patterns.

Non-pregnant women over the age of 18 who were responsible for or professed reasonable knowledge of the household food management patterns such as grocery shopping were invited to participate in the interview. Participants must have been residing in a household in which a member is receiving WIC benefits, if they were not the beneficiaries. Extending eligibility to household members will allow grandparents or other common proxies often responsible for grocery shopping in homes with young mothers to complete the survey or interview. However, eligibility was limited to only one representative per household in order to avoid sampling the same household more than once. Participant addresses were be obtained and checked in order to avoid multiple surveys from one household and to determine the food desert status of participants' residence.

In sum, eligibility criteria for this convenience sample included:

5. Female gender, professed to be non-pregnant
6. A minimum age of 19 years
7. Residence within a household receiving WIC benefits
8. Professed responsibility for (or with reasonable knowledge of) household food management, including grocery shopping

Sampling Strategies

According to WIC nutritionists, 2011 data indicated average participation was 488 clients (R. Cole, personal communication, October 18, 2012). Sample sizes for qualitative studies are generally much smaller than quantitative samples because there is a point of saturation, or a point of diminishing return, at which collection of new data does not reveal any new information about the issue being investigated (Bernard, 2011; Glaser & Strauss, 1967). Qualitative samples should be large enough to ensure an adequate range of perceptions has been included, but small enough

to avoid repetition or superfluity; therefore, qualitative researchers generally use the concept of saturation as a guide during data collection.

A qualitative study utilizing focus groups with rural residents in Minnesota and Iowa consisted of 57 participants (Smith & Morton, 2009), while a Nashville, Tennessee study used in-depth interviews with 20 individuals to assess residents' perception of the local food environment (Freedman, 2009). However, there is some evidence that 10-20 knowledgeable people are enough to elucidate core concepts within a well-defined population (Bernard, 2011). A sample of 30-50 people has been recommended for ethnographic or grounded theory studies (Morse, 1994), while Charmaz (2006) suggests that 25 participants is an adequate sample size for smaller projects.

Demographically, the eligible participants for the proposed study exhibited some degree of homogeneity – living within the same county, enrolled and receiving WIC benefits and services from the same health department, etc. Within the subsample, the primary concerns were were to include women of various ages and of various census tracts, therefore purposive sampling was used for interview participants. Over a data collection period of six weeks, 30 participants visiting the Health Department were selected for the one-on-one interview.

The Greene County Health Department conducted the WIC-specific clinic three days each week (Mondays, Wednesdays, and Fridays) from 8am-5pm (R. Cole, personal communication, October 18, 2012). On these days, participants were recruited after entering the Health Department and/or after completing their appointments. Special attention was paid to participant addresses in order to obtain an equal number of food desert residents and non-food desert residents. Information was later double checked by entering addresses provided by the participants into the USDA Food Access Research Atlas (ERS, 2012a).

Study Personnel

The principal investigator (PI) was responsible for conducting participant interviews, cognitive review of survey questions (discussed in Phase 3), and incentive distribution. A graduate student from the Department of Health Science served as a research assistant. The student had basic health and nutrition knowledge, and prior to entering the field, participated in an informal, one-time briefing session with the PI. The student received a brief overview of the purpose of the study, study protocol, and discussion of student researcher responsibilities, which included: completing consent forms, assisting the PI by taking additional field notes and assuming responsibility for childcare while study participants are completing the interview. During the briefing sessions, the student was provided the eligibility criteria, practiced reviewing consent forms with the PI, discussed with the PI the types of data to record in field notes (Mulhall, 2003), and was briefed provided information regarding the required reporting of suspected child abuse/neglect.

Data Collection

Clinic staff performed initial recruitment. Clients were directed to the research staff, and they were formally invited to participate in the study after explaining the study's purpose and verifying eligibility. All interviews were conducted within the Greene County Health Department building conference room, which provided a degree of privacy, reduced distraction, and avoided disrupting clinic operations. Interviews were administered orally in a semi-structured format using the interview guide found in below. The interview was conducted either while the participant was waiting for their appointment or following their appointment at the clinic. Eligible participants that were at the clinic without an appointment (e.g., accompanying friends or family members) were also invited to participate while waiting.

Semi-structured Interview Schedule

1. Participant pseudonym: _____

2. Food desert residence: Yes No

Begin the recording, if applicable

1. Demographics
   a. How old are you?

   b. How would you identify your race/ethnicity? (Offer the following choices: Native American/Alaska Native, Asian, Black or African American, Hispanic, Native Hawaiian/other Pacific Islander, White, Other)

   c. Are you married? (Offer these other choices: widowed, divorced, separated, never married, living with partner, other)

   d. Counting yourself, what is the total number of people that live in your household more than three months out of the year?

   e. How many of those are children 18 years or under?

   f. What is the highest level of education you received? (Offer the following choices: less than 9th grade, high school graduate/GED/equivalent, some college/Associate's degree, college graduate or above)

   g. Are you currently working outside the home? (Offer the following choices: employed full time, employed part time, currently unemployed, other)

   h. Do you or anyone living in your household have a condition that makes shopping for food difficult? (Offer examples including: a physical or mental disability, special diets, etc.

   i. How long have you been living at your current address?

   j. How long have you been receiving WIC?

   k. Are you or any member of your household currently using the following programs? (Place an X in the appropriate box based on the respondent's answers).

	Yes	**No**	**Don't know**
Supplemental Nutrition Assistance Program (SNAP or Food Stamps)			
Head Start Program			
Free or reduced-cost school meals			
Emergency Food Assistance Program (TEFAP)			

2. (Free list) “Think about all the places in your neighborhood that you can get food. List all of the places where you usually get food for your family.” (Interviewer will record all
    a. Record all places in the order participant lists them.

    b. Probe for specific store names and locations.

    c. Probe: From which of these places do you get the bulk of food for your household?

    d. Probe: Which of these are the most frequently used sources of food for your household? Where do you go the most?

3. (Free list) From the outlet(s) identified as most used/most important, “What are the kinds of foods that you get at _____?”
    a. Probe for specifics (foods, types, packages, etc.) using food groups (fruits, vegetables, grains, protein foods, dairy, fats).

4. (Open-ended) “Describe a normal trip to and from _____ [insert the outlet(s) identified as most used/most important] where you get most of the food for your household. Think about all that you do from start to finish.”
    a. Probe for details including: preparation (shopping lists, orders, coupons, price comparison, childcare, etc.) point of origin, who accompanies you, place(s) visited/other tasks accomplished, route, length of time, distance of travel, transportation methods, method(s) of payment.
    b. If most frequently used outlet is different from the most important outlet, repeat the question for most frequently used outlet.

The research assistant entertained children while the participant completed the interview. Reasonable entertainment (e.g., coloring activities) was offered for children accompanying the participant if a research assistant was not present. Each participant was asked all questions on the interview schedule, but was allowed to refuse or skip questions, should the questions have incited discomfort. Participants received $10 cash for their participation in the interview.

With participant permission, the exchange was documented using a digital voice recorder. Should participants have refused recording, note taking was offered as an alternative. Notes were recorded by the principal investigator (PI) and content was verified by the participant in a debriefing session following the interview. A debriefing period followed each interaction with participants in order answer questions and to assess potential concerns triggered by the research project.

The PI and/or research assistant present took field notes during each interview, whether or not the exchange is digitally documented, and discussed observations following interviews. The PI also wrote memos about observations and potential themes throughout the data collection and analysis processes. Additional field notes and memos served to document information that may not have been gleaned from a digital or handwritten recording of the exchange (e.g., relevant participant characteristics, environmental interferences, etc.).

Semi-Structured Interview Schedule.

Items in the interview schedule were designed to assess all locations from which participants receive food and will ask participants to describe usual food procurement travel patterns. In order to assess these sources of food, a qualitative technique called free listing was used. Free lists require participants to list as many items as they can think of in a particular domain (Bernard, 2011). Free listing is a useful first step in all research involving the definition

of new domains, and participants have little difficulty with this technique (Bernard, 2011). However, this method requires that researchers are familiar with the culture and language of the respondents. Assessing the food environment of Greene County prior to interviews with respondents assisted familiarity.

In this project, participants were asked to list all of the places from which they usually obtained food. In addition to audio recording participants' responses, the researcher recorded, with paper and pencil, all food sources. Probing was used to aid participant recall and to clarify outlet identification and location. From the first free list of food sources, participants were asked to identify the food source(s) from which they got most of the food for their household (termed bulk stores), as well as the source(s) they visited the most frequently, if different (termed most often stores). The researcher recorded relative frequency of using each source identified, and a second free list was used to ask what types of food are acquired from each of the sources identified as the most used.

It has been reported that persons in low-income areas with low access to traditional food stores are more likely to shop outside their neighborhoods, to visit stores from work, and to group shopping trips with other activities (trip chaining) (Drenowski, Aggarwal, Hurvitz, Monslvais, & Moudon, 012; Ver Ploeg et al., 2009). Therefore, an open-ended question was included in which the participant was asked to describe food procurement patterns to their most important and most often used food source(s) to allow for description of transportation, route, trip chaining, time spent, etc. Providing an open-ended question in which participants could elaborate provided meaningful insight into factors affecting residents' realized food access. Data gathered in Phase 2 was used to address Research Questions 3 and 4.

Data Analysis

Interview Question 1: Sociodemographic Information

Sociodemographic information obtained from the first question on the interview schedule was entered into Excel (Version 14.4.1, Microsoft Corporation, Redmond, WA, 2010) and imported into IBM SPSS Statistics (Version 22.0.0, IBM Corporation, Armonk, NY, 2013), used to describe and compare sample characteristics of residents of food desert tracts (FDTs) (Tracts 600 and 602) and non-food desert tract (NFDT) (Tract 601) using independent samples t-tests/median tests and Fisher's Exact Tests.

For statistical comparisons, sociodemographic characteristics with multiple categories were collapsed to create dichotomous variables. This affected marital status (never married, divorced, separated, and widowed versus married or living with partner); education (less than high school versus high school/equivalent and higher); and employment status (unemployed versus employed part-time or fulltime). Participants were asked if they were receiving any of the following programs: SNAP, Head Start, free or reduced-cost school meals, or Temporary Assistance for Needy Families (TANF). Most participants seemed confused by the TANF title, and only two (6.7%) said had used this program. The category was therefore changed in the dataset to represent any mention of any types of emergency food, thereby including the two participants that received TANF, as well as three additional participants that mentioned sources of emergency food in their free lists.

Interview Questions 2-4: Food Procurement Patterns

Participants' answers were transcribed verbatim into Microsoft Word (Version 14.4.1, Microsoft Corporation, Redmond, WA, 2010) using playback functions Sound Organizer (Version 1.2.0, Sony Corporation, 2011). Transcripts, fieldnotes, and memos were then imported

into MaxQDA (Version 11, VERBI GmbH, Berlin, Germany, 2014) for coding and further analysis. The researcher used field notes recorded during and following the interview to assist with interpretation. Resulting data was used to address Research Questions 3 and 4.

Question 2: Stores Used

Answers to free lists were cleaned, meaning responses naming the same places though phrased differently were combined. Targeted, selective coding was used to identify, classify, and enumerate all food retail outlets and outlet classifications. All food retail outlets were classified using the adapted NAICS system described in Phase 1 above. Additionally, distance between participants' homes and their primary stores was also calculated using Google Earth (Version 7.1.1.1888, Google, Inc., Mountain View, CA, 2013). The frequency with which participants named each outlet was recorded and added to the Excel (Version 14.4.1, Microsoft Corporation, Redmond, WA, 2010) food retailer database created in Phase 1, as was the number of times each outlet was named a bulk store and a most often store. Additionally, information about proportions of participants using various store types in any location and in Greene County alone were calculated, and shopping frequency can be assessed. Results for residents of FDTs and the NFDT were analyzed using t-tests/median tests and Fisher's Exact Tests.

Question 3: Foods Purchased.

Answers to free lists were cleaned, meaning responses referincing the same foods though phrased differently were combined. Targeted, selective coding was used to identify, classify, and enumerate all food retail outlets, outlet classifications, and foods listed in Questions 2 and 3. Foods listed were categorized by food group and further categorized by processing method using MaxQDA (Version 11, VERBI GmbH, Berlin, Germany, 2014) and Microsoft Excel (Version 14.4.1, Microsoft Corporation, Redmond, WA, 2010). Food-specific data from this section were

compared with data from the survey in order to assess the expansion of food groups as described above and to validate the responses of survey reviewers. This process is further discussed in the Survey Review section below

Question 4: Food Procurement Patterns from Participants' Most Used Food Source(s).

Transcripts of this open-ended question were coded using an iterative process in which coding scheme was analyzed at 20% intervals (Charmaz, 2006). Codes became condensed and further refined as this process continued. (A codebook with initial and final codes was created and is included in Appendix D.) Using directed content analysis, the final codes provided an theoretical understanding of participants' food procurement patterns. Any differences between residents living in food deserts, and residents of the control area were highlighted.

Survey Review

Because surveys have been successfully used to evaluate food access patterns [e.g. the 1996 National Food Stamp Program Survey (Ohls, Ponza, Moreno, Zambrowski, & Cohen, 1999)], a paper and pencil survey was developed to assess food retail access patterns and associated personal and household characteristics. The survey included items designed to address several SCT constructs as related to food access. Some valid and reliable measures were included (Clifford, Anderson, Auld, & Champ, 2005; Larson, Perry, Story, & Neumark-Stzainer, 2006; Ohls et al., 1999; United States Department of Agriculture Economic Research Service [ERS], 2014), and some tools were adapted for use (Center for Disease Control and Prevention National Center for Health Statistics [CDC], 2011, 2013).

The instrument included 53 questions divided into five sections:

1. Food shopping patterns (Ohls et al., 1999)
2. Food availability in the home (CDC, 2011, 2013)
3. Cooking self-efficacy, barriers and motivators to cooking, resource and skill adequacy, and nutrition knowledge (Clifford et al., 2005; Larson et al., 2006)
4. Household food security status (ERS, 2014)
5. Demographics (CDC, 2011, 2013).

Cognitive Testing

Only the food security questions (Section 4) have been validated with low-income populations and racial/ethnic minorities (Bickel, Nord, Price, Hamilton, & Cook, 2000), therefore several participants were asked if they were also willing to review questions from this paper and pencil survey immediately following completion of the questions on the interview schedule. Using a cognitive interview technique called verbal probing (Willis, 2004) the researcher probed further into the basis for participant responses, asking questions such as: "What does this question mean to you?", "Can you repeat this question in your own words?", "Was that easy or hard to answer?" This process will be used to evaluate question clarity, gain respondent feedback on question content, and evaluate logistics of future survey administration. This testing was documented using field notes recorded throughout the survey evaluation process.

