AN ANALYSIS OF THE RESTAURANT LANDSCAPE IN THE DETROIT METROPOLITAN AREA: TRAVEL BEHAVIOR AND SPATIAL PATTERNS OF DIFFERENCE

By

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ABSTRACT

AN ANALYSIS OF THE RESTAURANT LANDSCAPE IN THE DETROIT METROPOLITAN AREA: TRAVEL BEHAVIOR AND SPATIAL PATTERNS OF DIFFERENCE

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This dissertation examines the spatial pattern and density of fast food restaurants in the Detroit region, and uses the results of a travel survey to analyze what types of restaurants respondents travel to in an average week. These travel characteristics are explored relative to urban form and sociodemographics of the respondents. A primary contribution to the literature is the use of reported restaurant travel trips, as opposed to making assumptions based solely on proximity or density of nearby restaurants. The study area is the Detroit region, characterized by a wide range of socioeconomics, demographics, and urban forms in a relatively small geographic area. The study sites selected represent high- and low-density neighborhoods as well as areas of affluence and extreme poverty. The neighborhood study sites include two high-density, low-income neighborhoods in Detroit; two high-density, higher-income neighborhoods in Ann Arbor and Birmingham; and two low-density, high-income neighborhoods in Bloomfield Hills and West Bloomfield, for a total of six neighborhoods.

Using data on the locations of licensed restaurants in the study region at the time of the survey (2007-08), fast food density was calculated in multiple ways, including per capita, per square mile, and per road mile. The results show that residents of the City of Detroit have a slightly higher exposure to fast food than suburban counterparts. More notable is that of all restaurants in a municipality, Detroit has a higher proportion that is fast food (22%), compared to 15% in the low-density suburbs and 13% in the high-density suburbs. Using 997 completed

travel surveys, the analysis reveals stark differences in the types of restaurants visited by Detroit respondents compared to suburban respondents. The majority of all restaurant trips (77%) for Detroit respondents are to fast food establishments, compared to 22% in the low-density suburbs and 17% in the high-density suburbs. More than half (52%) of Detroit respondents report traveling to a fast food restaurant in an average week, compared to 16% in both the low-density and high-density suburbs. Thus, Detroiters are dining out to fast food about three times as often as their suburban counterparts, despite having only a slightly higher density and proportion of fast food restaurants.

Additionally, higher-income respondents travel farther on average to dine out, and are less likely to travel to fast food. While there is little difference in characteristics relating to a likelihood to dine out to restaurants in general, there are significant differences when examining trips to fast food restaurants. One or more trips to fast food in an average week is related to a higher body mass index, fewer servings of vegetables, more servings of soft drinks, less vigorous exercise, and cigarette smoking.

The connected street grid design, density, and mixed-use zoning that is often associated with good urban design, walkability, and better health outcomes can be found in the high-density study neighborhoods of urban Detroit and the suburbs of Ann Arbor and Birmingham. Yet despite similar urban form, the suburban communities are reporting a much lower prevalence of obesity, higher likelihood to engage in exercise, more ideal nutritional choices than Detroit. Further examination into these complex relationships is warranted in order to help alleviate the public health disparities we see around obesity and diet-related diseases.

For Mike. I'll miss you always.

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Lastly, I wish to thank the citizens of Detroit for participating in the survey, and to acknowledge the city as more than a place that exists under the lens of the academic microscope. I can only wish that I had the determination and strength of Detroit residents who have stayed and fought to rebuild and maintain communities, neighborhoods, and local economies when so much of the world had written them off. #DetroitVsEverybody

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KEY TO ABBREVIATIONS

BMI—Body Mass Index

CDC—Centers for Disease Control

DIA—Detroit Institute of Art

FFR—Fast Food Restaurants

HDS—High-density Suburban

HDU—High-density Urban

LDS—Low Density Suburban

MDARD—Michigan Department of Agriculture and Rural Development

SEMCOG—Southeast Michigan Council of Governments

CHAPTER 1: INTRODUCTION

"Everything that is social (justice included) is simultaneously and inherently spatial, just as everything spatial, at least with regard to the human world, is simultaneously and inherently socialized." –Soja (2010), p. 5.

Food affects our lives in a variety of ways, not the least of which being by providing adequate nutrition and sustenance for survival. It also has significant social, cultural and even emotional importance. In the United States, despite our food production levels and general affluence, we have residents with low food security as well as high rates of diet-related diseases. Research into spatial patterns of food outlets and food access behavior has been a growing topic in a variety of social science and public health disciplines. It is also of concern to practitioners and activists in urban areas. This dissertation explores the idea of Detroit as a "food swamp," an area with few healthy options and large relative amounts of less healthy, energy-dense snack foods (Rose, Bodor and Swalm 2009).

Interest into where and how individuals access the food they eat relative to what is available in their neighborhood intersects with research into childhood obesity (Alviola et al. 2014; Galvez 2009; Lee 2012; Salois 2012) and health of low-income individuals (for example Cotti and Tefft 2013; Drewnowski and Specter 2004; Gordon et al. 2011; Lovasi et al 2009). Food access is also of interest from the perspective of spatial equity and racial justice research (for example Dunn 2012; Kwate 2008; Passiodomo 2013; Zenk et al. 2014). Food desert/food access research has expanded from assessments of proximity to food retail (for example Eckert and Shetty 2011; Wrigley 2002; Wrigley et al. 2003) to more complex and comprehensive

research into travel behavior (for example Auchincloss et al. 2011; LeDoux and Vojnovic 2014; LeDoux and Vojnovic 2013; Rose 2011; Vojnovic et al. 2014). And food access research has shifted to focus not just on the absence of grocers (for example Eckert and Shetty 2012; Eckert and Shetty 2011; Whelan et al. 2002; Wrigley 2002; Wrigley et al. 2003;), but the role of lower-quality food outlets that remain (such as fast food restaurants and convenience stores) in diet and health (for example Cooksey-Stowers, Schwartz & Brownell 2017; Hillmers, Hillmers and Dave 2012; Jeffrey et al. 2006; Rose, Bodor and Swalm 2009).

While much of the food desert literature has focused on retail, (i.e., grocery and convenience stores), restaurants play an important role in the foodscape. To date, much of the focus on restaurants has been on the influence and distribution of fast food restaurants, with less attention given to restaurants of all types, including casual chains and upscale restaurants. Fast food and restaurant dining are a significant source of food consumption. While how much of an impact food away from home has on diet is unclear, research indicates that dining out is related to worse dietary choices. Mancino, Todd and Lin (2009), for example, argue that most models may overestimate this relationship by as much as 25%, but even when attempting to account for as much endogeneity and personal preference as possible, they found that lunch and dinner away from home related to higher caloric intake and lower quality nutrition. The average American consumes 2,044 calories per day, with 209 calories coming from restaurants with waiter service and 264 coming from fast food, and an average of 31% of daily calories coming from sources outside the home (Lin and Mentzer Morrison 2012). Thus, restaurants of all types can play a significant role in diet and health. The average adult fast food meal purchase contains around 900 calories (Block et al. 2013; Brissette et al. 2013). The percentage of calories

that come from fast food increased nearly threefold between 1978 and 2011, and fast food is the largest source of away-from-home calories for individuals both above and below the federal poverty level (Guthrie, Lin and Smith 2016). Individuals who are employed are more likely to consume fast food than the unemployed (Hamrick and Okrent 2014).

During and after the Great Recession of 2007-2009, Americans overall ate out at sit down restaurants less; however, fast food consumption remained constant. In fact, some segments of the population, such as employed single parents, were more likely to purchase fast food than before the recession (Hamrick and Okrent 2014). This is noteworthy given the time period that the survey data used in this research were collected (2007—2008)

This dissertation seeks to add to the literature on restaurant landscapes and food consumption behavior by using the results of a travel survey in the Detroit metro area. The research has two main objectives: first, to examine the spatial pattern of restaurants by type at the time of the travel survey for all five municipalities where the study sites are located—Ann Arbor, Birmingham, Bloomfield Hills (city and township), Detroit and West Bloomfield; second, to examine the travel behavior patterns in the survey data to explore differences among socioeconomic and demographic characteristics and neighborhood type. Spatial patterns of food outlets are certainly important, but they may tell us much more about patterns of disinvestment than they do about where people actually access food.

While research has shown that residents go outside the neighborhood to access full service grocers (LeDoux and Vojnovic 2013; LeDoux and Vojnovic 2014; Rose 2011; Vojnovic et al. 2014), we do not yet know if the same holds true for dining out at restaurants. This dissertation will answer that question by looking at where residents dine out. Additionally, it

will analyze the demographics of who is eating at fast food restaurants as compared to other types of restaurants such as casual chain or upscale restaurants.

The study area is the City of Detroit and select higher income suburbs of the city. Detroit is the poster child for post-industrial decline, having lost half of its population since its 1950 peak due to shifts in the manufacturing industry as well as suburbanization. The city continues to be plagued by poverty and unemployment and recently endured a bankruptcy, while several of its suburbs are quite affluent. Detroit is among the most racially segregated areas in the country, with the city's population (82% black) an inverse of the suburban population (80% white) (Vojnovic and Darden 2013), making the Detroit metro area severely segregated by both race and class.

While a changing economy throughout the second half of the Twentieth Century left fewer manufacturing jobs in the city, federal and state funding for the city also declined. Urban planners and civic leaders in Detroit struggle to achieve successful redevelopment in Detroit, according to June Manning Thomas (2013), for two primary reasons: lack of implementation tools and proper administrative structures, and racial bias, specifically white support of racial residential segregation. Residents left behind in Detroit have experienced difficulty in accessing quality services, most notably education, as Detroit Public Schools are under emergency manager control and undergoing restructuring (Weber 2015). The school system has been under state control for 12 of the last 15 years, under four different state-appointed emergency managers, and the elected school board recently filed a federal lawsuit against the state, citing mismanagement, fraud and abuse (Cwiek 2015). Detroit has held the undesirable title of "Murder Capital of the U.S." for five separate years since 1985, with the highest rate of murders

per 100,000 people (FBI, n.d.). Between 2008 and 2012, Detroit spent an average of $100 million more per year than it was generating in revenue (Brogan 2015). In 2013, Kevyn Orr, a bankruptcy lawyer, was appointed as Emergency Manager for Detroit by Governor Rick Snyder, though Detroit elected officials were not supportive of the appointment (Davey 2013); the city filed for Chapter 9 bankruptcy shortly thereafter. Although the City of Detroit emerged from bankruptcy in December 2014 (Davey 2014), in July 2015 Governor Snyder declared Wayne County, in which Detroit is located, to be in financial emergency (Lawrence 2015). The circumstances contributing to Detroit's decline from its peak as a thriving manufacturing powerhouse of 1.8 million residents will be addressed in detail in Chapter 3.

History has shown that highly concentrated industrial investment has brought about change to the spatial structure and layout of many cities. With the rise of industry and the accompanying pollution and growing population, upper-class residents began seeking refuge on the outskirts of the city, rather than on more centralized lots, marking the beginning of the trend toward suburbanization (Nijman and Clery 2015). The streetcar, and then ultimately the automobile and post-World War II federal policy encouraging homeownership and highway construction, further drove the exodus of more affluent individuals out of cities and into the suburbs, taking their tax revenue with them. While modern-day American suburbs—and their relationship to their central city—are often diverse and change over time, they have given rise to patterns of "spatial fragmentation" and "splintered urban governance" (*ibid*). This splintered urban governance is evident in Detroit's suburban fabric and a lack of regional cooperation among the various municipalities. Detroit's poor fiscal situation is something suburban voters

wish to distance themselves from, rather than invest in. Detroit's location among the surrounding suburban municipalities is depicted in Figure 1-1.

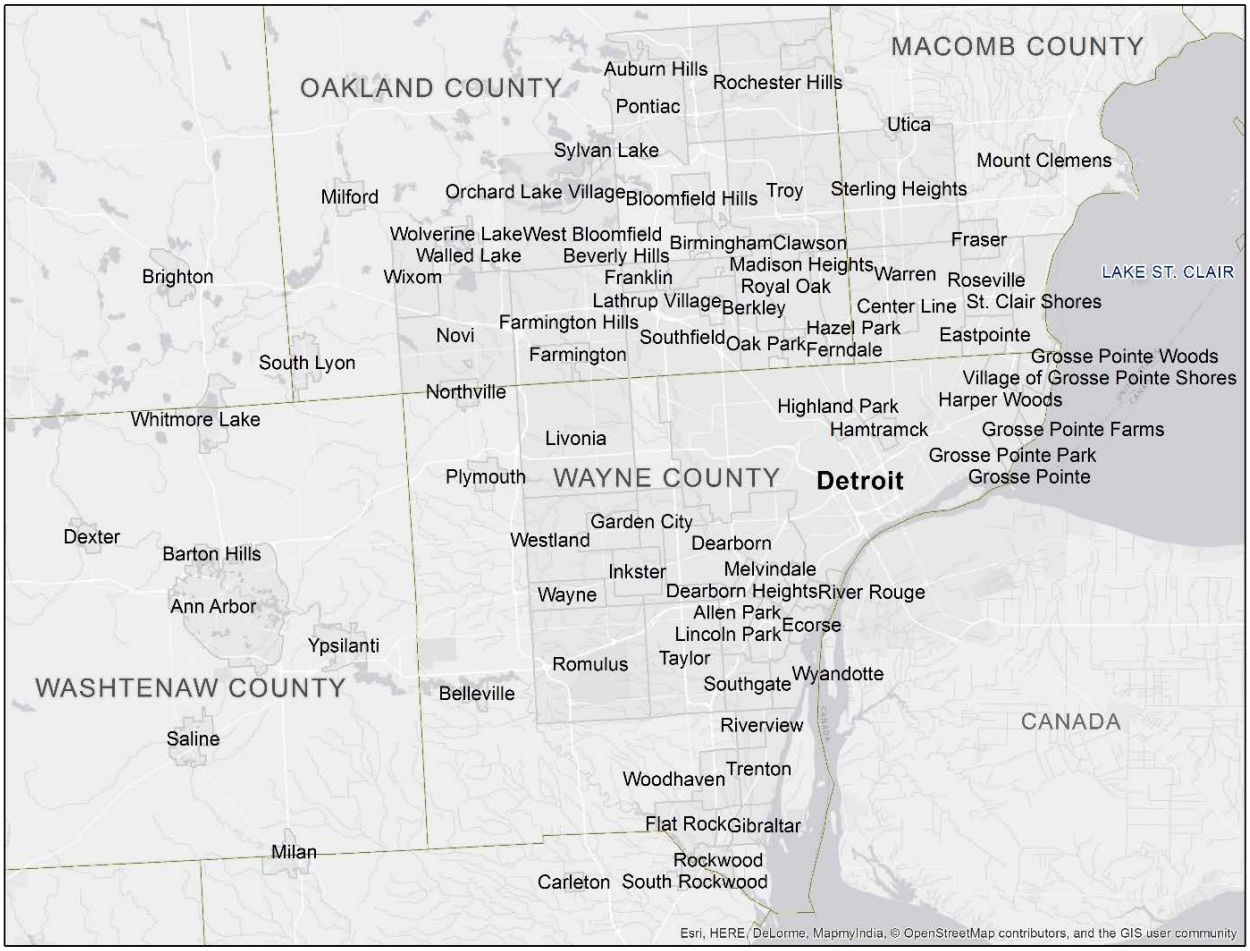

Figure 1-1: The greater Detroit metropolitan region

In an urban area such as this, residents often struggle to earn enough money to make ends meet. In 2007 (the time the survey used in this dissertation began), an estimated 32.5% of Detroit residents lived below the poverty level, including 45.7% of Detroit children under the age of 18 (2005-2007 American Community Survey 3-Year Estimates, U.S. Census). Its unemployment rate hovered around 14%, a low it would not see again until the end of 2014 after reaching a staggering 29% following the global recession of 2008 (Bureau of Labor

Statistics). One of the many needs that urban residents struggle to meet is accessing sufficient nutritious, affordable, culturally appropriate food. In U.S. cities, restaurants play a large role in our daily food habits. In the Detroit metropolitan area, given the spatial patterns of development and inequality, I expect to see significantly different patterns in restaurant availability and restaurant travel behavior.

Research Objectives

In considering the topics of food access, spatial inequality, and uneven development in the Detroit region, I have identified two main research objectives for this dissertation:

Objective 1: Examine the spatial pattern of restaurants by type at the time of the travel survey (2007) for all 5 municipalities, including a five-mile buffer zone around study areas.

This will lend to a better understanding of the choices survey respondents reported in the survey. Did they travel to what was the closest option, or did they bypass other choices?

Objective 2: Examine the travel behavior patterns in the survey data to explore differences among socioeconomic and demographic characteristics and neighborhood type.

This will provide insight into actual travel behavior with regard to restaurants, and not rely on inferring travel from proximity or density of food choices.

Research Questions

To achieve these objectives, four main research questions were identified:

1. What is the existing restaurant landscape in the study area?

2. Where and how often did the survey respondents report traveling to restaurants in relation to their home address?
3. Are there differences in this travel based on the study neighborhood or individual characteristics, such as income, education, vehicle ownership or family/household structure?
4. Are there any measurable relationships between self-reported measures of BMI (as a proxy for health) and restaurant travel, either by type of restaurant or frequency of dining out?

The questions will be answered by analyzing the results of a travel behavior survey for six neighborhoods in the Detroit region: two in the City of Detroit, and one each in Ann Arbor, Birmingham, Bloomfield Hills and West Bloomfield, collected in 2007-08. The survey will be supplemented with restaurant location data obtained from the Michigan Department of Agriculture and Rural Development. The research questions, survey methodology, data collection and study sites will be described in detail in Chapter 4.

Conceptual Framework

For legacy cities in the so-called Rust Belt, two primary, interrelated phenomena fueled the shift from economically thriving, populous cities to urban areas characterized by decades of population loss, tax revenue loss, disinvestment, and vacant land. Deindustrialization, caused by numerous factors including global economic policies, and suburbanization and decentralization, driven by social preferences and U.S. government policies in the post-WWII era, both fueled an exodus of residents and created the current patterns of central city

disinvestment (Beauregard 2009; Darden 1987; Eisenger 2014; Galster 2012; Sugrue 1996; Thomas 1990; Thompson 2001; Vojnovic et al. 2014). This dissertation is informed by the framework of how this resulting pattern has created a pattern of *spatial injustice*.

For those urban scholars, practitioners and other scholars interested in social justice, Detroit seems an obvious spatial area where social justice is not being met. According to Harvey (1973), there are three main principles for social justice in the geographic context (p. 107):

> 1) The spatial organization and the pattern of regional investment should be such as to fulfil the needs of the population…the difference between needs and actual allocation provide us with an initial evaluation of the degree of territorial injustice in an existing system.
>
> 2) A spatial organization and pattern of territorial resource allocation which provides extra benefits in the form of need fulfilment (primarily) and aggregate output (secondarily) in other territories through spillover effects, multiplier effects, and the like, is a "better" form of spatial organization and allocation.
>
> 3) Deviations in the pattern of territorial investment may be tolerated if they are designed to overcome specific environmental difficulties which would otherwise prevent the evolution of a system which would meet needs or contribute to the common good.

Harvey describes the principle of social justice, therefore, as one which "applies to the division of benefits and the allocation of burdens arising out of the process of undertaking joint

labour" (p. 97). [1] Or, to phrase it alternatively, social justice is concerned with the wealth—or, the benefits of labor--of the capitalist system pooling at the top of the system and not being distributed in a more equitable way among the working classes, as well as government policies, housing markets, and planning and zoning. While Harvey writes of *social* justice, he does so in a *spatial* context. Soja (2010) makes the argument that much of the research on social (or economic, or environmental) justice is spatial, and that using the term *spatial justice* will encourage us to recognize it as such. As this dissertation will highlight, disparities in spatial patterns of income, opportunities and amenities (as represented by restaurants in this case) are obvious across the Detroit metropolitan area. Suburban communities benefit from the city of Detroit in many ways that the city's own residents do not—be it enjoying sporting events or concerts in Downtown or being employed in tech jobs, hospitals or universities in Midtown, but the relationship is not reciprocal. With recent large redevelopment projects within the city focusing on only select areas, suburban residents and visitors to Detroit are much more likely to share in the benefits than most of the city's current residents (Eisenger 2003; Reese et al. 2017).

Given Detroit's racial segregation, high poverty rate and unemployment, and struggling public school system, it is a city whose residents face obstacles in attaining services. For this reason, this research will likely reveal a different restaurant landscape in Detroit than that found in the suburbs. On the other hand, several of Detroit's suburbs are among the most affluent places in the U.S., a stark contrast to Detroit. This allows a comparison between

[1] Though his critiques of capitalism were evident in Social Justice and the City, his later work would of course move away from a "liberal formulation" for addressing urban inequality toward a socialist perspective. However, these principles are still useful here for identifying social injustice in cities.

neighborhoods that are not far apart in geographic distance but are very different in sociodemographic composition. The results of neoliberalism and economic disinvestment in Detroit have created a landscape where extreme concentrated poverty and racial segregation leave these segments of the population with diminished access to services and amenities. Restaurants have not been examined in this context for Detroit, so this dissertation will fill that gap.

Another type of "justice" that is socioeconomic as well as spatial in nature is food justice. In essence, food justice "places the need for food security—access to healthy, affordable, culturally appropriate food—in the contexts of institutional racism, racial formation, and racialized geographies" (Alkon and Norgaard 2009, p. 289). Diller (2013) argues that, in light of the current obesity epidemic, Americans should have a legal right not just to food, but *to nutrition,* and a right to be protected to some degree from the misleading or deceptive marketing of low-quality foods. While most people accept that humans have an inherent basic right to food, the U.S. government deals with domestic food insecurity via food assistance programs and has resisted acknowledging rights-based approaches, most likely because of the impact that might have on neoliberal policies that have created monolithic food corporations (Anderson 2012). Detroit, of course, has been no stranger to the effects of neoliberalism and government policy and legislation, and the experience of an emergency manager and outside control weakens local autonomy. Allen (2010) posits that increasing local control over food systems can undo some of the inequities in the food system. With regard to food in Detroit, we could view the growth of urban agriculture (Colasanti et al. 2012; Colasanti and Hamm 2010) as pushback against a corporate-controlled food retail industry that has, until recently, ignored

Detroit for decades. See Figure 1-2 for how food justice, deindustrialization and suburbanization tie together.

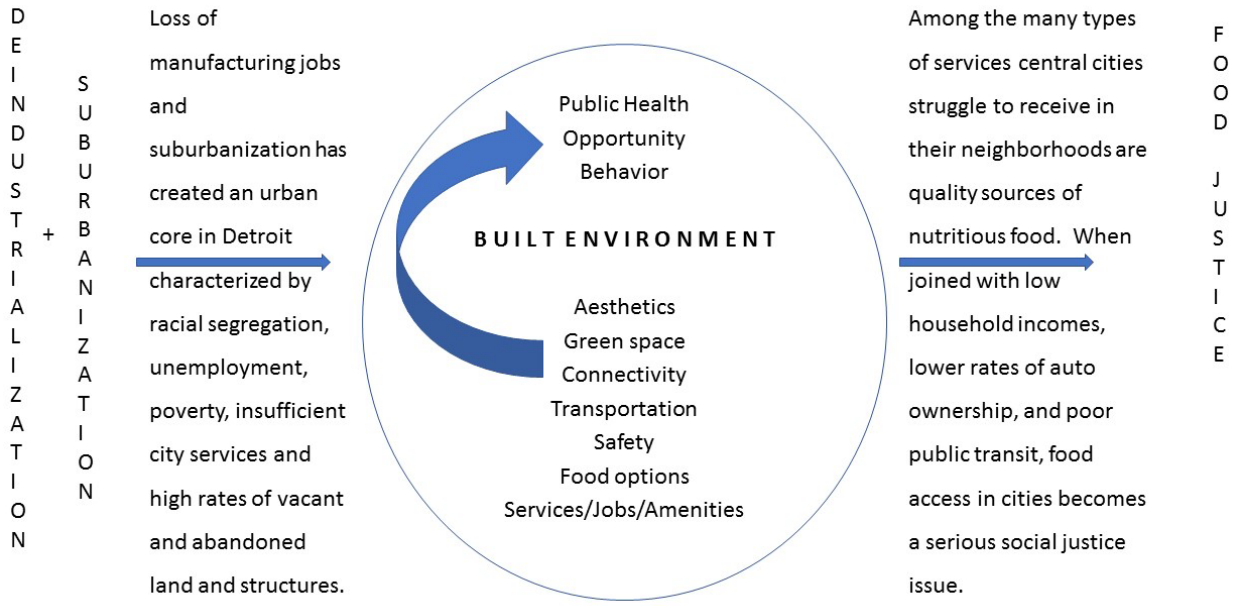

Figure 1-2: Conceptual diagram of postindustrial Detroit and food justice

A just food system has been defined as "one in which power and material resources are shared equitably so that people and communities can meet their needs, and live with security and dignity, now and into the future'' (Activist Researcher Consortium, 2004). Allen (2010) identifies numerous inequities, including low wages and poor working conditions for food-system workers, hunger and starvation of impoverished people and maldistribution of resources. While much of the food justice literature has focused on food retail like grocery stores, it can also be argued that lack of restaurants with healthier options, or a high concentration of fast food restaurants, in low income and minority neighborhoods is also a food justice issue. This framework of food justice is related to how the built environment shapes opportunity, in that individuals living in disadvantaged areas face additional obstacles to

accessing food than their more affluent counterparts. The factors that facilitated the current conditions in Detroit are related to those that contribute to obstacles in accessing nutritious food. For those concerned with issues of food justice, a disadvantaged landscape like Detroit provides a relevant case study.

It should be noted that while countless urban scholars have attempted to document and quantify inequality of various types—race, gender, income, employment, education, access to food, healthcare, services, amenities, etc.—in urban areas around the globe, the question of exactly what an equitable society would look like does not have a single, agreeable answer. Fainstein (2010) argues that equity, democracy and diversity are the primary qualities of urban justice, but cautions that these may be in conflict internally and/or with one another. It is a difficult, complex question, and this dissertation does not seek to answer it, but to lend additional support to the notion that it is a problem in dire need of a solution.

Intellectual Merit

There are two primary ways this research contributes to the food access literature. First, it furthers the shift from a mere analysis of the spatial pattern of food options across space to analyzing where people actually travel to access food. Using trips as reported by residents, we do not have to rely on assumptions of where people are traveling based on proximity. Therefore, the analysis adds to the existing literature by providing empirical information on the preferences for specific restaurants, the frequency of restaurant trips and the distance traveled. By overlaying these data on an analysis of fast food density, it becomes possible to compare fast food exposure and fast food consumption.

Second, it extends the research on access beyond grocery stores to restaurants. Much of the existing restaurant research in the social sciences focuses on proximity to fast food restaurants, while this research goes beyond that to look at all types of restaurants, with the justification that these could be outlets for fresh and healthy food in a landscape where these foods are lacking. In short, this research adds to the literature on Detroit, food justice, and restaurant landscapes by analyzing new empirical data collected across the Detroit region, and asking previously unanswered questions about the role of sociodemographics and built urban density in restaurant travel.

Organization

This dissertation is divided into seven additional chapters. Chapter 2 is a comprehensive literature review that weaves together several themes that are relevant to this research. Chapter 3 is devoted to the history and forces that have created the modern-day Detroit metropolitan region. Chapter 4 describes the data collection and methodology. Chapter 5 is an analysis of the spatial pattern of restaurants across the metro area and the travel behavior reported by the survey respondents. Chapter 6 looks for patterns and relationships between frequency of dining out and the types of restaurants visited and the demographic and socioeconomic characteristics of the respondents, and Chapter 7 explores these trips with regard to BMI and other health characteristics of the respondents. Chapter 8 concludes the dissertation with a discussion of the findings and their implications.

CHAPTER 2: LITERATURE REVIEW

The following section will demonstrate the intersectionality of the built environment, public health, and food environments and provide the background and context for the dissertation research.

The Built Environment and Impacts on Human Health and Behavior

Macintyre, Ellaway and Cummins (2002) noted the increase in studying the role of place and its influence on human health since the 1990s, and suggest using a framework of "universal human needs" to study place effects on health. They argue that health is not only based on who you are, but also on where you live. The framework the authors propose is based on basic human needs, such as Maslow's hierarchy of needs. These range from basic physical needs like food, water and shelter to more social and cultural needs. Essentially, those at the bottom of the hierarchy allow us to survive, but those higher up allow us to thrive. The literature on place and health is connected to the study of food access and travel behavior because diet is a principal driver of health. The available options in the built environment facilitate the ease or difficulty of accessing food.

The built environment, as defined by Handy et al. 2002, "comprises urban design, land use, and the transportation system, and encompasses patterns of human activity within the physical environment" (p. 65). Six primary dimensions of the built environment are density, land use mix, street connectivity, street scale, aesthetic qualities and regional structure (Handy et al. 2002). There is a large body of research on how the built environment impacts health in a variety of ways, such as through uneven access to resources, lack of walkability, unsafe

conditions and aesthetics. It is believed that land use and transportation policies contribute to positive or negative health outcomes by shaping food purchasing options and opportunities for physical activity (American Planning Association 2007).

Since one major component of human health is physical activity, there is a vast body of literature on how the built environment influences physical activity and obesity. There is support in the literature for theory suggesting that urban sprawl and automobile dependency have influenced lower rates of physical activity (Ewing et al. 2003) and are related to higher rates of obesity (Ewing, Pendall and Chen 2002). Conversely, urban environments characterized by compactness and pedestrian-friendly sidewalks encourage physical activity (Cervero 1996; Ewing 2005; Lathey et al. 2009). More mixed-use urban development and less time spent in a car correlate with lower rates of obesity (Frank et al. 2004).

Cohen et al. (2003) found that individuals in neighborhoods with vacant and boarded up buildings did not engage in as much outdoor physical activity. They also describe reactions to the built environment as either founded, due to the presence of drugs or other criminal activity that affect personal safety, or unfounded, based simply on aesthetics and perception. For example, they note that dilapidated neighborhoods do not inspire individuals to walk in the neighborhood unless necessary. Among older people, walkable neighborhoods, or those with destinations within reasonable walking distances, are positively correlated with more frequent walking (Berke et al. 2007; Marquet and Vliralles-Guasch 2015). Access to parks has also been related to higher levels of physical activity among children (Epstein et al. 2012). Access to greenspace and the presence of vegetation have also been positively correlated with mental health (Kardan et al. 2015; White et al. 2013). The condition of the built environment and its

ability to facilitate physical activity varies in higher income versus lower income neighborhoods, for example, through the decreased presence of recreation centers in low-income, minority neighborhoods as opposed to the more affluent areas (Gordon-Larsen et al. 2006). The presence of gyms and recreation facilities also correlate with higher rates of physical activity (Norman et al. 2006).

Equally important, if not more so, in a healthy lifestyle is diet. Obesity, heart disease, high blood pressure, type 2 diabetes, some cancers and dental disease are among conditions that can be brought on by poor dietary choices (World Health Organization 2003). A healthful diet should be based on fruits and vegetables, whole grains, nuts and legumes, low-fat dairy products and skinless poultry and fish, and should limit saturated fat, added sugars and sodium (American Heart Association, n.d.), leading to research questions about how accessible these items are in lower-income neighborhoods.

There are research findings that appear to support the idea that what exists in the built environment influences, at least to some degree, food and eating choices. The presence of supermarkets in a neighborhood is associated with a lower obesity rate, while a higher number of convenience stores is associated with a higher obesity rate (Morland et al. 2006). Among pregnant women, Laraia et al. (2004) found a higher quality of diet for those who live within two miles of a supermarket compared to women living four miles away. In a study in South Carolina, a higher number and density of supermarkets in the neighborhood related to lower BMI and waist circumference measurements among youth with diabetes (Lamichhane et al. 2012). In a survey of the literature, Papas et al. (2007) found that 17 out of 20 studies identified a significant connection between the built environment and obesity. In rural areas, better

health outcomes were related to higher numbers of supermarkets and direct farm sales, and lower numbers of fast food restaurants and convenience stores (Ahern et al. 2011).

In contrast to these studies, some literature suggests weak to no correlation between food behavior and urban form. For example, in their survey of the literature, Cobb et al. (2015) concluded that most studies do not find a definite relationship between food outlets and obesity. Shier et al. (2012) found no consistent relationship between food outlets in the environment and BMI of children. Some studies even suggest a correlation between supermarket availability and higher obesity rates (Cobb et al. 2015; Epstein et al. 2012; Shier et al. 2012). Though supermarkets do carry nutritious food choices, they also stock junk food. These findings suggest that access alone does not precipitate healthful food purchases or negate low-quality food purchases. The inconsistency in the findings suggests that some aspects of human behavior may not be captured in studies of proximity and physical access. This dissertation will help to fill this gap by using travel survey data and stated individual choices.

The study of the built environment and its influence on health is directly related to the discussion of food deserts. These underserved areas lead to questions of what role a perceived lack of healthful options, or inundation of unhealthful options, might contribute to the rate of obesity and other diet-related diseases that began to increase around the same time. For example, in 1998 Hill and Peters wrote in *Science* that "the current epidemic of obesity is caused largely by an environment that promotes excessive food intake and discourages physical activity" (p. 1371). While critics of this line of research (such as Guthman) are suspicious of any direct relationship between a person's weight and their neighborhood or socioeconomic

standing, the literature review that follows will demonstrate that numerous studies have suggested that a relationship exists, though it may not be one we yet fully understand. The literature demonstrates a clear relationship between diet and health (World Health Organization 2003; American Heart Association n.d.), but the relationship between the built environment and diet is less clear.

One of Guthman's (2011) critiques is that much of the literature on obesogenic environments, or built environments that facilitate obesity, treat individuals as objects in the environment rather than agents. To address this criticism, this dissertation seeks to treat individuals as agents by explicitly using travel information provided by the participants of the survey. By asking using their reports on destinations as opposed to the assumed travel behavior (derived by the researcher) we can begin to chip away at the complexity of the issue.

Urban Planning and Food

Cities are taking an interest in using planning and policy to shape a built environment that facilitates physical activity (Vojnovic et al. 2006) and better food options (American Planning Association 2007). Urban planners play a role, albeit one they may not recognize, in shaping the food environment (American Planning Association 2007; Pothukuchi and Kaufman 1999, 2000). Generally, urban planners have not viewed the food system as a primary area of their domain (Pothukuchi and Kaufman 1999, 2000), but that has begun to change as planners take a greater interest in the topic (American Planning Association 2007). Reasons that the American Planning Association (2007) currently recognizes the significance of the food system include: (a) food production requires a large amount of urban and regional land; (b) awareness

of the ability of planning to reduce both hunger and obesity; (c) the role of the food system in regional economies; (d) the environmental impacts of agriculture, and (e) the growth of urban agriculture. Northridge, Sclar and Biswas (2003) argue that the link between public health and urban planning was strong post-WWII, but has declined and should be reestablished. Planners and policymakers should be looking more closely at the built environment and urban form as one avenue through which to improve public health outcomes.

Over the last decade or so, urban food planning has become more prominent in local and regional policymaking. Examples of this trend include the rise of food policy councils, regional and city food plans, state and federal policy to support local food movements, and the inclusion of food in policy proposals which aim to address issues as diverse as social justice, urban sustainability, and native food cultures (Pothukuchi 2009). It is my hope that this dissertation will provide additional insight and information that can be used for this purpose.

Health Disparities by Race and Class

Over the last few decades, overweight and obesity have become a serious health concern. In 2012, 34.9% of adult Americans were obese, along with 16.9% of youth (Ogden et al. 2014). While this is a large number of Americans, the increase in obesity seems to have leveled off, with no significant increases since 2004 (*ibid*). But there are differences among income groups and racial and ethnic groups. For age-adjusted obesity rates, non-Hispanic blacks have the highest rates at 47.8%, followed by Hispanics at 42.5%, non-Hispanic whites at 32.6%, and non-Hispanic Asians at 10.8% (*ibid*). For women, obesity rates are higher for lower-income groups, but for black and Mexican-American men, higher incomes correlate with higher rates of obesity (Ogden et al. 2010). More education seems to reduce the likelihood of obesity

for women, but not for men (*ibid*). Overall, there is less variation among racial lines for men than for women, where black women have the highest rate, followed by Hispanic women (National Center for Health Statistics, 2011).

