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**Unavailable and Inaccessible:
An Analysis of Urban Food Insecurity**

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Urban
and Regional Planning at Virginia Commonwealth University

by

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May, 2012

Acknowledgements

I would like to acknowledge a number people who have contributed to the completion of this thesis. First, Dr. Michela Zonta for her guidance and encouragement throughout this undertaking. I am eternally grateful to my family, who have supported my continuing education. I would also like to express my gratitude to Dr. Kim Buttery and Dr. Jimmy Chen for their assistance in this project and acknowledge several of my fellow MURP students who have been enormously helpful in revising and refining this thesis; these students are Alecia Houston, Alissa Akins, Emily Ruf, Ryan Rinn, Samuel Tuttle, and Tolu Ibikunle. Finally, and most importantly, I would like to thank my wife, Anne Compton-Brown for her enduring love, support, and understanding.

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Abstract

UNAVAILABLE AND INACCESSIBLE: AN ANALYSIS OF URBAN FOOD INSECURITY

By: Stephen Shaun Brown

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Urban and Regional Planning at Virginia Commonwealth University

Virginia Commonwealth University, May, 2012

Director: Dr. Michela Zonta
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This study explored food insecurity by examining the ways in which residents of low-income, urban communities access food. The primary elements of this thesis are an analysis of the demographic and socioeconomic characteristics of the populations surrounding food retailers, and a survey of the availability, cost, and quality of fresh fruits and vegetables in food stores commonly found in the urban environment. Overall, this study found that low-income, minority communities are largely served by independent supermarkets, small grocers and convenience stores that charge higher prices for staple foods. Conversely, it was found that wealthy areas enjoy easy access to corporate supermarkets that offer higher-quality foods at lower prices.

Chapter I: Introduction

Food security, at the most fundamental level, is defined as access to adequate quantities of safe, healthy, culturally appropriate food. It has been evaluated at the global, national, regional, community, household, and individual level, and has presented its scholars and advocates with many difficulties in realizing a comprehensive, accurate understanding of the notion; one that takes into account the broad scope of its various nuances and implications. These complications have endured because food security is not easy to understand; it is sometimes a conceptual model, sometimes a concrete, enduring state of existence. Often, it spans the gap between these two, existing as a utopian ideal; persistent for some, fleeting for others.

Food insecurity is much easier to conceive. It is simply the lack of food security. More specifically, it is the inability of an individual or group of people to maintain sustainable access to sufficient quantities of nutritionally sound food.

Food insecurity is a phenomenon that plagues individuals, communities, and even countries. While many places throughout the world, especially developing countries experience frequent barriers to food access, there is also significant inequality in food access within the United States of America. Despite the prosperity of this nation, many minority and/or impoverished communities remain undernourished due to accessibility barriers that, unlike widespread food-shortages or insufficient national food distribution capabilities, can be easily overcome.

Inequality in food access is often the result of two interrelated variables; structural violence, and a failure to establish entitlements to food. Structural violence is most easily defined

as a combination of discriminatory elements built into the cultural, political, and economic framework of the social order. It is the method through which society ensures that the poor remain poor, the wealthy remain wealthy, and that the two do not mix. Entitlements are enforceable claims to ownership of an item, established most often via income-based trade, but sometimes through inheritance or production. When an individual has nothing to be traded and no means of producing something, an entitlement cannot be secured.

Recently, food security has gained much interest in the field of urban planning. The key component of food security is the ability of an individual to access food; an element that is inherently interconnected with the built environment. Planners have long claimed to serve the public interest in a comprehensive way, yet the food system has been, until recently, ignored; consigned to the realm of concerns that will be addressed by the private market. In the last few decades, urban planners have begun to acknowledge the importance of the food system in many areas of the profession, including equity planning, economic development, land-use planning, transportation planning, and community design.

Using Richmond, VA as a case study, this thesis tests the hypothesis that low-income, urban communities lack access to retailers that offer sufficient quantities of healthy foods. To begin, this study will present a review of the literature surrounding the history and evolution of the concept, various interpretations, and geographical extents at which food security can be measured. This will be followed by discussions of the recent interest in the food system by planning professionals, the demographic and socioeconomic characteristics commonly associated with food-insecure populations, the health consequences of food insecurity, and the key roles planners can play to address food insecurity in urban areas.

The research portion of this study explores the spatial distribution of populations that exhibit traits commonly associated with food insecurity, the types of food available in retailers that vary in both type and location, and the interaction of these food stores with the populations that surround them. The study also identifies areas in Richmond in which physical access to food stores may be restricted due to low rates of vehicle ownership and excessive distance to either a supermarket or transit stop.

A food availability survey that identified the types of food available in stores around Richmond was used to obtain data on the availability, price, quantity, and quality of fresh fruits and vegetables. This survey focused on fresh produce because of its short shelf-life and limited availability in urban food stores. The study recognizes that while fresh fruits and vegetables are necessary components in designing a wholesome diet and healthy lifestyle, there are several other factors that must also be taken into consideration. A nutritious diet must also be rich in whole grains, protein, and healthy oils; and avoid sugar, refined grains, fried or fatty foods, and processed meats. However, in order to accurately and straightforwardly illustrate inequalities in access to unprocessed, uncorrupted, nutritious foods, this study limited its scope to the availability of fresh, unpackaged fruits and vegetables.

Chapter II: Literature Review

Conceptual Framework

Security, defined as protection from harm, is absent when a person is denied the right to subsistence, clothing, housing, or other necessities. A violation of an individual's ability to procure and maintain access to any of these equates to a violation of that individual's overall security (Dunne and Wheeler 2004). Food security is specifically focused on an individual's risk of that experiencing harm because his or her ability to access food becomes comprised or lost (FAO 2003). For the past 40 years, food security has been an ongoing interest of international conferences, community organizations, academics, public health official, and urban planners. The competing explanations, philosophies, and suggested and attempted solutions surrounding this issue warrant an illustration of the host of attempts made at establishing a comprehensive, applicable definition for a concept that is so easily understood by those who do not have it.

The concept of food security emerged in the early 1970s in the course of a global food crisis. The 1974 World Food Conference concluded with the proclamation "within a decade no child will go to bed hungry, that no family will fear for its next day's bread... no human being's future and capacities will be stunted by malnutrition" (Esterik 1999, 226). This, as well as other declarations of that era, regarded food security as a concern on the global, international, and national level, dependent largely on the volume and stability of the world's food supply.

The same 1974 conference offered one of the first definitions of food security. This, like many other early efforts, dealt with the issue primarily at the global level: the "availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food

consumption and to offset fluctuations in production and prices” (FAO 2003, 26). A similar definition of global food security, offered by Chen and Kates (1994, 193), is “the realization, existence, and ability to sustain food security by all nations.”

At the national level, food security depends on the ability of a country’s existing food supply to feed its entire population. This definition has received some criticism because it is based on the minimum nutrition (caloric) requirements of the national population and it assumes that all regions and social classes within a given nation have equal, unconstrained access to the entire food supply at all times (Chen and Kates 1994, Ruel, et al. 1998).

Since the 1970s, attempts at defining food security have gradually shifted from a global and/or national scope to a concentration on the nutritional needs and well-being of local communities, households, and ultimately individuals (Mechlem 2004). In 1983, the Food and Agriculture Organization of the United Nations (FAO) included in its definition of food security the necessary balance between food demand and food supply, asserting that food security exists when “all people at all times have both physical and economic access to the basic food that they need” (FAO 2003, 27). The World Bank in 1986 offered as its standard definition, “access by all peoples at all times to enough food for an active, healthy life” (Chen and Kates 1994, 193). The 1996 FAO World Food Summit took into account the importance of culturally appropriate foodstuffs when crafting the following description: “Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (World Food Summit 1996). This definition was revised in 2001: “Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO 2003, 28).

The FAO further refined its definition in 2003, to include households and the individuals within them: “Essentially, food security can be described as a phenomenon relating to individuals. It is the nutritional status of the individual household member that is the ultimate focus” (29) Reshaping previous definition of food security, the FAO explained, “Household food security is the application of this concept to the family level, with individuals within households as the focus of concern” (FAO 2003, 29). A household is considered food-secure when all of its members have access to food sufficient for a healthy lifestyle, and when none of its members are at risk of losing this access (Ruel, et al. 1998).

In 2011, the World Health Organization (WHO) described food security as a multifaceted objective:

Food security is built on three pillars:

Food Availability: sufficient quantities of food available on a consistent basis.

Food Access: having sufficient resources to obtain appropriate foods for a nutritious diet.

Food Use: appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation (World Health Organization 2011).

Despite the scope of the WHO definition, food security is an essential aspect of household and individual health and well-being (Bickel, et al. 2000). When addressing food security, the nuances of these various definitions provide little guidance in identifying truly food-secure areas. Instead, as Chen and Kates (1994) point out, the simplest method of defining food security is to examine its absence: people and places that experience persistent malnutrition or hunger.

Describing *food insecurity*, the opposite of food security is much easier. The FAO states “food insecurity exists when people do not have adequate physical, social or economic access to food” (2003, 29). Another plausible definition is offered by Stracuzzi and Ward: “food insecurity indicates that access to adequate food is limited by a lack of money and other resources” (2010, 1). Perhaps the most comprehensive approaches comes from Maxwell and Wiebe: “a household is food-insecure not if it lacks access to sufficient food but rather if it lacks food security – that

is, if it does not enjoy an acceptable likelihood that it will have sustainable access to sufficient food during a period of time” (1999, 828-829). As this definition points out, food insecurity is not always a permanent state; it may last only a short time.

A *food desert*, according to the USDA (2009), is an area located more than 10 miles from the closest supermarket. In a more urban context, food deserts are defined as areas “characterized by relatively poor access to healthy and affordable food,” or areas with “a literal absence of retail food in a defined area” (Beaulac, Kristjansson and Cummins 2009, 1).

Ultimately, food insecurity and food deserts exist where food security does not, usually when households or individuals are unable to obtain food, whether through income, trade, or access to storage facilities or transportation (Clover 2003, Chen and Kates 1994). Food access is also limited by the distance between households and food outlets, physical or social handicaps, and/or lack of cooking skills and food knowledge (Caraher, Lloyd, et al. 2010). The consequence of insufficient food access is hunger, the painful sensation that results from a lack of food, which, if prolonged, leads to malnutrition (Economic Research Service 2009).

Despite the many grand statements by international administrations, such as those that participated in the 1974 World Food Conference, food insecurity is a persistent problem in the United States (Allen 1999). This is largely due to a lack of implementation on the part of national or state governments, as international institutions assumed, albeit erroneously, that sovereign states would initiate and promote measures to guarantee food security (Dunne and Wheeler 2004).

One of the most fascinating features of food insecurity and hunger, widespread or individual, is that they do not correlate directly or at all to the size of the regional food supply. In fact, according to some studies, many of the worst famines have occurred despite the availability

of an abundance of food (Sen 1982, Harvey 2001, Kent 2005). Rose and Richards (2004) point out that the United States experiences a high degree of unevenness in food security despite the advanced capabilities of its food distribution system. Food insecurity disproportionately affects low-income, inner-city households, who tend to lack means of both financially and physically accessing food.

Amartya Sen describes this phenomenon as an issue of individuals failing to establish an entitlement to food. Entitlements, Sen explains, are enforceable assertions of ownership of an item that has been acquired through trade or exchange with another party, production through one's own labor, or transference or inheritance from an individual that legally owns an item – whether as a gift or as a result of another's death (Sen, *Poverty and Famines: An Essay on Entitlement and Deprivation* 1982). Stability in food security will not arise from provisions and safety nets, instead, it can occur only when an environment is created in which an individual or household cannot fail to establish food entitlements (Sen and Sen 1982).

Sen asserts that, ultimately, what people eat depends on what they are able to acquire (1982), or put more simply, “if a group of people fail to establish their entitlement over an adequate amount of food, they have to go hungry” (Kent 2005, 7). People in poverty experience food insecurity and hunger most often, but levels of vulnerability vary by the individual or household; some are able to find gainful employment, while others require long-term social support. Vulnerability to experiencing food insecurity arises from a range of social and environmental influences (Bohle, Downing and Watts 1994).

Lane et al. (2008) and Freeman (2007) discuss food insecurity in low-income communities in terms of structural subordination/violence. Often, as Freeman states, poor health is blamed on the failure of an individual instead of placing the issue in the broader context of the

environment. Structural violence is a theoretical model in which harm to an individual is caused not by a single actor committing a violent act, but an unequal distribution of power or resources. In the case of food security, this type of oppression results from a combination of discrimination based on race or class, combined with market forces and public policy.

Demographic and Socioeconomic Influences

The broad concept of food security can be “usefully disaggregated into questions relating to adequacy of food availability and stability of both food availability and access” (Ruel, et al. 1998, 7). Adequacy of availability refers to the ability of the food supply to provide sufficient energy and essential nutrients, and be of good quality – free of contaminants and good in taste, texture, and appearance. Stability of availability and access implies sustainability in supply, income distribution or safety nets sufficient to ensure access even in times of crisis (Ruel, et al. 1998), and consistency in price (Cohen and Garrett 2010).

While food insecurity and hunger are easily defined, their varying extents can only be measured through gathering data on a variety of circumstances and experiences (Bickel, et al. 2000). There are several common, readily identifiable demographic and socioeconomic factors that can be used to predict food insecurity. Household income, educational attainment of household members, the gender and marital status of the household breadwinner, and the number and age of children in a household (Economic Research Service 2009) are often similar among food-insecure households.

Bickel, et al. (2000) report that a household may be experiencing food insecurity when it begins running out of food, when it has insufficient funds to obtain more, when a perception arises of insufficient quality or quantity in food supply, when there is a reduction of household food intake, or if a household sacrifices healthy options to purchase lower-quality, less expensive

food. Household food insecurity can be divided into three categories: food insecurity without hunger, food insecurity with moderate hunger, and food insecurity with severe hunger, with a household's level of hunger increasing as its ability to obtain adequate quantities of healthy food decreases (Bickel, et al. 2000). Although many living in poverty face a lack of sufficient food, not all people in poverty are food-insecure, and not all food-insecure households have incomes below the federal poverty line (Stracuzzi and Ward 2010).

Several investigations of household food insecurity have found that parents will often forfeit their own food to ensure that their children do not go hungry. Many households report food insecurity among adults, but not among children; younger children in food-insecure households are often more food-secure than their older siblings (Economic Research Service 2009, Bickel, et al. 2000). Another factor that contributes to greater food security among children is the availability of reduced-price or free school lunches, which often offer healthy foods to youth who have inadequate access to food (Widome, et al. 2009).

In urban areas, food security is highly dependent on a household or individual's income and the price of food to which they have access (Ruel, et al. 1998). Likewise, poverty is a major component in chronic food insecurity. In cities, decent food is usually within a short distance of most communities, yet even when healthy food is available locally, many low-income households suffer from food insecurity or malnutrition due to unreasonably high prices (Lane, et al. 2008, Von Braun, et al. 1998).

Urban households spend about 10% to 40% of their net income on food, however low-income families must devote to food a much greater percentage of their household income than middle- or high-income families do (Pothukuchi and Kaufman 2000). Because purchasing power is usually the urban dweller's sole means of obtaining food, high prices can have a severe effect

on food security. Urban households with limited land available to farm, are forced to purchase all of their food, in addition to housing, transportation, and other necessities (Cohen and Garrett 2010). The urban poor typically work low-paying, insecure jobs (Cohen and Garrett 2010), so relying solely on cash income as a means of acquiring food leaves the poor vulnerable to unforeseen financial disasters that may push them into temporary food insecurity (Von Braun, et al. 1998).

Changes in household income, and thereby access to food, can either increase or decrease food security, as nutrition is only one consideration for the financially disadvantaged. Increases in income do not always improve nutritional well-being for all members of a household, as the extra money may be spent to purchase greater quantities of low-quality foods or nonfood items. Likewise, extra food may be distributed unequally – parents placing a high priority on the health of their children, or individuals keeping high-quality food for themselves. Additionally, lack of knowledge may preclude the purchase of nutritionally complete food items, thus food security and health rely heavily on the actual use of available foods (Von Braun, et al. 1998).

Supermarkets moving out of, or refusing to locate in inner-city communities; policy restrictions, such as zoning and land use laws that limit the size and type of businesses allowed in certain places; low wages and purchasing power; mobility restrictions; and the abundance of unhealthy food options common in small grocers or convenience stores all combine to restrict or eliminate access to nutritious foods in low-income, especially minority, neighborhoods.

In terms of racial discrimination, studies have found that impoverished, African American communities are considerably further away from the nearest supermarkets than low-income, White communities (Zenk, et al. 2005). Concerning income discrimination, supermarkets tend to position themselves in or near wealthy, suburban communities (Lane, et al.

2008). Low wages, high food prices, and insufficient transportation such as reliance on public transit due to low rates of automobile ownership have been identified time and time again as major barriers to food security (Fuller n.d., Pothukuchi and Kaufman 2000, Lane, et al. 2008). The role of policy is not tied to intentional neglect or discrimination, rather to a lack of strategies and financial incentives to encourage supermarkets to open in food-insecure, low-income areas (Lane, et al. 2008).

The Role of Urban Planners

David Harvey stated “we change ourselves by changing our world and vice versa” (2001, 939). Conquering food insecurity requires realistic strategies for systemic change, with the duties of all participating parties clearly outlined. Empowerment, a long-held interest of equity planners, is the key to creating environments that enable people to feed themselves (McClain-Nhlapo 2004).

The American Planning Association (APA) obliges its members to “serve the public interest with compassion for the welfare of all people,” to “be conscious of the rights of others,” and to “seek social justice by working to expand choice and opportunity for all persons, recognizing a special obligation to plan for the needs of the disadvantaged” (2009). A comprehensive approach to food security, according to McClain-Nhlapo (2004), requires community participation in decision-making and empowerment of vulnerable groups, two essential components of the AICP Code of Ethics (American Planning Association 2009). The APA recognizes that food is essential to life, and that, despite the claim of the planning field to be comprehensive in scope, food is the only basic human necessity that has not been addressed from a professional planning standpoint (2007).

In spite of the many facets of planning that relate to this topic, the food system has been virtually ignored by planners in practice, in literature, and in education (Clifton 2004, Pothukuchi and Kaufman 2000). The significance of the food system in urban life, and the fact that a community's food security is highly responsive to the layout of the built environment, firmly place the food system on the planner's agenda (Roberts 2001). In recent years, the planning community has begun giving more attention to the food system, perhaps growing out of the larger movement towards empowerment and social justice (American Planning Association 2007, Campbell 2004).

A discussion of the urban planner's role in the food system necessitates an acknowledgement of the reasons that planners have not previously devoted their attention to it. In a study published in 2000, Kameshwari Pothukuchi and Jerome Kaufman interviewed 22 planning departments to examine their interaction with, and attention to the food system. The study found unequal levels of involvement among the agencies surveyed, but consistent explanations for their lack of interest. Many claimed insufficient funding, or felt that the food system was primarily the concern of the private market and therefore laid outside the scope of professional planning. Others did not know enough about the food system, considered food insecurity a rural, as opposed to an urban issue, or did not realize the ways in which the built environment relates to the food system (Pothukuchi and Kaufman 2000). The APA reported a similar rationale for planners' apathetic approach to food system planning, including the widespread professional opinion that the food system's interaction with the built environment was inconsequential and that food did not fall within the scope of planning actions (American Planning Association 2007).