Survey Description

Section 1: Food procurement patterns.

Questions for this section were drawn from the 1996 National Food Stamp Participant Survey (Ohls et al., 1999), designed to assess food shopping and store access of Food Stamp recipients and eligible non-recipients. Questions were grouped into one of four categories: stores used, travel information, changes wanted in the food environment, and careful shopping activities (e.g., using coupons).

Using nine multiple choice and open-ended questions, participants were asked to identify shopping frequency, identify and enumerate primary stores, and were asked whether they did most of their food shopping within or outside their neighborhood. With five questions, participants identified their primary transportation method to their primary store, estimated the distance (in miles) of this store from their home, and estimated round trip travel time and travel cost to the store. Participants then answered two questions about their satisfaction with the food shopping situation in their neighborhood, and chose from a list of changes they wanted to see in their food environment. Finally, the frequency of money-saving shopping activities was assessed using a four-point, Likert-type scale. Responses were coded from 0 ("Never") – 3 ("Pretty much every time I shop"). By summing responses for the six careful shopping items, a score was created (range 0-18).

Section 2: Food availability within the household.

A thorough investigation of food procurement patterns includes not only an assessment of how and where residents shop for food, but also of what residents are purchasing. There are limited tools available for measuring food purchasing behaviors, and while there is no agreed upon gold standard, the three primary types of measures include home food inventories, purchase record or receipt analyses, and Universal Product Code (bar code) scanning (French, Shimotsu, Wall, & Gerlach, 2008). Other studies have used food purchasing diaries completed by participants (Arcia, Crouch, & Kulka, 1990). These measures are comprehensive in nature but are beyond the scope of this project.

Since 2007-2008, the Consumer Behavior section of National Health and Nutrition Examination Survey (NHANES) includes diet-related consumer behavior questions, some specifically related to availability of certain types of food within the home (CDC, 2011, 2013).

An adaptation of the Flexible Consumer Behavior Survey Module, a measure of the usual availability of several types of food within the home, was included in the survey.

The Dietary Guidelines for Americans, 2010 (USDA Center for Policy and Promotion [CNPP], 2012) recommend consuming nutrient-dense foods and beverages such as fruits, vegetables, whole grains, low-fat or fat-free dairy products, and lean protein such as seafood, meats and poultry, beans and peas, and nuts and seeds (CNPP, 2012), and WIC food plans allow participants the chance to purchase many of these foods (FNS, 2012a). Most commonly assessed food groups in access literature are fresh produce (fruits and vegetables), but canned and frozen produce is a nutritionally acceptable alternative (Fruits and Veggies More Matters, 2012) and is often found in smaller, nontraditional stores common among rural areas (Bustillos et al., 2009). [However, canned, frozen, and dried fruits and vegetables are not WIC approved foods, meaning WIC participants cannot use their benefits to purchase these foods (Alabama Department of Public Health [ADPH], 2013a).]

Ver Ploeg et al. (2009) suggest that measuring the availability of nutritious food must encompass a broad array of foods and food sources, therefore the NHANES question was expanded to include six food groups identified in *Dietary Guidelines for Americans, 2010*: fruits, vegetables, protein foods, dairy products, and grains (United States Department of Agriculture [USDA], n.d.; CNPP, 2012). (See Table 9.) Specific examples within each food group were added to account for Alabama WIC-approved foods (ADPH, 2013a): fresh fruits and vegetables and their juices, dairy products, eggs, and whole grains and cereals. Although not all are covered by WIC, various packaging types of fruits, vegetables, and protein foods were also included in order to accurately capture buying patterns. Retained from the NHANES survey were sugar-sweetened beverages and salty snacks, while a “sweet snacks” category was added to account for

candy and baked goods. All questions were phrased in the manner of the NHANES measure (CDC, 2011, 2013), i.e., asking participants to indicate the frequency of each food's usual availability within the home on a five-component scale from always-never. Availability scores for each food group and food type were created for further analyses, with always scored as 4 and never scored as 0.

Table 9: Household Survey Food Groups

Food Group	Type	Alabama WIC Approved
Protein Foods	Fresh meat, fish, or poultry (MFP)	No
	Frozen MFP	No
	Canned MFP	Canned tuna and salmon only
	Dried peas and beans	Yes
	Eggs	Large only
	Peanut butter	Yes
Vegetables	Fresh Veg	Yes
	Frozen Veg	No
	Canned Veg	No
Fruit	Fresh Fruit	Yes
	Frozen Fruit	No
	Canned Fruit	No
	100% Juices	Yes
Grains	Whole wheat or whole grain bread	Yes
	Brown rice	Yes
	Whole wheat pasta	No
	Ready-to-eat cereal	Yes
	Cooked cereal	Yes
Dairy	Milk (skim, low-, reduced-fat)	Yes
	Yogurt (Low-fat, fat-free)	Yes
	Cheese (Low-fat)	Yes
Other	Salty snacks	No
	Sweet snacks	No
	Sugar-sweetened beverages	No

Comparison with interview data.

In each interview, participants were asked to list foods they typically purchased from the store(s) they identified as being most important for meeting their household food needs. Responses to the interview question were cleaned, meaning responses about that were phrased differently but referenced the same food were combined. Foods were then classified into food groups included in the paper and pencil survey using MaxQDA (Version 11, VERBI GmbH, Berlin, Germany, 2014) and Microsoft Excel (Version 14.4.1, Microsoft Corporation, Redmond, WA, 2010). Survey data from the two section reviewers were then compared with data collected in their interviews. If participants 1) mentioned the food group in their interview list and 2) indicated on the survey that they had the food group available in their home "always" or "most of the time," the data were considered aligned or consistent. ("Sometimes," "rarely," and "never" survey answers were considered not usually present in the home, thus not usually purchased.)

Section 3: Resource Adequacy, Cooking Self-Efficacy, Barriers and Motivators for Cooking, and Nutrition Knowledge

Personal and household factors including knowledge and perception of the nutritional content of food can influence food choice (Smith & Morton, 2009), and the demand for healthful foods like fruits and vegetables can be driven by time costs associated with their preparation, lack of knowledge about their nutritional content, and lacking familiarity with the foods, thus unfamiliarity with their taste, preparation techniques, etc. (Ver Ploeg et al., 2009). Additionally, cooking skills affect several aspects of food behavior, including home meal preparation and food management, food purchasing, and dietary intake (Ternier, 2010). Cooking competence not only equips the consumer with the ability to prepare meals, but also allows the consumer to be able to

make several types of meals from one food product, thus broadening food selection and potentially decreasing food costs.

This section, therefore, included four measures assessing participants' resource adequacy, cooking self-efficacy, barriers and motivators to cooking, and nutrition knowledge. Resource adequacy was assessed with a five-item measure of participants' perceived adequacy of their skills and resources for food preparation (cooking skills, money to buy food, appliances for food preparation, local food selection, and time to prepare food) using a four-point Likert-type scale from "very inadequate" to "very adequate" (Cronbach's α=.62) (Larson et al., 2006). Each item was assigned a numerical score from 1 (very inadequate) – 4 (very adequate), and answers were summed to create a resource adequacy score with potential ranges of 5-20. Larson et al. (2006) categorized scores from 5-10 as inadequate and scores from 11-20 as adequate; however, scores from this section will be maintained as continuous score variables to allow for consistency with other measures in the section.

This section also included a cooking self-efficacy scale, a measure of cooking barriers and motivators, and a nutrition knowledge measure, all from Clifford et al.'s 2009 investigation of cooking skill development with college students. The four-item cooking self-efficacy scale included a five-point Likert-type scale from "not at all confident" to "extremely confident." Each item was scored from 1 (not at all confident) – 5 (extremely confident) and summed to create a cooking self-efficacy score ranging from 4-20.

A six-item cooking barriers and motivators scale asked respondents to express the degree to which they agree with statements about the time, enjoyment, expense, ease and difficulty of cooking (Clifford et al., 2009). Items were scored 1 – 5, with higher scores indicating positive views of cooking, comfort in the kitchen, or cooking skill. (For example, "Strongly agree"

answers to “Cooking is hard” were scored as a 1. “Strongly agree” answers to the other three items, e.g. “I enjoy cooking,” were scored as a 5.) Summing scores generated a barriers/motivators score from 6-30.

Lastly, a four-item nutrition knowledge measure based on *Dietary Guidelines for Americans, 2000* (CNPP, 2012b) fruit and vegetable recommendations was included. (Questions based on the 2000 recommendations are still applicable as recommendations correspond with the most recent *Dietary Guidelines for Americans*.) Participants were asked to choose the correct answer for each of the four questions, and the percentage of correct answers was used as a nutrition knowledge score.

Content validity of Clifford et al. (2009) scales was established by an expert panel of nutrition researchers. Knowledge questions had correlations/percentage agreements above 0.70/70%, and the self-efficacy and barriers questions had correlations/percentage agreements above 0.50/50%, with most above 0.60/60%. Cronbach’s α was used to determine reliability of all questions, and items with inter-item correlation >.70 were grouped to create the individual scales.

Section 4: Household Food Security Supplement.

While food deserts may not be the source of food insecurity, they frame conditions under which disadvantaged communities and households must expend greater resources to obtain food (Morton, Bitto, Oakland, & Sand, 2005). Low-income, rural households with children are at increased risk for food insecurity (Coleman-Jensen et al., 2012) and may be affected by spatial distribution of the food supply, therefore it may be important to assess food security when investigating food shopping patterns of such households in food deserts.

Extensive testing has established the stability, reliability, and validity of the USDA Food Security Supplement (FSS) across several years, major population groups, and household types (Hamilton et al., 1997). Within the FSS is the Household Food Security Survey Module (HFSSM), often called the core module, which is a set of 10 questions for households with no children and 18 questions for households with children (Bickel et al., 2000) with which national prevalence of food security and food insecurity are estimated. The HFFSM includes questions assessing anxiety about the insufficiency of the household food budget, the experience of running out of food, report of inadequate quantity or quality of food eaten by household members, adjustments to food use, and frequency and consequences of reduced food intake by members of the household (Bickel et al., 2000; National Research Council, 2006). Questions may be framed to represent the last 30 days or the last 12 months.

A household's food security status is determined based on the number of affirmative responses to the core module questions, in other words, the number of food-insecure conditions reported (Bickel et al., 2000). [In order to eliminate answers based on voluntary dieting, fasting, etc., the language used specifies the cause of potential responses as inadequate resources to obtain food (Bickel et al, 2000).] Answers can be combined into a numeric measure that allows for classification of households along a scale ranging from zero (no reported conditions of food insecurity) to 18 (the most extreme level of food insecurity for households with children). For practical purposes, USDA created categories of food security ranging from high food security to very low food security, with each category representing a range of severity on the numerical scale (ERS, 2012c). The continuum is divided into the four ranges: high food security, marginal food security, low food security, and very low food security. For reporting purposes, USDA

describes households with high or marginal food security as food secure and those with low or very low food security as food insecure.

The survey included the 18-question, 12-month HFSSM for households with children, retrieved from the USDA website (ERS, 2014). The purpose of the survey was to assess usual food in the home and general food access patterns, therefore the 12-month measure, as opposed to the 30-day measure, was used in order to provide sufficiently robust data. Additionally, the 30-day measure cannot to be used to differentiate between households with high food security and households with marginal food security and may be a reflection of seasonal variances (Nord & Prell, 2007; Tarasuk & Beaton, 1999). Households can be classified according to the categories bulleted below.

- High food security (0 affirmative responses) – Households had no problems, or anxiety about, consistently accessing adequate food.
- Marginal food security (1-2 affirmative responses) – Households had problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced.
- Low food security (3-7 affirmative responses) – Households reduced the quality, variety, and desirability of their diets, but the quantity of food intake and normal eating patterns were not substantially disrupted.
- Very low food security (8-18 affirmative responses) – At times during the year, eating patterns of one or more household members were disrupted and food intake reduced because the household lacked money and other resources for food (ERS, 2012c).

The FSS includes more than 70 questions about food expenditures, use of federal and community food programs, food sufficiency and food security, and coping strategies (Bickel et al., 2000; ERS, 2014). Section III, Food Program Participation, was used as a template for one question in which participants were asked to identify with a yes or no response whether or not they (or any member of their household) have received food/benefits from four other federal food assistance programs or outlets: SNAP, Head Start, national school meals programs, and emergency food assistance. Affirmative answers can be coded as a 1, and negative answers as a

0. Data can be summed to create a Food Program score from 0-4 (0 being no program use besides WIC and 4 being use of the four programs).

Section 5: Demographics.

Demographic items collected by NHANES (CDC, 2011, 2013) served as a template for this section, and specific questions about personal/household characteristics that may act as facilitators or barriers to food procurement were incorporated (Glanz, 2009; Glanz, et al., 2005; Sharkey & Horel, 2009; Turrell, Blakely, Patterson, & Oldenburg, 2004). Items included: age; race/ethnicity; marital/partnership status; number, ages, and gender of all household members; education completed; employment status; disability status and dietary restrictions of any household members; length of time at current residence; and length of time receiving WIC benefits. (Federal food assistance program participation, discussed in Section 4, can be used as a proxy for income. To receive WIC benefits, participants must meet low-income eligibility requirements; therefore some degree of homogeneity in reported income is expected.)

Limited food access research has investigated the impact of disabilities and dietary restrictions on food shopping, though there is evidence that both can significantly alter shopping trips or food purchased (Glanz, 2009; Glanz, et al., 2005; Sallis, 1986; Sharkey & Horel, 2009; Whelan, Wrigley, Warm, & Cannings, 2002) With two questions, participants were asked if they or anyone in their household have mental or physical disabilities that impact the food shopping or any dietary restrictions that impact food shopping. Finally, type of residence, length of time at participants' current residence, and length of time receiving WIC benefits were included. (Participants' addresses were collected as well in order to verify the food desert status of their residence.) Though previously unexamined in the food desert literature, these variables may impact residents' realized food environments.

Summary of Analyses, by Research Question

Research Question 1: Does food retail density (the number of each type of outlet per square mile) in Greene County census tracts vary based on USDA food desert classification?

Dependent variables: Food retail density (5 rates for each area)

Independent variables: Census tract, USDA food desert classification

Food retail area density was presented for the FDTs (Tracts 600 and 602) and the NFDT (Tract 601), producing five variables for each of the geographic areas (Apparicio et al., 2007; Sharkey, 2009; Sharkey & Horel, 2009). Variables were descriptively compared by study area, providing unique insight into neighborhood variance between food deserts and non-food deserts beyond the presence of traditional food retailers.