Type 2 diabetes, a preventable disease for which overweight and obesity are established risk factors, accounts for up to 95% of all diagnosed cases of diabetes among adults (CDC 2017). Specifically, the crude rate of type 2 diabetes for adults is 15.1% for American Indians and Alaskan Natives, 12.7% for blacks, 12.2% for Hispanics, 8.2% for Asian Americans, and 7.5% for whites (*ibid*). Men are slightly more likely to develop diabetes than women, overall, but this varies by race/ethic group (*ibid*). In the U.S. in 2015, 30.3 million people (12.3% of the U.S. population) had diabetes, including 7.2 million people estimated to be living with diabetes but undiagnosed (*ibid*). This dissertation cannot explain the health status of the survey respondents, e.g., they were not asked whether they had been diagnosed with diabetes. But it can examine self-reported BMI, race/ethnicity and socioeconomic status along with restaurant travel to see if there is a relationship between BMI and type or frequency of restaurant travel. In many U.S. cities, and certainly in the Detroit region, neighborhoods are residentially segregated by race and class, making the available food options in those neighborhoods of interest to research of both spatial patterns of inequality in cities and health disparities.

Food Deserts: The "Grocery Gap" and the Evolution of a Theory

While this dissertation focuses on restaurants, much food access research focuses on food retail such as grocery stores, and so the evolution of that research is worth exploring. The literature has established the phenomenon of the "grocery gap" (Cotterill and Franklin 1995), where grocery stores left central cities, in part lured by greenfield development opportunities

in the suburbs, and in part as a response to shifting demographics as more affluent households moved to the suburbs while lower-income households remained in the central cities (Gottlieb and Joshi 2013). It is further suggested that consolidation in the grocery industry has made it difficult for smaller, independent retailers to thrive, which in turn creates less local control over the foodscape (Ellickson and Grieco 2013). Before the early 20th century, city residents primarily purchased groceries from small scale, independent stores (Eisenhauer 2002; Seth and Randall 2001). But profit margins in the grocery industry are minimal, and these smaller stores were slowly supplanted by regional and national chains capitalizing on economies of scale (Eisenhauer 2002; Seth and Randall 2001). By the 1960s, retailers were moving away from the urban core to the suburbs and beginning to build the large, 60,000 to 80,000 square feet supermarkets we know today—ten times the size they were in the 1930s (Gottlieb and Joshi 2013). Big box stores, such as Wal-Mart Supercenters, can be as large as 244,000 square feet (*ibid*).

This move to the suburbs, which were designed with the automobile in mind, makes transportation a key issue for food access; inner-city residents now often require a car or other transportation to reach grocery stores (*ibid*). Along with the shift out of central cities came consolidation in the industry, with just five retailers controlling 50% of the grocery retail market in the U.S. (Heffernan and Hendrickson 2002). Wal-Mart is the largest grocery retailer both in the U.S. and abroad, and controls 25% of the grocery market. In some areas they receive 50% of local grocery spending (Mitchell 2013).

Research has suggested that there are fewer grocery stores in low-income zip codes, and they tend to be smaller than those in more affluent neighborhoods (Cotterill and Franklin

1995; Donohue 1997; Moore and Diez-Roux 2006). National chain grocers are less likely to be located in lower income neighborhoods, and these chains usually offer lower prices than convenience stores or other food retailers (Chung and Myers 1999). Studies have found that low-income neighborhoods were less likely to have a national chain grocer, and when controlling for income, predominately black neighborhoods were half as likely as white neighborhoods to have a chain grocer, especially in urban areas; Latino neighborhoods revealed similar findings (Baker et al. 2006; Powell et al. 2007). Bodor et al. (2010) also found that supermarkets were lacking in predominately black neighborhoods, and argued that the presence of other types of stores did not offset this disparity because they did not carry fresh food items. Sharkey et al. (2009) found that, when controlling for population density, neighborhoods with greater socioeconomic deprivation had a greater distance to a supermarket.

In a study of Los Angeles food pantry clients, only 41% were within 0.8km (about a half mile) of a store offering a variety of fresh produce (Algert et al. 2006). In Minnesota, focus group participants stated that high prices, poor quality and a lack of variety were barriers to purchasing healthful food, and a survey of four sites found that the inventory of available food items in low-income areas supported those claims (Hendrickson et al. 2006). The literature also suggests that residents of poor neighborhoods pay more for the same items than residents of more affluent areas (Gottlieb et al. 1996; MacDonald and Nelson 2002). In reviewing the literature, Gottlieb and Joshi (2013) summarize research that identified the grocery gap in several major U.S. cities, such as New York, Chicago, and New Orleans. In summary, the

literature has suggested that many low-income, central city neighborhoods have fewer or lower quality options for purchasing groceries.

These shifts in the retail industry in turn created what we call “food deserts” (Wrigley 2002), or neighborhoods, usually of low-income and minority population, with a perceived lack of fresh food options. Concerns over how this impacts more vulnerable residents in urban environments drives much of the research, including this dissertation, but food deserts in rural areas are also a concern (Blanchard and Matthews 2007; McEntee and Aygeman 2010).

The concept of food deserts originated in the UK in the mid-1990s with rising concern over whether low-income individuals had adequate food retail in their neighborhoods to support eating healthfully (Wrigley 2002). Food deserts do not have a concrete definition, making the term more conceptual than categorical, used to describe neighborhoods that, for a variety of reasons—such as low quality or no fresh foods, high prices, or transportation barriers—are suspected of being limited food environments (Raja et al. 2008). While there is no singular definition, many authors have offered a variety of descriptions. Reisig and Hobbiss (2000) define a food desert as an “area of relative exclusion where people experience physical and economic barriers to accessing healthy food” (pg. 138).

The USDA defines food deserts as areas “with limited access to affordable and nutritious food, particularly such an area composed of predominately lower income neighborhoods and communities” (p.1). Leete et al. (2012) state that to have an operational definition of food deserts requires 1) the geographic unit of analysis; 2) an understanding of what is a sufficient inventory of healthful foods; 3) a threshold for measuring low access, and 4) a threshold for

identifying the populations at risk of low access. Raja et al. (2008) state that an absence of supermarkets alone cannot define a food desert if smaller retail outlets exist, or if financial and transportation resources make it feasible to travel outside the neighborhood to access healthy foods. Cannuscio et al (2010) also conclude that one must go beyond simply counting different types of establishments to understand the urban foodscape. Much of the research focuses on urban areas, but others (Blanchard and Matthews 2007; McEntee and Aygeman 2010) have researched the concept of rural food deserts as well, where vulnerable households might be located many miles from a food retailer.

Shaw (2006) posits that there may be different kinds of food deserts. She proposes that there are as many types of food deserts as there are factors that explain why people may struggle to achieve a healthy diet, including economic, sociological, geographical, and psychological reasons. McEntee and Agyeman (2010) cite three types of obstacles to food access: informational, geographic, and financial. Shaw (2006) also points out that when conducting mapping of food access, the results do not always align with resident perceptions. Based on her findings, Shaw (2006) suggests that the concept of food access can be broken down into three categories: ability, assets, and attitude. Similarly, McEntee and Aygerman (2010) categorize the three types of access as geographic, economic, and informational. Shaw (2006) also advises that the food desert concept could be applied to the non-poor as well, giving as an example a non-mobile elderly person living in an affluent suburb. Recently, the argument that a temporal element should also be considered in food desert analysis has been introduced, as the foodscape changes over time and retail is open during certain hours or even certain seasons, such as is the case with farmers markets (Widener and Shannon 2014).

In a critique of the food desert literature, Bitler et al. (2011) question whether there can be sufficient data to identify food deserts and, if so, to know if they are driven by supply or demand. They argue that there is little to no research that can definitively explain *why* a food desert exists. They raise valid points, which reinforce the need for more research in this area. The findings in the literature do suggest that individuals face barriers and obstacles in accessing healthful foods, though the findings may vary across research questions and geographies. Within a metro area, for example, we may find that both low-income inner-city neighborhoods and more affluent suburban ones are several miles from the nearest supermarket (Eckert and Shetty 2011). The factors that shaped the two may be different (although related, via neoliberal market processes) but one is better equipped to handle that difference—through higher incomes and personal vehicles—than the other. Also, the way we define food deserts in scope and scale can generate conflicting research findings and make generalizations difficult (Leete 2012).

Agent-based modeling is increasingly being suggested as a way to address the complexity of human behavior in understanding the influence of the food environment and how humans make choices within it (Auchincloss et al. 2011; Auchincloss and Diez Roux 2008; Widener 2014). Agent-based models are computer simulations that use known information about agents in a space (in this case, humans in a built environment) and their behaviors to model and predict their actions under different circumstances (Ligmann-Zielinska 2010). The data used in this dissertation lend themselves to future study that involves agent-based modeling.

A primary question when exploring food access is how to define access. The preceding section highlighted how the research has proposed different but similar thresholds of proximity in terms of distance to food outlets. This concept is one that has been explored in the health geography literature with regard to accessibility of health care. Some measurements used in that field include: availability, accessibility, affordability, acceptability and accommodation (Penchansky and Thomas 1981). All of these characteristics are also applicable to urban food outlets.

From Food Deserts to Food Swamps: Fast Food Restaurants and Disadvantaged Neighborhoods

As researchers attempted to measure and define food deserts, a new realization emerged in the literature; though many neighborhoods were lacking full-service supermarkets to provide affordable, nutritious, culturally-appropriate food, other types of food outlets were prevalent. Rose, Bodor and Swalm (2009) coined this phenomenon a "food swamp," which they define as "areas in which large relative amounts of energy-dense snack foods, inundate healthy food options" (pg. 2). Cooksey-Stowers, Schwartz & Brownell (2017) found that food swamps are a better predictor of obesity rates in an area than just the lack of supermarkets. Less healthy food outlets options include fast food restaurants and convenience stores.

Freeman (2007) writes that "the overabundance of fast food and lack of access to healthier foods…have increased African American and Latino communities' vulnerability to diet-related death and disease. Structural perpetuation of this race- and class-based health crisis constitutes 'food oppression'" (p.2221). Block et al. (2004) found that the density of fast food restaurants positively correlated with measures of poverty and African American population in New Orleans, while controlling for confounders such as commercial zoning. Kwate (2008) writes

that racial residential segregation has created a higher concentration of fast food restaurants in black residential neighborhoods than white neighborhoods. Smoyer-Tomic et al. (2008) found in Canada that fast food exposure (defined as a census block with a fast food restaurant within 500 meters) was greater in areas with more Aboriginals, renters, single parents, and low-income households, while it was lower in areas with higher median income and home values. In a review of food access literature, Fleischhacker et al. (2011) reported that the majority of studies found higher access to fast food for low socioeconomic areas and minority neighborhoods. Lewis et al. (2005) found that in lower income Los Angeles neighborhoods, a greater percentage of existing restaurants were fast food, and healthy menu options in restaurants were more likely to found in more affluent neighborhoods.

In a study in New Zealand, Pearce et al. (2007) found that access to fast food restaurants was higher—that is, the distance needed to travel to reach a fast food restaurant was shorter—in socioeconomically disadvantaged neighborhoods. Powell et al. (2007) found that predominately black and Latino neighborhoods tend to have fewer restaurants than predominately white neighborhoods, and that the restaurants they do have are mostly fast food outlets. Similar to the findings that suggest food prices in retail stores are higher in low-income areas (e.g. MacDonald and Nelson 2002; Gottlieb et al. 1996), Leschewski and Weatherspoon (2014) found that some fast food chains charge slightly more for their products in food deserts in Michigan cities, as opposed to more affluent areas.

Several factors are evaluated when proprietors decide where to locate a business, and restaurants may look at characteristics of the site as well as area demographics. For example, McDonald's lists on their website various physical site characteristics—a corner location and/or

a signalized intersection, specific size requirements and space for parking—but does not discuss what demographic characteristics they prefer (McDonalds n.d.). Yet, research suggests they not only locate disproportionately in low-income and minority areas, but also near schools. In New York City, for example, 41.6% of schools had a fast food restaurant location within 400 meters (Neckerman et al. 2011). In Los Angeles, 23.3% of schools had one or more fast food restaurants located within 400 meters and 64.8% of within 800 meters (Simon et al. 2008). In Chicago, 78% of schools had a fast food restaurant within 800 meters (Austin et al. 2005). Given efforts by the fast food industry to market their products to children (Nestle 2006), their decisions to locate in close proximity to schools is troublesome.

Fast Food Restaurants and Health

The primary concern with fast food restaurants is that their menu options are comprised mostly of high fat, high calorie items, and fast food restaurants are often implicated in the United States' alarming obesity rate (Alviola et al. 2014; Boone-Heinonen et al. 2011; Chen et al. 2013; Dunn et al. 2011; Miura and Turrell 2014; Morland and Evenson 2009; Pereira et al. 2005; Rosenhack 2008). Much of the literature focuses on where the restaurants are, but lacks the data to connect actual individual behavior (i.e., trips to restaurants) with individual characteristics. Taste and convenience are the most common reasons individuals give for going to fast food restaurants, despite the potentially negative health impacts (Lucan et al. 2010; Rydell 2008).

Prentice and Jebb (2003) examined the energy-density of fast food menu items and concluded that regular consumption of fast food is likely to contribute to obesity, especially given how substantially different such high-calorie food is from traditional African diets that

fueled much of human evolution and development. Bowman and Vinyard (2004) found that adults who ate fast food on at least one of two food survey days had a higher body mass index and were more likely to be overweight. However, whether the mere existence of fast food restaurants contributes to poor health of those who live near them is less clear. Some studies show no correlation between proximity and obesity (Burdette et al. 2004), while others (Alviola et al. 2014; Morland and Evanson 2009) do find a correlation between the number of fast food restaurants in an area and its obesity rates.

Other studies (Boone-Heinonen et al. 2011) have shown a correlation between proximity and consumption, but a conclusion cannot easily be drawn about the relationship between proximity and obesity. While Jeffery et al. (2006) found a positive relationship between eating at fast food restaurants and increased body mass index, they did not find a relationship between proximity to fast food and increased body mass index. In a review of the literature, Rosenhack (2008) concluded that there is strong evidence to suggest a relationship between fast food consumption and obesity. Dunn (2010) observed, in medium density counties, a positive relationship for women as well as blacks and Hispanics between BMI and fast food availability. Despite marketing in recent years that suggests fast food restaurants are offering more healthful foods, the calorie density of their menus has gone mostly unchanged (Bauer et al. 2012).

Since fast food consumption is demonstrated to be related to poor health outcomes, and the research is mixed on the effects of proximity and consumption, some have called for zoning regulations to limit where fast food restaurants can locate (Sturm and Cohen 2009). The city of Los Angeles enacted a ban on new fast food restaurants in South L.A. in 2008, hoping to

address high rates of obesity and attract sit-down restaurants with potentially healthier fare (Jennings and Smith 2015). Seven years later, obesity has not declined, nor have the new healthier restaurants arrived (*ibid*). Some argue that a more specific land use policy, coupled with higher fast food prices and a shift in social norms, would be more effective in reducing obesity related to fast food consumption (Charles 2015).

Food in Detroit

For a variety of reasons, Detroit is an interesting environment in which to study various aspects of the food environment. Detroit is often designated as a food desert because of the lack of chain grocers in the city (Tumber 2012). There are two general themes to this research: the potential for Detroit to be a beacon of urban agriculture (Colasanti, Hamm and Litjens 2013; Colasanti and Hamm 2010), and the concern over food access and disparities in poor, black neighborhoods. This project falls into the latter category.

Zenk et al. (2005a) found diminished grocery options in low income, mostly black Detroit neighborhoods, but did note that grocers that had opened in neighborhoods that were once mostly white remained open as these neighborhoods transitioned to middle class black neighborhoods. In another study, Zenk et al. (2005b) found that women who shopped at supermarkets or specialty stores consumed more produce than women who shopped at Detroit's independent grocers. The women found the quality of the produce at the supermarkets better, but not more affordable. The study showed that income and educational attainment correlated with more fruit and vegetable intake.

A third Zenk et al. (2006) study found that the quality of produce was lower in Detroit's lower income black communities than in more middle class, racial heterogeneous communities;

the lower income communities also had more liquor stores and fewer grocers per capita than the other areas. LeDoux and Vojnovic (2013, 2014), Vojnovic et al, (2014) and Rose (2011) found that Detroiters traveled outside of their neighborhoods in order to obtain groceries. Pothukuchi et al. (2008) found a higher number of food safety violations by food retailers in Detroit's poorer and black neighborhoods than in other parts of the city.

With regard to restaurants, Neal (2006) categorized Detroit as a McCulture desert, describing the city as having a high proportion of standardized, national chain restaurants (like McDonalds) relative to other choices, but having fewer restaurants overall relative to other cities with populations over 100,000.

In summary, a review of the literature demonstrates the complexity of the urban food environment and its impacts, as well as some of the noted disparities in the Detroit region. This dissertation will add to the literature by focusing on restaurant travel using reported travel trips to better understand how individuals in the Detroit region navigate their restaurant options.

CHAPTER 3: TRIUMPH AND TROUBLE IN THE MOTOR CITY

It is not a coincidence that so many urban scholars are interested in studying Detroit. From its explosive growth in the early 1900s, to its oft-cited examples of racial tensions and institutionalized racist practices, and ultimately to the modern landscape of the metro region displaying severe segregation and stark disparities in income and government resources, it is a place that possesses many vexing urban problems. In the context of this dissertation, the neoliberal and racist practices that have shaped the region have also shaped the food landscape. While Detroit residents live with inadequate community services like education, police and fire, obtaining appropriate and affordable nutrition is another obstacle that they face in higher proportions than their suburban counterparts, where incomes are generally high and local services are good. With regard to restaurants, whatever role they play in one's life, from being a convenient source of calories to being an important part of social and cultural life, they too are shaped in large part by the same market forces that have decimated Detroit. Chain grocery retailers, until the last few years, largely neglected Detroit neighborhoods, yet there is no shortage of fast food restaurants within the city.

Detroit's Origin: The Making of the Motor City

Detroit's geographic location has perhaps been its strongest asset, at least in the early stages of its development—the city sits on a river, with easy access to the Great Lakes and Canada, making it a natural location for a fort, and was established as such—Fort Pontchartrain du Détroit—by the French in 1701. It became the City of Detroit in 1806. This location makes it relatively easy to transport resources in and products out, setting Detroit up to be a natural hub for industry. The Detroit River has been a vital component of every stage of Detroit's growth,

from carrying Native American canoes to ships carrying ore and coal to Detroit's manufacturers (Woodford 2001). Railroads were developed in the latter half of the 19th Century that connected Detroit with other Midwest cities, including Chicago, which better connected them to other manufacturing areas (Woodford 2001).

Initially, Detroit's industries in the mid to late 1800s were focused on fabricating machinery for the extraction of Michigan's natural resources, as well as processing those resources (Woodford 2001). To this end, the two were mutually supportive—machinery was needed to extract natural resources, and natural resources were needed for manufacturing machinery (Woodford 2001). The city was also producing railroad equipment, including the Pullman sleeping car, and Great Lakes vessels (Woodford 2001). Industrial growth in Detroit began in the 1880s, at which point 40% of the labor force was employed in manufacturing (Archer 1995). From this history we see that it was not necessarily the automobile that started Detroit's industrial legacy, but it undoubtedly launched it to new heights. By 1920, Detroit was the urban area most invested in manufacturing in the United States, and 45.4% of the manufacturing workforce was employed in the auto industry (Bates 2012).

The first automobile plant to begin operation within the city of Detroit was the Oldsmobile plant, which opened in 1899 but burned to the ground in 1901 (Woodford 2001). While R.E. Olds, who returned to the Lansing area following the fire, was selling his cars at a price only the wealthy could afford, Henry Ford, who established the Ford Motor Company in 1903, was working on a mass-produced, affordable means of transportation, and began producing the Model-T in 1908 (Woodford 2001).

While Detroit was not home to all the new auto firms coming into existence in the late 1800s and early 1900s, by 1910 seven of the top ten producers of automobiles were located in the Detroit area, with a combined market share of 65%, which only increased as the "Big Three"—Ford, General Motors, and Chrysler—asserted their dominance of the industry (Klepper 2010). Klepper (2010) posits the idea that a successful cluster does not arise necessarily based on where an industry "starts", but on where there is a successful innovator, and Detroit in the early 1900s had its fair share, so this is a plausible explanation for why Detroit became the Motor City. Detroit had established a strong manufacturing center and happened to be home to a group of innovators who were willing to collaborate just enough to catapult the affordable and accessible automobile into reality.

While other automakers helped to build Detroit's status as automobile capital of the world, Henry Ford was at the epicenter of all that made it possible. From mass production of the Model T, to vertical integration drastically increasing production, to workers' rights reforms that improved health and safety, Ford's method created decent wages and conditions for factory workers, facilitating Detroit's establishment as the Motor City and creating a class of workers who were earning reasonable wages while possessing few unique skills (Woodford 2001).

Race—and Structural Racism—in the City of Detroit

As much as it is known as a former industrial powerhouse, Detroit is, sadly, known almost as well for its palpable racial tension, including deadly riots in 1943 and 1967. African Americans play a large part in Detroit's industrial history, with many people migrating from the south for employment. Detroit is now the city in the U.S. with the highest percentage of black

residents (U.S. Census 2010), and so one cannot study Detroit without giving significant attention to race.

Like many black Americans who migrated to the north from the south, those who came to Detroit were encouraged by the promise of employment. The black population in Detroit increased by 611% from 1910 to 1920 (Bates 2012). The rapid growth of the automobile industry required droves of workers. However, these migrants quickly found that racism was alive and well in the north. Yes, African Americans were able to obtain jobs, but not the best jobs; they were not always paid as well as their white counterparts, and they were the first to be laid off (Sugrue 1996). They also found that the neighborhoods and housing stock that were available to them were substandard (Woodford 2001). Racial tensions over the housing conditions may have contributed in part to a race riot that broke out in the sweltering summer of 1943 (Woodford 2001), after the Detroit Housing Commission adopted a policy of residential segregation (Galster 2012; Thompson 2001). And when industry began moving from the central city to the suburbs in search of cheap land and room to expand, black Detroiters were less mobile than whites and less able to go where the jobs were (Sugrue 1996). In 1950, 58% of white residents in the Detroit metro region lived in the city of Detroit; by 2009, that number was 4%. By contrast, the percentage of regional black residents in the city limits grew from 58% to 68% (Galster 2012).

By the 1960s, the peak of the Civil Rights movement, Detroit was on the downward side of its population curve (Figure 3-1). Even though city leaders felt they had made considerable progress on racial issues since 1943, a riot broke out in 1967 following a police raid of a “blind pig,” or speakeasy, in a black neighborhood. The violence lasted for days, killing dozens and

resulting in millions of dollars in property damage (Woodford 2001; Darden et al. 1987). Of the 43 reported deaths, the police or the National Guard killed at least 27 (Darden et al. 1987). Both Darden et al. (1987) and Woodford (2001) describe the 1967 riot as less about violence between black and white individuals, as the 1943 riot had been, and more as a pushback against abuse of authority, and the attacks were aimed not at people but at symbols of white authority and society.

For example, in 1963, only 7% of the Detroit police department employees were black (Darden et al. 1987). While serious steps were taken following the 1967 riot to bring calm to the racial tension, the tension persisted between white police officers and black residents (Darden et al. 1987). By the mid-1970s, Detroit was the largest city in the U.S. to have a black majority. By that time, the city had elected its first black mayor and it had its first black police chief (Woodford 2001; Darden et al. 1987). Despite these advances, some whites resented the affirmative action policies that were improving black representation in employment sectors, and the racial tensions continued (Darden et al. 1987).

Today, Detroit's neighborhoods are severely segregated by race and class (Vojnovic and Darden 2013; Sugrue 1996; Darden et al. 1987). In fact, the racial makeup of the suburbs versus the city itself is essentially an inverse relationship; while 82% of Detroit residents are black, 80% of suburban residen0ts are white (Vojnovic and Darden 2012).

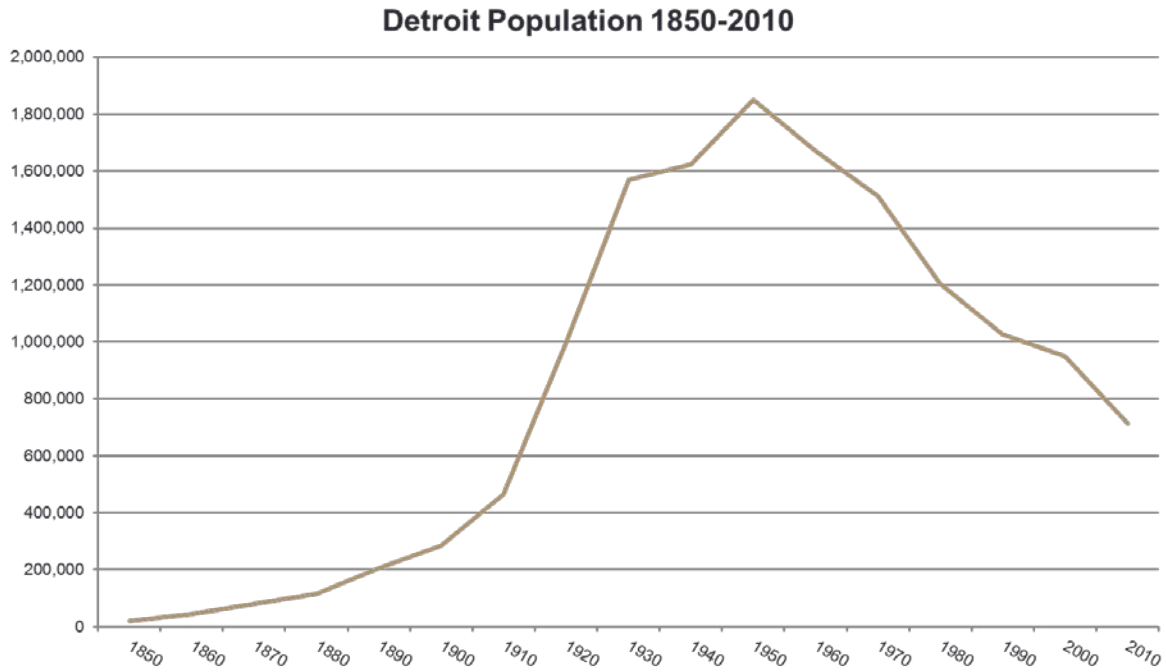

Figure 3-1: Detroit population, 1850--2010 (U.S. Census 2010)

Decline: Decentralization of Population and Industry

It is difficult to point to a singular event or change that precipitated the decline of Detroit, but ironically the groundwork may have been laid with the creation of an affordable automobile which, when combined with the highway systems that led out of cities, facilitated the flight of the more affluent classes out of Detroit. Of course, post-war suburbanization was only one component of Detroit's collapse. As Park wrote, cities are "a product of nature, and particularly of human nature" (1925, p.1). Indeed, some of the less praiseworthy aspects of human nature have played a role in Detroit being what it is today: racism, the relentless pursuit of profit, and corruption. Other national and global factors that were out of the hands of Detroit's leaders also contributed to what appear to have been insurmountable obstacles.

The transition perhaps began in the years following World War II. Mass layoffs occurred in the 1950s, influenced partly by fluctuations in consumer demand and partly by continued

increases in production technology, taking away not only manufacturing jobs but affecting businesses such as restaurants and bars that had been supported by auto workers (Sugrue 1996). As early as 1958, research showed that industry had begun leaving the city, citing taxes, need for more land, need for more parking, and labor problems as their top four concerns (Black 1958). Entering a period of deindustrialization, cities like Detroit that had been heavily invested in a single industry were exceptionally hard hit (Digaetano and Lawless 1999). Between 1948 and 1967, Detroit lost nearly 130,000 manufacturing jobs (Sugrue 1996). By 1982, that total had climbed to 335,000 (Thomas 1990). These losses in manufacturing jobs disproportionately affected black youth and black migrants, fueling racial tensions (Sugrue 1996). From 1950 to 1980, the unemployment rate among all Detroiters rose from 7.5% to 11.7%; among blacks the rate rose from 28.3% to 56.4% (Sugrue 1996).

Part of the decline in manufacturing jobs in Detroit was due to increased mobility and decentralization in the auto industry within the U.S. In 1950, 56% of automobile jobs were in Michigan; just ten years later, that number was 40% (Sugrue 1996). Rubenstein (1986) identifies four eras of decentralization of manufacturing in the U.S. The first was a ten-year period, beginning in the mid-1890s, when commercial production of automobiles started in factories dispersed throughout the Northeast; the second was the agglomeration and growth of the auto industry in southern Michigan; the third, extending from 1914 to the mid-1960s, was characterized by decentralization of factories from southern Michigan to many other parts of the United States. In the fourth era, he posited a return of manufacturing to the Midwest, though intermittent plant closures in the Midwest and the introduction of foreign automakers'

facilities into the Midwest may nullify the fourth phase in terms of any positive impact on U.S. manufacturing (Rubenstein 1987).

During World War II, Detroit was known as the "Arsenal of Democracy," since the city was able to convert plants from production of consumer goods to production of military goods. By rapidly converting back to consumer production, Sugrue (1996) argues that the city missed an opportunity to be able to participate in defense manufacturing, which continues to be a lucrative market. Additionally, U.S. automakers seem to have had very poor foresight. As Freedman and Blair (2010, pg. 106) explain, the approach has been to "perpetually double down its bets on successful strategies," and plan as if an economic boom will continue indefinitely; this results in companies trading off "the flexibility to adapt effectively to change" for short term profits.

The consolidation of production into just three firms, the "Big Three" (Ford, Chrysler and General Motors), also limits flexibility and innovation. In 1920, there more than 80 auto firms operating in the U.S.; by 1960, the "Big Three" accounted for more than half of global auto production (Dicken 2007).

Enter Globalization

In the 1970s, Detroit began to feel the effects of the rapidly globalizing economy. Since they did not foresee a quickly changing auto market, or at least, as Freedman and Blair (2010) described, they were not prepared for such a change, they were not able to quickly adapt to what was to come. The 1973 oil embargo caused fuel prices to skyrocket, which of course impacted the auto industry; although the direct effects of the oil crises on the U.S. economy are not definitive, a decline in car sales was measurable following the 1973 and 1979 events (Barsky

and Kilian 2004). While by this time many of the auto manufacturing jobs had moved from Detroit to allow for assembly closer to consumer markets (Rubenstein 1986), the Detroit area remains the home of the headquarters of the "Big 3"—Ford, Chrysler and General Motors. This is in a sense a double whammy for the region, as the headquarters themselves, at least in theory, contribute to the tax base of the region in addition to employing those in the manufacturing sector. The effects of the embargo and the resulting drop in car sales were felt by all three companies, and unemployment in Detroit began to rise. The new push for smaller, more fuel-efficient cars was a race that was being won by European and Japanese automakers (Freedman and Blair 2010). After the experience of 1973, the "Big Three" were a little better prepared for the 1979 energy crisis, offering more fuel-efficient vehicles, but by then the European and Japanese automakers had their foot in the door of the American market and consumers had options (Freedman and Blair 2010). The 1970s set the American auto industry up for decline, and changed the tide for Detroit.

The energy crises of 1973 and 1979 were early examples of how events around the world could affect industry here in the U.S. Those events both had roots in political unrest in the Middle East. The new global economy created an environment where American consumers were able to easily purchase cars from foreign corporations, and also where American corporations were able to reach beyond their own country for component production. From 1980 to 2003, the U.S. percent share of world automobile products exported dropped from 11.9 to 9.6, while its import share rose from 20.3 to 24.7 (Dicken 2007). In the new international division of labor, corporations, including auto manufacturers headquartered in Detroit, are positioning themselves to exploit less organized workers and pay lower wages,

operating in free trade zones, launching joint partnerships, and creating management agreements around the world (Cohen 1981).

This decline in industry in Detroit at the same time that urban environments were shifting toward decentralization and suburbanization created a set of conditions that resulted in significant disinvestment in the city, leading to rising unemployment, abandonment by residents who could afford to leave, and a local government system with seemingly insurmountable problems, creating an open door for government corruption and incompetence in the last few decades (Pedroni 2011).

Why Detroit?

Other archetypical modernist cities, including Chicago and New York City, have not faced this same fate of massive population and revenue losses (Table 3-1). What is it about Detroit, then, that has caused it to struggle so in the post-industrial era?

Table 3-1: Population changes in 1950's five largest cities

City	1950	2010	Percent Change
New York	7,891,957	8,175,133	+3.6
Chicago	3,620,962	2,695,598	-25.6
Philadelphia	2,071,605	1,526,006	-26.3
Los Angeles	1,970,358	3,792,621	+92.5
Detroit	1,849,568	713,777	-61.4

Source: U.S. Census

Chicago, which grew on the rising tide of agricultural production in the U.S.—production which has been able to increase even as the number of farmers in the U.S. decreases—has been able to capitalize on the financial side of farm commodities and expand into other financial services, despite losses in manufacturing (Sassen 2001). New York has also grown to

be a global financial powerhouse. One need look no farther than Wall Street to understand Manhattan's importance. Despite the fact that manufacturing jobs declined throughout the U.S. due to increased automation, and that manufacturing began to disperse away from the traditional manufacturing centers, cities like Chicago and New York were more successful at compensating for those losses. In 1989, producer services earnings as a share of all earnings stood at 48.4% in New York, 26% in Chicago, and only 13.5% in Detroit (Sassen 2001). Table 3-2 shows how poorly Detroit has fared in replacing manufacturing jobs with service sector jobs relative to other cities.

Table 3-2: Changes in manufacturing and employment sectors in select cities, 1948-1982

City	Manufacturing	Services	Net Gain/Loss	Percent Gain/Loss
New York	-778,000	+505,000	-273,000	-35.1
Chicago	-660,000	+211,000	-449,000	-68.0
Philadelphia	-343,000	+71,000	-272,000	-79.3
Detroit	-335,000	-3,000	-338,000	-100.9
Boston	-88,000	+114,000	+26,000	+29.5
Pittsburgh	-62,000	+40,000	-22,000	-35.5

Source: Adapted from Thomas 1990

So, despite being modern cities in a postmodern time, from an economic standpoint these cities were flexible enough to adjust to a postindustrial economy, and to maintain their positions in the upper echelon of cities. Detroit, on the other hand, seems to have remained fiercely loyal to a system and an industry that has not been equally loyal to the residents of Detroit. The history of structuralized racism and segregation described previously has played out more severely in Detroit than in most other U.S. cities.

Pointing to a singular cause of Detroit's collapse is impossible. It is more likely that a series of changes and events has led to Detroit's current state. Journalist Nathan Bomey, who has closely followed Detroit's bankruptcy experience, writes (2017):

> The astonishing deterioration in Detroit's revenue base throughout the second half of the twentieth century was the fundamental source of the city's financial crisis, obliterating Detroit's ability to pay for basic services. But it was a slow bleed, gradually draining more and more of the city's finances over several decades. Toward the end, however, the pace of decline accelerated rapidly, primarily because of the Great Recession and a debt deal that ultimately wrecked the city's budget. Political corruption—often cited as a major contributor to Detroit's financial demise—played only a small role (pg. 18).

Ultimately, Detroit accumulated substantial debt while trying to provide minimal public services and meet obligations to city pensioners. This initiated the movement toward the largest municipal bankruptcy in U.S. history. A heated public debate about how to reduce the city's debt while minimizing impacts on retirees and without risking some of the city's cultural attractions such as the Detroit Institute of Art (DIA) ensued as city officials, state government, and creditors seeking repayment worked toward compromise. In an almost unheard-of act of philanthropy, nonprofit foundations with a stake in Detroit's success pitched in to minimize the negative impacts of bankruptcy on Detroit's residents. This so-called "Grand Bargain," which raised more than $800 million from foundations, private donors and the State of Michigan, sought to fund the city's obligations to government pensions in order to protect the DIA from liquidation (Kennedy 2014). Today, Detroit's finances are stable, and some services are being better funded (Bomey 2017). There is robust redevelopment occurring in the Downtown and Midtown areas of the city, driven in large part by the sports-franchises of billionaires Dan Gilbert and Mike Illitch with financial support from the city, though the benefits of this

investment have yet to make a significant improvement in the lives of everyday Detroiters (Reese et al. 2017; Mallach 2014).

The following tables and maps provide a glimpse into the current socioeconomics of Detroit and how it compares to the broader region. Figure 3-2 shows Detroit's location in the Tri-County region. Table 3-3 shows select socioeconomic characteristics for Detroit. Table 3-4 shows how Wayne County lost population while the counties to the north gained residents. Macomb, Oakland and Wayne counties are often referred to as the Tri-County area, and when examined together, the spatial pattern of segregation in race and class is evident. Poverty and vacant structures are concentrated within Detroit, and median home values are much higher in the northern suburbs., while Figures 3-3 through 3-5 visualize some disparities between Detroit and its immediate suburbs, including the more affluent areas of Oakland and Macomb counties.