Transportation, Location, and Access

The primary aspects of the urban environment that are most often cited as reasons for food insecurity among the poor are transportation and store location, both of which relate directly to the work of urban planners.

Rose and Richards (2004) believe that food access issues are not limited to the resources of individuals or households, but arise from the areas in which they are located. Supermarkets, the primary source of food-at-home purchases, are often located in suburban areas, far away from low-income inner-city communities (Short, Guthman and Raskin 2007). A prime example of this is the fact that a large percentage of African American communities in the U.S. lack access to supermarkets or full-service grocery stores (Beaulac, Kristjansson and Cummins 2009, Raja, Ma and Yadav 2008).

Caraher, Dixon, et al. found that more than 90% of food shopping is done in supermarkets (1998). Interestingly though, the presence of supermarkets in cities all over the country continues to dwindle (Raja, Ma and Yadav 2008). Middle- and upper-income neighborhoods usually have as much as three times as many supermarkets as low-income, urban areas, which are often= miles away from the nearest supermarket (Vallianatos, Shaffer and Gottlieb 2002).

Beginning in the 1960s, supermarkets began abandoning inner-city areas in favor of middle class and wealthy suburbs (Gottlieb, et al. 1996, Clifton 2004, Lane, et al. 2008). Suburban locations offer not only higher median incomes than urban centers, but large parcels of land close to multiple high-density, sprawling communities. These economic benefits, combined with the corporate will to desert low-income, crime-ridden areas have left inner city residents with few or no sources of nutritious food (Freeman 2007).

Sen and Sen, however, make a strong argument against the argument that food insecurity occurs only in areas without supermarkets; “Moving food into famine areas will not in itself do much to cure starvation, since what needs to be created is food entitlement and not just food availability. Indeed, people have perished in famines in sight of much food in shops (1982, 454). An important tenet that is often overlooked in this type of reasoning is that food security means not only accessing food, but accessing healthy food. Low-income and minority populations may experience health deficiencies because adequate quantities of fruits and vegetables are inaccessible (Freedman and Bell 2009).

The combination of distance-to-stores and the financial limitations experienced by low-income communities only increases the probability that residents are food-insecure (Stracuzzi and Ward 2010). Households in areas with poor access to the variety of nutritious, affordable food found in national chain supermarkets (Chen and Florax 2010) are often forced to adjust their diets based on the availability of food in their area (USDA 2009). This is especially true in low-income and minority urban communities, which are now served primarily by small grocers or convenience stores that offer a selection of food that is expensive, limited in quantity and variety, and poor in nutritional quality (Raja, Ma and Yadav 2008, Vallianatos, Shaffer and Gottlieb 2002, Rose and Richards 2004, Beaulac, Kristjansson and Cummins 2009). There is an increasing supply of evidence that a community’s racial and economic composition effects their food environment. Chain supermarkets tend to locate in wealthy, white areas, while independent small grocery and convenience stores dominate communities in which the population is impoverished or of a racial minority (Freedman and Bell 2009).

Higher prices in urban convenience stores or small grocers, and the mass departure of supermarkets from urban neighborhoods are not the result of greed alone. Serving inner-city

markets comes with higher operating costs than catering to suburban areas, which some storeowners feel legitimizes charging more for their products (Rose and Richards 2004, Lane, et al. 2008). Stores in low-income areas experience greater theft, more bad checks, and frequent employee turnover, as well as high repair and maintenance costs for aging buildings (Gottlieb, et al. 1996). Add to these the store owner's inability to purchase and store goods, especially perishable foodstuffs, in bulk and spatial factors such as restricted shelf space that must concede to local preference and demand, and the result is shelves stocked with processed, high-sugar, high-fat foods, and a limited but expensive selection of produce (Vallianatos, Shaffer and Gottlieb 2002, Freeman 2007, Lane, et al. 2008). Small stores must also meet the demand for alcohol and tobacco products, further limiting the availability of healthy foods (Lane, et al. 2008). Regardless of their inherent deficits, these corner stores are often the only food retailers accessible to low-income families that, in order to save on food expenditures, select lower quality, lower priced items (Freeman 2007, Lane, et al. 2008).

Zenk et al. (2005) argue that the presence of supermarkets in low-income neighborhoods may not always benefit residents, as a large store may displace smaller grocers or convenience stores that have historically invested in the community. They concede, however, that these stores can improve the overall health in the community by providing a better selection of lower cost foods at prices lower than small food stores can offer. The benefit to the overall community, though, is not only an increase in nutritional health, but in overall public welfare. Cassady and Mohan found that supermarkets contribute to creating a supportive neighborhood environment (2004), and may decrease the frequency of violent and drug-related crime (Lane, et al. 2008).

Spatial barriers to access to healthy food are not limited to physical distance to shops, but also include insufficient mobility (Caraher, Lloyd, et al. 2010). Automobile ownership is much

less prevalent in low-income communities, so residents must often depend on public transportation or seek help from others to access affordable supermarkets (Pothukuchi and Kaufman 2000, Vallianatos, Shaffer and Gottlieb 2002, Lane, et al. 2008). In studying food access, many researchers do not account for how the arrangement of the street network affects the distance people must travel to reach a store (Raja, Ma and Yadav 2008). Access to transportation heavily influences shopping behavior (Caraher, Dixon, et al. 1998), yet urban transit services are not designed to accommodate the needs, i.e. food shopping, of those most reliant on them (Gottlieb, et al. 1996).

Cassady and Mohan found that most low-income consumers prefer supermarkets to specialty stores or farmers' markets. This is likely due to the tendency of supermarkets, compared to other smaller food retailers, to offer a variety of healthy food at a lower cost to the consumer (2004). Low-income, transit-dependent households who choose to shop at supermarkets outside their neighborhoods must endure the high costs of public transportation (Stracuzzi and Ward 2010), or taxi fares, further limiting the amount of money available for food purchases (Cassady and Mohan 2004). Long distances between households and supermarkets exacerbate access problems associated with financial restrictions because consumers must consider not only the monetary, but also the time costs of travel when choosing a grocery shopping destination (USDA 2009, Stracuzzi and Ward 2010). Because automobile ownership is less prevalent in low-income areas than in wealthier communities, shoppers are left with two options: spend more money on lower-quality food in neighborhood convenience stores, or rely on inconvenient, costly public transportation or taxis to access supermarkets (Gottlieb, et al. 1996, Short, Guthman and Raskin 2007).

Reliance on public transit affects not only the amount of money one is able to spend on food, but the quantity of food one is able to purchase. Carrying multiple bags of groceries home from a bus stop is difficult, yet all too common (Gottlieb, et al. 1996). Thus, without personal transportation, many families are unable to access adequate quantities of fresh, healthy food (Vallianatos, Shaffer and Gottlieb 2002) – the very definition of food insecurity. Additionally, grocery shoppers who must travel long distances to supermarkets are more likely to be accompanied by their children, further encumbering their ability or will to obtain adequate foods (USDA 2009).

Although the term *food desert* has many definitions, they all share one common theme: areas with limited food availability. The USDA (2009) quantifies food deserts as areas more than ten miles from a supermarket, yet in an urban environment, where many low-income households do not own a vehicle, this distance decreases considerably. Raja, et al. state that the term is used loosely, sometimes referring to areas with limited food retail outlets, sometimes describing areas lacking conventional supermarkets or retailers that sell nutritious foods (Raja, Ma and Yadav 2008).

Despite which definition is used, food deserts exist in the United States (Beaulac, Kristjansson and Cummins 2009), and people in food deserts are forced to travel great distances to buy healthy food (Stracuzzi and Ward 2010). Distance, not selection or price, is often the ultimate factor taken into consideration when choosing a food store. Food shopping, for transit-dependent, low-income households, thus “becomes a question not of what one would like to buy, but what is available, given mobility restrictions” (Gottlieb, et al. 1996).

Health Implications of Food Insecurity

Food insecurity is not only an issue for urban planners, but for public health officials as well. Public health scholars that study food-system issues have found that food insecurity is rarely a problem of insufficient quantity, but of inadequate access. Like planning scholars, public health officials have found high prices and inadequate transportation options as the most common barriers to accessing nutritious food. Patrick Casey and Kitty Szeto (2001) report that a large number of families in the United States are food-insecure, despite the abundance of food available and the high levels of wastage in this country.

Food insecurity and constraints on access to healthy foods put low-income households at risk for chronic diseases, obesity, and malnutrition, all of which can result from an unhealthy diet (Beaulac, Kristjansson and Cummins 2009, Stracuzzi and Ward 2010). Consumption of nutrient deficient food is a direct threat to the well-being of food-insecure, low-income individuals because their access to healthier options is limited, compared to residents of wealthier communities (Fuller n.d.).

Stracuzzi and Ward (2010), recognizing the need for affordable, healthy food, found that access to nutritious options in inner cities has declined in recent years, as grocery stores have continued to move to the suburbs. Their analysis of food insecurity found that spatial mismatch between people and stores and inadequate transportation access were major contributors to the problem. They determined that food insecurity increases as proximity to a grocery store or supermarket decreases, especially among households with limited access to transportation. Kelly Clifton (2004) observed that low-income consumers with insufficient transportation often buy food from small, high-priced grocery or convenience stores that lack the variety, quality, and affordable prices found in suburban supermarkets. Similarly, Short, Guthman and Raskin report

that transportation-disadvantaged residents often rely on small grocers and liquor stores for food; for those that did shop in supermarkets, high transportation costs limited the money available for food purchases (2007). Essentially, shopping for food in low-income communities “becomes a question of not what one would like to buy, but what is available, given mobility restrictions” (Gottlieb, et al. 1996, 12)

In addition to being able to physically access food stores, there are a number of factors that influence shopping behavior once inside these stores; factors that may lead to low-income shoppers choosing less-expensive, lower-quality items over healthier options. Retailers decide which foods will be sold in their stores, where they will be placed, how they will be priced, and in what ways they will be promoted. Glanz, Bader, and Iyer (2012) developed a number of strategies that may encourage shoppers to purchase healthier food. First, they suggest that retailers actually sell healthy foods, and either replace or reduce unhealthy items. Second, they have some hope that reducing the prices of healthier foods may inspire consumers to buy higher-quality foods. Finally, Glanz, et al. suggest highlighting the availability of healthy foods by offering taste-tests or placing nutritious items in visible, accessible locations, such as on eye-level shelves or along checkout aisles (Glanz, Bader and Iyer 2012).

Multiple studies cite the cost of nutritious food as a further obstacle to acquisition (Short, Guthman and Raskin 2007, Raja, Ma and Yadav 2008). Researchers have found that healthy food choices, such as fresh fruits and vegetables, are often more expensive and less available than foods high in refined grains, sugars and fats. In order to obtain the greatest quantity of food and dietary energy, these low-quality items are often purchased instead of nourishing produce (Drewnowski and Darmon 2005, Jetter and Cassady 2006).

Inexpensive, high-energy foods can be cost-effective for low-income families, but they come at the expense of real nourishment (Cook and Frank 2008). There exists substantial evidence that households that consume low-nutrient foods witness developmental problems in children, and increased disease in the elderly (Economic Research Service 2009, Stracuzzi and Ward 2010, Cook and Frank 2008). Obesity is more present among communities with low incomes and low levels of education, once again because the food stores to which they have convenient access structure prices so that high-fat, high-sugar items are available in greater variety and at a lower cost than healthy alternatives (Drewnowski and Darmon 2005, Stracuzzi and Ward 2010, Vallianatos, Shaffer and Gottlieb 2002).

Although poverty is a major player in food insecurity, not all people living in poverty are food-insecure; many households with incomes above the poverty line experience food-insecurity as well. Stracuzzi and Ward (2010) cite high cost of food and housing, job loss, divorce, illness, and disabilities as additional factors, aside from household income, that contribute to food-insecurity. The same study found that, unlike mortgage and utility payments, which are often fixed costs, food is often the first expense to be reduced in times of financial hardship. Households will cut back on both quantity and quality of food purchased, choosing processed foods, refined grains, added sugars, and fats – convenient foods that provide more dietary energy at a lower cost – over fresh fruits, vegetables, whole grains, lean meats, and fish – healthy foods that are generally expensive and are usually not found outside of supermarkets. This decision however, comes at a cost for people of all ages. Undernourished children experience physical and mental health issues; parents suffer anxiety over being able to afford adequate food; and degenerative diseases in the elderly may appear more quickly if they are hungry or malnourished (Stracuzzi and Ward 2010).

Planning for the Future

Recent years have witnessed a widening gap in the collaboration between urban planners and public health professionals, despite their shared knowledge of the effects of the built environment on the health of its residents (Northridge, Sclar and Biswas 2003). Several authors have discussed the role that planners should play in addressing food security issues, based on the skills of planning professionals, and the ways in which planners can and do contribute to addressing food security issues.

Janet Hammer (2004) identified the analytical and facilitative expertise inherent in the planning profession as skills that can be used to measure the socioeconomic and environmental health of the existing food system, assist communities in developing goals, and promote collaboration among food system stakeholders. Pothukuchi and Kaufman encourage planning professionals to identify connections between larger planning objectives and the food system, in order to discover concerns to be addressed in short- and long-term goals. They maintain, “planners are in a unique position to engage the community in a dialogue about the meaning and goals of a food-secure community” (2000, 10). Because planners have a unique understanding of the social, political, economic, and environmental dimensions of their communities, their expertise and community-oriented perspectives give them the potential to greatly strengthen community food systems and become much more involved in food issues (Pothukuchi and Kaufman 2000, Pothukuchi 2004).

It should also be noted that food establishments are an important aspect of the urban economy. Many city residents are employed in restaurants, supermarkets, and fast food outlets (Pothukuchi and Kaufman 2000). Economic development incentives can work to retain food outlets in vulnerable areas, or encourage new stores to locate in these places (Stracuzzi and Ward

2010). Opportunities for land use regulations that allow farmers markets and urban agriculture should be considered as well (Raja, Ma and Yadav 2008). Farmers markets can be set up to accept SNAP vouchers for produce and other fresh foods, and planners should find other ways to connect the conventional food system to urban agriculture in their communities. They should work to increase visibility of food security issues to state officials, other planners, and the public in general (Campbell 2004).

While planners currently play an important role in shaping a community's food system, they have much to learn and contribute. Pothukuchi believes planners should study the public health implications of community-food linkages, increase their research skill-set, and bring community food planning to the local level (2004). Until a detailed understanding of the local food environment is developed, comprehensive solutions to eliminate food insecurity, improve public health, and create equitable access to food cannot be fully formed (Raja, Ma and Yadav 2008).

The roles of land use planners in influencing the built environment, through zoning, siting, and permitting stores and farmers markets, in designing transportation policies and options, and in facilitating community-policymaker collaboration, are critical in shaping the future of food security planning (Northridge, Sclar and Biswas 2003, Hammer 2004). These professionals should also analyze the spatial dimensions of urban areas, and use their resources to translate spatial concerns into policy goals and land-use strategies (Pothukuchi 2004).

Transportation planners play a vital role in the food system as well. A significant portion of urban automobile traffic consists of household or individual trips to grocery stores (Pothukuchi and Kaufman 2000). Low-income people often rely on public transit to access not only healthy food outlets, but also employment (Clifton 2004, Gottlieb, et al. 1996), so

improving food access for these individuals will depend heavily on increasing their access to or through adequate transportation.

In trying to create a more equitable food environment, planners should examine both people and policies. Understanding the social context of a food-insecure area is important when designing a plan to address food-related issues. Many studies, for example, have found that low-income individuals rely heavily on public transit for food access (Lane, et al. 2008, Pothukuchi and Kaufman 2000, Vallianatos, Shaffer and Gottlieb 2002), however, in some places, only very few shoppers will use public transportation for supermarket access (USDA 2009). Understanding policy means looking at food deserts from all possible angles. Urban governments may impose more cumbersome zoning restrictions than those in suburban or rural areas. The costs of construction or operation, i.e. taxes, rent, and security, may be higher in cities than in others. Finally, traffic patterns, visibility, and other spatial arrangements of sites in cities may restrict accessibility, leaving retailers to select lower-density suburban locations.

Summary

Food insecurity, as Su-ming Khoo stated, is a *wicked* problem; the kind of problem that “cannot be definitively solved because there are competing ideas about what the problem and solution are” (2010, 34). In some cases it arises from poverty, in others from lack of knowledge, but always from lack of access to healthy food. Despite its cause, food insecurity is a problem that has serious implications for planners, public health officials, and most importantly, those who experience it. In attempting to address this issue planning practitioners must identify vulnerability at the community level through the use of objective information, such as demographic and socioeconomic figures, as well as subjective data, such as community opinions

and desires and the attitudes of landowners or retailers that can be recruited to build a future with more equitable food access.

Chapter III: Methodology and Research Design

Purpose and Background Information

The purpose of this study is to understand how low-income households access food, as well as what types of food are available to be accessed. This will be done through an examination of the spatial distribution of demographic, socioeconomic, and environmental factors that are believed to correspond to food insecurity among low-income, urban households, using Richmond, Virginia as a case study. Richmond was chosen because it is a diverse, urban environment, with recognizable racial and economic segregation.

The case study consists of four parts. The first is a detailed investigation of risk factors using demographic and socioeconomic population data at the census tract level, obtained from the 2010 U.S. Census. The next portion consists of a survey that compared the selection, price, quantity, and quality of fresh fruits and vegetables found in stores of various type in neighborhoods throughout the city. The third segment is an inquiry into the characteristics of populations surrounding food retailers located in Richmond. The final piece of the study is an examination of the population that lives within, and outside of, walking distance of supermarkets and transit stops in an effort to identify vulnerable areas that are underserved by Richmond's public transportation.

Introduction to the Study Area

Richmond, the capitol of the Commonwealth of Virginia, is a diverse, mid-sized city, with a total population of 204,214 (U.S. Census Bureau 2010d). Table 3.1 presents a comparison of demographic and socioeconomic characteristics of the city of Richmond, the Richmond Metro

Area, and the Commonwealth of Virginia.