Research Question 2: Does food retail density (the number of each type of outlet per 100 square miles) in Greene County census tracts vary based on USDA food desert classification?

Dependent variables: Food retail density (5 rates for each area)

Independent variables: Census tract, USDA food desert classification

Food retail per capita density was presented for the FDTs and the NFDT, producing five additional variables for each of the geographic areas (Apparicio et al., 2007; Sharkey, 2009; Sharkey & Horel, 2009), which controlled for population density and allowed alternate descriptive comparisons among areas to be made.

Research Question 3: What are the household food procurement patterns of Greene County WIC participants?

This question was addressed descriptively using data from one-on-one interviews, which included free listing sources of food, the bulk and most often used outlets, shopping frequency at these outlets, use of nonretail food sources, and open-ended answers about preparation for, structuring of, and experiences from food shopping trips.

Research Question 4: Do household food procurement patterns of Greene County WIC participants differ based on whether or not participants live in a food desert?

Using the data described for Research Question 3, any differences in food procurement patterns between residents living the FDTs and the NFDT were highlighted. Specifically, demographic information, bulk and most often store types, locations, shopping frequencies, and distances traveled were compared based on area of residence using t-tests/median tests and Fisher's Exact Tests in IBM SPSS Statistics (Version 22.0.0, IBM Corporation, Armonk, NY, 2013). Other data (e.g., transportation methods, childcare, shopping strategies) were compared descriptively.

Data Management, Ethics, and Responsibility

The present study was approved by The University of Alabama Institutional Review Board and the Alabama Department of Public Health Review Board. There were adequate provisions for maintaining the privacy of participants. The proposed research includes no use of individually identifiable, protected health or personal information; therefore the project does not violate local, state, or federal regulations for research, including HIPPA, FERPA, or PPRA legislation.

Participant's addresses were collected within interview, but were not included on the voice recording. The addresses were kept separately in the interview log and used for three purposes: 1) to ensure multiple members of the same household are not interviewed, 2) for use

within the USDA Food Access Research Atlas to determine whether or not participants live in a food desert (ERS, 2012a, 2012b), and 3) to calculate the distance from participants' homes to their most often used food store. The log was kept with the PI at all times. The log was destroyed following data collection, and addresses were not entered into the dataset used for analyses. The USDA Food Access Research Atlas is an open-access tool available online (ERS, 2012b). The tool does not keep a record of searches completed. For added protection, the researcher cleared all browser data following searching for participants' addresses.

All participants were assigned pseudonyms by choosing names randomly from a list of popular baby names (US Social Security Administration, 2013). Participants were identified by this pseudonym within all study documentation and in the presentation of results. All data produced as a result of this project was kept on file in a locked office on The University of Alabama campus. This includes, but is not limited to: consent forms, field notes, interview schedules, and interview transcripts. All electronic information, including digital recordings, was be stored on a password protected, limited access computer. The researcher performed all data entry, cleaning, and analyses, thereby limiting the potential for breaches in confidentiality.

Ethical issues of representation arose when presenting information uncovered in interviews (Marshall & Rossman, 2011). The researcher transcribed interviews verbatim, meaning incomplete sentences and incorrect grammar was included. While it can be argued this is a disservice to participants, 'cleaning up' speech may involve sacrificing data that could assist in more accurately translating participant viewpoints. The presentation of results from qualitative analyses is prefaced with the acknowledgement of potential misinterpretations due to cultural differences, recognizing that results are translations of participant views and behaviors.

Examining the problem of food deserts with community members demands reciprocity be considered. The incentives provided may enhance participants' momentary purchasing power, and money spent may directly support the area's food supply. The researcher has received funding from the University of Alabama Graduate School, a $600 Research and Travel grant. Half of the grant ($300) was used for incentives. Participants received $10 cash for their time. Participants received the incentive at the conclusion of the interview and survey review period. Incentives were provided if participants completed a full interview only; however, incentives were provided regardless of whether or not participants are willing and able to review survey questions. Remaining funds were used to purchase supplies, such as a voice recorder, and supplement research assistants' out-of-pocket travel costs.

APPENDIX C

IRB CERTIFICATION

Office for Research

Institutional Review Board for the
Protection of Human Subjects

THE UNIVERSITY OF
ALABAMA
RESEARCH

March 18, 2013

Alisha Gaines
College of Human Environmental Sciences
The University of Alabama
Box 870311

Re: IRB # 13-OR-091, "Potential and Realized Food Environments: An Application of The Social Cognitive Theory in Alabama Food Deserts"

Dear Ms. Gaines:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on March 17, 2014. If the study continues beyond that date, you must complete the IRB Renewal Application. If you modify the application, please complete the Modification of an Approved Protocol form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, please complete the Request for Study Closure form.

Should you need to submit any further correspondence regarding this application, please include the assigned IRB application number.

Good luck with your research.

Sincerely,

[redacted]

Director & Research Compliance Officer
Office for Research Compliance
The University of Alabama

358 Rose Administration Building
Box 870127
Tuscaloosa, Alabama 35487-0127
(205) 348-8461
FAX (205) 348-7189
TOLL FREE (877) 820-3066

Office for Research

Institutional Review Board for the
Protection of Human Subjects

THE UNIVERSITY OF
ALABAMA
RESEARCH

February 6, 2014

Alisha Gaines
Department of Health Science
College of Human Environmental Sciences
The University of Alabama

Re: IRB # 13-OR-091-R1 (Data Analysis Only) "Potential and Realized Food Environments: An Application of the Social Cognitive Theory in Alabama Food Deserts"

Dear Ms. Gaines:

The University of Alabama Institutional Review Board has granted approval for your renewal application.

Your renewal application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on February 5, 2015. If your research will continue beyond this date, complete the relevant portions of the IRB Renewal Application. If you wish to modify the application, complete the Modification of an Approved Protocol Form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, complete the appropriate portions of the IRB Study Closure Form.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,

[redacted]

Director & Research Compliance Officer
Office for Research Compliance
The University of Alabama

358 Rose Administration Building
Box 870127
Tuscaloosa, Alabama 35487-0127
(205) 348-8461
FAX (205) 348-7189
TOLL FREE (877) 820-3066

APPENDIX D

CODEBOOKS

Codebook Iteration 1 (20% of participants)

Codebook 1			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Food Source	Traditional	Grocery	Stores that carry a full line of groceries
		Specialty	Stores that carry a specific food category, or items such as organic, ethnic/international, or health-focused foods
	Convenience	-	Small stores retailing a limited line of goods that generally includes milk, bread, soda, and snacks
	Nontraditional	Dollar	Limited assortment stores with a variety of general merchandise, including some food products, at low prices
		Pharmacy	Stores that retail prescription or nonprescription drugs and medicines, and, increasingly, food products
	Mass merchandiser	Mass merchandiser	Primarily sell household items, electronic goods, and apparel, but also offer packaged foods
		Wholesale club	Membership retail/wholesale hybrids with a limited variety of products in a warehouse-type environment with bulk packaging
		Supercenter	Combinations of large food-drug stores and mass merchandisers. Offer a wide variety of food and nonfood merchandise.
	Restaurant	Full service	Patrons order and pay after eating. Servers are generally present. Includes cafeterias and buffets.
		Limited service	Patrons select items and pay before eating. Meals may be consumed on premises, taken out, or delivered.
	Store code	-	Unique code assigned to each store in order to gauge frequency of use.
	Non-retail	-	Sources of non-retail food included in participant free lists.
	Bulk store	-	Food retailer(s) from which participants purchased the bulk of their household food
	Most often store	-	Food retailer(s) participants visited the most number of times each month

Codebook 1			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Bulk Foods Purchased	Meat, fish, poultry	Fresh meat, fish, poultry (MFP)	Fresh pork ribs, ground beef
		Frozen MFP	Frozen chicken tenderloins
		Canned MFP	Canned tuna, salmon
	Grains	Bread	Fresh bread, typically loaf
		Pasta	Any pasta, typically wheat, various packaging
		Rice	Any rice
		Ceral	Kix, Cheerios
	Dairy	Milk	Any fluid milk
		Yogurt	Any yogurt
		Cheese	Any cheese
	Vegetables	Fresh	Turnip greens, broccoli, cabbage
		Frozen	Frozen broccoli
		Canned	Canned green beans, corn
	Fruit	Fresh	Fresh bananas, cantaloupe, apples
		Frozen	Frozen strawberries
		Canned	Canned pears, peaches, or fruit cocktail
	Eggs	-	Whole eggs
	Fats	-	Butter, margarine, oil
	Dry baking/seasoning	-	Salt, pepper, “seasonings”
	Condiments	-	Ketchup, barbeque sauce, salad dressing
	Snacks and desserts	-	Chips, cookies, ice cream
	Beverages	-	Water, juice, soda
	Miscellaneous	-	Foods mentioned not part of categories described above
Most Often Foods Purchased	See coding scheme in “Bulk Foods Purchased”		Categorization of all food types in free lists from participants' most often stores

Codebook 1			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Careful Shopping Strategies	Pre-store	-	Strategies used by participants before shopping
	In-store	-	Strategies used by participants while shopping
Shopping Structure	Shopping frequency	-	Frequency participants shopped at their bulk and most often stores
	Childcare	-	Childcare solutions to avoid taking children food shopping
	Point of origin	-	The place from where participants usually began their food shopping
	Other structure	-	Structure-based preferences of food shopping
Time	In-store	-	Time spent shopping
	Travel	-	Time spent in transit to preferred stores
Travel	Mode of transportation	-	Means by which participants typically reached preferred food stores
	Cost	-	Monetary costs of transportation when food shopping
	Distance	Most often	Distance from participants' point of origin to most often stores
		Bulk	Distance from participants' point of origin to bulk stores
Area store problems	Area store problems	-	Negative qualities of Greene County stores named

Codebook Iteration (40% of participants)

Codebook 2			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Food Source	Traditional	Grocery	Stores that carry a full line of groceries
		Specialty	Stores that carry a specific food category, or items such as organic, ethnic/international, or health-focused foods
	Convenience	-	Small stores retailing a limited line of goods that generally includes milk, bread, soda, and snacks
	Nontraditional	Dollar	Limited assortment stores with a variety of general merchandise, including some food products, at low prices
		Pharmacy	Stores that retail prescription or nonprescription drugs and medicines, and, increasingly, food products
	Mass merchandiser	Mass merchandiser	Primarily sell household items, electronic goods, and apparel, but also offer packaged foods
		Wholesale club	Membership retail/wholesale hybrids with a limited variety of products in a warehouse-type environment with bulk packaging
		Supercenter	Combinations of large food-drug stores and mass merchandisers. Offer a wide variety of food and nonfood merchandise.
	Restaurant	Full service	Patrons order and pay after eating. Servers are generally present. Includes cafeterias and buffets.
		Limited service	Patrons select items and pay before eating. Meals may be consumed on premises, taken out, or delivered.
	Non-retail	-	Sources of non-retail food included in participant free lists.
	Bulk store	-	Food retailer(s) from which participants purchased the bulk of their household food
	Most often store	-	Food retailer(s) participants visited the most number of times each month
Bulk Foods Purchased	Meat, fish, poultry	Fresh meat, fish, poultry (MFP)	Fresh pork ribs, ground beef
		Frozen MFP	Frozen chicken tenderloins

Codebook 2			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Bulk Foods Purchased, continued	MFP, continued	Canned MFP	Canned tuna, salmon
	Grains	Bread	Fresh bread, typically loaf
		Pasta	Any pasta, typically wheat, various packaging
		Rice	Any rice
		Ceral	Kix, Cheerios
	Dairy	Milk	Any fluid milk
		Yogurt	Any yogurt
		Cheese	Any cheese
	Vegetables	Fresh	Turnip greens, broccoli, cabbage
		Frozen	Frozen broccoli
		Canned	Canned green beans, corn
	Fruit	Fresh	Fresh bananas, cantaloupe, apples
		Frozen	Frozen strawberries
		Canned	Canned pears, peaches, or fruit cocktail
	Eggs	-	Whole eggs
	Fats	-	Butter, margarine, oil
	Dry baking/seasoning	-	Salt, pepper, “seasonings”
	Condiments	-	Ketchup, barbeque sauce, salad dressing
	Snacks and desserts	-	Chips, cookies, ice cream
	Beverages	-	Water, juice, soda
	Miscellaneous	-	Foods mentioned not part of categories described above
Most Often Foods Purchased	See coding scheme in “Bulk Foods Purchased”		Categorization of all food types in free lists from participants' most often stores
Careful Shopping Strategies	Pre-store	-	Strategies used by participants before shopping
	In-store	-	Strategies used by participants while shopping

Codebook 2			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Shopping Structure	Shopping frequency	-	Frequency participants shopped at their bulk and most often stores
	Childcare	-	Childcare solutions to avoid taking children food shopping
	Point of origin	-	The place from where participants usually began shopping
	Other structure	-	Structure-based preferences of food shopping
Determinants of shopping decisions	Location	-	Location of food retailers
	Price	-	Price of food within food retailer
	Food products	-	Foods carried within the store
	Schedule	-	Working or daily schedule
	Transportation	-	Availability of transportation to/from the store
Time	In-store	-	Time spent shopping
	Travel	-	Time spent in transit to preferred stores
Travel	Mode of transportation	-	Means by which participants typically reached preferred food stores
	Cost	-	Costs of transportation when food shopping
	Distance	Most often	Distance from participants' point of origin to most often stores
		Bulk	Distance from participants' point of origin to bulk stores
	Trip-chaining	-	Pairing shopping trips with other errands
Area store problems	Area store problems	-	Negative qualities of Greene County stores named
Knowledge	Of sales	-	Participant knowledge of price and sales, important for dictating shopping decisions
	Of WIC foods	-	Participant knowledge of foods covered by WIC benefits, important for dictating shopping decisions/foods purchased
	Of stores/store characteristics	-	Participant knowledge of area store contents and other characteristics, important for dictating shopping decisions

Codebook 2			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Barriers and Facilitators	Barriers	Pre-store	Personal, interpersonal, or environmental factors that negatively impact food procurement before shopping
		In-store	Personal, interpersonal, or environmental factors that negatively impact food procurement while shopping
	Barriers, continued	Post-store	Personal, interpersonal, or environmental factors that negatively impact food procurement after shopping
	Facilitators	Pre-store	Personal, interpersonal, or environmental factors that facilitate food procurement before shopping
		In-store	Personal, interpersonal, or environmental factors that facilitate food procurement while shopping
		Post-store	Personal, interpersonal, or environmental factors that facilitate food procurement after shopping

Codebook Iteration 3 (60% of participants)