Table 3-3: Socioeconomic snapshot of the city of Detroit

Variable	2000[1]	2010[2]
Population	951,270	713,777
White population	12.3%	10.6%
Black population	81.6%	82.7%
Asian population	1.0%	1.1%
Hispanic or Latino (any race)	5.0%	6.8%
Vacant housing units	10.3%	22%
Owner-occupied units	54.9%	51%
Individuals below poverty level	26.1%	39.3%[3]
Children under 18 below poverty level	34.5%	55.1%[3]
Percent high school graduate or higher	69.7%	77.6%[3]

1. Decennial Census, 2000; 2. Decennial Census, 2010; 3. 2009-13 American Community Survey 5-Year Estimates

Figure 3-2: Detroit's location in the tri-county area

Table 3-4: Population changes in the detroit tri-county area, 1950-2010 (U.S. Census)

County	1950 Population	2010 Population	Percent Change
Macomb	184,961	840,978	+355
Oakland	396,001	1,202,362	+204
Wayne	2,435,235	1,820,584	-25

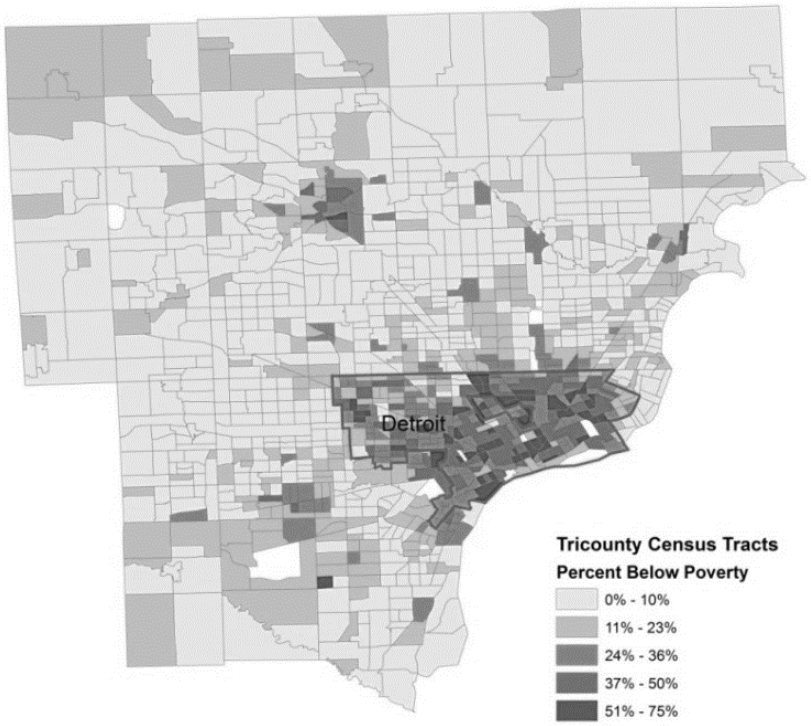

Figure 3-3: Macomb, Oakland and Wayne County percentage below poverty level by census tract (U.S. Census 2010)

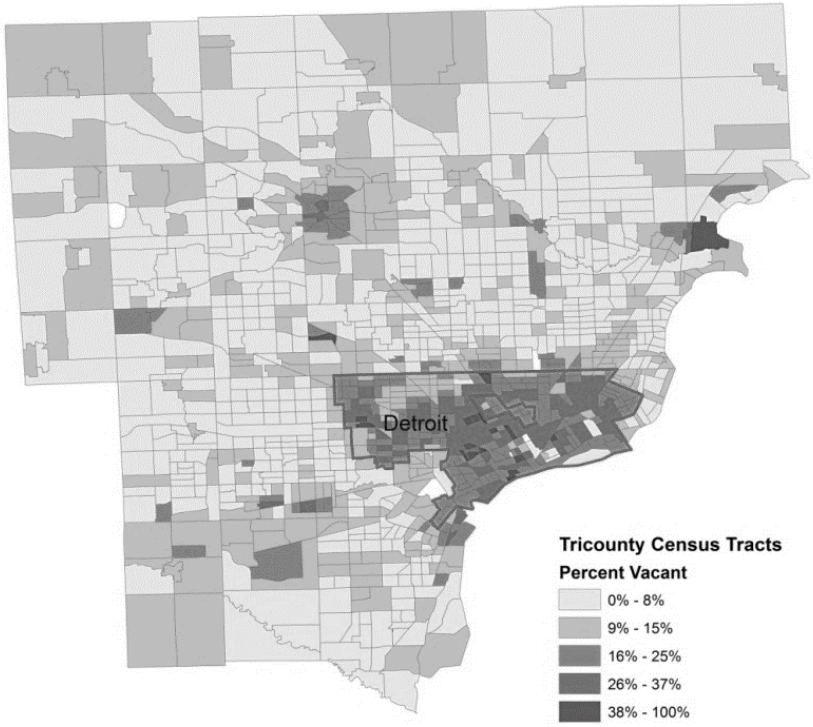

Figure 3-4: Macomb, Oakland and Wayne County percentage of structures vacant by census tract (U.S. Census 2010)

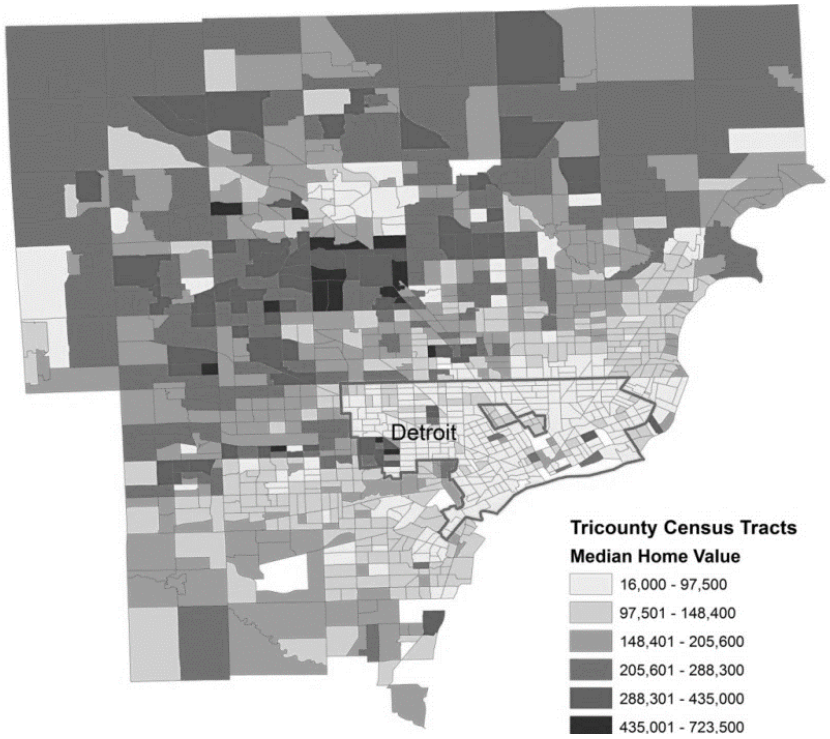

Figure 3-5: Macomb, Oakland and Wayne County median home value ($) by census tract (U.S. Census 2010)

CHAPTER 4: DATA COLLECTION AND METHODOLOGY

The survey data used for this dissertation came from a project funded by a National Science Foundation Human Social Dynamics Grant, titled "Exploring the Social Dynamics of Accessibility, Travel Behavior, and Physical Activity by Income/Race, Age and Gender: An Inner-City/Suburb Comparison in the Detroit Region." The survey was collected in the fall of 2007 into early 2008 via mail using a stratified random selection, based on built-environment and demographic characteristics.

Study Sites

In identifying the six neighborhoods for participation in the survey, the goal was to have a representation of different urban form (density and connectivity) and socioeconomic makeup. The six sites are located in Detroit (two neighborhoods) and the suburbs of Ann Arbor, Birmingham, Bloomfield Hills and West Bloomfield (Figure 4-1). The suburbs have similar socioeconomic characteristics to one another and are more affluent than Detroit (Table 4-1). Ann Arbor and Birmingham are characterized by high-density development and high street connectivity and are therefore more walkable, while Bloomfield Hills and West Bloomfield are low-density and low-connectivity and therefore more auto-dependent in design. The Detroit neighborhoods are also characterized by high-density and high street connectivity, although conditions such as safety come into play in Detroit in a way that they may not in suburban walkable neighborhoods. In this way, we cannot assume residents of the Detroit neighborhoods walk even though the street grid, in theory, facilitates walkability. A comparison of residential land uses is found in Table 4-2.

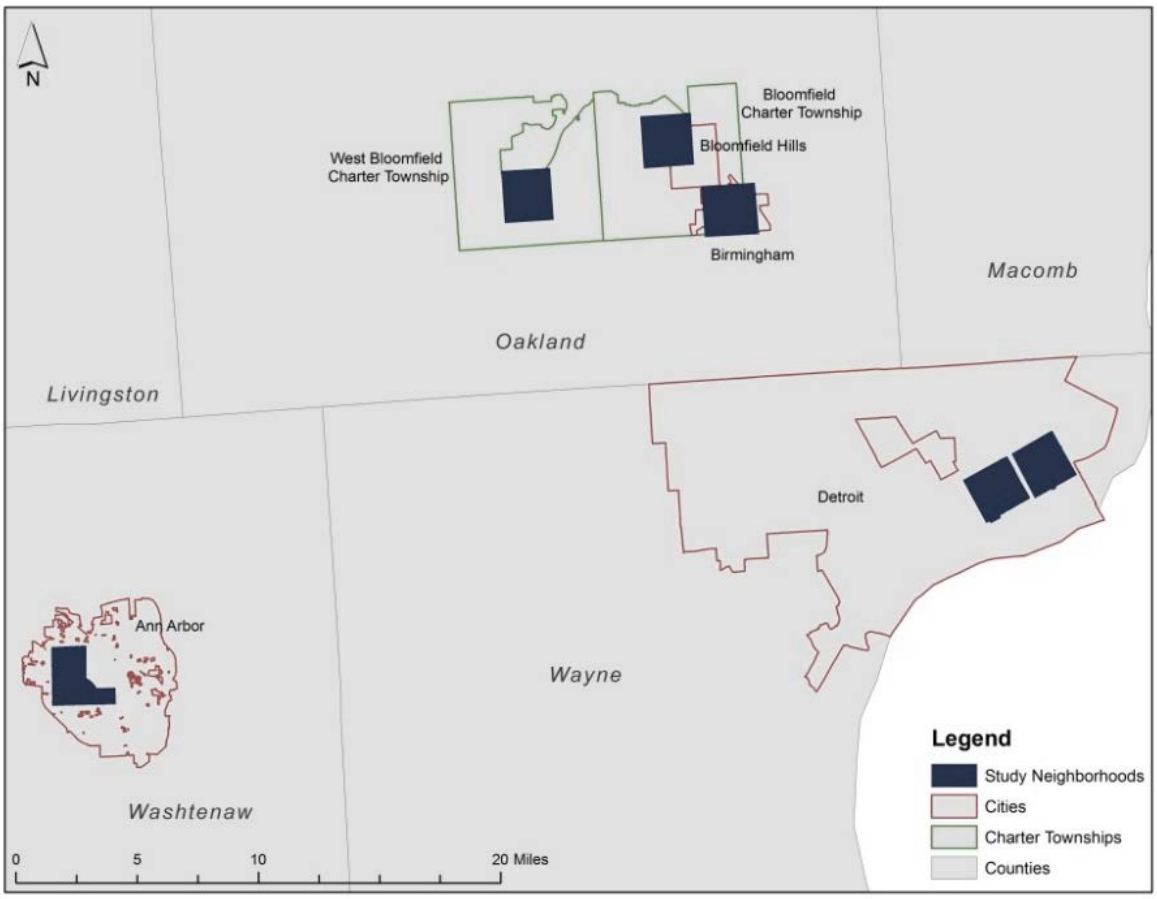

Figure 4-1: Blue polygons represent the study sites within municipalities (red polygons)

Table 4-1: Select characteristics of municipalities where survey was conducted

		High-Density Suburban		Low-Density Suburban		
	Detroit	Ann Arbor	Birmingham	Bloomfield Hills	Bloomfield Township	West Bloomfield
2010 Population	713,862	113,934	20,103	3,869	41,070	64,690
Population Density (per sq mi)	5,135	4,128	4,188	773	1,593	2,067
Non-white Pop	92.2%	29.6%	9.3%	13.8%	13.4%	23.5%
Did not graduate high school	23.2%	3.1%	1.8%	2.4%	2.4%	6.1%
Median Household Income	$ 28,357	$52,625	$ 101,529	$ 133,370	$106,778	$ 97,004
Individuals in Poverty	26.1%	20.2%	3.8%	1.6%	4.6%	4.0%

Source: SEMCOG Community Profiles

Table 4-2: 2008 residential land use of municipalities where survey was conducted

		High-Density Suburban		Low-Density Suburban		
	Detroit	Ann Arbor	Birmingham	Bloomfield Hills	Bloomfield Township	West Bloomfield
Single Family Residential (Acres)	36,636.4	6,345.2	1,677.7	1,976.2	10,745.2	11,260.5
Single Family Residential (%)	41.1%	35.3%	52.2%	61.3%	65.1%	56.4%
Multi-Family Residential (Acres)	1,661.4	1,133.9	34.1	0	68.1	401.4
Multi-Family Residential (%)	1.9%	6.3%	1.1%	0%	0.4%	2%

Source: SEMCOG 2008 Land Use

The inclusion of Ann Arbor in Washtenaw County goes outside the commonly used tri-county region of Wayne, Macomb and Oakland, discussed previously, for this research. It should be noted that Ann Arbor, being home to the University of Michigan, has a diverse population made up of students and faculty as well as other professionals affiliated with the university, and those who live in Ann Arbor but work in Detroit. According to SEMCOG, more than 1,000 Ann Arbor residents were commuting to Detroit for work in 2013. While the high number of professionals brings high incomes, the large number of students—an enrollment of nearly 45,000—can increase poverty levels. A report by the Census Bureau on this topic found that the Ann Arbor poverty rate for 2009-2011 dropped from 20.5% to 10.0% if college students who do not live with family were excluded from the analysis (Bishaw 2013). Thus, while Ann Arbor has the second highest poverty rate of the municipalities included in this research, nearly half of those in poverty may be college students with temporarily limited earning ability.

Travel behavior studies have traditionally almost exclusively focused on comparisons of dynamic low-density and high-density communities, exploring how differences in the built environment affect access to urban amenities. The selection of higher density urban Detroit neighborhoods, representative of highly segregated low-income communities experiencing severe disinvestment, and their comparison with wealthy higher density suburban neighborhoods allows for an analysis into how neighborhoods with similar urban forms—higher density, mixed land use and connected built environments—affect access based on socio-demographic characteristics. This is an important contribution of this research, since low-income, highly segregated neighborhoods experiencing extreme decline and disinvestment are traditionally not included in travel behavior research. Figures 4-2 through 4-6, using basemap satellite imagery available from ESRI in ArcMap, show the difference between the more grid-like street patterns of Detroit, Ann Arbor, and Birmingham, and the lower density, curvilinear, predominately residential land use patterns of Bloomfield Hills and West Bloomfield.

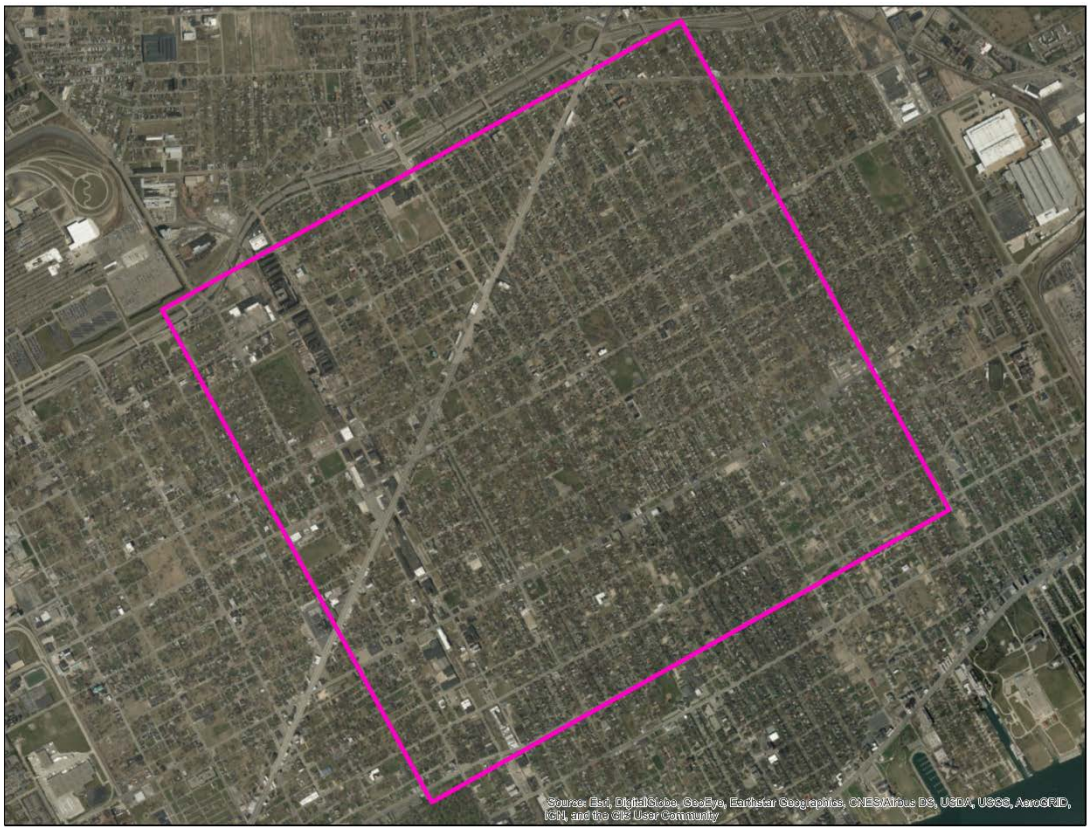

Figure 4-2: Aerial view of Detroit (1) study site street grid

Figure 4-3: Aerial view of Detroit (2) study site street grid

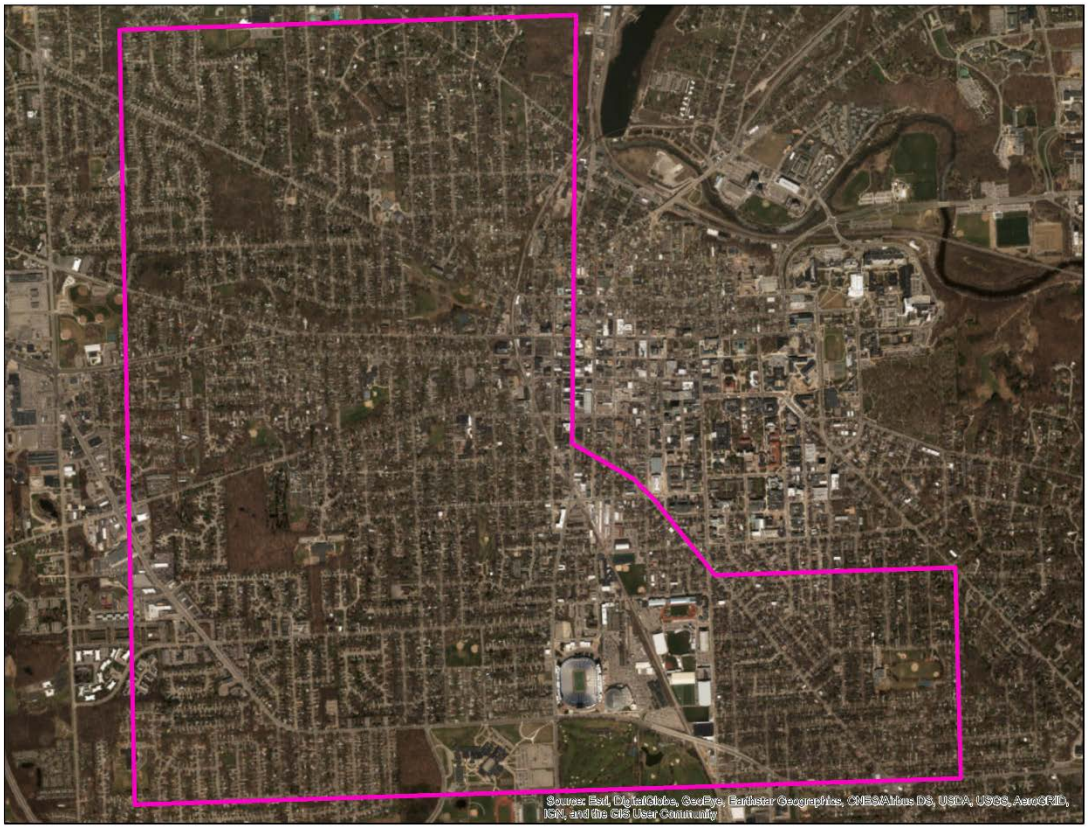

Figure 4-4: Aerial view of Ann Arbor study site street grid

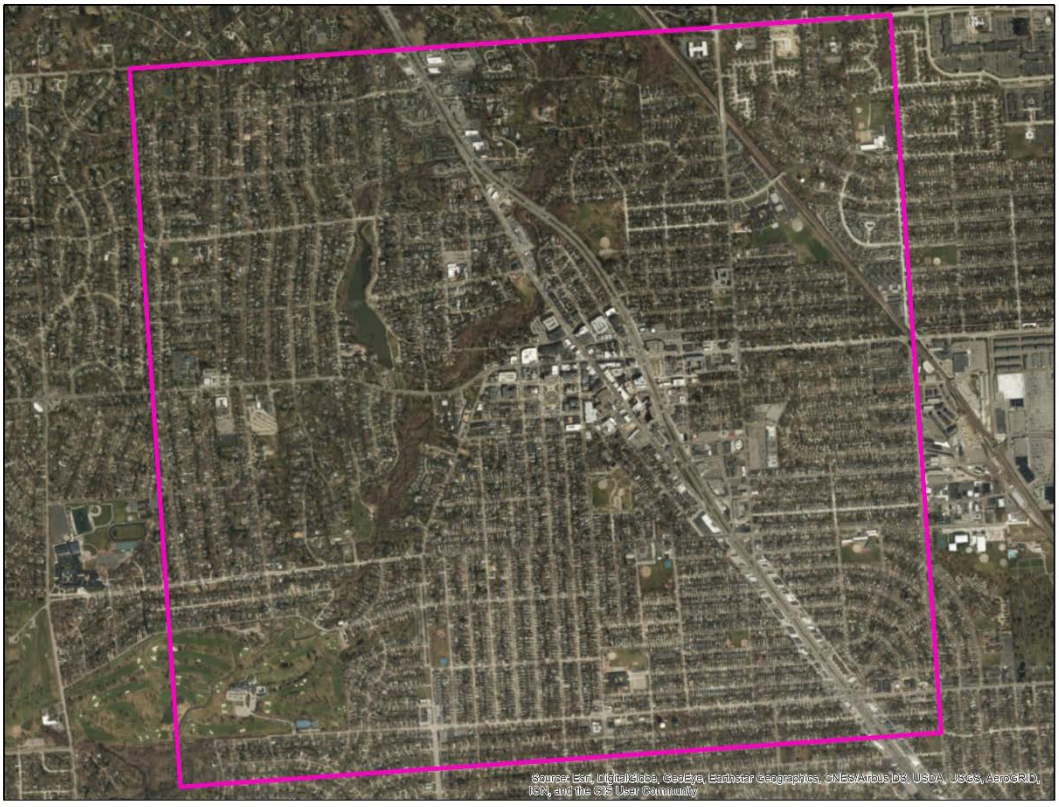

Figure 4-5: Aerial view of Birmingham study site street grid

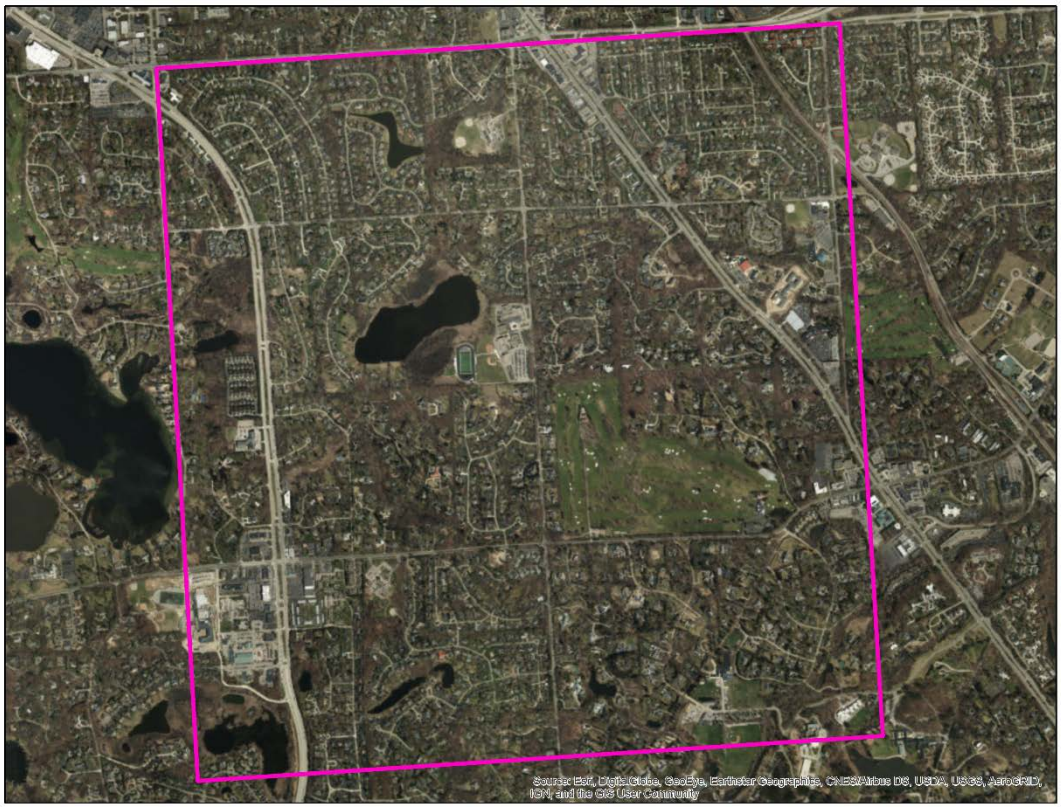

Figure 4-6: Aerial view of Bloomfield Hills study site street grid

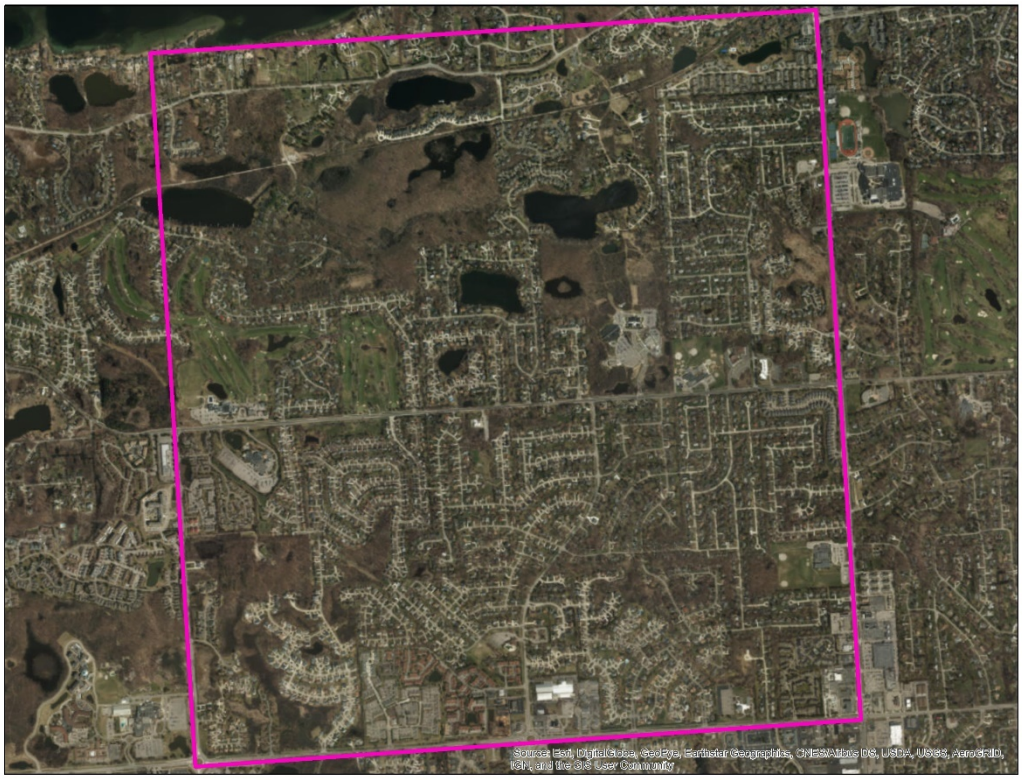

Figure 4-7: Aerial view of West Bloomfield study site street grid

Survey Responses

The survey asked questions about travel, exercise, diet, and other personal variables. A total of 1,191 surveys were collected (128 from Detroit 1, 158 from Detroit 2,297 from Ann Arbor, 196 from Birmingham, 211 from Bloomfield Hills, and 201 from West Bloomfield), with an overall response rate of 20%, which is good for a mail survey (Sommer and Sommer 1997). About 8% of the returned surveys were not included for analysis due to being incomplete. Of the 1,191 completed surveys, 194 were excluded because more than one survey was received from a single address, or because they appeared to be a duplicate survey. In the cases of multiple surveys from one household, random selection was used to determine which of the two to exclude. This was done because the responses from, say, a married or live-in couple, would likely overlap significantly with regard to restaurant travel. The final number of surveys used in this dissertation is 997 (Table 4-3). Tables 4-4 and 4-5 display the race and income responses for the survey by study site, reflecting the overall racial and economic segregation of the Detroit metro region.

Table 4-3: Survey responses used in dissertation

	Urban Detroit		**Higher Density Suburbs**		**Lower Density Suburbs**	
	Detroit 1	**Detroit 2**	**Ann Arbor**	**Birming-ham**	**Bloomfiel d Hills**	**West Bloomfield**
Total Respondents	111	144	241	162	175	164
Total Restaurant Trips	196.75	231.5	338.25	234.25	262.75	195.25
Percent of Respondents Reporting at Least One Trip	64.86%	55.56%	67.2%	71.51%	65.14%	76.22%

Table 4-4: Percent of respondents white/non-white for each study site

	Urban Detroit		Higher Density Suburban		Lower Density Suburban	
	Detroit 1	Detroit 2	Ann Arbor	Birmingham	Bloomfield Hills	West Bloomfield
White	5.00	10.64	93.68	94.18	91.63	84.21
Non-White	95.00	89.36	6.32	5.82	8.37	15.79

Table 4-5: Percent of respondents by income group for each study site

	Urban Detroit		Higher Density Suburban		Lower Density Suburban	
	Detroit 1	Detroit 2	Ann Arbor	Birmingham	Bloomfield Hills	West Bloomfield
Less than 20k	50.44	63.19	20.30	21.43	19.10	24.12
20k to 40K	34.51	21.53	16.61	8.93	13.48	8.82
40k to 60k	9.73	7.64	25.46	17.86	12.92	13.53
60k to 100k	4.42	6.94	24.72	16.67	23.03	26.47
100k to 150k	0.88	0.69	10.33	19.05	13.48	15.29
Greater than 150k	0.00	0.00	2.58	16.07	17.98	11.76

For this dissertation, the personal characteristics (age, gender, socioeconomics, nutrition habits and self-reported BMI) were used along with the questions pertaining to restaurant travel data, which respondents were asked to provide for an average week. The respondents provided the locations of the restaurants, usually an intersection. Using the information provided, the street addresses of the restaurants were found using an internet search, primarily Google maps, and entered into a spreadsheet in order to be geocoded. In many cases, the restaurants had closed since the time of the survey, but the location could still be found on online search engines. Some reported trips were unable to be geocoded due to lack of sufficient information to confirm a location. For example, if the responded wrote only

"Chinese food," not a specific restaurant, but gave an intersection where there was in fact a Chinese restaurant present, then it could be deduced to which restaurant they were referring. On the other hand, if they said only "diner," and gave a vague location such as "Woodward," where any number of restaurants could fit that description on a road that spans many miles, then no restaurant location could be assigned to that reported trip. The restaurants were then organized by type (including fast food, casual chain, upscale, ethnic, and café/bakery) using personal knowledge and examination of menus, websites, and Yelp reviews.

Additional Data

In addition to the survey, the locations of all licensed food handling operations in the counties containing the study sites, at the time of the survey (2007-08), were obtained from the Michigan Department of Agriculture and Rural Development. I requested data for Lenawee and Monroe Counties (not included in this analysis) as well as Macomb, Oakland, Washtenaw and Wayne Counties, and received a list of 12,824 establishments. Because I was only interested in restaurants for this dissertation, I removed establishments from this list that were obviously not a restaurant. I began by searching the data set for key terms such as "cafeteria," "school," "church," "bar," "concessions," and removed those from the list. I then sorted the list by name and went through the remaining items, removing listings based on name or based on a Google search. I ended with 7,863 restaurants in the dataset for the four counties used in this analysis. This dataset from MDARD contained addresses to allow for geocoding of these restaurants. This serves to give a deeper understanding into the pattern of restaurants across the region.

Research Objectives

Objective 1: Examine the spatial pattern of restaurants by type at the time of the travel survey (2007) for all 5 municipalities, including a five-mile buffer zone around study areas.

This lends a better understanding of the choices survey respondents reported in the survey. Did they travel to what was the closest option, or did they bypass other choices? The locations of all licensed restaurants at the time of the survey was provided by the Michigan Department of Agriculture and Rural Development, and were geocoded in ArcMap.

Objective 2: Examine the travel behavior patterns in the survey data to explore differences among socioeconomic and demographic characteristics and neighborhood type.

This objective answered questions about people's restaurant travel behavior in the Detroit metro area. Using survey data collected during an NSF-funded mail survey in 2007, this research was able to answer multiple questions.

Research Questions

1. What is the existing restaurant landscape in the study area? [Objective 1]
    a. Do different neighborhoods have a different density of type of restaurants based on socioeconomics of the neighborhoods?
2. Where and how often did the survey respondents report traveling to restaurants in relation to their home address? [Objective 2]
    a. How far did they have to travel?
    b. What was the mode of travel?

c. What type of restaurants did they frequent?

d. How often did they dine out?

e. How did this travel relate to the overall restaurant pattern? [Objectives 1 and 2]

3. Are there differences in this travel based on the study neighborhood or individual characteristics, such as income, education, vehicle ownership or family/household structure? [Objective 2]
4. Are there any measurable relationships between self-reported measures of BMI (as a proxy for health) and restaurant travel, either by type of restaurant or frequency of dining out? [Objective 2]

Hypotheses

It was expected that differences in the availability of restaurant options would be delineated along socioeconomic lines, as are so many differences in access to amenities reported in this area. Since fast food restaurants are often found in commercial strips, the more affluent study areas will have a fair number of fast food restaurants, but I expected that they would make up a greater proportion of overall restaurants in the Detroit neighborhoods. To put it another way, I expected Detroit to have fewer casual chain and upscale restaurants compared to the suburbs. It was also expected that the types of restaurants frequented by respondents from Detroit would be significantly different from those of more affluent suburban respondents, with more frequent visits to fast food for Detroiters and relatively fewer trips to upscale restaurants, cafes, and even casual chain restaurants. Based on existing literature, it was expected that higher BMIs would correlate with the Detroit respondents more so than the

suburban respondents. While this may also correlate with a higher relative consumption of fast food, it was not expected that this research would be able to conclude that the restaurant travel behavior contributes to higher BMIs, only that there is a relationship. Lastly, it was expected that the primary mode of travel for all neighborhoods would be by personal vehicle, and that despite high walkability in Ann Arbor and Birmingham, Detroit would have the highest proportion of trips by walking because of lower access to personal vehicles.

Methodology

To answer these questions, a variety of methods were employed. For Question 1, census data were collected and visualized to demonstrate the spatial patterns of socioeconomic inequality in the Detroit region, which is the backdrop of this research. The locations of restaurants across the region at the time of the survey were mapped to analyze the pattern of these restaurants, in density and in type, across the study area. Spatial analysis of the restaurant landscape in the different study areas measured the density and availability of different types of restaurants in different types of neighborhoods. All mapping was done in ArcGIS.