Table 3.1: Population Overview

	City of Richmond, VA		Richmond, VA Metro Area		Commonwealth of Virginia	
	Number	Percent	Number	Percent	Number	Percent
Sex and Age						
Population: Total	204,214	100%	1,258,251	100%	8,001,024	100%
Male	97,331	47.7%	608,491	48.4%	3,925,983	49.1%
Female	106,883	52.3%	649,760	51.6%	4,075,041	50.9%
Median Age	32.0		38.0		37.5	
Median Age: Males	31.3		36.5		36.1	
Median Age: Females	32.7		39.2		38.7	
Race						
Non-Hispanic Black or African American	102,264	50.1%	370,775	29.5%	1,523,704	19.0%
Non-Hispanic White	79,813	39.1%	754,328	60.0%	5,186,450	64.8%
Hispanic	12,803	6.3%	63,289	5.0%	631,825	7.9%
Other Races	9,334	4.5%	69,859	5.5%	659,045	8.2%
Households and Families						
Total Households	87,151	100%	488,300	100%	3,056,058	100%
Average Household Size	2.2		2.5		2.54	
Husband-Wife Families	20,914	24%	230,103	47.1%	1,534,844	50.2%
Husband-Wife Families with Children	7,239	8.3%	95,115	19.5%	644,610	21.2%
Female-Headed Households, No Husband Present, with Children	8,822	10.1%	71,992	14.7%	206,015	6.7%
Average Family Size	2.95		3.03		3.06	
Housing Tenure						
Occupied Housing Units	87,151	100%	488,330	100%	3,056,058	100%
Owner-Occupied	37,596	43.1%	330,241	67.6%	2,055,186	67.2%
Renter-Occupied	49,555	56.9%	158,089	32.4%	1,000,872	32.8%
Economic Characteristics						
Median Household Income	\$39,608		\$55,325		\$60,674	
Mean Household Income	\$60,786		\$74,254		\$81608	
Median Income Male Workers	\$42,186		\$50,395		\$51,597	
Median Income Female Workers	\$36,638		\$39,501		\$40,669	
All People Below Poverty Level			25.8%			
Female Headed Households, No Husband Present, with Related Children Below Poverty Level		52.3%	40.8%	39.5%		

Source: (U.S. Census Bureau, 2010 American Community Survey 2010d, U.S. Census Bureau 2010d)

There are several demographic and socioeconomic characteristics of the City of Richmond that are found in much larger proportions of the population than in the Richmond Metro Area and the Commonwealth. The proportion of African American residents in the city is

more than twice that of the population of the Commonwealth, and about 20% higher than in the region. The lower median age and high proportion of renter-occupied housing units are likely a result of the large student populations of Virginia Commonwealth University, Virginia Union University, and the University of Richmond, all located within or very near the city.

The median annual household income in Richmond is \$39,608, very low compared to the median incomes of Metro Area and the Commonwealth. Similarly, the poverty rate in the city is more than twice as high as in larger areas. A larger proportion of female headed households with children and no husband present is found in the Metro Area, but the poverty rate among that population in Richmond is 11.5% higher.

Food Insecurity in Richmond

Feeding America, the nation's leading charity for domestic hunger-relief, operates 51 food pantries in Richmond alone. According to a recent study by this organization, the number of food-insecure people in Richmond, Virginia was 40,020, 19.9% of its total population. 60% of these people had income below 130% of the poverty line, 10% had income between 130% and 185% of the poverty line, and 30% of food-insecure people had income greater than 185% of the poverty line (Feeding America 2012).

The percentage of food-insecure individuals for the Commonwealth, on the other hand, was only 11.8%: 40% with income that fell below 130% of the poverty line, 19% with income between 130% and 185% of the poverty line, and 41% with income above 185% of the poverty line. The average cost of one meal in Richmond, \$3.00, was 32 cents higher than the average cost, \$2.68, of a single meal in Virginia (Feeding America 2012).

Public Health

People in households that do not have access to healthy foods often turn to processed or

prepared food for sustenance. While these foods may relieve hunger, the consequences of an unhealthy diet are malnourishment and weight gain. Table 3.2 shows the proportions of overweight and obese adults in Richmond City and the Commonwealth of Virginia, according to a study conducted between 2007 and 2009. Overweight adults are those who have a body mass index (BMI) equal to or greater than 25, and obese adults are those who have a BMI greater than or equal to 30 (Virginia Behavioral Risk Factor Surveillance System 2007-2009, Virginia Behavior Risk Factor Surveillance System 2007-2009a).

Table 3.2: Percent of Overweight and Obese Adults, Virginia & Richmond City Health District, 2007-2009

		Richmond City Health District	Virginia	Richmond City Health District	Virginia
		Overweight Adults		Obese Adults	
Overall		67.9%	61.3%	32.5%	22.5%
Age	18-34	66.6%	50.5%	33.7%	22.1%
	35-44	71.6%	65.2%	42.6%	27.1%
	45-54	73.7%	67.3%	35.9%	30.1%
	55-64	67.8%	72.1%	22.8%	29.1%
	65+	61.5%	60.6%	24.1%	21.7%
Gender	Male	66%	68.7%	24.3%	25.6%
	Female	69.4%	54%	39%	25.5%
Race	White	59.7%	60.7%	23.6%	24.7%
	African American	77.9%	71.8%	36.7%	35.4%
Income	Less than \$35,000	73.2%	62.6%	39.8%	29.9%
	\$35,000 to \$74,999	73.3%	62.9%	36.4%	26.9%
	More than \$75,000	56.6%	61.7%	19%	22.5%
Education	Less than High School	62.4%	63.4%	44.8%	33.1%
	High School or GED	73.2%	65.4%	30.1%	28.9%
	Some College	68.5%	61.7%	39.6%	27.1%
	College or Higher	66.3%	58.3%	24.6%	21.1%

Source: (Virginia Behavior Risk Factor Surveillance System 2007-2009a, Virginia Behavioral Risk Factor Surveillance System 2007-2009)

As shown in table 3.2, Richmond has a higher proportion of both overweight and obese adults than the Commonwealth as a whole. Obesity rates are higher among females than males, and higher in African American populations than among Whites. Obesity is also most prominent in populations that earn less than \$35,000 per year, but nearly as pronounced among individuals that earn between \$35,000 and \$74,999 annually.

Data Collection

Demographic and Socioeconomic Characteristics

Analysis of demographic and socioeconomic information that may contribute to the existence of food deserts in Richmond was conducted through the comparison of a series of maps displaying factors that have been found to influence the status of a household's food security. Electronic data was obtained from the 2010 U.S. Census, the 2006-2010 American Community Survey, the city of Richmond, and the Greater Richmond Transit Company (GRTC).

At the time this research was conducted, demographic and socioeconomic data from the U.S. Census and American Community Survey were available only at the census tract level. All information was displayed using census tracts located completely inside the city of Richmond as defined by the U.S. Census Bureau. In order to maintain consistency among maps and information, the jurisdictional boundaries as defined by the 2010 U. S. Census were used. The following maps were constructed using ESRI ArcGIS software:

1. Context: Location of Census Tracts, James River, and Major Roads.
2. Total Population By Census Tract
3. Racial Distribution By Census Tract
4. Female Headed Households By Census Tract
5. Single-Mother Family Households By Census Tract
6. Educational Attainment By Census Tract
7. Location of RRHA Public Housing Developments
8. Median Household Income By Census Tract
9. Low-Income Population By Census Tract

10. Poverty Rate By Census Tract
11. Poverty Location Quotient By Census Tract
12. African American Poverty Location Quotient By Census Tract
13. White Poverty Location Quotient By Census Tract
14. SNAP (Food Stamp) Participation By Census Tract
15. Vehicle Ownership By Census Tract

With the exception of the first map, which displays census tract numbers and major roads to be referenced in later discussions, all maps display a unique factor that is believed to influence a household's food security status. The purpose of constructing these maps is to identify areas in Richmond that experience a combination of demographic and socioeconomic factors that put residents at high risks of experiencing food insecurity.

Food Availability Surveys

The second portion of this study involved the collection of data on the availability, quantity, price, and quality of fresh fruits and vegetables sold in food retailers within the city of Richmond (see Appendix :1 Food Availability Survey Instrument). The purpose of this portion of the study was to determine if the cost and quality of fresh produce differed among store types and locations. A total of 51 food stores were surveyed: 18 Convenience Stores, three Ethnic Grocers, two General Merchandise Stores, three Pharmacies, 10 Small Grocers, six Specialty Grocers, two Supercenters, and seven Supermarkets.

To ensure that operating costs, taxes, and political influences were similar, only stores located completely within the jurisdictional boundary of the city of Richmond were considered in this research. It is important to note that many Convenience Stores, Pharmacies, Supercenters, and Supermarkets are corporate operations and have branches located throughout the city. If prices in stores owned or operated by the same company were found to be the same in multiple locations, data from only one store were included in the analysis. If prices were different across one or more stores operating under the same name, data from all stores were evaluated. Ethnic,

Small and Specialty Grocers, however, were all operated by different business owners, so prices were expected to fluctuate.

Because this study focused heavily on store locations and the demographic and socioeconomic characteristics of the communities surrounding Supermarkets, at least one store owned by each company that operates Supermarkets in Richmond was surveyed. Ten out of the 12 Supermarkets in Richmond are owned by multi-store corporations. The remaining two are single-store operations that met all criteria necessary to be classified as Supermarkets. Of the seven stores surveyed, five are corporate establishments and two are not.

The survey instrument was designed to analyze the availability, quantity, quality, and cost per pound of fresh fruits and vegetables in each store. Also noted was the general line of goods found in each store type. Figures from each store were compared against stores in the same category, and the average cost per pound of each item was determined for each store type.

Evaluation of food retailers focused on the availability, cost, quantity, and quality of fresh fruits and vegetables because these items, unlike grains or frozen or canned foods, have short shelf-lives and therefore expire and must be purchased more frequently than other types of food if a consumer wishes to keep them on hand. The cost, and thereby affordability, of fresh fruits and vegetables is a major factor in obtaining food for a nutritious diet, as produce provides more vital nutrients per serving than processed, frozen, or preserved foods.

Food Store Classification and Geocoding

Internet search engines (Google 2012, Bing 2012, Yellow Pages 2012), and field research were used to obtain the names and addresses of food retailers in Richmond. The addresses were geocoded in order to represent the location of food retailers as points on base maps of the city. During the course of this research many unlisted businesses were found, recorded, and added to

the list of stores to be geocoded.

This study identified 236 food retailers in Richmond, Virginia: 129 convenience stores, 13 Ethnic Grocers, 4 Farmers' Markets, 11 General Merchandise Stores, 18 Pharmacies, 34 Small Grocers, 13 Specialty Grocers, 2 Supercenters, and 12 Supermarkets. Each one of these stores retails food of some kind; fresh, canned, frozen, boxed, or any combination of these.

The geocoded stores were represented using different symbols for each store type. Retailers were categorized using definitions similar to those provided by the 2007 North American Industry Classification System, or NAICS. In the case that a retailer was not defined by NAICS, the general characteristics of the retailer were used to distinguish it from others.

In order to classify food retailers effectively, some modifications were made to the NAICS definitions. When applicable, the NAICS code is provided for each category. The Supermarkets and Other Grocery (except Convenience Stores) Stores, were divided into two categories, Supermarkets and Small Grocers. This division was based on store size, selection, and quantity of foods sold. Gasoline Stations with Convenience Stores and Convenience Stores were combined into one category, Convenience Stores. NAICS definitions for the categories Farmer's Market, Ethnic Grocer, and Specialty Grocer were not available, but these food retailers are important sources of food and warrant their own categories. Food stores were classified as follows:

- **Convenience Stores** (NAICS Codes 447110 and 445120): Convenience Stores, sometimes called food marts or mini marts, sell a limited selection of goods that typically include soft drinks, milk, bread, candy, snacks, frozen foods, and sometimes fresh fruits and vegetables. Convenience Stores may be free standing, or attached to gasoline stations (U.S. Census Bureau: North American Industry Classification System (NAICS) 2011). Examples

include 7-Eleven, Uppy's, and Rennie's convenience stores.

- **Ethnic Grocers:** Ethnic Grocers are food stores whose line of goods consists primarily of foods either commonly consumed and purchased by certain immigrant populations or intended for use in ethnic-style cuisines. Examples include Tokyo Market and Oaxaca Latin market.

- **Farmers' Markets:** Farmers' Markets are defined here as open-air marketplaces that sell products grown by local farmers or produced by local artisans. Produce at Farmers' Markets is available seasonally, and these markets are usually only open one or two days each week. Examples include the 17th Street Farmers' Market and the South of the James Farmers' Market.

- **General Merchandise Stores** (NAICS Code 452990): General Merchandise Stores often sell a limited line of canned and frozen foods. These stores also retail a broad line of merchandise, including clothing, dry goods, home furnishings, dry goods, hardware, and other items, with no concentration on a specific line of goods (U.S. Census Bureau: North American Industry Classification System (NAICS) 2011). Examples include Dollar Tree and Family Dollar stores.

- **Pharmacies and Drug Stores** (NAICS Code 446110): Pharmacies and Drug Stores are establishments that sell pharmaceutical medicines, healthcare products, cosmetics, magazines, tobacco, frozen or refrigerated foods, milk, cheese, and canned foods. Pharmacies were included in this study because they generally retail staple foods such as canned fruits and vegetables, eggs, and dairy (U.S. Census Bureau: North American Industry Classification System (NAICS) 2011). Examples include CVS, Walgreens, and Rite Aid.

- **Small Grocery Stores** (NAICS Code 445299): Small Grocery Stores are stores with a

floor area of less than 15,000 square feet, and a parking lot less than 40,000 square feet in area. The store must primarily retail food products, but may also sell personal care items, alcoholic beverages, and magazines. Small Grocery Stores are differentiated from supermarkets because their purchasing power and line of goods are limited by store size (U.S. Census Bureau: North American Industry Classification System (NAICS) 2011). Examples include Nutall's Market and Song's Market.

- **Specialty Grocers:** Specialty Grocers are small grocery stores whose line of goods consists primarily of one type of product, such as meat, fish, or wine; or sell non-traditional groceries, such as international foods organic produce or health supplements. Also included in this category are markets attached to or supplementary to cafés or restaurants. Examples include Good Foods Grocery, Ellwood Thompson's and Nick's International Foods and Produce.

- **Supercenters** (NAICS Code 452910): Supercenters, also called Warehouse Clubs, sell canned or frozen food, alcoholic beverages, and sometimes fresh produce. These stores have no primary line of goods, but sell a variety of new merchandise, such as clothing, appliances, and home goods (U.S. Census Bureau: North American Industry Classification System (NAICS) 2011). Examples include Target and Wal-Mart.

- **Supermarkets** (NAICS Code 445299): Supermarkets are those establishments typically referred to as supermarkets or grocery stores. All stores classified as Supermarkets in this study, met the following criteria: The floor area of the store must be greater than 15,000 square feet; the store must have an on-site parking lot greater than 40,000 square feet; the store must offer a large selection of food products, including fresh, canned, or frozen fruits and vegetables; fresh, frozen or prepared meat, poultry, fish; the store may also offer a general line

of health and personal care goods, magazines, and pet supplies, but the primary line of goods must consist of food items (U.S. Census Bureau: North American Industry Classification System (NAICS) 2011). Examples of Supermarkets are Kroger, Martin's Food Stores, and Food Lion.

Once stores were identified and classified, ESRI ArcGIS was used to geocode the locations of stores that have the centroid fully within the city of Richmond. Each store category was assigned a symbol, and combined with the demographic and socioeconomic maps generated previously. Using these maps, stores to be included in the Food Availability Survey were identified.

Decisions about which stores to survey were made using several criteria. The first priority in this survey was to obtain data from stores located in low-income, high-poverty census tracts. This was important because poverty and food insecurity are very often found in similar areas. The second priority was to ensure that a minimum of 10% of food stores in each category were surveyed, but emphasis was placed on evaluating a larger proportion of Convenience Stores, Small Grocers, and Supermarkets. Another important consideration in choosing which stores to survey was proximity to other food stores and to bus stops. All stores located more than 1/4 mile from a bus stop were included in the survey, as were all stores located more than two miles from the nearest Supermarket.

Proximity and Accessibility: Supermarkets and Transit

The final goal of this study was to identify areas with low rates of vehicle ownership that were more than walking distance from either a supermarket, a bus stop, or both. This was done by placing a one-quarter mile buffer around the geocoded locations of bus stops and Supermarkets in Richmond and calculating the population of blocks whose centroids fell outside

the buffers. One-quarter of a mile was used as the standard for typical walking distance.

Data Analysis

Demographic and Socioeconomic Characteristics

The analysis of demographic and socioeconomic data, mapped by census tract, is presented in a series of discussions concerning areas in which concentrations of extremes in each category occur, for example, groups of census tracts with very high populations of one race or census tracts with very low rates of vehicle ownership. The discussions of each element are enriched by including a map illustrating the spatial distribution of that specific trait (sources for all data displayed in maps can be found in Appendix 2. All population characteristics discussed are believed to contribute to food insecurity.

Poverty

Poverty is an especially important indicator of food security, and therefore warrants an extended discussion of its analysis. Poverty analysis was undertaken through the use of four measures. First, the percentage of households experiencing poverty were mapped. Second, a Location Quotient analysis was performed to identify census tracts with disproportionately large populations living in poverty within the city. The final two analyses used poverty by race, both African American and White, to identify census tracts in which a racial group experiences abnormally high poverty.

The benefit of a Location Quotient (LQ) analysis is that it is a quantitative measure of the local intensity of a phenomenon relative to the regional intensity. Local, in this case census tract, LQ is compared to Regional, or city, LQ to identify abnormalities in spatial distribution; a higher LQ indicates a higher intensity of activity in a specific area. Location Quotient is determined using the following formula:

$$LQ = \frac{t_p/c_p}{T/C}$$

in which t_p represents the total population of the census tract living below the poverty level, c_p represents the total population of that census tract for which poverty status is determined, T represents the sum of people living below poverty in the city, and C represents the sum of the total population of the city for which poverty status is determined.

The LQ by race analysis was undertaken by first dividing the total number of people in poverty of one race in a census tract by the total population of that race in the census tract, and then dividing that number by the quotient that resulted from dividing total people in poverty of that race in the whole city by the total population of that race in the city.

After considering all salient demographic and socioeconomic population characteristics, a summary of findings discusses areas in which risk of food insecurity is high, as a result of the combination of many traits associated with that phenomenon.

Household Structure

This study differentiated between two types of households consisting of single females with children. The first, classified in the census as Family Households: *Female Householder, No Husband Present Families With Related Children Under 18*, does not account for domestic partners that may offer childcare or financial support, advantages that greatly assist a grocery-shopping mother. To balance this, this study also attempted to determine the number of female-headed households with children that do not have the benefit of an unmarried partner. This was done by adding the number of *Unmarried Partner Households: Female Householder and Male Partner: With Children Under 18 Years* to *Unmarried Partner Households: Female Householder and Female Partner: With Children Under 18 Years*, the sum of which represents the number of households with children under 18 in which the householder is female, no husband

is present, and in which the female householder and related children live with a partner to whom the householder is not married. This number was then subtracted from the total number of family households categorized as *Female Householder, No Husband Present: With Related Children Under 18 Years*. The difference was then divided by the total number of *Families With Related Children Under 18* to derive the percentage of *Households Consisting of Single Mothers With Children Under 18 That Do Not Live With A Domestic Partner*. In short, this map illustrates the areas in Richmond in which unmarried mothers do not have a partner on which to rely. For intelligibility, when referring to family households of this type they will be simply called "Single-Mother Families."

Food Availability Surveys

Once food retailers in Richmond were identified, categorized, and geocoded, Food Availability Surveys were conducted at 51 stores around the city. A copy of the survey instrument can be found in Appendix 1. Data were compiled into spreadsheets, and used to determine the average price of each item in each type of store. This portion includes a discussion of the range of prices among the items that were available in each type of store. Also included in each section is a brief description of the quantity and quality of items on the checklist, and an acknowledgement of the locations of stores that had the largest and smallest selection of produce.