Codebook 3			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
All Stores Visited	Traditional	Grocery	Stores that carry a full line of groceries
		Specialty	Stores that carry a specific food category, or items such as organic, ethnic/international, or health-focused foods
	Convenience	-	Small stores retailing a limited line of goods that generally includes milk, bread, soda, and snacks
	Nontraditional	Dollar	Limited assortment stores with a variety of general merchandise, including some food products, at low prices
		Pharmacy	Stores that retail prescription or nonprescription drugs and medicines, and, increasingly, food products
	Mass merchandiser	Mass merchandiser	Primarily sell household items, electronic goods, and apparel, but also offer packaged foods
		Wholesale club	Membership retail/wholesale hybrids with a limited variety of products in a warehouse-type environment with bulk packaging
		Supercenter	Combinations of large food-drug stores and mass merchandisers. Offer a wide variety of food and nonfood merchandise.
	Restaurant	Full service	Patrons order and pay after eating. Servers are generally present. Includes cafeterias and buffets.
		Limited service	Patrons select items and pay before eating. Meals may be consumed on premises, taken out, or delivered.
Store Importance	Bulk store	-	Food retailer(s) from which participants purchased the bulk of their household food
	Most often store	-	Food retailer(s) participants visited the most number of times each month
Non-retail	Non-retail	-	Sources of non-retail food included in participant free lists.
Bulk Foods Purchased	Protein foods	Fresh meat, fish, poultry	Fresh pork ribs, ground beef
		Frozen MFP	Frozen chicken tenderloins

Codebook 3			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Bulk Foods Purchased, continued	Protein foods, continued	Canned MFP	Canned tuna, salmon
		Eggs	Whole eggs
		Peanut butter	Any peanut butter
		Dried peas/ beans	Dried black eyed peas
	Grains	Bread	Fresh bread, typically loaf
		Pasta	Any pasta, typically wheat, various packaging
		Rice	Any rice
		Ready to eat cereal	Kix, Cheerios
		Cooked cereal	Oatmeal, cream of wheat
	Dairy	Milk	Any fluid milk
		Yogurt	Any yogurt
		Cheese	Any cheese
	Vegetables	Fresh	Turnip greens, broccoli, cabbage
		Frozen	Frozen broccoli
		Canned	Canned green beans, corn
	Fruit	Fresh	Fresh bananas, cantaloupe, apples
		Frozen	Frozen strawberries
		Canned	Canned pears, peaches, or fruit cocktail
		Juice	100% fruit juices
	Other	Salty snacks	Chips, crackers
		Sweet snacks	Ice cream, cookies, pie
		Sugar-sweetened beverages	Soda, fruit drinks, Kool-Aid
		Water	Bottled water
		Baking/seasonings /condiments	Flour, salt, ketchup

Codebook 3			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Bulk Foods Purchased, continued	Other, continued	Fats	Vegetable oils, butter, margarine
Most Often Foods Purchased	See coding scheme in "Bulk Foods Purchased"		Categorization of all food types in free lists from participants' most often stores
Careful Shopping Strategies	Pre-store	-	Strategies used by participants before shopping
	In-store	-	Strategies used by participants while shopping
Shopping Structure	Shopping frequency	Bulk	Frequency participants shopped at their bulk stores
		Most often	Frequency participants shopped at their most often stores
	Childcare	-	Childcare solutions to avoid taking children food shopping
	Point of origin	-	The place from where participants usually began their food shopping
Determinants of shopping decisions	Price/sales	-	Food price or sales on food
	Benefit acceptance	-	Whether or not stores accepted SNAP or WIC benefits
	Location/transportation availability	-	Where the store was located and/or the availability of transportation to the store
	Store variety	-	The variety of products in the store
	Food products	-	The variety of food products
	Non-food products	-	The variety of non-food products
	Food quality	-	The perceived quality of food products in the store
	Food appearance	-	The appearance of food in the store
	Work schedule	-	Work schedules of participants and/or family/friends who were acting as shopping partners or sources of transportation
	Store hours	-	Store operating hours
	Staff relationships	-	Participants' relationships with store staff
	Habit	-	Routines established for food shopping

Codebook 3			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Determinants of shopping decisions, continued	Items needed	-	Specific items needed in the household
	Weather	-	Weather conditions of the origin or destination
Travel	Mode of transportation	-	Means by which participants typically reached preferred food stores
	Cost	-	Costs of transportation when food shopping
	Distance	Most often	Distance from participants' point of origin to most often stores
		Bulk	Distance from participants' point of origin to bulk stores
	Trip-chaining	-	The combination of several errands, including food shopping
Area store problems	Area store problems	-	Negative qualities of Greene County stores named
	Satisfaction with area stores	-	Degrees of satisfaction expressed about local food shopping
Knowledge	Of sales	-	Participant knowledge of price and sales, important for dictating shopping decisions
	Of WIC foods	-	Participant knowledge of foods covered by WIC benefits, important for dictating shopping decisions/foods purchased
	Of stores/store characteristics	-	Participant knowledge of area store contents and other characteristics, important for dictating shopping decisions

Codebook Iteration 4 (80% of participants)

Codebook 4			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
All Stores Visited	Traditional	Grocery	Stores that carry a full line of groceries
		Specialty	Stores that carry a specific food category, or items such as organic, ethnic/international, or health-focused foods
	Convenience	-	Small stores retailing a limited line of goods that generally includes milk, bread, soda, and snacks
	Nontraditional	Dollar	Limited assortment stores with a variety of general merchandise, including some food products, at low prices
		Pharmacy	Stores that retail prescription or nonprescription drugs and medicines, and, increasingly, food products
	Mass merchandiser	Mass merchandiser	Primarily sell household items, electronic goods, and apparel, but also offer packaged foods
		Wholesale club	Membership retail/wholesale hybrids with a limited variety of products in a warehouse-type environment with bulk packaging
		Supercenter	Combinations of large food-drug stores and mass merchandisers. Offer a wide variety of food and nonfood merchandise.
	Restaurant	Full service	Patrons order and pay after eating. Servers are generally present. Includes cafeterias and buffets.
		Limited service	Patrons select items and pay before eating. Meals may be consumed on premises, taken out, or delivered.
Store Importance	Bulk store	-	Food retailer(s) from which participants purchased the bulk of their household food
	Most often store	-	Food retailer(s) participants visited the most number of times each month
Bulk Foods Purchased	Protein foods	Fresh meat, fish, poultry	Fresh pork ribs, ground beef
		Frozen MFP	Frozen chicken tenderloins
		Canned MFP	Canned tuna, salmon

Codebook 4			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Bulk Foods Purchased, continued	Protein foods, continued	Eggs	Whole eggs
		Peanut butter	Any peanut butter
		Dried peas/ beans	Dried black eyed peas
	Grains	Bread	Fresh bread, typically loaf
		Pasta	Any pasta, typically wheat, various packaging
		Rice	Any rice
		Ready to eat cereal	Kix, Cheerios
		Cooked cereal	Oatmeal, cream of wheat
	Dairy	Milk	Any fluid milk
		Yogurt	Any yogurt
		Cheese	Any cheese
	Vegetables	Fresh	Turnip greens, broccoli, cabbage
		Frozen	Frozen broccoli
		Canned	Canned green beans, corn
	Fruit	Fresh	Fresh bananas, cantaloupe, apples
		Frozen	Frozen strawberries
		Canned	Canned pears, peaches, or fruit cocktail
		Juice	100% fruit juices
	Other	Salty snacks	Chips, crackers
		Sweet snacks	Ice cream, cookies, pie
		Sugar-sweetened beverages	Soda, fruit drinks, Kool-Aid
		Water	Bottled water
	Other, continued	Baking/seasonings/ condiments	Flour, salt, ketchup
		Fats	Vegetable oils, butter, margarine

Codebook 4			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Most Often Foods Purchased	See coding scheme in "Bulk Foods Purchased"		Categorization of all food types in free lists from participants' most often stores
Non-Retail Food Sources	Community centers	-	Community centers in all areas
	Gardens	-	Participant-owned gardens
	Fishing	-	Participants fishing activity
	Food from/with family/friends	-	Shared meals, food from others' shopping, hunting, fishing, or gardening activity
	Emergency food	-	Food banks, commodity foods
	Places of worship	-	Meals or food from churches or other religious organizations
Careful Shopping Strategies	Sales papers	-	Consulting non-specific "sales papers"
	Newspapers	-	Consulting newspapers for store sale announcements
	In-store circulars	-	Consulting store-specific sales papers in-store
	Food stocking	-	Purchasing and storing large amounts of food
	Coupons	-	Using coupons from any source when shopping
	In-store price comparison	-	Comparing prices of foods and brands while shopping
	Brand-based shopping	-	Choosing food items based on the brand name
	Inter-store price comparison	-	Comparing prices of food among different stores
	Grocery lists	-	Making lists of items needed
	Mental lists/habit	-	Purchasing similar foods each trip without a formal list
	Others with sales knowledge	-	Consulting family members or friends that also use any of the above shopping strategies
Shopping Structure	Shopping frequency	Bulk	Frequency participants shopped at their bulk stores
		Most often	Frequency participants shopped at their most often stores

Codebook 4			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Shopping Structure, continued	Childcare	-	Childcare solutions to avoid taking children food shopping
	Children included shopping	-	Experiences of participants who take children with them when food shopping
	In-store shopping time	-	Time spent in-store when food shopping
	Point of origin	-	The place from where participants usually began their food shopping
	Trip chaining	-	The combination of several errands, including food shopping
	Schedule	-	Structure-based preferences of food shopping, e.g., time of day, etc.
Travel	Mode of Transportation	Own car	Participants had access to their own cars for food shopping
		Walk	Participants walked to their preferred stores
		Borrow vehicle(s)	Participants borrowed vehicles from family members or friends
		Rides from family/friends	Participants received rides from/with family members or friends
	Transportation cost	-	Costs of transportation when food shopping
Shopping Decision Drivers	Price/sales	-	Food price or sales on food
	Benefit acceptance	-	Whether or not stores accepted SNAP or WIC benefits
	Location/transportation availability	-	Where the store was located and/or the availability of transportation to the store
	Store variety	-	The variety of products in the store
	Food products	-	The variety of food products
	Non-food products	-	The variety of non-food products
	Food quality	-	The perceived quality of food products in the store
	Food appearance	-	The appearance of food in the store

Codebook 4			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Shopping Decision Drivers, continued	Work schedule	-	Work schedules of participants and/or family/friends who were acting as shopping partners or sources of transportation
	Store hours	-	Store operating hours
	Staff relationships	-	Participants' relationships with store staff
	Habit	-	Routines established for food shopping
	Items needed	-	Specific items needed in the household
	Weather	-	Weather conditions of the origin or destination
Neighborhood Shopping Satisfaction	Satisfaction comments	-	Explicit statements about participants' satisfaction with area stores
	Problems with area stores	-	Specific problems encountered when food shopping in Greene County stores
		Overcrowding	Overcrowding due to store size and limited number of stores
		Wait time	Increased checkout time due to store size and overcrowding
		Staff attitude	Poor attitudes of area store staff
		Poor food quality	Experiences purchasing/observing old, expired, spoiled, or generally unattractive food
		Limited stock	Perceived limited stock due to store size
		High prices/limited sales	Perceived high prices of area stores

Codebook Iteration 5 (100% of participants)

Final Codebook			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
All Stores Visited	-	-	Categorization of all food retail outlets included in participant free lists into one of five categories
	Traditional	Grocery	Stores that carry a full line of groceries
		Specialty	Stores that carry a specific food category, or items such as organic, ethnic/international, or health-focused foods
	Convenience	-	Small stores retailing a limited line of goods that generally includes milk, bread, soda, and snacks
	Nontraditional	Dollar	Limited assortment stores with a variety of general merchandise, including some food products, at low prices
		Pharmacy	Stores that retail prescription or nonprescription drugs and medicines, and, increasingly, food products
	Mass merchandiser	Mass merchandiser	Primarily sell household items, electronic goods, and apparel, but also offer packaged foods
		Wholesale club	Membership retail/wholesale hybrids with a limited variety of products in a warehouse-type environment with bulk packaging
		Supercenter	Combinations of large food-drug stores and mass merchandisers. Offer a wide variety of food and nonfood merchandise.
	Restaurant	Full service	Patrons order and pay after eating. Servers are generally present. Includes cafeterias and buffets.
		Limited service	Patrons select items and pay before eating. Meals may be consumed on premises, taken out, or delivered.
Store Importance	-	-	Identification of a food retailer as an important store
	Bulk store	-	Food retailer(s) from which participants purchased the bulk of their household food
	Most often store	-	Food retailer(s) participants visited the most number of times each month

Final Codebook			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Bulk Foods Purchased	-	-	Categorization of all food types in free lists from participants' bulk stores
	Protein foods	Fresh meat, fish, poultry	Fresh pork ribs, ground beef
		Frozen MFP	Frozen chicken tenderloins
		Canned MFP	Canned tuna, salmon
		Eggs	Whole eggs
		Peanut butter	Any peanut butter
		Dried peas/ beans	Dried black eyed peas
	Grains	Bread	Fresh bread, typically loaf
		Pasta	Any pasta, typically wheat, various packaging
		Rice	Any rice
		Ready to eat cereal	Kix, Cheerios
		Cooked cereal	Oatmeal, cream of wheat
	Dairy	Milk	Any fluid milk
		Yogurt	Any yogurt
		Cheese	Any cheese
	Vegetables	Fresh	Turnip greens, broccoli, cabbage
		Frozen	Frozen broccoli
		Canned	Canned green beans, corn
	Fruit	Fresh	Fresh bananas, cantaloupe, apples
		Frozen	Frozen strawberries
		Canned	Canned pears, peaches, or fruit cocktail
		Juice	100% fruit juices
	Other	Salty snacks	Chips, crackers
		Sweet snacks	Ice cream, cookies, pie

Final Codebook			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Bulk Foods Purchased, continued	Other, continued	Sugar-sweetened beverages	Soda, fruit drinks, Kool-Aid
		Water	Bottled water
		Baking/seasonings/ condiments	Flour, salt, ketchup
		Fats	Vegetable oils, butter, margarine
Most Often Foods Purchased	See coding scheme in "Bulk Foods Purchased"		Categorization of all food types in free lists from participants' most often stores
Non-Retail Food Sources	-	-	Sources of non-retail food included in participant free lists.
	Community centers	-	Community centers in all areas
	Gardens	-	Participant-owned gardens
	Fishing	-	Participants fishing activity
	Food from/with family/friends	-	Shared meals, food from others' shopping, hunting, fishing, or gardening activity
	Emergency food	-	Food banks, commodity foods
	Places of worship	-	Meals or food from churches or other religious organizations
Careful Shopping Strategies	-	-	Strategies participants use before or during food shopping to save money
	Sales papers	-	Consulting non-specific "sales papers"
	Newspapers	-	Consulting newspapers for store sale announcements
	In-store circulars	-	Consulting store-specific sales papers in-store
	Food stocking	-	Purchasing and storing large amounts of food
	Coupons	-	Using coupons from any source when shopping
	In-store price comparison	-	Comparing prices of foods and brands while shopping
	Brand-based shopping	-	Choosing food items based on the brand name

