4-2012

# A Perception Analysis of Downtown Residents: The City of Lansing, MI. Food Desert in Context

Thomas J. Veldman
*Western Michigan University*

# A PERCEPTION ANALYSIS OF DOWNTOWN RESIDENTS: THE CITY OF LANSING, MI FOOD DESERT IN CONTEXT

by
Thomas J. Veldman

A Thesis
Submitted to the
faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Master of Arts
Department of Geography
Advisor: Lucius Hallett, IV, Ph.D.

Western Michigan University
Kalamazoo, Michigan
April 2012

# A PERCEPTION ANALYSIS OF DONWTOWN RESIDENTS: THE CITY OF LANSING, MI FOOD DESERT IN CONTEXT

Thomas J. Veldman, M.A.

Western Michigan University, 2012

This thesis examines the perceptions of residents inside and outside of a USDA-defined food desert in Lansing, MI related to fresh and frozen produce access. Through an online and paper survey, Lansing-area residents ranked their perceived level of access to fresh produce, their perception of their own health, and reported their general daily intake of fresh produce. Through several statistical analyses, this thesis was able to determine that residents residing within the study area in downtown Lansing had statistically significant variations in their perception of access to fresh and frozen produce, traveled longer to their preferred primary and secondary food retailers, and self-reported similar fresh produce intake and perceptions of health when compared with other area residents. Car ownership was also found to have significant impacts on perception of access, and, including age, a participant's perception of health. Other factors that were analyzed included level of worry associated with access, travel times to food retailers, and the types of stores visited by residents inside and outside the study area. Results indicated that residency inside the study area, travel time, level of education and income did not influence fresh produce consumption among participants, nor their perception of health, and that the severity of this food desert may not be as extensive as other food deserts.

# ACKNOWLEDGMENTS

For the memory of my father
Jerry Lee Veldman
8-4-43 to 1-23-88

I would like to acknowledge my committee, especially my chair, Dr. Lucius Hallet, IV for all of his assistance in this research. His tireless enthusiasm was critical at so many junctures, from initial conversations on the topic, all the way to end, has proven to be critical to the completion of this body of work. His willingness to listen to every idea, no matter how zany it appeared at the time, enabled me to so many times to connect the themes of this research. Without him, none of this would have happened. I would also like to acknowledge the tireless efforts of Dr. Gregory Veeck, who is, perhaps, one of the most influential people I have ever had the pleasure of meeting in my entire life. I cannot adequately describe the deep admiration I have for him. His ability to connect with students and to inspire them to achieve more than they thought possible is truly without equal, and I will sorely miss his daily guidance, humor, and biting intellect. I would also like to thank Dr. Benjamin Ofori-Amoah for his assistance on this research. Dr. Ofori provided sound judgment throughout the entire research and critical feedback, and helped provided well-needed insight. It was a sincere honor and privilege working with him, and everyone else on my committee. I would also like to thank Dr. Kirk Goldsberry and Megan Reed from Michigan State University. The relationship this body of work has opened up for me personally and professionally has irrevocably altered the trajectory of my life. Their assistance, and interest, is, and always will be, greatly appreciated by me.

I would also like to thank my colleagues in the department of Geography at Western Michigan University. There are too many of you to account for properly, and your assistance, even if only listening to me vent frustrations, or to share what I found to be exciting results, was greatly appreciated. I wish all of you the best of luck in your future endeavors.

The support and love of my family was absolutely critical during this time, and without them, I don't know how I would have been able to do this. I want to thank my mother for raising three great kids on her own after the passing of my father. She did it thanklessly, and tirelessly, and she did it the best of anyone person I have ever seen. To my older sister, Elizabeth, who I have competed against for many years without her knowledge. I held what she accomplished at Kalamazoo College and UC Berkley in the highest of regards, as she defined what it means to excel. Despite my years of being your doofus brother, I always looked up to you. And, last but certainly NOT least, my younger sister, Jennifer, who introduced me to so many people, and advocated for me when I wouldn't. What you're capable of accomplishing in an hour of work and your tireless and never ending endeavors puts me and my work to shame. I have always been proud of you.

However, none of this would have been possible without the constant love and support of Andrea Blanka Széll. When I was out huffing and puffing in the urban jungle of downtown Lansing during what felt like the hottest summer I have ever experienced, she was there. When I would frantically check survey responses trickle in after a day of walking, she was there. She listened to every word, and provided much needed encouragement and support when I needed it the most. I cannot emphasize enough how important she was through this entire experience, and how much more enjoyable my life has become experiencing this all with her at my side.

Finally, this thesis is dedicated to my daughter Elizabeth. Nothing fills a father with as much joy as seeing his daughter brag about her father to her friends. You have always made me proud, and I hope that I can continue to inspire your fascination with this world, your place in it, and your continued academic excellence. You will go as far as your interest and imagination let you go. Don't ever let anyone tell you cannot do it. You can. Don't ever give up, even if it seems like you've lost it all. Always, always, always keep at it. Your joy in life will be found in the journey you take in shaping who you want to become. Always make the best of each decision when you have the opportunity. And if you made a wrong choice, relax: You can always reinvent yourself later.

Thomas J. Veldman

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# CHAPTER I
# INTRODUCTION

## Background

In downtown Lansing, Michigan, little is known about the role income, level of education, gender, ethnicity, source of fresh produce, method of transit or travel time plays on the perception and consumption of fresh fruit and vegetables for residents. According to the United States Department of Agriculture (USDA), a significant portion of downtown Lansing, MI is classified as a "food desert." This fact, combined with recent research into the Lansing, MI food environment by Reed (2011), Goldsberry, et al. (2010), Duvall, et al. (2010), as well as a 2009 Downtown Marketing Study showing residents desiring greater access to fresh produce, serves as the rationale for determining if downtown Lansing residents perceive access to fresh food differently from other area residents. By soliciting the opinions of residents that live inside and outside of a USDA defined food desert, this study explores perceptions of fresh produce for area residents, and creates opportunities for this method of research for future food desert studies.

While most food desert studies focus on measuring access to fresh produce without interacting with the people living in these areas, this study was designed to analyze the actors interacting with the local food-retail environment in Lansing and to determine whether statistically significant differences of perceptions exist among actors and locations. It seeks to understand how people within the boundaries a USDA-defined food desert perceive their access to fresh produce, the stores they shop at, the travel time to these stores, and how they perceive their own health when

compared to nearby residents living outside of a USDA-designated food desert. In analyzing perceptions of residents by focusing on these interactions, this study aims to identify how this access affects people living in downtown Lansing. With recent quantitative research into food deserts measuring distance to food retailers as a means to determine access, most studies do not take into consideration individual perceptions of access as a potential factor in the relationship residents have with their food environment. This study aims to add to the literature by analyzing residential perceptions in the context of a food desert, and can help dismiss or confirm several assumptions about those living within one. By studying Lansing, MI, this adds to the recent research already conducted in the Lansing area related to this food environment.

Studying how people perceive their food environment is relevant geographic research for multiple disciplines and can provide policy makers with more accurate information about people interacting with their local food environment and how access can influence dietary behavior. The difficulties people face interacting with their local food-retail landscape provides greater rationale for conducting this study, as purchasing the food necessary for a healthy diet can be overwhelming even for the most well-informed consumer. Confronted with thousands of options in supermarkets, and given the millions of dollars spent marketing often dubious health claims of these products, consumers often make quick and ill-informed decisions when purchasing their food. Purchasing decisions, then, are influenced by multiple ambient conditions. These range from product placement, targeted sales, and even

the presence of music while inside a typical grocery store or supermarket. Even before a consumer enters a store, they are required to decide where to shop for a multitude of reasons: weather, budget, time constraints, and proximity. These decisions influence where consumers shop, and in doing so, influence the type of food they are likely to encounter. Whether it is organic local food at the nearby seasonal farmer's markets, the Peruvian asparagus at Meijer, Wal-Mart, or Kroger, or the canned green beans at the locally-based Quality Dairy, all ultimately influence the health of those that consume it.

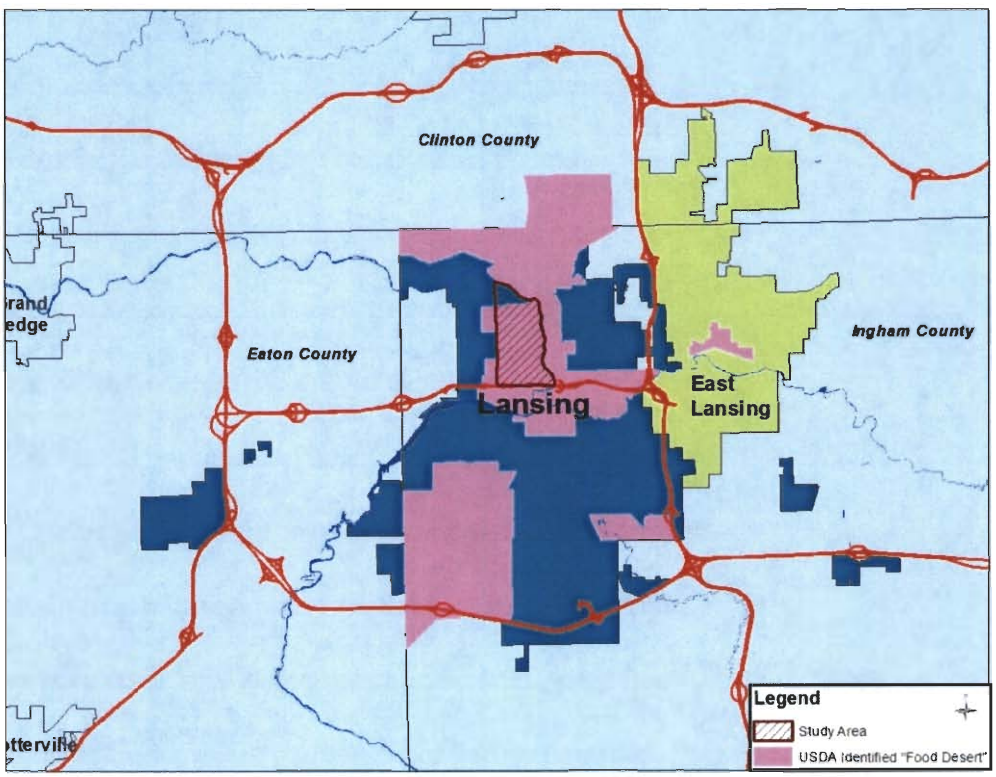
However, those food-retailers that are most likely to provide the healthy and nutritious foods are not evenly distributed for various socio-economic groups within the United States. Studies in Cardiff ,Wales (Wrigley, 2002), and London, Ontario (Larsen and Gillian, 2008), have recorded the phenomenon known as "Food Deserts." These food deserts are areas of relative social exclusion where people experience physical and economic barriers to accessing healthy food (Cummins, S., et al. 2007, Wrigley, et al. 2002). The literature indicates that people living in a food desert pay higher prices for groceries at small food shops, and liquor and convenience stores in their neighborhoods, and must travel greater lengths to obtain fresh food (Larsen and Gilliand, 2008). However, living in a food desert is not the only variable affecting consumption of fresh produce, as men are found to consume fewer fresh fruit and vegetables compared to women, and increases in income are highly correlated to daily fresh produce consumption (Dehghan 2011). The literature, however, is far from clear, and many aspects of food desert research are contested. For example,

while some food desert specific research has shown that living in a food desert decreases consumption of fresh produce (Acheson, 1998), but other research shows that this is not the case (Cummings and Macintyre, 2002), while others still cite socio-economic factors as the primary influence on diet (Pearson, et al. 2005). This study intends to address the effects of both living in a food desert and its impact on diet. Within this study, the roles gender, race, income, education and even travel time have on the daily intake of fresh produce will hopefully emerge in the analysis of the data.

Like most American rust-belt cities, community leaders in Lansing have been trying to find a new vision for the city in the 21st century after the decline and dismantling of several nearby GM auto-manufacturing plants. The City of Lansing has seen an increase in capital investment projects in its downtown retail district beginning in 2000, with the construction of several mixed-use development projects. This has occurred while also dealing with a population loss of 4.1% (119,000 in 2000 to 114,000 in 2010, US Census). Due to these capital investment projects, downtown Lansing has seen increased cultural and economic activity with the opening of several new bars and restaurants. However, access to readily available and affordable fresh-food products for downtown residents does not appear to have changed during this period. A 2009 Lansing Market Survey highlighted this lack of access when it estimated an annual $39 million food-retail leakage to other parts of the Lansing area for food purchases (Downtown Lansing Market Study and Strategies Summary Version 2009). Another setback for access confronting downtown residents came when L&L, a major local food retailer, shuttered the doors on 5 local grocery stores

in early 2011. While some of the closed stores have since reopened under new management and names, several of these stores remain closed, and will be for the foreseeable future. Two of these stores still closed are within a couple of miles of the proposed study area, and it is quite certain that residents within this area will feel the impact of their closing.

**Figure 1.1: Study Area Overview**




(Source: USDA, MCGI)

Studying perceptions of food access in downtown Lansing is especially relevant due to several barriers in this area for pedestrians that make walking and biking to other grocery stores difficult or impossible for residents. The study area, shown in Figure 1, is contained within these barriers: I-496 to the South, the Grand

River along the eastern and northern boundaries, and M-99 (MLK Blvd) to the West. However, there is reasonable access to a functioning 7 days-a-week bus-based mass-transit system with the Capital Area Transit Authority (CATA), which has several major regional routes crisscrossing the study area that can take residents to stores on the suburban fringe. However, to classify this area as lacking access to a fresh-food retailer is misleading, as there are two active food-retail locations immediately bordering the study area. These two sources of fresh produce are the Vallarta market in the northeast section of the study area, and the redesigned and rebuilt Lansing City Market near the eastern boundary of the study area along the eastern bank of the Grand River. Even with this access, the USDA still defines several block groups in this area as being a food desert (Figure 1).

Several studies have attempted to map and quantify access to fresh produce integrating various GIS-based models in an attempt to find linkages between access and consumption of fresh produce. Duvall, et al. (2010) created a classification schema of the various fresh food retailers, accounting for quantity and type of produce available, and Goldsberry, et al. (2010), employed various methodologies when visualizing access to the available fresh produce in the Lansing food environment. Goldsberry showed, using cumulative distance, that portions of this area were unequally serviced by food-retailers, with areas of greater accessibility to all of the available fresh food items in the Lansing area concentrated within the City of East Lansing. Downtown Lansing had moderate access when using both the container and weighted methods, yet the USDA through their food-desert locator

map[1] shows large areas of Downtown as being a food-desert. The inherent problem associated with the USDA methodology for identifying food deserts stems from the agency excluding smaller, independent stores with sales under $2 million a year from the identification criteria.

**Problem Statement**

With the trend of the past several decades for food-retailers to locate in suburban and exurban locations (Pothukuchi, 2005), residents in urban centers are often required to travel longer to food retailers to secure fresh produce, thus incurring greater cost. Few studies have focused on ascertaining whether people living in a USDA designated food desert perceive their access differently than residents outside these areas, relying instead on using GIS to visualize access irrespective of the behavior of people in these areas. Downtown Lansing has a diverse population, with varying income levels, educational achievement, and method of transit to food retailers in the Lansing area. Using a top-down methodology to map access makes assumptions about people in a food desert whereby researchers do not take into account the actions of the actors in these areas. The goal of this thesis is to determine whether employing a perception analysis of food desert residents is an appropriate tool for food desert studies, and to help identify factors that shape the perceptions of people in these areas as they purchase food. This research will account for the socioeconomic characteristics of study participants and their method of transit and travel time to their preferred source of fresh produce to determine if people living in a

[1] USDA Food Desert Locator Map: http://www.ers.usda.gov/Data/FoodDesert/

food desert perceive their access differently when it comes to consuming fresh produce. If so, it hopes to empower policy makers to make more effective decisions to improve the diets of people affected by this lack of access.

To accomplish these goals, I analyze how residents inside and outside of the downtown Lansing food-desert perceive their food environment using a survey. I attempt to determine whether fresh produce consumption has statistically significant variation among age, income, education, gender, and even travel time groups, and between residents inside and outside the downtown study area. This is accomplished by determining baseline demographic information about Lansing area residents, their method of transit, and travel times to their primary and secondary food retailers. The results of this survey, coupled with this baseline information, created a foundation for analyzing perceptions in the context of multiple factors, controlling for a participants location inside and outside of a food desert, and then analyzing other factors to determine the impact these factors have on consumption and perception. The analysis of these specific factors together will better explain the relationship Lansing area residents have with their food environment, inside and outside of the downtown study area.

**Research Questions**

In order to determine whether study area residents have a different perception of access to fresh produce, it is important to answer a variety of questions related to travel time and source of fresh produce to determine any perceived impact on the

participant's access. Specifically, this study is designed to answer the following questions:

1. Do study-area residents travel longer to purchase fresh produce at their preferred stores when compared to other Lansing-area residents?
2. Are downtown study-area residents consuming less fresh fruit and vegetables when compared to other Lansing-area residents, and can patterns of consumption be detected when analyzing consumers based on their travel time, other factors related to age, gender, income, level of education or race?
3. Does perception of access to fresh produce differ for people living in the study-area versus other area residents due to travel time, and/or are these perceptions shaped by other factors related to age, gender, income, level of education or race?
4. Due to issues related to access to fresh produce, does the perception of a person's health differ inside and outside the study area?

Lansing-area residents inside and outside of the study area were solicited to participate in an online survey (using the survey site Survey Monkey) to answer questions related to the primary research questions stated above. Given previous work in studying this food environment by Duvall, et al. (2010) and Goldsberry, et al. (2010) and Reed (2011), this study aimed to continue this research trend by focusing specifically on the downtown area. However, instead of attempting to link access to a top-down visualization of access, this study focuses on taking the experiences and perceptions of the study participants into consideration in the context of access.

Thus, does access actually impact perception, validating some of the essential theories surrounding food desert research that states access determines quality of diet and health, or is the perception of an individual not relevant based on geographic location? If the former is true, this study aims to contribute to geographic research into food deserts by focusing entirely on the actions and opinions of people in the pursuit of food.

The results of this research should encourage further studies examining perceptions of resident's in food deserts to identify the factors influencing fresh fruit and vegetable consumption. Another goal is to demonstrate that while powerful, GIS is not the only tool geographers may bring to bear in food desert research, and that each locality requires its own method for proper analysis.

**Anticipated Results**

I expect my research to demonstrate that study-area residents in downtown Lansing have a statistically significant difference in their perception of access when compared to similar consumers and residents outside this area. Given the concentration of stores on the suburban fringes of the Lansing area, the travel time of study-area residents in downtown Lansing is longer than other Lansing-area residents when shopping food, and this travel time will impact participants perceived access to fresh produce. Due to increased travel times, the fresh fruit and vegetable consumption of study-area residents is lower when compared to a similar person outside the study area. And finally, as a result of eating fewer fresh fruits and vegetables, study-area

residents will view themselves as being unhealthier when compared to similar Lansing-area residents.

**Thesis Outline**

Chapter I – Introduction – provides an overview of this thesis research. It identifies the general issues consumers face navigating food environments, and lists general definitions regarding the food desert phenomenon. It provides a rationale for this research in that it highlights past attempts to research access based on aggregated spatial data, and underscores the assumptions made about people living in food deserts that may in fact not be valid. It introduces the study area, and the goals associated with this thesis research.

Chapter II – Methodology – This chapter will outline the various methods employed in this research and will connect the research questions posed by this research to questions in the questionnaire. It will provide an introduction into the demographic make-up of the Lansing-East Lansing Metropolitan Statistical Area (MSA), and the source of secondary data used in this thesis research.

Chapter III – Literature Review – This chapter will provide a general history of food desert research, and the various spatial analyst methodologies researchers have used to identify areas of lower food provisions. It identifies and critiques previous research into the Lansing food environment by analyzing the assumptions and limitations recent research attempts made in analyzing this local area. This chapter will also introduce qualitative research into food deserts, and the need for a mixed

methods approach to food deserts that allow actors to freely generate their own concerns they have when navigating their food environments.

Chapter IV – Results and discussion – This chapter will discuss at length the various statistical analyses used in understanding participant answers, and the results of these analyses.

Chapter V – Conclusions – This chapter will provide conclusions to this research, implications for researchers and policy makers, and insight into any limitations of this research.

The informed consent, HSIRB approval form, and survey used in this research can be found in the appendix.

# CHAPTER II
# METHODS

## Methods Overview

Again, the primary purpose of this study is to examine perceptions of access for area residents in the context of a USDA-defined food desert in downtown Lansing and to determine how perceptions of access to fresh produce vary for Lansing-area residents across space. I also address the socio-economic characteristics of study participants to account for any potential explanatory effects these variables have on their perception. To achieve this, a questionnaire for Lansing-area residents was used to collect information between May and September 2011. Questions asked in this survey were designed to allow participants to indicate their perceived views of food access and their worry associated with access. These questions asked general consumption patterns of fresh and frozen produce. They also indicated where they shopped, their reasons for shopping at these locations, and the general perceptions toward the major fresh produce providers in the Lansing area.