For Question 2, the restaurant locations reported by the survey respondents were mapped, and compared to the overall pattern. Summary statistics compared the different neighborhood types and demographic groups in terms of travel preferences. For Question 3, statistical analyses were employed to better understand the differences in the travel behavior. Tests of differences among groups (gender, education, locational, etc.) such as ANOVA and t-

tests were used to be able to draw inferences about the differences among groups. Similar methods were used to answer Question 4.

Study Limitations

There are a few limitations to the study that should be acknowledged. First, regarding actual travel distance and routes, I am assuming the trip originates at the home address, which may not always be the case, particularly for stops made during trips with multiple purposes. It is also not known what the respondents purchased at the restaurant. For example, stopping at a fast food restaurant in the morning could be for a black coffee (zero calories) or a 1,000-calorie meal. For respondents who did not report any restaurant trips but completed the rest of the survey, I am assuming no response means they do not dine out in an average week. The fact that many respondents, particularly in the Detroit neighborhoods, did not report a trip to restaurants is revealing in and of itself but does reduce the number of trips available for analysis. Lastly, when assigning a restaurant type there may be cases where the restaurants are not accurately coded. However, for restaurants whose typology is unclear or unknown, they would be labeled as “other.”

CHAPTER 5: PATTERNS OF RESTAURANT LOCATIONS AND TRAVEL BEHAVIOR ACROSS THE STUDY AREA

Introduction

As discussed in Chapters 2 and 3 of this dissertation, the landscape of the Detroit metropolitan region is one of uneven development and unequal access to services. The first portion of this chapter will examine whether this is true for restaurants. Using a list of licensed restaurants, provided by the Michigan Department of Agriculture and Rural Development, that were operating at the time of the survey, I identified restaurants that can be classified as fast food (including carryout pizza chains and quick-serve chains). For the counties containing the study sites (Macomb, Oakland, Washtenaw, and Wayne), I calculated fast food density, as well as what percentage of all licensed restaurants were fast food restaurants. The second portion of the chapter uses the results of the travel survey to compare restaurant travel across the study sites. More detailed explorations of the socioeconomic aspect of this travel is the focus of Chapter 6.

Darden et al. (1987) define uneven development as "the spatial trajectory of investment and disinvestment, economic growth and decline" (p. 11). In terms of the Detroit metropolitan region, this has manifested in a spatial pattern of a central city, Detroit, that is populated primarily by African Americans, that has depressed household incomes, far above-average unemployment, and a lack of quality services such as police, fire and schools, while the northern suburbs of the city are, in almost every way, the opposite. As Darden et al. pointed out then, and as is still true today, the broader Detroit region taken as a whole is doing well, economically, but the city itself struggles to provide jobs and services to its disadvantaged residents. June Manning Thomas (2013) wrote that "society's failure to address the most

fundamental dilemmas of racial injustice tainted Detroit's" efforts to redevelop the city in the post WWII era (p.3).

As discussed in more detail in Chapter 3, this pattern of uneven development highlighted by Darden et al. is due, in part, to the same trends of post-WWII suburbanization that many American cities experienced. Like many cities in the so-called Rust Belt, Detroit also saw a shift in its manufacturing sector—the dominant economic sector—as factories moved to the suburbs, the Sun Belt, or out of the country. While Detroit is not alone among northern U.S. cities that attracted African Americans from the South during the late 1800s and early 1900s, the rapid growth of the auto industry in Detroit at that time led to an exponential increase in the city's black population, and residential segregation and racism ensued. When middle class and affluent whites began leaving Detroit for the suburbs, this exodus was much more pronounced than in many other U.S. cities that experienced such suburbanization. Today, these events have created conditions of stark racial and class segregation that make it difficult for Detroit and its residents to achieve equitable opportunities for equitable economic development and vital city services.

In addition to these economic and cultural factors, local and federal urban policies contributed to the incapability of the city to ward off its significant decline. In the early part of the 1900s, Detroit's leaders spent an average of $25 million per year on capital expenditures (Thomas 2013). After all, the population was growing, and the manufacturing industry was strong. But this quickly depleted their available funds, and as the U.S. faced the Great Depression, then World War II—during which much of Detroit's manufacturing capabilities were directed toward supplying the war—and then the post-war suburbanization, bringing

significant changes and little opportunity to rebound. The racial segregation of the city's neighborhoods led to overcrowded black neighborhoods with substandard housing, and systemic racism fueled the riots of 1943 and 1967. Weak federal urban policy, urban renewal projects that disrupted black neighborhoods, and a lack of regional planning shaped the urban environment that exists today. Given the large spatial footprint of Detroit, a city that is now less than half its peak population of 1.8 million residents, suburban development—as opposed to using vacant land in the city—contributes to economic and environmental burdens for both governments and residents (Vojnovic and Darden 2013). Unlike many other cities of its size and age, Detroit failed to establish an efficient public transit system (Thomas 2013), a problem that is glaring today, given that many Detroiters cannot afford to own automobiles.

Given the patterns of racial and class segregation evident in U.S. cities today, and the barriers that this brings for central city residents seeking employment, education, services and amenities that are enjoyed by suburban residents, significant research has been conducted to explore the extent of these disparities. Heller and Sawicki (2003) organized the literature on disparities of services in black neighborhoods compared to white neighborhoods into the following potential causes: differences in income and spending power; the density of demand; household structure; differences in consumption patterns; underreporting of disposable income for predominantly black neighborhoods; inaccurate information on neighborhood attributes and personal consumption preferences; racial bias; failure to keep pace with neighborhood change; and lack of available land for new development in central cities. With regard to restaurants, research in this vein has tended to focus on the prevalence of fast food restaurants in neighborhoods that are predominately African American or Latino. As discussed

in Chapter 2, obesity and diet-related diseases disproportionately impact minorities. 39% of African American men and 59% of African American women are obese (CDC 2012), and a diet that exceeds daily caloric needs is a primary driver of obesity. Fast food menu items, if consumed regularly, are linked to elevated measures of body mass index (Duffey et al. 2007).

According to Kwate (2008), racial residential segregation has created a higher concentration of fast food restaurants in black residential neighborhoods than white neighborhoods. He identifies four "pathways" through which this has happened: 1) population characteristics (concentrated blackness and concentrated poverty); 2) economic characteristics (the retail environment and labor conditions); 3) physical infrastructure (zoning); and 4) social characteristics (neighborhood stigma). Freeman (2007) writes that "the overabundance of fast food and lack of access to healthier foods…have increased African American and Latino communities' vulnerability to food-related death and disease. Structural perpetuation of this race- and class-based health crisis constitutes 'food oppression'" (p.2221).

Examining census block groups across the U.S., James et al. (2014) found that fast food access was positively correlated with the percentage black population, controlling for population density and poverty (though increases in poverty strengthened the relationship between race and fast food access, and poverty alone did not reveal a relationship). Block et al. (2004) found that the density of fast food restaurants positively correlated with measures of poverty and African American population in New Orleans. Powell et al. (2007) found that predominately black and Latino neighborhoods tend to have fewer restaurants than predominately white neighborhoods, but that the restaurants they do have are comprised of a greater proportion of fast food restaurants than predominately white neighborhoods. Lewis et

al. (2005) found that in lower income Los Angeles neighborhoods, a greater percentage of existing restaurants were fast food, and healthy menu options in restaurants were more likely to be found in more affluent neighborhoods. In addition, Leschewski and Weatherspoon (2014) found that some fast food chains charge slightly more for their products in food deserts in Michigan cities, as opposed to more affluent areas.

Since fast food consumption is demonstrated to be related to poor health outcomes, and the research is mixed on the effects of proximity and consumption, some have called for zoning regulations to limit where fast food restaurants can locate (Sturm and Cohen 2009). The city of Los Angeles enacted a ban on new fast food restaurants in South L.A. in 2008, hoping to address high rates of obesity and attract sit-down restaurants with potentially healthier fare (Jennings and Smith 2015). Seven years later, obesity has not declined, nor have the new healthier restaurants arrived (*ibid*). Some argue that a more specific land use policy, coupled with higher fast food prices and a shift in social norms, would be more effective in reducing obesity related to fast food consumption (Charles 2015).

Methodology and Research Questions

To explore the spatial patterns of fast food and restaurant travel for the study area, this chapter is divided into two approaches: the first explores the general spatial pattern of fast food availability in the study region, and the second uses the travel behavior reported by the survey respondents to explore how respondents from each study site navigate the restaurant landscape. For the first approach, I obtained a list of all licensed restaurants that were in operation at the time the survey data were collected from the Michigan Department of Agriculture and Rural Development. As described in Chapter 4, since the list included any

licensed food preparation site, from this list I removed sites such as churches, school or hospital cafeterias, catering businesses, sports and entertainment venues, and night clubs, or any venue that, to the best of my knowledge, would not be considered a restaurant in the traditional sense of being a stationary place of business where patrons purchase meals as the sole or primary activity on the premises.

From the list of restaurants, I identified fast food restaurants such as chains including McDonald's and Burger King, carryout pizza chains like Little Caesars, and quick serve sandwich chains such as Quizno's.[2] I defined a fast food restaurant here as one with no wait staff, where you order and pay for food at a counter, and which may or may not have a drive-through window, similar to Reitzel et al. (2014) and Taylor and Ard (2015).[3] While pizza locations may not traditionally be considered fast food, given the above characteristics and given that pizza is high in calories, fat and sodium, and given that many pizza chains offer "grab and go" pizzas that require no wait time, I argue that these types of quick-serve pizza locations can be included in this category. Selecting restaurants by names, (i.e., using known national fast food chains) ensures that those selected are in fact fast food restaurants (a similar approach was used by James et al. 2014), though it does run the risk of omitting some local/non-chain restaurants that could meet my criteria. However, these omissions are likely minor and using the known chain locations allows for consistency across the region.

[2] I did not attempt to code the full set of restaurants by type in the same manner that the restaurants listed by respondents in the survey were coded due to the sheer size of the restaurant list from MDARD. It would not be feasible to accurately code the full list due to the large number of restaurants.

After cleaning the data set, I calculated what proportion of restaurants in the dataset were fast food restaurants by county and city. While due to time and logistical limitations I did not attempt to categorize all restaurants on my list, I was able to differentiate those I designated as fast food from the rest. To calculate fast food density, I geocoded in ArcMap (with 95.3% success) the locations of the fast food restaurants using the addresses provided by MDARD. Using a 2010 census tract shapefile, I then calculated fast food density for each census tract per capita and per square mile across the four counties of the study region.

After using the Mean Center function in ArcMap to find the mean center of each survey site, I calculated buffer rings around that mean center in half-mile intervals up to 3 miles. This completely covered each two-square-mile survey collection site and a distance surrounding each site (an example appears in Figure 5-1). Using these buffers and the spatial join function in ArcMap, I counted the number of fast food restaurants within each half-mile ring. This provided an "as the crow flies" measurement, but to account for road networks—the way individuals would actually travel—I also calculated the total miles of road segments in each ring, following the methods of Reitzel et al. (2014), using road shapefiles downloaded from the U.S. Census. Dividing the number of fast food restaurants in each ring by the total miles of road segments in each ring provided an additional measure of fast food density.

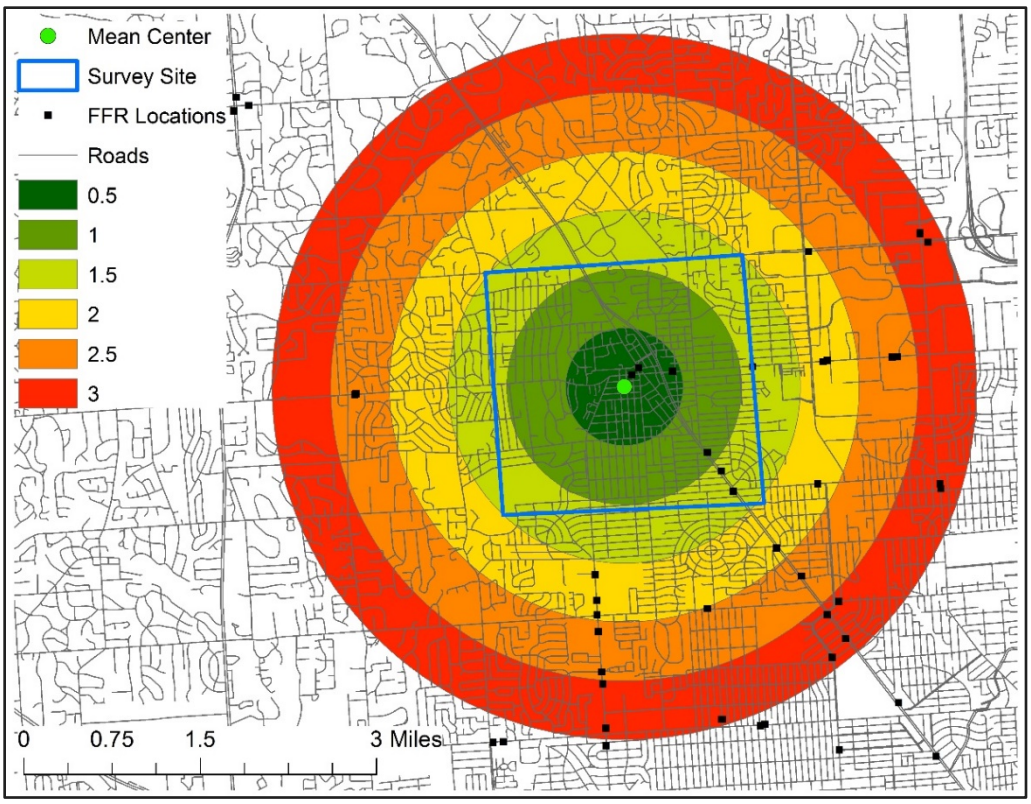

Figure 5-1: Example of buffer rings and study site

For the second portion of this chapter, I identified differences in travel frequency, restaurant type, and mode and distance of travel for the various study sites[4]. Maps were created in ArcMap to visualize the patterns of travel by restaurant type and frequency. Frequency for each location was calculated simply by how many times it was visited in an average week according to the survey results. Maps were produced for all study sites together and each individually (the Detroit sites are presented together in the map due to the large amount of overlap in the travel). Lastly, a standard distance calculation was performed on the trip points for each survey site. The standard distance calculation gives a measure of how clustered or dispersed these trip points are, not around the center of the study site, but around

[4] The methodology for collecting and cleaning the survey data is described in Chapter 4.

the mean center of the trip points. The calculation was weighted by the frequency that each restaurant was visited. The purpose of this calculation was to provide insight into whether Detroit residents and/or those in more walkable, dense areas have a smaller standard distance than those in more autocentric areas.

The main research questions to be answered in this chapter are, do residents in the city of Detroit have a higher exposure to fast food restaurants, and do they make up a greater proportion of all restaurants than in the suburbs; and, how do restaurant types and frequency vary across the different study neighborhoods?

Results Part 1: Regional Fast Food Landscape

In the following results, "city" or "municipality" refers to the city as a whole, while "study site" refers to the two-square-mile site within each municipality from which survey data were collected. Because the Bloomfield Hills study neighborhood includes parts of both the city and township, and the since the city is within the township, the city and township were included together for this analysis. Where "FFR" appears in tables, it refers to "fast food restaurants." Figure 5-2 shows all fast food restaurants from the MDARD dataset plotted with reference to the study sites and municipalities. It is evident from these maps that in the more residential, low-density suburban communities of Bloomfield Hills and West Bloomfield, the fast food restaurants are located mostly on the outskirts of the municipality, whereas the more traditional urban areas with more mixed-use landscapes have them scattered throughout. Since fast food restaurant corporations tend to take advantage of site locations that have high automobile traffic, the locations are usually found along busy roads or in shopping center

parking lots. In Figure 5-2, the high traffic roads can be identified based on where the points are located.

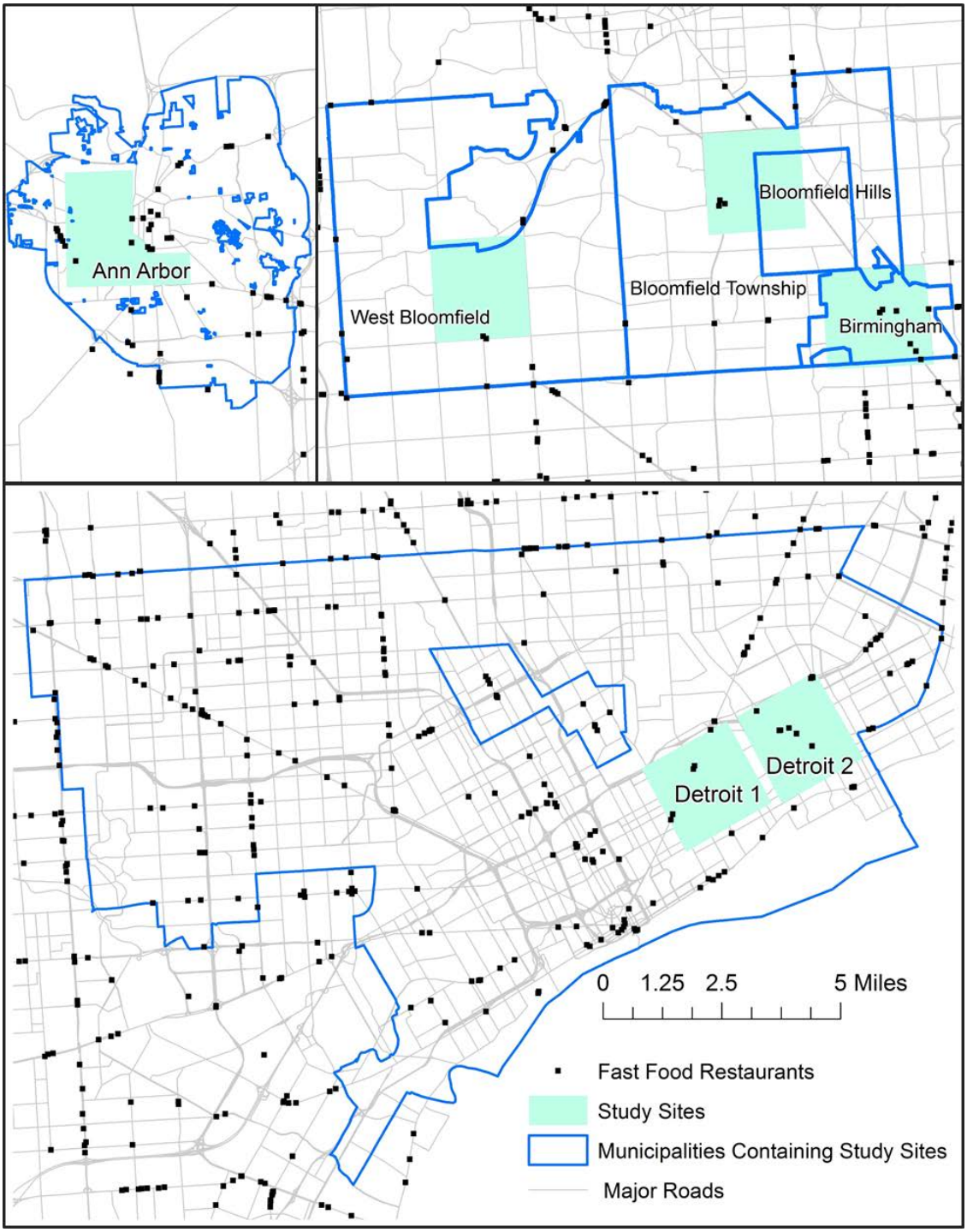

Figure 5-2: Municipalities, study sites and fast food restaurants

To estimate how prevalent fast food restaurants are in the study areas, a few different measurements were calculated. Using the list from MDARD and having identified the restaurants that were fast food restaurants, the percentage of all restaurants in the municipality and the study site that were comprised of fast food was calculated. Those results are found in Table 5-1. The results were as expected—that Detroit would have the highest percentage of all restaurants being fast food restaurants—but there was one surprise. The suburb of Bloomfield Hills had a fast food percentage only 1 percentage point lower than Detroit. But most of these fast food restaurants in Bloomfield Hills, as can be seen in Figure 5-2, fall along the main roads that make up the norther border of the township, and zero fall within the city of Bloomfield Hills. The higher-density sites—Detroit, Ann Arbor, and Birmingham—had higher measures than the low-density suburbs in other calculations as well: fast food restaurants per 1,000 residents, per square mile, and per mile of road.

Fast food restaurants per 1,000 residents and per square mile, by census tract, are presented in maps in Figures 5-3 and 5-4, respectively. These maps were created by conducting a spatial join to link the geocoded fast food point data to census tract polygons. While neither of these Figures reveal strong spatial clusters of fast food density, and though the two maps visualize different results based on the methods of standardization, it does appear that the northern suburbs have lower fast food densities while Detroit and Ann Arbor have tracts with higher densities.

Table 5-1: Fast food densities of municipalities where surveys were collected

	Urban Detroit	Higher Density Suburbs		Lower Density Suburbs	
	Detroit	Ann Arbor	Birmingham	Bloomfield Hills	West Bloomfield
FFR per 1,000 residents	0.32	0.39	0.30	0.25	0.12
FFR per square mile	1.60	1.53	1.25	0.36	0.25
FFR per mile of road	0.05	0.07	0.03	0.01	0.02
% of restaurants in city that are FFR	21.28%	14.85%	10.17%	20.29%	10.61%
# of FFR within study site	9 (Detroit 1) 4 (Detroit 2)	5	4	4	2

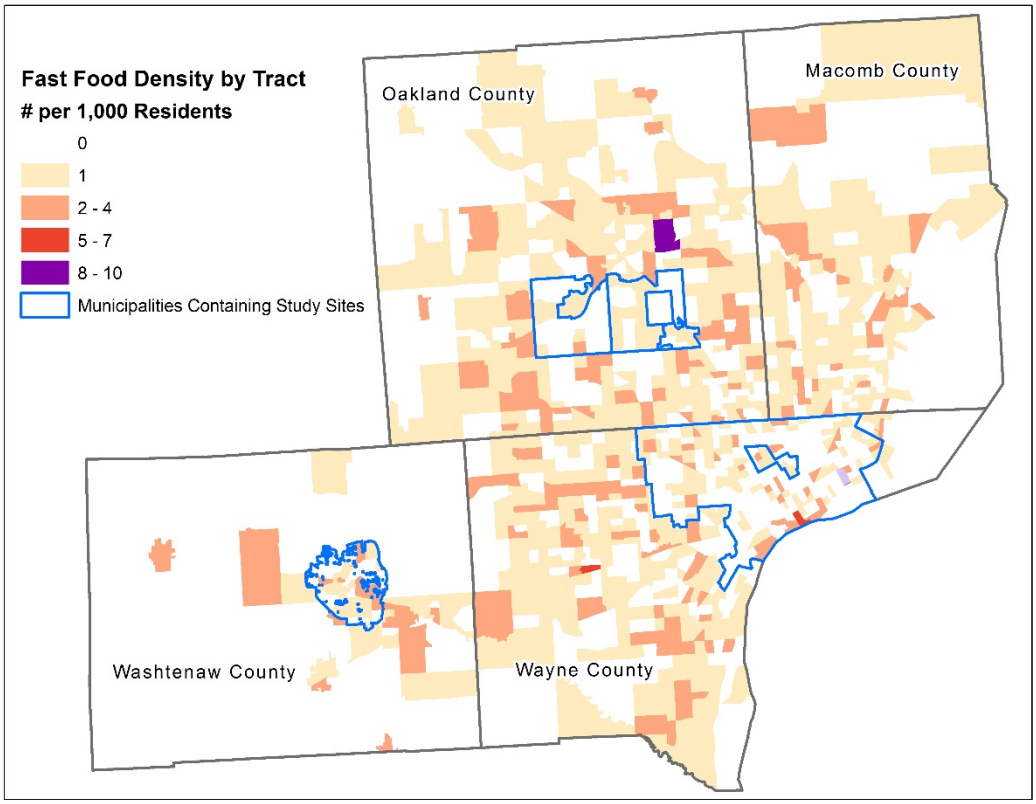

Figure 5-3: Fast food locations, per capita, using census tracts

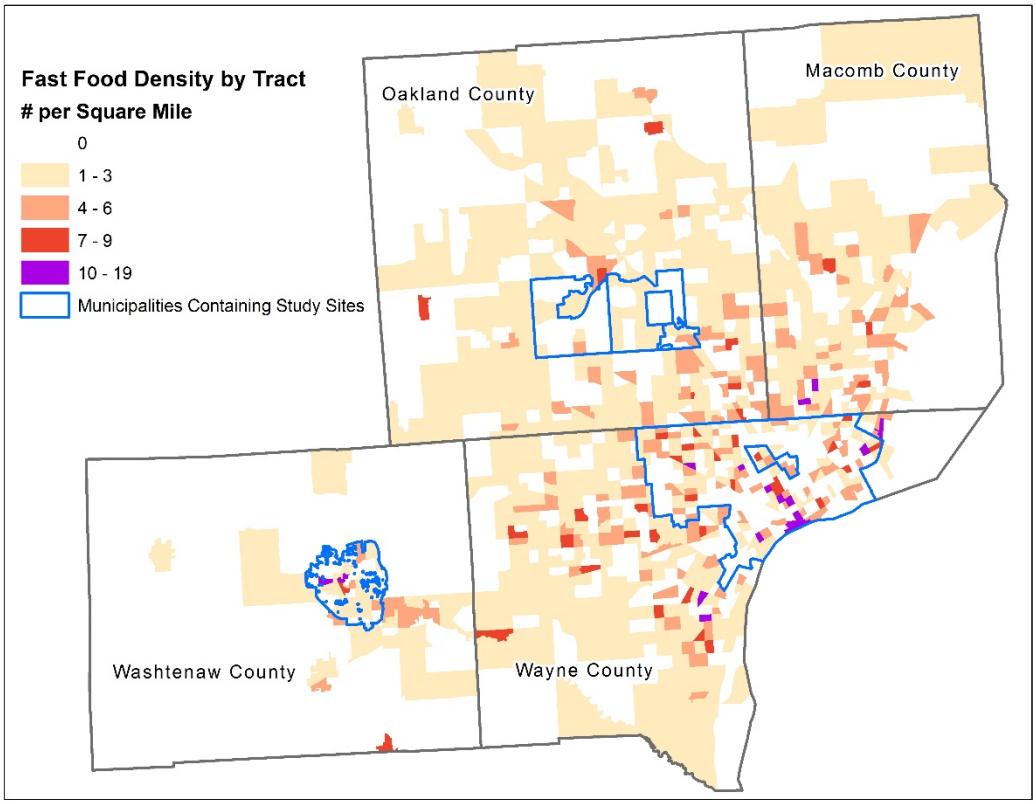

Figure 5-4: Fast food locations, per square mile, using census tracts

Because the choropleth maps differed somewhat in their patterns, another approach used to visualize fast food patterns across the region was a hot spot analysis in ArcMap. Using the shapefile that joined fast food locations to census tracts for Macomb, Oakland, Washtenaw and Wayne Counties, I used the Getis-Ord Gi* statistic in ArcMap, with a fixed distance band and Euclidean distance, to further explore whether Detroit is indeed a kind of fast food "swamp." I performed the analysis using two different weights: the number of fast food restaurants per capita, and per square mile. Again, the two analyses gave very different results, but both suggested, like earlier results, that Detroit residents may have a higher exposure to fast food restaurants (Figures 5-5 and 5-6). The per capita measure displayed hot spots in the eastern portions of the city, where the study neighborhoods are, but measuring per square mile

revealed hot spots in the northwest part of the city, spilling over into the suburbs just north of the city boundary. Using fast food restaurants per capita, the results showed no significant findings for the affluent suburban communities to the north while using per square mile suggested they are a potentially statistically significant cold spot when it comes to fast food density.

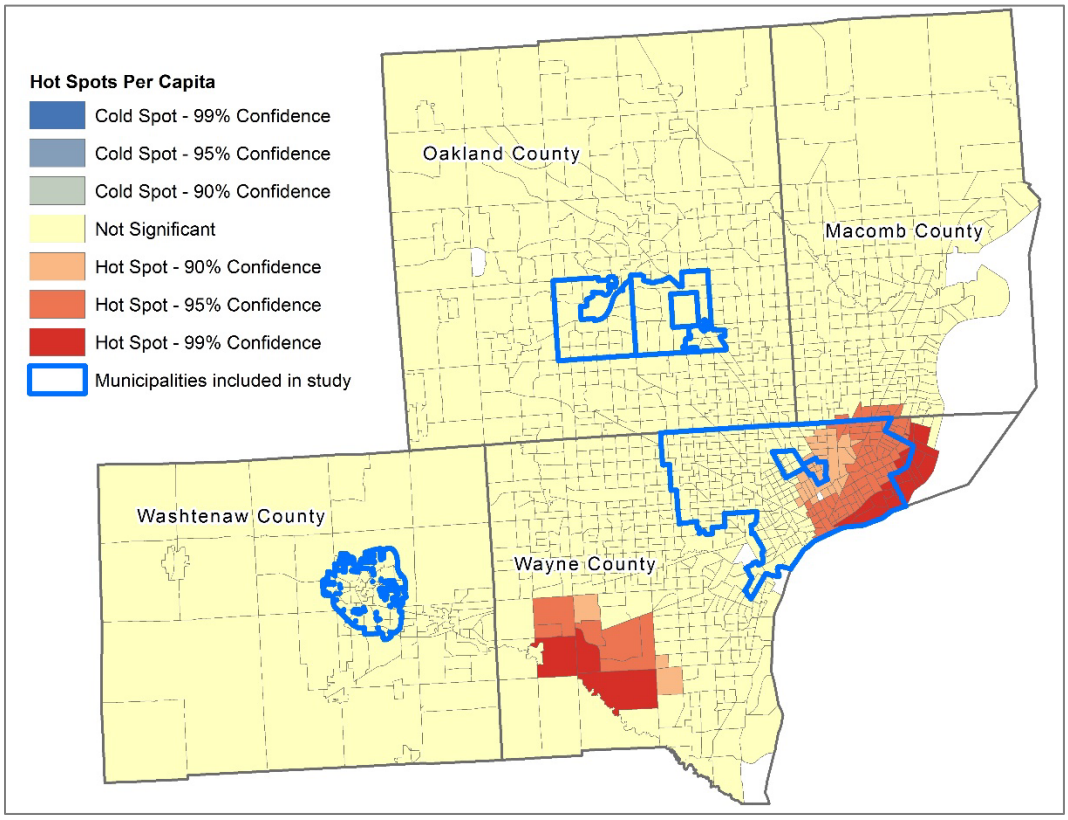

Figure 5-5: Hot spot analysis of fast food locations, per capita, using census tracts

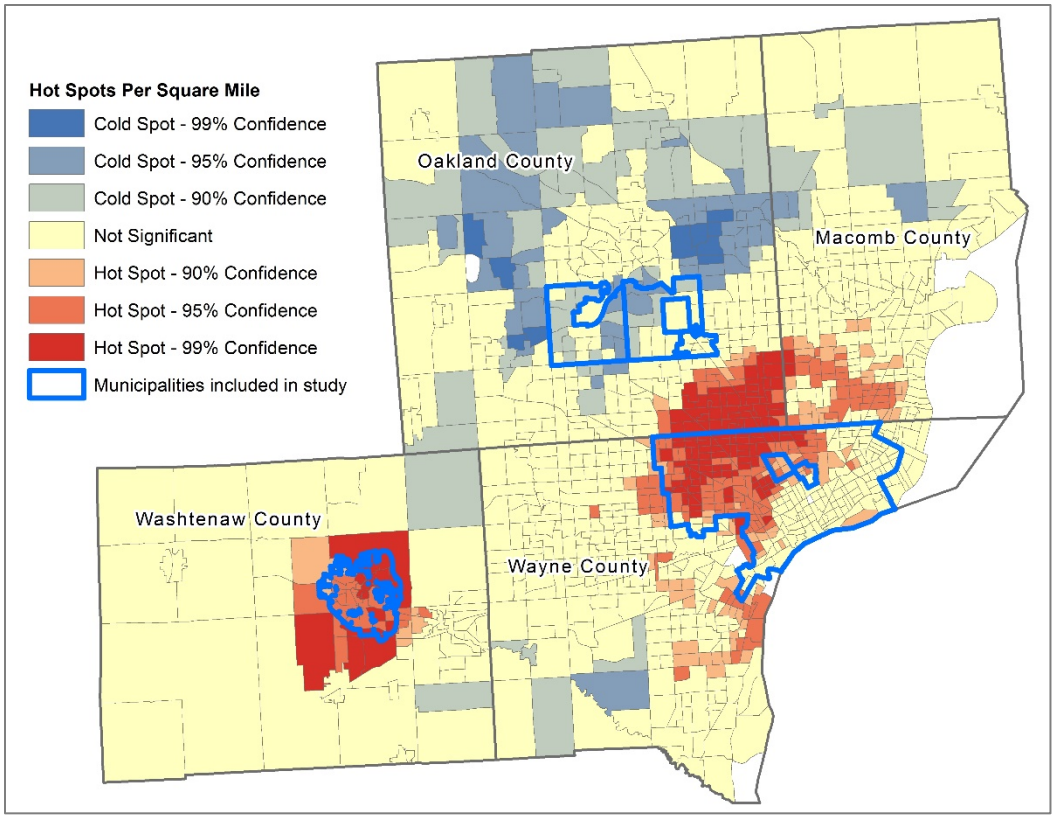

Figure 5-6: Hot spot analysis of fast food locations, per square mile, using census tracts

The previous analyses focused primarily on the municipalities as a whole. To get a better understanding of the fast food landscape closer to the neighborhoods where the survey respondents resided, additional focus was given to those locations. Using the mean center of each of the two-square-mile study sites and a series of half-mile buffer rings with raw counts (Table 5-2) and fast food counts standardized by the miles of road in each half-mile buffer (Table 5-3), these calculations provide insight into the number of fast food restaurants available in the study site and whether they are located near the center of the site, the periphery of the site, or evenly throughout. Since fast food restaurants are located on busy roads, road miles are a logical way to standardize spatial areas for fast food density. Once again, the results reveal

that the low-density suburbs of Bloomfield Hills and West Bloomfield have a lower prevalence of fast food restaurant location than do the higher-density areas.

Table 5-2: Locations of FFR relative to mean center of study sites

Buffer Ring (miles)	Urban Detroit		Higher Density Suburbs		Lower Density Suburbs	
	Detroit 1	Detroit 2	Ann Arbor	Birming-ham	Bloomfield Hills	West Bloomfield
0.5	2	5	1	3	0	0
1.0	1	0	10	1	4	0
1.5	5	6	10	3	1	2
2.0	9	8	2	8	1	5
2.5	6	12	8	10	4	3
3.0	15	9	2	13	3	3
TOTAL	38	40	33	38	13	13

Table 5-3: Locations of FFR relative to mean center of study sites, standardized by miles of road

Buffer Ring (miles)	Urban Detroit		Higher Density Suburbs		Lower Density Suburbs	
	Detroit 1	Detroit 2	Ann Arbor	Birming-ham	Bloomfield Hills	West Bloomfield
0.5	0.024	0.112	0.033	0.035	0.000	0.000
1.0	0.006	0.000	0.116	0.007	0.032	0.000
1.5	0.015	0.018	0.044	0.016	0.005	0.025
2.0	0.024	0.019	0.008	0.035	0.004	0.047
2.5	0.014	0.025	0.028	0.038	0.013	0.013
3.0	0.025	0.017	0.007	0.040	0.008	0.011
TOTAL	0.019	0.021	0.028	0.031	0.010	0.017

Results Part 2: Restaurant Travel Behavior by Study Site

After thoroughly exploring the fast food landscape of the study region, I examined the survey data to understand how the participants in the travel behavior survey navigated the

available choices. General trip characteristics can be found in Table 5-4. On average, the survey respondents reported travelling to a restaurant 1.45 times per week. About 67% of the sample reported dining out at least once per week. West Bloomfield has the highest percentage of respondents reporting dining out at least once per week (76.22%), but they also had the fewest trips per respondent (1.35). Detroit #2 had the lowest percentage of respondents reporting traveling to a restaurant at least once per week (55.56%), with Detroit #1 being second lowest (64.86%) but close behind Bloomfield Hills (65.14) and Ann Arbor (67.2%). Detroit #1 had the highest number of trips per respondent (1.69), and the highest proportion of all restaurant trips (82%), suggesting that a subset of this sample is consuming fast food more than once per week.