Final Codebook			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Careful Shopping Strategies, continued	Inter-store price comparison	-	Comparing prices of food among different stores
	Grocery lists	-	Making lists of items needed
	Mental lists/habit	-	Purchasing similar foods each trip without a formal list
	Others with sales knowledge	-	Consulting family members or friends that also use any of the above shopping strategies
Shopping Schedule and Structure	-	-	Descriptions of shopping preferences as related to schedule or structure of shopping trips
	Bulk shopping frequency	-	Frequency participants shopped at their bulk store(s)
	Most often shopping frequency	-	Frequency participants shopped at their most often store(s)
	Childcare	-	Childcare solutions to avoid taking children food shopping
	Children included shopping	-	Experiences of participants who take children with them when food shopping
	In-store shopping time	-	Time spent in-store when food shopping
	Point of origin	-	The place from where participants usually began their food shopping
	Trip chaining	-	The combination of several errands, including food shopping
	Schedule	-	Structure-based preferences of food shopping, e.g., time of day, etc.
Travel	-	-	Travel and transportation-based food shopping information
	Mode of transportation	-	Means by which participants typically reached preferred food stores
		Own car	Participants had access to their own cars for food shopping
		Walk	Participants walked to their preferred stores
		Borrow vehicle(s)	Participants borrowed vehicles from family members or friends

Final Codebook			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Travel, continued	Mode of transportation, continued	Rides from family/friends	Participants received rides from/with family members or friends
	Transportation cost		Monetary costs of transportation when food shopping
	Time cost	-	Time costs experienced when participants did not have their own vehicles
	Opportunity cost	-	Opportunity costs experienced when participants did not have their own vehicles
Shopping Decision Drivers	-	-	Determinants of food shopping location
	Price/sales	-	Food price or sales on food
	Benefit acceptance	-	Whether or not stores accepted SNAP or WIC benefits
	Location/transportation availability	-	Where the store was located and/or the availability of transportation to the store
	Store variety	-	The variety of products in the store
	Food products	-	The variety of food products
	Non-food products	-	The variety of non-food products
	Food quality	-	The perceived quality of food products in the store
	Food appearance	-	The appearance of food in the store
	Work schedule	-	Work schedules of participants and/or family/friends who were acting as shopping partners or sources of transportation
	Store hours	-	Store operating hours
	Staff relationships	-	Participants' relationships with store staff
	Habit	-	Routines established for food shopping
	Items needed	-	Specific items needed in the household
	Weather	-	Weather conditions of the origin or destination
Neighborhood Shopping Satisfaction	-	-	Participant statements related to satisfaction with Greene County food retailers

Final Codebook			
Set	***Code***	***Subcode***	***Applied Meaning/Example***
Neighborhood Shopping Satisfaction, continued	Satisfaction comments	-	Explicit statements about participants' satisfaction with area stores
	Problems with area stores	-	Specific problems encountered when food shopping in Greene County stores
		Overcrowding	Overcrowding due to store size and limited number of stores
Neighborhood Shopping Satisfaction, continued	Problems with area stores, continued	Wait time	Increased checkout time due to store size and overcrowding
		Staff attitude	Poor attitudes of area store staff
		Poor food quality	Experiences purchasing/observing old, expired, spoiled, or generally unattractive food
		Limited stock	Perceived limited stock due to store size
		High prices/limited sales	Perceived high prices of area stores
Quotes	Quotes	-	Representative participant quotes to be used in the manuscript

APPENDIX E

COGNITIVE TESTING OF A FUTURE SURVEY INSTRUMENT

Introduction

To date, food desert research has generally taken the form of objective investigations of food retail environments within defined geographical areas, often socioeconomically disadvantaged and/or minority neighborhoods, or has attempted to link distance from local food retailers with health effects such as dietary quality (Beaulac, Kristjansson, & Cummins, 2009; Larson, Story, & Nelson, 2009; Ver Ploeg et al., 2009; Ver Ploeg et al., 2012; Walker, Keane, & Burke, 2010). However, speculation about potential difficulty in accessing a food retailer depends not only on neighborhood characteristics, but also on consumer characteristics such as travel patterns, income, car ownership, or disability.

Researchers have called for further investigation of how people organize food shopping within daily activities and consideration of how such activities expand consumers' food environments (Sharkey, 2009; Ver Ploeg et al., 2009). Despite the increasing body of access literature, there is a deficit in literature characterizing food deserts as the result of research with residents. Because surveys have been successfully used to evaluate food access patterns [e.g. the 1996 National Food Stamp Program Survey (Ohls, Ponza, Moreno, Zambrowski, & Cohen, 1999)], a paper and pencil survey was developed to assess food retail access patterns and associated personal and household characteristics. The purpose of this study was to describe survey testing performed with Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) clients participating in the semi-structured interview described in Chapter 3 in order to evaluate face validity and help gauge logistics for future administration.

Theoretical Framework

Little food access research has been grounded in theory, therefore applying a health behavioral theory, such as the Social Cognitive Theory (SCT), that highlights the interplay between personal factors, environmental factors, and behavior, is a valuable approach (Bandura, 1986). An overarching concept of SCT is reciprocal determinism – a triadic model that posits a simultaneous, reciprocal interaction exists among a person's individual characteristics, their behaviors, and their environment (Baranowski, Perry, & Parcel, 2002). Figure 8 depicts how variables of interest fit within the reciprocal determinism framework.

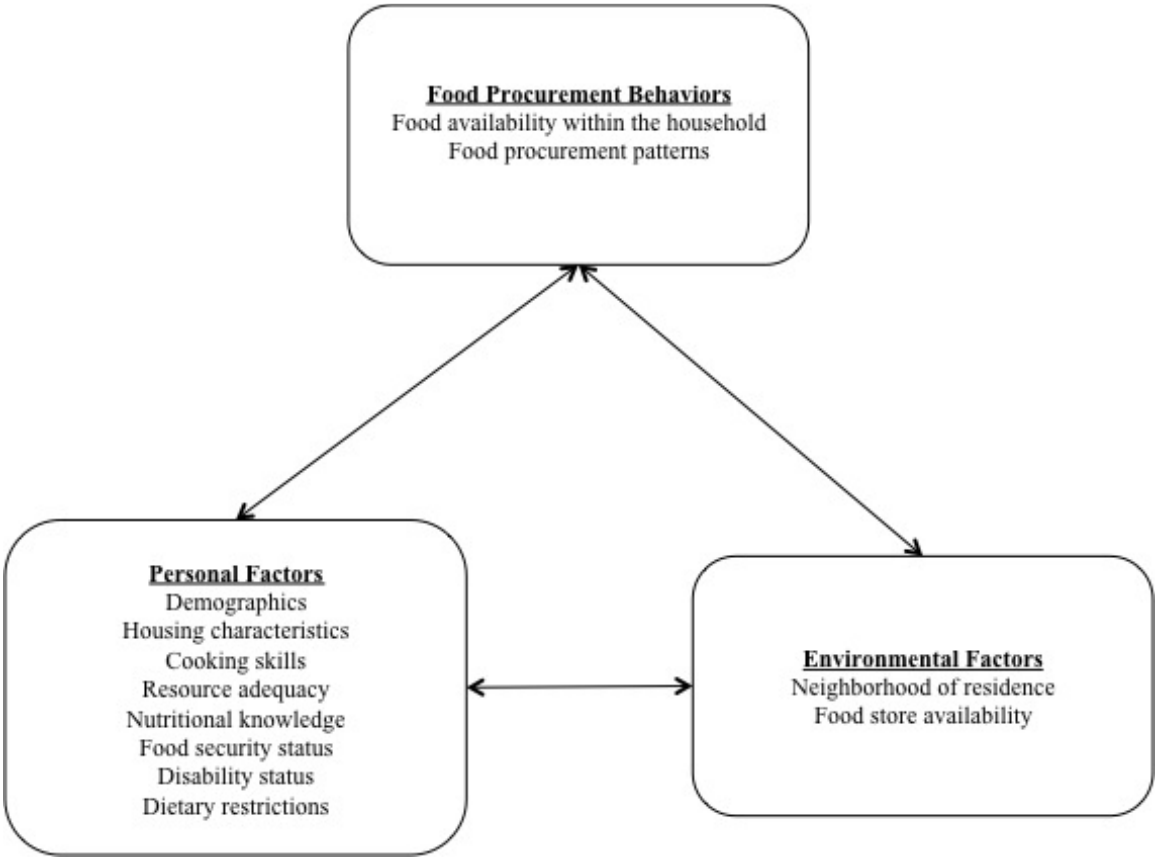

Figure 8: Application of Survey Variables to the Reciprocal Determinism Framework Adapted from Parajes (2002)

The factors of reciprocal determinism are impacted by the other constructs of theory. Because SCT has not been tested comprehensively, investigators should specify the range of the theory's application (Baranowski et al., 2002). Therefore, only some SCT constructs were addressed in survey items. Selected constructs, their definitions, their application in the proposed study, and their adaptation post-review are included in Table 10.

Methods

The survey included items designed to address several SCT constructs as related to food access. Some valid and reliable measures were included (Clifford, Anderson, Auld, & Champ, 2005; Larson, Perry, Story, & Neumark-Stzainer, 2006; Ohls et al., 1999; United States Department of Agriculture Economic Research Service [ERS], 2014), and some tools were adapted for use (Center for Disease Control and Prevention National Center for Health Statistics [CDC], 2011, 2013).

The instrument included 53 questions divided into five sections:

1. Food shopping patterns (Ohls et al., 1999)
2. Food availability in the home (CDC, 2011, 2013)
3. Cooking self-efficacy, barriers and motivators to cooking, resource and skill adequacy, and nutrition knowledge (Clifford et al., 2005; Larson et al., 2006)
4. Household food security status (ERS, 2014)
5. Demographics (CDC, 2011, 2013).

Cognitive Testing

Only the food security questions (Section 4) have been validated with low-income populations and racial/ethnic minorities (Bickel, Nord, Price, Hamilton, & Cook, 2000), therefore several participants of the interview were also asked to review the survey immediately following completion of the questions on the interview schedule.

Table 10: Comparison of Original and Updated Operationalization of Select SCT Constructs, by Reciprocal Determinism Component

Reciprocal Determinism Component	*Construct*	*Operationalization (Original Survey)*	*n Items*	*Operationalization (Updated Survey)*	*n Items*
Behavioral Factors	NA	Usual food availability within the home (CDC, 2011, 2013)	6 food groups (25 foods)	Usual food availability within the home (CDC, 2011, 2013)	6 food groups (25 foods)
		Usual food shopping patterns (Ohls et al., 1999)	18	Usual food shopping patterns (Ohls et al., 1999)	10
Personal Factors	Behavioral Capability	Nutrition knowledge scale (Clifford et al., 2009)	4	Resource and skill adequacy (Larson et al., 2006)	5
		Resource and skill adequacy (Larson et al., 2006)	5		
	Self-efficacy	Cooking self-efficacy scale (Clifford et al., 2009).	4	Cooking self-efficacy scale (Clifford et al., 2009).	4
	Facilitation	Demographic variables (CDC, 2011, 2013)	14	Demographic variables (CDC, 2011, 2013)	14
		Cooking barriers and motivators (Clifford et al., 2009)	6	Cooking barriers and motivators (Clifford et al., 2009)	6
		Household food security status (ERS, 2014) and food assistance program score	19	Food assistance program score	1
			Total: 142		*Total: 46*

Adapted from Baranowski et al. (2002) and McAlister, Perry, & Parcel (2008).

Thirteen of the 30 interview participants read and responded to survey questions. Participants were instructed to complete the survey as if they were taking it normally, and though they were unaware, they were timed as they answered questions. Each participant answered approximately five questions, meaning each of the questions in Sections 1-3 was reviewed twice. One participant reviewed questions included in Section 5, and the Household Food Security Module (Section 4) was not evaluated, as questions would not be altered for use. Using a cognitive interviewing technique called verbal probing (Willis, 2004), the researcher investigated the basis for participants' responses, asking questions such as: "What does this question mean to you?" or "Can you repeat this question in your own words?" or "Was that easy or hard to answer?" This testing was documented using field notes.

Survey Description

Section 1: Food Procurement Patterns.

Questions for this section were drawn from the 1996 National Food Stamp Participant Survey (Ohls et al., 1999), designed to assess food shopping and store access of Food Stamp recipients and eligible non-recipients. Questions were grouped into one of four categories: stores used, travel information, changes wanted in the food environment, and careful shopping activities (e.g., using coupons).

Using nine multiple choice and open-ended questions, participants were asked to identify shopping frequency, identify and enumerate primary stores, and were asked whether they did most of their food shopping within or outside their neighborhood. With five questions, participants identified their primary transportation method to their primary store, estimated the distance (in miles) of this store from their home, and estimated round trip travel time and travel cost to the store. Participants then answered two questions about their satisfaction with the food

shopping situation in their neighborhood, and chose from a list of changes they wanted to see in their food environment. Finally, the frequency of six money-saving shopping activities was assessed using a four-point, Likert-type scale. Responses were coded from 0 ("Never") – 3 ("Pretty much every time I shop"). By summing responses, a score was created with a potential range from 0-18.

Section 2: Food Availability Within the Household.

This section included an adaptation of the Flexible Consumer Behavior Survey Module, a measure of the usual availability of several types of food within the home, found within the National Health and Nutrition Examination Survey (NHANES) (CDC, 2011, 2013). The module was expanded to include six food groups identified in *Dietary Guidelines for Americans, 2010*: fruits, vegetables, protein foods, dairy products, and grains (United States Department of Agriculture [USDA], n.d.; USDA Center for Policy and Promotion [CNPP], 2012a). Specific examples within each food group were added to account for Alabama WIC-approved foods (Alabama Department of Public Health [ADPH], 2013a): fresh fruits and vegetables and their juices, dairy products, eggs, and whole grains and cereals. Various packaging types of fruits, vegetables, and protein foods were also included in order to accurately capture buying patterns. All questions were phrased in the manner of the NHANES measure (i.e., asking participants to indicate the frequency of each food's usual availability within the home on a five-component scale from always-never) (CDC, 2011). Availability scores for each food group and food type were created, with "always" scored as 4 and "never" scored as 0.