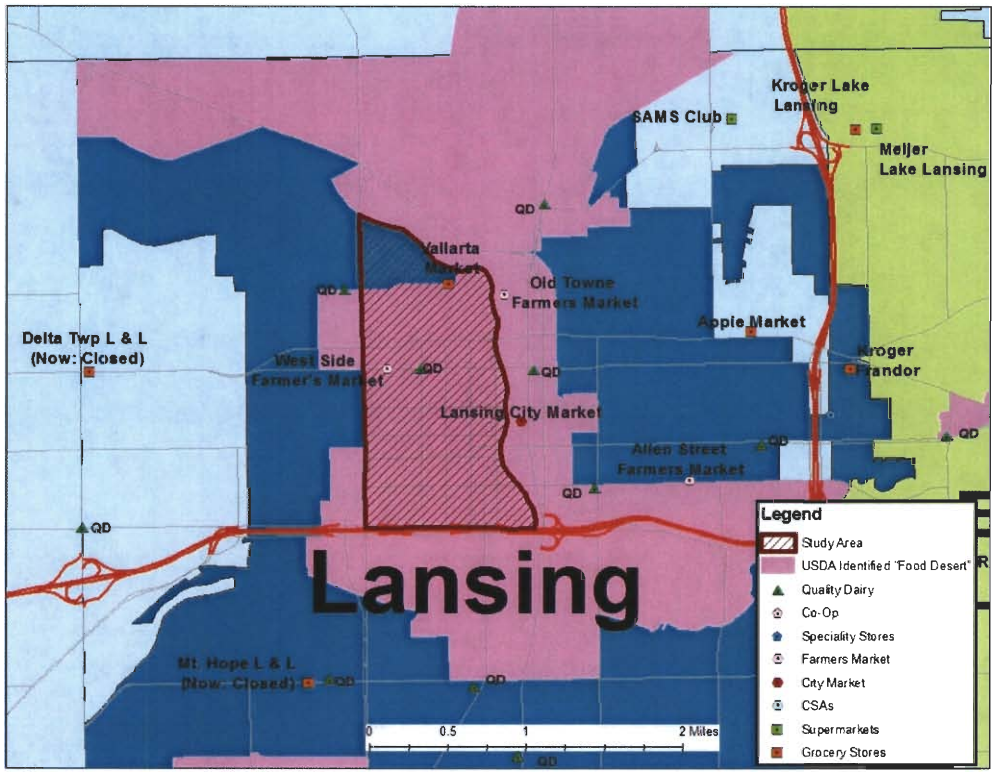
In order to collect a statistically viable sample, the study area in downtown Lansing was canvassed door-to-door with flyers advising these residents of an online survey conducted through SurveyMonkey.com. This resource has recently proven useful in previous food-based studies, notably Simms (2011). Given that certain residents would not have personal or convenient access to the internet, an identical print version of the survey was available if the resident was willing to complete it on the spot. For residents outside the downtown study area, word of mouth was generated through several Lansing-based Facebook groups via wall posts with links

to the online survey. All told, 255 people participated in the study, with 251 viable survey responses.

**Study Area**

Given that the entire population of the Lansing-East Lansing MSA was eligible to participate, the entire study area can be described as the tri-county region encompassing greater Lansing. More practically, however, the study areas in this research can best be described as inside and outside of the USDA-defined food desert in downtown Lansing (Figure 2). The Lansing area is a predominately automobile oriented mid-sized city with a majority white population. According to the 2010 Census, the Lansing-East Lansing Metropolitan area has a total population of 464,036 people. Of this, 78.3% self-identified as White non-Hispanic, 8.6% Black or African American non-Hispanic, 6.2% Hispanic or Latino, 3.8% Asian and 3.3% two or more races. Within the study area itself, the 2010 Census indicates a total population of 6,157 people. Of that population, 56.8% are White non-Hispanic, 23.1% Black or African American non-Hispanic, 11.14% Hispanic or Latino, 4.29% Asian, 3.52% two or more races, and .27% other.

**Figure 1.2: Near Downtown Fresh Produce Food Retailers and Seasonal Farmer's Markets**




(Source: USDA, MCGI, Google. Created by Author)

Most residents in the Lansing-area use an automobile when commuting to work, school, and to the store, and with the climate of Lansing, especially in winter, walking and biking are not realistic year-round options for most residents when purchasing food. The dominance of the automobile in the Lansing-area has created several barriers for pedestrian mobility, notably within the downtown study area. With several four-lane major arterial roads, I-496 and the Grand River bordering the area (Figure 2), walking routes from one part of the study area to another are limited to appropriate crossings. Periods of inclement weather, specifically in winter, can create further barriers to pedestrian mobility as snow and ice is known to accumulate on sidewalks. After years of economic distress in the region, and in particular after

the financial crisis of 2008, the downtown study area also has large numbers of foreclosed or abandoned homes further exacerbating the timely removal of snow and ice debris. Year-round availability of produce in downtown is limited to the Vallarta Market and the Lansing City Market, as shown in Figure 2, which requires most residents to travel to food retailers outside this area. However, Figure 2 also shows the locations of several Quality Dairy Stores in the study area, and two seasonal farmer's markets – Old Towne, and Westside. . These farmer's markets operate only during the summer months, which corresponded to the dates area residents were solicited to participate in this study. Also visible in this map are several other major Lansing food retailers, including two L&L stores that remain closed.

**Questionnaire Development and Implementation**

Informed by the recent research by Reed (2011) into the Lansing-food retail environment, and Simms (2011) Southwest Michigan Farmer's Market research, a questionnaire was developed to gather data on individual and regional food shopping behavior. With a 4-month window in which to collect data, and due to research budget constraints, an online survey website was determined to be the most appropriate method to collect as many responses as possible, but as previously noted, paper copies of the survey were also available to complete for participants that did not have reasonable access to the internet. Surveymonkey.com has been successfully used in recent geographic research for collecting primary data on retail behavior, notably Simms (2011). This methodology ensures anonymity and convenience for survey participants, and allowed for more questions to be answered in a given period

of time by each participant. Whereas Reed (2011) implemented a street-intercept methodology when gathering data, that study had limited access to major area supermarkets for conducting research, and had a shorter interaction time with consumers at each retailer. Given this, an online survey avoids any "hassle" associated with food-retailers refusing researcher access or researcher consumer interferences, and could provide data from a larger geographic area. This method also ensures lesser bias in the data collection method associated with questionnaire rejection, and with interviewer bias. It also enables participants to think and answer questions on their own time, and allows them time to communicate their ideas without time constraints.

**Survey Development and Questions**

There were various categories of questions asked of participants during the data collection period of this research. Given that this was an attempt to ascertain the perceptions of Lansing-area residents as it related to fresh produce access, questions tended to focus on these perceptions. Other questions were asked in attempt to ascertain what factors play a role in these perceptions. A copy of the final survey used in this research is found as Appendix A.

**Informed Consent**

Prior to starting the survey, a scanned version of the original HSIRB approval form was displayed giving the participant the appropriate recourse should they choose to stop their participation in the study. Participants were instructed to carefully read

and save a copy of this form if they chose to do so. No participants during this study requested to have their answers removed after they were submitted.

**Demographics**

Questions concerning participants socio-economic information was scattered throughout the survey, with questions requesting the most vital information asked first. Demographic, mobility, and socio-economic questions asked of participants included information concerning income, level of education, race, gender, approximate age, approximate level of income, and method of transit. Participants were also asked to indicate method of payment for food (cash, credit, debit/check, food stamps, Women Infants Children (WIC) or other), their current college status (in college full-time or part-time or not at all), level of employment (from unemployed, part-time, full-time or retired), pension status or social security status, and whether they owned a car.

**Rating Access**

The next set of questions concerned respondents views regarding access to fresh and frozen/canned produce in the Lansing-area. This section also included an open-ended question allowing participants to provide any information they felt important prior to answering the Likert-type questions concerning access. Once done, participants ranked their perceived level of access of fresh produce and frozen/canned produce on a scale from 1 to 5, with 1 equaling Very Poorly, with 3 being Average, and 5 being Very Good. Participants were also able to indicate Not Applicable. These questions were critical to providing answers for one of the

research questions posed by this study: whether perception of access to fresh produce differ for people living within the study-area versus other area residents.

**Quality of Life Questions**

After participants ranked their level of access, they were next asked to rate their quality of life in their current location, and their sense of the overall quality of food access in the Lansing-area. Similar to the previous section, participants were asked to rank their scores from 1 to 5, with 1 indicating a very negative opinion, 3 being neutral, and 5 equaling a very positive opinion. In addition, questions relating to residents that have resided in the Lansing-area for one year or less were asked asking participants to rate their sense of access in their previous community using the same scale, and then ranked their overall general opinion of where they lived prior to Lansing. While not critical to the primary questions asked of this research, length of residency questions were asked to see if duration of residence who have any impact on perception regarding access to fresh and frozen/canned produce.

**Consumer Type**

The next set of questions were also asked using a Likert-type scales, with 1 being strongly disagree, 3 being neutral, and 5 being strongly agree. These questions also included a "not applicable" for participants that did not feel the question was relevant to their situation. The purpose of these questions were to identify the types of different consumers in the Lansing-area, and to see if any information could be gleamed from different consumer types of fresh produce purchases in the Lansing-area.

The first question asked participants whether they considered themselves a healthy person, free of food-related diseases (heart disease, diabetes, etc.). This question is based on information identified in the literature that suggested consumers living in a food desert were less healthy than consumers living outside a food desert (Acheson, 1998). This was also a central research question for this research, as it was anticipated from previous literature on food deserts, that residents inside the downtown study area would perceive their overall health to be poor vis-a-vis residents outside the food desert.

The next set of questions focused on the consumption behaviors related to various food products, starting with estimates of the daily consumption of fresh produce (3-5 servings a day), followed by frozen/canned fruit and vegetables (3-5 servings a day) in order to discover if Lansing-area residents were more prone to eating one type of available produce over another. These questions were critical to this research, specifically whether self-reporting downtown study-area residents consume fewer fresh fruit and vegetables than other Lansing-area residents. Frozen and canned fruit and vegetables were included as an adjustment in that most studies exclude this category from food desert research, despite the fact that there are very viable options given contemporary processing technologies. The focus of the issues related to most food deserts concern access to fresh produce. However, if a participant ranked their consumption and perception of access higher for frozen and canned fruit and vegetables, this finding could go a long way in providing an

alternative narrative for a participant's perception of access to fresh produce, and ultimately for consumption of fresh produce.

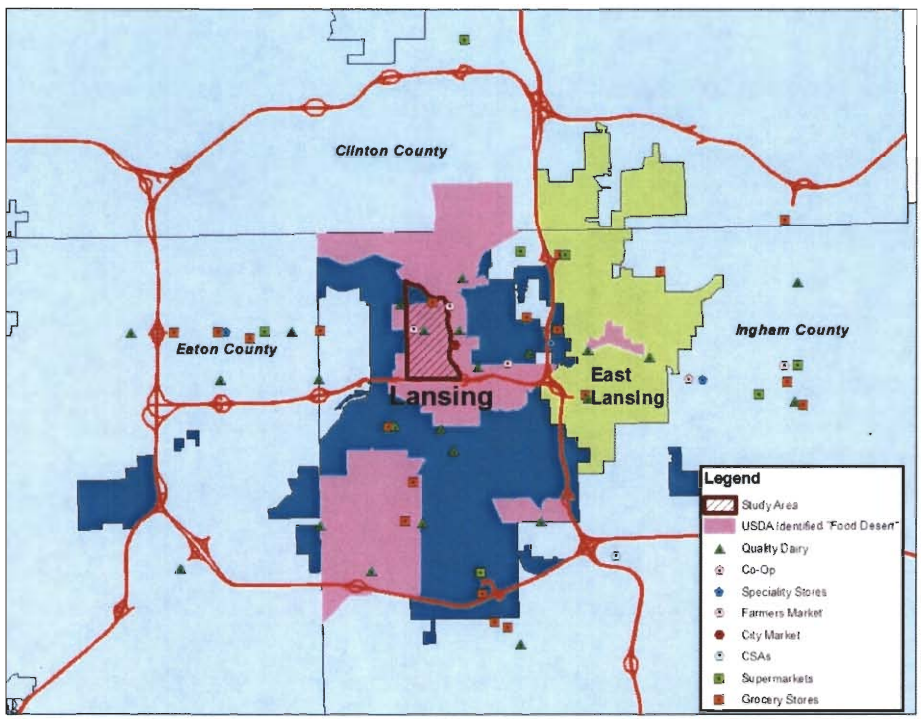
In the next section of the questionnaire, participants ranked their consumption of pre-prepared meals, such as microwave dinners, on a daily basis (1-2 meals a day) by indicating whether they agreed with this statement. Participants then ranked their weekly consumption of fast food and other restaurant food, ranging from 3-7 meals a week. This question was asked to determine what impact "fast-food" and/or other types of restaurants had on the daily and weekly diet of the study participants.

Perception of access and consumption were not the only variables this study was designed to examine. Another set of metrics this study wanted to answer was the level of concern different area residents had related to distances to fresh produce, their own diet, and their ability to secure fresh produce. These questions can provide a more thorough narrative of the experiences of Lansing-area residents in the pursuit of fresh produce, which is sometimes lacking in food-desert research. To accomplish this task, participants were next asked to rank their level of "worry" related to those questions. The final set of Likert-type questions focused on ascertaining the motivating factors the participant had in choosing one particular store over another, asking whether there were certain grocery stores they would never shop at food, whether they mixed in grocery shopping with other errands, whether they shopped at the location closest to home regardless of size or chain, and finally whether they shopped only based on weekly sales or coupons. These questions were asked to help

identify the various types of consumers in the Lansing food-retail environment used in the analysis of the survey results.

## Major Local Food Retailers

**Figure 2.3: Lansing Area Food Retailers**




(Source: USDA, MCGI, Google)

Participants, using Likert-type questions, ranked their general opinion of the major food-retailers in the Lansing area, which are shown in Figure 3. The information from these questions provides an overall narrative of the popularity of the various food-retailers in the Lansing-area. While not critical to the core questions of this study, determining the most popular fresh-food retailers in the Lansing-area demonstrates the type of produce area consumers see when shopping. Participants ranked their overall opinion of each store using a Likert-type with 1 equaling a very

negative opinion, 3 equaling a neutral opinion, and 5 equaling a very positive opinion. Participants also indicated whether they never heard of a store by selecting N/A. The stores included regional, national and even international chain stores such as Kroger, Meijer, Aldi, Wal-Mart, and Save-A-Lot. Locally owned or independently operated stores such as the Lansing City Market, Local Farmers Markets, the Vallarta Market, Apple Market, Goodrich Shop Rite, Quality Dairy and Horrocks were included in this list. While Duvall et al.(2010) demonstrated that fresh produce was sometimes available at liquor and convenience stores in the Lansing-area, the list was limited to stores that carried a more substantial variety of foods. While classified in NAICS (North American Industry Classification System) as a Grocery Store, Quality Dairy, for example, is more like a convenience store in operation than what a person would reasonably associate with a grocery store. Their relatively small size, and limited availability of fresh produce, supports this classification. A Lansing-based store, with over 25 stores in the area, Quality Dairy represents a critical and culturally relevant component to the Lansing-area food retail environment. Lansing-area residents are very familiar with this store, often referring to it simply as "QD." Its inclusion in this discussion is vital to understanding this chain's role in this food environment. While Quality Dairy was included, other convenience stores were not, as the purpose was to rate the major food-retailers in the Lansing-area.

Participants rated their general opinion of each store, using the same list of Lansing-area food retailers. Using a 5-point Likert-type, participants indicated their shopping frequency at these stores with 1 equaling very rarely (Once or twice a year),

2 equaling rarely (Once or twice every 3-4 months), 3 equaling infrequently (Once or twice ever 1-2 months), 4 equaling frequently (Once or twice a month) and 5 equaling very frequently (Three times a month or more). The rationale behind using shopping frequencies is that it was expected that Lansing-area consumers would interact with significantly more than just one or two stores in any given year. Identifying the store that consumers interact with most frequently helps determine whether Lansing-area residents, inside and outside the study area, are being exposed the available fresh produce in the Lansing area. If study-area participants are found to limiting their purchasing to smaller stores, offering smaller quantities of fresh produce, this study can help pinpoint why this interaction is occurring [Larger stores tend to offer a larger variety of fresh produce items when compared to local, smaller stores]. In addition, this information helps track the interaction consumers have with those stores closest to their homes within the downtown study area.

Since it was expected that most Lansing-area consumers would interact with a variety of stores in the Lansing-area, the next set of questions focused on primary sources and secondary sources of fresh and frozen/canned fruits and vegetables. These questions differ significantly from the Likert-type questions in that participants were able to freely identify by street address or name (later converted to a physical address) their primary and secondary fresh and frozen/canned food retailers in the Lansing-area. Participants identified the location based on type, choosing only one, identifying the location based on whether it was a grocery store, convenience store, farmer/city market, community garden, personal garden or other. However, in

practice, this question was found to be confusing for some participants in that they answered one for each category.

With the primary and secondary sources identified, participants then indicated their reasons for shopping at these locations. The reasons included ability to use self-checkout; quality of produce; variety of produce; price; no other options; close to home; close to work/school; close to bus route; store hours; or other. Once consumers identified their reasons for shopping at their primary and secondary food-retailers, they then indicated their travel time to these locations. Travel time, and not distance, to these stores were indicated by participants to control for variations in distance associated with method of transit, and to standardize survey questions. The reason for excluding distance was predicated on the anticipation that most mass-transit users would measure distance irrespective of their method of transit, and would not account for the distance their actually traveled to get there (such as walking to and from the bus stop, or the indirect routes often associated with mass transit). To account for these differences, and to improve accuracy, travel time to the stores was the metric used for measuring access. Larsen and Gilliand (2008) concluded in their research that walking distance from the home to the nearest bus stop, and then from the bus stop to the store, were critical when modeling for mass transit.

**Open-ended Questions**

Participants also freely generated their own views associated with the Lansing food environment, highlighting one of the benefits of using an online survey. Since time was not a constraint, the majority of participants provided more in-depth

responses discussing their views of the local food environment than what could have been anticipated in the design of this survey. These questions will be discussed in the results section of this thesis to provide a qualitative overview of this food environment, but will not be analyzed to detect a trend. These responses will help "paint" a more complete picture of this area, and can provide general insights into the responses participants indicated through the Likert-type scales and other questions in this research.

**Data**

All survey participants provided either their actual or block address and zip code. This data was later imported into ArcGIS 10.0, along with primary and secondary store locations, to geocode their physical location. Shapefiles for ArcGIS came from the Michigan Center for Geographic Information (MCGI)[2] for Ingham, Eaton and Clinton Counties, including all townships, villages, cities, and census designated places (CDP), and their corresponding road networks. Store location addresses identified by survey participants were verified using Google maps. All survey responses collected from Surveymonkey.com were downloaded in an excel spreadsheet format on September 15, 2011. Survey data was imported into SPSS Version 19 for statistical analysis of findings. All baseline demographic information was provided by the 2010 U.S. Census [3] at the MSA-level outside the study area, and at the census-tract level inside the study area.

[2] Michigan Center for Geographic Information (MCGI): http://www.mcgi.state.mi.us/mgdl/
[3] 2010 Census Data: http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

**Testing of Data**

Survey participation was solicited using a convenience sampling method inside the downtown study area, and were solicited via word of mouth for those outside the study area. Since the scope of this thesis is limited to detecting perceptions differences inside and outside of the food desert, future research should attempt to sample a larger portion of the Lansing area with a larger number of participants to resolve any issues associated limitations of this research design. Still, the current research offers significantly more information on perceptions than any previous research.

A variety of statistical tests were used to analyze the quantitative data collected through the survey. Likert-type questions were primarily tested using Chi-square analysis to determine the distribution of responses between gender, education groups, residency inside and outside the study area, and car ownership. ANOVA testing was used to test for differences based on level of income and travel time groups. After running an initial analysis of ordinal survey data collected through Likert-type questions, categories were merged, and negative, neutral and positive groups were created. This method grouped responses based on whether a participant indicated either a negative or disagree answer, a neutral answer, or a positive or agree on a Likert-type question. Any variables that were found to impact consumption of fresh produce were tested using Chi-square analysis comparing one similar group inside the study area, to a similar group outside the study area. Only questions that were critical to answering the research questions of this study were tested in this

method. Since participants were allowed to "skip" questions at their choosing, there were null answers for some of the questions, but these "missing responses" were excluded from all statistical tests in SPSS.

# CHAPTER III
# LITERATURE

## Food Desert Research

This chapter summarizes previous studies concerning the definitions of food deserts, and how the lack of access to fresh produces impacts people's lives. Given the popularity of this topic, it comes as no surprise that the literature on the subject comes from a broad range of disciplines, from geography, public health, and community planning. Whatever the discipline, the majority of food desert research focuses on quantifying and measuring access based on location, irrespective of how people choose to behave in the pursuit of food. Larsen and Gilliand (2008), for example, focused on block-group centroid modeling for determining access, whereas Goldsberry, et al. (2010) focused on visualizing the nutritional terrain through the availability of fresh food items available in a given area. Both created radically different interpretations of what a local food environment might look like in a GIS, but what both studies lacked was the participation of people who actually interact with their food environment. Whatever the intent of the research, very few studies ever attempt to illicit the participation of those residing in food desert areas (Reed 2011).