In both measures, the HDS and LDS communities were nearly identical (70% reporting at least on trip per week, and an average of 1.42 trips per week). Detroit had a lower percentage of respondents who dined out weekly (60%), but those diners did so slightly more often (1.65 trips per week). Detroit respondents may be somewhat less likely to dine out weekly, but those who do are going more often than their suburban counterparts.

The suburban sites all reported a significantly lower proportion of their restaurant travel being to fast food restaurants than Detroit residents, with Ann Arbor and Birmingham being the lowest. A breakdown of trips to all types of restaurants by type can be found in Figure 5-7. While there are variations from site to site, a general theme that can be seen is that all of the sites have a much more diverse trip type than Detroit, where about 77% of all restaurant travel reported in the survey was to a fast food restaurant. By comparison, among LDS respondents, 22% of all trips were to fast food, and for HDS respondents, the proportion was 17%.

Table 5-4: Survey responses regarding restaurant trips

	Urban Detroit		Higher Density Suburbs		Lower Density Suburbs		
	Detroit 1	Detroit 2	Ann Arbor	Birming-ham	Bloom-field Hills	West Bloom-field	Total
Total Respondents	111	144	241	162	175	164	997
Total Restaurant Trips	196.75	231.5	338.25	234.25	262.75	195.25	1,458.75
Percent of Respondents Reporting At least One Restaurant Trip	64.86%	55.56%	67.2%	71.51%	65.14%	76.22%	67.06%
Average Number of Trips Per Respondent (all)	1.69	1.61	1.40	1.41	1.50	1.35	1.45
Proportion of Trips That Were to Fast Food	82.0%	72.6%	19.81%	14.62%	21.03%	22.02%	36.26%
Percentage of Respondents Who Reported Making At least One Weekly Trip to Fast Food	56.8%	46.5%	16.2%	15.4%	17.7%	15.2%	25.1%
Average Distance of Trips (mi)	3.24	2.33	2.17	3.07	4.67	3.9	3.23
Average Distance of Trips (mi) Urban Type	2.79		2.62		4.29		

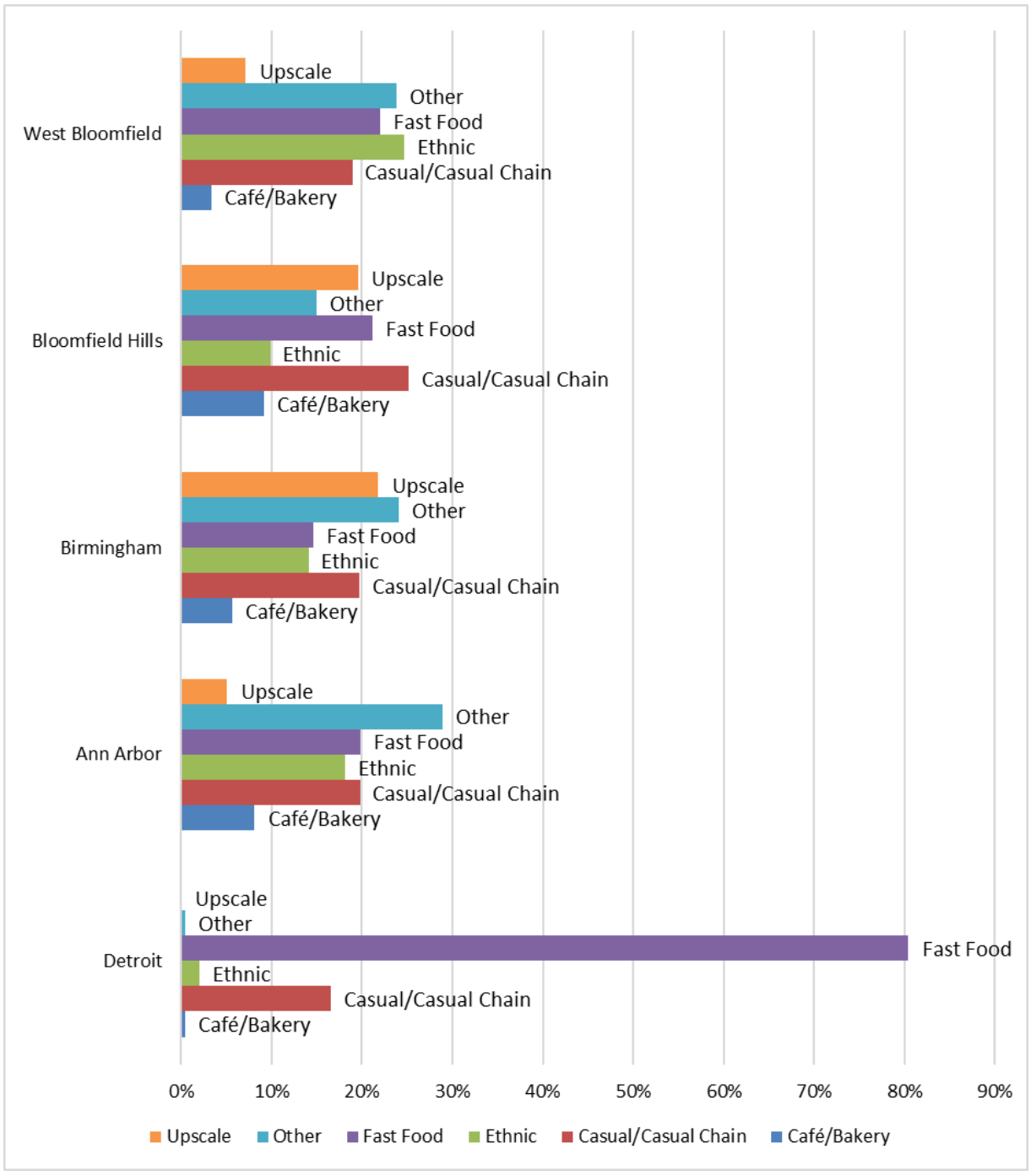

Figure 5-7: Breakdown of trips by type (Detroit sites are combined for simplicity)

Figure 5-8 displays all of the locations of the restaurants mentioned in the survey that could be mapped, meaning the respondent included enough specific information that it could be linked to a geographic location. Each color of dot corresponds to a survey site. The two Detroit sites are included together to keep the map easier to read, since there is significant overlap between those two trip sets. From this map, it is generally visible that the Ann Arbor residents remain primarily close to home, while the northern suburban areas appear more dispersed, though few trips are to the city of Detroit from the suburbs. Within Detroit, most trips appear to be within or just outside the study sites, except for a linear pattern to the northeastern suburbs, where respondents traveled to access national casual chain restaurants located in commercial shopping malls in that area, because such restaurants were not located within the city at the time of the survey. For example, there is now an Applebees location on Eight Mile Road, but that location opened after the time of this survey.

Figures 5-9 through 5-13 zoom in to each site individually and display the type of restaurant represented by each point and the number of times each restaurant was visited in total by respondents from each site. The restaurant type and the frequency with which it is visited are mapped separately due to the close proximity of points and the tendency to overlap; separating the two makes for less cluttered maps. The graduated symbol scale is not uniform across study sites, as Detroit had a handful of fast food restaurants that were visited by as many as 57 respondents, while the suburban communities did not have restaurants with that high of a frequency. The maps suggest that the restaurants closest to the study sites are the most frequently visited, where the most frequently visited locations are visualized by the largest symbol size.

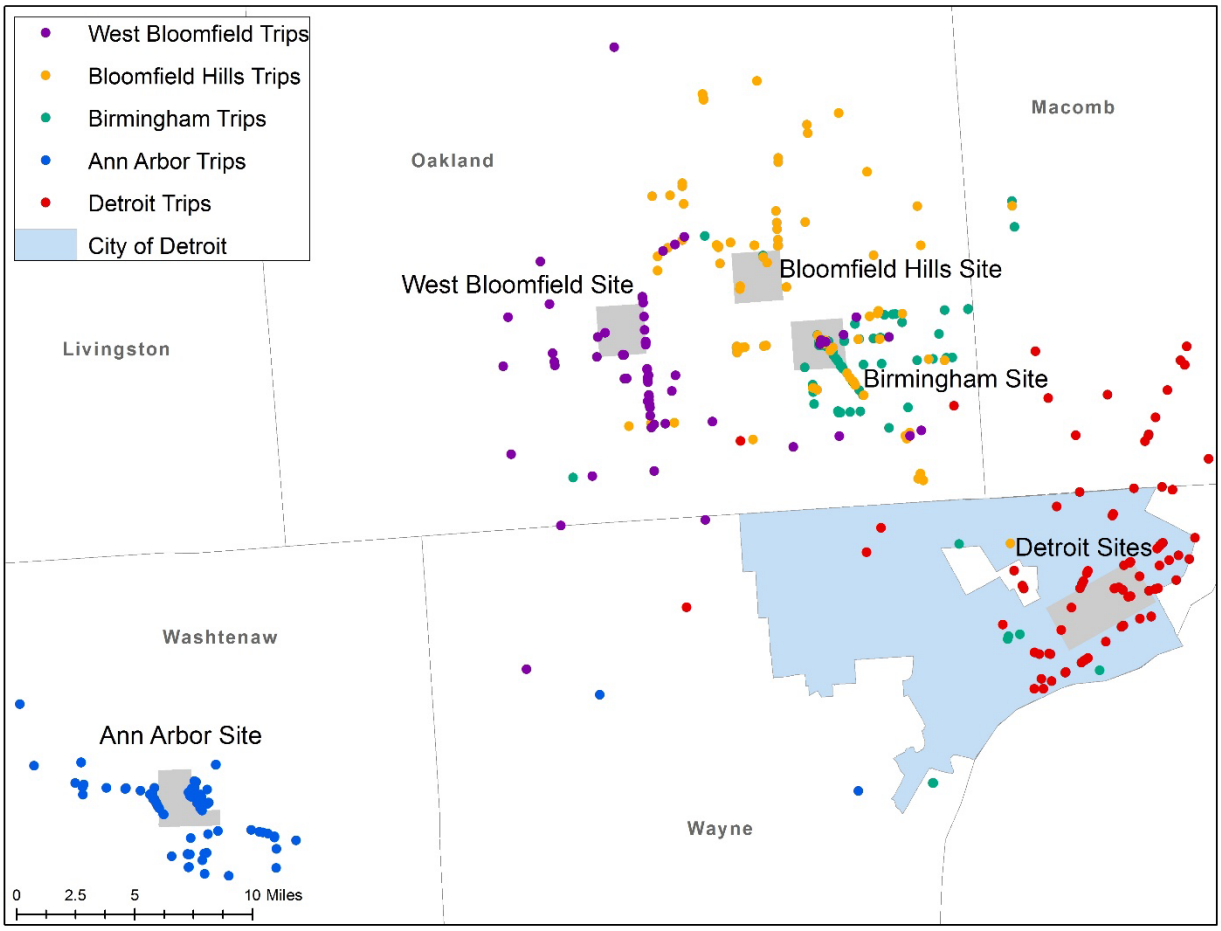

Figure 5-8: All restaurant trips, all sites

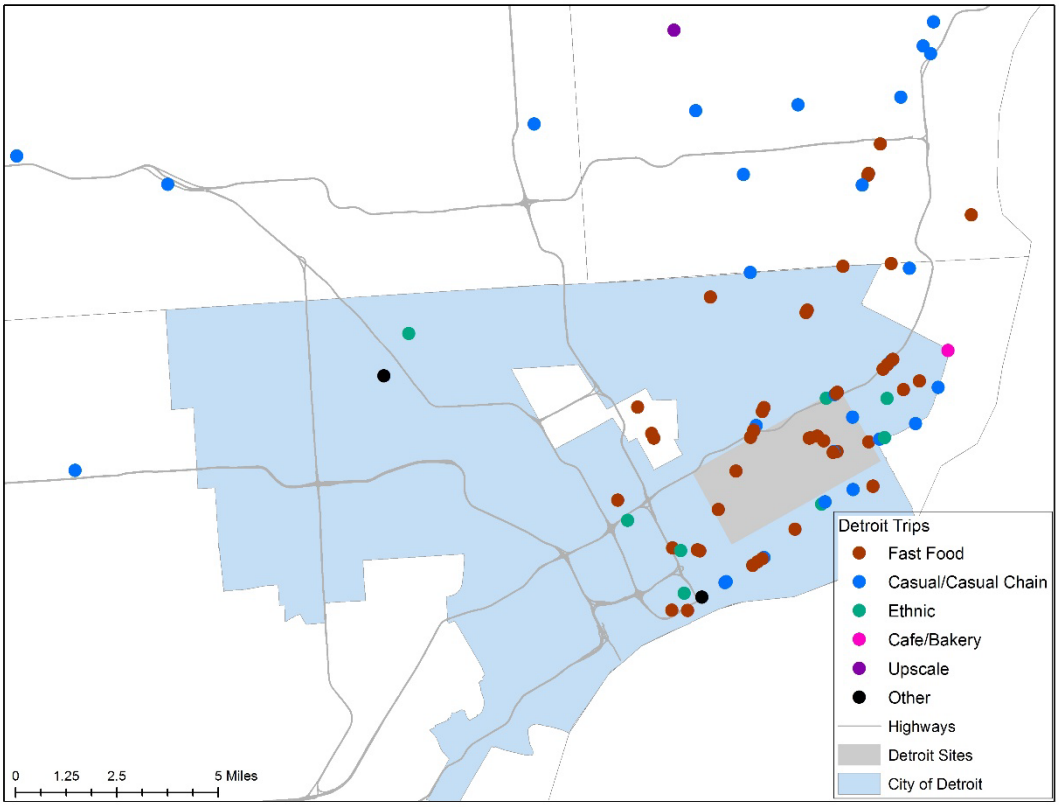

Figure 5-9a: Detroit (both sites) trips, by restaurant type

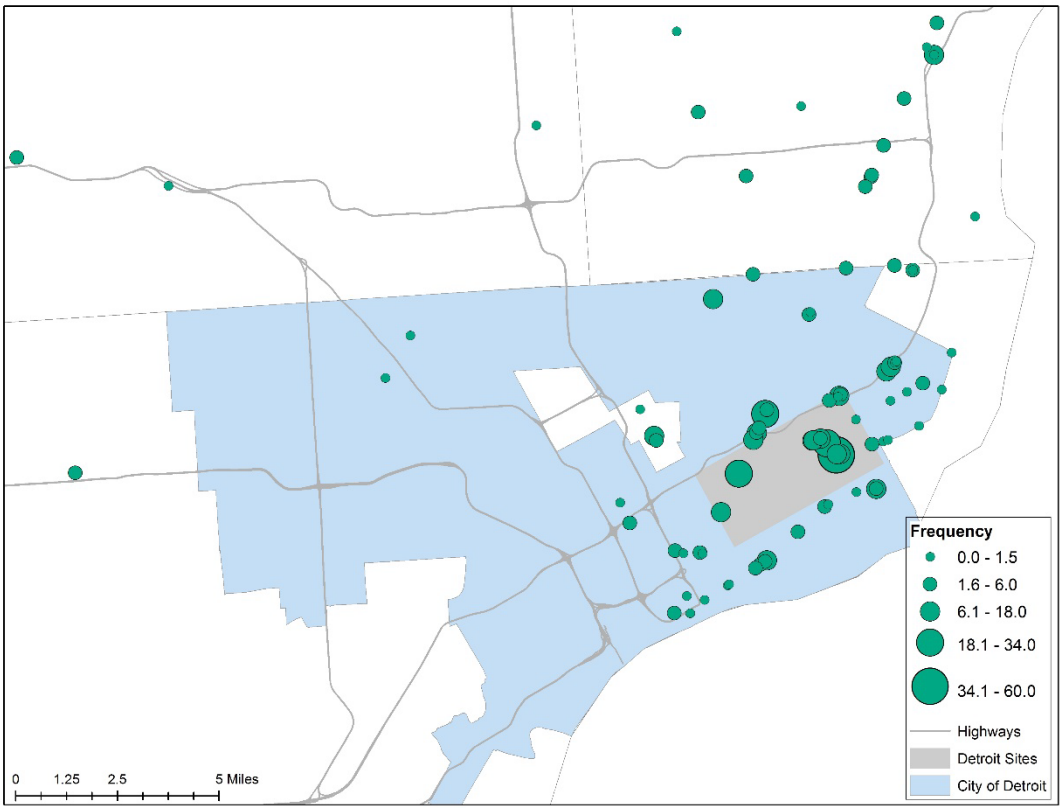

Figure 5-9b: Detroit (both sites) trips, by frequency restaurant was visited

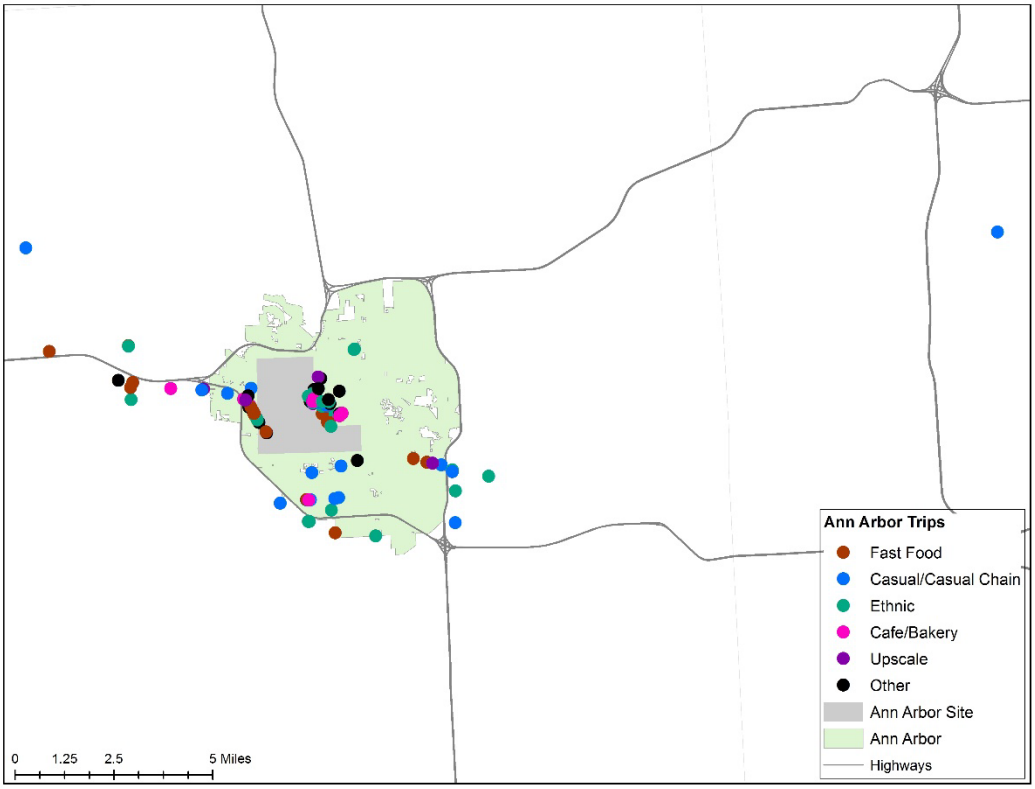

Figure 5-10a: Ann Arbor trips, by restaurant type

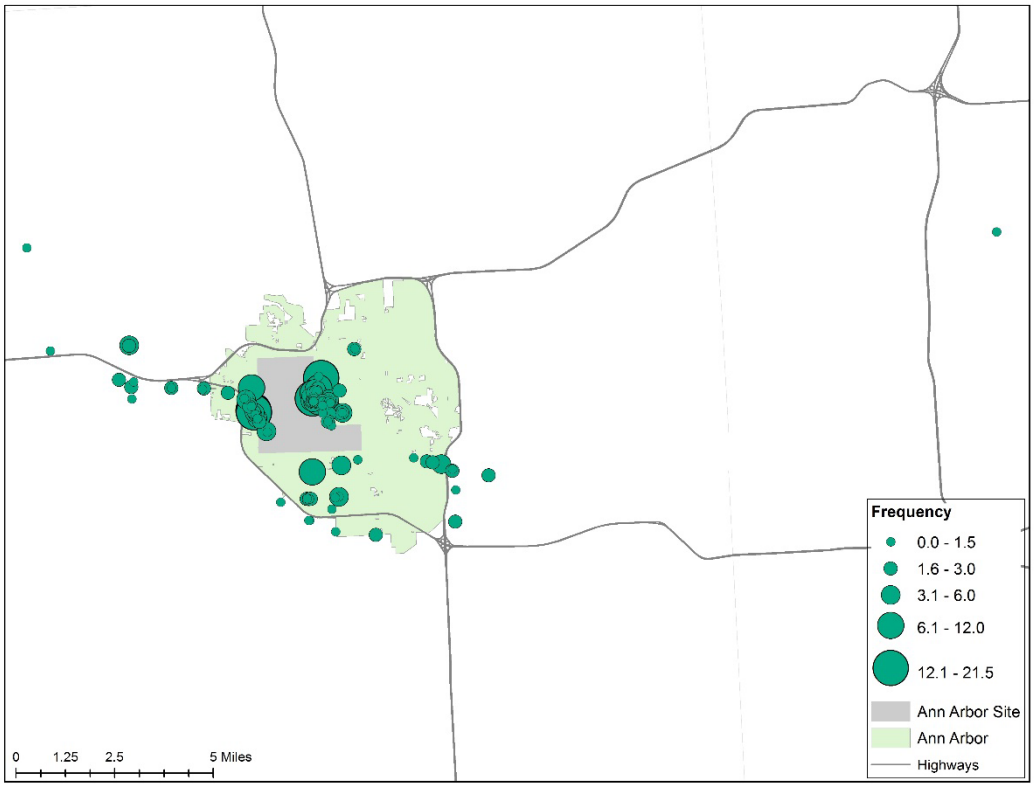

Figure 5-10b: Ann Arbor trips, by frequency restaurant was visited

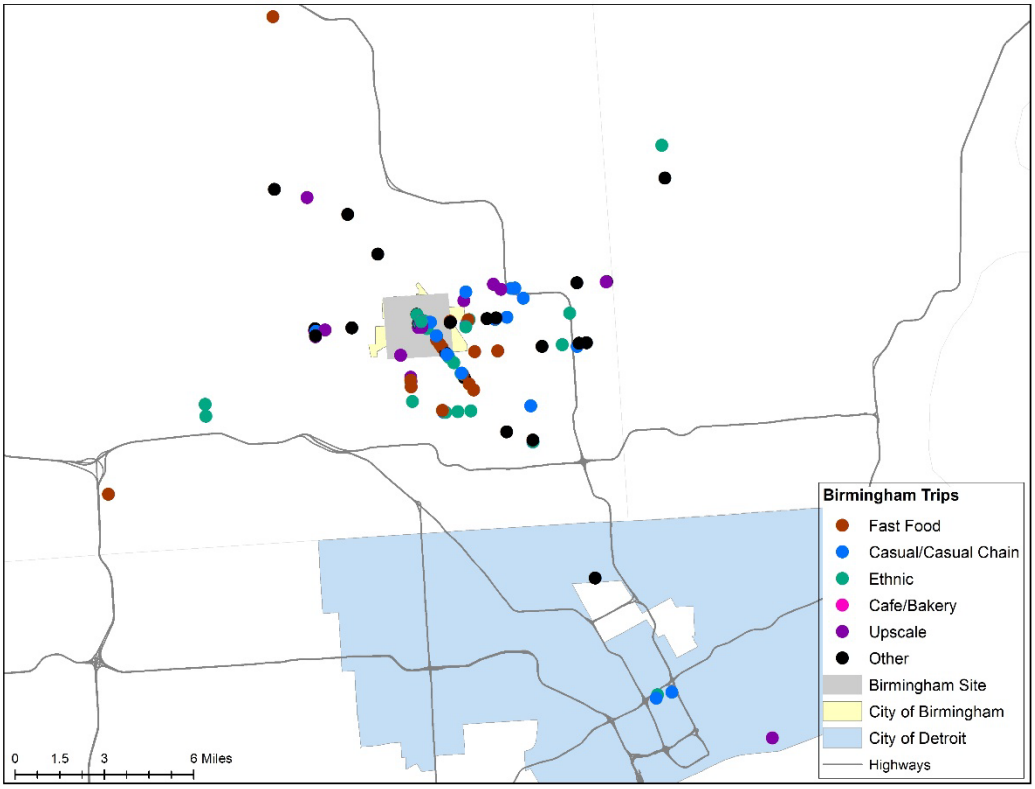

Figure 5-11a: Birmingham trips, by restaurant type

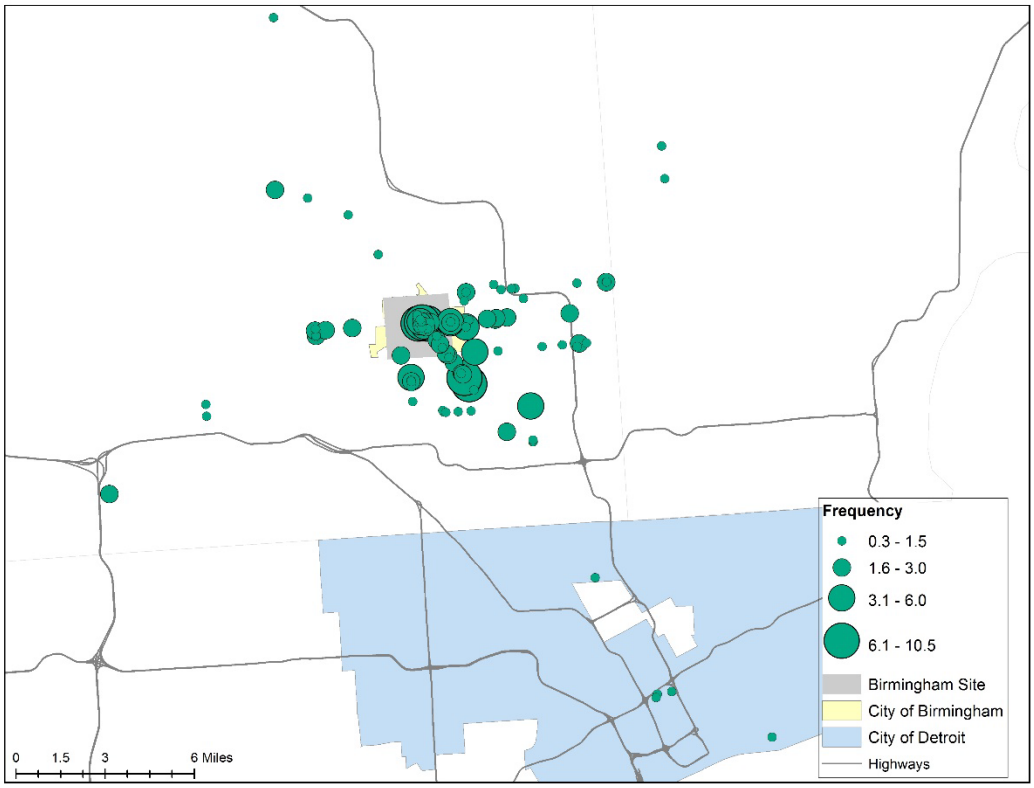

Figure 5-11b: Birmingham trips, by frequency restaurant was visited

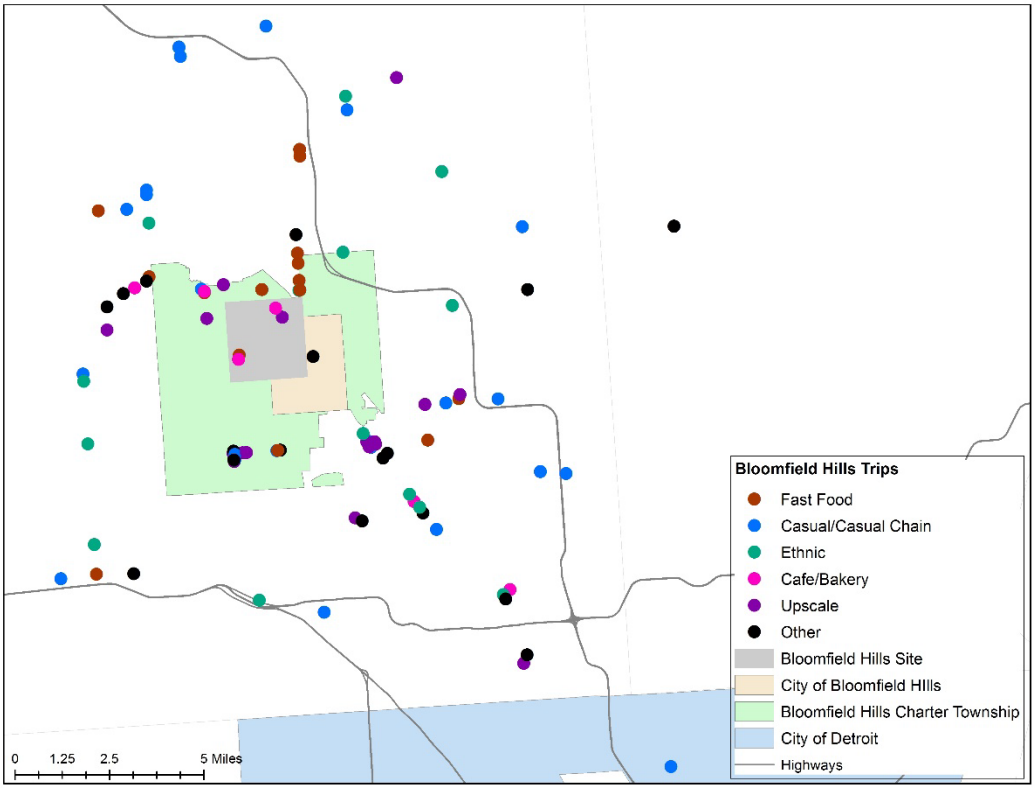

Figure 5-12a: Bloomfield Hills trips, by restaurant type

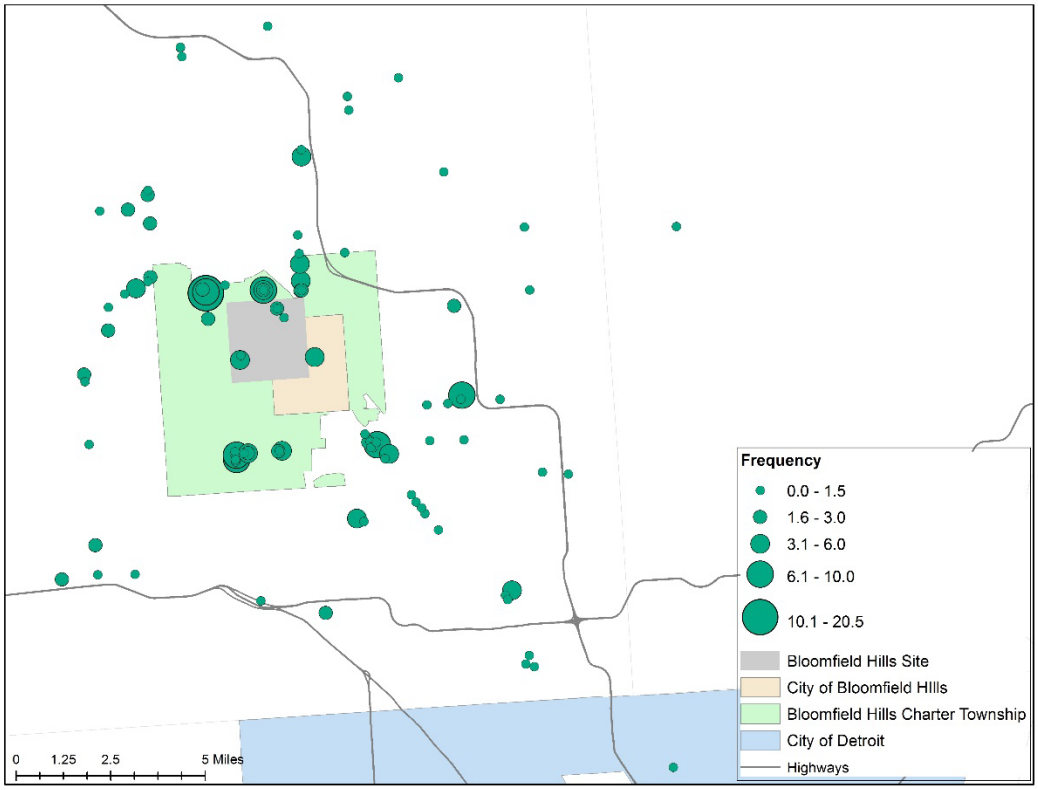

Figure 5-12b: Bloomfield Hills trips, by frequency restaurant was visited

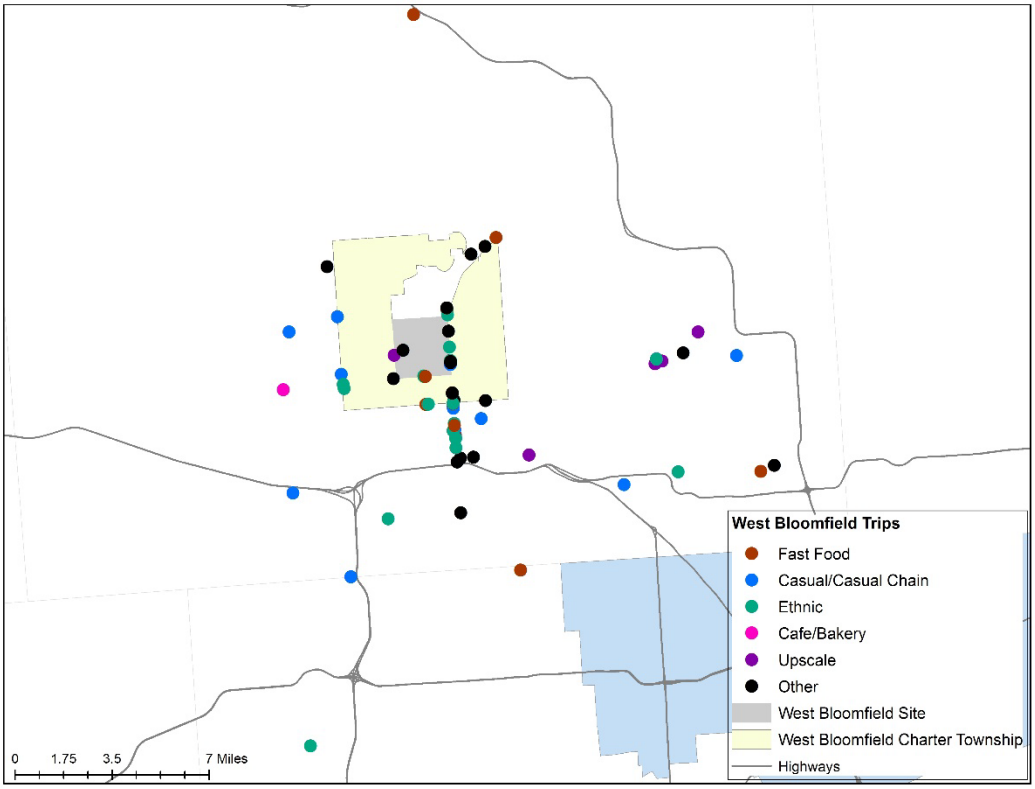

Figure 5-13a: West Bloomfield trips, by restaurant type

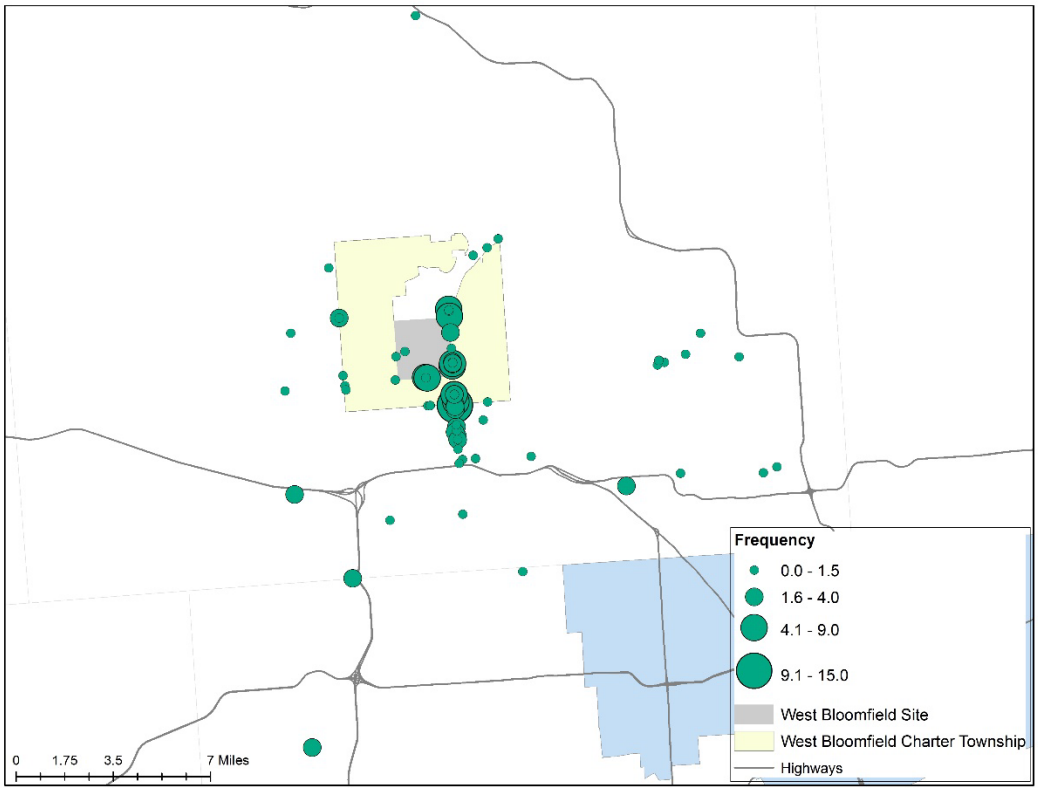

Figure 5-13b: West Bloomfield trips, by frequency restaurant was visited

A standard distance measurement was taken to see whether respondents from each study site stayed in a general area (more clustered trips), or whether the trips were more dispersed across the landscape. The results demonstrate that residents of some study sites have more clustered or dispersed restaurant travel behavior than others. This is not necessarily a measure of how close to home they stay, as the circle is centered on the mean center of the trip points and not the mean center of the study site. However, the circles generated in Figure 5-13 do visualize how the trip patterns relate spatially to the study site, and the quantitative measurements are found in Table 5-5. The measurements in miles represent the radius of the circles, which contain all the trips within one standard deviation of the mean.