This evaluation concludes with a comparison of the average cost of each item in each type of store. Average prices for each item were compared to determine if there were obvious disparities in the prices of fresh produce among different store types.

Food Store Location Analysis

The final portion of this study is an analysis of the locations of food retailers around the

city of Richmond and their correlation with the demographic and socioeconomic characteristics of surrounding areas. The following maps were created for the Food Store Location Analysis:

1. All Food Stores Located in Richmond City
2. Food Stores Located in Richmond City and Poverty Rate By Census Tract
3. Supermarkets in Richmond City
4. Supermarkets in Richmond City Within a One-Quarter-Mile Radius of GRTC Bus Stops in Richmond City
5. Total Population of all Blocks Within a One-Mile Radius of Supermarkets in Richmond
6. Total Population of all Blocks Within a Two-Mile Radius of Supermarkets in Richmond

The last portion of this analysis consists of the analysis of the proximity of Supermarkets to public transportation stops. Circular buffers were placed around both bus stops and supermarkets. One-quarter mile buffers around all GRTC bus stops were created to illustrate the typical walking distance from bus stop to home or store. An analysis of the number of people living inside and outside these buffers allows the identification of neighborhoods in which residents with low rates of vehicle ownership are more than walking distance far from a bus stop. Because Supermarkets tend to serve large geographic areas instead of small communities, one- and two-mile buffers were placed around these stores and used to study the demographic and socioeconomic characteristics of census tracts that fall completely or partially within these buffers. Population data at the block level were included in the maps illustrating the one-quarter mile, one mile, and two mile buffers to provide more accurate estimates of how accessible Supermarkets are to the communities in which they are located.

Chapter IV: Results

Introduction

The purpose of this chapter is to examine the spatial distribution of demographic, socioeconomic, and environmental factors that are believed to correspond to food insecurity among low-income households. Analysis and surveys were conducted in Richmond, Virginia, a city in which almost 20% of the population experienced food insecurity in 2009 (Feeding America 2012). Richmond was chosen because it is a demographically, socially, and economically diverse city with a rate of food insecurity nearly twice as high as the percentage of food-insecure individuals in the entire Commonwealth of Virginia. This chapter begins with an introduction of the boundaries of the study area and the census tracts within. Discussions of demographic and socioeconomic characteristics of the city are accompanied by a series of choropleth maps that illustrate the distribution of race, female-headed households with children, educational attainment, public housing developments, median household income, poverty rate, the percentage of households participating in SNAP, and vehicle ownership at the census tract level. The analysis of the spatial distribution of socioeconomic and demographic characteristics of Richmond's population concludes with a discussion of the trends in the concentration and clustering of socio-demographic correlated with food insecurity. This is followed by the analysis of the spatial distribution of food stores in relation to population characteristics.

Description of Study Area

Richmond, Virginia is made up of 66 census tracts as defined by the 2010 U.S. Census. Figure 4.1 shows the boundary of the city of Richmond, the boundaries and number of each

census tract, the James River, major thoroughfares, and the boundaries of the surrounding counties. Major roads and 2010 census tract numbers are displayed as reference features and will be mentioned throughout the following discussions.

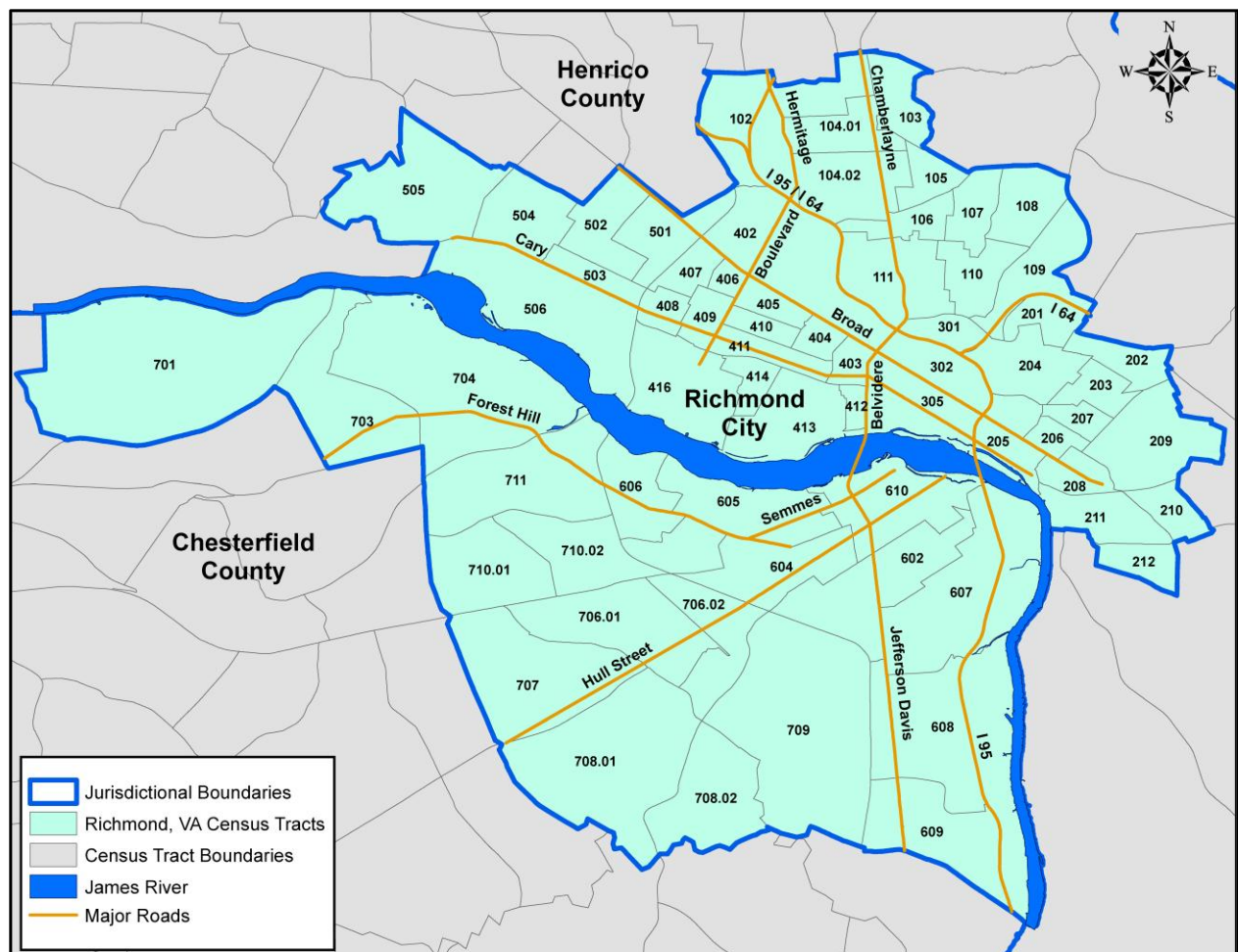


Figure 4.1: Reference Map

Demographic and Socioeconomic Analysis

As illustrated in the literature review, researchers have found that demographic factors among food-insecure households are often similar. These include race, family structure, educational attainment, income, and vehicle availability. This section discusses and illustrates the

distribution of these characteristics throughout the city to provide a foundation for identifying areas in Richmond that are inherently vulnerable to experiencing food insecurity.

In examining the socioeconomic characteristics of Richmond, it was found that census tract 403 exhibited many of the traits commonly identified in food-insecure communities, such as high levels of poverty and low annual median incomes. Upon further examination, it was discovered that more than 90% of the population of this tract was made up of students living in dormitories at Virginia Commonwealth University. Because students often receive financial support from family members or student loans, this tract was excluded from the many portions of this analysis. This tract will be represented by a VCU emblem placed over a gray background to signify that its population was not accounted for in certain analyses.

Race

The 2010 U.S. Census (2010d) reports that Richmond has a much higher percentage of African American residents than the Commonwealth of Virginia as a whole. Fifty percent of Richmond residents report their race as African American, in contrast with only 19% of all Virginia residents. For the purposes of this study, neighborhood racial concentration is determined by the percentage of population of one race in each census tract. Census tracts featuring 75 percent of the population of one race are classified as neighborhoods with a high racial concentration.

Figure 4.2, illustrating the racial distribution of African Americans in Richmond, shows that census tracts in the eastern portion of the city have the highest percentage of African American residents. There are 22 census tracts, primarily in the eastern region of the city, in which the proportion of African Americans is greater than 75% of the total. Census tracts in the western portion of Richmond, especially those north of the James River, have much lower

proportions of African American residents, many with a population below 15%.

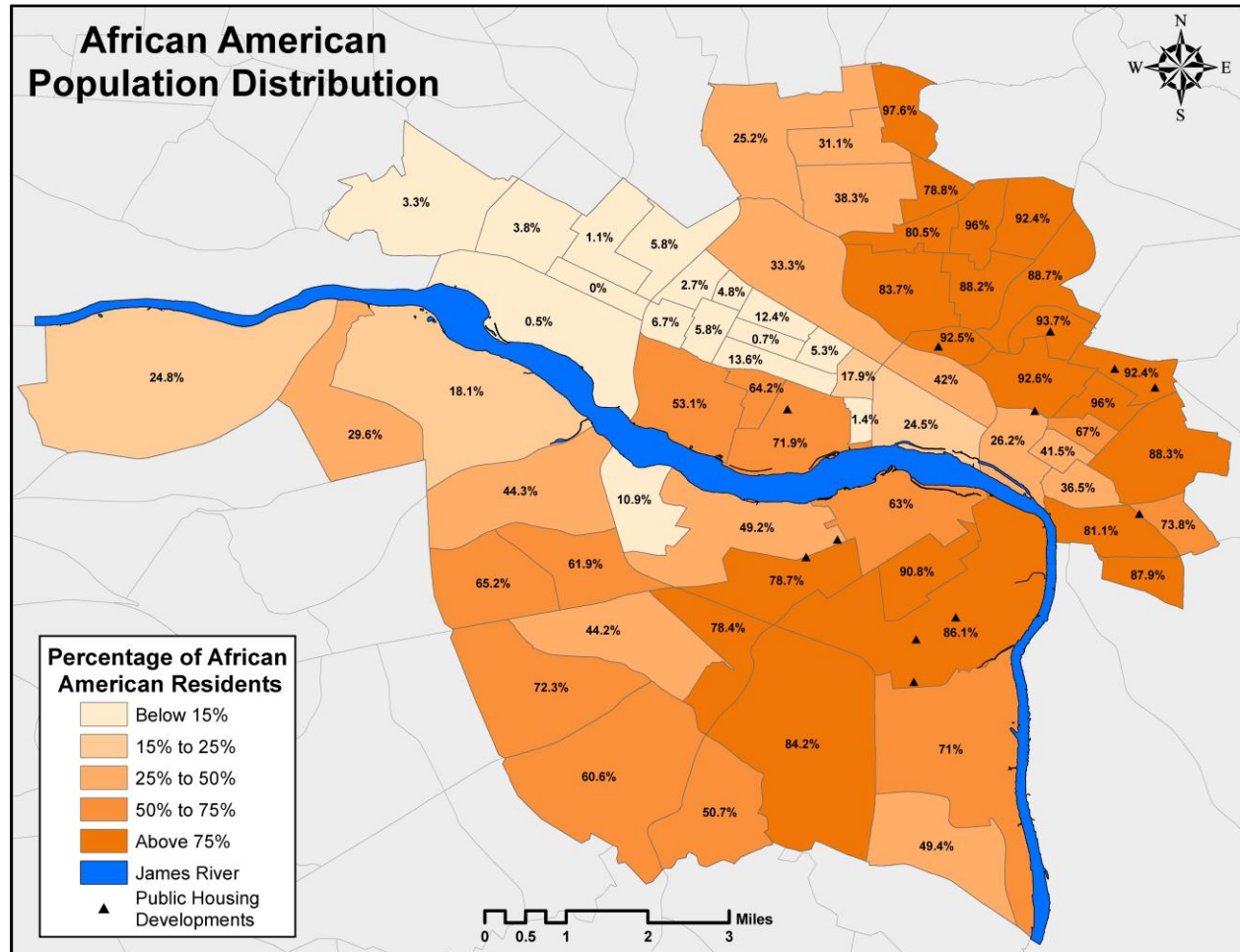


Figure 4.2: Racial Distribution

The tracts in which African Americans and Whites are most evenly distributed are: tract 711, in which the population is 44.3% African American and 45.8% White; tract 605, in which the population is 49.2% African American and 44.7% White; and tract 206, in which the population is 53.1% African American and 46.9% White.

Richmond residents who identify themselves as Hispanic or Latino make up only 6.3% of the total population. The highest concentrations of Hispanics or Latinos occur in tracts 706.01 (39.68%), tract 608 (21.01%), tract 708.01 (18.93%), tract 708.02 (18.7%), and tract 408 (15.64%). All other census tracts have a Hispanic or Latino population of less than 15%, 11 of

which are home to no one identifying themselves with this ethnicity.

Household Structure

As noted by the Economic Research Service (USDA 2009), single women with children and mothers who work full-time spend less time preparing food than women who do not fall into these categories. Single mothers, the study reports, spend less time cooking for their families than married women. Working women with children must consider not only to the time it takes to travel to and from a supermarket, but the time required to prepare healthy meals as well. Single mothers, especially those with no cohabiting partner, are additionally burdened by bringing their children along on grocery shopping trips. For shoppers that are already limited by low wages and physical distance to supermarkets, the addition of children can make both traveling and shopping more difficult (USDA 2009). Often, the combination of these factors results in single mothers and their children sacrificing fresh, home-cooked meals, choosing instead meals from restaurants or microwave dinners (USDA 2009).

Food insecurity among children is more prominent in households headed by single mothers than in those headed by married couples. Also, the likelihood of experiencing food insecurity increases as the number of children in a household grows (Congressional Digest 2010). In many cases, children in a household are not always direct descendants of the household heads. The Census has two classifications for children living in family households: *Own Child*, a child under 18 who is related to the householder by birth, marriage, or adoption; and *Related Child*, a category encompassing children under 18 who are related to the householder by birth, marriage, or adoption, as well as nieces, nephews, and stepchildren living in the household. In Richmond, there are a greater number of households with *Related Children* than *Own Children*. Because the purpose of this portion of the study is to identify single mothers with the greatest

burden, the data for female-headed family households with *Related Children* and no husband present are presented.

One of the difficulties that arises when attempting to identify areas with a large population of single mothers is the fact that although many families consist of a woman and her children, but no husband, the household may include a partner with whom she and her children cohabit but to whom the mother is not married. The census does not explicitly account for this, however data can be manipulated to approximate the number of family households that fall into this category. Before discussing these figures, it is necessary to briefly present the proportions of family households classified as *Female Householder, No Husband Present Families With Related Children Under 18* (Figure 4.3).

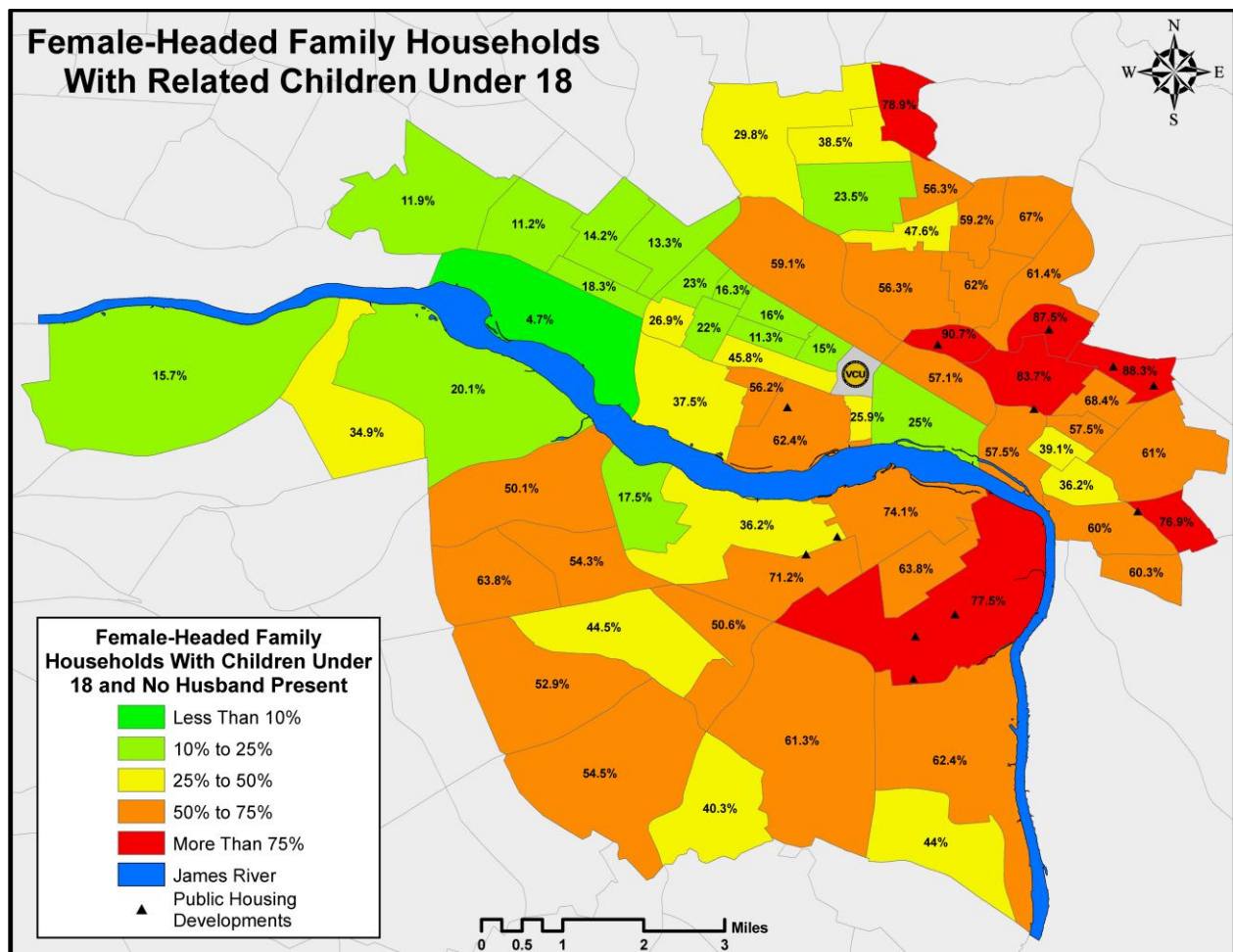


Figure 4.3: Female Headed Households

Out of the 20,442 families with children under 18 in Richmond, 10,759 (52.6%) are female headed with no husband present. In 34 census tracts, located primarily in the northeastern region of the city, these families account for more than 50% of all families with children. Only one tract, 506, has the distinction of less than 10% of all families with children falling into this category.