Reed (2011) had limited success while attempting to extend the research of Goldsberry, et al. (2010) to correlate consumption patterns based on previously calculated access through the sampling of Lansing, MI, area residents. Moore, et al. (2008) examined perceptions of access to fresh produce in the context of number of

available food retailers in a given area of residents residing in NC, NY, and MD. Whereas Reed's (2011) scale was local (Lansing, MI), Moore's, et al. (2008) scale was across several states, and tracked perceptions based on rural, urban and even suburban communities. Not surprising, they found that people living with areas well serviced by food retailers have a more positive perception of access when compared with areas of lower access. In the context of the Lansing area, Reed (2011) discovered people living in Lansing generally view their food purchases as healthy, and access as sufficient.

**Definitions of a Food Desert**

There are mixed definitions of food deserts: some suggest areas lacking supermarkets (Short, et al. 2007), while others define food deserts as areas lacking access to affordable fresh fruits and vegetables (Wrigley et al. 2002). Access in these areas has further been identified by some as an important contributor to a poor diet and obesity (Acheson, 1998). Whatever the definition, research has generally indicated that life in a food desert can be quantified, and that residents should be able to discuss their perceived access to fresh produce based on where they live. This is supported by multiple studies that focus on neighborhood food access as being relevant due to the importance of the local food environment for offering healthy food options for residents (Laurison et al., 2008; Lewis et al., 2005; Moore & Diez Roux, 2006; Zenk et al., 2005).

## USDA Methodology for Identifying Food Deserts

With the increasing popularity into researching this subject, the USDA has developed an online tool[4] to identify food deserts using a simplified spatial methodology. This methodology is based on distance to the nearest supermarket, overlaid with areas with poverty rates of > 20% in a census tract, and a minimum population of 500 people within a census tract. This approach results in several areas in the Lansing-East Lansing MSA as being food deserts, including significant portions of the downtown study area. The USDA, however, does not take into consideration alternative sources of fresh produce (farmer's markets, Co-ops) or smaller grocery stores, which include stores such as the Vallarta market on the border of the study area, and the Lansing City Market, discussed previously. Instead the USDA uses a minimum annual sales figure of $2 million dollars to distinguish large-scale food retailers from smaller ones. Most importantly, this methodology excludes smaller, independent grocery and other food stores that may offer fresh produce in areas classified as food deserts. As such, local studies are critical to identify stores that offer produce in USDA-defined food deserts.

## Effects of Access

Consumption of fresh produce is not necessarily predicated on living close to a supermarket, and it is important to take into account the socioeconomic characteristics of people when researching this phenomenon. Research has shown consumption of fresh produce to be influenced by several factors, including race, and

[4] http://www.ers.usda.gov/Data/FoodDesert/documentation.html

the number of available stores. Morland et al. (2002) found differences in African-American populations residing in census tracts with one or more supermarkets who were more likely to meet the daily fruit and vegetable consumption recommendations when compared to similar residents living in census tracts without one. Additionally, studies have shown that improving access after the construction of a new supermarket in areas previously underserved saw increases in fruit and vegetable consumption of area residents (Wrigley et al., 2002), and also that increased access to a supermarket is associated with lower obesity rates (Morland, et al. 2007). Qualitative research into food deserts support these findings, and finds that life in a food desert is far from a minor inconvenience, as access has a considerable impact on the quality of daily life (Whelan, et al., 2002). This has resulted in the breadth of research on food deserts focused primarily on physical access to healthy and nutritious foods (Rose & Richards, 2004; Whelan, et al. 2002) and the benefits that result from increasing access to supermarkets (Laurison et al., 2008). The rationale behind using supermarkets as the benchmark for measuring access comes from these stores offering both higher quality and healthier foods at more affordable prices compared with smaller stores (Glanz, et al. 2007). However, this approach does not take into account people's actual behavior or opinion on the matter. This study allows for this type of interaction, allowing participants to indicate where they shopped for fresh produce, and did not make assumptions about participants shopping only at the closest fresh food retailer, which is clearly not always the case.

## Supermarkets

Certainly, since supermarkets offer a wider variety of fresh produce than smaller stores, the locations of these stores is critical to research on food deserts. It becomes vital to determine where consumers actually shop when researching consumer behavior. The proliferation of supermarkets outside of urban areas in the United States is attributed to the development of the suburbs (Pothchucki, 2005), as larger food retailers have fled urban areas in search of available lower-cost land and the freeway or major arterial road access available in exurban and suburban areas. These new locations outside urban areas represent a direct threat to smaller urban markets due to economies of scale offered by supermarkets providing lower costs for consumers when compared to smaller stores in many urban areas (Alwitt and Donley 1997). This has resulted in a disparity of supermarket access in the United States for many urban areas (Laurison et al., 2008). This lack of access comes at a cost for many low-income urban residents, as low-income residents in these areas typically pay more for groceries at nearby convenience stores, often spend more time traveling to distant supermarkets, as well as possibly incurring other costs related to forgone consumption or poor food habits (Cotterill, 1992; Kane, 1990; MacDonald & Nelson 1991; Morland, Wing & Roux, 2002; Pothukuchi, 2005; Whelan, et al. 2002).

## Mobility

The trend of supermarket development in low-density areas has resulted in most Americans shopping for food using an automobile (Handy 1996). However, even if access were to improve for people in an area with poor access, few people

would substitute driving for walking to the grocery store (Dunkley, et al.2004; Hand and Clifton, 2001; Hallet and McDermott, 2010). Even people without access to cars would rather borrow a car, share a ride, or take a taxi to purchase groceries (Clifton, 2000) over the other options available to them. However, the effects of life in a food desert will vary greatly for people facing different transportation methods, as travel time is an additional cost, as is the opportunity cost of time spent travelling greater distances to stores (Hallett and McDermott, 2010). This level of mobility for an individual is an important factor when attempting to assess healthy food access (Reed 2011), and is a critical component in understanding how people are required to interact with their local food environment. Even though people in the Lansing area rely primarily on the automobile for daily tasks, there is a viable bus-based mass-transit system with the Capital Area Transit Authority (CATA), which operates on 7-day a week, with reliable service to locations throughout the Lansing-area. However, Giuliano (2005) finds that while the poor use mass transit more, they like it less, and that owning a car is the only reasonable option for basic household maintenance and income generation. Even though mass transit is available in the Lansing area, walking is still a critical component in this method of transit. Larsen and Gilliand (2008) concede that modeling for mass transit requires including walking into these calculations, as people are required to walk to and from a bus stop close to home, and close to their destination.

**Dietary Influences**

The basis of this research is predicated on exploring the conflicting views of the effects of living in food desert as it relates to the consumption of fresh produce. While some studies on food deserts have shown this phenomenon as important contributors to poor diet (Acheson, 1998), Cummings and Macintyre (2002) discussed the lack of empirical evidence for this hypothesis. Pearson et al. (2005) suggested that the lack of a locally available supermarket is not a factor that influences fruit and vegetable intake. Pearson found that the predominant factors influencing fruit and vegetable consumption are cultural differences, including gender and age, and not poverty or distance. These findings were confirmed by Dubowitz et al.(2008) that state the socioeconomic status of a neighborhood influences fruit and vegetable intake, and that individual characteristics including sex, ethnicity, education and income are related to fruit and vegetable intake. This provides a rationale for analyzing perceptions of access in this research in the context of both living in the food desert, but also the socioeconomic characteristics of study participants, primarily gender, age, income, level of education and even race.

Dehghan (2011) shows a distinct relationship between income and gender and the increased consumption of fresh produce in a survey-based study of Canadian adults. Of those participating, 15.6% of men self-reported, using a 24-hr intake recall survey, five or more servings of fresh fruit and vegetables in a day. This is contrasted with 31.4% of women reporting daily consumption of five or more servings of fresh fruit and vegetables in a day. Income level in this study also showed increases in the

frequency a person would consume greater than or equal to 5 servings of fresh fruit and vegetables. The lowest reported income earners reported 21.8% of participants indicating 5 or more, with the second lowest income earners reporting 18.9% of participants eating the same amount. However, the trend increased up to 25.3% of participants of the highest income bracket in the survey consuming 5 or more servings of fresh fruit and vegetables. Interestingly, those with a post secondary degree (86.7%) dominated participation in this survey, and despite 39.9% of participants self reporting a BMI index suggesting overweight or obese, only 4.7% reported being in poor health.

Supermarket access, according to Moore et al. (2007), influences dietary intake. They found that individuals without access to a supermarket near their home are 25-46% less likely to have a healthy diet compared to participants in areas with access near their home. After the opening of a large food superstore closer to their home, thus increasing access for residents, Wrigley et al. (2002) found that people who consumed fewer than two servings of fruits and vegetables per day increased consumption of these items by 34% after the store's opening. Moore et al. (2007) confirmed previous work showing a relationship between supermarket availability and dietary patterns. However, a strong model to define these influences on dietary behavior does not currently exist (Reed, 2011; Laraia,, et al. 2004; Ball, et al, 2006). Studies that focus on only one source for food, specifically grocery stores and supermarkets provide a misleading view of food deserts (Bitler and Haider, 2010).

Lack of access in an area does not mean an individual is limited to shopping there (Morland, et al.2002).

Overall, the literature provides often conflicting information concerning the role of access, whether distance or travel time, and the socioeconomic characteristics of an individual, when analyzing differences in the consumption of fresh produce. This reflects a lack of a consensus on what actually happens in a food desert when resident participation is not included, which can be compounded by using GIS to visualize access in a local food environment. My thesis contributes to the literature by confronting this lack of consensus directly and focusing on the perceptions as well as the actions of the consumers living in a food desert. This analysis of Lansing-area residents, inside and outside the study area while accounting for differences in gender, age, level of income, level of education, of participants, provides a more in-depth look at life in a food desert. By including analysis of these factors based on travel time and car ownership, this study aims to provide a more complete picture of what affect living in downtown Lansing has on consumers there with respect to the perceptions as well as the actions this has on consumption of fresh produce.

**Lansing Food Environment Studies**

This study is not the first to examine the Lansing, MI food environment, but it does attempt to refine some of the methods previously employed. Duvall, et al. (2010) conducted an analysis of the availability of the different fresh food options for Lansing-area residents in all stores, regardless of size or type, with inventory of available fresh food assembled from store visits between February and April 2008.

This enabled Goldsberry (2010) and others to discover through various methods of analysis several neighborhoods within Lansing with reduced access to fresh produce compared to other neighborhoods. This census paints a more complete picture of the Lansing fresh food environment, as few research studies verified lists of food in stores when analyzing access (Reed 2011).

Goldsberry, et al. (2010) also contributed significantly to the methodology of food desert studies when they established three different models of access to fresh produce in Lansing: a container method, a weighted method, and a cumulative distance method, each model portraying different visualizations of the Lansing food environment. The container method measured the opportunity to purchase fresh food in a 10 minute travel time zone for both pedestrians and commuters, and gave equal weights to items "next door" to an individual and one 10 minutes away (Reed 2011). The weighted method gives higher accessibility scores to fresh produce items that are located closer to an individual location than similar fresh produce items that are located farther away. The third model was the cumulative distance method establishing an access score based on the overall distance that a consumer would need to travel to obtain every produce item that was available in Lansing. Reed (2011) attempted to correlate access to the various methods outlined by Goldsberry et al. (2010). However, even with access and available produce items well defined, Reed (2011) indicates there is no relationship between calculated access in the Lansing area and the consumption of fresh fruits and vegetables.

Reed (2011) extended the Goldsberry, et al. (2010) research with the input of consumers when analyzing the Lansing food-retail environment. This was conducted at participating food retailers using an intercept methodology to solicit consumer opinion on access. Overall, Reed found that consumers in the Lansing area generally have a positive view of their local food environment, generally view their purchases as being healthy, and were not limited to shopping only at stores closest to home. Reed's methodology, however, relied upon the participation of a food retailer prior to interacting with consumers, direct interaction with participants, and limited time in which to collect survey data. Reed acknowledges that direct interaction with the researcher could influence participants to provide more socially acceptable answers, pursuant to findings of Tyebjee (1979). However, Reed did not attempt to ascertain whether people living inside or outside of a food desert would self-report different views of their local food environment when compared to a similar resident outside one.

**Previous Participant-based Studies on Food Environments**

Even within the general definitions of food deserts, it is accepted that access to fresh produce is limited in areas designated as food deserts, despite the varying definitions and criteria, discussed earlier. While some argue that physical access to a store plays a role in influencing what a person eats (Acheson, 1998), the predominant factor appears to be unique to the individual. This could be income, culture, or other factors causing a consumer to prefer fresh fruit and vegetables over other food options (Pearson et al. 2005). If the above statements are true, it can be assumed that

a person living in a food desert may be unhealthier compared to a similar person living in an area with more fresh food options. If a person lives in an area with better access, that person could potentially consume healthier food options. It is therefore reasonable to assume that this person will view themselves as healthier when compared to a similar person living inside a food desert. A logical conclusion of life in a food desert, assuming that each individual is a rational actor, is that a person in a food desert will view themselves, and their choices, as being unhealthier when compared with a similar person in an area of improved access. However, is this assumption reasonable?

Recent research about the available fresh food in the Lansing looking to establish a relationship between consumption and access proved mostly illusive. This is highlighted by Reed's (2011) findings that were unable to correlate access and consumption. Given the multitude of factors identified previously in the literature concerning fresh food consumption to race, income, method of transit and even proximity to a supermarket, how do the people that live in a food desert perceive their access? Do their perceptions ultimately uphold or dismiss the very notion of the food desert debate when compared to other residents in a local geographic area?

Moore, et al.(2008) conducted a random telephone digit survey of over 5,700 residents in Maryland, North Carolina, and New York and found a strong relationship between perceived availability of healthy foods and the overall density of available food stores in a geographic area. Unlike many previous studies cited in this review, this study was not limited to simply mapping supermarkets and grocery stores, but

also measured accessibility to smaller chain stores. Results indicated that minority participants had, in general, a lower perceived availability of healthy food options when compared with white participants. Understandably, they also found that study participants living in areas with the lowest supermarket densities had a lower perceived accessibility score when compared with those living in areas of higher supermarket density.

Walker, et al. (2011) found that previous food desert studies offer little insight into the additional factors that are involved in food purchasing and consumption patterns of food desert residents. They assert that previous studies tend to focus on measures that have been studied extensively in food desert research, including cost, availability, and access, and fail to allow participants to freely generate, from their perspectives, ideas that are important to them because of living in a food desert. According to them, a mixed methods approach is appropriate in food desert studies because it involves participation of the stakeholders. Stakeholders are able to identify, list, and organize barriers according to their perception and integrates the results in such a way that multivariate analyses can be used to make comparisons between groups (Walker, et al, 2011; Trochim, 1989; Trochim & Kane, 2005). Walker, et al. (2011) conducted research that identified perceptions of the various factors that influence food-buying practices of residents inside and outside of a food desert. Food prices, income, and budgeting were found to be the most important factors influencing food buying practices according to Walker and others.

Capps and Nayga (1999), using correlation analysis, found that income was positively related to the likelihood that an individual would perceive maintaining a healthy weight as important. This study also found that African American respondents assigned less importance than whites to use of sugar in moderation, eat a variety of foods, and choose a diet with plenty of breads, cereals, rice and pasta. However, African Americans are more likely to perceive maintaining a healthy weight as important when compared to whites. Age increases the likelihood that an individual would use salt and sugar in moderation, consume more fruits and vegetables, and consume adequate fiber in their diet. This was consistent with previous studies that found that older consumers appear to care more about their diet than younger consumers (Dolby, 1996; Patterson et al., 1996). In terms of geographic location, Midwesterners prefer a diet with plenty of breads, cereals, rice and pasta when compared to low fat diets. Previous studies imply that men are typically less interested in diet and health issues than are women (Dolby, 1996; Food Marketing Institute, 1990; Nayga, 1997).

**Literature on Methods**

As indicated in the previous sections of this chapter, most research of food environments has relied on assumptions, and not on information from people as they interact with their food environment (Reed 2011). Survey research has been an important tool in geographic research for decades and is designed to acquire information about the characteristics and behaviors of a population through standardized questionnaires (McLafferty, 2010). Reed (2011) successfully employed

survey research in the study of the Lansing Food Environment, as did Simms (2011) when investigating attitudes of consumers toward Farmers Markets in Southwest Michigan. In geographic research, questionnaire surveys are used to examine environmental perceptions and consumer choices (Rushton, 1969; Gould and White, 1974). This is a useful tool for gathering information about individuals' lives not available from secondary sources (McLafferty, 2010). Online surveys, particularly those through SurveyMonkey.com, are effective at gathering data from a geographic area in studies on food and perception, notably with Simms' (2011) recent examination of consumers in Southwest Michigan. The proliferation of the internet over the past decade into most homes makes it an effective medium in which to conduct this research.

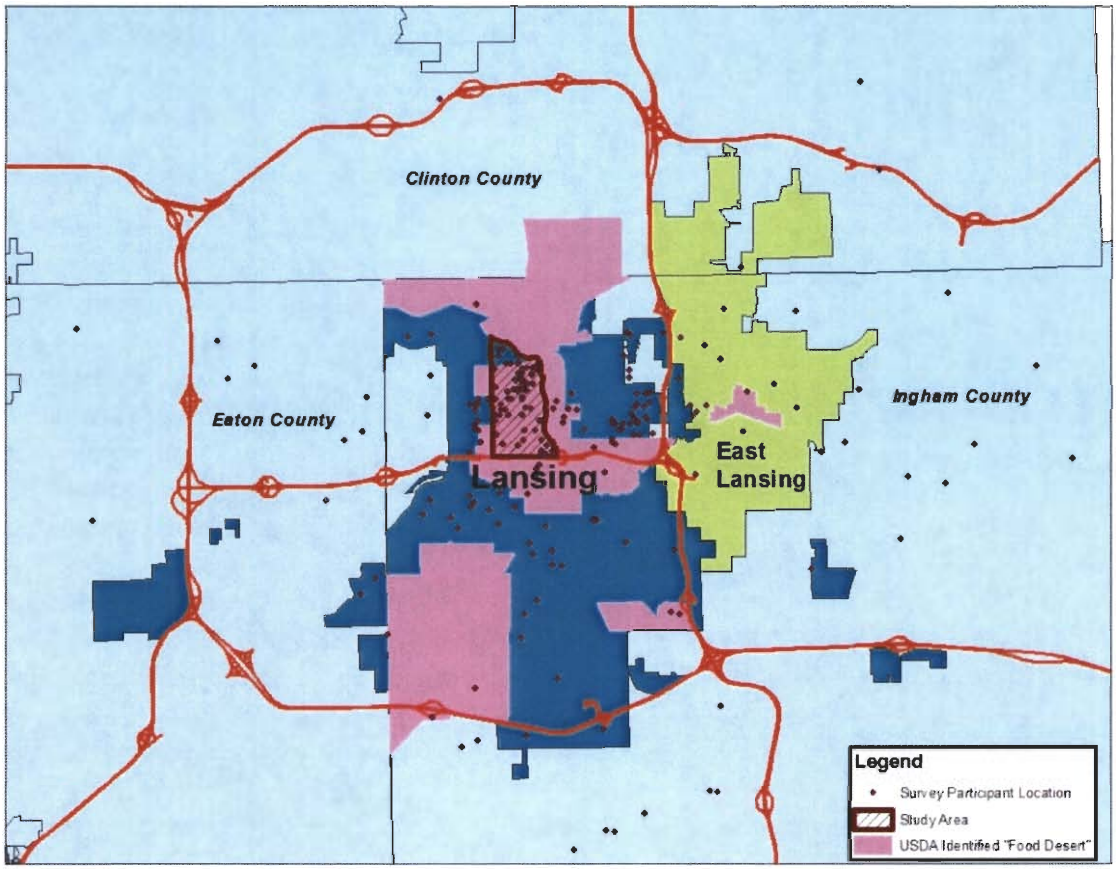
# CHAPTER IV
# RESULTS AND DISCUSSION

## Results Overview

This section will cover the results and discussion associated with the various statistical analyses performed using the responses from the survey. Baseline demographic information and their distributions between participants inside and outside the study area will be addressed first. This will then be followed by an analysis of the Likert-type ordinal variables using Chi-square analysis for participants inside and outside the study area, with raw-mean scores providing a narrative and interpretation as to whether the response to a particular question was positive/agree, neutral or negative/disagree. To account for any explanatory effects associated with participants demographic information, the same ordinal Likert-type questions were analyzed across categories of income, age, race, gender, travel time, level of education, and car-ownership to determine what affect these had on the survey responses.

Survey responses were relatively well distributed across the Lansing area (Figure 4.4), and showed higher concentration of responses, outside of the study area, in areas east, west and south of the study areas. Participation rates for people outside of Lansing were more unevenly distributed, and as distance from the study area increased, the rate of participation among area residents decreased.