On the average, the high-density suburbs had the smallest standard distance circle (3.08 miles), followed by the Detroit sites (3.62 miles), and the low-density suburbs (much larger at 4.07 miles). The Ann Arbor and Detroit 2 circles are nearly centered on the study site, while the northern suburbs are pulled southward toward popular restaurants in Birmingham and Royal Oak. The circle for Detroit 1 (more southwestern of the two Detroit sites) is much larger than Detroit 2, and the second largest of the six sites (4.26 miles) which is somewhat surprising. This may be partially explained by the pull of the casual chain restaurants just outside the northeastern city boundary, which, at the time of the survey, was the closest location for many casual national chain restaurants for residents of the Detroit study sites. Only one Detroit survey respondent reported dining at an upscale restaurant, so these chains, like Red Lobster and Olive Garden, may serve that type of role for these respondents, given the difference in income compared to the suburban respondents. It is noteworthy that the patterns for the two

Detroit sites are different, revealing how distinct neighborhoods within an area of the city are unique.

The autocentric suburb of West Bloomfield has the largest standard distance at 4.32 miles. While the suburban communities to the north of Detroit often reported driving into other neighboring communities for preferred dining options, Ann Arbor, being farther removed and having a fair amount of diverse dining options within its boundaries, has the smallest circle (2.58 miles), reflecting its disconnect from the sprawling northern Detroit suburbs and its walkability. Ann Arbor had, by a fair margin, the largest proportion of restaurant trips made by walking or biking, at 32.25%, modes of travel which are more conducive to shorter trips closer to home. Mode of travel and distance traveled will be discussed in detail in Chapter 6, but overall, respondents reported making 78.18% of restaurant trips by car, 18.73% by walking or bicycling, and 3.09% by bus. Nearly all respondents (98% or more) in the suburban communities reported having at least one car in the household, while for Detroit respondents, that number was closer to 70%. Logically, access to a car makes longer trips more feasible.

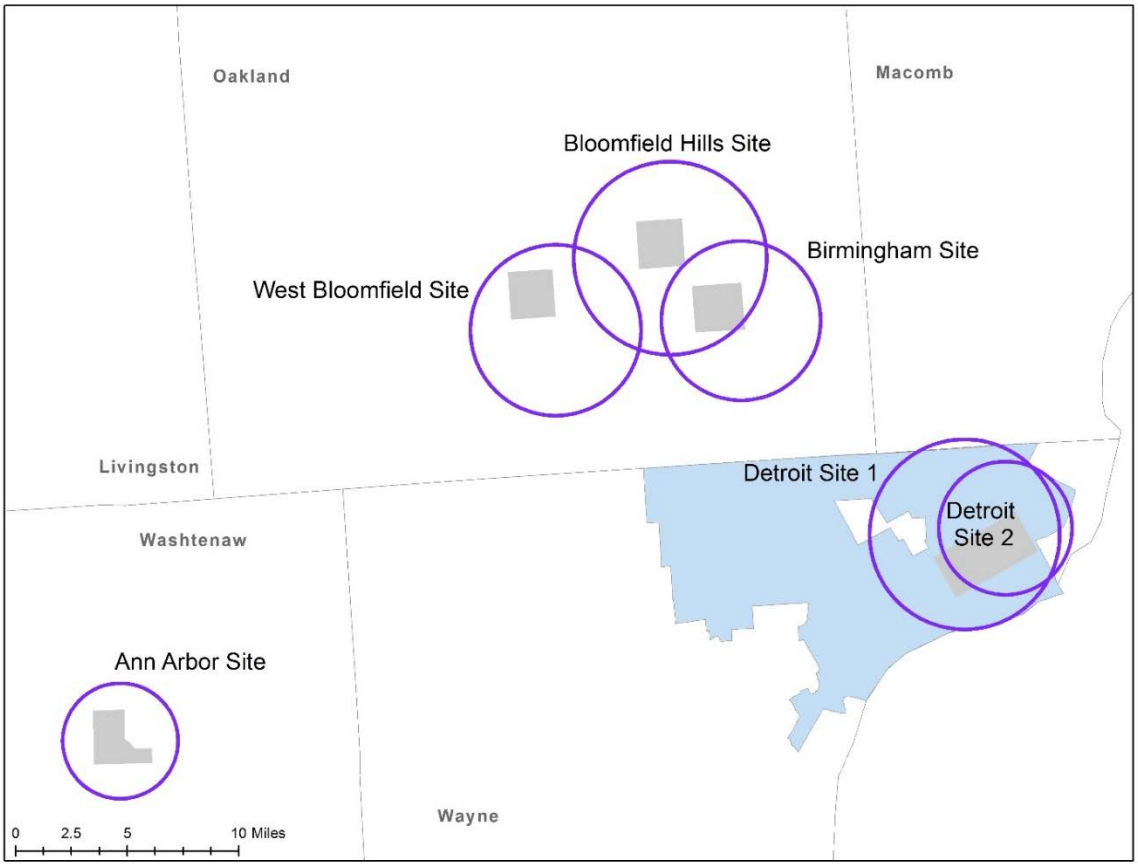

Figure 5-14: Standard distance circles for restaurant trips within one standard deviation of mean center of trip cluster for each site

Table 5-5: Standard distance (in miles) for restaurant trip clusters for each site

Urban Detroit		**Higher Density Suburbs**		**Lower Density Suburbs**	
Detroit 1	Detroit 2	Ann Arbor	Birmingham	Bloomfield Hills	West Bloomfield
4.26	2.98	2.58	3.57	4.32	3.82
3.62		3.08		4.07	

Discussion and Conclusion

As presented in the literature review in Chapter 2, many attempts at characterizing the food environment in urban areas focus on quantifying the presence or absence of specific types of food outlets. This chapter adds to the literature first by attempting to quantify disparities in fast food density and saturation in the Detroit metropolitan region, where such an analysis has not yet been done. The preceding analyses approached this in a handful of different ways. Though the quantitative results varied by analysis, all seemed to suggest to some degree that Detroit residents have a higher exposure to fast food than do their suburban counterparts, especially compared to the low-density suburban communities. The number of fast food restaurants per capita found within Detroit and the higher density suburbs of Ann Arbor and Birmingham were comparable to one another, and were higher than in the lower density suburbs of Bloomfield Hills and West Bloomfield. This suggests that there are fewer nearby opportunities for residents of the more affluent, lower density suburbs to access fast food. Similar patterns hold at the city level when fast food density is measured by area (per square mile) or, since fast food restaurants are located along roads, by miles of road in the city.

When looking at the patterns spatially on maps at the census tract level, no clear patterns can be visualized. Measuring fast food density by per capita or per square mile do not reveal a strong association with fast food restaurants in predominately black census tracts within Detroit compared to the predominately white suburbs—the map appears quite random--however, the hot spot analysis maps suggest that parts of Detroit may be statistically significant fast food hot spots, but disagree with which parts of the city are hot spots depending on whether census tracts are weighted by restaurants per capita or per square mile. However,

it should be cautioned that these patterns are likely explained by the fact that Detroit is a large, older city with a history of mixed use neighborhoods, and higher density suburbs like Birmingham and Ann Arbor also have substantial mixed use or close proximity between residential and commercial, whereas low-density, primarily residential communities like Bloomfield Hills and West Bloomfield are more particular about their commercial activities and also simply have less opportunity for high densities of fast food because of their specific built environment characteristics based on low-density development patterns.

Looking at what proportion of all restaurants are fast food restaurants, Detroit and the suburb of Bloomfield Hills have a similar value, 21.28% and 20.29%, respectively, while the other municipalities are lower. However, looking at a map of where the fast food locations are, nearly all of West Bloomfield's fast food restaurants are on the city's border, which is delineated by main roads where such commercial activity is expected, while Detroit, being a larger city with multiple land uses, is crisscrossed by major roads and has fast food restaurants scattered throughout, adjacent to residential neighborhoods.

The second way this chapter adds to the literature is by using actual travel data to go beyond mapping what restaurants exist and analyzing where residents go when they go out to eat. Survey respondents from the Detroit neighborhoods appear to dine out closer to home and consume fast food as a higher proportion of their restaurant dining than their suburban counterparts, and weekly fast food consumption is about three times more likely for residents of the Detroit neighborhoods. According to the survey results, 52% of Detroit respondents dined at fast food at least once per week, compared to about 16% of suburban residents. However, given that Detroit survey respondents do report traveling outside the city limits to

access casual chain restaurants (such as Applebee's, Red Lobster, and Olive Garden), and given the need for an automobile to make such a trip, it may not be so much the presence of fast food restaurants so much as the lack of other options that influences the increased consumption. In effect, while Detroit and the higher-density suburbs have similar urban densities and potential for a variety of land use types, Detroiters have slightly more exposure to fast food restaurants, but substantially higher consumption of fast food compared to Ann Arbor and Birmingham, according to the survey results—especially at locations in close proximity to their homes. From discussions in the neighborhood during the course of the study, we know that a local McDonalds is a popular destination, and the survey results confirm this. A visitor ordering a Big Mac with a large fry, large Coke, and a sundae for desert would consume 1,710 calories in a single meal (McDonalds.com-b). If the fast food meals in Detroit are mostly like this, it would equal an average of 318 calories a day from fast food, which would be above the U.S. average of 264 calories per day (Lin and Mentzer Morrison 2012). Future research should build on our findings of *where* Detroiters are eating to better understand *what* they are eating at these locations. Though research in Detroit has shown residents traveling outside the neighborhood or the city to reach desirable grocers (LeDoux and Vojnovic 2013; Rose 2011; Vojnovic et al. 2014), when it comes to restaurants, for many Detroiters, eating at fast food near home appears common. Is this because of a preference for fast food, a lack of mobility to travel farther, or because fast food is more affordable? Future research should explore these questions of motivations and perceptions around fast food in the Detroit region.

Though non-fast food restaurants may offer more opportunities for healthful menu items, they too offer high-calorie dishes that equal multiple serving sizes (An 2016). Therefore,

the difference in opportunity demonstrated by these results is evidence of disparities in restaurant types between the city and its suburbs, as respondents travel farther to dine at casual chains. But restaurants serving healthful options including fresh fruits and vegetables, whole grains and lean meats present an opportunity for more nutritious fare than is available in fast food restaurants, providing opportunities to make better nutritional choices.

Studies after the introduction of grocery stores into food deserts show that they may not quickly change behaviors toward better food choices (Elbel et al. 2015), but they do provide the option for a community that did not have it before. The same could be said for the introduction of other types of restaurants with more healthful options in a landscape dominated by fast food. While economic disinvestment in places like Detroit is well documented, there are also questions about how best to incorporate affordable, culturally appropriate fresh food options in central city neighborhoods. To date, approaches such as limiting new fast food restaurants appear to have no effect on obesity (Sturm and Hattori 2015); but perhaps local economic development support for healthier restaurant options could. Additional research is needed to identify policy approaches that can help close this gap. As continued redevelopment in Detroit encourages national chains to establish a presence within the city limits—many for the first time—restaurants that did not exist within Detroit proper at the time of the survey, such as Applebee's and Panera Bread, have since opened locations in the city. Future research may reveal whether the presence of these locations shifts restaurant travel behavior of Detroit residents. Ideally, more opportunities for affordable dining options with more healthful options that would appeal to all Detroit residents—not just the Midtown and Downtown crowds—would test this theory.

CHAPTER 6: SOCIOECONOMIC FACTORS IN RESTAURANT TRAVEL BEHAVIOR

Introduction

As discussed in the literature review, overweight and obesity are common conditions in the U.S., leading to serious, potentially life-shortening health problems. Because obesity is a complex issue involving physical activity, food access and choices, cultural factors, and even relates to psychological aspects, it is important to acknowledge and examine the differences in prevalence among income, racial, and ethnic groups in the search for potential causes and solutions. For age-adjusted obesity rates, non-Hispanic blacks have the highest rates at 47.8%, followed by Hispanics at 42.5%, non-Hispanic whites at 32.6%, and non-Hispanic Asians at 10.8% (Ogden et al. 2010). For women, obesity rates are higher for lower-income groups, but for black and Mexican-American men, higher incomes correlate with higher rates of obesity (*ibid*). More education seems to reduce the likelihood of obesity for women, but not for men (*ibid*). Overall, there is less variation among racial lines for men than for women, where black women have the highest rate, followed by Hispanic women (Vojnovic et al. forthcoming; National Center for Health Statistics 2011).

Type 2 diabetes, a preventable disease for which overweight and obesity are established risk factors, accounts for up to 95% of all diagnosed cases of diabetes among adults (CDC 2014). Specifically, the age-adjusted rate of diabetes is 15.9% for American Indians and Alaskan Natives, 13.2% for blacks, 12.8% for Hispanics, 9.0% for Asian Americans, and 7.6% for whites (*ibid*). Men are slightly more likely to develop diabetes (*ibid*). In the U.S. in 2012, 12.3% of the population had diabetes, but an additional 37% is estimated to be pre-diabetic, or at risk of developing diabetes (*ibid*). This dissertation cannot explain the health status of the survey

respondents, but it can examine self-reported BMI, race/ethnicity and socioeconomic status along with restaurant travel to see if there is a relationship between BMI and type or frequency of restaurant travel. In many U.S. cities, and certainly in the Detroit region, neighborhoods are residentially segregated by race and class, and studying access to food options in these neighborhoods is of interest to researchers focusing on spatial patterns of inequality in cities and health disparities.

With changes in the grocery retail industry that led to consolidation, larger food stores, and a shift in location out of central city neighborhoods (Cotterill and Franklin 1995), what has been left behind is a high proportion of less affordable and less nutritious food options such as convenience stores and fast food restaurants, creating a condition known as a "food swamp." Rose, Bodor and Swalm (2009) define food swamps as "areas in which large relative amounts of energy-dense snack foods, inundate healthy food options" (pg. 2). Cooksey-Stowers, Schwartz and Brownell (2017) found that food swamps are a better predictor of obesity rates in an area than just the lack of supermarkets.

The primary concern with fast food restaurants is that their menu options are comprised mostly of high fat, high calorie items, and therefore fast food restaurants are often implicated in the United States' alarming obesity rate (Rosenhack 2008). Some studies have examined the relationship between fast food and race in various locations. Freeman (2007) writes that "the overabundance of fast food and lack of access to healthier foods…have increased African American and Latino communities' vulnerability to food-related death and disease. Structural perpetuation of this race- and class-based health crisis constitutes 'food oppression'" (p.2221). Block et al. (2004) found that the density of fast food restaurants positively correlated with

measures of poverty and African American population in New Orleans, while controlling for confounders such as commercial zoning. Kwate (2008) writes that racial residential segregation has created a higher concentration of fast food restaurants in black residential neighborhoods than white neighborhoods.

In a review of food access literature, Fleischhacker et al. (2011) reported that the majority of studies found higher access to fast food for low socioeconomic areas and minority neighborhoods. Lewis et al. (2005) found that in lower income Los Angeles neighborhoods, a greater percentage of existing restaurants were fast food, and healthy menu options in restaurants were more likely to found in more affluent neighborhoods. Powell et al. (2007) found that predominately black and Latino neighborhoods tend to have fewer restaurants than predominately white neighborhoods, and that the restaurants they do have are mostly fast food outlets.

In addition to race, studies have also examined the relationship between socioeconomic status, usually represented by income, and fast food exposure and consumption. Smoyer-Tomic et al. (2008) found in Canada that fast food exposure (defined as a census block with a fast food restaurant within 500 meters) was greater in areas with more Aboriginals, renters, single parents, and low-income households, while it was lower in areas with higher median income and home values. In a study in New Zealand, Pearce et al. (2007) found that access to fast food restaurants was higher—that is, the distance needed to travel to reach a fast food restaurant was shorter—in socioeconomically disadvantaged neighborhoods. Similar to the findings that suggest food prices in retail stores are higher in low-income areas, Leschewski and

Weatherspoon (2014) found that some fast food chains charge slightly more for their products in food deserts in Michigan cities, as opposed to more affluent areas.

However, whether the mere existence of fast food restaurants contributes to poor health of those who live near them is less clear. Much of the literature focuses on where the restaurants are, but lacks the data to connect actual individual behavior (i.e., trips to restaurants) with individual characteristics. Some studies show no correlation between proximity and obesity (Burdette et al. 2004), while others (Alviola et al. 2014; Morland and Evanson 2009) do find a correlation between the number of fast food restaurants in an area and its obesity rates.

Other studies (Boone-Heinonen et al. 2011) have shown a correlation between proximity and consumption, but a conclusion cannot easily be drawn about the relationship between proximity and obesity. While Jeffery et al. (2006) found a positive relationship between eating at fast food restaurants and increased body mass index, they did not find a relationship between proximity to fast food and increased body mass index. In a review of the literature, Rosenhack (2008) concluded that there is strong evidence to suggest an independent relationship between fast food consumption and obesity. Dunn (2010) observed, in medium density counties, a positive relationship for women as well as blacks and Hispanics between BMI and fast food availability. Despite marketing in recent years that suggests fast food restaurants are offering more healthful foods, the calorie density of their menus has gone mostly unchanged (Bauer et al. 2012).

The purpose of this chapter is to examine socioeconomic and demographic characteristics of the survey respondents in relation to their restaurant travel behavior. The

results will contribute additional findings to the complex discussion of food, place and health, as well as generate conclusions for the Detroit Metropolitan area and its restaurant landscape that are here-to-fore lacking.

Methodology and Research Questions

Using the cleaned and coded survey data (as described in detail in Chapter 4), the following statistical analyses were conducted using SPSS 17. Using crosstabulations, *phi*-coefficients, and ANOVA, questions of restaurant travel by income, race, auto-ownership (which is, in essence, a function of income), the presence of children, and gender are addressed. The main research question is, are there any relationships between income, race, gender, and auto ownership and 1) the likelihood to dine out in an average week, 2) the likelihood to visit fast food restaurants in an average week, and 3) the distance traveled to access restaurants?

Results: Restaurant Travel and Household Income

The first set of analyses focused on the respondents' household income. The majority of the higher income groups reside in the affluent suburban communities. For reference, Table 4-5 is replicated below (Table 6-1). The breakdown of household income for all survey respondents can be seen in Figure 6-1, and Figure 6-2 visualizes the income disparities between respondents from Detroit compared to the suburbs. Not all respondents provided information on income, thus the N for household income is 850.

Table 6-1: Percent of respondents by income group for each study site

	Urban Detroit		Higher Density Suburban		Lower Density Suburban	
	Detroit 1	Detroit 2	Ann Arbor	Birmingham	Bloomfield Hills	West Bloomfield
Less than 20k	50.44%	63.19%	20.30%	21.43%	19.10%	24.12%
20k to 40K	34.51%	21.53%	16.61%	8.93%	13.48%	8.82%
40k to 60k	9.73%	7.64%	25.46%	17.86%	12.92%	13.53%
60k to 100k	4.42	6.94	24.72	16.67	23.03	26.47
100k to 150k	0.88	0.69	10.33	19.05	13.48	15.29
Greater than 150k	0.00	0.00	2.58	16.07	17.98	11.76

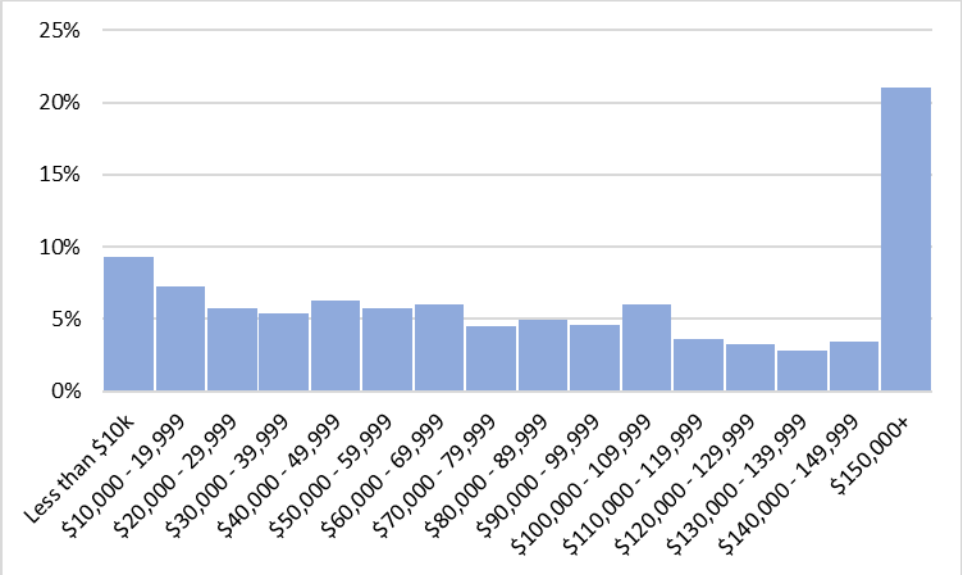

Figure 6-1: Survey respondents' household income (N=850)

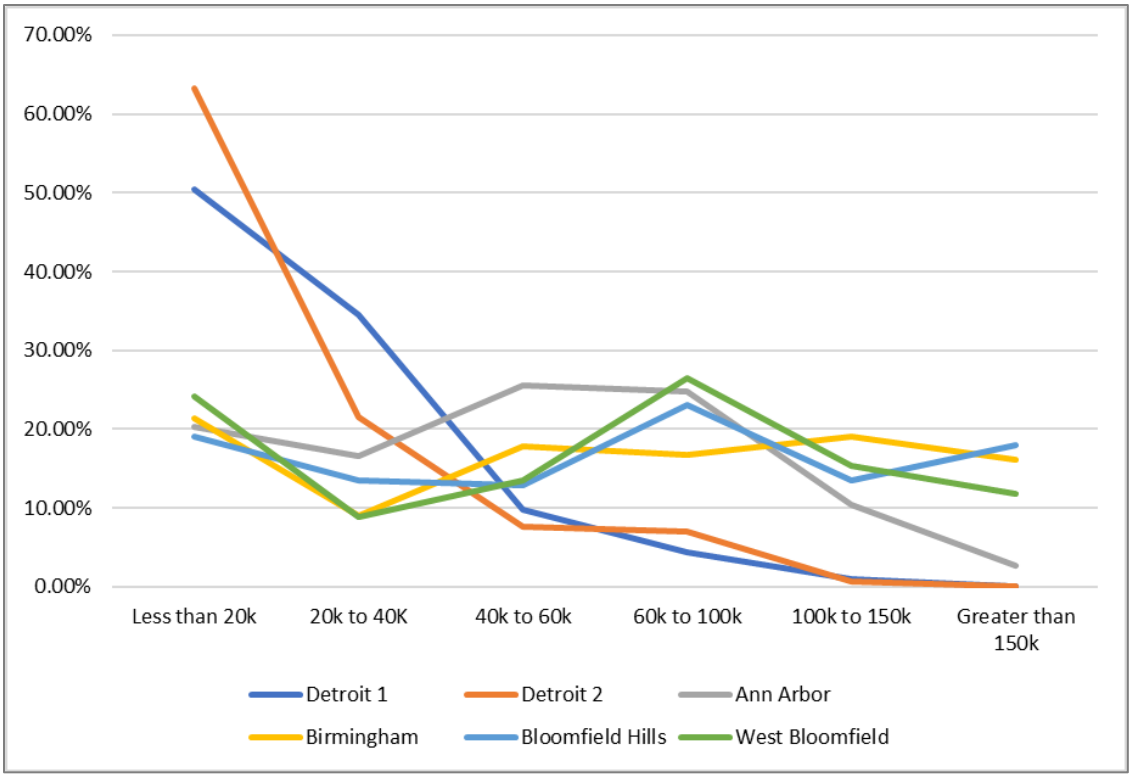

Figure 6-2: Visualizing survey respondents' household income disparities by study site.

The survey data on income is aggregated into $10,000 intervals. Table 6-2 displays the general restaurant travel behavior for each income group; what percentage reported dining out to any type of restaurant in an average week, and what percent reported visiting a fast food restaurant. More than 50% of each income group reported dining out at least once per week, even the lowest income respondents. Income groups under $50,000 reported a higher likelihood of visiting fast food restaurants. Overall, there does not appear to be a linear increase or decrease with income evident in the Table. Figures 6-3 and 6-4 plot these data to explore whether linear relationships are visible in this way. The data line represents the percentage of respondents in each income category who report at least one restaurant trip weekly (Figure 6-3), and at least one fast food trip, specifically (Figure 6-4). Neither graph is terribly convincing

that there is a strong relationship between income and restaurant trips, though there does appear to be somewhat of a negative relationship between increasing income and the tendency to consume fast food, with an *R*-squared value of -0.561.

Table 6-2: General restaurant trip behavior of respondents by household income group

Income Group	Weekly Restaurant Trip	No Weekly Restaurant Trip	Weekly Fast Food Trip	No Weekly Fast Food Trip
Less than $10k	58.2%	41.8%	43.0%	57.0%
$10,000 - 19,999	62.9%	37.1%	43.5%	56.5%
$20,000 - 29,999	67.3%	32.7%	46.9%	53.1%
$30,000 - 39,999	58.7%	41.3%	32.6%	67.4%
$40,000 - 49,999	67.9%	32.1%	43.4%	56.6%
LESS THAN $50K	62.6%	37.4%	42.2%	57.8%
$50,000 - 59,999	59.2%	40.8%	26.5%	73.5%
$60,000 - 69,999	80.4%	19.6%	19.6%	80.4%
$70,000 - 79,999	65.8%	34.2%	31.6%	68.4%
$80,000 - 89,999	52.4%	47.6%	14.3%	85.7%
$90,000 - 99,999	61.5%	38.5%	15.4%	84.6%
$50K –99,999K	64.4%	35.6%	21.5%	78.5%
$100,000 - 109,999	68.6%	31.4%	25.5%	74.5%
$110,000 - 119,999	77.4%	22.6%	9.7%	90.3%
$120,000 - 129,999	82.1%	17.9%	17.9%	82.1%
$130,000 - 139,999	54.2%	45.8%	4.2%	95.8%
$140,000 - 149,999	75.9%	24.1%	24.1%	75.9%
$150,000+	76.5%	23.5%	13.4%	86.6%
MORE THAN $100K	74.3%	25.7%	15.5%	84.5%
TOTAL	**67.8%**	**32.2%**	**26.1%**	**73.9%**

N=850, not all respondents reported income

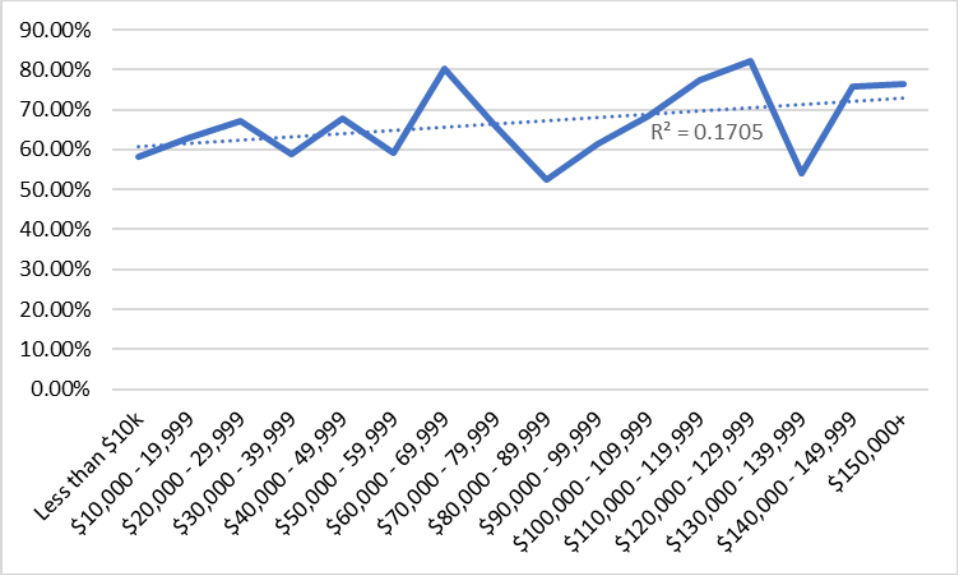

Figure 6-3: Percent of respondents in each income group who reported at least one restaurant trip

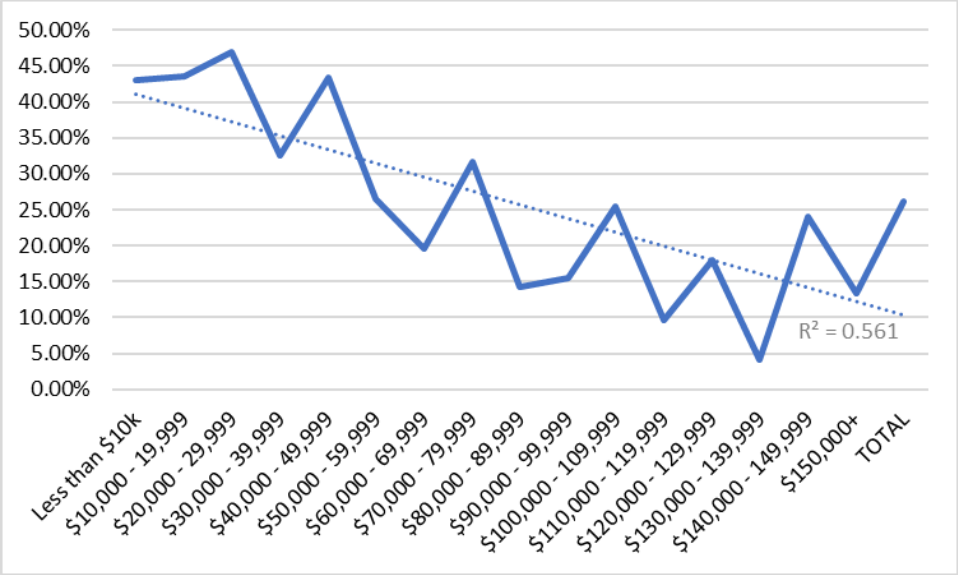

Figure 6-4: Percent of respondents in each income group who reported at least one fast food trip

In another attempt to explore whether income has any relationship with restaurant travel behavior, a t-test was performed to see if the mean income of those reporting no weekly trips varied from those who do dine out at least once in an average week. A similar test was performed for weekly fast food consumption. In the survey, income was aggregated in increments of $10,000. The numeric code in the survey data, then, is for example, 1 (less than

$10,000), 2 ($10,000-$19,999), etc. When the mean is calculated for the t-test, it is using these codes, which cannot be translated to an exact mean income. Therefore, the "equivalent income group" column in Table 6-3 represents the range into which the mean household income falls for each group. The results show that dining out at least once per week is associated with a higher average income ($80,000 - $89,000) than for respondents who do not dine out at least weekly ($60,000 - $69,000). Conversely, when looking at fast food trips, dining out at fast food at least once per week is associated with a lower average household income ($50,000 - $59,000) compared to those who report no weekly fast food trips ($80,000 - $89,000), and by a wider margin than the difference in restaurant travel in general.

Table 6-3: Difference of means t-test for income group and restaurant travel

All Restaurant Trips				
	Coded numeric mean	**Std. Deviation**	**Std. Error Mean**	**Equivalent income group**
Zero trips per week	7.91	5.163	.312	$60,000 - 69,999
At least one trip per week	9.18	5.325	.222	$80,000 - 89,999
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
3.268	848	.001	1.265	.387
Fast Food Trips				
	Coded numeric mean	**Std. Deviation**	**Std. Error Mean**	**Equivalent income group**
Zero trips per week	9.58	5.185	.207	$80,000 - 89,999
At least one trip per week	6.47	4.961	.333	$50,000 – 59,000
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
-7.764	848	.000	-3.108	.400

To help address the heavy skew toward the highest income group in the survey data (possibly explained by those earning more money being comfortable answering this question and those earning less perhaps not providing a response to this question), and also to see whether simplifying how the income data is organized clarifies these patterns, aggregate income groups were created: less than $50,000, $50,000-$99,999, and $100,000 or more (Table 6-4). A *phi* value was calculated to measure a statistical relationship. A *phi* value of +/- .3 is needed to suggest even a weak relationship. Despite the apparent trends of increasing restaurant trips with higher income (Figure 6-5), but fewer fast food trips with higher income (Figure 6-6), the results do not support a statistical relationship when organized this way. The *phi* values in Table 6-5 measure no relationship between the aggregate income groups and weekly restaurant travel.

Table 6-4: Survey respondents' household income, aggregated (N=850)

Income	Percent of Respondents
Less than $50,000	34.0%
$50,000-$99,999	25.8%
$100,000 or more	40.2%

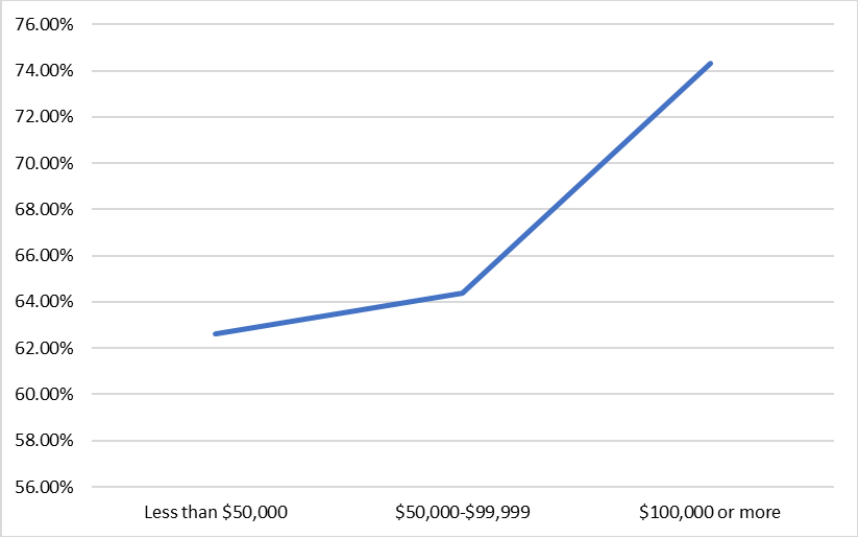

Figure 6-5: Percent of respondents in each income group who reported at least one restaurant trip

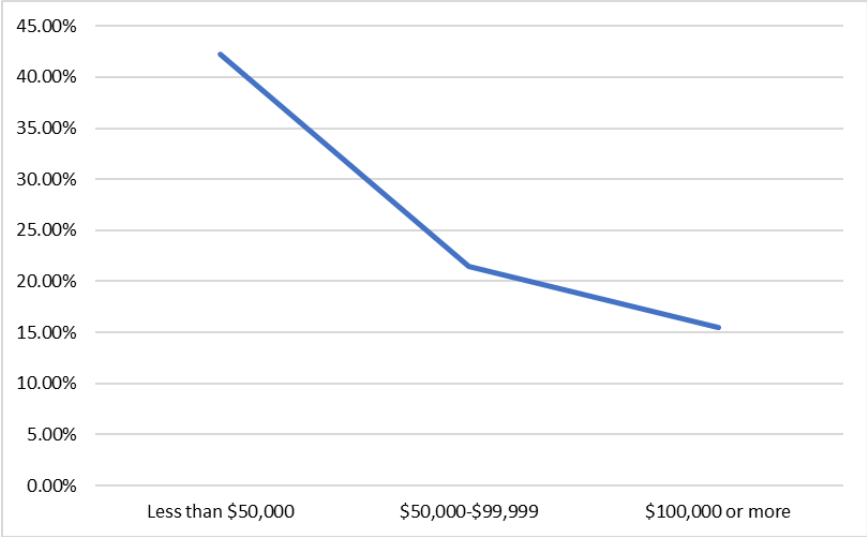

Figure 6-6: Percent of respondents in each income group who reported at least one fast food trip

Table 6-5: General restaurant trip behavior of respondents by household income group

Income Group	Weekly Restaurant Trip	*Phi*		Weekly Fast Food Trip	*Phi*
Less than $50,000	62.6%	.115		42.2%	.268
$50,000-$99,999	64.4%			21.5%	
$100,000 or more	74.3%	**Approximate Significance**		15.5%	**Approximate Significance**
TOTAL	67.8%	.004		26.1%	.000

In addition to looking at likelihood to dine out as a binary, yes or no variable, I also measured the total number of trips each respondent reported in an average week versus their income level. These findings are in Table 6-6, and while the highest income bracket had the highest average number of trips (1.727), the middle bracket had the lowest (1.426); the means overall were not statistically different according to the results of an ANOVA, with a p-value of .222.