There are seven tracts in which the percentages of female headed families with children and no husband present account for more than 75% of all families with children. Four of these are clustered in the central northeastern region of Richmond, and the other three tracts in which the vast majority of families with children are headed by females with no husband present are found in the north, east, and southern portions of the city.

While these numbers provide a base from which more detailed statistics may be derived, they are insufficient because they do not take into account the possibility that an unmarried mother may live with a domestic partner that provides financial support and sometimes child care. For this reason, the data presented in figure 4.4 is much more useful in determining the actual number of single mothers that alone bear the burden of related children in their households. Figure 4.4 displays the percentage of Single Mother family households with children under 18, those in which the householder is female and no husband is present, and in which the female householder and related children do not live with a partner (male or female) to whom the householder is not married. In short, this map illustrates the areas in Richmond in which unmarried mothers do not have a partner on which to rely. For simplicity, family households of this type they will be referred to as "Single-Mother Families."

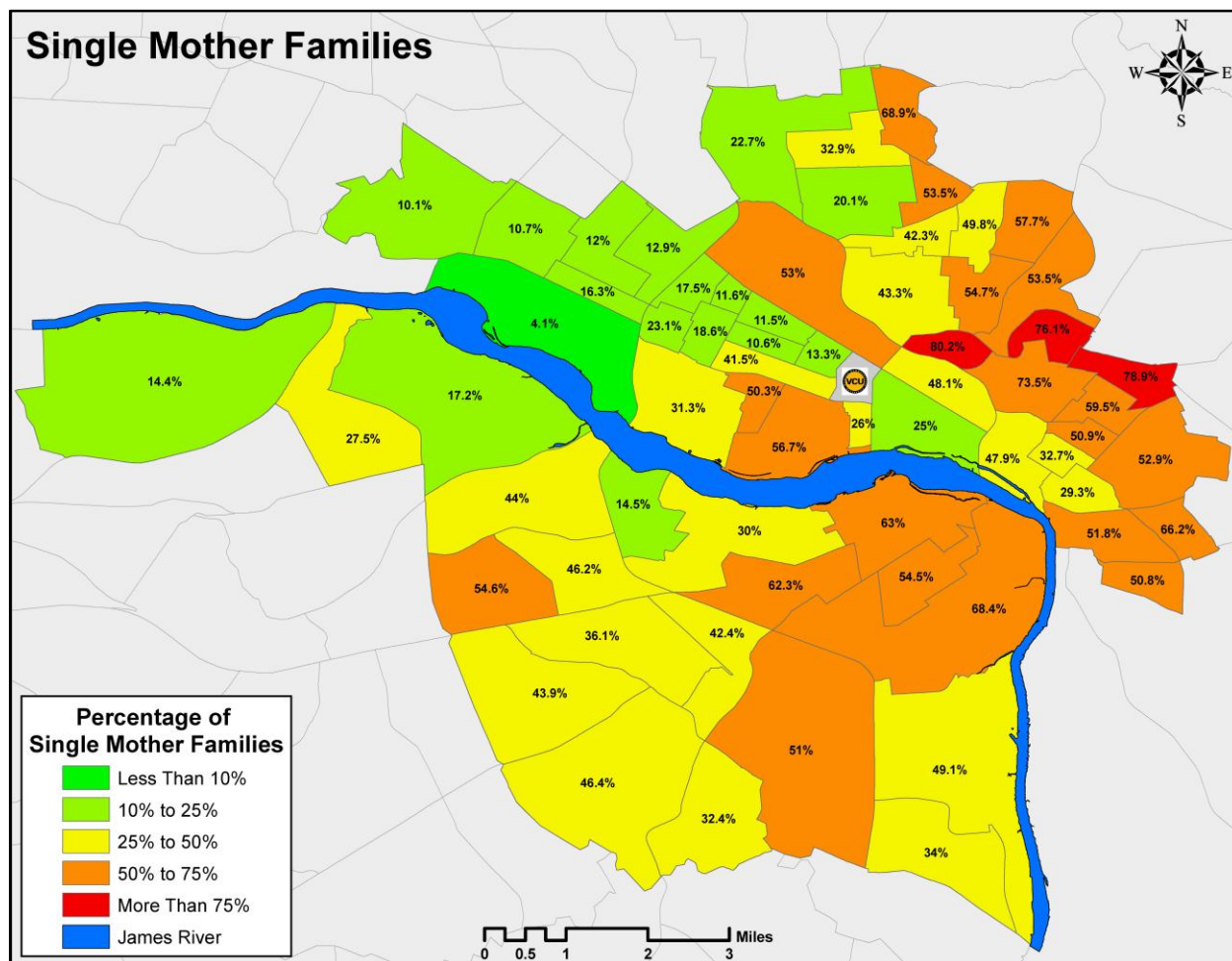


Figure 4.4: Single-Mother Families

Tract 506 is the only tract in which less than 10% of all families with children are single mother families. In many of the tracts nearby, single-mother families account for more than 10% but less than 25% of families with children.

Tracts 201, 202, and 301 have the highest proportions of single-mother families compared to all families with children. Tract 301 has the largest share, 80.2%, but tract 202 at 78.9% and tract 201 at 76.1% are not far behind. Bordering these, and extending all the way to the eastern border of Richmond, are tracts in which single mother families make up 29% to nearly 75% of all families.

Educational Attainment

The Congressional Digest (2010) found that food insecurity was 10 times more prevalent in households in which no adult had completed high school than in households in which an adult had at least a Bachelor's Degree. This study also reports that in more than 50% of households with food-insecure children, no adult had more than a high school education.

Industries in cities require increasingly higher levels of educational attainment, thus insufficient education may lead to poverty in urban areas (Kuhn 2005). Virginia's Poverty Reduction Task Force reports that increasing educational attainment results in a substantial reduction in poverty. It has also been found that there are strong links between poor health and educational achievement, as schools play a major role in imparting health literacy, knowledge and skills such as the ability to read and understand nutrition labels, basic cooking skills, and an understanding of the functions of fats, proteins, and carbohydrates, as well as which foods contain these (St. Leger 2001).

Figure 4.5 illustrates the proportion of residents 25 years and older in each census tract that have not attained a high school diploma or equivalent.

With the exception of tracts 604, 608, and 609, located south of the James River, all of the census tracts in which 20% or more of the population over 25 has less than a high school diploma are concentrated in the central eastern and northeastern portion of the city. Tracts 201, 202, 204, and 301 have the highest percentage (more than 30%) of people more than 25 years old with less than a high school diploma. The tracts just southeast of these, and several on the northeastern edge of the city are home to a population in which 20% to 30% of the population did not graduate high school.

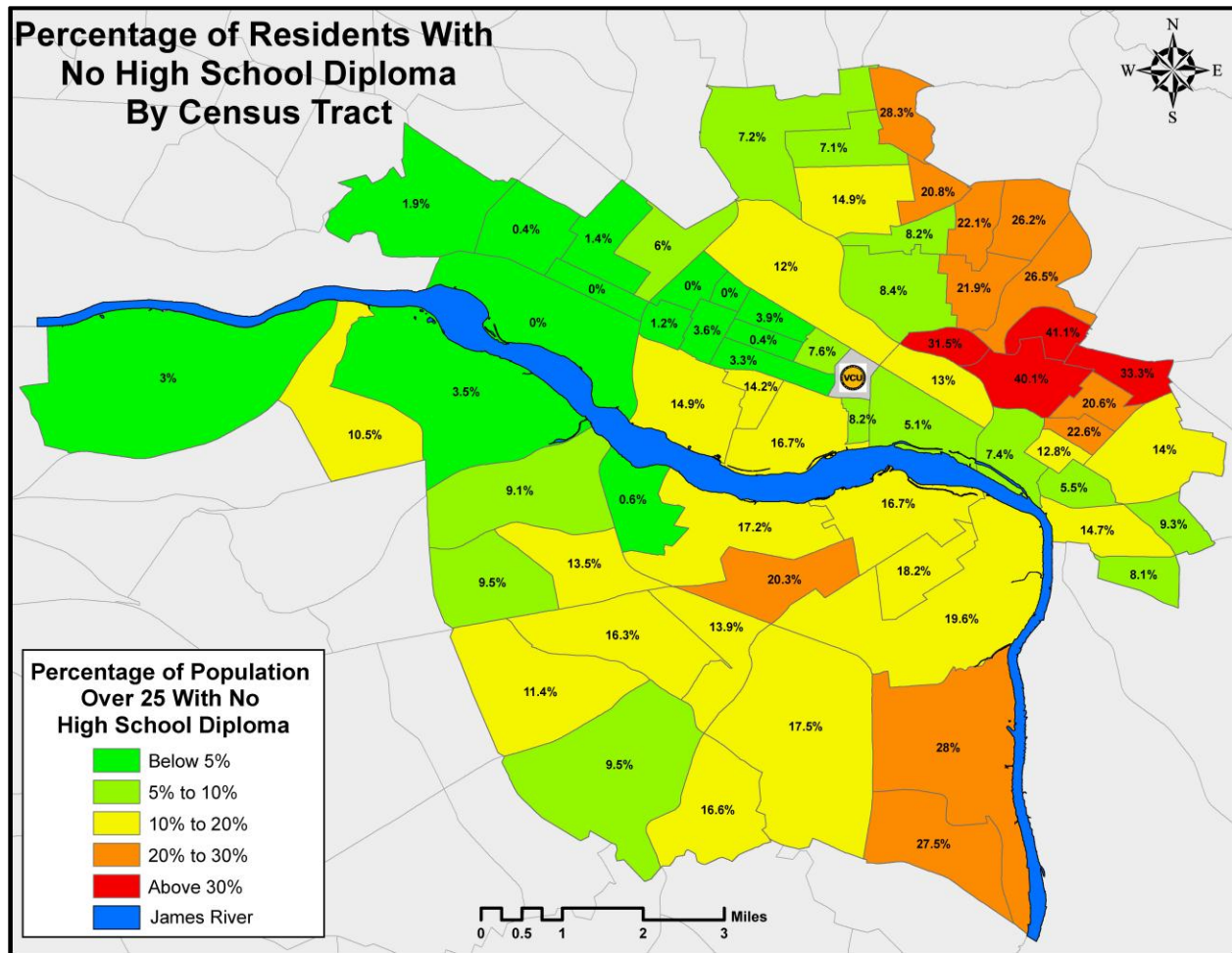


Figure 4.5: Educational Attainment

Public Housing

The Richmond Redevelopment and Housing Authority (RRHA) operates 11 family public housing developments, in which there exist a total of 3,255 housing units (Richmond Redevelopment & Housing Authority 2012). These are illustrated in figure .

Data from the City of Richmond (2010) shows that in census tract 301, there are 254 buildings. Of these, 202 buildings are part of the public housing development located in that tract. The development in tract 301 consists of 783 units of public housing. Exact figures concerning the total population of this development were not available.

Other public housing developments are located in several of the nearby census tracts. Tract

201 has 447 units of RRHA housing; tract 202 has two RRHA developments with a total of 951 units of public housing; the development in tract 204 hosts 458 units of public housing; tract 210 has a development with 64 public housing units; tract 607 has three public housing developments with a total of 452 units; tract 605 has a development with 30 units of public housing; tract 604 has 18 units of public housing in its one development; and tract 413 has one public housing development that consists of 52 units (Richmond Redevelopment & Housing Authority 2012).

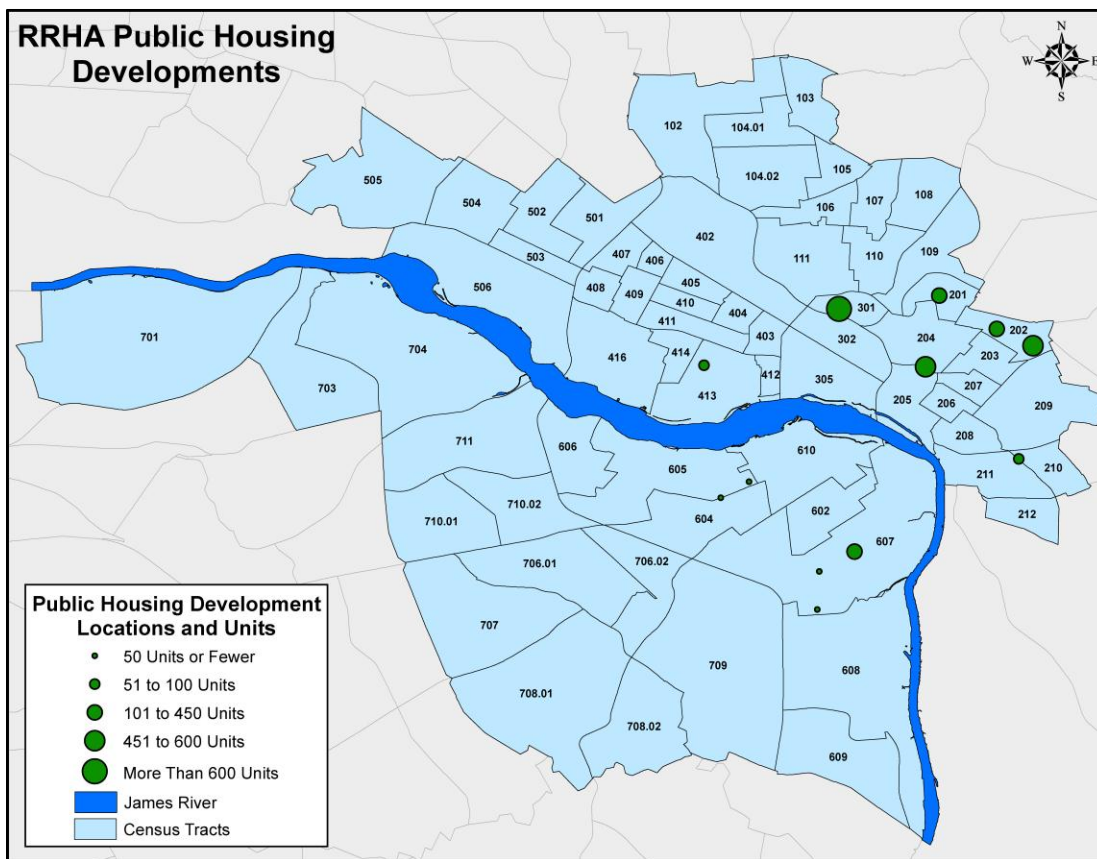


Figure 4.6: Public Housing

Demographic reports from RRHA show that 59% of the households living in its developments are female headed and include children. Ninety-eight percent of people identified as the heads of their household are Black/African American only, and 2% are Non-Hispanic White. The average annual income of families in all RRHA developments is \$8,043 (Richmond Redevelopment & Housing Authority 2012).

Median Household Income

As Amartya Sen (1982) explains, the ability of a household or an individual to obtain a sufficient quantity of food depends on the ability that person or group of people have to establish an entitlement to that food. Because the United States is essentially a capitalist country in which money is the standard medium of exchange or payment, the primary method of establishing the entitlement to food is through income-based trade. In urban areas where land for growing food is scarce, households must rely almost exclusively on income as a means of acquiring food.

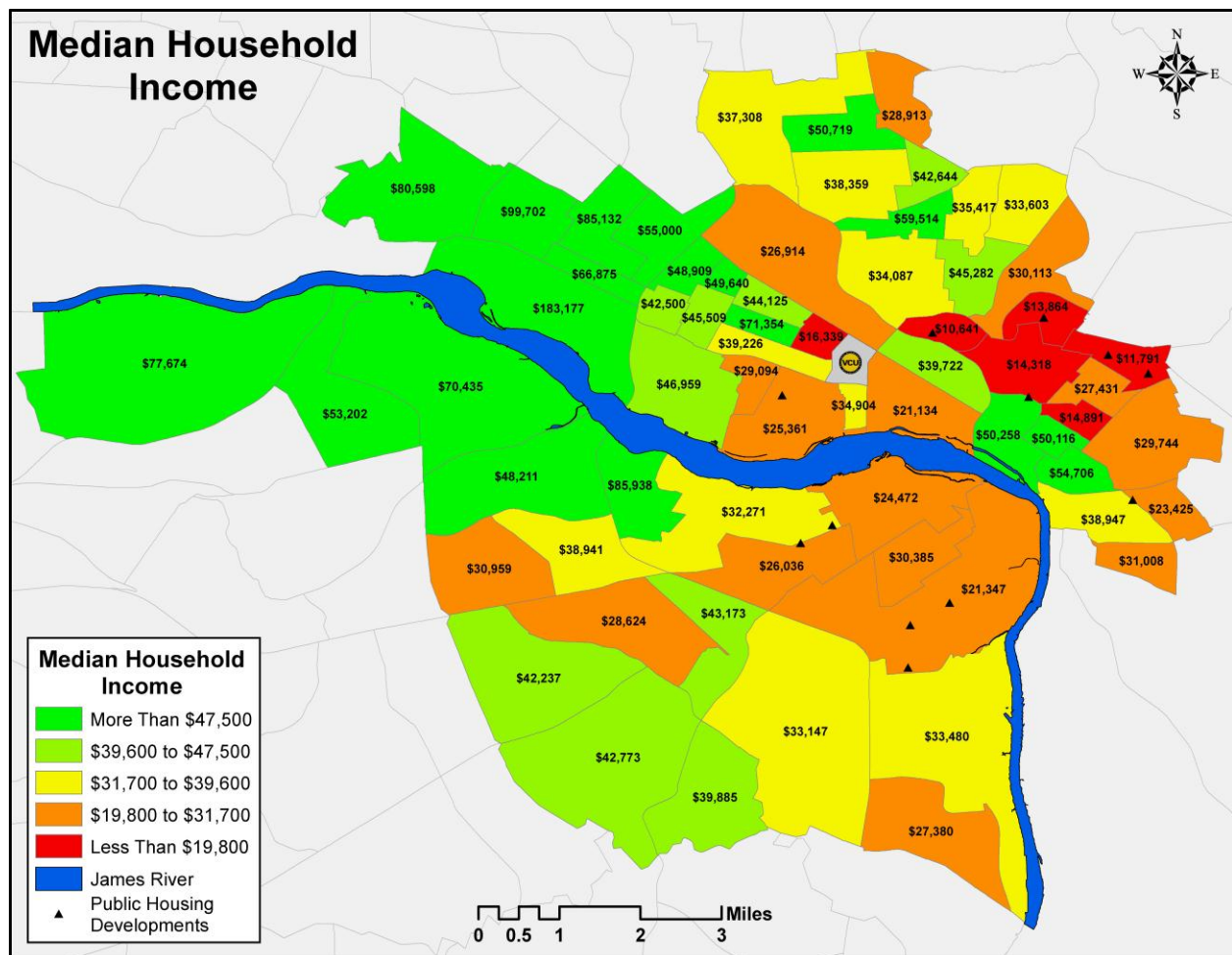


Figure 4.7: Median Household Income

Richmond's median household income is estimated to be \$39,608. To illustrate the distribution of wealth (Figure 4.7), the median household income of each census tract was divided into five categories; below 50% of the city's median income, 50% to 80%, 80% to 100%, 100% to 120%, and above 120% of the city's median. Median household income was chosen over mean household income to eliminate the potential of skewed results caused by outliers.