**Figure 4.4: Survey Participant Location**




(Source: USDA, MCGI)

## Summary Results of Participant Demographics

This section will cover the demographic information provided by survey participants both inside and outside the study area. It will show that outside the study area, participation rates among the major ethnic groups was largely representative, while inside the study area, participation was skewed toward whites, with lower participation rates among various minority groups. It will also show an over representation of participants, both inside and outside the study area, with a 4-year college degree or higher.

Survey participation among the various ethnic groups in the Lansing-area and within the study area was varied. Participation rates for people outside the study area were mostly representative of the general racial makeup according to a comparison with the 2010 Census. When this is compared to participation among study area residents, whites participated more than all other racial groups, and accounted for over 70% of total survey participants, even though they made up only 56.8% of the population of the study area according to the 2010 Census.

**Table 4.1: Participant Race Percentages**

| Ethnicity | **Study Area** | ***2010 Census: Study Area*** | **Outside Study Area** | ***2010 Census: Lansing-East Lansing MSA*** |
|---|---|---|---|---|
| White non-Hispanic | 70.93% | 56.80% | 78.79% | 78.30% |
| Black/African American | 12.79% | 23.10% | 6.06% | 8.60% |
| Hispanic | 6.98% | 11.14% | 2.42% | 6.20% |
| Asian | 1.16% | 4.29% | 0.61% | 3.80% |
| Other | 1.16% | 4.67% | 1.82% | 3.10% |
| No Answer/Refused | 6.98% | | 10.30% | |

## Income

Survey participants inside the study area reported distinct differences in their annual income when compared to participants outside the study area. Of those that reported their income, 62.9% of participants outside the study area reported an annual household income of $50,000 a year or higher. When this is compared to study area residents, 71% reported earning less than $50,000 a year, and with 39.6% reporting an annual income less than $25,000 a year. Those making under $15,000 a year were 16.3% inside the study area, compared with 7.5% outside the study area.

**Table 4.2: Self-Reported Income Ranges**

| Annual Income Range | Within Study Area | |
|---|---|---|
| | No | Yes |
| Under $15,000 a year | 7.5% | 16.3% |
| $15,001 to $25,000 | 6.9% | 23.3% |
| $25,001 to $50,000 | 22.6% | 31.4% |
| $50,001 to $75,000 | 27.0% | 19.8% |
| $75,001 to $100,000 | 18.9% | 9.3% |
| $100,001 to $150,000 | 15.1% | 0.0% |
| More than $150,001 | 1.9% | 0.0% |

## Age

**Table 4.3: Self-Reported Age Groups**

| What is your approximate age? | | Within Study Area | | Total |
|---|---|---|---|---|
| | | Out | In | |
| 18-24 | Count | 12 | 4 | 16 |
| | % | 8.3% | 5.0% | 7.1% |
| 25-35 | Count | 77 | 28 | 105 |
| | % | **53.5%** | **35.0%** | 46.9% |
| 36-45 | Count | 31 | 16 | 47 |
| | % | 21.5% | 20.0% | 21.0% |
| 46-55 | Count | 18 | 14 | 32 |
| | % | 12.5% | 17.5% | 14.3% |
| 56-65 | Count | 5 | 15 | 20 |
| | % | 3.5% | 18.8% | 8.9% |
| 66+ | Count | 1 | 3 | 4 |
| | % | .7% | 3.8% | 1.8% |
| Total | Count | 144 | 80 | 224 |
| | % | 100.0% | 100.0% | 100.0% |

Inside the study area, 55% of participants reported being between the ages of 25 and 45 (Table 3), compared to 53.5% of participants outside the study area reporting an age their ages between 25-35. Participants were not asked to provide their actual age, but were allowed to report it, if they chose to, in 10-year increments, save the 18-24 range. Age groups for above the age of 76 were grouped into a 66+

age bracket during the analysis due to low participation rates of people over the age of 66.

### Educational Achievement

Overall, the educational achievement levels of study participants varied only slightly inside and outside of the study area. With 138 participants reporting their educational achievement outside the study area, with 27 non-responses, 68.1% had a 4-year degree or higher, compared to 59.2% inside the study area. All told, 38.4% outside the study area had a bachelor's degree compared to 34.2% inside the study area. Post-secondary educational achievement was 29.7% outside the study area, compared to 25% inside the study area. No one outside the study area reported having less than a 9$^{th}$ grade level of education, and this was at 1.3% inside the study area. The percentage of participants with an associate's degree outside the study area was around 8.7%, and 1.3% inside.

**Table 4.4: Self-Reported Level of Education**

| Level of Education | Within Study Area | |
|---|---|---|
| | No | Yes |
| Less than 9th grade | 0.0% | 1.3% |
| Some High School | 2.9% | 6.6% |
| High School/GED | 14.5% | 22.4% |
| Some College | 5.8% | 9.2% |
| Associates | 8.7% | 1.3% |
| **Bachelor's Degree** | **38.4%** | **34.2%** |
| Masters/JD | 27.5% | 22.4% |
| PhD/MD | 2.2% | 2.6% |

## Consumer Behavior and Travel Times

This section will provide a general overview of how participants inside and outside the study area interact with the Lansing food environment. It will analyze the results of survey responses in which participants identified their primary and secondary sources of fresh produce, their mode of transportation to and from the store, travel time, opinion of local food retailers, and frequency shopping at the major food retailers. It will show that the residents inside and outside the study area general travel using similar methods, to similar stores. However, while all survey respondents report shopping at similar stores and use roughly similar means, it will also show that study area residents take longer to arrive at their preferred destination.

### Primary Method of Shopping and Car Ownership

The vast majority of respondents inside and outside the study area rely on cars when purchasing food, with usage rates of 91.6% outside the study area, and 79.7% inside the study area. The use of a bus was not widely reported for people outside the study area, with only one respondent, or .7%, indicating they used a bus to purchase food. This contrasts with a nearly 11.4% of study area participants relying on the bus when purchasing food. Rates of shopping by foot and bike were reported at 2.8% each outside the study area, and 2.5% each inside the study area. People that share a ride with a friend, neighbor or relative accounted for 2.1% of respondents outside the study area, and 3.8% inside the study area. These findings support previous research that few people are willing to substitute driving for walking, or biking (Dunkley, et al.2004; Hand and Clifton, 2001; Hallet and McDermott, 2010).

### Summary Results of Travel Time to Primary and Secondary Food-Retailers

The only major difference between participants inside and outside the study area as it relates to shopping is the time spent travelling to their preferred primary and secondary food retailers. Table 4.6 shows that mean travel times for study area residents is around 5 minutes greater, irrespective of method, for both primary and secondary stores. This suggests that the critical factor that could influence perception of access is time.

**Table 4.5: Self-Reported Travel Times**

| | Within Study Area Mean: | | Std. Deviation | |
|---|---|---|---|---|
| | Out | In | Out | In |
| How long does it typically take you to reach your **primary** food retailer? In minutes: | **10.51** | **15.74** | **6.538** | **8.936** |
| | *N = 138* | *N = 78* | | |
| How long does it typically take you to reach your **secondary** food retailer? In minutes: | **11.02** | **16.74** | **7.783** | **12.703** |
| | *N = 136* | *N = 74* | | |

Overall, study-area residents indicate an average travel time of around 16 minutes to their primary food retailer, and around 17 minutes to their secondary food retailers, irrespective of method of transit. When we compare these to participants outside the study area, their indicated average travel time was around 11 minutes for both primary and secondary food retailers. Study-area participants had a greater range in values, with a standard deviation of around 9 minutes for their primary food retailer, and 13 minutes for their secondary food retailer. The standard deviation for

travel times to primary and secondary food retailers for participants outside the study area were around 6.5 and 8 minutes, respectively.

**Table 4.6: Self-Reported Travel Time t-test Results**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | |
|---|---|---|---|---|---|---|
| | | F | Sig. | df | Sig. (2-tailed) | Mean Difference |
| How long does it typically take you to reach your primary food retailer? In minutes: | ***Equal variances assumed*** | ***2.143*** | ***.145*** | ***214*** | ***0.000002*** | ***-5.236*** |
| How long does it typically take you to reach your secondary food retailer? In minutes: | ***Equal variances not assumed*** | 9.630 | .002 | ***103.528*** | ***.001*** | ***-5.721*** |

### Primary and Secondary Sources of Fresh Produce

This section will summarize the results of the open-ended questions that allowed survey participants to freely indicate their primary and secondary sources of fresh produce in the Lansing area. While there is perhaps little distinction in the mind of the public as to the difference between a supermarket and grocery store, for the purposes of this research, grocery stores were identified as those stores who provided food stuffs only, and that offered a significant variety of fresh produce, and other edible items. Examples of grocery stores in the Lansing area include Kroger, Good Rich's, Vallarta Market, Adam's Market, and Horrocks. Even though Horrocks describes itself as a "farmer's market", their year-round operation, and imported

produce from outside the region, suggest otherwise. Supermarkets included stores like Meijer and Wal-Mart, which also offered consumer items in addition to selling groceries.

**Table 4.7: Self-Reported Primary Type of Fresh Food Provider**

| Primary Food Retailers | Within Study Area | |
|---|---|---|
| | **No** | **Yes** |
| **Supermarket** | **45.8%** | **50.6%** |
| **Grocery Store** | **40.3%** | **45.5%** |
| Farmer/City Market | 5.6% | 2.6% |
| Community Garden | 0.7% | 0.0% |
| Personal Garden | 2.1% | 0.0% |
| Co-Op | 2.8% | 1.3% |
| CSA Farms | 2.8% | 0.0% |

Results clearly show the dominance of supermarkets and grocery stores as sources of fresh produce for Lansing area residents. Both study area and non-study area participants rely primarily on supermarkets or grocery stores as their source for fresh produce, accounting for 86.1% for participants outside the study area, and 96.1% inside the study area. Participants outside the study area indicated greater variability in alternative sources of fresh produce, with approximately 14% indicating either relying a farmers markets/city market, community garden, food co-ops, or a CSA farm as their primary source of fresh produce. No study-area participants indicated using personal gardens, community gardens, or a CSA Farm as their primary source of fresh produce. However, 2.6% indicated that they shopped at a

farmer's market or city market, and 1.3% indicated they shopped at a food co-op during the study period.

When examining secondary sources of fresh produce, a plurality exists in the sources of fresh produce for Lansing area residents, both inside and outside the study area. While approximately 65.3% of residents outside the study area indicate shopping at either a grocery store or supermarket as their secondary source of fresh produce, 22.9% indicate shopping at a Farmer's Market or the City Market. These rates were similar for study area participants as well, with approximately 74.7% relying on grocery stores or supermarkets, and 16% for Farmer's or the City Market, as their secondary source of fresh produce. Approximately 1.3% of study area participants indicated using their personal garden to provide fresh produce, and 5.3% indicated shopping at a Health Food Store. No study area participants indicated using either a community garden or Co-op as their secondary source of fresh produce.

Interestingly, and contrary to suggestions in the literature, study area participants reported shopping at convenience stores almost equally as participants outside the study area, at 2.7% and 2.1%, respectively. As previously indicated, all responses identifying primary and secondary sources were open-ended. While no one indicated shopping at a 7-11, or other smaller convenience store, each participant was given equal opportunity to accurately account for their shopping behavior by identifying these sources of food. This suggests, but is not entirely verifiable due to the skewed demographic data, that study area participants are not constrained in their access.

**Table 4.8: Self-Reported Secondary Type of Fresh Food Provider**

| Secondary Food Retailers | Within Study Area | |
|---|---|---|
| | No | Yes |
| **Supermarket** | **28.5%** | **32.0%** |
| **Grocery Store** | **36.8%** | **42.7%** |
| Convenience Store | 2.1% | 2.7% |
| **Farmer/City Market** | **22.9%** | **16.0%** |
| Community Garden | 1.4% | 0.0% |
| Personal Garden | 4.2% | 1.3% |
| Co-Op | 1.4% | 0.0% |
| Health Food Store | 2.8% | 5.3% |

Results indicate that Lansing-area residents have generally good exposure to the various fresh produce available in the Lansing area. These results do not indicate that study area residents are at a disadvantage to being exposed to fresh produce, and that store type does not appear to play a role in limiting the diet of participants.

### Opinions of Major Local Food Retailers

This section will summarize how the participants inside and outside the study area view the major food retailers in the Lansing area. While not central to the analysis, these results show near uniformity in the opinions of the major food retailers in the Lansing area. The mean scores for each store are displayed as Table 4.9. It shows that inside and outside the study area, participants rated Horrocks the highest in terms of overall opinion, followed by Local Farmer's Markets (not individualized), Meijer, and the City Market. The general positive image of Meijer can be attributed to a number of factors, including dominance of the local market, being a Michigan based company, and being a union-friendly store in a town with strong union ties.

Stores that were mostly poorly viewed by both groups were Wal-Mart Quality Dairy, Aldi, Save-A-Lot, and Vallarta Market.

**Table 4.9: Mean Opinion of Local Major Food Retailers**

| Food Retailer | Within Study Area | |
|---|---|---|
| | In | Out |
| Kroger | 3.58 | 3.42 |
| Meijer | 3.98 | 3.84 |
| Wal-Mart | 2.33 | 2.28 |
| Aldi | 2.95 | 2.70 |
| Save-A-Lot | 2.60 | 2.37 |
| Lansing City Market | 3.72 | 3.88 |
| Local Farmers Markets | 3.93 | 4.28 |
| *Vallarta* | 2.58 | 2.83 |
| Quality Dairy | 2.75 | 2.67 |
| Apple Market | 3.19 | 3.18 |
| Goodrich Shop-Rite | 3.64 | 3.84 |
| L&L | 3.04 | 3.11 |
| Horrocks | 4.30 | 4.28 |

### Shopping Frequencies at Major Local Food Retailers

Overall, participants inside and outside the study area indicated similar shopping frequencies at the major food retailers in the area. Meijer was indicated as the most frequently visited store, with most residents shopping there on a monthly basis. This test did not account for primary or secondary sources of fresh produce, but rather provided mean frequencies area residents would visit these stores. These ranges varied from never, once or twice a year, all the way up to several times a month. A score of 4 indicates monthly visits, whereas a score less than 1 indicates at most once a year.

Residents inside the study area generally avoid shopping for fresh produce at the Vallarta market, and indicate similar shopping frequencies at the Lansing City Market, as shown in Table 4.10. Open-ended responses from consumers inside and outside the study area offer some insight into these decisions, highlighting quality of produce and price of produce at these locations. The Lansing City market, while viewed favorably, was cited as having higher-priced produce compared to other Lansing food-retailers, whereas the Vallarta market was cited as having lower quality produce. Residents inside the study area indicate they would use the Lansing City Market more if prices were more competitive, and offered more convenient hours to fit their schedule. Respondents have clearly indicated frustration at the Vallarta market, repeatedly stating they sell "out-dated produce and can-goods" due to the impression that the market knows many local residents have no other options.

Respondents inside the study area also indicated a lot of frustration about the closing of L&L, and it has been shown to impact the purchasing patterns of residents in the Lansing area. Those in the downtown study area saw two of these stores close near the study area, but even residents in other areas of Lansing have indicated that they, too, have been affected by these closings.

Negative responses, however, were also mixed in with several respondents stating that they had "no problem" securing the fresh produce they wanted. Several indicated using multiple stores for their sources of food, indicating an interaction with multiple stores in the local food environment.

**Table 4.10: Mean Shopping Frequency of Local Major Food Retailers**

| Food Retailer | Within Study Area | |
|---|---|---|
| | Yes | No |
| Kroger | 2.92 | 2.87 |
| Meijer | 4.00 | 3.90 |
| Wal-Mart/Sam's | 1.05 | 1.15 |
| Aldi | .96 | .61 |
| Save-A-Lot | .52 | .37 |
| **Lansing City Market** | **2.21** | **2.19** |
| Farmers Markets | 2.29 | 2.88 |
| **Vallarta** | **1.01** | **.25** |
| **QD** | **1.32** | **.89** |
| Apple Market | .96 | .84 |
| Goodrich | 1.39 | 1.65 |
| L&L | .80 | .93 |
| Horrocks | 2.87 | 2.49 |

### Reasons for Choosing Food Retailers

Participants indicated a multitude of reasons when choosing food retailers in the Lansing-area, including proximity to home/work/school, price, quality and variety of produce, and even convenience. These questions address why they chose one store over another, but did not attempt to ascertain the decisions participants made once they entered the store. Chi-square analysis of the various reasons for choosing their primary retailer was conducted controlling for residency inside and outside of the study area. The analysis revealed that residency in the study area did not influence whether a person would behave differently than residents outside the study area simply based on living there ($x^2$=1.452, df = 3, p = .693). Further analysis, accounting for income, gender, level of education, car ownership and travel time, did reveal some differences among the participants across the Lansing food environment. This section will provide a brief discussion of these results in an attempt to better

describe how these variables appear to impact a person's interactions with the local food environment. Choice based on convenience and hours of operation for a food retailer were rated consistently low for all factors, with only 8 of the total respondents indicating this as the defining reason for choosing their primary food retailer, and will not be addressed when discussing these socio-economic variables.

Gender had some low-level explanatory power, but was not found to be statistically significant ($x^2 = 7.363$, df =3, p = .061). Proximity was the most often indicated reason for men, accounting for 49.3% of the responses, compared with 29.5% of women indicating the same reason. Quality and variety was the most indicated reason for women, accounting for 50% of responses, compared to 37.3% of men indicating the same reason. Generally speaking women in the Lansing area are driven primarily by the quality and variety of the produce at a food retailer, whereas men are driven primarily by the distance to these locations.

Income by group, on the other hand, did not reveal anything extraordinary, nor were the differences statistically significant ($x^2 = 10.933$, df = 9, p = .28). The lowest income group bracket, 0-25 K a year, had a plurality of choices indicating quality/variety at 39.5%, followed by proximity (30.2%) and price (27.9%). The 25-50k group also indicated a plurality, with proximity the most indicated choice (43.1%), followed by quality/variety (39.2%), then price (11.85%). The 50-100k group had a slight majority of responses indicating quality/variety as their primary reason for selecting their primary food retailer (50.6%), followed by proximity (36.7%), and price (8.9%). The 100k+ group was similar to the 50-100k group, with

a plurality indicating quality/variety (45%), followed by proximity (40%) and price (10%).

Car ownership, on the other hand, was found to be statistically significant ($x^2$ = 9.217, df = 3, p = .027). Of those owning cars, 48.3% indicated that quality/variety, compared with non-car owners at 17.6%, as the primary reason for choosing their primary retailer. Proximity and price were the primary reasons for non-car owners, understandably, with proximity accounting for 41.2% of respondents, and price accounting for 35.3% of responses. Given that only 21 total responses in this survey came from non-car owners, future analysis should include more non-car owners when analyzing reasons consumers choose one store over another.

Similarly to car ownership rates, travel time groups also indicated different reasons for choosing stores, which were statistically significant variations ($x^2$ = 16.861, df = 6, p = .01). Those traveling longer than 20 minutes to their primary retailer were primarily motivated by price and proximity, accounting 38.5% and 30.8% of responses, respectively. Quality/variety of produce was the primary motivating factor for 10-20 minute group, at 57.8% of responses, indicating that this group was a highly selective group of consumers that were willing, and able, to travel these distances to get the produce they wanted. Price and proximity, understandably, accounted for 15.6% and 23.4% of responses, respectively, of this group. Those traveling 0-10 minutes were primarily motivated by proximity when choosing their store, accounting for 45.5% of responses. This was followed by quality/variety at 39.1%, and price at 10.9 %.

Level of education was also significant ($x^2 = 7.879$, df =3, p = .049) when accounting for reasons for choosing one store over another. Those with a 4-year degree or more had a majority of responses indicating that quality/variety was the primary reason for choosing their store, at 51.3%. This was followed by proximity at 34.5%, and price at 10.1%. Those with less than a 4-year degree were more likely to indicate proximity as their primary reason, accounting for 41.5% of responses. This was followed by quality/variety at 32.3%, and price at 21.5%.

**Chi-square Analysis of Ordinal Survey Data: Residents Inside and Outside the Study Area**

This section will provide an analysis and discussion of ordinal Likert-type questions rated by participants inside and outside the study area. It will cover questions related to perception of access, consumption of fresh and frozen/canned produce, perceptions of health, and other questions asked in a Likert-type format in the survey. Pearson's chi-square analysis will be used with an alpha of .05 used for determining significance. The raw mean score is the score given based on the numerical value assigned to Likert-type questions, with a 1 being either a very negative/strongly disagree, 3 being neutral, and 5 being either a very positive/strongly agree. In order to not violate the rules associated with Chi-square analysis that requires a minimum of 5 responses, negative/disagree comments were similarly grouped, neutral responses grouped and positive/agree comments being grouped. The raw mean score discovered through t-tests will serve as a narrative and interpretation

of the scores, whereas the test of significant differences will be through chi-square analysis.

**Question: How would you rate your ability to purchase fresh produce in the Lansing area given your current mode of transportation?**

The results of the Chi-square analysis show in Table 4.11, that there was significant variation in their perception of access between participants inside and outside the study area as it related to perception of access for fresh produce ($x^2$= 10.081, df= 2, p = .006). Participants ranked their responses using a 5-point Likert-type, with 1 = very poorly, 3= neutral, and 5 = very good before they were grouped into poor, neutral or positive view of access groups. The overall mean score for residents inside the study area was 3.59 out of 5, or about part way between Average and Good, compared with 4.17 out of 5 for residents outside the study area. This shows that residents inside the study area view their access differently, while not negative, more negatively when compared with residents outside the study area.