When a similar analysis was performed for average distance traveled to restaurants by income bracket, however, there was a statistically significant difference between the means, with a *p*-value of .000 (Table 6-7). Those with a household income of $50,000-$99,999 travel farther to restaurants (2.060 miles) than those earning less than $50,000 (1.371 miles), and those earning $100,000 or more travel farther (2.357 miles) than those in the middle group. Using a Scheffe post hoc test to understand the relationships between the means, the statistically significant difference is between the lowest income group and the other two income groups. There is no significant difference between the middle and highest income groups when it comes to average distance traveled. This suggests that those earning less than $50,000 travel significantly shorter distances than those in higher income groups, and dine out at restaurant options closer to home.

Table 6-6: Mean number of restaurant trips per week by income group, and one-way ANOVA

	Income Group	Mean	Std. Deviation		
	Less than $50,000	1.598	2.087		
	$50,000-$99,999	1.426	1.867		
	$100,000 or more	1.727	2.027		
	Total	1.606	2.009		
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	12.150	2	6.075	1.506	.222
Within Groups	3416.958	847	4.034		
Total	3429.109	849			

Table 6-7: Mean distance of restaurant trips per week by income group, and one-way ANOVA

	Income Group	Mean	Std. Deviation		
	Less than $50,000	1.371	2.036		
	$50,000-$99,999	2.060	2.861		
	$100,000 or more	2.357	2.841		
	Total	1.941	2.630		
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	150.390	2	75.195	11.140	.000
Within Groups	5494.509	814	6.750		
Total	5644.900	816			

(I) Income Group	(J) Income Group	Mean Difference (I-J)	Std. Error	Sig.
Less than $50,000	$50,000-$99,999	-.68891*	.23635	.015
	$100,000 or more	-.98610*	.21179	.000
$50,000-$99,999	Less than $50,000	.68891*	.23635	.015
	$100,000 or more	-.29719	.22951	.433
$100,000 or more	Less than $50,000	.98610*	.21179	.000
	$50,000-$99,999	.29719	.22951	.433

*** The mean difference is significant at the 0.05 level.**

Results: Restaurant Travel and Race

As explained previously in this dissertation, the Detroit metropolitan region is severely segregated not only by class but by race. Because of this, travel behavior by race was analyzed. Because the majority of respondents who provided data on their race were either black (22.6%) or white (67.1%), with 5.5% of respondents not answering the question, race for the following analyses is aggregated as white or nonwhite. For reference, Table 4-4 is reproduced here showing that Detroit is predominately nonwhite while the suburbs are the opposite (Table 6-8). The results for a *phi* coefficient for restaurant trips in general found no difference between white and nonwhite respondents in whether they dine out at least once per week (Table 6-9). However, examining fast food trips, white respondents were statistically less likely to dine out at fast food on a weekly basis, with a *phi* value of -.330 and a *p*-value of .000. Based on what is known about the spatial pattern of race in the Detroit region, this relates to the survey findings discussed in Chapter 5, where fast food trips were found to comprise nearly 80% of all restaurant trips in predominately-black Detroit, compared to closer to 20% of all trips in the majority-white suburbs.

Table 6-8: Percent of respondents white/non-white for each study site

	Urban Detroit		Higher Density Suburban		Lower Density Suburban	
	Detroit 1	Detroit 2	Ann Arbor	Birmingham	Bloomfield Hills	West Bloomfield
White	5.00	10.64	93.68	94.18	91.63	84.21
Non-White	95.00	89.36	6.32	5.82	8.37	15.79

Table 6-9: Crosstabs and *phi* value for race and weekly restaurant trip

	At Least One Restaurant Trip Weekly	
Race	Yes	No
White (N=669)	69.4%	30.6%
Non-White (N=273)	64.5%	35.5%
	Value	**Approximate Significance**
Phi	.048	.145
	At Least One Fast Food Trip Weekly	
Race	Yes	No
White (N=669)	16.3%	83.7%
Non-White (N=273)	48%	52%
	Value	**Approximate Significance**
Phi	-.330	.000

Results: Restaurant Travel and Automobiles

In many urban areas outside large cities with reliable and efficient mass transit, owning a private automobile—and being able to afford gasoline, maintenance, insurance, and licensing fees—is a necessity for travelling to work, accessing services and shopping, and just getting wherever one may need to be. This is doubly true for suburban communities designed with the automobile in mind. In addition to getting residents from point A to point B, car ownership also provides an element of freedom and convenience. Driving makes trips much faster, more comfortable in inclement weather, and, in many cases, safer by getting through higher crime areas faster and with lowered chances of human interaction.

Survey respondents were asked about the number of cars available for use in the household they lived in. The percentage of respondents reporting at least one car can be found in Table 6-10. In line with the documented disparities between Detroit and its suburbs, nearly all respondents from the suburban communities reported having at least one car, while that was true of only around 70% of Detroit households in the survey. Table 6-11, the mode of travel for reported restaurant trips in the survey, somewhat mirrors this trend of auto ownership—in every municipality, the majority of trips (78%) were made by car, but in the Detroit neighborhoods, the percentage was substantially lower than most of the suburbs. However, Ann Arbor survey respondents reported the highest proportion of walking and the lowest proportion of driving. It is likely that the high-density development around the University of Michigan campus contributes to the walkability of restaurant travel.

Table 6-10: Percent of survey respondents with at least one car in household

Urban Detroit		**Higher Density Suburbs**		**Lower Density Suburbs**	
Detroit 1	Detroit 2	Ann Arbor	Birmingham	Bloomfield Hills	West Bloomfield
70.1%	68.6%	98.3%	98.1%	98.8%	98.6%

N=955, several respondents failed to answer this question

Table 6-11: Mode of travel and distance traveled

	Urban Detroit		**Higher Density Suburbs**		**Lower Density Suburbs**		
	Detroit 1	Detroit 2	Ann Arbor	Birming-ham	Bloomfield Hills	West Bloomfield	Total
Percent of Trips by Walking/Biking	13.88%	19.77%	32.25%	14.54%	4.83%	4.83%	18.73%
Percent of Trips by Bus/Transit	9.25%	5.06%	2.59%	0.38%	0%	0.97%	3.09%
Percent of Trips by Car	76.87%	75.17%	65.15%	85.17%	95.17%	94.50%	78.18%
Average Distance of Trip (miles)	3.24	2.33	2.17	3.07	4.67	3.9	3.23

Whether shopping for groceries or going out to eat, access to a vehicle makes getting food easier. A crosstabulation of those respondents with at least one car in the household and those with no car showed that about half of respondents with no car dined out at least once per week, while half did not. For respondents with a car, more than two-thirds dined out at least once per week. Because both variables are binary, a *phi* value was calculated to measure a statistical relationship. A *phi* value of +/- .3 is needed to suggest even a weak relationship. The *phi* value, while significant, is only .120, meaning it is not possible to draw a relationship between access to a car and going out to eat (Table 6-12). However, this measure may be influenced by the fact that nearly everyone in the study (90% of the sample) had access to a vehicle except for a subset of Detroit respondents. To further explore this, the same crosstab was performed on only the Detroit respondents, where having a car in the household was less predictable (65% of respondents). A similar pattern emerged, but the statistical significance of the relationship was stronger, with a *phi* value of .234 and a significance value of .001 (Table 6-13). It is still not a robust score, but it does suggest that access to a personal vehicle is a factor in restaurant travel in the City of Detroit.

Table 6-12: Crosstabs and *phi* value for car in household and weekly restaurant trip

	At Least One Restaurant Trip Weekly	
Car in Household	Yes	No
Yes (N=869)	68.8%	31.2%
No (N=86)	48.8%	51.2%
	Value	Approximate Significance
Phi	.120	.001

Table 6-13: Crosstabs and *phi* value for car in household and weekly restaurant trip, Detroit sites only

	At Least One Restaurant Trip Weekly	
Car in Household	Yes	No
Yes (N=159)	67.9%	32.1%
No (N=85)	48.2%	51.8%
	Value	**Approximate Significance**
Phi	.234	.001

Regarding distance traveled to dine out, a difference of means t-test for those with cars and those without cars revealed that those with no car travel an average of around a mile, while those with cars travel about a mile further to dine out, with a *p*-value of .000 (Table 6-14). Thus, in the survey data, access to a car in the household was related to a longer average travel distance to restaurants. This is logical, and suggests that those without access to cars are relying on options closer to home, within walking or biking distance.

Table 6-14: Difference of means *t* test for zero cars versus at least one car in household and average distance traveled to restaurants

	Avg. Distance Traveled (miles)	**Std. Deviation**	**Std. Error Mean**	
No car in household	1.135	2.0934	.2284	
At least one car	2.044	2.7878	.0966	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
3.664	114.974	.000	.9088	.2480

Results: Restaurant Travel and Children

The presence of children in the home was examined to see if that factor influenced likelihood of dining out (Table 6-15) and, specifically, to fast food restaurants. The *phi* values and p-values do not support a relationship between children and dining out, but a higher *phi* value (.135) with .000 significance suggests that the relationship between children and fast food could warrant more exploration.

Table 6-15: Crosstabs and *phi* value for children in the home and weekly restaurant trip

	At Least One Restaurant Trip Weekly	
Child in Home	Yes	No
Yes (N=320)	67.2%	32.8%
No (N=619)	66.6%	33.4%
	Value	**Approximate Significance**
Phi	.013	.925
	At Least One Fast Food Trip Weekly	
Child in Home	Yes	No
Yes (N=320)	66.6%	33.4%
No (N=619)	20.7%	79.3%
	Value	**Approximate Significance**
Phi	.135	.000

Results: Restaurant Travel and Gender

Women are often responsible for making food choices for the household, especially if there are children present. To explore this idea, the *phi* coefficient was calculated to see if there was a relationship between gender (a binary variable) and dining out at least once weekly or consuming fast food at least once weekly (also binary variables). The results are presented in Table 6-16. There was no obvious relationship between gender and these travel behaviors, as shown by *phi* values that hover very close to zero.

Table 6-16: Crosstabs and *phi* value for gender and weekly restaurant trip

	At Least One Restaurant Trip Weekly	
Gender	Yes	No
Male (N=333)	66.4%	33.6%
Female (N=649)	67.5%	32.5%
	Value	**Approximate Significance**
Phi	.011	.723
	At Least One Fast Food Trip Weekly	
Gender	Yes	No
Male (N=333)	21.3%	78.7%
Female (N=649)	27.3%	72.7%
	Value	**Approximate Significance**
Phi	.065	.042

Discussion and Conclusion

The findings of this chapter reinforce the complexities of place and the built environment and the complex relationships with race and class. Disadvantages of class discrimination and race discrimination can exist separately and together, as they appear to do in Detroit. As described in Chapter 5, research findings suggest Detroiters may have a higher exposure to fast food restaurants than some, but not all, of their suburban counterparts. This chapter explored questions of restaurant travel by income, race, auto-ownership (which is, in essence, a function of income), the presence of children, and gender.

The relationship between household income and restaurant travel was explored in a few different ways. The relationship between income and the proportion of each income group who dines out at least once per week is not linear (Figure 6-4), however when assessing weekly fast food travel, the results suggest that the likelihood of visiting fast food weekly decreases with an increase in income (Figure 6-5). This may be because more income opens up more restaurant options due to affordability and/or access.

When looking at income in a different way, by using t-tests to compare the mean income of respondents reporting at least one restaurant trip compared to those reporting zero, the results again hint at differences based on income. Those reporting at least one trip on average fall into the $80,000 - $89,000 range for household income, while those reporting no trips fall into the $60,000 - $69,000 range (Table 6-3). Conversely, when focusing on fast food only, those reporting at least one trip fall into the $50,000 - $59,000 range while those not reporting a fast food trip fall into the $80,000 - $89,000 range. These results suggest that income may make one more likely to dine out on a weekly basis (or more frequently), but that

those who are regularly patronizing fast food restaurants have a lower average household income.

When household income was aggregated into groups of less than $50,000, $50,000 - $99,999, and $100,000 or more, despite the apparent trends of increasing restaurant trips with higher income but fewer fast food trips with higher income, the results do not support a statistical relationship when organized this way (Table 6-5).

The final income analysis measured the total number of trips each respondent reported in an average week (as opposed to a simple binary zero or one or more) versus their income group. These findings are in Table 6-6, and while the highest income bracket had the highest average number of trips, the middle bracket had the lowest, and the means overall were not statistically different according to the results of an ANOVA, with a p-value of .222. Therefore, while it seems as though income does play a role in dining out behavior, this behavior is not in any way linear or easily predictable.

When a similar analysis was performed for average distance traveled to restaurants by income bracket, however, there was a statistically significant difference between the means, with a p-value of .000 (Table 6-7). Those with a household income of $50,000 - $99,999 travel an average of seven-tenths of a mile farther to restaurants than those earning less than $50,000, and those earning $100,000 or more travel an average of three-tenths of a mile more than those in the middle group. The statistically significant difference is between the lowest income group and the other two income groups. There is no significant difference between the middle and highest income groups when it comes to average distance traveled. This suggests

that the lowest income groups are not travelling as far to dine out as higher income groups, which may make them more reliant on the options available in their neighborhood.

Looking at race, based on the relationship between residential segregation and poverty levels in the Detroit region, one would expect to see similar patterns between race and income when it comes to dining out. While a crosstabulation and *phi* coefficient did not reveal significant results for dining out in general, fast food was a different story. Here, while nonwhite respondents were essentially split 50/50 on weekly fast food consumption, white respondents were less likely to dine out at fast food (Table 6-9).

Mode of travel differences by neighborhood density are as one would expect, with a few interesting patterns to note (Table 6-11). In both Detroit neighborhoods, about 75% of all restaurant trips are by automobile. In the low-density, affluent suburbs of Bloomfield Hills and West Bloomfield, nearly all trips (95%) are by automobile. The high-density, affluent suburb of Birmingham is in between, with 85% of trips being made by automobile, while the similarly high-density suburb of Ann Arbor has the lowest proportion of restaurant trips made by automobile, at 65%. The demographics of the city of Ann Arbor are somewhat skewed by the presence of the University of Michigan and its large student body. Many students may not bring a car to campus and thus may be more likely to walk places than permanent city residents. If not for this, it is possible we might otherwise see a closer parallel between Ann Arbor and Birmingham, which also has a high-density walkable downtown.

A crosstabulation of those respondents with at least one car in the household and those with no car showed that about half of respondents with no car dined out at least once per week, while half did not. For respondents with a car, more than two-thirds dined out at least

once per week. There was no statistical relationship to these numbers, perhaps because most respondents reported having at least one vehicle in the household (Table 6-12). To further explore this, the same crosstabulation was performed on only the Detroit respondents, where having a car in the household was less predictable (65% of respondents). A similar pattern emerged, but the statistical significance of the relationship was stronger, with a *phi* value of .234 and a significance value of .001 (Table 6-13). It is still not a robust score, but it is a higher value than for the survey as a whole (.120). A difference of means t-test on the average distance traveled to restaurants for those with cars and those without cars revealed that those with no car travel an average of around a mile, while those with cars travel about a mile further to dine out, with a *p-value* of .000 (Table 6-14). This is logical, suggesting that those without access to cars are relying on options closer to home, within walking or biking distance. This would be relevant to the question of whether those without cars are more dependent on the nearby food environment than those with cars.

Because much of the marketing done by fast food restaurants historically has been to children and busy parents, the presence of children in the home was examined to see if that factor influenced the likelihood of dining out and, specifically, to fast food restaurants (Table 6-15). In this survey data, the presence of children alone does not appear to be a statically significant factor in predicting restaurant travel behavior. Lastly, the gender of the respondent was analyzed, and these findings show the travel behavior reported in this survey was very similar for males and females (Table 6-16).

Overall, household income, access to an automobile, and race were revealed as being related to differences in restaurant travel behavior, especially with regard to choosing fast food

restaurants. While this survey cannot answer the “why” of this—for example, there may be a social or cultural preference for the taste of fast food menu items, or a dislike of certain other restaurant items—the findings do validate the differences in behavior in the Detroit metropolitan area based on some, but not all, demographic and socioeconomic characteristics.

CHAPTER 7: RELATIONSHIPS BETWEEN REPORTED HEALTH CHARACTERISTICS AND RESTAURANT TRAVEL BEHAVIOR

Introduction

In 2003, urban geographer Daniel Sui published a commentary on the "fat city." He marveled at how the term now had two meanings. While his musings were focused on Houston, Texas, a similar conundrum has occurred in the Detroit metropolitan area. On the one hand, the "fat city" can describe the problems of urban sprawl. The Detroit region saw the same pattern of decentralized, outward growth that many other U.S. cities have experienced, leading to inefficient land uses, traffic congestion, decline of the central city, and other urban "heart" problems. But many cities today, Detroit included, also suffer from a very literal problem with fat. Newspapers, magazines and websites publish annual lists of the "fattest cities." The lists do not always agree with one another depending on the data used to compile them, but in the spring of 2017, Detroit was number two on *Men's Fitness Magazine*'s list of "The 25 Fattest Cities."

There are several possible factors for obesity in the city, and in all likelihood, individuals living in any given neighborhood are exposed to more than one of these influences. Macintyre, Ellaway and Cummins (2002) suggest using a framework of "universal human needs" to study place effects on health. They argue that health is not only based on who you are, but also on where you live. The built environment, as defined by Handy et al. 2002, "comprises urban design, land use, and the transportation system, and encompasses patterns of human activity within the physical environment" (p. 65). Six primary dimensions of the built environment are density, land use mix, street connectivity, street scale, aesthetic qualities and regional structure

(*ibid*). There is a large body of research on how the built environment impacts health in a variety of ways, such as through uneven access to resources, lack of walkability, unsafe conditions and aesthetics. It is believed that land use and transportation policies contribute to positive or negative health outcomes by shaping food purchasing options and opportunities for physical activity (American Planning Association 2007). Some researchers argue that overreliance on the personal automobile and autocentric urban design encourages less walking. Compact urban design—characterized by development density, land use diversity, street connectivity, destination accessibility, and shorter distance to transit—reduces driving in cities (Ewing and Cervero 2017; Ewing and Hamidi 2015). Frank et al. (2004) found that more mixed-use land use correlated with a lower rate of obesity, as did less time spent in a car. Among older people, walkable neighborhoods, or those with destinations within reasonable walking distances, positively correlate with more frequent walking (Berke et al. 2007; Marquet and Vliralles-Guasch 2015).

To this end, we would generally expect cities with a more compact, walkable design to have lower rates of obesity than sprawling suburban neighborhoods. Yet many central cities (including Detroit) have several characteristics of compact urban design (gridded street layouts, high street connectivity, diverse land uses) but still have some of the highest rates of obesity. Other factors that can affect walkability include crime and fear of safety, neighborhood blight, existence and upkeep of pedestrian walkways, feelings of exclusion, lack of social support, and other issues that may be specific to neighborhoods or certain demographic or socioeconomic groups (Adkins et al 2017). Cohen et al. (2003) found that individuals in neighborhoods with vacant and boarded up buildings did not engage in as much outdoor physical activity. They also

describe reactions to the built environment as either founded, due to the presence of drugs or other criminal activity that affect personal safety, or unfounded, based simply on aesthetics. The condition of the built environment and its ability to facilitate physical activity varies in higher income versus lower income neighborhoods, for example, through the decreased presence of recreation centers in low-income, minority neighborhoods as opposed to the more affluent areas (Gordon-Larsen et al. 2006).

In 1998 Hill and Peters wrote in *Science* that "the current epidemic of obesity is caused largely by an environment that promotes excessive food intake and discourages physical activity" (p. 1371). While critics of this line of research (such as Guthman) are suspicious of any direct relationship between a person's weight and their neighborhood or socioeconomic standing, the literature review that follows will demonstrate that numerous studies have suggested that a relationship exists, though it may not be one we yet fully understand. The literature demonstrates a clear relationship between diet and health (World Health Organization 2003; American Heart Association n.d.), but the relationship between the built environment and diet is less clear, at least insofar as exactly how characteristics of unique cities and neighborhoods might influence individual behavior.

One of Guthman's (2011) critiques is that much of the literature on obesogenic environments, or built environments that facilitate obesity, treat individuals as objects in the environment rather than agents. To address this criticism, this dissertation seeks to treat individuals as agents by explicitly using travel information provided by the participants of the survey. By using their reports on destinations as opposed to the assumed travel behavior (derived by the researcher) we can begin to chip away at the complexity of the issue.

As explored in detail in previous chapters, the presence or absence of food outlets in the neighborhood is another possible influence in urban obesity rates. For the purposes of this dissertation, the impact of food choices on health is the most compelling justification for trying to understand the urban fabric, the restaurant landscape and what people are eating. There are research findings on the question of whether what exists in the built environment influences, at least to some degree, food and eating choices. In a survey of the literature, Papas et al. (2007) found that 17 out of 20 studies identified a significant connection between the built environment and obesity. In a different survey of the literature, Cobb et al. (2015) concluded that most studies do not find a definite relationship between food outlets and obesity. Shier et al. (2012) found no consistent relationship between food outlets in the environment and BMI of children. Some studies even suggest a correlation between supermarket availability and higher obesity rates (Cobb et al. 2015; Epstein et al. 2012; Shier et al. 2012). These findings suggest that access alone does not precipitate healthful food purchases or negate low-quality food purchases. The inconsistency in the findings suggests that some aspects of human behavior may not be captured in studies of proximity and physical access. This dissertation will help to fill this gap by using travel survey data and stated individual choices.

The primary concern with fast food restaurants is that their menu options are comprised mostly of high fat, high calorie items. Fast food restaurants are often implicated in the United States' alarming obesity rate (Rosenhack 2008), and as previously stated, diet-related diseases disproportionately afflict minority populations, leading to an interest in examining the patterns of these restaurants in low income and minority neighborhoods. However, whether the mere existence of fast food restaurants contributes to poor health of those who live near them is less

clear. Much of the literature focuses on where the restaurants are, but lacks the data to connect actual individual behavior (i.e., trips to restaurants) with individual characteristics. Taste and convenience are the most common reasons individuals give for going to fast food restaurants (Lucan et al. 2010; Rydell 2008). Some studies show no correlation between proximity and obesity (Burdette et al. 2004), while others (Alviola et al. 2014; Morland and Evanson 2009) do find a correlation between the number of fast food restaurants in an area and its obesity rates.

Other studies (Boone-Heinonen et al. 2011) have shown a correlation between proximity and consumption, but a conclusion cannot easily be drawn about the relationship between proximity and obesity. While Jeffery et al. (2006) found a positive relationship between eating at fast food restaurants and increased body mass index, they did not find a relationship between proximity to fast food and increased body mass index. In a review of the literature, Rosenhack (2008) concluded that there is compelling evidence to suggest a dependent relationship between fast food consumption and obesity. Dunn (2010) observed, in medium density counties, a positive relationship for women as well as blacks and Hispanics between BMI and fast food availability. Despite marketing in recent years that suggests fast food restaurants are offering more healthful foods, the calorie density of their menus has gone mostly unchanged (Bauer et al. 2012).

Soft drinks are promoted at fast food restaurants as part of “value meals,” and often in large volumes. While consumption of excess or unhealthy fat has been a health concern for many decades, the role of sugar in diet-related diseases is more recent. Between 1970 and 2000, the prevalence of obesity in adults tripled while intake of fat actually decreased; this is

likely due to the increase in sugar-sweetened beverages over that same time period (Kavey 2010). Globally, Basu et al. (2013) found that a 1% increase in consumption of soft drinks was associated with an additional 4.8 overweight adults per 100, 2.3 more obese adults, and 0.3 more adults with diabetes. While use of artificial sweeteners can reduce the calories in a beverage, there is some concern that regular consumption of diet soft drinks may have other adverse health outcomes, such as vascular disease (Gardener et al. 2012).

The analysis of this chapter examines the relationship between restaurant travel behavior and self-reported BMI and other variables reflecting respondents' nutrition choices. BMI is not always the best measure of an individual's health or fitness, however, it is widely used because it is a simple measurement that is easy to collect. This information from the respondents is vital because most obesity data are aggregated at the county level. Some attempts have been made to simulate models to estimate local obesity levels, including in the Detroit metropolitan region. Koh, Grady and Vojnovic (2015) used microsimulation to estimate obesity prevalence at the census tract level, using 2010 Behavioral Risk Factor Surveillance System (BRFSS) data. They found that 80% of the high obesity prevalence census tracts predicted by the model, which included Macomb, Oakland and Wayne Counties, were in the city of Detroit or just north of Detroit city limits.

The purpose of this chapter is to explore the relationship between respondents' restaurant travel and other characteristics related to health, including BMI, consumption of sugary drinks, and exercise. This will provide insight into whether respondents who report regular trips to fast food restaurants engage in additional behaviors that have potentially negative health impacts.

Methodology and Research Questions

The survey respondents reported their height and weight, and their BMI was calculated using that information. Respondents also answered questions related to frequency and type of exercise, and consumption of fresh, canned or frozen vegetables. To examine relationships between characteristics with potential health implications and urban form and restaurant travel, one-way ANOVAs and t-tests were conducted on the data in SPSS, and Tukey post-hoc tests were performed on ANOVA results. The main research question for this chapter is, what is the relationship between the respondents' restaurant travel behavior, BMI, soft drink consumption, vegetable consumption, exercise habits, and smoking behavior? A major premise of this research is that fast food consumption plays a role in negative health outcomes, but other behaviors like lack of exercise and soft drink consumption contribute to elevated BMIs, as well, so it is important to examine these characteristics of the survey sample.

Results: BMI

The categories used in Table 7-1 are those used by the CDC. Table 7-1 shows that obesity prevalence is highest in Detroit (42.9%) and lowest in the higher density suburbs (10.6%). In Table 7-2, there is a statistically significant difference in average BMI between those respondents with access to a vehicle (26.1) and those without (28.14). In the following tables, high-density urban (HDU) is comprised of the two Detroit survey respondents; high-density suburban (HDS) contains the suburbs Ann Arbor and Birmingham; and low-density suburban (LDS) represents the autocentric suburbs Bloomfield Hills and West Bloomfield.

Table 7-1: BMI of respondents based on survey information

	High Density Urban	High Density Suburbs	Low Density Suburbs	Total
<18.5 (underweight)	1.2%	1.6%	1.9%	1.6%
18.5-24.9 (normal)	23.7%	59.8%	52.9%	48.1%
25-29.9 (overweight)	32.2%	27.9%	30.0%	29.8%
30+ (obese)	42.9%	10.6%	15.2%	20.6%

Table 7-2: t-test **mean BMI and access to cars**

	Avg. BMI	Std. Deviation	Std. Error Mean	
No access to car (N = 82)	28.14	7.5536	.8342	
Access to car (N = 827)	26.10	5.7239	.1990	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
.-2.384	90.46	.019	2.0447	.8576

With regard to BMI and restaurant travel, Table 7-3 compares the t-test difference of means results for average BMI for respondents who dine out at restaurants at least once per week and those who do not, as well as those who dine at fast food at least once per week and those who do not. The average BMI regarding dining out in general shows no difference, however, those who report at least one fast food trip weekly are characterized by a higher (2.69 points) BMI than those who do not (p-value .000).

Table 7-3: Difference of means t-test **for restaurant trips and average BMI**

	Avg. BMI	Std. Deviation	Std. Error Mean	
No restaurant trips (N = 305)	26.32	6.0138	.3443	
At least one restaurant trip (N = 642)	26.09	6.0414	.2384	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
.542	945	.588	.2272	.4195
	Avg. BMI	**Std. Deviation**	**Std. Error Mean**	
No fast food trips (N = 702)	25.55	5.1036	.1926	
At least one fast food trip (N = 242)	28.24	7.3730	.4740	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
.-5.252	324.148	.000	-2.6870	.4407

Results: Soft Drinks

Sugary drinks are often implicated in the United States obesity issue due to the ease with which they can be a source of nutritionally-devoid calories. In tables 7-4 through 7-6, the relationship between respondents' reported average servings of such drinks and their neighborhood type, BMI, and restaurant travel behavior are explored. Table 7-4 examines the relationship between respondents' BMI and soft drink consumption. Apart from the underweight group, the average number of soft drink servings increases as BMI increases through the CDC-defined categories. Post-hoc testing on the ANOVA results revealed that those in the obese category consume about 10 additional servings of soda or soft drinks per month compared to those in the normal category (p-value .009).

The average number of servings of soft drinks and fruit drinks, diet or full calorie, is highest for the Detroit neighborhoods (39.8 servings) and lowest for the high-density suburbs of Birmingham and Ann Arbor (16.4 servings) (Table 7-5). A one-way ANOVA performed on these responses showed that the average number of servings by neighborhood type varied significantly (Table 7-4). Post hoc testing revealed that the difference between high-density urban Detroit and the high-density suburbs was 23.37 (p-value .000), and between HDU and HDS the difference was 17.83 (p-value .000). The difference between high and low-density suburbs was less substantial at 5.56 (p-value .095).

Though diet/calorie-free drinks have fewer calories than their full-calorie counterparts, there is some concern that diet soft drinks may also play a role in obesity and/or contribute to other health problems (Gardener et al. 2012). Respondents were asked what proportion of their soft drinks where the diet version. Here a little more than half (54.5%) of Detroit respondents said they rarely or never chose diet versions, while 40% of the low-density suburban respondents always or almost always chose diet soft drinks (Table 7-5).

Given that a variety of soft drinks are available at fast food restaurants, it was expected that there would be a measurable relationship between soft drink consumption and restaurant behavior. Table 7-6 shows that there is essentially no difference in the average monthly consumption of soft drinks between those who dine out at restaurants in general and those who do not. However, looking at fast food behavior, respondents who report at least one trip per week to fast food restaurants consume about 14 servings more than those who do not visit fast food regularly (p-value .000). This is an average of about a half-serving more per day for respondents who visit fast food restaurants at least once weekly.

Table 7-4: Soft drink consumption and BMI category one-way ANOVA

	BMI Group	Mean	Std. Deviation		
Average number of soft drink servings per month, by BMI	<18.5 (underweight)	22.500	37.1882		
	18.5-24.9 (normal)	20.816	34.0464		
	25-29.9 (overweight)	24.877	39.0415		
	30+ (obese)	30.860	41.1753		
	Total	24.105			

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13921.620	3	4640.540	3.362	.018
Within Groups	1290666.442	935	1380.392		
Total	1304588.062	938			

Table 7-5: Soft drink consumption by urban type, one-way ANOVA

		High Density Urban	High Density Suburbs	Low Density Suburbs	Total
Average number of servings of soft drinks, soda, pop, or fruit drinks, diet or regular (per month)		39.818	16.432	21.990	24.279
How often were these diet/sugar-free?	Almost never or never	54.4%	45.5%	38.8%	45.5%
	Almost always or always	19.0%	34.6%	40.0%	32.4%

ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	87668.458	2	43834.229	33.440	.000
Within Groups	1296405.723	989	1310.825		
Total	1384074.181	991			

Table 7-6: Soft drink consumption and restaurant travel behavior

	Avg. Servings	Std. Deviation	Std. Error Mean	
No restaurant trips (N = 328)	23.707	38.6134	2.1321	
At least one restaurant trip (N = 664)	24.561	36.7692	1.4269	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
-.338	990	.735	-.8537	.4195
	Avg. Servings	**Std. Deviation**	**Std. Error Mean**	
No fast food trips (N = 744)	20.714	34.5867	1.2680	
At least one fast food trip (N = 248)	34.972	43.0356	2.7328	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
.-4.733	359.271	.000	-14.2574	.3.0126

Results: Vegetable Consumption

While consumption of soft drinks should be limited in a healthful diet, vegetables, on the other hand, provide vital nutrients and fiber. USDA recommends a minimum of 2 1/2 cups daily for women and 3 cups for men. In 2013, only 8.9% of Americans met the recommended daily servings; in Michigan, that number was 7.7% (CDC 2015). Survey respondents were asked how many servings of vegetables they consume in an average month. An analysis of vegetable consumption across BMI categories showed that the average number of vegetable servings when down as BMI went up, with the underweight category having the highest number of servings and the obese group having the lowest. According to Tukey post-hoc testing, the statistically significant differences were between the "normal" weight group (51 servings) and the overweight group (42 servings), with a difference of 9 servings (p-value .004) and between

the normal weight group (51 servings) the obese group (38 servings), with a difference of 13 servings (p-value .000).

A similar analysis was performed to examine vegetable consumption by urban type (Table 7-8). Detroit respondents reported an average of almost 30 servings of vegetables in a month (or an average of less than one serving per day) while the two suburban neighborhoods reported an average of about 50 servings per month, significantly more than the Detroit residents. While there was no significant difference between the two suburban types, Tukey post-hoc testing found that Detroit respondents reported significantly fewer servings of vegetables per month, consuming 21.93 fewer servings than the high-density suburban respondents (p-value .000) and 19.18 fewer servings than the low-density urban respondents (p-value .000).

Lastly, vegetable consumption was compared to respondents' reported restaurant travel. As with soft drinks, it was expected that there might be fewer servings of vegetables among those who dine at fast food restaurants since the menu items are not usually comprised of fresh or frozen vegetables (if you exclude French fries). Table 7-9 shows, similar to soft drink consumption, that there is no significant difference in average monthly vegetable consumption between those who dine out at restaurants in general at least once per week compared to those who do not. However, again we see that those who dine out at fast food restaurants report consuming 12.7 fewer servings of vegetables than those who do not visit fast food restaurants on a regular basis (p-value .000).

Table 7-7: Vegetable consumption and BMI category one-way ANOVA

	BMI Group	Mean	Std. Deviation		
Average number of vegetable servings per month, by BMI	<18.5 (underweight)	52.867	33.6407		
	18.5-24.9 (normal)	50.986	37.3989		
	25-29.9 (overweight)	41.557	35.0984		
	30+ (obese)	38.096	35.1821		
	Total	45.555	36.5914		
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	29315.973	3	9771.991	7.449	.000
Within Groups	1226603.452	935	1311.875		
Total	1304588.062	938			

Table 7-8: Vegetable consumption

	Type of Environment	Mean	Std. Deviation		
Average number of servings fresh, canned or frozen vegetables each month	High Density Urban	29.899	34.7228		
	High Density Suburbs	51.832	35.3025		
	Low Density Suburbs	49.080	35.3832		
	Total	45.316	36.3034		
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	87668.458	2	43834.229	33.440	.000
Within Groups	1296405.723	989	1310.825		
Total	1384074.181	991			

Table 7-9: Vegetable consumption and restaurant travel behavior

	Avg. Servings	Std. Deviation	Std. Error Mean	
No restaurant trips (N = 327)	42.687	35.6921	1.9738	
At least one restaurant trip (N = 664)	46.611	36.5578	1.4187	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
-1.601	989	.110	-3.9241	2.4507
	Avg. Servings	**Std. Deviation**	**Std. Error Mean**	
No fast food trips (N = 743)	48.497	36.4057	1.3356	
At least one fast food trip (N = 248)	35.786	34.3410	2.1807	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
4.970	446.170	.000	12.7103	2.5572

Results: Exercise

Respondents were also asked about their exercise activity. While exercise is not directly related to fast food restaurants (unlike soft drinks and vegetables which are menu item components), the attitudes toward exercise may be related to the attitudes that motivate one to choose or not choose fast food restaurants. In Table 7-10, the general attitude toward the importance of exercise for improved health are presented by neighborhood type. Most respondents stated that exercise was of moderate or high importance, but we see slightly more support for the importance of exercise in the suburban communities, especially in the high-density walkable suburban communities.