A total of 19 census tracts in Richmond have median household incomes higher than 120% of that of the city. Tract 506 has the highest median household income, \$183,177; more than ten times that of the tract with the lowest median income.

Households with the lowest median incomes occur in tracts 201, 202, 204, 207, 301, and 404. Census tract 301 has the lowest median income in the city, only \$10,641, less than 27% of the city's median.

Low Income

The primary concern of this study is food insecurity among urban, low-income and impoverished populations. Low-income populations, for the purpose of this study, will be defined as individuals living in households with an income below or equal to 200% of the federal poverty level. Figure 4.8 illustrates the percentage of individuals living in low-income households.

Thirty-eight percent of tracts in the city are home to a population of individuals in which less than 50% live in low-income households. Of these, the majority are in the western half of the city. the other 14 are concentrated in the northern or central-eastern area. Census tract 506 has the lowest rate of individuals in low-income households, 6.3%, and is the only tract in which less than 10% of residents are considered low-income.

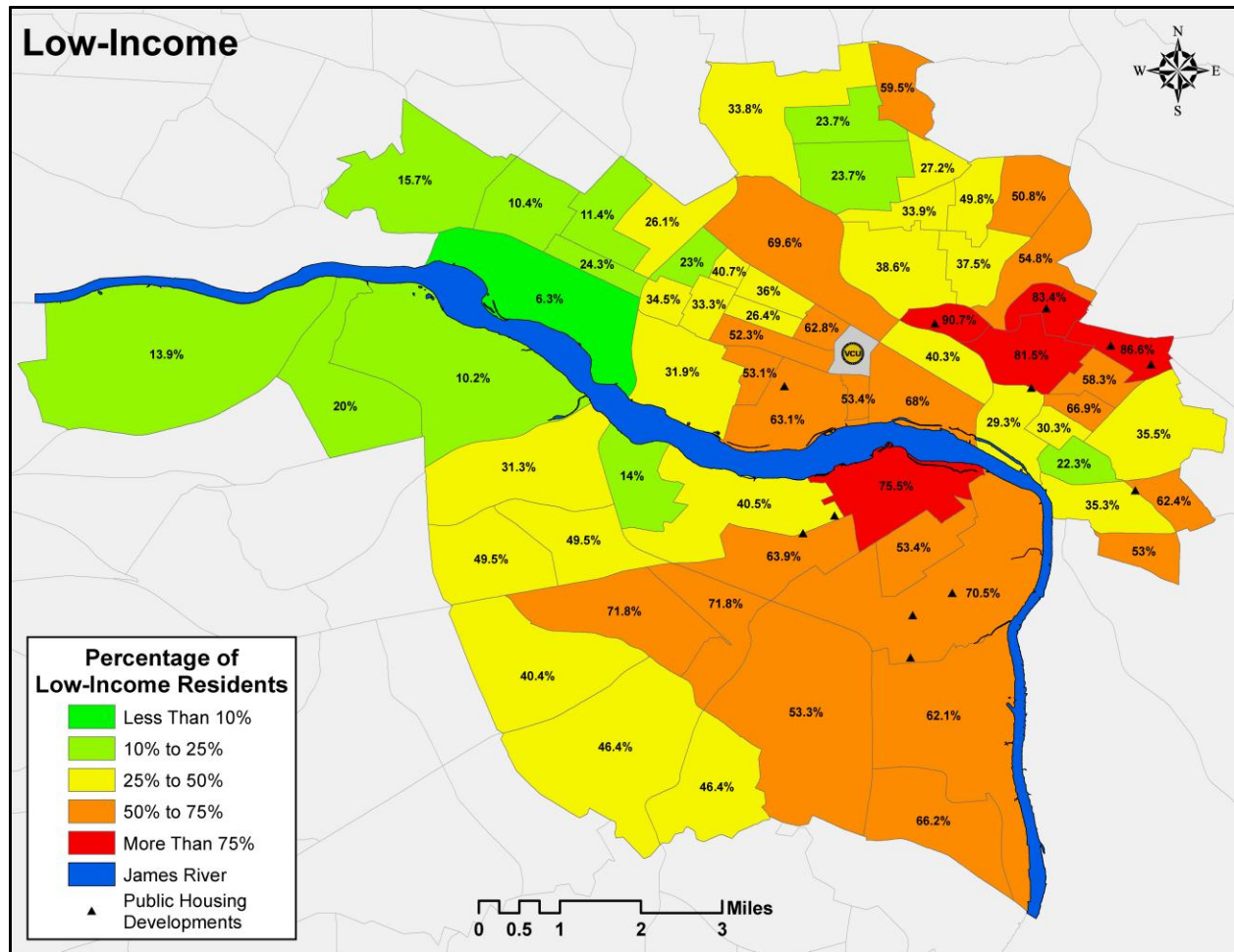


Figure 4.8: Low Income

The 28 tracts in which 50% or more of individuals live in low-income households are located in three major clusters; only three census tracts lie outside these groups. One cluster is located in the center of the city, north of the James River, and includes seven census tracts in which between 52.3% and 69.6% of people live in low-income households. South of the river, nine tracts form a larger cluster in which the low-income population ranges from 50.7% to 75.5% of all people accounted for. The cluster with the highest rates of people living in low-income households is located in the northeast. Four of the eight tracts in this cluster are home to a population of which more than 80% is considered low-income. Census tract 301 has the highest percentage of low-income residents, 90.7%. This tract is also the only one in the city in which

more than 90% of its population lives in low-income households.

Poverty

Poverty is a highly visible indicator of food insecurity. Supermarkets, it has been found, often shy away from high-poverty areas, leaving poor residents to shop in stores that may not offer the same selection, quantity, or variety of affordable produce. It is important to note that not all food-insecure people live in poverty, and likewise, not all people living in poverty are food-insecure. However, as supermarkets tend to be located in high-income urban areas or wealthy suburbs, it is important to display the distribution of poverty within the study area as a precursor to the discussion of store locations.

The discussion of poverty is divided into four separate sections. Each paints an important picture of the role of poverty and how it interacts with the demographic characteristics of those that endure it. First, a general overview of the distribution of high- and low-poverty census tracts is provided. Second, an analysis of poverty using location quotients (LQ) to identify census tracts with disproportionately high populations of people in poverty, as compared to the city as a whole, is provided. The next two analyses of poverty illustrate how it effects people of different races. As Zenk, et al. (2005, 660) stated, “an analysis of race without regard to poverty and of poverty without regard to race offers an incomplete picture.” Using location quotients, census tracts with abnormally high rates of poverty among African Americans, and those with a disproportionate rate of poverty among Whites were identified. The first map (figure 4.9) illustrates the distribution of people living in households with income levels below the Federal poverty line.

In general, the western portion of Richmond enjoys very low rates of poverty; 31 census tracts have a rate of less than 20%, and 12 boast less than 10%. Residents of the central and

eastern regions of the city, however, experience the highest poverty rates. There is a cluster of five high-poverty census tracts, defined as those in which the population in poverty is greater than 40% of the whole, that occupies the area just north of the James River. The poverty rate among these ranges from 40.2% to 51.9%.

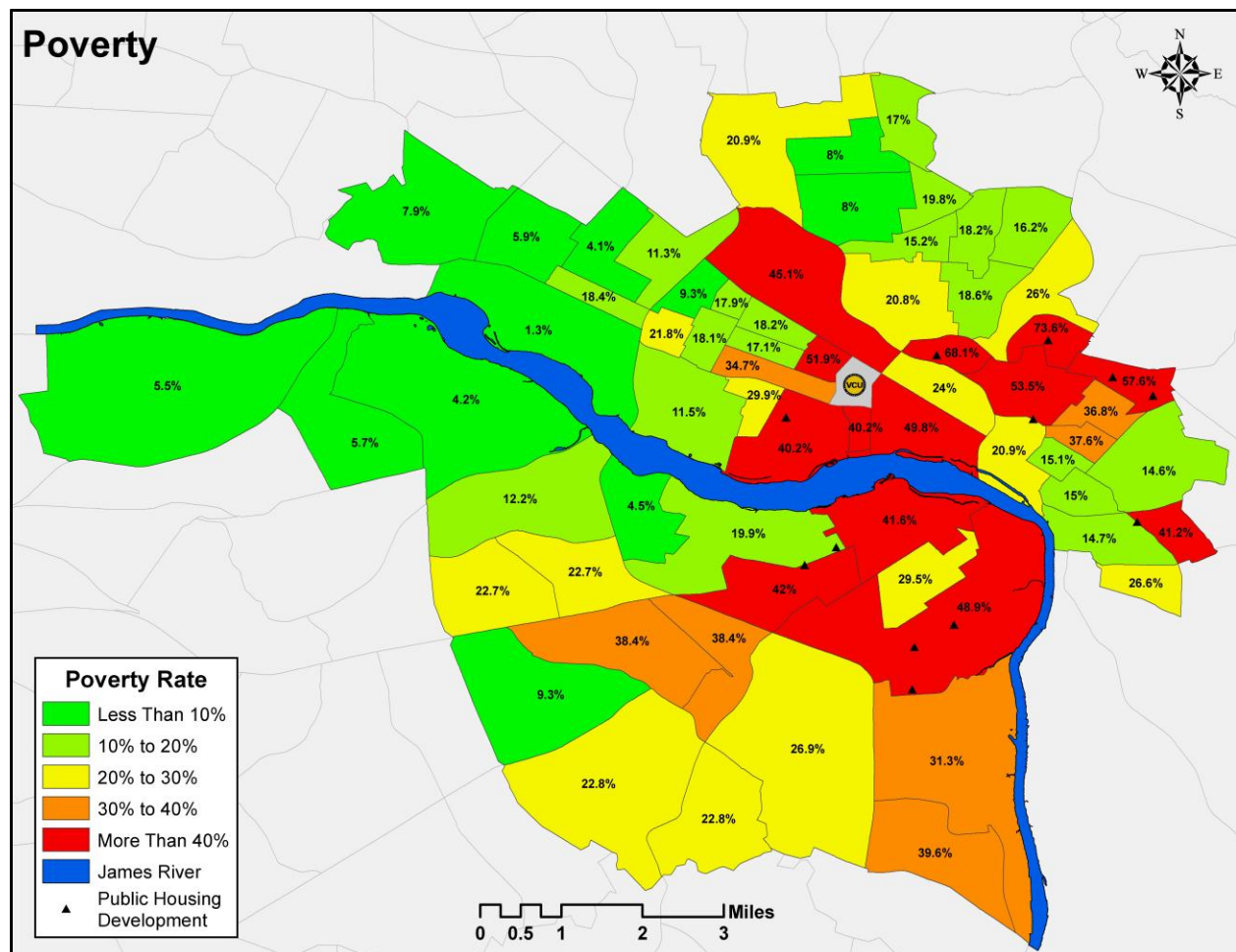


Figure 4.9: Poverty

Another poverty cluster occurs south of the river, in which there are three tracts with poverty rates ranging from 41.6% to 48.9%. The percentage of the population that lives in poverty in these tracts is very similar to that of their northern neighbors, and to the lone tract, that lies northeast of the river, one that is surrounded by tracts that experience much lower levels of poverty.

The most impoverished area in Richmond is located in the eastern region of the city, north of the river. In this grouping, the largest proportions of the population live in poverty. Tract 201 has the highest percentage of residents in poverty, 73.6%, followed by tracts 301, 202, and 204, with poverty rates of 68.1%, 57.6%, and 53.5%, respectively.

Location Quotients of Poverty

A location quotient (LQ) of poverty was calculated for each census tract in Richmond to identify areas in which the population living in poverty is overrepresented. Location quotients are equivalent to ratios of the proportion of people in poverty in a census tract to the city-wide proportion. Census tracts with a LQ of less than 1.0 have a lower proportion of residents in poverty compared to the proportion of people living in poverty in the entire city.

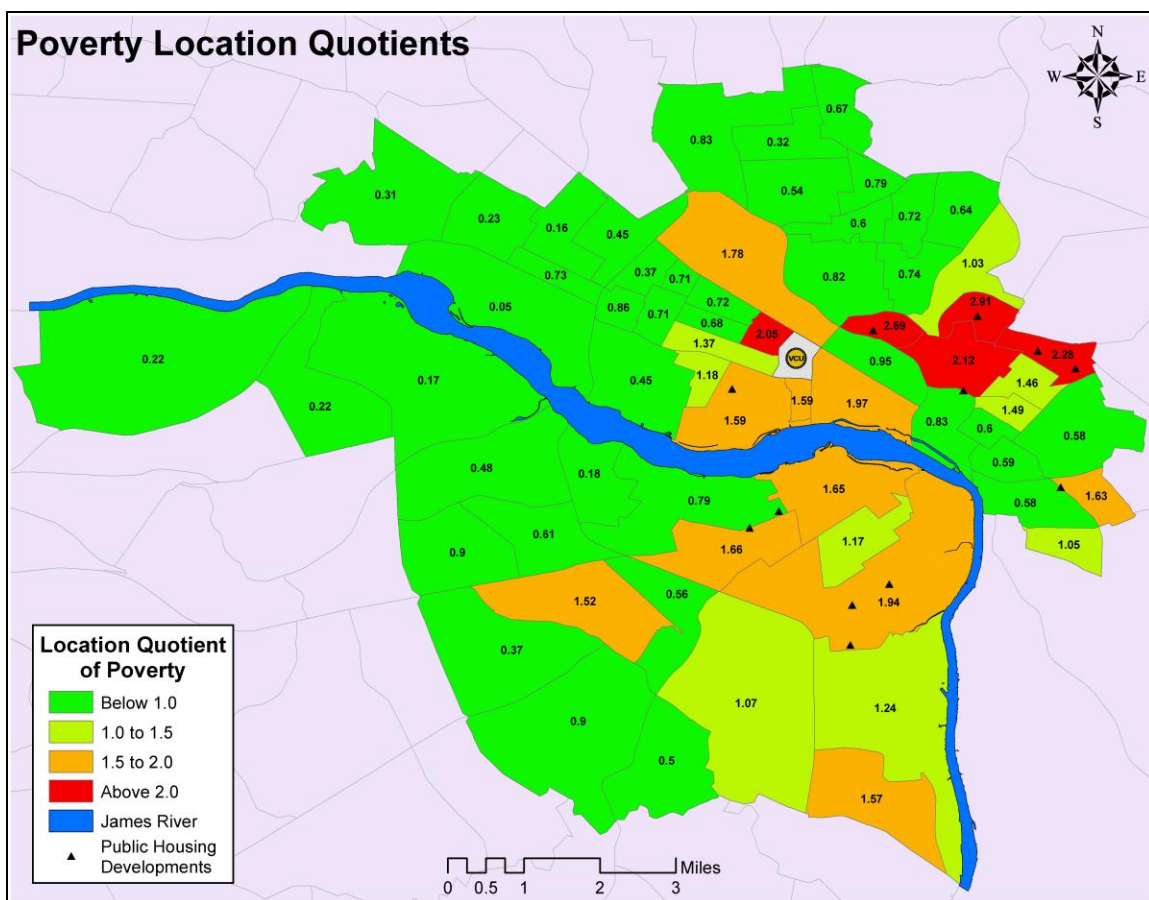


Figure 4.10: Location Quotients of Poverty

Tracts in which the LQ is greater than 2.0 have a disproportionately high population living in poverty, when compared to the city as a whole. Figure 4.10 shows the location quotients of poverty for the entire population of each census tract in Richmond.

There are five census tracts, located primarily in the eastern half of Richmond that have poverty locations quotients above 2.0. This indicates that these tracts have the highest concentrations of people living below the poverty line. Tract 201 has the highest LQ, 2.91, which indicates that the ratio of people in poverty in this tract to people in poverty in the entire city is 2.91:1. The surrounding census tracts also have exceptionally high poverty rates, as does tract 404, which lies just west of this cluster.

Poverty Location Quotient by Race

To identify areas in which the population of impoverished African American and White residents is disproportionately high compared to the proportion of the overall poverty rate among those populations, another location quotient analysis was performed. To calculate the location quotient of poverty by race, the following formula was used:

$$LQ = \frac{t_r/c_r}{T_R/C_R}$$

in which t_r is equal to the population of a race living in poverty in a census tract, c_r is equal to the total population of that race in the census tract, T_R represents the total population of the race living in poverty in the entire city, and C_R represents the total population of that race in the city.

African American Poverty Location Quotient

The purpose of this analysis is to identify tracts in which the proportion of African Americans living in poverty is disproportionately high when compared to the proportion of African American residents of the city that experience poverty.

Figure 4.11 shows that in twenty-four of the 52 census tracts in which the poverty rate is

below 40%, African Americans make up more than 50% of the population. In fact, many census tracts in which African Americans make up more than 75% of the population have LQs below 1.0.

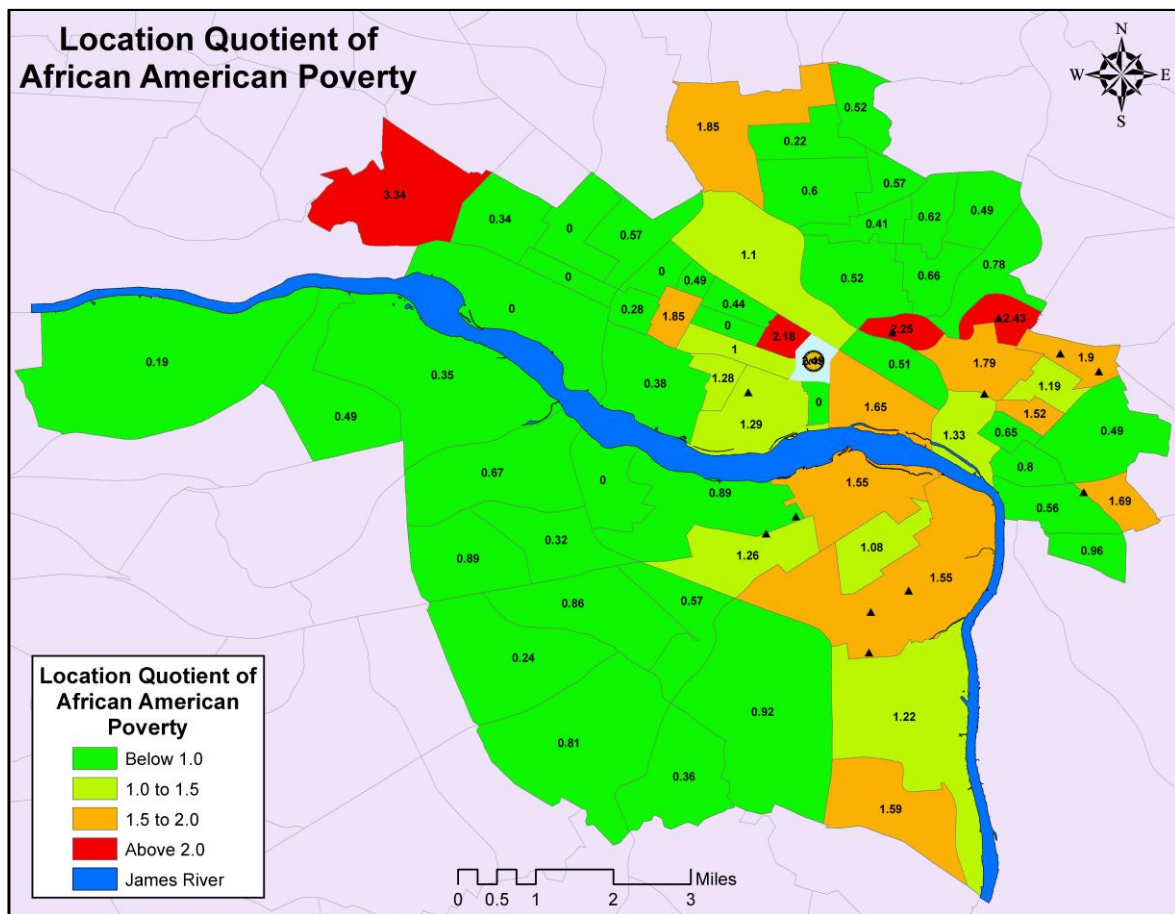


Figure 4.11: Location Quotient of African American Poverty

There are 18 tracts in which the LQ is between 1.0 and 2.0, tracts where the proportion of African Americans living in poverty is slightly higher than that of the city, but in which poverty is not exceptionally overrepresented. Most of these tracts are clustered either along the eastern edge of the city, south of the river, or in the central-eastern section north of the river.