**Table 4.11: Chi-square Analysis of Perception of Fresh Produce Access**

| Perception of Fresh Food Access Groups: | | Within Study Area | | |
|---|---|---|---|---|
| | | Out | In | Total |
| Poor View of Access Group | Count | **$15_a$** | **$18_b$** | 33 |
| | % | **9.2%** | **20.9%** | 13.3% |
| Neutral View of Access Group | Count | $25_a$ | $19_a$ | 44 |
| | % | 15.3% | 22.1% | 17.7% |
| Positive View of Access Group | Count | **$123_a$** | **$49_b$** | 172 |
| | % | **75.5%** | **57.0%** | 69.1% |
| Total | Count | 163 | 86 | 249 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 10.081, df =2, p = .006.**

**Question: How would you rate your ability to purchase canned/frozen fruits and vegetables in the Lansing area given your current mode of transportation?**

Similar to the previous question, residents inside the study area also rated their views of access to canned/frozen fruits and vegetables slightly more negatively when compared with residents outside the study area, and were then grouped into poor, neutral and positive groups. With a raw data mean score of 3.91out of 5 inside the study area, and 4.46 out of 5 outside the study area, both participant groups report generally better views about their access to canned and frozen produce items in the Lansing area. However, the Pearson Chi-square analysis did find a significant difference in perception between the groups, ($x^2$=13.339, df = 2, p = .001). This suggests that even access to frozen/canned fruits and vegetables is perceived very differently between study and non-study area residents.

**Table 4.12: Chi-square Analysis of Perception of Access for Frozen/Canned Produce**

| Perception of Frozen/Canned produce Access Groups: | | Within Study Area | | |
|---|---|---|---|---|
| | | Out | In | Total |
| Poor View of Access Group | Count | **$4_a$** | **$12_b$** | 16 |
| | % | **2.5%** | **14.1%** | 6.6% |
| Neutral View of Access Group | Count | $20_a$ | $14_a$ | 34 |
| | % | 12.7% | 16.5% | 14.0% |
| Positive View of Access Group | Count | **$133_a$** | **$59_b$** | 192 |
| | % | **84.7%** | **69.4%** | 79.3% |
| Total | Count | 157 | 85 | 242 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$=13.339, df =2 p = .001**.

### Question: What is your overall general opinion about where you currently live?

Another question that had statistical significance when analyzed was concerning a participant's general opinion of where they currently lived ($x^2$= 14.519, df = 2, p = .001). This question used the same general theme of other Likert-type questions, with 1 = very negative, 3 = neutral, and 5 = very positive. With an overall mean score of 3.54 out of 5 inside the study area, and a mean score of 4 out of 5 outside the study area, residents living outside of the downtown study area had a generally more positive view of where they were living. Study area participant rankings of where they lived suggested positive to overall neutral point of view of their community.

**Table 4.13: Chi-square Analysis of Opinion of Community**

| General opinion of community groups: | | Within Study Area | | |
|---|---|---|---|---|
| | | Out | In | Total |
| Poor View | Count | **$13_a$** | **$17_b$** | 30 |
| | % | **8.1%** | **20.0%** | 12.2% |
| Neutral View | Count | **$17_a$** | **$18_b$** | 35 |
| | % | **10.6%** | **21.2%** | 14.3% |
| Positive View | Count | **$130_a$** | **$50_b$** | 180 |
| | % | **81.3%** | **58.8%** | 73.5% |
| Total | Count | 160 | 85 | 245 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 14.519, df = 2, p = .001.**

### Question: I consider myself a healthy person (in shape, free of food-related diseases – heart disease, diabetes)

Participants inside the study area indicated a higher mean score when asked to rate whether they viewed themselves as a healthy when compared with participants outside the study area, with a raw mean of 3.96 out of 5 inside the study area compared to a raw mean of 3.91 out of 5 outside the study area. The responses were not statistically different ($x^2$= 1.481, df = 2, p = .477), and perception of health does not differ based on living inside or outside of the study area (See Table 4.14). However, according to the Michigan Department of Community Health[5] , the overweight and obesity rate for residents in Ingham County (home to the study area and the majority of residents participating in this study) for adults from 2005 to 2007 is approximately 66.3%. It suggests that participants were either unaware of their

[5] http://www.michigan.gov/documents/mdch/Obesity_chapter_283600_7.pdf

own health, have a misleading view of their health, or were all mostly healthy and in shape when completing this survey.

**Table 4.14: Chi-square Analysis of Opinion of Health**

| Opinion of Health Groups | | Within Study Area | | |
|---|---|---|---|---|
| | | Out | In | Total |
| Disagree Group | Count | $25_a$ | $11_a$ | 36 |
| | % | 15.6% | 13.1% | 14.8% |
| Neutral Group | Count | $15_a$ | $12_a$ | 27 |
| | % | 9.4% | 14.3% | 11.1% |
| Agree Group | Count | $120_a$ | $61_a$ | 181 |
| | % | 75.0% | 72.6% | 74.2% |
| Total | Count | 160 | 84 | 244 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 1.481, df = 2,p = .477.**

### Question: A major portion of my diet comes from fresh fruit and vegetables (more than 3-5 servings a day)

The analysis of whether consumption rates of fresh produce was statistically different between participants inside and outside the study area reveal that there is not a statistically significant difference between population groups (See Table 15). With a raw mean score of 3.49 out of 5 inside the study area, and a raw mean score of 3.6 out of 5 outside the study area, a Chi-square analysis finds there is no difference ($x^2$= .869, df =2, p = .647). This suggests that both groups view their daily consumption of fresh produce similarly, and that living within the study area does not impact the reported consumption of fresh produce. However, not asking directly the number of fresh produce items consumed on a daily basis may have created some ambiguity in how participants answered this question. Using a 24-hour recall of fresh produce

intake, however, similar to Dehghan (2011) only accounts for produce consumed in the previous 24-hour period, and does not address whether participants generally consume significant portions of fresh produce in their diet. This question was designed to specifically allow residents to describe their overall diet, and not the previous 24 hours.

**Table 4.15: Chi-square Analysis of Fresh Fruit/Vegetables Consumption**

| Consumption of Fresh Fruit/Vegetable Groups: | | Within Study Area | | |
|---|---|---|---|---|
| | | Out | In | Total |
| Disagree Group | Count | $36_a$ | $23_a$ | 59 |
| | % | 22.4% | 27.4% | 24.1% |
| Neutral Group | Count | $28_a$ | $15_a$ | 43 |
| | % | 17.4% | 17.9% | 17.6% |
| Agree Group | Count | $97_a$ | $46_a$ | 143 |
| | % | 60.2% | 54.8% | 58.4% |
| Total | Count | 161 | 84 | 245 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. $x^2$= **.869, df =2, p = .647.**

### Question: A major portion of my diet comes from canned/frozen fruits and vegetables (more than 3-5 servings a day)

Considering that most food desert studies focus on the consumption of fresh produce, this study wanted to include canned/frozen fruits and vegetables in this analysis. If fresh produce consumption was significantly different between the population groups, and if consumption of canned/frozen fruits and vegetable consumption was different between population groups, the reported consumption of these items provides some additional insight into how the two population groups viewed their access and consumption of fresh produce. Similar to consumption rates

of fresh produce, participants inside the study area and outside the study area display relatively similar patterns of consumption of frozen/canned fruits and vegetables, and living within the study area does not appear to impact a person's consumption of frozen/canned fruits and vegetables. With a raw mean score of 2.54 out of 5 inside the study area, and a raw mean score of 2.47 out of 5 outside the study area, a Chi-square analysis found that the difference between this population groups as statistically insignificant ($x^2$= 1.650, df =2, p = .438). Both groups reported a general disagreement with the statement that they consume significant quantities of this type of produce on a daily basis (See table 4.16).

**Table 4.16: Chi-square Analysis of Consumption of Frozen/Canned Fruit and Vegetables**

| Consumption of Frozen Fruit/Vegetable Groups: | | Within Study Area | | |
|---|---|---|---|---|
| | | Out | In | Total |
| Disagree Group | Count | $94_a$ | $48_a$ | 142 |
| | % | 60.3% | 57.8% | 59.4% |
| Neutral Group | Count | $31_a$ | $13_a$ | 44 |
| | % | 19.9% | 15.7% | 18.4% |
| Agree Group | Count | $31_a$ | $22_a$ | 53 |
| | % | 19.9% | 26.5% | 22.2% |
| Total | Count | 156 | 83 | 239 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 1.650, p = .438.**

**Question: A major portion of my diet comes from pre-prepared meals (microwave dinners, etc.) (1-2 meals a day or more)**

Both participants inside and outside the study area indicated that they did not consume many pre-prepared meals, with a mean score of 1.87 out of 5 inside the study area, and a mean score 1.94 out of 5 outside the study area. A Chi-square analysis of the distribution of answers found no statistical difference ($x^2$= 1.161, df =

2, p = .560). The results indicate that consumers in both groups do not generally view themselves as eating food products that could potentially be detrimental to their health.

**Table 4.17: Chi-square Analysis of Consumption of Pre-prepared Meals**

| Consumption of Pre-Prepared Meals Group: | | Within Study Area | | |
|---|---|---|---|---|
| | | Out | In | Total |
| Disagree Group | Count | $123_a$ | $62_a$ | 185 |
| | % | 76.9% | 75.6% | 76.4% |
| Neutral Group | Count | $15_a$ | $11_a$ | 26 |
| | % | 9.4% | 13.4% | 10.7% |
| Agree Group | Count | $22_a$ | $9_a$ | 31 |
| | % | 13.8% | 11.0% | 12.8% |
| Total | Count | 160 | 82 | 242 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 1.161, df= 2, p = .560.**

### Question: I eat several meals a week from fast-food and other restaurants (3-7 meals a week or more)

Consumption rates of "fast food" and restaurant foods based on living inside and outside the study area were also found to be statistically insignificant from each other. With a raw mean score of 2.55 out of 5 inside the study area, and a mean score of 2.39 out of 5 outside the study area, Chi-square analysis confirmed living within the study area does not appear to affect consumption of food from outside the home ($x^2$= 3.653, df = 2, p = .161). This analysis demonstrates that, for the most part, self-reported consumption patterns of "fast food" is not predicated on living within a USDA-defined food desert, and is relatively uniform across the Lansing food environment.

**Table 4.18: Chi-square Analysis of Consumption of Fast-food and Restaurants**

| Consumption of Fast-Food and Restaurants Groups: | | Within Study Area | | Total |
|---|---|---|---|---|
| | | Out | In | |
| Disagree Group | Count | $96_a$ | $40_a$ | 136 |
| | % | 60.4% | 48.2% | 56.2% |
| Neutral Group | Count | $20_a$ | $16_a$ | 36 |
| | % | 12.6% | 19.3% | 14.9% |
| Agree Group | Count | $43_a$ | $27_a$ | 70 |
| | % | 27.0% | 32.5% | 28.9% |
| Total | Count | 159 | 83 | 242 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 3.653, df = 2, p = .161.**

### Question: I am worried about my diet

Also not affected by living with the study area is the level of concern a participant has regarding their diet. Generally both groups had raw mean score of 3.12 out of 5 inside the study area, hovering around score of neutral, and 2.81 out of 5 outside the study area, approaching a Neutral as well. The Chi-square results reported that the distribution of responses for disagree or agree or neutral was not significant inside or outside the study area ($x^2$= 3.706, df = 2, p = .157). The results of this test suggest that living in the study area, with lower access scores, does not seem to impact whether a person is concerned for their diet. However, the distribution of responses does indicate, although not significant, that people in the study area generally agree with a higher worry associated with their diet.

**Table 4.19: Chi-square Analysis of Worry About Diet**

| Worried about diet Groups: | | Within Study Area | | Total |
|---|---|---|---|---|
| | | Out | In | |
| Disagree Group | Count | $69_a$ | $32_a$ | 101 |
| | % | 43.4% | 39.0% | 41.9% |
| Neutral Group | Count | $33_a$ | $11_a$ | 44 |
| | % | 20.8% | 13.4% | 18.3% |
| Agree Group | Count | $57_a$ | $39_a$ | 96 |
| | % | 35.8% | 47.6% | 39.8% |
| Total | Count | 159 | 82 | 241 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 3.706, df = 2, p = .157**

### Question: I am worried about being able to purchase fresh fruit and vegetables

Even though living in or out of the study area does not impact a person's concern for their diet, it does impact the relative level of worry associated with being able to secure fresh produce. With a raw mean score of 3.19 out of 5 for residents inside the study area, and a raw mean of 2.60 out of 5 outside the study area, the Chi-square analysis found these differences to be statistically significant ($x^2$= 8.476, df =2, p = .014). Living within the study area has a significant impact on the perceptions people have about the perceived ability to secure fresh produce from their home (See Table 4.20).

**Table 4.20: Chi-square Analysis of Worry About Ability to Purchase Fresh Produce**

| Worried about Ability to Purchase Fresh Produce Groups: | | Within Study Area | | Total |
|---|---|---|---|---|
| | | Out | In | |
| Disagree Group | Count | **$85_a$** | **$33_b$** | 118 |
| | % | **53.8%** | **39.8%** | 49.0% |
| Neutral Group | Count | $25_a$ | $9_a$ | 34 |
| | % | 15.8% | 10.8% | 14.1% |
| Agree Group | Count | **$48_a$** | **$41_b$** | 89 |
| | % | **30.4%** | **49.4%** | 36.9% |
| Total | Count | 158 | 83 | 241 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 8.476, df =2, p = .014**

### Question: I am worried about having to travel long distances to purchase food

Study area residents, due to increased travel times to their primary and secondary food retailers, have been found to have a higher worry associated with distance to their food retailer of choice. Chi-square analysis of survey participants related to this question confirmed a very significant difference in these scores ($x^2$= 13.016, df = 2, p = .001), as shown in table 4.21.

**Table 4.21: Chi-square Analysis of Worry About Distance Traveled Purchasing Food**

| Worried about distance to purchase Groups: | | Within Study Area | | Total |
|---|---|---|---|---|
| | | Out | In | |
| Disagree Group | Count | **$84_a$** | **$24_b$** | 108 |
| | % | **53.2%** | **29.3%** | 45.0% |
| Neutral Group | Count | $22_a$ | $14_a$ | 36 |
| | % | 13.9% | 17.1% | 15.0% |
| Agree Group | Count | **$52_a$** | **$44_b$** | 96 |
| | % | **32.9%** | **53.7%** | 40.0% |
| Total | Count | 158 | 82 | 240 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 13.016, df = 2, p = .001**

**Question: There are certain grocery stores that I would never shop at for food**

Consumer choice is a strong motivating factor when shopping for food in the Lansing-area, and residency inside or outside the study area does not influence this. A vast majority of residents in the Lansing-area indicate avoiding certain food retailers. When taken into account with the primary reasons people visit stores, Lansing-residents that cannot find the quality and variety of foods at one location will avoid it in favor of one that offers it. With nearly identical mean scores of 3.99 out of 5 within the study area, and a mean score 4.01 out of 5 outside, a Chi-square analysis shows that participants have strong similarities when choosing their stores ($x^2$= 1.336, df = 2, p = .513). This suggests that participants within the study area do not rely primarily on the stores immediately in their neighborhood, and that shopping in the Lansing area for food is driven primarily by consumer choice, and not consumer desperation (Table 4.22).

**Table 4.22: Chi-square Analysis of Stores Never Shopped at for Food**

| Stores I will never shop at for food Groups: | | Within Study Area | | Total |
|---|---|---|---|---|
| | | Out | In | |
| Disagree Group | Count | $21_a$ | $14_a$ | 35 |
| | % | 13.5% | 17.9% | 15.0% |
| Neutral Group | Count | $15_a$ | $5_a$ | 20 |
| | % | 9.6% | 6.4% | 8.5% |
| Agree Group | Count | $120_a$ | $59_a$ | 179 |
| | % | 76.9% | 75.6% | 76.5% |
| Total | Count | 156 | 78 | 234 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 1.336, df =2, p = .513**

**Question: I mix in my grocery shopping with other errands, and prefer to shop at stores that offer items other than food**

Participants inside and outside the study area also have similar shopping habits as it relates to mixing errands when shopping for food. The distribution of answers shows that plurality of residents indicate agreement on this issue, with 45.1% agreeing inside the study area, and 46.2% outside the study area. When taken into account with the dominance of the supermarket and grocery store in the Lansing-area, a significant number of residents will maximize their shopping efficiency. Chi-square analysis found no variation in this behavior between residents inside and outside of the study area ($x^2$= .03, df = 2, p = .878). This demonstrates that a significant percentage of Lansing consumers view food shopping as "just another errand," and future studies should attempt to measure what impact this has on fresh-produce consumption.

**Table 4.23: Chi-square Analysis of Mixing Shopping with Other Errands**

| Mixing shopping with other errands Group: | | Within Study Area | | Total |
|---|---|---|---|---|
| | | Out | In | |
| Disagree Group | Count | $44_a$ | $23_a$ | 67 |
| | % | 27.8% | 28.0% | 27.9% |
| Neutral Group | Count | $41_a$ | $22_a$ | 63 |
| | % | 25.9% | 26.8% | 26.3% |
| Agree Group | Count | $73_a$ | $37_a$ | 110 |
| | % | 46.2% | 45.1% | 45.8% |
| Total | Count | 158 | 82 | 240 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= .03, df=2, p = .878.**

**Question: I only shop for food close to home at the closest store regardless of size or store chain**

Both respondent groups also indicated similarities when choosing a store, and that they did n0t choose stores necessarily based on proximity to the home. Analysis confirms that consumers in the Lansing area rely on factors other than proximity when choosing their preferred retailers ($x^2$= 2.19, df= 2, p = .335). When combined with frequencies associated with store type, and the responses associated with mixed-errand shopping, most Lansing-area residents inside and outside the study area are clearly drawn to supermarkets. Open-ended questions in this survey suggest an inter-dependent food relationship with several stores in the area. Participants would indicate that they relied on certain stores for fresh produce and others for proteins, grains and other food products.

**Table 4.24: Chi-square Analysis of Shopping Close to Home Responses**

| Shopping only close to home Groups: | | Within Study Area | | Total |
|---|---|---|---|---|
| | | Out | In | |
| Disagree Group | Count | $123_a$ | $68_a$ | 191 |
| | % | 76.9% | 84.0% | 79.3% |
| Neutral Group | Count | $19_a$ | $5_a$ | 24 |
| | % | 11.9% | 6.2% | 10.0% |
| Agree Group | Count | $18_a$ | $8_a$ | 26 |
| | % | 11.3% | 9.9% | 10.8% |
| Total | Count | 160 | 81 | 241 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Within Study Area categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 2.19, df =2, p = .335**

## ANOVA and Chi-square Analysis of Ordinal Likert-type Questions

This section will cover the multi-method approach to determining whether there were any detectable differences between age, gender, car ownership, travel

time, income, education and race on questions related to perception of access, consumption and questions related to worry over access.

### Car Ownership Chi-square Analysis

The automobile dominates the Lansing area, as is the case with most American cities. Of those participating in this research, 21 indicated that they did not own a car. Chi-square analysis of Likert-type questions reveals that car ownership impacts a person's perception of access to fresh produce ($x^2$= 10.248, df =2, p = .006). For example, 42.9% of non-car owners indicated a positive view of access, compared to 71.6% of car owners, whereas 33.3% of non-car owners indicated a poor view of access. While a plurality of non-car owners indicates a positive view of access, it is still a statistically poorer view of fresh food access in the Lansing area.

**Table 4.25 Car Ownership Perception of Fresh Produce Access**

| Perception of Fresh Food Access Groups: | | Do you own a car? | | Total |
|---|---|---|---|---|
| | | Yes | No | |
| Poor View of Access Group | Count | **$21_a$** | **$7_b$** | 28 |
| | % | **10.7%** | **33.3%** | 12.8% |
| Neutral View of Access Group | Count | $35_a$ | $5_a$ | 40 |
| | % | 17.8% | 23.8% | 18.3% |
| Positive View of Access Group | Count | **$141_a$** | **$9_b$** | 150 |
| | % | **71.6%** | **42.9%** | 68.8% |
| Total | Count | 197 | 21 | 218 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Do you own a car? Categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 10.248, df = 2, p = .006**

Similar to perceptions of fresh produce access, those who do not own a car in the Lansing area also have a poorer view of access to frozen produce in the Lansing area. Chi-square analysis shows differences between car ownership groups are statistically significant ($x^2$= 9.728, df =2, p = .008). However, non-car owners do

have a more positive view of access to frozen and canned produce in the Lansing area compared to fresh produce, with 57.1% indicating a positive view of access to these food products in the Lansing area.