Table 7-10: How important is exercise to you in achieving improved health?

	High Density Urban	High Density Suburbs	Low Density Suburbs	Total
Low	13.7%	4.7%	8.1%	8.1%
Moderate	36.7%	28.9%	34.0%	32.5%
High	49.1%	66.4%	57.9%	59.3%

Respondents were asked questions about both vigorous and moderate exercise. Vigorous exercise might be described as a high-intensity workout, whereas moderate exercise might include walking or leisurely bicycling. For both of these questions, the following tables compare exercise behavior to BMI, neighborhood type, and restaurant travel behavior. With regard to BMI, the normal weight category reported the highest number of vigorous workouts per week, with 2.2, and the obese group reported the lowest, with 1.4 (Table 7-11). Tukey post-hoc testing showed that the statistically significant differences were between the normal weight group and the obese group (a difference of 0.88, p-value .000), and overweight and obese (a difference of 0.72, p-value .002).

When vigorous exercise was compared to neighborhood type (Table 7-12), we see that the suburban communities are just slightly higher than the Detroit neighborhoods. Post-hoc testing showed that the high-density suburbs (an average of 2.2 times per week) were significantly different from Detroit (1.7 times per week, a difference of 0.46, p-value .025).

Comparing vigorous exercise and restaurant travel behavior, similar to the two previous categories, it might be expected that more frequent exercise would correlate with a lower likelihood of regular fast food consumption. And the results follow the findings of the soft drink and vegetable analyses; there is little difference in exercise frequency among those who dine

out in general at least once per week and those who do not, but we do see a significant difference with regard to fast food (Table 7-13). Those who report dining out at fast food at least once per week also reported engaging in vigorous exercise on 0.42 times fewer occasions than those respondents who did not dine out at fast food at least once per week (p-value .006). As with the previous analyses, it should be noted that the standard deviations for vigorous exercise were large relative to the mean, suggesting a wide range of data values.

Table 7-11: Vigorous exercise, by BMI category

	BMI Group	Mean	Std. Deviation		
Average number of vigorous exercise sessions, by BMI	<18.5 (underweight)	1.3929	2.27172		
	18.5-24.9 (normal)	2.2397	2.11776		
	25-29.9 (overweight)	2.0811	2.20751		
	30+ (obese)	1.3579	1.80553		
	Total	1.9989	2.11300		
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	107.169	3	35.723	8.194	.000
Within Groups	3879.888	890	4.359		
Total	3987.057	893			

Table 7-12: Vigorous exercise, by neighborhood type

	Type of Environment	Mean	Std. Deviation		
Average number of vigorous exercise sessions, by neighborhood type	High Density Urban	1.7080	2.10050		
	High Density Suburbs	2.1665	1.97457		
	Low Density Suburbs	2.0653	2.27468		
	Total	2.0221	2.11564		
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	31.172	2	15.586	3.501	.031
Within Groups	4171.739	937	4.452		
Total	4202.911	939			

Table 7-13: Vigorous exercise and restaurant behavior

	Avg. # of Times	Std. Deviation	Std. Error Mean	
No restaurant trips (N = 302)	2.0624	2.15954	.12427	
At least one restaurant trip (N = 638)	2.0031	2.09599	.08298	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
-.402	938	.688	-.05936	.14784
	Avg. # of Times	**Std. Deviation**	**Std. Error Mean**	
No fast food trips (N = 743)	2.1297	2.13915	.08085	
At least one fast food trip (N = 248)	1.7083	2.01727	.13021	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
-2.749	436.622	.006	-.42138	.15327

The same set of analyses were performed for responses to the question of how many times per week respondents engaged in moderate (as opposed to vigorous) exercise. Moderate exercise sessions were reported with more frequency compared to vigorous exercise. Following the same trend as vigorous exercise, the number of times per week reported increased as BMI decreased (Table 7-14). The statistically significant difference in means was between the normal BMI group (5.1 times per week) and the obese group (3.6 times per week, a difference of 1.5, p-value .019).

For differences in neighborhood type, the high-density suburbs reported the most moderate exercise per week (an average of 5) while the low-density suburbs reported the least (an average of 3.9, Table 7-15). Post-hoc testing showed this difference (1.1) to be significant (p-value .019).

With regard to restaurants, the expectation was that the findings would be similar to previous analyses in this chapter, with fast food consumption being related to less exercise, though perhaps not to the same degree as with vigorous exercise. However, for both restaurants trips in general and fast food trips specifically, the average amount of moderate exercise per week was nearly identical, within two-tenths of a percent (Table 7-16).

Table 7-14: Moderate exercise, by BMI category

	BMI Group	Mean	Std. Deviation		
Average number of moderate exercise sessions, by BMI	<18.5 (underweight)	5.167	4.7722		
	18.5-24.9 (normal)	5.081	7.4607		
	25-29.9 (overweight)	4.029	2.5942		
	30+ (obese)	3.609	2.4133		
	Total	4.481	5.5755		
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	342.878	3	114.293	3.711	.011
Within Groups	26702.560	867	30.799		
Total	27045.437	870			

Table 7-15: Moderate exercise, by neighborhood type

	Income Group	Mean	Std. Deviation		
Average number of moderate exercise sessions, by neighborhood type	High Density Urban	4.338	7.0912		
	High Density Suburbs	5.023	5.9938		
	Low Density Suburbs	3.912	3.0853		
	Total	4.478	5.4812		
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	222.937	2	111.469	3.732	.031
Within Groups	27327.355	915	29.866		
Total	27550.292	917			

Table 7-16: Moderate exercise and restaurant behavior

	Avg. # of Times	Std. Deviation	Std. Error Mean	
No restaurant trips (N = 292)	4.409	6.2395	.3651	
At least one restaurant trip (N = 626)	4.510	5.0942	.2036	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
-.402	938	.688	-.05936	.14784
	Avg. # of Times	**Std. Deviation**	**Std. Error Mean**	
No fast food trips (N = 694)	4.522	4.8609	.1845	
At least one fast food trip (N = 224)	4.342	7.0776	.4729	
t	**df**	**Sig. (2 tailed)**	**Mean Difference**	**Std. Error Difference**
-.427	916	.669	-.1801	.4214

Results: Smoking

Lastly for this chapter, respondents were asked whether or not they smoked cigarettes. As with exercise, smoking is not directly related to fast food restaurants or diet, but here again the question is whether those who smoke are also more likely to dine out at fast food. In Table 7-17, we see that 9.5% of the survey respondents smoke every day, and 85.3% do not smoke at all. The high-density and low-density suburban sites are similar to one another, while the prevalence of smoking is slightly higher in Detroit, where 26% of respondents reported smoking daily, compared to only about 4% of the suburban respondents.

Table 7-17: Do you smoke cigarettes?

	High Density Urban	High Density Suburbs	Low Density Suburbs	Total
Every Day	26.1%	3.8%	3.9%	9.5%
Some Days	8.8%	4.8%	2.7%	5.1%
Not at all	65.1%	91.3%	93.4%	85.3%

Table 7-18: Cigarette smoking and fast food trips

	No Weekly Fast Food Trip	At Least One Fast Food Trip
Smoker	61.5%	38.5%
Non-Smoker	77.1%	22.9%

Discussion and Conclusions

This chapter first explored BMI—the only potential outcome indicator of lifestyle collected in the survey—and then focused on four key characteristics of the survey respondents (soft drink consumption, vegetable consumption, moderate and vigorous exercise, and smoking) in relation to neighborhood type (high-density urban, high-density suburban, low-density suburban), and restaurant travel behavior.

The survey results show that obesity is much more prevalent in Detroit (42.9%) than in the higher density suburbs (10.6%) or low-density, autocentric suburbs (15.2%). This is in line with the findings of the microsimulation analysis done by Koh, Grady and Vojnovic (2015), which predicted, using census data, that census tracts within Detroit would have a higher rate of obesity than the suburban communities. Some of this difference may be explained by the general concept of walkability; the high-density suburban neighborhoods in Birmingham and Ann Arbor have high connectivity, making it easier to walk there than in neighborhoods with curvilinear roads and lower density, predominately residential land uses like those found in

Bloomfield Hills and West Bloomfield. And while car ownership might be expected to lead to higher BMI, in fact in these results suggest there is a slightly lower average BMI among those respondents with access to a vehicle (26.1) compared to those without (28.14). While this may seem counterintuitive, that car ownership would lead to higher BMI as it allows for the option of less active mobility, it may be the case that car ownership allows individuals to more easily overcome the accessibility issues around healthful food options in their neighborhoods. Another possible factor is whether Detroit residents walk in their neighborhoods despite a high-connectivity urban form; other factors such as blight, crime and safety may limit walkability. This would partially explain the difference between Detroit and other high-density suburban communities.

As would be expected given the literature highlighting the calorie density of fast food menu items and the potential for weight gain with consumption of these items (Bowman and Vinyard 2004; Jeffery et al. 2006; Prentice and Jebb 2003; Rosenhack 2008), the survey respondents who reported at least one weekly trip to fast food restaurants had a statistically significant higher BMI than those who did not, a difference of 2.69. This difference did not appear with those who do or do not dine out at restaurants of all types weekly. A possible explanation for this could be that those interested in limiting high calorie foods are better able to do so at full service restaurants with a wider variety of lean meats, vegetables, whole grains in the kitchen and the ability to adapt dishes to health-conscious patrons.

Sugary drinks are often implicated in the United States' obesity issue due to the ease with which they can be a source of nutritionally-devoid calories. The survey results found that respondents who fall into the obese BMI category consume an average of 10 additional

servings of soda per month than those in the normal category, in line with previous research on soft drinks and obesity. Related to this, Detroit respondents, where the average BMI is highest, were less likely to consume diet or sugar free soft drinks than their suburban counterparts. A little more than half (54.5%) of Detroit respondents said they rarely or never chose diet versions, while 40% of the low-density suburban respondents always or almost always chose diet soft drinks.

Given that a variety of soft drinks are available at fast food restaurants, it was expected that there would be a measurable relationship between soft drink consumption and restaurant behavior. This relationship is not affirmed by the survey data when all restaurant travel is examined, but respondents who reported at least one trip per week to fast food restaurants consumed about 14 servings of soft drinks per month more than those who do not visit fast food regularly (p-value .000). This is an average of about a half-serving more per day for respondents who visit fast food restaurants at least once weekly. Whether the fast food visits are the source of some of these soft drink servings cannot be confirmed by the survey questions, however.

Survey respondents were asked how many servings of vegetables they consume in an average month. An analysis of vegetable consumption across BMI categories showed that the average number of vegetable servings went down as BMI went up, with the underweight category having the highest number of servings and the obese group having the lowest. The statistically significant differences were between the normal weight group (51 servings) and the overweight group (42 servings), with a difference of 9 servings, and between the normal weight group (51 servings) and the obese group (38 servings), with a difference of 13 servings.

A similar analysis was performed to examine vegetable consumption by urban type. Detroit respondents reported an average of almost 30 servings of vegetables in a month (or an average of less than one serving per day) while the two suburban neighborhoods reported an average of about 50 servings per month, significantly more than the Detroit residents. Detroit respondents reported significantly fewer servings of vegetables per month, consuming 21.93 fewer servings than the high-density suburban respondents, and 19.18 fewer servings than the low-density urban respondents.

Lastly, vegetable consumption was compared to respondents' reported restaurant travel. As with soft drinks, it was expected that there might be fewer servings of vegetables among those who dine at fast food restaurants since the menu items are not usually comprised of fresh or frozen vegetables (if you exclude French fries). Similar to soft drink consumption, there is no significant difference in average monthly vegetable consumption between those who dine out at restaurants in general at least once per week compared to those who do not. However, again we see that those who dine out at fast food restaurants report consuming 12.7 fewer servings of vegetables than those who do not visit fast food restaurants on a regular basis.

The values in the analysis of soft drink and vegetable consumption should be interpreted with the caveat that the standard deviation of the means for each category were quite large; respondents did not keep a food diary and were likely estimating their response for this question. Even in estimation, the trends reflect what we might expect: respondents who consume more soft drinks, on average, had a higher BMI and were more likely to visit fast food establishments. The inverse was true of respondents who reported consuming more servings of

vegetables. Both soft drinks and insufficient consumption of vegetables could be factors in poor health outcomes and diet-related diseases.

Respondents were also asked about their exercise activity. While exercise is not directly related to fast food restaurants (unlike soft drinks and vegetables which are menu item components), the attitudes toward exercise may be related to the attitudes that motivate one to choose or not choose fast food restaurants. Most respondents stated that exercise was of moderate or high importance, but we see slightly more support for the importance of exercise in the suburban communities, especially in the high-density walkable suburban communities.

Respondents were asked questions about both vigorous and moderate exercise. Vigorous exercise might be described as a high-intensity workout, whereas moderate exercise might include walking or leisurely bicycling. With regard to BMI, the normal weight category reported the highest number of vigorous workouts per week, with 2.2, and the obese group reported the lowest, with 1.4. When vigorous exercise was compared to neighborhood type, we see that the suburban communities are just slightly higher than the Detroit neighborhoods.

Comparing vigorous exercise and restaurant travel behavior, similar to the two previous categories, it might be expected that more frequent exercise would correlate with a lower likelihood of regular fast food consumption. And the results follow the findings of the soft drink and vegetable analyses; there is little difference in exercise frequency among those who dine out in general at least once per week and those who do not, but we do see a significant difference with regard to fast food. Those who report dining out at fast food at least once per

week also reported engaging in vigorous exercise 0.42 times fewer than those respondents who did not dine out at fast food at least once per week.

The same set of analyses were performed for responses to the question of how many times per week respondents engaged in moderate (as opposed to vigorous) exercise. Moderate exercise sessions were reported with more frequency compared to vigorous exercise. Following the same trend as vigorous exercise, the number of times per week reported increased as BMI decreased. For differences in neighborhood type, the high-density suburbs reported the most moderate exercise per week while the low-density suburbs reported the fewest.

With regard to restaurants, the expectation was that the findings would be similar to previous analyses in this chapter, with fast food consumption being related to less exercise, though perhaps not to the same degree as with vigorous exercise. However, for both restaurants trips in general and fast food trips specifically, the average amount of moderate exercise per week was nearly identical, within two-tenths of a percent. This may be explained by respondents engaging in vigorous exercise being more health conscious all around and avoiding fast food, while those engaging in moderate exercise are a larger subset of the population and overall may be less concerned with fitness.

Lastly for this chapter, respondents were asked whether or not they smoked cigarettes. As with exercise, smoking is not directly related to fast food restaurants or diet, but here again the question is whether those who smoke are also more likely to dine out at fast food. Nine and a half percent of the survey respondents smoke every day, and 85.3% do not smoke at all. The suburban sites are similar to one another, while the prevalence of smoking is slightly higher in

Detroit, where 26% of respondents reported smoking daily, compared to only about 4% of the suburban respondents.

Without knowing all the specifics about the respondents' health, a few relationships can be gleaned from the data, both regarding where the respondents live (high-density Detroit, high-density suburbs, or low-density suburbs) and their consumption and exercise habits. The findings with regard to BMI in relation to vegetable consumption, soft drink consumption, and vigorous exercise are as expected based on the literature. The results also confirm spatial disparities in health and fitness between Detroit and its suburbs, and in many cases we see the high-density, walkable suburbs having the most ideal results (more vegetable consumption, less soft drink consumption, lower BMI, etc.). Recalling the findings of Chapter 5, this may be partially explained both by the walkability of the neighborhoods and the variety in types of restaurants in Ann Arbor and Birmingham, as well as more financial accessibility. While the high-connectivity street grid exists in Detroit, the city does not have the same variety of restaurants to which residents can travel, nor the same level of household income that affords more choice in dining options.

CHAPTER 8: CONCLUSIONS

"The city is manifestly a complicated thing." –David Harvey (p. 22)

The city is, indeed, a complicated thing to study. Similarly, human behavior and the way that we interact and engage with our urban environments can also be shaped by a wide variety of characteristics, including income, mobility, awareness, mental and emotional health, family structure, and racial, ethnic, and gender identities; people rarely experience their neighborhoods in the exact same way. In the process, other characteristics of the survey respondents were examined to provide a more comprehensive review of the differences between socioeconomic groups and different urban built environments. This dissertation has explored several of these characteristics using the results of an in-depth travel survey in the Detroit region, particularly as they relate to restaurant travel behavior. Restaurants have received considerable criticism for their potentially negative health effects, however, restaurants could also serve as sources of healthful and culturally appropriate food, as well as being an important part of a community fabric.

The purpose of this dissertation was not to denigrate fast food restaurants, but rather to explore how they fit into the restaurant travel behavior of residents in the Detroit metropolitan region. As previous chapters have asserted, the premise of this research is that Detroit residents have been left without a variety of healthy food options, relying instead on corner stores and fast food restaurants close to their neighborhood. The concern, as highlighted by the literature review and this research, is that a lack of affordable, nutritious, culturally appropriate

food options has created a culture of fast food consumption, which may be quick and convenient but has potentially significant negative health implications.

The study of food access in central city neighborhoods—as well as in suburban and rural communities—has expanded and evolved to better reflect the complexity of the food landscape and human opportunity and behavior. Initial study of food deserts measured the spatial pattern of supermarkets relative to population (e.g. Wrigley 2002; Wrigley et al. 2003; Eckert and Shetty 2011), and later research focused also on the proportion of available food that is high in fat and calories but low in nutritional value (e.g. Rose, Bodor and Swalm 2009; Cooksey-Stowers, Schwartz and Brownell 2017). Much of this research used spatial data regarding the locations of populations and food outlets, and while analyses of the landscape could be made, relationships between individuals living in an area and the places where they actually dine or shop are largely speculative.

The food desert premise is that the absence of grocery stores in a neighborhood denies access to fresh, healthy, affordable food to that population. But recent research using data that includes information on where residents of disadvantaged Detroit neighborhoods shop shows that they travel outside the neighborhood to access the groceries they prefer to buy (LeDoux & Vojnovic 2013). While this still may be an extra burden on these residents, to have to travel farther to shop for groceries, especially if they do not own a car, we have a better understanding of how they are accessing food that examining proximity alone does not provide.

Studying the Detroit region is important for a few reasons. One, few American cities have experienced the kind of decline that Detroit has, dropping from nearly two million residents to under 700,000. In its wake, this decline has left poverty, unemployment, racial

residential segregation, vacant land and disadvantaged neighborhoods. While the layout and density of the city is supportive of thriving urban communities, the reinvestment happening in Detroit has occurred primarily in the Downtown and Midtown sections, catering to skilled professionals and driving up housing prices in those neighborhoods (Reese et al. 2017). Meanwhile, average Detroit residents, including in the very low-income neighborhoods studied in this dissertation, continue to struggle to find jobs, to receive satisfactory public services, and to access health-promoting amenities like food outlets offering healthy options. Contrary to the patterns in Detroit, the suburban communities, composed of primarily white, middle class to affluent residents who have fled the City of Detroit over the last several decades, attracted retailers and other services. This dissertation captures the differences in restaurant travel behavior and select health characteristics between Detroit and its suburbs.

This dissertation focuses on the restaurant landscape and examines both spatial patterns of fast food density and reported travel data from survey respondents in six Detroit area neighborhoods. The research expands on and adds to existing literature by measuring the fast food landscape, which had not been previously done in the Detroit region, and incorporating the travel behavior of the survey respondents rather than attempting to model it using assumptions based on proximity and the findings of other studies. The dissertation sought to answer several questions about the restaurant landscape and restaurant travel behavior in the study region. The goal was to understand if Detroit had a higher density or proportion of fast food restaurants, and whether that might play a role if Detroit respondents reported more frequent visits to fast food restaurants than suburban respondents.

Revisiting the Research Questions

This research centered around four key questions, with the first one focused on the distribution of restaurant types across the Detroit region. To answer the question "what is the existing restaurant landscape in the study area," the locations of all restaurants were coded by type, and their spatial distribution was examined. The answer was, yes, there are differences in fast food density and proportion, but not in the exact way that one might have expected. While Detroit did have a higher fast food density than the low-density suburbs (LDS) of Bloomfield Hills and West Bloomfield, it was similar to the high-density suburbs (HDS) of Ann Arbor and Birmingham. In fast food restaurants per 1,000 residents, Detroit had 0.32, the HDS averaged 0.35, and the LDS averaged 0.19. In a similar trend, in fast food restaurants per square mile, Detroit had 1.6, the HDS had 1.4, and the LDS had 0.3. Comparing fast food restaurants per mile of road again revealed that Detroit and the HDS were similar, both with 0.05 fast food restaurants per road mile, and the LDS were lower, at 0.02. While I would have originally expected Detroit to be significantly higher than the suburban communities, it does make sense that the presence of fast food appears more correlated with mixed land uses, the densities of the different land uses, and commercial activity. From this, one could argue that residents of Detroit, Ann Arbor and Birmingham have a higher exposure to fast food than those in Bloomfield Hills or West Bloomfield. For this measurement, the difference is seen between high-density versus low-density land uses.

So, residents of Detroit and the HDS may have similar opportunities for proximity to fast food, but what about other options? I expected that Detroit would have the highest proportion of all restaurants that are fast food. Using the data from MDARD that listed all restaurants, I

identified those that could be categorized as fast food. From there, I calculated the proportions. Detroit did have the highest proportion of all restaurants classified as fast food, at 21.28%. The HDS averaged 12.51%, and the LDS averaged 15.45%. The proportion of restaurants that were fast food in the LDS was unexpected. However, it was likely explained by the number of fast food restaurants on the main road that makes up the boundary of Bloomfield Hills Township, and the relative lack of other commercial activity, including restaurants, within this area. This increased Bloomfield Hill's proportion of fast food restaurants to 20.29%, and in this analysis, the LDS actually had a higher proportion of all restaurants classified as fast food than the HDS, but Detroit was the highest. Overall, in both fast food density and fast food proportion, Detroit was higher than the suburban municipalities, suggesting a slightly higher exposure to fast food for Detroit residents. The results of the travel survey would reveal whether trips to fast food restaurants reflected these trends.

The second research question focused on "where and how often did the survey respondents report traveling to restaurants in relation to their home address?" Respondents from high-density urban Detroit and the high-density suburbs had similar measures of average trip distance, 2.79 miles and 2.62 miles, respectively. The average distance for the low-density suburbs was greater, 4.29 miles. Using standard distance to measure how clustered the trip pattern is, the findings were similar to average trip length: the HDS were lowest (3.08 miles), followed by Detroit (3.62 miles), and the LDS had the most dispersed trip cluster with a measure of 4.07 miles. While the HDS and LDS neighborhoods are similar in socioeconomic and demographic composition, the low-density, residential nature of Bloomfield Hills and West

Bloomfield requires that residents travel farther from home to access many commercial activities, such as restaurants.

In both Detroit neighborhoods, about 75% of all restaurant trips are by automobile. In the low-density, affluent suburbs of Bloomfield Hills and West Bloomfield, nearly all trips (95%) are by automobile. The high-density, affluent suburb of Birmingham is in between, with 85% of trips being made by automobile, while the similarly high-density suburb of Ann Arbor has the lowest proportion of restaurant trips made by automobile, at 65%. The demographics of the city of Ann Arbor are somewhat skewed by the presence of the University of Michigan and its large student body. Many students may not bring a car to campus and thus may be more likely to walk places than permanent city residents. If not for this, it is possible we might otherwise see a closer parallel between Ann Arbor and Birmingham, which also has a high-density walkable downtown.

Overall, a mix of restaurant types were reported by the survey respondents. In the suburban communities, the proportion of one type or another varied, but the bulk of destinations were to casual chains, ethnic restaurants, and locations captured in the “other” category. In Detroit, the results were very different, where 80% of all trips were to fast food restaurants. In the suburbs, no site measured more than 22% of trips to fast food restaurant options.

On average, the survey respondents reported travelling to a restaurant 1.45 times per week. About 67% of the sample reported dining out at least once per week. In both measures, the HDS and LDS communities were nearly identical (70% reporting at least on trip per week,

and an average of 1.42 trips per week). Detroit had a lower percentage of respondents who dined out weekly (60%), but those diners did so slightly more often (1.65 trips per week). Detroit respondents may be somewhat less likely to dine out weekly, but those who do are going more often than their suburban counterparts.

While the analysis suggests that Detroit residents may have a somewhat higher exposure to fast food than some suburban communities, the survey findings reveal that they have a substantially higher consumption of fast food. Detroit respondents report visiting fast food three times as often as suburban respondents. However, given that Detroit survey respondents do report traveling outside the city limits to access casual chain restaurants (such as Applebee's, Red Lobster, and Olive Garden), and given the need for an automobile to make such a trip, it may not be so much the presence of fast food restaurants as the lack of other options that influences the increased consumption.

Research question three provided some insight into the findings of question two. Research question three asked, "are there differences in this travel based on the study neighborhood or individual characteristics, such as income, education, vehicle ownership or family/household structure?" The relationship between household income and restaurant travel was explored in a few different ways. The results suggest that the likelihood of visiting fast food weekly decreases with an increase in income. This may be because more income opens up more restaurant options due to affordability and/or access. Those reporting at least one trip on average fall into the $80,000 - $89,000 range for household income, while those reporting no trips fall into the $60,000 - $69,000 range. Conversely, when focusing on fast food only, those reporting at least one trip fall into the $50,000 - $59,000 range while those not reporting a fast

food trip fall into the $80,000 - $89,000 range. These results suggest that income may make one more likely to dine out on a weekly basis (or more frequently), but that those who are regularly patronizing fast food restaurants have a lower average household income.

Another set of analyses examined the respondents' trips when aggregated into groups with household incomes of less than $50,000, $50,000-$99,999, or more than $100,000. Those with a household income of $50,000 - $99,999 travel an average of seven-tenths of a mile farther to restaurants than those earning less than $50,000. Those earning $100,000 or more travel an average of three-tenths of a mile more than those in the $50,000 - $99,999 range. The statistically significant difference is between the lowest income group and the other two income groups. There is no significant difference between the middle and highest income groups when it comes to average distance traveled. This suggests that the lowest income groups are not travelling as far to dine out as higher income groups. Simply, lower income groups seem more reliant on the restaurant options available in their neighborhood.

Based on the relationship between residential segregation and poverty levels in the Detroit region, one might expect to see similar patterns between race and income when it comes to dining out. While a crosstabulation and *phi* coefficient did not reveal noteworthy results for dining out in general, fast food was a different story. Here, while nonwhite respondents were essentially split 50/50 on weekly fast food consumption, white respondents were less likely to dine out at fast food.

A crosstabulation of those respondents with at least one car in the household and those with no car showed that about half of respondents with no car dined out at least once per

week, while half did not. For respondents with a car, more than two-thirds dined out at least once per week. There was no statistical relationship to these numbers, perhaps because most respondents reported having at least one vehicle in the household. A difference of means t-test on the average distance traveled to restaurants for those with cars and those without cars revealed that those with no car travel an average of around a mile, while those with cars travel about a mile further to dine out. This is logical, suggesting that those without access to cars are relying on options closer to home, within walking or biking distance. This would be relevant to the question of whether those without cars are more dependent on the nearby food environment than those with cars.

In these survey data, the presence of children alone does not appear to be a statically significant factor in predicting restaurant travel behavior. Similarly, the gender of the respondent was analyzed, and these findings show the travel behavior reported in this survey was very similar for males and females.

Overall, household income, access to an automobile, and race were revealed as being related to differences in restaurant travel behavior, especially with regard to choosing fast food restaurants. While this survey cannot answer the "why" of this—for example, there may be a social or cultural preference for the taste of fast food menu items, or a dislike of certain other restaurant items—the findings do validate the differences in behavior in the Detroit metropolitan area based on some, but not all, demographic and socioeconomic characteristics.

Given the findings associated with out-of-home dining behavior, research question four asked, "are there any measurable relationships between self-reported measures of BMI (as a

proxy for health) and restaurant travel, either by type of restaurant or frequency of dining out?" The survey results show that obesity is much more prevalent in Detroit (42.9%) than in the HDS (10.6%) or LDS (15.2%).

Some of this difference may be explained by the general concept of walkability, given that the high-density suburban neighborhoods in Birmingham and Ann Arbor have high connectivity, making it easier to walk than in neighborhoods with curvilinear roads and lower density, predominately residential land uses that can be found in the neighborhoods in Bloomfield Hills and West Bloomfield. And while car ownership might be expected to lead to higher BMI, in fact in these results there is a slightly lower average BMI among those respondents with access to a vehicle (26.1) compared to those without (28.14). While this may seem counterintuitive, that car ownership might lead to higher BMI as it allows for the option of less active mobility, it may be the case that car ownership allows individuals to more easily overcome the accessibility issues around healthful food options in their neighborhoods. To put it another way, having a car makes it easier to seek out healthy options if one so chooses. It may also be associated with higher health consciousness among residents of higher socio-economic status (Vojnovic et al., 2014). Upper-income groups might not only be more health conscious, but they would have the resources to pursue healthier lifestyles, including buying healthier food options and joining a gym, or even hiring a personal trainer. Another possible factor is whether Detroit residents walk in their neighborhoods despite a high-connectivity urban form; factors such as blight, crime and safety may limit walkability. This could partially explain the difference between Detroit and other high-density suburban communities.

The survey respondents who reported at least one weekly trip to fast food restaurants had a statistically significant higher BMI than those who did not, a difference of 2.69. This difference did not appear with those who do or do not dine out to restaurants of all types weekly. A possible explanation for this could be that those interested in limiting high calorie foods are better able to do so at full service restaurants with a wider variety of lean meats, vegetables, and whole grains in the kitchen and the ability to adapt dishes to health-conscious patrons.

The survey results found that respondents who fall into the obese BMI category consume an average of 10 additional servings of soda per month than those in the normal category, in line with previous research on soft drinks and obesity. Related to this, Detroit respondents, where the average BMI is highest, were less likely to consume diet or sugar free soft drinks than their suburban counterparts. Respondents who reported at least one trip per week to fast food restaurants consumed about 14 servings of soft drinks per month more than those who do not visit fast food regularly. This is an average of about a half-serving more per day for respondents who visit fast food restaurants at least once weekly. Whether the fast food visits are the source of some of these soft drink servings cannot be confirmed by the survey questions, however.

An analysis of vegetable consumption across BMI categories showed that the average number of vegetable servings went down as BMI went up, with the underweight category having the highest number of servings and the obese group having the lowest. The statistically significant differences were between the normal weight group (51 servings) and the overweight group (42 servings), with a difference of 9 servings, and between the normal weight group (51 servings) the obese group (38 servings), with a difference of 13 servings. Detroit respondents reported an average of almost 30 servings of vegetables in a month (or an average of less than

one serving per day) while the two suburban neighborhoods reported an average of about 50 servings per month, significantly more than the Detroit residents. Detroit respondents reported significantly fewer servings of vegetables per month, consuming 21.93 fewer servings than the high-density suburban respondents, and 19.18 fewer servings than the low-density urban respondents.

As with soft drinks, it was expected that there might be fewer servings of vegetables among those who dine at fast food restaurants since the menu items are not usually comprised of fresh or frozen vegetables (if you exclude French fries). Similar to soft drink consumption, there is no significant difference in average monthly vegetable consumption between those who dine out at restaurants in general at least once per week compared to those who do not. However, again we see that those who dine out at fast food restaurants report consuming 12.7 fewer servings of vegetables than those who do not visit fast food restaurants on a regular basis.

Respondents did not keep a food diary and were likely estimating their response for these questions. However, the trends reflect what we might expect: respondents who consume more soft drinks, on average, had a higher BMI and were more likely to visit fast food establishments. The inverse was true of respondents who reported consuming more servings of vegetables. Both soft drinks and insufficient consumption of vegetables could be factors in poor health outcomes and diet-related diseases. Without knowing all the specifics about the respondents' health status, a few relationships can be gleaned from the data, both regarding where the respondents live (high-density Detroit, high-density suburbs, or low-density suburbs) and their consumption and exercise habits. The findings with regard to BMI in relation to vegetable consumption, soft drink consumption, and vigorous exercise are as expected based on the

literature. The results also confirm spatial disparities in health and fitness between Detroit and its suburbs, and in many cases, we see the high-density, walkable suburbs having the most ideal results (including more vegetable consumption, less soft drink consumption, and lower BMI).

Conclusion

There are two primary ways this research contributes to the food access literature. First, it furthers the shift from a mere analysis of the spatial pattern of food options across space to analyzing where people actually travel to access food. Using trips as reported by residents, we do not have to rely on assumptions of where people are traveling based on proximity. Therefore, the analysis adds to the existing literature by providing empirical information on the preferences for specific restaurants, the frequency of restaurant trips and the distance traveled. By overlaying these data on an analysis of fast food density, it becomes possible to compare fast food exposure and fast food consumption.

Second, it extends the research on access beyond grocery stores to restaurants. Much of the existing restaurant research in the social sciences focuses on proximity to fast food restaurants, while this research goes beyond that to look at all types of restaurants, with the justification that these could be outlets for fresh and healthy food in a landscape where these foods are lacking. In short, this research adds to the literature on Detroit, food justice, and restaurant landscapes by analyzing new empirical data collected across the Detroit region, and asking previously unanswered questions about the role sociodemographics and built urban density in restaurant travel.

The findings in this dissertation reveal stark differences in socioeconomic status and health characteristics between residents of Detroit and the suburban communities. While differences in overall restaurant travel where not significant, analyses that singled out fast food travel did reveal statistically significant differences between Detroit respondents, who were generally of low income, and suburban respondents who were generally higher income. Many of the health disparities revealed in the analysis—in BMI, vegetable consumption, soda consumption, and lack of exercise—appear to be related to the consumption of fast food by Detroit residents. This is not to say that affluent suburban residents avoid fast food; they just visit fast food restaurants in moderation, while visiting a wide range of other types of restaurants.

This analysis is not the first to show substantial gaps between Detroit and its suburbs; those disparities have been long-documented in a wide body of research findings. This dissertation adds a new dimension to this body of literature by using detailed survey data on personal characteristics and how individuals navigate the restaurant landscape of the Detroit region. The findings are concerning; a heavy dependency on calorie dense, nutritionally-void fast food would contribute to the poor health outcomes and diet-related disease disparities documented between white and nonwhite Americans. Policy approaches to encourage Detroit residents to consume less fast food might include public health outreach, nutrition and cooking classes, and economic development incentives to bring reinvestment and a wider variety of healthy food options into Detroit neighborhoods. This dissertation provides substantial evidence that Detroit residents rely primarily on fast food for dining out, that they choose locations close to home, and that they have higher average BMIs and less vegetable

consumption than suburban residents. Previous research has shown that poor public health is related to a lower socioeconomic position in the Detroit region (Darden et al. 2010), and this research reveals that fast food consumption may play a part in this. Given the role that nutrition plays in human health, addressing this gap is an important part of helping eliminate the socioeconomic disparities in the Detroit region.

Future research can build on this dissertation in several ways. One, the restaurant travel data can be examined in relation to the retail store location and travel analysis previously conducted (LeDoux and Vojnovic 2013, 2014). This will allow for exploration into whether those who are frequently dining out at nearby fast food restaurants might be doing so because they are not travelling outside the neighborhood to purchase groceries and are more reliant on nearby options. Two, qualitative research should explore the reasons why individuals in Detroit consume fast food three times more often than their suburban counterparts, and why it makes up 80% of Detroiters' restaurant travel. This would help us understand how much of these findings are because of the built environment, sociodemographics, or mere preference. And three, an additional round of survey data collection would provide the opportunity for temporal analysis, to see if restaurant travel behavior has changed in light of economic development in Detroit and the addition of new restaurants and grocery stores since this survey was completed. Detroit's comeback is well underway, but attention must be paid to ensure that the benefits of this comeback are shared by all Detroiters, especially those living in disadvantaged and forgotten residential neighborhoods. This includes the development of an equitable food system and ensured access to healthy, affordable, culturally appropriate food options that will improve and sustain the health of Detroit residents.

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