Comparison with interview data.

Data from this section were compared with data from the semi-structured interview in order to assess the expansion of food groups as described above. In each interview, participants were asked to list foods they typically purchased from the store(s) they identified as most important for meeting household food needs (Bernard, 2011). Responses to the interview question were cleaned, and foods were classified into food groups included in the paper and pencil survey using MaxQDA (Version 11, VERBI GmbH, Berlin, Germany, 2014) and Microsoft Excel (Version 14.4.1, Microsoft Corporation, Redmond, WA, 2010). Survey data from the two section reviewers were then compared with data collected in their interviews. If participants 1) mentioned the food group in their interview list and 2) indicated on the survey that they had the food group available in their home "always" or "most of the time," the data were considered aligned or consistent. ("Sometimes," "rarely," and "never" survey answers were considered not usually present in the home, thus not usually purchased.)

Section 3: Resource Adequacy, Cooking Self-Efficacy, Barriers and Motivators for Cooking, and Nutrition Knowledge.

A four-item cooking self-efficacy scale, a six-item measure of cooking barriers and motivators, and a four-item nutrition knowledge measure were drawn from Clifford et al.'s 2009 investigation of cooking skill development with college students. An expert panel of nutrition researchers established content validity of these measures (Clifford et al., 2009). Knowledge questions had correlations/percentage agreements above 0.70/70%, and the self-efficacy and barriers questions had correlations/percentage agreements above 0.50/50%, with most above 0.60/60%. Cronbach's α was used to determine reliability of all questions, and items with inter-item correlation >.70 were grouped to create the individual scales.

Designed to assess participants' confidence in their ability to perform basic kitchen tasks such as following a recipe, the cooking self-efficacy measure included a five-point Likert-type scale from "not at all confident" to "extremely confident." Each item was scored from 1 (not at all confident) – 5 (extremely confident) and summed to create a cooking self-efficacy score ranging from 4-20. The cooking barriers and motivators scale asked respondents the degree to which they agreed with statements about the time, enjoyment, expense, ease and difficulty of cooking (Clifford et al., 2009). Items were scored 1 – 5, with higher scores indicating positive views of cooking, comfort in the kitchen, or cooking skill. (For example, "Strongly agree" answers to "Cooking is hard" were scored as a 1. "Strongly agree" answers to the other three items, e.g. "I enjoy cooking," were scored as a 5.) Summing scores generated a barriers/motivators score from 6-30. The nutrition knowledge measure (Clifford et al., 2009) was based on Dietary Guidelines for Americans, 2000 fruit and vegetable recommendations (CNPP, 2012b). Participants were asked to choose the correct answer for each of the four questions; the percentage of correct answers formed the nutrition knowledge score.

Resource adequacy was assessed with a five-item measure of participants' perceived adequacy of their skills and resources for food preparation (e.g., money to buy food, appliances for food preparation, time to prepare food) (Larson et al., 2006). The measure included a four-point Likert-type scale from "very inadequate" to "very adequate" (Cronbach's α=.62). Each item was assigned a numerical score from 1 (very inadequate) – 4 (very adequate), and answers were summed to create a resource adequacy score (5-20).

Section 4: Household Food Security Supplement.

Extensive testing has established the stability, reliability, and validity of the USDA Household Food Security Survey Module (HFSSM) (Bickel et al., 2000; Hamilton et al., 1997). The 18-question, 12-month HFSSM for households with children, retrieved from the USDA website, was included in the present survey (ERS, 2014). A household's food security status is determined based on the number of affirmative responses to the questions, in other words, the number of food-insecure conditions reported (Bickel et al., 2000). Answers can be combined into a numeric measure (0-18) that allows for further categorization:

- High food security (0 affirmative responses) – Households had no problems, or anxiety about, consistently accessing adequate food.
- Marginal food security (1-2 affirmative responses) – Households had problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced."
- Low food security (3-7 affirmative responses) – Households reduced the quality, variety, and desirability of their diets, but the quantity of food intake and normal eating patterns were not substantially disrupted.
- Very low food security (8-18 affirmative responses) – At times during the year, eating patterns of one or more household members were disrupted and food intake reduced because the household lacked money and other resources for food (ERS, 2012c).

Additionally, FSS Section III, Food Program Participation, was used as a template for another question in which participants were asked to identify whether or not they received food/benefits from four other federal assistance programs or outlets: SNAP, Head Start, national school meals programs, and Temporary Assistance for Needy Families (ERS, 2014).

Section 5: Demographics.

Demographic information was collected using items from NHANES (CDC, 2011, 2013). Specific questions about personal/household characteristics that may act as facilitators or barriers to food procurement were incorporated, including: age; race/ethnicity; marital or partnership status; number and ages of all household members; education completed; employment status;

disability status and dietary restrictions of any household members; length of time at current residence; and length of time receiving WIC benefits (Glanz, 2009; Glanz, Sallis, Saelens, & Frank, 2005; Sharkey & Horel, 2009; Turrell, Blakely, Patterson, & Oldenburg, 2004).

Results and Discussion

Overall Impressions and Timing

Based on answers and suggestions provided, participants responded to survey items with good understanding. When asked broad questions about their impression of the survey, participants found most questions easy to answer, though some sections were more difficult than others, especially the nutrition knowledge portion of Section 3, discussed further below. When asked about the length of the survey, responses were mixed. For example, some participants believed they would complete a survey that was only one or two pages in length, compared to the 11 of the present survey. Others believed they would not mind filling out this survey, especially if the tabular checkbox format were used throughout, if there were long waits in the clinic, and/or if incentives were provided.

Participants averaged approximately 18 seconds per question. The 18-item HFSSM can take roughly 10 minutes to complete, or 33 seconds per question. Using the participants' timing for Sections 1, 2, 3, and 5, and the HFSSM estimates for Section 4, it can be estimated that the survey would take participants about 21 minutes to complete. Because participants had discussed the topic of several of the questions in the interview, this may be an underestimate for similar populations. The following discussion is organized by survey section and includes suggestions for content or format changes when applicable.

Section 1: Food Procurement Patterns

Participants believed the questions in this section were anywhere from easy to only slightly hard to answer. Both agreed that questions were functional as is, though one stated that it took "a little while" to read through answer options. Condensing and reorganizing questions would likely prove helpful, as would including a "choose all that apply" instruction to questions that remain asked with multiple realistic answers. Also, one participant believed that the skip instructions made sense, but followed the instructions incorrectly. Therefore, further direction or rearrangement is necessary.

Survey questions were phrased to ask about "food shopping," though participants interpreted this to ask how often they were "grocery shopping," and their suggestions for rephrasing included words like "grocery store." "Grocery shopping" can be used loosely to refer to any food shopping, or it can mean visiting a grocery store, thereby excluding other types of food stores. Researchers should be aware of the understood meaning within populations of interest. Lastly, questions in this section could be reorganized by subject group: stores used, travel information, desired changes in the food environment, and careful shopping activities.

Stores used.

Participants were food shopping twice a month. Based on interview data, large shopping trips once a month were common. However, these two participants also visited smaller or more convenient stores 2-3 times per month, therefore researchers should note that questions about shopping frequency with defined answer choices may limit responses and mask the nuances of food shopping.

When asked to choose what type of store was used most commonly for food shopping, survey participants identified supermarkets or specialty stores. This is reflective of interview data in which most participants, including the two survey reviewers, identified grocery stores and supercenters as primary food sources. However, according to interview data, neither of the reviewers relied on specialty stores such as meat markets. Given these results, it may be helpful to include an area-appropriate example of each store type listed.

Both participants indicated visiting three stores per month. These results aligned with data from interviews in which participants named anywhere from one to four primary stores. The survey reviewers both noted only two stores from which they were purchasing most of their food. However, visiting additional stores for supplemental food was common among most participants.

Both survey participants shopped outside of their neighborhood. Questions using the word "neighborhood" could be problematic because participant and researcher definition of the term may vary. This is a common problem noted in food desert literature and one that may need to be accepted as a limitation in such as survey if neighborhood delineations are not separately discussed. Additionally, one participant asked if the question allowed for only one answer, and suggested including an answer that was reflective of routine shopping in several areas. This could perhaps explain why participants listed local stores in the open-ended, fill-in-the blank question discussed above, but indicated in this question that they shopped out of the area.

When answering the follow-up question: "Why don't you shop at stores in your neighborhood?" responses included high prices, limited food selection, and routine pairing of food shopping trips out of the area with other errands. These answers reflected interview data; high prices were the most common complaint about Greene County stores. Adding options that

were mentioned throughout interviews may also be worthwhile, (e.g., long wait, poor service, poor food quality), though participant burden should be considered.

Travel information.

Survey review participants indicated they were using automobiles to access food stores. One participant owned a car, while another received rides from friends and family, congruent with their interview data. The majority of interview participants owned or had access to cars they used to take themselves food shopping. The few that did not have car access were relying on friends, family, or neighbors for rides. Other answer choices such as taxi services and public transportation were not available in participants' neighborhoods and could thus be eliminated from answer choices if the survey is used with this population.

Both respondents spent an hour and a half in transit, and both incurred travel costs. However, only one followed the skip instructions and answered the question about amount of travel fees experienced ($20), further emphasizing the need to redesign skip patterns. Also, based on interview data, participants' transportation fees are related to the location of the store, so many participants encounter a range of cost. The question could be rephrased to clearly ask about the participants' most used store or average cost. The question also doesn't distinguish between the type of costs incurred. If more specific answers are needed, the question should be reworded.

When asked to estimate the mileage traveled, both participants skipped the question after extended pauses. Interview data suggested that many participants easily reported mileage to and from stores, though more seemed comfortable reporting the time spent in transit. Time may be a better reflection of route preference, traffic, weather conditions, etc., and researchers may complete distance estimates if points of origin and store locations are known. Additionally, eliminating estimation questions may reduce respondent burden.

Changes wanted.

Participants answered these questions with ease, and data reflected the larger group's dissatisfaction with their neighborhood food environment. Both participants were unhappy with their shopping situations, and they chose identical change preferences. Answers align with interview participants' desire for increased variety of stores, variety of food available, and decreased food prices countywide. Despite the lengthy list of potential answers, one participant liked seeing the options because they helped her think of things she believed were important.

Careful shopping activities.

Participants thought this question made sense, and it took them very little time to answer it, though banding rows in various shades may be helpful for visual clarity. Reviewers' average score was 13.5/18. Both women indicated using all activities at least occasionally, and they both used shopping lists and stocked up on sale items every time they shopped. Given concerns about budget and food price, it is unsurprising that these women reported using several careful shopping strategies to save money. Results reflect interview data that suggested most participants made use of careful shopping activities, though with varying frequency. Regarding phrasing, "Look in the newspaper for grocery specials?" may need to be clarified. Interview participants used newspaper announcements or circulars as well as in-store sale papers. Based on participant vernacular, several words may be changed, i.e., "sales" instead of "specials," "grocery list" instead of "shopping list," etc.

Section 2: Food Availability Within the Household

Data regarding food purchases can allow researchers to use food available in the home as a proxy for the impact of environmental availability on food shopping patterns. In general, participants thought the survey questions were easy to answer, and they answered them quickly. Participants reported relatively high scores for most food groups, as presented in Table 11.

Table 11: Average Food Availability Scores

	Average Score	*Possible Score*	*Most common types*
Fruit	10.5	16	Fruit juice, fresh fruit
Vegetables	11	12	Canned vegetables
Protein foods	16.5	24	Frozen meat, eggs
Grains	13.5	20	Ready to eat cereal
Dairy products	9	12	Milk, cheese
Other	9.5	12	Sodas

Participants were frequently purchasing or otherwise receiving fresh produce, and often bought canned produce likely due to shelf life. (These data may also reflect freezing or canning at home using fresh produce.) Results suggest that fresh produce is reasonably accessible to participants and may also point to the effectiveness of WIC vouchers for fresh fruits and vegetables. This is encouraging, as a primary concern about constrained food access is the availability of fresh foods such as fruits and vegetables.

Protein foods results align with interview data in which reliance on meat, fish, and poultry as a protein source was high. Nearly all interview participants purchased fresh meat, though several purchased frozen MFP in place or in addition to fresh. This is reflected in survey participants' answers in which fresh and frozen meats were available at home much more often than canned meat.

While grains data reflected the consistency with which interview participants purchased bread and cereal, answers regarding other grains are were of concern. Many participants purchased refined rice and pasta, though that data would not be captured with the current

measure that is specific to whole grain products. For example, one participant purchased refined pasta, but answered "rarely" on the survey to "whole wheat pasta."

Survey participants' answers to dairy questions accurately represent group interview data in which most participants listed milk and cheese in lists, but rarely listed yogurt, despite WIC vouchers that allow for yogurt purchases. Though fat content was not specified in participants' lists, many participants purchased whole milk products, in line with recommendations that young children should receive whole milk until age two (USDA Food and Nutrition Service [FNS], 2012a). As with grains, phrasing that limits respondents to healthful versions of products per the *Dietary Guidelines for Americans* (USDA, n.d.; CNPP, 2012a), may not accurately capture respondents' household food availability. Researchers will need to prioritize gathering data about general foods/groups or specific types of foods.

Lastly, the availability of snack-type foods and sugar-sweetened beverages varied between the two survey participants, though it was common for these items to be included in interview lists of the larger group. Interview participants also included food types not included in survey questions, including condiments, seasonings, fats, etc. Researchers can consider including further food groups in accordance with research questions.

In potential analyses, researchers could explore other options beyond food group scores for comparison. While it is beneficial to assess multiple forms of each food group, and answers may reflect access, scores mask nuances in purchasing/receiving patterns. For example, higher scores reflect having all food types available. Those purchasing fresh items, but not processed items will have lower scores, though not necessarily lower access or lower quality diets

Comparison with Interview Data

Of the 24 food types, 11 (45.8%) were aligned with interview information. The food groups with conflicting information are shaded in Table 12. Though over half of food categories contained conflicting data, closer examination revealed that for all but three food types (fresh meat, fish, poultry; dried peas and beans; and pasta), the number of affirmative answers in the survey exceeded the number of affirmative interview responses. This could suggest incomplete probing and may point to the survey as a more effective tool for gathering such data. Additionally, inclusion of only healthful options in the survey may explanation of failed overlap.