**Table 4.26 Car Ownership Perception of Frozen Produce Access**

| Perception of Frozen/Canned produce Access Groups: | | Do you own a car? | | Total |
|---|---|---|---|---|
| | | Yes | No | |
| Poor View of Access Group | Count | **$9_a$** | **$4_b$** | 13 |
| | % | **4.7%** | **19.0%** | 6.1% |
| Neutral View of Access Group | Count | $24_a$ | $5_a$ | 29 |
| | % | 12.5% | 23.8% | 13.6% |
| Positive View of Access Group | Count | **$159_a$** | **$12_b$** | 171 |
| | % | **82.8%** | **57.1%** | 80.3% |
| Total | Count | 192 | 21 | 213 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Do you own a car? Categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 9.728, df = 2, p = .008**

Perception of health was also affected by car ownership, as non-car owners indicated a poorer view of their health compared to car owners in the Lansing area ($x^2$= 6.020, df = 2, p = .049). Car ownership was one of the only variables that had any explanatory effect on a person's view of their own health in this research besides age which is discussed later. However, since only 21 people indicated they did not own a car, further analysis of this variable is very limited given the sample size in this study. It is highly recommended that car ownership be addressed in future Lansing food environment studies as it relates to a person's health.

**Table 4.27 Car Ownership Perception of Health**

| Opinion of Health Groups | | Do you own a car? | | Total |
|---|---|---|---|---|
| | | Yes | No | |
| Disagree Group | Count | $27_a$ | $6_a$ | 33 |
| | % | 13.6% | 28.6% | 15.0% |
| Neutral Group | Count | $19_a$ | $4_a$ | 23 |
| | % | 9.5% | 19.0% | 10.5% |
| Agree Group | Count | **$153_a$** | **$11_b$** | 164 |
| | % | **76.9%** | **52.4%** | 74.5% |
| Total | Count | 199 | 21 | 220 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Do you own a car? Categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 6.020, df =2, p = .049**

Not surprisingly car ownership also impacts the level of worry one has about distances to purchasing food. Since car ownership can extend the range a person can travel in pursuit of food, the results of this variable are rather self-explanatory. Over 66.7% of non-car owners indicated a worry associated with distance, compared to 28.6% indicating no worry. The differences between the car ownership groups were statistically significant ($x^2$= 6.959, df = 2, p = .031) (Table 4.28).

**Table 4.28 Car Ownership Worry Associated With Distance**

| Worried about distance to purchase Groups: | | Do you own a car? | | Total |
|---|---|---|---|---|
| | | Yes | No | |
| Disagree Group | Count | $92_a$ | $6_a$ | 98 |
| | % | 47.2% | 28.6% | 45.4% |
| Neutral Group | Count | $30_a$ | $1_a$ | 31 |
| | % | 15.4% | 4.8% | 14.4% |
| Agree Group | Count | **$73_a$** | **$14_b$** | 87 |
| | % | **37.4%** | **66.7%** | 40.3% |
| Total | Count | 195 | 21 | 216 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Do you own a car? categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 6.959, df = 2, p = .031.**

Continuing with the previous section and the range limitations associated with not owning a car, non-car owners were also more likely to limit their shopping to

food destinations closest to them. While a majority of respondents, 65%, indicate they disagree with this question, s sizeable minority, 25%, agree with this question. The differences between car owners and non-car owners were significant ($x^2$= 6.959, df = 2, p = .048) (Table 4.29).

**Table 4.29 Car Ownership Shopping Only Close to Home**

| Shopping only close to home Groups: | | Do you own a car? | | Total |
|---|---|---|---|---|
| | | Yes | No | |
| Disagree Group | Count | $163_a$ | $13_a$ | 176 |
| | % | 82.3% | 65.0% | 80.7% |
| Neutral Group | Count | $19_a$ | $2_a$ | 21 |
| | % | 9.6% | 10.0% | 9.6% |
| Agree Group | Count | **$16_a$** | **$5_b$** | 21 |
| | % | **8.1%** | **25.0%** | 9.6% |
| Total | Count | 198 | 20 | 218 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Do you own a car? categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 6.959, df =2, p = .048**

## Gender Chi-square Results

**Table 4.30 Gender Consumption of Fresh Produce**

| Consumption of Fresh Fruit/Vegetable Groups: | | Gender | | Total |
|---|---|---|---|---|
| | | Female | Male | |
| Disagree Group | Count | **$30_a$** | **$28_b$** | 58 |
| | % | **19.7%** | **32.6%** | 24.4% |
| Neutral Group | Count | $22_a$ | $20_a$ | 42 |
| | % | 14.5% | 23.3% | 17.6% |
| Agree Group | Count | **$100_a$** | **$38_b$** | 138 |
| | % | **65.8%** | **44.2%** | 58.0% |
| Total | Count | 152 | 86 | 238 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Gender categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 10.526, df = 2, p = .005.**

Chi-square analysis on gender shows 65.8% of women agreeing that that a major portion of their diet comes from fresh produce, compared with men where 44.2% were in the agree category. In the neutral group, 23.3% of men indicated a

neutral response to this question, compared with 14.5% of women. In the disagreement group, 32.6% of men indicated that they disagree with the statement that a major portion of their diet comes from fresh produce, compared to 19.7% of women. This was found to be statistically significant ($x^2$= 10.526, df = 2, p = .005) and consistent with Dehghan (2011) showing women were more likely to consume increased amounts of fresh produce compared with men.

**Table 4.31 Gender Consumption of Fast-Food Groups**

| Consumption of Fast-Food Groups: | | Gender | | Total |
|---|---|---|---|---|
| | | Female | Male | |
| Disagree Group | Count | **$96_a$** | **$37_b$** | 133 |
| | % | **63.6%** | **43.5%** | 56.4% |
| Neutral Group | Count | $21_a$ | $12_a$ | 33 |
| | % | 13.9% | 14.1% | 14.0% |
| Agree Group | Count | **$34_a$** | **$36_b$** | 70 |
| | % | **22.5%** | **42.4%** | 29.7% |
| Total | Count | 151 | 85 | 236 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Gender categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 10.526, df = 2, p = .005**

Also statistically significant was the consumption of fast-food and other restaurant foods, with women reporting a raw mean score of 2.26 out of 5 and men reporting a raw mean of 2.78 out of 5. Chi-square analysis of the distribution of answers found 42.4% of men agree with this statement, 14.1% indicating neutral, and 43.5% disagreeing with this statement. While a slight plurality exists with more men indicating that they disagree with this statement, this was found to be statistically significant distribution ($x^2$= 11.095, df = 2, p =.004). With women, 63.6% disagreed with this statement, compared to 13.9% neutral, and 22.5% agreeing.

**Table 4.32 Gender Worry About Diet**

| Worried about diet Groups: | | Gender | | Total |
|---|---|---|---|---|
| | | Female | Male | |
| Disagree Group | Count | **$71_a$** | **$26_b$** | 97 |
| | % | **47.0%** | **31.3%** | 41.5% |
| Neutral Group | Count | $24_a$ | $20_a$ | 44 |
| | % | 15.9% | 24.1% | 18.8% |
| Agree Group | Count | $56_a$ | $37_a$ | 93 |
| | % | 37.1% | 44.6% | 39.7% |
| Total | Count | 151 | 83 | 234 |
| | % | 100.0% | 100.0% | 100.0% |

Each subscript letter denotes a subset of Gender categories whose column proportions do not differ significantly from each other at the .05 level. **$x^2$= 11.095, df = 2, p =.004.**

Interestingly, and contrary to the suggestions of Dolby (1996) and Nayga (1997), men do demonstrate a slightly higher worry associated with their diet. The analysis showed that men had a raw mean of 3.18 out of 5, compared to a raw mean for women at 2.77 out of 5. Chi-square analysis concerning the level of worry associated with their diet showed that this was close to significant ($x^2$= 5.588, df= 2, p =.054). With women, 47% indicated they disagreed, 15.9% indicated a neutral response, and 37.1% indicated agreement. Compared with men, 31.3% indicated disagreement, 24.1% indicated a neutral response, and 44.6% indicated agreement.

Since gender was the only variable that proved different with respect to the consumption of fresh produce, further analyses of the effects of living inside the study area were conducted. Women living within the study are were compared with women outside the study area, as were men living inside compared with men outside the study area. Conducting a Chi-square analysis found that the gender of respondents inside the study area did not identify any variations compared to men and women outside the study area as it related to changes on consumption patterns. As such,

living within the USDA-designated food desert in downtown Lansing was not found to influence self-reported consumption of fresh produce.

### A Comparison of Income and Food Related Perceptions

To conduct a one-way ANOVA between income groups and the Likert-type questions concerning access, consumption and level of concern, income levels were grouped into the following categories: 0-25K a year, 25-50k, 50k-100k, and 100k+. Fisher's LSD Post-hoc analysis found various statistically intra-significant variations between income groups.

A comparison of perceptions of fresh food access and income identified statistically significant variations at the .05 level between 0-25K and 100k+, with a mean difference of .429 ($F(2, 211) = 1.411$, $p = 1.4 \times .0001$). Differences among all other income groups were found to be statistically different from the other. Perception of frozen/canned access also had proved different across income groups significance at the .05 level, using LSD Post-hoc analysis, with differences between 0-25k and 50k-100k, and 100k+, with .236 and .387 mean differences, respectively ($F(2, 207) = 10.103$, $p = .0001$).

The level of worry associated with being able to purchase fresh fruit and vegetables also had significance at the .05 level using LSD Post-Hoc analyses between the various income groups ($F(2, 211) = 14.848$, $p = .0001$). The lowest income group, 0-25K, was significantly different from the 50-100k, and 100K+ groups, with mean differences of .483 and .955, respectively. The next income

group, 25-50k, had a statistical significant difference between the 100k+ group, with a mean difference of .607.

Also significant at the .05 level was the worry associated with distances to purchase food, between the 0-25K groups and all other groups ($F(2,209) = 23.135$, $p = .0001$). LSD Post-Hoc analysis showed a mean difference between 0-25K of .557; 50-100K, .618; and 100K+ of 1.037. LSD Post-Hoc analysis did not reveal any other statistical variations between consumption, views of health, or other Likert-type questions.

Overall, however, income level had very little explanatory effect for the majority of variables acquired through the questionnaire. Given the concentration of lower income groups inside the study area, and the inverse concentration of higher income groups outside the study area, analyzing results based on income cannot discount the geography of the distribution of incomes.

**Level of Education Chi-square Analysis**

Participants were grouped into two categories, those with a 4-year college degree and those without a 4-year college degree. Chi-square analysis did not reveal any statistical variations between those with a 4 year degree that would provide any explanatory power on the Likert-type questions.

**Age Bracket Groups Chi-square Analysis and ANOVA**

Age groups had some variation between groups when tested using a one way ANOVA as it related to views of health, and fresh produce consumption. LSD Post-

Hoc analysis was employed to determine mean differences between age groups, using a .05 level of significance. Intra-variations across age groups revealed differences in perception of health ($F(5, 218) = 3.964$, $p = .002$), fresh produce consumption ($F(5, 218) = 3.374$, $p = .006$). Age did not find any variations in perception of access, or other variables in the Likert-type questions.

Participant age groups showed variation in the variable of the perception of health between the 25-35 age group, and the 36-45, 46-55, and 56-65 groups. The 25-35 group had a higher mean difference of .491, between 36-45, .421 between 46-55, and .771 for the 56-65 age groups. This suggests that an increase in age influenced the perception a person was healthier, with mean scores decreasing as age increased.

The 25-35 age group also saw mean differences significant at the .05 level between 46-55 and 56-65 groups as it related to consumption of fresh produce. The results showed a mean difference of .443 for the 46-55 age group, and .824 for the 56-65 age group. The 36-45 group saw a mean difference of .612 compared to the 46-55 group, and .994 compared to the 56-65 age group. The results of this analysis show that fresh produce consumption decreasing with age, with multiple significant differences between several age groups.

**Race Analysis**

Due to low participation rates among the various ethnic groups in the Lansing area, a Chi-square analysis revealed too few groups to not violate the fewer than 5 cases per cell required of this type of analysis. Also, due to low participation rates, it

was not possible to test perceptions based on the race of the participant. As a result, this study will not be able to fully analyze any explanatory effects of race and the perception of access, consumption, or level of worry associated with access.

**Travel-time ANOVA Analysis**

Whereas certain demographic data impacted consumption of various food products, the analysis of travel 10-minute time groups reported differences in perception of access, questions related to level of worry, and differences related to avoiding certain grocery stores. The results of the one-way ANOVA analysis will show that an increase in travel time for a participant to their primary food retailer will impact their perception of access, and will also impact their level of worry associated with ability and distance. All data was analyzed at the .05 significance level, using LSD Post-Hoc analysis.

Perception of access to fresh produce rankings had significant variation among the 20+ minute travel time groups, and the 0-10 and 10-20 travel time groups. The 20+ travel time groups reported a mean decrease of 1.436 compared to the 0-10 minute group, and .1.051 compared to the 10-20 minute groups. With a mean score of 4.23 for the 0-10 group, 3.84 for the 10-20 group, and 2.79 for the 20+ group, these scores indicate that travel time appears to have a very significant impact on the perception one has related to being able to access fresh produce ($F(2, 211) = 11.387$, $p = .0001$).

Similar to fresh produce perception of access scores, frozen and canned produce ratings decreased significantly with increases in travel time ($F(2, 207) =$

7.049, p = .001). Whereas the mean score for frozen/canned produce was higher (4.57 0-10 Minutes; 4.12 10-20 Minutes; 3.68 20+ Minutes) when compared to fresh produce, these decreases were still highly significant at the .05 significance level. Post-Hoc analysis showed the 20+ minute travel group had a lower mean difference of .888 compared with the 0-10 minute group, and .437 compared to the 10-20 minute. This view between the 10-20 and 20+ minute groups was not found to be significantly different. However, the mean difference of .451 between the 0-10 minute and 10-20 minute group was statistically different, so the .437 difference was borderline significant at the .05 level.

Worry associated with diet was also significantly different between the 20+ minute group and the 0-10 and 10-20 minute groups (F (2, 211) = 3.784, p = .024). With an increased mean, thus increased level of worry, of .861 compared between the 20+ minute group to the 0-10 minute group, and .673 compared to the 10-20 minute group, the post-hoc analysis show that increased travel time increases the level of the worry associated with their diet. The analysis of worry about ability to purchase fresh fruit and vegetables also shows significant differences between several groups at the .05 level (F (2, 211) = 14.848, p = .0001), which increased between the 20+ minute and the 0-10 and 10-20 minute groups, and between the 10-20 and 0-10 minute group. This resulted in an increased mean difference of 1.609 between the 0-10 and 20+ group, and an increase of 1.016 between the 10-20 and 20+ group. Between the 10-20 and 0-10 group, the mean increased by a statistically significant .594, showing that

0-10 minute travel group had lower overall worry when compared to the other travel groups.

Understandably, the level of worry associated with having to travel long distances to purchase food also increased dramatically among travel time groups, which were significant at the .05 level ( $F(2, 209) = 23.135$, $p = .0001$). The 20+ travel time group reported higher mean level of worry associated with distance of 1.922 compared with the 0-10 group, and 1.069 compared to the 10-20 minute group. The 10-20 minute group reported an increased mean of .852 when compared to the 0-10 group. However, those with greater travel times also report an increased mean associated with certain grocery stores they would never shop at for food, and is significant at the .05 level ($F(2, 204) = 4.389$, $p = .01$). The mean increase between the 20+ minute group and the 0-10 minute group was .863, and a .633 increase when compared with the 10-20 minute group. The results of this analysis suggest, though not conclusive, that the quality of stores closest to people in the 20+ minute group are of such a quality that they willingly undertake a longer trip to the store of their choice. The fact that travel time did not impact their self-reported consumption of fresh produce indicate that they are able to secure the produce they want, even though they are travelling longer to get there.

**Summary of Consumer Behavior and Perception of Access**

The Lansing-area is a supermarket and car-dependent food environment, with typical concentrations of lower-income and minority resident in its downtown area. Open-ended responses indicate that a large number of participants in this area desire

affordable, quality produce, and will shop more often at those stores that offer products that meet these criteria. However, price alone was not the primary motivating factor for Lansing residents, as the quality and variety of produce, and the proximity of a store, were the major reasons for selecting specific stores in the Lansing area. Even those with limited means, and limited transportation options, report choosing those stores based on that criteria, indicating price was not the most important factor when choosing a store.

Lansing-area consumers, inside and outside the study area, indicate a complex relationship with the food environment as a result of this analysis. No single variable accounted for the majority of responses. Generally access to an automobile and the resulting increased travel times as a result of not owning one, and residency inside and outside the study area, primarily dictates the perceived level of access to fresh and frozen produce items in the Lansing area. However, these variables did not appear impact the consumption of fresh produce based on the answers derived from the questions in the survey. Car ownership did impact a person's perception of health, and this should be examined further in studies of the Lansing food environment. Whether this affect is due to car ownership, or whether car ownership is ancillary to the participants current financial situation remains to be seen, and cannot be answered concretely in this research.

The level of concern associated with lower perceived access was clearly apparent, but the level of concern also varied due to factors such as residency, travel time, and car ownership. As a result, these worries appear to increase the stress

associated with securing fresh produce in the Lansing area. Due to such limiting factors of both quality and affordability associated with fresh produce in Downtown Lansing, residents in these areas are required to travel longer to secure the fresh produce they want to have in their daily diets. These increased travel times sometimes result in greater distances compared to other Lansing-area residents, and this research has been able to detect this trend.

## Discussion

This section will answer the four primary research questions posed by this study, and identify what factors, if any, are influenced based on residency in the study area, or other factors related to age, gender, income, level of education or race.

### Research Question 1: Do study-area residents travel longer to purchase fresh produce at their preferred stores when compared to other Lansing-area residents?

Consistent with food desert research including Larsen and Gilliand (2008), this research clearly demonstrates that downtown residents inside the USDA defined food desert do indeed travel longer to purchase fresh produce at their preferred stores. As a result of these increased travel times, perception of access to fresh and frozen produce items in the Lansing area worsens as travel time increases. Increased travel time also impacts the level of worry people report in being able to secure fresh produce, and the distances they are required to travel to purchase these items. For all intents and purposes, residence in the downtown study area appears to result in increased travel times, but it is not an area that impacts a person's ability to secure or

consume the fresh produce they want to consume. Morland, et al.(2002) asserted that living in a food desert does not limit people to shopping there, and this is clearly the case for people living in the study area. Open-ended responses from participants support this assertion at the same time that these results suggest a desire for greater accessibility to affordable and quality fresh produce items in the downtown area.

Income also has an impact on perceptions of access, as well as the reported level of worry associated with securing fresh produce, as well as the distance any given person must travel to secure it. However, given that the highest reported income earners reside outside of the study area, location, and not income, can provide better explain lower reported perception scores.

**Research Question 2: Are downtown study-area residents consuming less fresh fruit and vegetables when compared to other Lansing-area residents, and can patterns of consumption be detected when analyzing consumers based on their travel time, or other factors related to age, gender, income, level of education or race?**

Living within the study area downtown does not appear to impact the self-perceived consumption rates of fresh produce. This is conclusive with Pearson's (2005) findings that found living in a food desert did not impact a person's consumption of fresh produce items, and similar to the findings by Reed (2011), in which participants generally view their consumption rates of healthy food equally across the Lansing-region. Residency within a food desert does not appear to impact the ability of residents to consume the fresh produce they want to consume, and does not appear to impact their ability to purchase it. Low participation rates of minorities

in the survey excluded race from being analyzed in this study, and certainly needs to be addressed in future studies of the Lansing food environment. Moreover, education, income and travel time did not impact a person's consumption of fresh produce in the Lansing, which is partially contrary to Dubowitz's, et al.(2008) assertion that consumption of fresh produce is primary influenced based on these variables. The mechanism used to measure consumption may be an exogenous factor as to why these variables were not impacted by a participants socio-economic status.

While some of the data did provide low-level explanatory power through analysis in SPSS, it did not provide the needed "knock-out punch" to fully explain issues related to perception of access. However, results partially confirmed Dubowitz's, et al.(2008) and Dehghan's (2011) findings, gender and age impacts consumption of fresh produce, with women consuming more produce then men. Results from ANOVA testing of age shows consumption of fresh produce to be highest in the 36-45 age group, with a mean score of 3.89 out of 5, followed by a mean score of 3.72 out of 5, in the 25-35 group. However, fresh produce consumption did not decrease uniformly as one increases in age. Instead it rises and peaks at the 36-45 age group, and then decrease as age increases, with the exception of the 66+ group, which had a mean score of 4 out of 5. Post-hoc analysis of these questions does show some significant differences between age groups, and this should be explored in more detail in future Lansing food environment studies.

**Research Question 3: Does perception of access to fresh produce differ for people living in the study-area versus other area residents due to travel time, or are these perceptions shaped by a person's other factors related to age, gender, income, level of education or race?**

Perception of access to fresh produce and even frozen/canned vegetables differ between residents inside and outside the study area, and travel time and car ownership both appear to influence these perceptions. Frozen and canned produce is uniformly rated higher than fresh produce access, and while the raw mean scores of individuals living inside and outside the food desert do not suggest an overall negative view, they clearly show a lowered perceived access when compared to residents outside of the food desert. Perception of fresh and frozen food access decreased, as well, as travel time increased, and also decreased between those that owned cars, and those that did not. No other variables recorded a statistically significant difference in perception scores related to access to fresh and frozen produce.