The tracts in which African American poverty location quotients surpass 2.0 are tract 505 (3.34), tract 201 (LQ = 2.43), tract 301 (LQ = 2.25), and tract 404 (LQ = 2.18). African Americans in tract 201 make up 93.71% of the tracts entire population. The overall poverty rate

in tract 201 is 73.6%, but the poverty rate among African Americans is 72.7%. In tract 301, the African American population makes up 85.7% of the total, the rate of African Americans living in poverty is 67.5%, and the overall poverty rate 68.1%. In tract 404, African Americans account for only 5.3% of the population, yet 65.3% of African Americans in this tract live below the federal poverty line; the total rate of poverty for tract 404 is 51.9%.

The census tract with the highest LQ, or that in which the proportion of African Americans living in poverty is significantly higher than the proportion of African Americans living in poverty in the whole city was tract 505 (LQ = 3.34). This tract, located in the northwest corner of the city has a poverty rate of only 7.9% overall, and an African American population of only 1.4%. A closer analysis revealed that of the 39 African American residents identified in this census tract, 100% live in poverty. This same tract has a population of 2,716 White residents, and only 6%, 163 White residents, live in poverty, indicating that there is a highly uneven distribution of resources between people of different races in this census tract.

White Poverty Location Quotient

The final discussion of poverty concerns location quotients of poverty among White residents of Richmond. The distribution of poverty among Whites is much different than that of African Americans. The LQs of 38 tracts in the city are below 1.0, which indicates a lower proportion of poverty among White residents in a tract than in the city as a whole. These tracts, displayed in green in figure 4.12 are located mostly in the high-income areas of the western region of Richmond.

There are two small clusters near the northern boundaries of the city, and one larger cluster to the northeast of the curve in the James River. Also, a majority of the tracts south of the river have LQs below 1.0. Richmond has only six tracts in which the LQ of White poverty is between

1.0 and 1.5, and only four with LQs between 1.5 and 2.0.

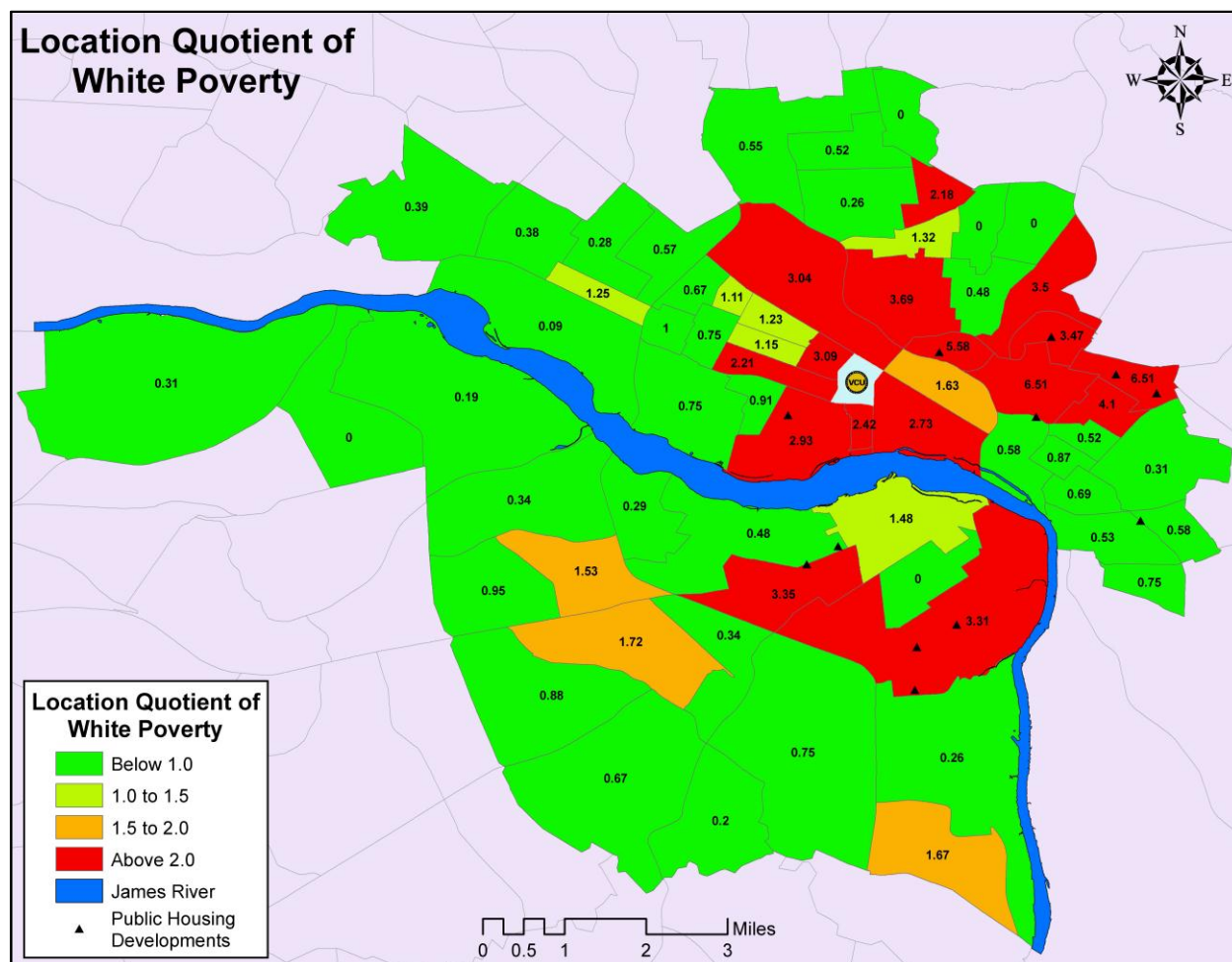


Figure 4.12: Location Quotient of White Poverty

Conspicuous differences in racial poverty concentration arise when observing the number of tracts with a White poverty LQ above 2.0. There are 15 tracts in which the LQ of white poverty exceeds 2.0, and in these tracts, many of the LQs are higher than those found in tracts with the greatest concentrations of African American poverty.

The lowest White poverty LQ above 2.0 belongs to tract 105, located in the northeastern region. The highest LQ of White poverty, 6.51, is found in tracts 202 and 204, near the eastern border of Richmond. Tract 202 has a total population of 80 (2.1%) White residents, and a 100% rate of poverty among them. The White population of tract 204 is 2.2% of the whole, and 100%

(93) of the White residents live in poverty.

Despite the over-representation of White poverty in nearly one-quarter of census tracts in Richmond, the percentage of African American poverty (30%) in the whole city is nearly double the percentage of White poverty (15.4%). The actual number of African American residents living in poverty is nearly three times as high as the number of Whites in poverty; 29,743 African Americans compared to only 11,191 Whites.

Supplemental Nutrition Assistance Program (SNAP) Participation

The Supplemental Nutrition Assistance Program (SNAP) is the new name, as of October, 2008, for the federal assistance program formerly known as the Food Stamp Program. SNAP was designed to mitigate food insecurity, relieve poverty, and improve the quality of foods consumed by participants in an effort to reduce obesity rates. There is, however, widespread concern that SNAP participants use their benefits to purchase unhealthy foods, instead of those that would be most beneficial for households in which the quality of foods consumed was already questionable.

In order to qualify for SNAP benefits, a household must meet certain qualifications concerned with monthly income and countable resources, primarily based on household size, employment of householders, and age and disability status of household members. Benefits are distributed on the first day of each month, and SNAP households are expected to spend about 30% of their additional resources and income on food (United States Department of Agriculture 2012a).

SNAP allows participants to purchase food such as bread, cereal, fruit, vegetables, meat, fish, poultry, and dairy products. Participants are also permitted to purchase soft drinks, candy, ice cream, energy drinks, and other processed foods. SNAP benefits cannot, however, be used to

purchase alcohol, tobacco, nonfood items such as household supplies or soap, or prepared foods that will not be eaten at home (United States Department of Agriculture 2012).

Because one of the primary concerns of this program is to alleviate or eliminate food insecurity, identifying areas in which participation is high will be helpful in determining areas at risk for food insecurity. Figure 4.13 illustrates the percentage of households in each census tract participating in SNAP.

There are 40 census tracts in Richmond, concentrated primarily in the northwestern region of the city, in which less than 15% of the total number of households receives SNAP assistance. In 20 tracts, less than 5% of households receive any SNAP benefits, and in four tracts, not a single household participates in the program.

Only three census tracts, 201, 202, and 301 are home to a population in which more than 50% participate in SNAP. Tract 201 has the highest rate of participation, 72.9%, while only slightly more than 50% of residents of tracts 202 and 301 participate in this program.

Tract 204, which lies along the southern borders of tracts 201, 202, and 301, has a SNAP participation rate of 49.9%. However, this tract is much larger, and encompasses a greater number of households than those north of it. It is possible that the boundaries of these four tracts act not to help identify populations at risk for food insecurity, but to arbitrarily divide an area in which an even greater percentage of the population is food-insecure.

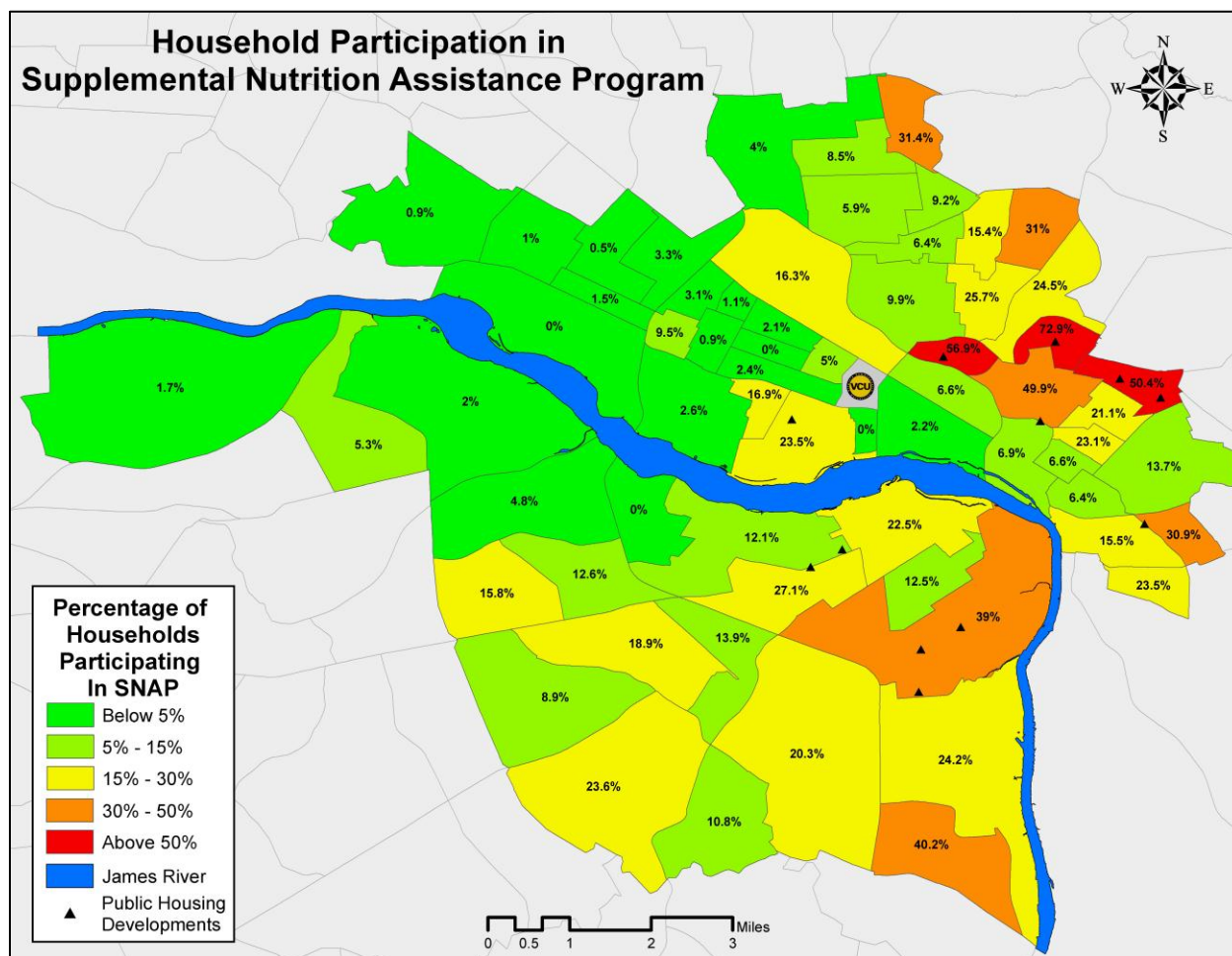


Figure 4.13: SNAP Participation

Vehicle Availability

The Economic Research Service describes vehicle access as "perhaps the most important determinant of whether or not a family can access affordable and nutritious food" (USDA 2009, 18). In an urban setting, a personal vehicle may not be the sole means of transportation for a household. Public transportation or taxi services are often available for long-distance travel, and short trips can usually be made on foot or by bicycle. However, traveling by personal automobile, even in a city, enables shoppers to purchase and carry home larger quantities of food; more grocery bags can fit in the trunk of a car than can be carried on a bus or by foot. Traveling by personal automobile also reduces the time it takes to access food. Drivers can go to

and from the store on their own schedule instead of having to wait for or worry about missing a bus or train. Finally, although fuel does come at a cost, low-income shoppers do not have to endure the high cost of public transit for both the trip to, and the trip from, a supermarket; a cost that infringes on an already limited food budget.

Figure 4.14 displays the percentage of the households in each census tract that own at least one working automobile. Automobile ownership is highest in the less dense areas of Richmond; 12 tracts have household automobile ownership rates above 95%. These tracts are located primarily in the northwestern region of the city. Household automobile ownership rates south of the James River vary from 2.2% to 30.8%.

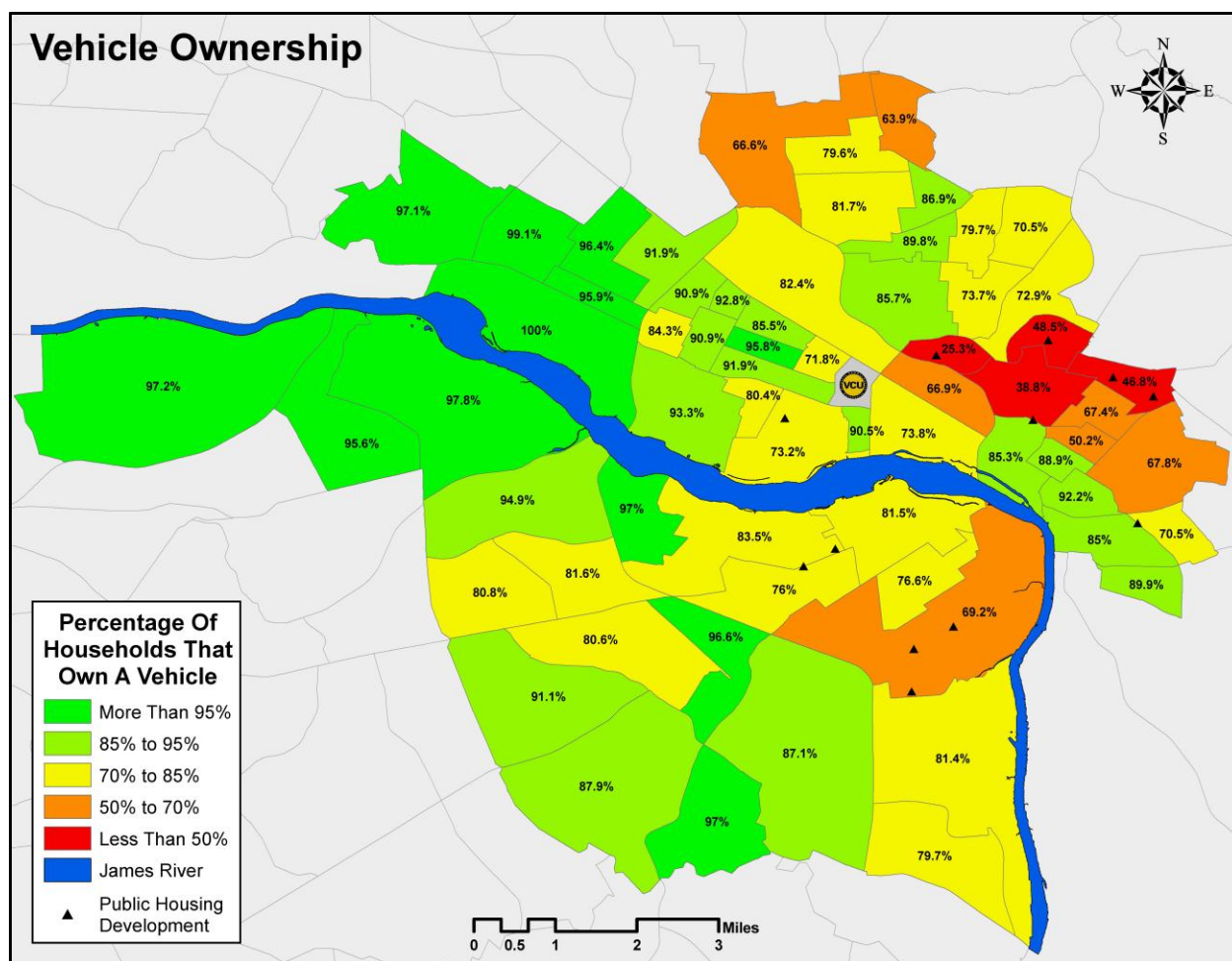


Figure 4.14: Vehicle Ownership

In the northeastern part of Richmond, automobile ownership is much less prevalent. Tract 301 has the lowest rate of automobile ownership. In this tract, 74.7% of households do not own a single vehicle. In tracts 201, 202, and 204, all of which border tract 301, fewer than 50% of all households own an automobile. Four of the census tracts that surround these also have low vehicle ownership rates. In tracts 203, 207, 209, and 302, the rates of household automobile ownership range between 67.8% and 50.2%. Outside of this cluster, only three other census tracts have household vehicle ownership rates below 70%. The two northernmost tracts in Richmond, 102 and 103, have automobile ownership rates of 66.6% and 63.9%, respectively. In tract 607, which is situated just south of the river on the eastern edge of the city, 30.8% of households do not own a vehicle.