Table 12: Food Comparison Data

Food Group	*Food Type*	*n of 2 (%) affirmative in interview*	*n of 2 (%) affirmative in survey*
Protein Foods	Fresh meat, fish, or poultry (MFP)	2 (100)	1 (50)
	Frozen MFP	1 (50)	2 (100)
	Canned MFP	0 (0)	0 (0)
	Dried peas and beans	1 (50)	0 (0)
	Eggs	2 (100)	2 (100)
	Peanut butter	0 (0)	1 (50)
Vegetables	Fresh Veg	2 (100)	2 (100)
	Frozen Veg	1 (50)	2 (100)
	Canned Veg	2 (100)	2 (100)
Fruit	Fresh Fruit	2 (100)	2 (100)
	Frozen Fruit	0 (0)	0 (0)
	Canned Fruit	0 (0)	1 (50)
	Juice	1 (50)	2 (100)
Grains	Bread	2 (100)	2 (100)
	Rice	0 (0)	0 (0)
	Pasta	1 (50)	0 (0)
	Ready-to-eat cereal	0 (0)	1 (50)
	Cooked cereal	1 (50)	2 (100)
Dairy	Milk	1 (50)	2 (100)
	Yogurt	0 (0)	0 (0)
	Cheese	1 (50)	2 (100)
Other	Salty snacks	1 (50)	1 (50)
	Sweet snacks	1 (50)	1 (50)
	Sugar-sweetened beverages	1 (50)	2 (100)

Section 3: Resource Adequacy, Cooking Self-Efficacy, Barriers and Motivators for Cooking, and Nutrition Knowledge

Average scores for this section are presented in Table 13 and indicated high confidence in cooking abilities. This is not unexpected, as most interview participants mentioned bulk shopping for items they can cook, eat, and store. This was also apparent in the cooking barriers and motivators scale, in which the average participant score suggested generally low barriers to and positive views about cooking.

Table 13: Average Cooking Self-Efficacy, Barriers and Motivators for Cooking, Nutrition Knowledge, and Resource Adequacy Scores

	Average Score	*Possible Score*
Cooking self-efficacy	19.5	20
Cooking barriers and motivators	24.5	30
Nutrition knowledge	1	4
Resource adequacy	15.5	20

The nutrition knowledge measure was, by far, the most difficult and one of the more time consuming sets of questions. Participants found question content difficult, but they did not believe the language or setup increased difficulty of the questions. Researchers should evaluate the importance of nutrition knowledge questions, and, if including, could choose questions involving multiple food groups. Additionally, WIC participants receive nutrition education as it pertains to child feeding, while survey questions pertain to adult intake requirements. In the future, it may be better to assess knowledge of child feeding practices or meal planning.

Resource adequacy assessed participants' perceived adequacy of their skills and resources for food preparation (cooking skills, money to buy food, appliances for food preparation, local food selection, and time to prepare food) (Larson et al., 2006). Average participant score (15.5/20) indicated adequate resources. Both participants marked money and

store selection as less adequate than resources over which they had more control, such as cooking skill.

The two reviewers expressed an interest in cooking, and therefore took more time to answer (and had more comments about) cooking-focused questions. One reviewer that paused at this question said that she took extra time to think about how she felt about cooking, but that her pause was not due to confusing language or setup. However, there was some pause due to phrasing: using “adequate” should be avoided, as one participant said she needed a better understanding of the word.

Section 4: Household Food Security Supplement

The Household Food Security Supplement was not reviewed, as extensive testing has established the stability, reliability, and validity of the FSS (Hamilton et al., 1997). As the focus of this project was not food security, and other measures of socioeconomic status were included, this section may be cut without losing data that helps answer the research questions.

Section 5: Demographics

Demographic data of survey reviewers was similar to that of the entire sample of interview participants and is presented in Table 14. The sole reviewer of this section was a 26-year-old Black female, living with her partner and two children. She had a high school diploma and was unemployed at the time of survey. Regarding the question about marital status, the reviewer noted that “partner” was a “professional” word. She understood the meaning but believed that people in her neighborhood would be more comfortable with “boyfriend” or “girlfriend.” Also, when asked how many of the four household members were children under 18, she interpreted the question to read “How many children are 18 years or under?” thus rephrasing the question is necessary.

Table 14: Demographic Questions and Responses of Survey Participants

Survey Questions and Answers	*Survey Review Sample (n=13)**	*Section Reviewer (n=1)*
What is your current street address?	-	-
What is your age?	Median=28.0 years	26.0 years
What is your race/ethnicity?	n=13 (100%) Black	Black
What is your marital status?	n=1 (7.7%) married n=10 (76.9%) never married n=2 (15.4%) living with partner	Living with partner
Counting yourself, what is the total number of people that live in your household more than three months out of the year?	Median=4	4
How many of those are children 18 years and under?	Median=2	2
What is the highest level of education you received?	n=2 (15.4%) < high school n=10 (76.9%) High school n=1 (7.7%) Some college	High school
What is your employment status?	n=1 (7.7%) full time n=2 (15.4%) part time n=10 (76.9%) unemployed	Unemployed
Do you or someone in your household own a car?	n=10 (76.9%) yes n=3 (15.4%) no, but has car access	Yes
Do you or anyone living in your household have a physical or mental disability that impacts your household food shopping?	n=13 (100.0%) no	No
Do you or anyone living in your household have any special dietary needs that impact your household food shopping?	n=3 (23.1%) yes n=10 (76.9%) no	No
Which of the following best describes the place where you are currently living?	Data unavailable	Trailer
How long have you been living at your current residence?	Median=4 years	6 years
How long have you been receiving WIC benefits?	Median=2 years	4 years

*Data for the sample were retrieved from interview questions, with the exception of current residence type, which was not asked of any participants. Find demographic data for all 30 interview participants in Chapter 3.

Throughout interviews, participants generally listed the highest grade they completed when asked about their education, i.e., 12th, 11th, etc. Education options should be increased to allow those who did not complete high school to answer accurately. Like most interview participants, the reviewer had a car and had no trouble answering this question. However, it may be helpful to specify "working" car, as a few participants owned unreliable cars. Though the participant did not have any special shopping conditions as dictated by disability or dietary restriction, she suggested rephrasing of these questions.

The participant had been at her current residence for six years. Researchers should understand that if attempting to assess residence as a proxy for area familiarity, "current residence" is less than ideal. Based on interview data, several participants had moved from one home to another in the same area, or had moved back to the area after having left. The answers here then would not be reflective of their longstanding knowledge of the area and local stores, and the question could be rephrased to ask about general county residence.

The participant had two young children, both still eligible for WIC, and had therefore been continually receiving benefits throughout their lifetime (four years total). However, this question is also complex, as many participants have received WIC for multiple children, but not always continually. If the purpose of the question is to identify familiarity with the WIC food package and thus shopping for WIC items, clarifying the question to ask about cumulative participation could be helpful. Lastly, suggested additions for this section include FSS Section III questions (ERS, 2014) previously included in Section 4 of the survey regarding participation in food and nutrition programs, which may be used as a proxy for income.

Conclusions

All measures in the survey reviewed were selected based on constructs within the Social Cognitive Theory. SCT served as a useful framework for selecting dimensions of demographic and food shopping behaviors to be investigated in relation to participants' limited food shopping environment, and the survey served as a worthwhile tool with which such behaviors could be collected and further examined. Participants were able to complete the survey with generally good understanding and with speed dictated by section and question type. Survey sections should be limited to content crucial for adequate examination of research questions, thereby limiting survey length and respondent burden. Clear, concise questions that can stand alone without extensive instruction or skip patterning are preferable. Trimming for conciseness would also help reduce respondent burden, and using language that more accurately reflects the vernacular of the participants is worthwhile. The survey is provided below, with participant-informed suggestions for improvement surrounding the bolded questions.

Household Survey

Section 1

Think about your usual food shopping trips, and answer the questions below to the best of your ability.

Suggested revision:
Section 1: Think about your normal food shopping trips, and answer the questions.

1. **Not counting trips to pick up just a few items, how often do you go food shopping for your household?**
    a. **More than once a week**
    b. **Once a week**
    c. **Once every two weeks**
    d. **Once a month or less**
    e. **Never go for more than one or two items**
    f. **Don't know**

2. **At what kind of store do you usually shop for food?**
    a. **A supermarket or grocery store (Skip to Question 3.)**
    b. **A specialty store like a meat market, bakery, or produce stand (Answer Question 2A.)**
    c. **A convenience store or corner market (Answer Question 2A.)**
    d. **A dollar store or pharmacy (Answer Question 2A.)**
    e. **A warehouse or discount store (Answer Question 2A.)**
    f. **Other (please specify, then Answer Question 2A):**
    _____

Suggested revision, combining Questions 1-2, 8-10:
Check how often you get food from each of these kinds of stores.

	More than one time a week	One time a week	Two or three times a month	One time a month	Rarely or never
A supercenter like Wal-Mart					
A grocery store like Piggly Wiggly					
A specialty store like a farmers' market or meat market					
A gas station or corner store					
A dollar store or pharmacy					
A warehouse or discount store like Sam's Club					

2A. Why don't you do most of your food shopping at supermarkets?

- **a. No supermarkets close by**
- **b. No transportation**
- **c. Costs too much to get there**
- **d. Can't find the types of food I need there**
- **e. No child or elderly care**
- **f. Hours aren't convenient**
- **g. They don't accept SNAP or WIC**
- **h. Not treated with respect**
- **i. Other (please specify):**

_____

_____

Suggested revision Question 2A:

If you don't go to supercenters like Wal-Mart or grocery stores like Piggly Wiggly, why? (Circle all that are true for you.)

a. I do shop at these stores
b. None close by
c. No transportation
d. Costs too much to get there
e. Prices are too high there
f. Can't find the food I need there
g. Don't have anyone to watch children
h. Store hours aren't convenient
i. They don't accept SNAP or WIC
j. Not treated with respect

Other things, like: _____

3. What is the name of the store where you buy most of your food?

_____

Suggested revision, Question 3:

What is the name and city of the store where you buy <u>most</u> of your food?

_____

4. How do you usually get to this store?

- **a. Walk**
- **b. Bicycle**
- **c. Drive a car**
- **d. Get a ride with friends or relatives**
- **e. Take a bus**
- **f. Take a taxi**
- **g. Take a customer service van**
- **h. Other (please specify):**

  _____

5. Do you pay any out-of-pocket costs for this transportation?

- **a. Yes (Answer Question 5A.)**
- **b. No (Skip to Question 6.)**
- **c. Don't know (Skip to Question 6.)**

5A. (If you answered Yes to Question 5, then answer this question.)
How much do you pay in out-of-pocket costs for round-trip transportation?
$_____._____

Suggested revision, Questions 5-5A:

Do you have to pay someone else for this transportation?

- a. Yes, I pay about $_____.____.
- b. No

6. How far is this store from your home? Give your best estimate. _____ miles

Suggested revision:

Delete Question 6.

7. Not including time in the store, how long does it take to travel to and from this store?

- **d. 15 minutes**
- **e. 30 minutes**
- **f. 45 minutes**
- **g. 1 hour**
- **h. 1 ½ hours**
- **i. 2 hours or more**

Suggested revision, Question 7:

How long does it take to get to this store?

- a. 15 minutes
- b. 30 minutes
- c. 45 minutes
- d. 1 hour
- e. 1 ½ hours
- f. 2 hours or more

8. Do you usually shop at one particular store or do you shop at several stores?

- **a. One store**
- **b. Several stores**
- **c. Don't know**

9. What are the other types of stores you sometimes use, besides your main type of store?

- **a. A supermarket or grocery store**
- **b. A specialty store like a meat market, bakery, or produce stand**
- **c. A convenience store or corner market**
- **d. A dollar store or pharmacy**
- **e. A warehouse or discount store**
- **f. Other (please specify): _____**

10. How many stores do you shop at in a typical month?

- **a. 0**
- **b. 1**
- **c. 2**
- **d. 3**
- **e. 4**
- **f. 5 or more**

Suggested revision:

Delete Questions 8-10, which are addressed in the suggested revisions for Questions 1-2.

11. How often do you:

	Pretty much every time I shop	Fairly often	Only occasionally	Never	Don't know
Look in the newspaper for grocery specials?					
Use coupons?					
Stock up on an item when you find a bargain?					
Compare prices across stores?					
Go to food stores for advertised specials?					
Use a shopping list?					

Suggestions Question 11: Move to the end of Section 1 and alter as follows.
How often do you:

	Pretty much every time I shop	**Fairly often**	**Only sometimes**	**Rarely or never**
Look in the newspaper for sales?				
Use in-store sales papers?				
Use coupons?				
Stock up when you find a good deal?				
Compare prices at different stores?				
Go to stores for special sales?				
Make a grocery list?				

12. Do you do most of your food shopping at stores that are close to your home or do you travel outside your neighborhood?

- **a. Close by (Skip to Question 13.)**
- **b. Outside my neighborhood (Answer Question 12A.)**
- **c. Don't know (Skip to Question 13.)**

12A. (If you answered Outside My Neighborhood to Question 12, then answer this question.) Why don't you shop at stores in your neighborhood?

- **a. No stores close by**
- **b. Crime**
- **c. High prices**
- **d. Limited food selection**
- **e. I'm embarrassed to use government benefits near home**
- **f. I do food shopping as part of a trip with multiple purposes or destinations outside my neighborhood**
- **g. I get rides with people who shop outside my neighborhood**
- **h. Other (please specify):**

_____

_____

Suggested revision, Questions 12-12A:

7. Do you do <u>most</u> of your food shopping at stores that are close to your home or do you travel outside your neighborhood? a. Close by (Go to Question 8 ↓) b. Outside my neighborhood (Go to Question 7A →)	7A. Why don't you shop at stores in your neighborhood? (Circle all reasons you think are true.) a. No stores close by b. Crime c. High prices d. No variety of food e. Poor food quality f. Long waits g. Bad service h. I'm embarrassed to use government benefits near home i. I do food shopping as part of a trip with multiple purposes or destinations outside my neighborhood j. I get rides with people who shop outside my neighborhood k. Some other reason, like: _____ _____

13. Are you satisfied or dissatisfied with the food shopping situation in your neighborhood?

- **a. Satisfied**
- **b. Very satisfied**
- **c. Somewhat satisfied**
- **d. Neither satisfied or dissatisfied**
- **e. Somewhat dissatisfied**
- **f. Very dissatisfied**
- **g. Don't know**

Suggested revision, Question 13:

How do you feel about the food shopping situation in your neighborhood?

a. Satisfied
b. Very satisfied
c. Somewhat satisfied
d. Neither satisfied or dissatisfied
e. Somewhat dissatisfied
f. Very dissatisfied

14. Overall, what changes or improvements would you like to see in the food shopping situation in your neighborhood? (Circle all that apply.)