**Research Question 4: Due to issues related to access to fresh produce, does the perception of a person's health differ significantly inside and outside the study area?**

This study has shown that living within the study area in downtown Lansing does not appear to impact the perception of a person's health, as the average score of residents derived from this analysis are statistically insignificant from one another. This suggests that living in the food desert in downtown Lansing does not appear to be a significant factor influencing perception of a person's health. The primary

factors influencing a person's perception of health included age and car ownership. While men report greater concern associated with their health, this did not impact their views that they were themselves healthier. However, when all of these factors influencing perception of health are taken into account with the 66% obesity and overweight rates provided by the Michigan Department of Community Health, it appears that residents participating in this study did not answer honestly, or at least had a generally biased view of their own health that tended to show that they were healthy, irrespective of whether they consumed vegetables or not. This is in accordance with results of Dehghan (2011) in which very few participants indicated poor health, even though they were found to be overweight/obese. Relying on surveys to assess the health of respondents in food desert studies should be adjusted to actually incorporate measures to account for the actual health. Asking participants directly about their health relating to heart-disease, diabetes, and other food-related health issues might mitigate the sometimes uninformed assertions that they are "healthy."

# CHAPTER V
# THE DOWNTOWN LANSING FOOD DESERT: CONCLUSION OF FINDINGS

The results of this research have upheld several findings of the Lansing food environment reported by Reed (2011), and suggest that the actual impacts and effects of the downtown Lansing food desert may not be as extensive as they reportedly found in other food deserts nationwide. Given the USDA designation, the existence of two fresh produce food retailers in the study area suggests that this area should not be classified as an actual food desert. Results do generally demonstrate that participants have a very complex and evolving relationship with the Lansing-food environment, and yet are quite adept at navigating this area to access those items they wish to consume. Further, the study shows that participants alternate food-shopping behavior based on weather, price, local-food, organic, and quality of produce when choosing which store to purchase specific food items. Given that Wrigley's (2002) initial definition of a food desert focused included the metric of "culturally acceptable foods", it appears Lansing-area residents purchase those food types that are culturally acceptable to them. However, given that study area participants report the price of fresh produce at the Lansing City Market and the low-quality of produce at the Vallarta Market as limiting factors, this area appears to be a food desert in that it forces residents to shop elsewhere in order to acquire the affordable and quality produce they desire.

Given responses related to "stress" associated with purchasing food, study area residents have suggested, due to increased travel time to their preferred stores that living in a food desert can create problems for purchasing fresh produce, and in

reaching these stores. Future research should address and quantify this stress associated with food, and determine if stress associated with securing fresh produce has any detrimental effects on a person's health. However, it is reasonable to assume that a person travelling longer to their preferred food-retailer will not always be so inclined to make this trip. As people age, and physically mobility decreases, the idea of walking to that bus stop in the middle of February in Michigan becomes even less desirable than between May and September. While this study capture perceptions and consumption rates during the late spring and summer months, the seasonal effects previously described as a barrier to pedestrians also represents barriers to research. More attention should be placed on what happens in food deserts during winter months, when those seasonal fresh-produce providers abandon these areas until the following year.

Increasing travel times for study area participants did not reportedly impact their ability to purchase fresh produce they wanted to consume. This appears to confirm the findings of Pearson's (2005) study that a food desert designation does not impact a person's consumption of fresh produce. However, contrary to Pearson, this study shows that a person's socio-economic characteristics, mainly income and level of education, did not result in statistically viable variations in the consumption of fresh produce. This finding upholds the findings of Reed (2011) that residents in the Lansing-area generally view their food purchases as "healthy." However, if as the evidence suggests, that people in this area have a potentially misguided view of their own health, does it not also suggest that they may have a misguided view as to what

they are actually eating? These questions, unfortunately, are beyond the scope of this research, and should be addressed in future Lansing food-environment studies.

**Limitations of Research**

This study has been successful at analyzing differences in the perceptions of Lansing area residents in the context of the downtown Lansing food desert. While this research did not quantify daily consumption of fresh produce, it was able to provide a general narrative of study area residents view of their daily consumption of fresh produce, frozen/canned produce, fast-food, and pre-prepared meals. This information notwithstanding, future Lansing food environment studies should provide more specific information concerning the daily intake of specific food items.

Interest, it seems, dictates participation, and even non-answers may indicate a lack of interest from low-income and other at-risk populations in urban areas. This research failed, in certain respects, in securing greater participation of low-income and minority residents whose views of food access could provide a more thorough understanding of the nature of consumption of fresh produce and the perceptions access grants to health. A further limitation of this study was the high participation rates of residents with a college degree, which was consistent with Reed (2011) and Simms (2011) studies that also had higher proportions of college-degree holders participating in food studies. The study failed to capture these critical perceptions, due in part to the use of an online survey and/or a lack of interest in social science research among these participants. A non-answer on the part of these groups may signal a lack of awareness or alternatively a view that everything is "A-Okay" with

what they consider to be adequate food accessibility. If this is the case, then this is quite telling, and the problems facing improving the diet of the American consumer is truly daunting if those that are at-risk do not view this as a problem. Given the tendency of participants to view themselves as healthy irrespective of their consumption of fresh produce, and perhaps, irrespective of their actual health, people may not be aware of what it means to be healthy, or they are unwilling to address it. Whatever the reason, this study fully acknowledges that an incomplete picture of the Lansing area remains, and input from these potentially at-risk individuals is still critical to fully understanding the nature of the Lansing food environment.

As was previously discussed, this research was also limited to operating during late spring and the summer months in Michigan. It captured perceptions of access in the context of farmer's markets, and relatively pleasant weather for area residents. Addressing what happens in winter months in food desert cities can help paint a more complete picture, and limiting research to months convenient to graduate studies is a boon to graduate students, but a bust for accounting for those still living there after the grant money has been spent.

**Implications for Future Food Desert Studies**

While it appears that the USDA defined downtown Lansing, MI food desert is not directly involved in the consumption, or lack thereof, of fresh produce, and the perception of health for residents inside it, it does not negate the existence of other food deserts, nor does it negate the effects it has on residents who find themselves living in one. Given the 'broad stroke' by the USDA to identify food deserts, and

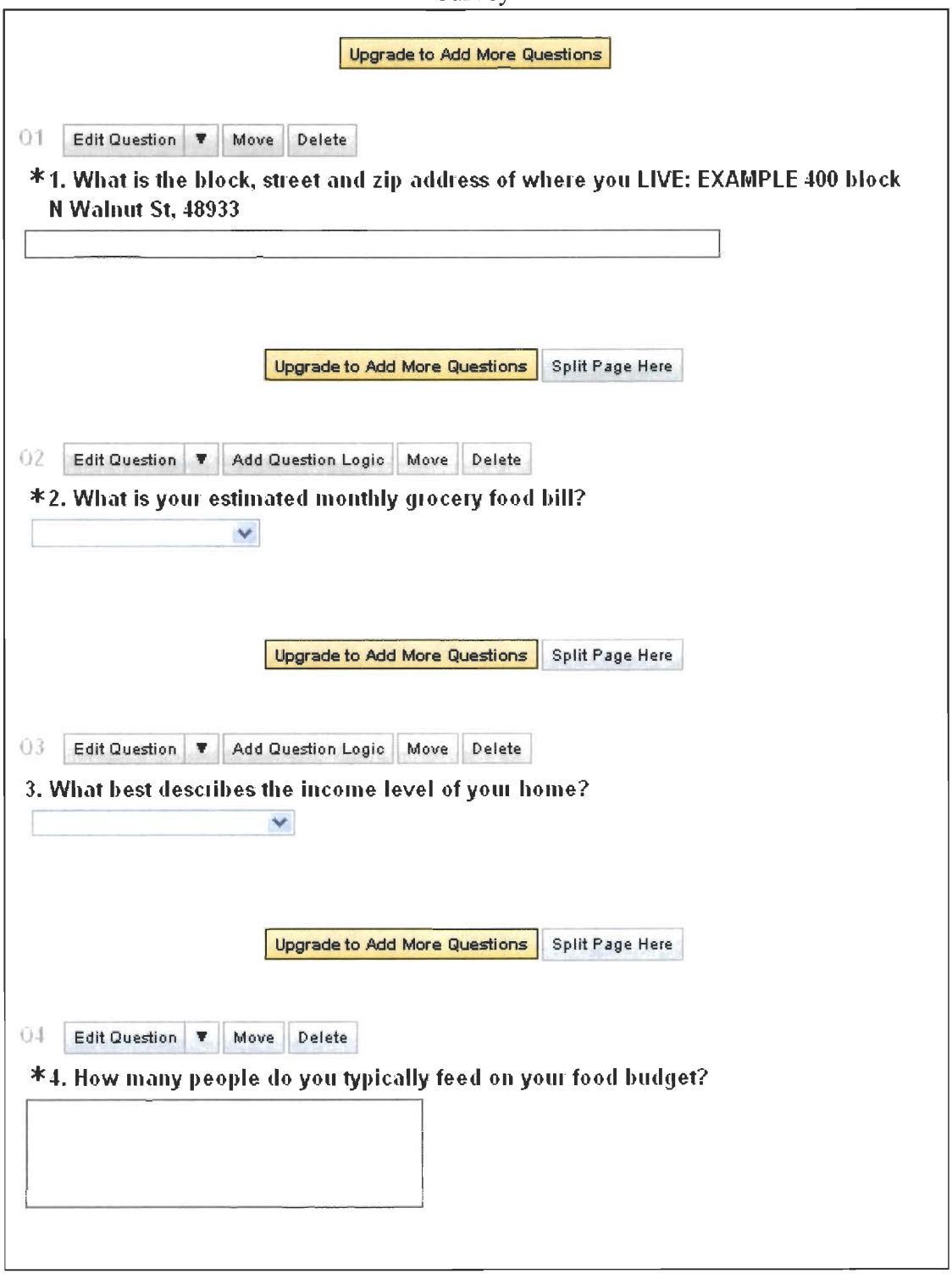
their exclusion of local food retailers with annual sales under $2 million, local studies will continue to be critical at refuting or confirming these classifications across the United States. However, based on this research, the food desert in downtown Lansing does not seem comparable to other food deserts frequently cited in the Literature, and this analysis demonstrates the need for taxonomy of the different types of food deserts. While this analysis shows that the Lansing-area food desert has little to no effect on the consumption of produce and the health of the residents living inside it, does not mean that the presence of other food deserts do not. It does suggest that the downtown Lansing area may not be a food desert in the classical definition, as fresh produce is available nearby, however, it does suggest that is a food desert based on the limitations to secure affordable and quality produce in this area. The two primary fresh produce food retailers in downtown Lansing represent distinct problems for local policy makers to address. Specifically increasing access to quality and affordable fresh produce, thus reducing travel times, and the worry associated with travel times, to supermarkets in the suburban fringe parts of Lansing. However, the analysis of travel time in this area indicates that this did not impact the ability for Lansing consumers to secure fresh produce.

Future geographic research into food deserts should emphasize establishing a classification or rating scheme that can be used to assess and compare food deserts across the developed world. This classification can provide policy makers in these areas a better understanding of the problems they face in their particular communities, and develop mitigation strategies based on the severity of the effects living in local

food deserts. Even though local food retailers may exist in some of the food deserts identified by the USDA, the assessments of quality and affordability of the produce in these areas will need to be developed in these locations on a case-by-case basis. Not all residents in these areas will be inclined to devote time to community gardens, nor will they find farmer's markets to be culturally appropriate locations for a multitude of reasons. This will result in the continued dominance of the supermarket as the provider of choice for fresh produce.

Appendix A

Survey



05 Edit Question ▼ Add Question Logic Move Delete

***5. What is the typical payment method you use when purchasing food at a grocery store or supermarket?**

- ◯ Cash
- ◯ Credit Card
- ◯ Debit Card/ Personal Check
- ◯ Michigan Bridge Card
- ◯ WIC
- ◯ Other (please specify)

Upgrade to Add More Questions | Split Page Here

06 Edit Question ▼ Add Question Logic Move Delete

**6. What is your gender?**

- ◯ Female
- ◯ Male

Upgrade to Add More Questions | Split Page Here

07 Edit Question ▼ Add Question Logic Move Delete

**7. What is your race/ethnicity?**

- ◯ Black/African American
- ◯ White Non-Hispanic
- ◯ Hispanic Origin – Black or White
- ◯ Native American
- ◯ Asian
- ◯ Asian - Indian
- ◯ Arabic/Middle Eastern
- ◯ Other (please specify)

Q9 Edit Question ▼ Move Delete

**9. Please answer the following questions concerning access to food in the Lansing area:**

| | Very Poorly | Poorly | Average | Good | Very Good | Not Applicable |
|---|---|---|---|---|---|---|
| How would you rate your ability to purchase fresh produce in the Lansing area given your current mode of transportation? | ○ | ○ | ○ | ○ | ○ | ○ |
| How would you rate your ability to purchase canned/frozen fruits and vegetables in the Lansing area given your current mode of transportation? | ○ | ○ | ○ | ○ | ○ | ○ |

Upgrade to Add More Questions | Split Page Here

Q10 Edit Question ▼ Move Delete

**10. Please provide your opinion for the following questions:**

| | Very Negative Opinion | Negative Opinion | Neutral | Positive Opinion | Very Positive Opinion | Not Applicable |
|---|---|---|---|---|---|---|
| What is your overall general opinion about where you currently live: | ○ | ○ | ○ | ○ | ○ | ○ |
| If you have lived in the Lansing area FOR ONE YEAR OR LESS, what is your OVERALL general opinion about where you USED to live: | ○ | ○ | ○ | ○ | ○ | ○ |
| What is your overall opinion of food access in Lansing: | ○ | ○ | ○ | ○ | ○ | ○ |
| If in the Lansing area for LESS THAN ONE YEAR, what is your overall opinion of food access of where you lived PRIOR to living in the Lansing area: | ○ | ○ | ○ | ○ | ○ | ○ |

011 Edit Question ▼ Move Delete

***11. Please indicate whether you agree or disagree with the following questions:**

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | Not Applicable |
|---|---|---|---|---|---|---|
| I consider myself a healthy person (in shape, free of food-related diseases – heart disease, diabetes) | ○ | ○ | ○ | ○ | ○ | ○ |
| A major portion of my diet comes from fresh fruit and vegetables (more than 3-5 servings a day) | ○ | ○ | ○ | ○ | ○ | ○ |
| A major portion of my diet comes from canned/frozen fruits and vegetables (more than 3-5 servings a day) | ○ | ○ | ○ | ○ | ○ | ○ |
| A major portion of my diet comes from pre-prepared meals (microwave dinners, etc.) (1-2 meals a day or more) | ○ | ○ | ○ | ○ | ○ | ○ |
| I eat several meals a week from fast-food and other restaurants (3-7 meals a week or more) | ○ | ○ | ○ | ○ | ○ | ○ |
| I am worried about my diet | ○ | ○ | ○ | ○ | ○ | ○ |
| I am worried about being able to purchase fresh fruit and vegetables | ○ | ○ | ○ | ○ | ○ | ○ |
| I am worried about having to travel long distances to purchase food | ○ | ○ | ○ | ○ | ○ | ○ |
| There are certain grocery stores that I would never shop at for food | ○ | ○ | ○ | ○ | ○ | ○ |
| I mix in my grocery shopping with other errands, and prefer to shop at stores that offer items other than food | ○ | ○ | ○ | ○ | ○ | ○ |
| I only shop for food close to home at the closest store regardless of size or store chain | ○ | ○ | ○ | ○ | ○ | ○ |
| I only shop for food based on weekly sales, deals or coupons | ○ | ○ | ○ | ○ | ○ | ○ |
| I frequently purchase food items from markets and stores that cater to specific ethnic groups | ○ | ○ | ○ | ○ | ○ | ○ |
| I purchase mostly organic fruits/vegetables when I shop | ○ | ○ | ○ | ○ | ○ | ○ |

Q12 Edit Question ▼ Move Delete

***12. The following is a list, though incomplete, of fresh food retailers in the Lansing Area. Please rate your overall opinion of each retailer using the following scale:**

| | Very Negative Opinion | Negative Opinion | Neutral Opinion, neither good nor negative | Positive Opinion | Very Positive Opinion | Never Heard of Them |
|---|---|---|---|---|---|---|
| Kroger - All Stores | ○ | ○ | ○ | ○ | ○ | ○ |
| Meijer - All Stores | ○ | ○ | ○ | ○ | ○ | ○ |
| Wal-Mart /Sam's Club - All Stores | ○ | ○ | ○ | ○ | ○ | ○ |
| Aldi – All Stores | ○ | ○ | ○ | ○ | ○ | ○ |
| Save-A-Lot | ○ | ○ | ○ | ○ | ○ | ○ |
| Lansing City Market | ○ | ○ | ○ | ○ | ○ | ○ |
| Local Farmers Markets | ○ | ○ | ○ | ○ | ○ | ○ |
| Vallarta Market | ○ | ○ | ○ | ○ | ○ | ○ |
| Quality Dairy – All Stores | ○ | ○ | ○ | ○ | ○ | ○ |
| Apple Market | ○ | ○ | ○ | ○ | ○ | ○ |
| Goodrich Shop Rite | ○ | ○ | ○ | ○ | ○ | ○ |
| L&L | ○ | ○ | ○ | ○ | ○ | ○ |
| Horrocks | ○ | ○ | ○ | ○ | ○ | ○ |

Q13 Edit Question ▼ Move Delete

***13. Please indicate the frequency at which you shop for fresh produce at these providers in the Lansing area:**

| | Very Rarely: 1 to 2 times a year | Rarely: About 1 or 2 times every 3 - 4 months | Infrequently: 1 to 2 times every 1 - 2 months | Frequently: 1 - 2 times a month | Very Frequently: 3 - 4 times a month or more | Never Shop there for fresh produce |
|---|---|---|---|---|---|---|
| Kroger - All Stores | ○ | ○ | ○ | ○ | ○ | ○ |
| Meijer - All Stores | ○ | ○ | ○ | ○ | ○ | ○ |
| Wal-Mart /Sam's Club - All Stores | ○ | ○ | ○ | ○ | ○ | ○ |
| Aldi – All Stores | ○ | ○ | ○ | ○ | ○ | ○ |
| Save-A-Lot | ○ | ○ | ○ | ○ | ○ | ○ |
| Lansing City Market | ○ | ○ | ○ | ○ | ○ | ○ |
| Local Farmers Markets | ○ | ○ | ○ | ○ | ○ | ○ |
| Vallarta Market | ○ | ○ | ○ | ○ | ○ | ○ |
| Quality Dairy – All Stores | ○ | ○ | ○ | ○ | ○ | ○ |
| Apple Market | ○ | ○ | ○ | ○ | ○ | ○ |
| Goodrich Shop Rite | ○ | ○ | ○ | ○ | ○ | ○ |
| L&L | ○ | ○ | ○ | ○ | ○ | ○ |
| Horrocks | ○ | ○ | ○ | ○ | ○ | ○ |

Q14 Edit Question ▼ Move Delete

***14. What is your PRIMARY source of fresh produce or canned/frozen vegetables and fruit in the Lansing-East Lansing area? CHOOSE ONLY ONE. (The question is looking for your primary source, not the primary source for each category. Pick the category that best represents your primary source of food, and please provide the location of that source. MAKE SURE THERE IS ONLY DATA IN ONE FIELD - MAKE SURE THERE ARE NO SPACES IN OTHERS, AS THIS WILL PREVENT YOU FROM PROCEEDING)**

Grocer/Supermarket: NAME and LOCATION (Example: Lake Lansing Meijer)

Convenience Store: NAME and LOCATION (Example: QD, Cedar and Greenlawn)

Farmer/City Market: NAME and LOCATION

Community Garden

Personal Garden

Other:

+ Add Question | Split Page Here

Q15 Edit Question ▼ Add Question Logic Move Delete

**15. What is your PRIMARY reason for shopping at the location you indicated in the previous Question?**

- Ability to use self-checkout
- Quality of produce
- Variety of produce
- Price
- No other options
- Location – close to home
- Location – close to work/school
- Location – close to bus route
- Store hours
- Other (please specify)

Q16 Edit Question | Move | Delete

***16. What is your SECONDARY source of fresh produce or canned/frozen vegetables and fruit in the Lansing-East Lansing area? CHOOSE ONLY ONE (The question is looking for your secondary source, not the secondary source for each category. Pick the category that best represents your secondary source of food, and please provide the location of that source. MAKE SURE THERE IS ONLY DATA IN ONE FIELD - MAKE SURE THERE ARE NO SPACES IN OTHERS, AS THIS WILL PREVENT YOU FROM PROCEEDING.)**

| | |
|---|---|
| Grocer/Supermarket: NAME and LOCATION (Example: Lake Lansing Meijer) | |
| Convenience Store: NAME and LOCATION (Example: QD, Cedar and Greenlawn) | |
| Farmer/City Market: NAME and LOCATION | |
| Community Garden | |
| Personal Garden | |
| Other: | |

null | Split Page Here

Q17 Edit Question | Add Question Logic | Move | Delete

**17. What is your PRIMARY reason for shopping at the location for the previous Question?**

- Ability to use self-checkout
- Quality of produce
- Variety of produce
- Price
- No other options
- Location – close to home
- Location – close to work/school
- Location – close to bus route
- Store hours
- Other (please specify)

Q18 Edit Question Move Delete

**18. How long does it typically take you to reach your primary food retailer? In minutes:**

null Split Page Here

Q19 Edit Question Move Delete

**19. How long does it typically take you to reach your secondary food retailer? In minutes:**

null Split Page Here

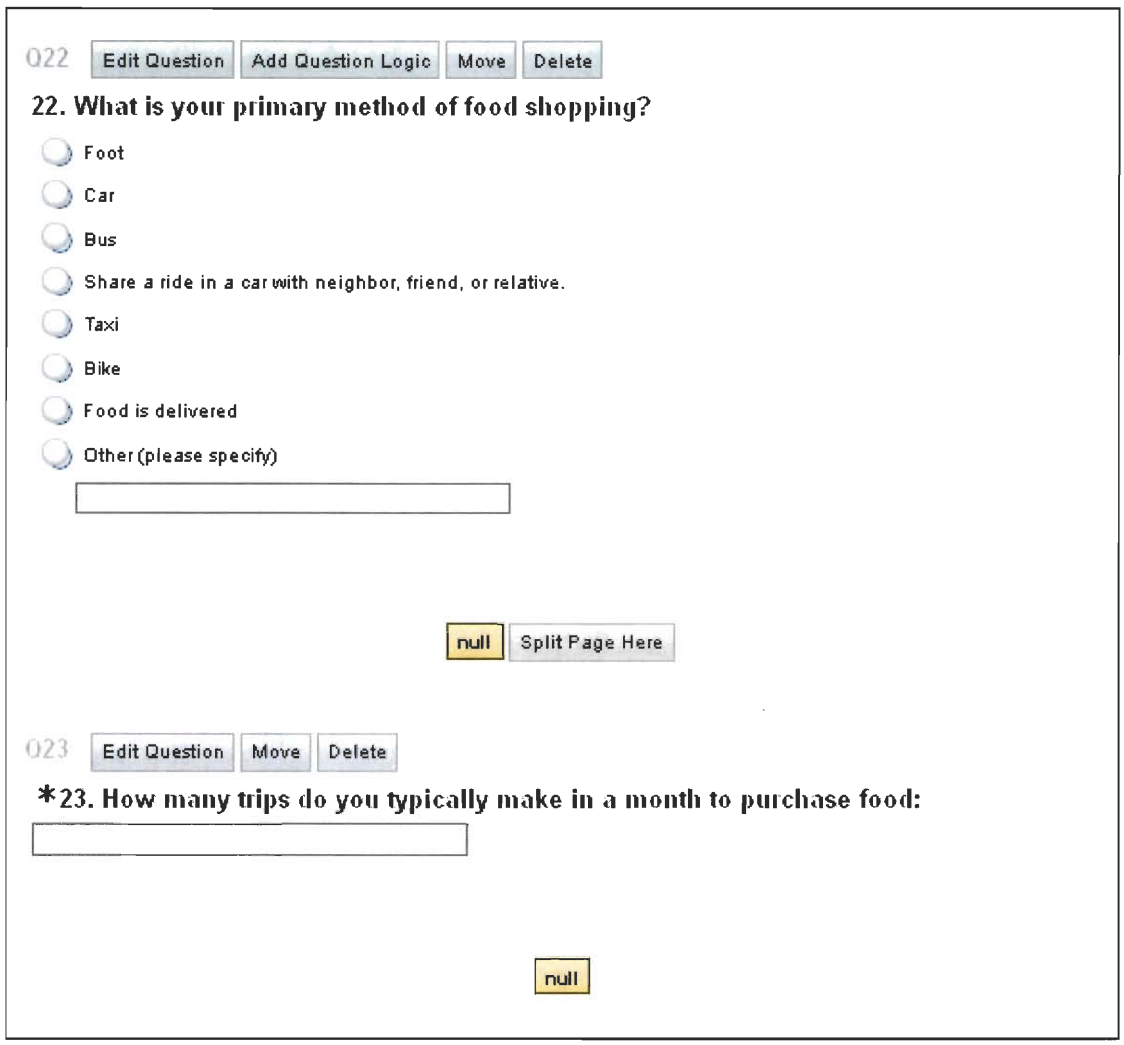
Q20 Edit Question Move Delete

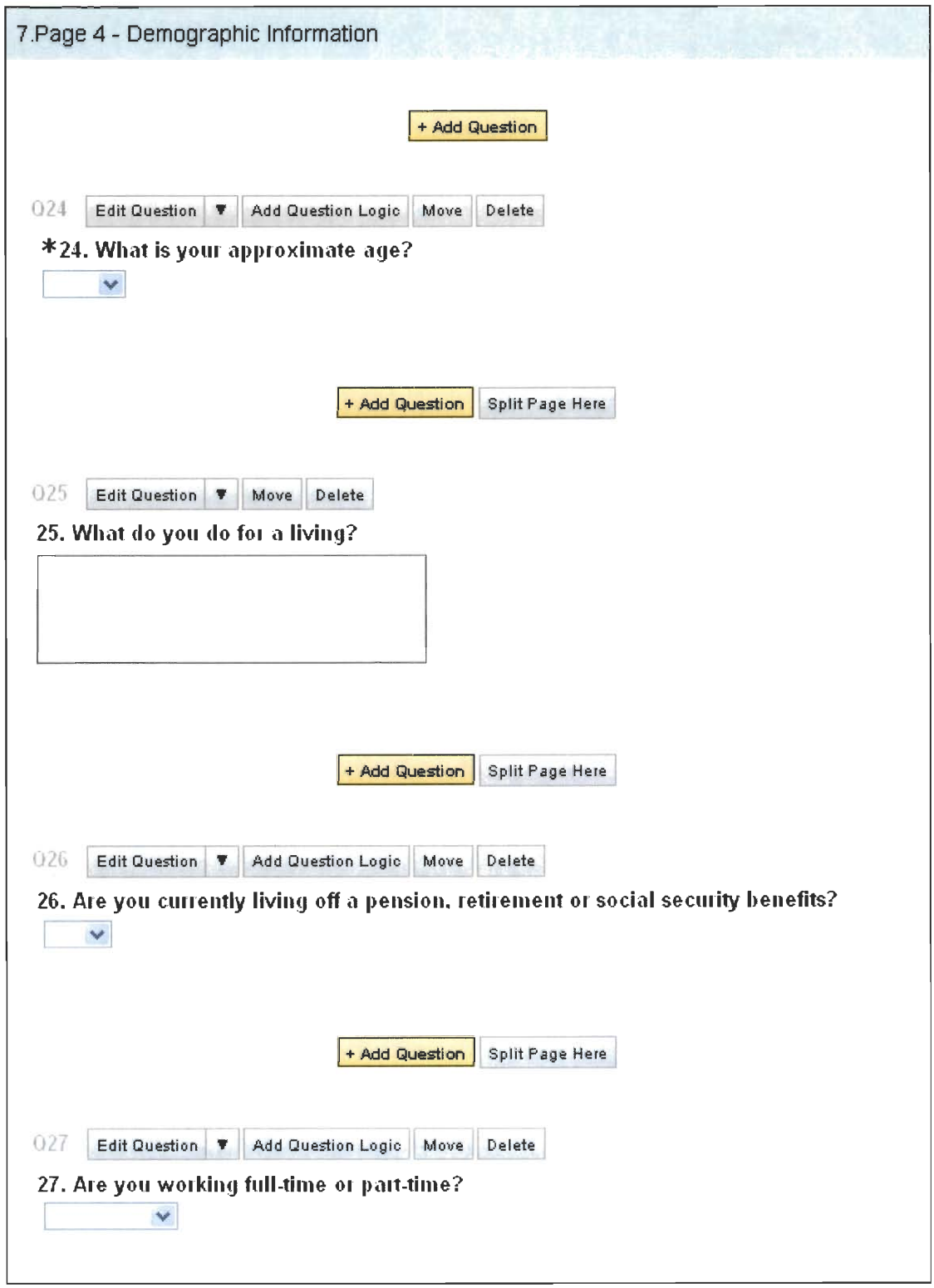
**20. What is the average length of time you spend shopping for food on an average trip? In hours and minutes: (example 0 hrs 45 mins, or 1 hr. 15 mins)**

null Split Page Here

Q21 Edit Question Add Question Logic Move Delete

**21. Do you own a car?**


Q22
Edit Question
Add Question Logic
Move
Delete
22. What is your primary method of food shopping?
Foot
Car
Bus
Share a ride in a car with neighbor, friend, or relative.
Taxi
Bike
Food is delivered
Other (please specify)
null
Split Page Here
Q23
Edit Question
Move
Delete
*23. How many trips do you typically make in a month to purchase food:
null


7.Page 4 - Demographic Information
+ Add Question
Q24
Edit Question
Add Question Logic
Move
Delete
*24. What is your approximate age?
+ Add Question
Split Page Here
Q25
Edit Question
Move
Delete
25. What do you do for a living?
+ Add Question
Split Page Here
Q26
Edit Question
Add Question Logic
Move
Delete
26. Are you currently living off a pension, retirement or social security benefits?
+ Add Question
Split Page Here
Q27
Edit Question
Add Question Logic
Move
Delete
27. Are you working full-time or part-time?

Q28 Edit Question | Move | Delete

**28. How long have you lived at this residence in years and/or months?**

null | Split Page Here

Q29 Edit Question | Move | Delete

**29. If less than one year, where did you live prior to here? Leave blank if not applicable.**

null | Split Page Here

Q30 Edit Question | Add Question Logic | Move | Delete

**30. If in your current location for less than a year, how would you best describe your previous community?**

- Suburban
- Urban
- Rural
- Campus
- Apartment Complex
- Trailer Park
- Other (please specify)

Q31 Edit Question | Add Question Logic | Move | Delete

**31. Are you currently taking classes at the college level?**

null | Split Page Here

Q32 Edit Question | Add Question Logic | Move | Delete

**32. What is your highest level of education?**

- Less than 9th grade
- Some High School
- High School/GED
- Some College
- Associates
- Bachelors Degree
- Masters/JD
- PhD/MD
- Other (please specify)

null | Split Page Here

Q33 Edit Question | Move | Delete

**33. Optional – In the space below, please provide any opinions you have about food access at your current location:**

Appendix B
HSIRB Approval Letter

WESTERN MICHIGAN UNIVERSITY

Human Subjects Institutional Review Board

Date: March 10, 2011

To: Lucius Hallett, Principal Investigator
Thomas Veldman , Student Investigator for thesis

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number: 11-03-10

This letter will serve as confirmation that your research project titled "A Perception Analysis of Downtown Residents: The City of Lansing, MI: Food Desert in Context" has been **approved** under the **exempt** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: March 10, 2012

Walwood Hall, Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293 FAX: (269) 387-8276

# Appendix C
# Consent Form

**CONSENT FORM**

You are invited to participate in a Western Michigan University research project entitled "*A Perception Analysis of Downtown Residents: The City of Lansing, MI Food Desert in Context.*" The study is designed to analyze how residents purchase food in Downtown Lansing, where they purchase food, and their perceptions of food access given their current mode of transportation. Information gathered from this research may aid future research into understanding the nature of food deserts in communities worldwide. The study is being conducted by Dr. Lucius F. Hallett IV and Mr. Thomas J. Veldman, from the Department of Geography of Western Michigan University. The research is being carried out for part of the thesis requirements for Mr. Thomas J. Veldman.

Your responses will be completely anonymous, please do not put your name or address anywhere on this form except where indicated to be considered for the $100 Gift Card, which will be stored separately upon receipt from the survey you completed. It will not be possible to link your personal information to your survey response once this information has been separated. You may choose not to answer any question by leaving the question blank. If you do not want to participate in the survey, please discard the survey and the return envelope. By returning the completed survey, you indicate your consent for the use of the answers you supply. If you have any questions, or you wish to not participate in this survey after you submitted it, you may contact Dr. Lucius F. Hallett, IV at (269-387-3536 or lucius.hallett@wmich.edu), Mr. Thomas Veldman at (517-889-2044 or thomas.j.veldman@wmich.edu), the Human Subjects Institutional Review Board (269-387-8293) or the Vice President for research at Western Michigan University (269-387-8298).

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Subjects should not participate in this project if the stamped date is more than one year old.

*Contact Information:*


**Dr. Lucius F. Hallett, IV**
1903 W. Michigan Ave. MS 5424
Kalamazoo, MI 49008-5424
PH: 269-387-3536
E-mail: lucius.hallett@wmich.edu

**Thomas Veldman**
1903 W. Michigan Ave. MS 5424
Kalamazoo, MI 49008-5424
PH: 517-889-2044
E-mail: thomas.j.veldman@wmich.edu

**Human Subjects Institutional Review Board**
1903 W. Michigan Ave. MS 5456
Kalamazoo, MI 49008-5424
PH: 269-387-8293
E-mail: research-compliance@wmich.edu

**Office of the Vice-President for Research**
1903 W. Michigan Ave. MS 5456
Kalamazoo, MI 49008-5424
PH: 269-387-8293
E-mail: ovpr-info@wmich.edu


**Survey Code:** **ONLINE: Please reference your initials and block address if you choose not to participate after you complete the online survey.**

WESTERN MICHIGAN UNIVERSITY
H. S. I. R. B.
Approved for use for one year from this date:
MAR 1 2 2011
HSIRB Chair

# BIBLIOGRAPHY


Acheson, D. (1998). Independent inquiry into inequalities in health. London: The Stationary Office.

Alwitt, Linda A., and Thomas D. Donley. (1997). "Retail Stores in Poor Urban Neighborhoods." *The Journal of Consumer Affairs* 31.1 139-64.

Ball, K., Timperio, A. F., & Crawford, D. A. (2006). Understanding environmental influences on nutrition and physical activity behaviors: where should we look and what should we count? *The International Journal of Behavioral Nutrition and Physical Activity, 3-33.*

Bitler, Marianne and Steven J. Haider. 2010. "An Economic View of Food Deserts in the United States." *Journal of Policy Analysis and Management* 30(1),153-176.

Capps, O., & Nayga, R. (1999). US consumers' perceptions of the importance of following the US dietary guidelines. *Food Policy, 24*(5), 553-564.

Cotterill, R. W., & Haller, L. E. (1992). Barrier and queue effects: A study of leading us supermarket chain entry patterns. *The Journal of Industrial Economics, 40*(4), 427-440.

Cummins, S., & Macintyre, S. (2002). A systematic study of an urban foodscape: the price and availability of food in greater Glasgow. *Urban Studies*, 39(11), 2115 -2130.

Cummins, S., & Macintyre, S. (2006). Food environments and obesity—neighbourhood or nation? *International Journal of Epidemiology*, 35(1), 100 - 104.

Cummins, S., Marshall, D., Sparks, L., Taylor, M., Dawson, J., Dewar, J., et al. (2007). The development of a healthy eating indicator shopping basket tool (HEISB) for use in food access studies—identification of key food items. *Public Health Nutrition, 10*(12), 1440-1447.

Cummins, S., Smith, D. M., Taylor, M., Dawson, J., Marshall, D., Sparks, L., & Anderson, A. S. (2009). Variations in fresh fruit and vegetable quality by store type, urban-rural setting and neighbourhood deprivation in Scotland. *Public Health Nutrition*, 12(11), 2044-2050.

Diez-Roux, A. V., Nieto, F. J., Caulfield, L., Tyroler, H. A., Watson, R. L., & Szklo, M. (1999). Neighbourhood differences in diet: the Atherosclerosis Risk in

Communities (ARIC) Study. *Journal of Epidemiology and Community Health*, 53(1), 55-63.

Diez-Roux, A. V., Nieto, F. J., Caulfield, L., Tyroler, H. A., Watson, R. L., & Szklo, M. (1999). Neighbourhood differences in diet: the Atherosclerosis Risk in Communities (ARIC) Study. *Journal of Epidemiology and Community Health*, 53(1), 55-63.

Dolby, V., 1996. Where American diets fall short, supplements make up the difference. *Better Nutrition for Today's Living* 58 (9), 12.

Donald, R. (2007). Food stamps, the thrifty food plan, and meal preparation: The importance of the time dimension for US nutrition policy. *Journal of Nutrition Education and Behavior, 39*(4), 226-232.

Downtown Professionals Network. (2009). Downtown Lansing, Michigan Market Study and Strategies Summary Version.

Duvall, C. S., Howard, P. H., & Goldsberry, K. (2010). Apples and Oranges? Classifying Food Retailers in a Midwestern US - City Based on the Availability of Fresh Produce. *Journal of Hunger & Environmental Nutrition*, 5(4), 526-541.

Eyre, H., Clarke, G., & Guy, C. (2004). Food retail change and the growth of food deserts: A case study of Cardiff. *International Journal of Retail Distribution Management, 32*(2/3), 72.

Fisher, G. (1997). The low-income consumer: Adjusting the balance of exchange, *The Journal of Consumer Affairs, 31*(2), 372-376.

Food Marketing Institute, 1990. Trends: Consumer Attitudes and the Supermarket. Washington, DC.

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.

Goldsberry, K., Duvall, C. S., Howard, P. H., & Stevens, J. E. (2010). Visualizing nutritional terrain: a geospatial analysis of pedestrian produce accessibility in Lansing, Michigan, USA. *GEOCARTO International*, 25(6), 485-499.

Gould, P. and White, R. (1974). *Mental Maps.* Baltimore, MD: Penguin Books.

Hallett IV, L. F., & McDermott, D. (2011). Quantifying the extent and cost of food deserts in Lawrence, Kansas, USA. *Applied Geography, 31*(4), 1210-1215.

Laraia, B. A., 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*, *39*(5), 869-875.

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*(1), 16.

Laurison, H., Giang, T., Karpyn, A., Hillier, A., & Perry, R. D. (2008). Closing the grocery gap in underserved communities: The creation of the Pennsylvania fresh food financing initiative. *Journal of Public Health Management and Practice, 14*(3), 272-279.

McLafferty, Sara L. (2010). Conducting Questionnaire Surveys. *Key Methods in Geography, 2nd Edition.* Sage Books: 77-88

Michigan Department of Community Health. (2009). Overweight and Obesity: Surveillance Report Series. http://www.michigan.gov/ documents/mdch/ Obesity_chapter_283600_7.pdf

Moore, L. V. (2007). *Measuring the local food environment and its associations with diet quality.* University of Michigan). *ProQuest Dissertations and Theses,* , 91 p.

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., A.V. Diez Roux, and S. Brines (2008). "Comparing Perception-Based and Geographic Information System (GIS)-Based Characterizations of the Local Food Environment," *J Urban Health*, March, 85(2): 206-16.

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., Diez Roux, A., & Wing, S. (2002). 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.

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.

Nayga Jr., Rodolfo M. & Capps Jr., Oral, 1999. "US consumers' perceptions of the importance of following the US dietary guidelines," *Food Policy*, Elsevier, vol. 24(5), pages 553-564, October.

Nayga, R.M., 1997. Impact of sociodemographic factors on perceived importance of nutrition in food shopping. *Journal of Consumer Affairs* 31 (1), 1–9.

Patterson, R.E., Kristal, A.R., White, E., 1996. Do beliefs, knowledge, and perceived norms about diet and cancer predict dietary change? *American Journal of Public Health* 86 (10), 1394–1400.

Pearson, T., Russell, J., Campbell,M.J.,&Barker, M. E. (2005).Do'food deserts' influence fruit and vegetable consumption? - a cross-sectional study. *Appetite*, 25, 195-197.

Pothukuchi, K. (2005). Attracting supermarkets to inner-city neighborhoods: Economic development outside the box. *Economic Development Quarterly, 19*(3), 232-244.

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*(3), 189-195.

Reed, M. (2011). Examining the behavioral interactions between urban residents and their food environment: A case study of greater Lansing, Michigan. *ProQuest Dissertations and Theses.*

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.

Rushton, G. (1969). Analysis of spatial behavior by revealed space preference', *Annals of the Association of American Geographers,* 59: 391-406

Short, A., Guthman, J., Raskin, S. (2007) Food Deserts, Oases, or Mirages?: Small Markets and Community Food Security in the San Francisco Bay Area *Journal of Planning Education and Research* March 26, 352-364.

Simms, E. (2011). Local food: Perceptions and realities in southwest Michigan, *ProQuest Dissertations and Theses.*

Trochim, W. (1989). An introduction to concept mapping for program planning and evaluation. Evaluation and Program Planning, 12, 1-16.

Trochim, W. M., & Kane, M. (2005). Concept mapping: An introduction to structural conceptualization in health care. International Journal for Quality in Health Care, 17, 187-191.

Tyebjee, T. T. (1979). Telephone survey methods: the state of the art. *The Journal of Marketing*, *43*(3), 68-78.

U.S. Census Bureau. (2010). Census. Retrieved October 11, 2010, from http://2010.census.gov/2010census/.

United States Department of Agriculture. (2011). Food Desert Locator. http://www.ers.usda.gov/data/fooddesert/fooddesert.html

Walker, R., Keane, C., Burke, J., (2010), Disparities and access to healthy food in the United States: A review of food deserts literature, *Health & Place*, Volume 16, Issue 5, 876-884

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

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

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

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