- **a. More large national chain supermarkets in the area**
- **b. Better security at or near store areas**
- **c. More direct public transportation routes to stores**
- **d. Transportation services provided by the stores**
- **e. Stores that stay open for 24 hours**
- **f. Stores that open early and close late**
- **g. Large supermarkets or stores located within walking distance**
- **h. More stores that accept SNAP/Food Stamps and WIC Benefits**
- **i. Stores that sell bulk items at a discount**
- **j. Other (please specify):**

  _____

  _____

Suggested revision, Question 14:

What changes would you like to see where you live? (You can circle more than one answer.)

- a. More big grocery stores in the area
- b. Better security at store areas
- c. Better public transportation to stores
- d. Transportation provided by stores
- e. Stores that stay open for 24 hours
- f. Stores that open early and close late
- g. Large grocery stores within walking distance
- h. More stores that accept SNAP/Food Stamps and WIC
- i. Stores that sell bulk items at a discount
- j. Other things, like: _____

Section 2

The next questions ask how often you and your family have certain types of food available at your home. Place an X in the appropriate box.

Suggested revision:

Section 2: Mark X in the box that describes how often you have different types of food at home.

15. Fruit

	Always	Most of the time	Sometimes	Rarely	Never
Fresh fruit					
Canned/jarred fruit					
Frozen fruit					
100 % juice					

Suggested revision, Question 15:
Fruits

	Always	Most of the time	Sometimes	Rarely	Never
Fresh fruit					
Canned/jarred fruit					
Frozen fruit					
100 % juice					

16. Vegetables

	Always	Most of the time	Sometimes	Rarely	Never
Fresh vegetables					
Canned/jarred vegetables					
Frozen vegetables					

Suggested revision, Question 16:
Vegetables

	Always	Most of the time	Sometimes	Rarely	Never
Fresh vegetables					
Canned/jarred vegetables					
Frozen vegetables					

17. Protein Foods

	Always	Most of the time	Sometimes	Rarely	Never
Fresh meat, fish, or poultry					
Frozen meat, fish, or poultry					
Canned meat, fish, or poultry					
Whole eggs					
Peanut butter					

Dried peas or beans					

Suggested revision, Question 17:
Protein Foods

	Always	**Most of the time**	**Sometimes**	**Rarely**	**Never**
Fresh meat, fish, or poultry					
Frozen meat, fish, or poultry					
Canned meat, fish, or poultry					
Eggs					
Peanut butter					
Dried peas or beans					

18. Grains

	Always	**Most of the time**	**Sometimes**	**Rarely**	**Never**
Whole wheat or whole grain breads (sliced bread, tortillas, buns, bagels, etc.)					
Brown rice					
Whole wheat pasta					
Ready to eat cereal					
Cooked cereal like oatmeal					

Suggested revision, Question 18:
Grains

	Always	Most of the time	Sometimes	Rarely	Never
Bread, tortillas, buns, or bagels					
Rice					
Pasta					
Ready to eat cereal					
Cooked cereal like oatmeal					

19. Dairy Products

	Always	Most of the time	Sometimes	Rarely	Never
Milk (skim, low, or reduced fat)					
Yogurt (low-fat or fat-free)					
Cheese (low-fat)					

Suggested revision, Question 19:
Dairy Products

	Always	Most of the time	Sometimes	Rarely	Never
Milk					
Yogurt					
Cheese					

20. Other

	Always	Most of the time	Sometimes	Rarely	Never
Salty snacks like chips and crackers					
Sweet snacks like candy or cookies					
Soft drinks, fruit-flavored					

drinks, fruit punch (do not include diet drinks, 100% juice, or sports drinks)					

Suggested revision, Question 20:
Other

	Always	**Most of the time**	**Sometimes**	**Rarely**	**Never**
Salty snacks like chips and crackers					
Sweet snacks like candy or cookies					
Sodas or fruit drinks (Do not include diet drinks, 100% juice, or sports drinks)					

Section 3

We would like to know how confident you are in the kitchen, how you rate your resources for cooking, and what you know about nutrition.

Suggested revision:
Section 3: Mark an X in the boxes that describe how confident you are in the kitchen and how you rate your cooking resources.

21. Place an X in box that best describes your confidence in completing each of the tasks listed.

	Extremely confident	**Very confident**	**Moderately confident**	**Not very confident**	**Not at all confident**
I can cook a nutritious meal.					
I can cook a meal in a short amount of time.					
I can cook a nutritious meal without spending a lot of money.					
I can follow a recipe.					

Suggested revision, Question 21:

	Extremely confident	Very confident	Somewhat confident	Not very confident	Not at all confident
I can cook a nutritious meal.					
I can cook a meal in a short amount of time.					
I can cook a nutritious meal without spending a lot of money.					
I can follow a recipe.					

22. Place an X in the box that best describes how you feel about cooking.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Cooking takes too much time.					
I enjoy cooking.					
Cooking meals is expensive.					
If you know how to cook, it is easier to eat more fruits and vegetables.					
Cooking is hard.					
I feel comfortable in the kitchen.					

Suggested revision, Question 22:

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Cooking takes too much time.					
I enjoy cooking.					
Cooking meals is expensive.					
If you know how to cook, it is easier to eat more fruits and vegetables.					
Cooking is hard.					
I feel comfortable in the kitchen.					

23. Place an X in the box that best describes your rating for each of the following resources or skills.

	Very inadequate	**Inadequate**	**Adequate**	**Very adequate**
Cooking skills				
Money to buy food				
Appliances for food preparation				
Food selection in local stores				
Time available to prepare food				

Suggested revision, Question 23:

	Very bad	**Bad**	**Neither good or bad**	**Good**	**Very good**
My cooking skills					
Money to buy food					
Appliances for cooking					
Food selection in local stores					
Time to prepare food					

24. According to the newest Dietary Guidelines, when following an average 2,000 calorie diet, how many cups of fruits and vegetables should you eat each day?

- **a. 1 ½ cups of fruit and 2 cups of vegetables**
- **b. 2 cups of fruit and 2 ½ cups of vegetables**
- **c. 3 ½ cups of fruit and 4 cups of vegetables**
- **d. 5 cups of fruit and 6 cups of vegetables**

25. Which of the following are <u>true</u> about fruits?

- **a. Fruits canned in syrup contain more calories than fruits canned in juice**
- **b. Frozen fruits are not as nutritious as fresh fruits**
- **c. Fruits are low in calories and high in fiber**
- **d. Both a and c are true**
- **e. All of the above are true**

26. Which of the following statements are <u>true</u> concerning vegetables?

a. **Canned and frozen vegetables have similar nutrients as fresh vegetables**
b. **Canned vegetables lose a lot of nutrients through the canning process**
c. **Frozen vegetables contain less fiber than fresh vegetables**
d. **Both b and c are true**
e. **Both a and c are true**

27. Which of the following are considered vegetables?

a. **Beans**
b. **Salsa**
c. **Tortilla chips**
d. **Ketchup**
e. **Both a and b are considered vegetables**
f. **All of the above foods are considered vegetables**

Suggested revision:
Delete Questions 24-27.

<u>Section 4</u>

The next questions are about the food eaten in your household in the last 12 months, and whether you were able to afford the food you need.

Suggested revision: This section, the Household Food Security Module, was not reviewed. Suggest deleting this section as it does not relate specifically to research questions, and would only be a control variable. However, Questions 22-23 (participation in food assistance programs) may be helpful in describing the population income. Suggest moving these questions to the demographic section.

28. As you read each statement that people have made about their food situation, think about whether it was often, sometimes, or never true for you or other adults in your household in the last 12 months. Place an X in the appropriate box.

	Often true	Sometimes true	Never true	Don't know
I worried that my food would run out before I got money to buy more.				
The food that I bought just didn't last, and I didn't have money to get more.				
I couldn't afford to eat balanced meals.				

Circle the answer that best describes your household.

29. In the last 12 months, since last (insert month here), did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

- **a. Yes (Answer question 29A.)**
- **b. No (Skip to Question 30.)**
- **c. Don't Know (Skip to Question 30.)**

29A. (If you answered Yes to Question 29, then answer this question.) How often did this happen?

- **a. Almost every month**
- **b. Some months but not every month**
- **c. Only 1 or 2 months**
- **d. Don't Know**

30. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

- **a. Yes**
- **b. No**
- **c. Don't Know**

31. In the last 12 months, were you ever hungry but didn't eat because there wasn't enough money for food?

- **a. Yes**
- **b. No**
- **c. Don't Know**

32. In the last 12 months, did you lose weight because there wasn't enough money for food?

- **a. Yes**
- **b. No**
- **c. Don't Know**

33. In the last 12 months, did you or other household adults (include only family members) ever not eat for a whole day because there wasn't enough money for food?

- **a. Yes (Answer Question 33A)**
- **b. No (Skip to Question 34)**
- **c. Don't Know (Skip to Question 34)**

33A. (If you answered Yes to Question 33, then answer this question.) How often did this happen?

- **a. Almost every month**
- **b. Some months but not every month**
- **c. Only 1 or 2 months**
- **d. Don't Know**

34. As you read each statement that people have made about the food situation of their children, think about whether it was OFTEN, SOMETIMES, or NEVER true in the last 12 months for any child under 18 years old living in the household. Place an X in the appropriate box.

	Often true	Sometimes true	Never true	Don't know
We relied on only a few kinds of low-cost food to feed the children because we were running out of money to buy food.				
We couldn't feed the children a balanced meal, because we couldn't afford that.				
The children were not eating enough because we just couldn't afford enough food.				

Circle the answer that best describes your household.

35. In the last 12 months, since (insert current month) of last year, did you ever cut the size of any of the children's meals because there wasn't enough money for food?

- **a. Yes**
- **b. No**
- **c. Don't Know**

36. In the last 12 months, did any of the children ever skip meals because there wasn't enough money for food?

- **a. Yes (Answer Question 36A.)**
- **b. No (Skip to Question 37.)**
- **c. Don't Know (Skip to Question 37.)**

36A. (If you answered Yes to Question 36, then answer this question.) How often did this happen?

- **a. Almost every month**
- **b. Some months but not every month**
- **c. Only 1 or 2 months**
- **d. Don't Know**

37. In the last 12 months, were the children ever hungry but you just couldn't afford more food?

- **a. Yes**
- **b. No**
- **c. Don't Know**

38. In the last 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food?

- **a. Yes**
- **b. No**
- **c. Don't Know**

39. Are you or any member of your household eligible for the following programs? Place an X in the appropriate box.

	Yes	No	Don't know
Supplemental Nutrition Assistance Program (SNAP or Food Stamps)			
Head Start Program			
Free or reduced-cost school meals			
Emergency Food Assistance Program (TANF)			

40. In the past 12 months, did you or any member of your household use the following programs? Place an X in the appropriate box.

	Yes	No	Don't know
Supplemental Nutrition Assistance Program (SNAP or Food Stamps)			
Head Start Program			
Free or reduced-cost school meals			
Emergency Food Assistance Program (TANF)			

Section 5

We want to learn a little about you and the people that live in your household. Please fill in or circle the answers that describe you.

Suggested revision:
Section 4: We want to learn a little about you and the people that live in your household. Please fill in or circle the answers that describe you.

41. What is your current street address? (No P.O. Boxes, please.)

_____

42. What is your age? _____ years

Suggested revision, Question 42:
How old are you? _____ years

43. What is your race/ethnicity? (Circle all that apply.)

a. American Indian or Alaska Native
b. Asian
c. Black or African American
d. Hispanic
e. Native Hawaiian or other Pacific Islander
f. White
g. Other (please specify):

_____

h. Prefer not to answer

Suggested revision, Question 43:

What is your race/ethnicity? (You can circle more than one.)

Same answer choices as above.

44. What is your marital status?

- **a. Married**
- **b. Widowed**
- **c. Divorced**
- **d. Separated**
- **e. Never married**
- **f. Living with partner**
- **g. Other:**

_____

Suggested revision, Question 44:

Are you?

a. Never married
b. Married
c. Widowed
d. Divorced
e. Separated
f. Living with my boyfriend or girlfriend
g. Other: _____

45. Counting yourself, what is the total number of people that live in your household more than three months out of the year? _____

45A. How many of those are children 18 years or under? _____

Suggested revision, Question 45-45A:

45. Counting yourself, how many people live with you more than three months out of the year? _____

46. How many people in your house are children (18 years old or under)? _____

46. What is the highest level of education you received?

- **a. Less than 9th grade**
- **b. High school graduate, GED, or equivalent**
- **c. Some college or Associate's degree**
- **d. College graduate or above**

Suggested revision, Question 46:

What is the highest level of education you finished?

a. Less than 9th grade
b. 9th, 10th, or 11th grade
c. 12th grade or GED
d. Some college or Associate's degree
e. College graduate or above

47. What is your employment status?

- **a. Employed full time**
- **b. Employed part time**
- **c. Unemployed**
- **d. Other: _____**

48. Do you or someone in your household own a car?

- **a. Don't know**
- **b. Yes**
- **c. No, but we have a car we can use to get around, or we know someone with a car that can take us around.**
- **d. No, we do not have access to a car.**

Suggested revision, Question 48:

Do you or someone in your household own a working car?

a. Yes
b. No, but we have a car we can use to get around, or we know someone with a car that can take us around.
c. No, we do not have access to a car.

49. Do you or anyone living in your household have a physical or mental disability that impacts your household food shopping?

- **a. Yes**
- **b. No**

If yes, please describe:

_____

Suggested revision, Question 49:

Do you or anyone living in your household have a physical or mental disability that affects how you shop for food?

a. No
b. Yes, it is: _____

50. Do you or anyone living in your household have any special dietary needs that impact your household food shopping?

- **a. Yes**
- **b. No**

If yes, please describe:

_____

Suggested revision, Question 50:

Do you or anyone living in your household have any special dietary needs that impact your household food shopping?

a. No
b. Yes, it is: _____

51. Which of the following best describes the place where you are currently living?

- **a. Apartment, condo, or duplex**
- **b. Trailer or mobile home**
- **c. Free-standing house**
- **d. Shelter or other semi-permanent home**
- **e. Currently without a permanent home**
- **f. Other (please specify): _____**

Suggested revision, Question 51, Answer f:

Something else, like: _____

52. How long have you been living at your current residence? _____

Suggested revision, Question 52:

How long have you been living in your neighborhood? _____

Suggested additions:

Are you or any member of your household **eligible** for these programs?

	Yes	**No**	**Don't know**
SNAP or Food Stamps			
Head Start Program			
Free or reduced-cost school meals			

In the past 12 months, did you or any member of your household **use** these programs?

	Yes	**No**	**Don't know**
SNAP or Food Stamps			
Head Start Program			
Free or reduced-cost school meals			
Emergency Food Assistance (food banks, etc.)			

53. How long have you been receiving WIC benefits? _____

Suggested revision, Question 53:

How long total have you been receiving WIC benefits? _____