Summary

The demographic and socioeconomic characteristics discussed in this section provide a strong foundation for understanding the spatial distribution of food insecurity risk factors in Richmond, such as poverty, race, household structure, and vehicle ownership. Food insecurity, however, is not caused only by demographic and socioeconomic qualities. While it is likely to arise in households that exhibit a combination of many risk factors, one of the most important determinants of a household's food security status is its ability to access and afford high-quality foods. The next section compares the availability, cost, and quality of fresh fruits and vegetables in various store types and locations throughout the city of Richmond; factors that are just as, if not more, important than those discussed in this section.

Food Availability Analysis

Introduction

Multiple studies report that small grocers and convenience stores in low-income, urban communities charge higher prices for fresh produce than supermarkets (Drewnowski and Darmon 2005, Clifton 2004, Jetter and Cassady 2006). Researchers also claim that fresh fruits and vegetables sold in small stores are limited in quantity and tend to be of lower quality than those found in supermarkets. This study involved a survey of 51 food stores in Richmond, Virginia. Only stores that are located inside the city's boundary were surveyed in order to eliminate variables such as real estate tax differences, political influences, or any other contextual factors that may affect the location of stores across different municipalities.

The survey instrument consisted of a short checklist in which the price per pound, quantity, and apparent quality of 16 staple fruits and vegetables were recorded. Prices were then compiled into two spreadsheets; one comparing the price of each item in all stores of similar type, and one comparing the average prices of all items across all store types. Also recorded was the primary line of goods sold in each store surveyed. A copy of the survey instrument can be found in Appendix 1.

One limitation that became apparent in the course of this research is that some retailers price items individually, and some price by the pound. To provide a fair comparison, all items were converted to price per pound instead of individual price. This was done by determining the average number of each item in one pound of that item. The only exception to this rule was lettuce, which was sold by the head in all stores. Conversion rates for all items can be found in Appendix 3.

Normalizing all items to price per pound produced another difficulty that may affect the outcome of this study. This disparity is most easily explained through the use of the an example: Item x is sold in most stores at a cost of \$2.99 per pound. In one store, however, item x is sold for \$1.49 each. Because an individual x weighs $1/3$ pound, converting the price of one x , \$1.49, to the cost per pound of x results in a price of \$4.47 per pound of item x ; \$1.48 more per pound than that found in all other stores. Despite this disparity, there was no other accurate method of normalizing the cost of items for comparison across different store types.

This analysis also includes a brief discussion of the quality and quantities of food items found in each store type. It is often reported that Convenience Stores and Small Grocers have not only a smaller selection of produce from which shoppers can choose, but also offer smaller quantities of lower quality items than larger retailers. In most stores, the quantity of each item was recorded accurately. Sometimes, however, items such as onions, potatoes, or oranges were displayed in large boxes or stacks, and quantity was approximated.

Although every effort was made to judge foods objectively, the evaluation of the quality of items for sale was inevitably subjective; it was based on the author's opinion and knowledge of the foods in the survey. Observations of quality were recorded and divided into three categories: Good, Fair, and Poor. Items characterized as Good appeared to be in peak condition; ripe, attractive, and ready to eat. Items characterized as Fair appeared to be at the end of their shelf lives, and possessed more than one soft spot, bruise, and other sign of beginning to spoil. Fair items were still edible, but not in optimum condition. Items characterized as Poor were clearly rotten or spoiled; wilted and covered in bruises, sometimes with spots of mold.

Survey Results

A total of 51 food retailers of in eight categories were surveyed; 19 Convenience Stores, 10 Small Grocers, 7 Supermarkets, 6 Specialty Grocers, 3 Ethnic Grocers, 3 Pharmacies, 2 General Merchandise Stores, and 2 Supercenters. The following food availability analysis is divided into four segments. The first section describes the types of stores that did not provide comprehensive results, and the following three are each devoted to results from stores of different types. Figure 4.15 is a map of all stores surveyed during the course of this study and the poverty rate in each census tract.

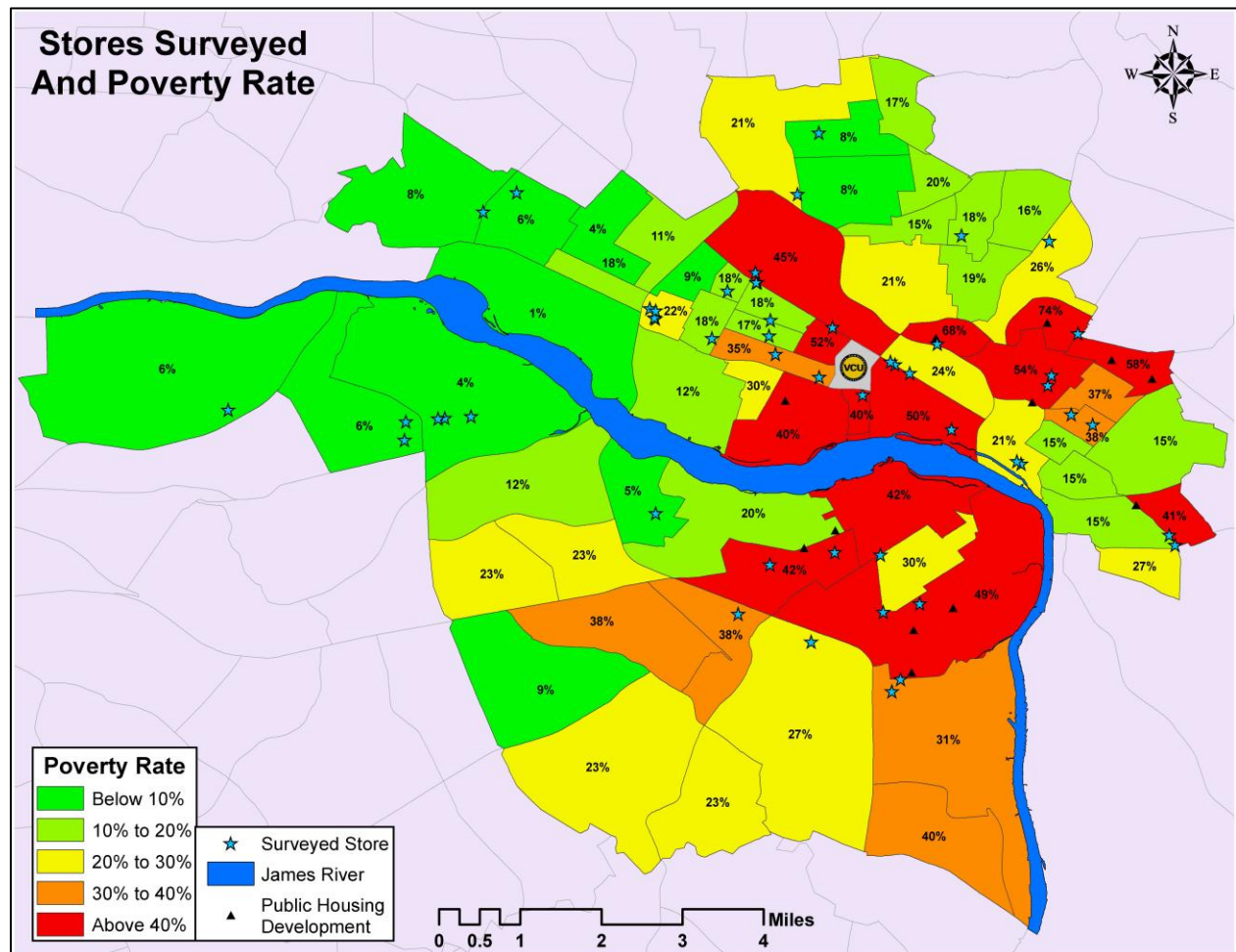


Figure 4.15: Stores Surveyed and Poverty Rate

Five of the nine types of stores surveyed during the course of this research are not included in the comparison of price, selection, and quality because they either produced no results or results for which insufficient comparisons could be made. These four store types include General Merchandise Stores, Pharmacies, Ethnic Grocers, Specialty Grocers, and Supercenters.

Of all the stores surveyed, it was observed that none of the General Merchandise Stores or Pharmacies that were visited retailed fresh produce of any kind. General Merchandise Stores sold soft drinks, snacks, canned food, milk, eggs, and cheese, along with a line of goods that consisted mostly of non-food items such as household goods, pet supplies, and home decor. The same results were observed in Pharmacies; no fresh fruits or vegetables but a line of food items that included canned food, snack foods, frozen meals, soft drinks, and candy.

Ethnic Grocers are also excluded from this discussion. Although most stores had some fresh produce, none sold a selection of fresh produce large enough to be able to compare it to the selection of produce of other stores in this category. Of the three Ethnic Grocers at which this survey was conducted, one store sold no fresh fruits or vegetables, one store sold only onions, and one store sold lettuce, onions, and tomatoes. The majority of food sold in the Ethnic Grocery Stores in Richmond was either canned or freeze dried. This type of store retailed many spices and preserved foods that are not typically available in other establishments, but offered very little in the way of fresh produce. Because the Ethnic Grocer with the largest selection of fresh fruits and vegetables sold less than one-quarter of the total number of items on the checklist, the results from this category were deemed insufficient and excluded from the following discussion. Stores in all other categories offered a greater selection of fresh produce, but quantity and cost among stores of different type varied greatly.

The Specialty Grocers category was developed to describe stores that did not fit into any other categories. Specialty Grocers include establishments that sell exclusively organic groceries and health supplements, stores that complement a cafe or restaurant, or stores that sell a wide variety of international foods instead of limiting their selection to foods popular among members of only one culture or ethnic groups.

The line of goods found in stores in this category varied widely. Some stores sold food and goods similar to those found in supermarkets or small grocers, but prices were abnormally high because the entire selection was purchased locally and grown organically. Other Specialty Grocers, those attached to cafes or restaurants offered very few options for produce, and very low quantities of those foods available. Among organic food stores and stores that sold a variety of international foods, many had a large selection of produce for sale, but were incompatible with, and were therefore not appropriate for comparison to, stores of other types, such as Small Grocers, Convenience Stores, or Supermarkets.

Supercenters are also excluded from the subsequent discussion for a number of reasons. Among the two stores in Richmond classified as Supercenters, only one sold fresh produce. The other offered a selection of staple groceries, such as cereals, dairy products, bread, and canned and frozen foods, but not a single fresh fruit or vegetable. In addition, although these stores are located within the city of Richmond, the demographic and socioeconomic characteristics of the areas in which they are located preclude them from contributing much to a discussion of food access in low-income urban communities. Both stores are located near the western boundary of the city, a low-density, suburban area with very low poverty rates, median household incomes above \$50,000, and vehicle ownership rates above 95%. Neither tract has an overall poverty LQ of more than 0.25, and neither has a White or African American poverty LQ of more than 0.5.

The three store categories that are discussed here are Convenience Stores, Small Grocers, and Supermarkets. Convenience Stores and Small Grocers are the most common types of food retailers located in urban areas and, according to numerous studies cited in the literature review of this thesis, are often the most accessible source of food for low-income communities that do not have access to supermarkets. These store types also provided the most comprehensive data, in terms of food availability, selection, and cost, throughout the course of this research.

Store owners that allowed this survey to be conducted in their establishments were assured that no identifying information would be published, and that all results would remain completely confidential. In accordance with this agreement, stores were divided by type and assigned a letter in place of the business name.

Convenience Stores

Table 4.1 displays the results of surveys conducted at 13 of the 18 Convenience Stores in which surveys were conducted. Stores are represented with letters, underneath which are the census tract in which the store is located and the poverty rate of that tract, followed by the price per pound, quantity, and quality of each item in the store. Five of the stores that were surveyed are not represented in this table. In four, no fresh produce was sold, and in the other one, the store owner was not willing to disclose the cost of his goods. The Cells shaded gray indicate that the item was not available at the time of the survey.

This survey found that Convenience Stores generally sell a line of goods meant for easy transport and quick consumption. All Convenience Stores offered alcoholic beverages, tobacco products, canned foods, frozen meals, soft drinks, candy, and snack foods such as potato chips or packaged baked goods. Most also offered prepared sandwiches, frozen meats, milk, cheese, and assorted fruit cups.

Table 4.1: Cost Per Pound of Survey Items in Convenience Stores

Convenience Stores Census Tract (Poverty Rate)																					
	A 405 (18.2%)			B 709 (26.9%)			C 604 (42%)			D 410 (17.1%)			E 411 (34.7%)			F 412 (40.2%)			G 608 (31.3%)		
	Price	#	Quality	Price	#	Quality	Price	#	Quality	Price	#	Quality	Price	#	Quality	Price	#	Quality	Price	#	Quality
Apples	\$2.37	14	Good				\$1.50	1	Good	\$1.80	30	Good				\$2.97	30	Good			
Bananas	\$2.37	3	Good	\$1.50	5	Fair	\$1.50	15	Fair				\$1.95	14	Good	\$2.97	33	Good	\$2.50	5	Good
Broccoli																					
Cantaloupes																					
Carrots										\$1.99	3.5 lbs.	Good									
Celery																					
Cucumbers	\$1.99	4	Good																		
Grapes	\$4.99	2 lbs.	Good																		
Green Beans																					
Green Peppers	\$2.99	2	Good				\$1.59	15	Poor							\$1.89	2	Poor			
Lettuce										\$3.49	7	Good									
Mushrooms																					
Onions	\$1.49	14	Good				\$1.29	15	Good	\$1.00	8	Good	\$0.99	15	Good	\$0.99	12	Good			
Oranges	\$3.96	10	Good							\$2.40	40	Good	\$3.96	15	Good	\$3.96	20	Good			
Potatoes	\$1.49	8	Good				\$1.29	20	Good	\$1.17	4	Good	\$2.97	20	Good	\$1.33	30	Poor			
Tomatoes	\$2.99	4	Good																		

Table 4.1 Continued

Convenience Stores Census Tract (Poverty Rate)																				
Item	H 607 (48.9%)			I 703 (5.7%)			J 102 (20.9%)			K 402 (45.1%)			L 210 (41.2%)			M 211 (14.7%)			Average Price	
	Price	#	Quality	Price	#	Quality	Price	#	Quality	Price	#	Quality	Price	#	Quality	Price	#	Quality		
Apples	\$2.07	40	Good	\$2.67	12	Good				\$2.73	3	Good				\$2.97	10	Good	\$2.39	
Bananas	\$2.07	2	Good	\$1.47	7	Good	\$2.37	2	Good	\$2.73	2	Poor							\$2.14	
Broccoli																				
Cantaloupes																				
Carrots																			\$1.99	
Celery																				
Cucumbers																			\$1.99	
Grapes				\$5.28	4	Good													\$5.14	
Green Beans																				
Green Peppers													\$6.36	4	Good	\$3.00	8	Good	\$3.16	
Lettuce																\$2.29	1	Good	\$2.89	
Mushrooms																				
Onions													\$0.69	50	Good				\$1.08	
Oranges	\$2.07	80	Good	\$3.56	2	Good													\$3.32	
Potatoes													\$2.07	20	Good				\$1.72	
Tomatoes																\$2.67	15	Good	\$2.83	

In general, Convenience Stores offered a limited selection of one or more types of fruit; bananas were the most widely available item, followed by apples and oranges. Foods that require preparation, especially vegetables, were not as widely available in Convenience Stores. None of the Convenience Stores surveyed in this study offered broccoli, cantaloupes, celery, green beans, or mushrooms. Carrots and cucumbers were found in only one store each, and grapes, lettuce, and tomatoes were sold in only two stores each. Six stores sold onions and potatoes, and five of these six also sold green peppers.

The cost per pound of fresh fruits and vegetables sold in Convenience Stores varied not only by the item, but also by the store. The difference in price per pound of green peppers between stores was the greatest. The lowest price for a pound of green peppers was \$1.59, and the highest was \$6.36; a difference of \$4.77. Apples and bananas varied by \$1.47 per pound between the highest and lowest cost, oranges by \$1.89, and potatoes by \$1.64. Overall, grapes were the most expensive item sold in Convenience Stores, an average of \$5.14 per pound, and onions were the least expensive, with an average price of only \$1.72 per pound.

Quantity, like selection of fresh fruits and vegetables available in Convenience Stores varied widely. Generally, the survey found that stores with a limited selection of produce also offered small quantities of the items available. In most stores, large quantities, typically between 15 and 40 each, of apples, bananas, potatoes, and oranges were available.

The condition of fruit sold in Convenience Stores was generally good. Apples, in all stores in which they were sold, were found to be in good condition, and quantities ranged from one to approximately 45. Bananas were available in all but two stores, in quantities ranging from two to more than 30. In most stores, bananas were in good condition; ripe and attractive. Two stores however, had bananas in fair condition, and in one store both of the two bananas for sale

were in poor condition. Also, the stores demanding the highest prices for bananas were also those in which they were of lower quality. Oranges in all stores appeared to be of good quality. The largest quantity of oranges in one store was nearly 80, and the store with the fewest had only two for sale.

Vegetables were less widely available, and often of lower quality than fruits in Convenience Stores. Carrots, which were sold in only one store, were packaged in half-pound bags. All appeared to be fresh and in good condition. Stores that sold green peppers usually had only a few available. The largest number of green peppers found in any Convenience Store was 15, and the store with the fewest had only two. Lettuce, in both stores in which it was sold, was in good condition. One store had five heads of lettuce for sale, and the other had seven. Potatoes and onions in Convenience Stores were usually displayed in large boxes placed either on a low shelf or on the ground. In most stores the quantities of potatoes and onions exceeded 20. These two items were typically in good condition, with the exception of one store in which the potatoes were refrigerated and completely spoiled. Tomatoes were sold in two stores and were in both cases found to be of good quality. One store had a stock of four tomatoes, and the other had nine.

The Convenience Store with the widest variety of fresh produce for sale was store A, which is located in an area in which the median income is \$44,125 and the poverty rate is 18.2%. In this and other stores with low poverty rates, all food was found to be of good quality. In stores located among higher poverty rates, some items were not as fresh. Stores C, F, and K, all located in tracts with poverty rates above 40%, offered produce of lower quality compared to stores in higher-income areas.

Although prices often varied highly among individual stores, the costs of most items were not found to be significantly different in low-income areas than in wealthy census tracts. Store H,

which is located in the area with the highest poverty rate, tract 607, had prices that hovered around the median. This store did, however, offer a smaller selection than many of the stores in wealthier census tracts. Store F, located near a population of with a poverty rate of 40.2% had the highest prices for the largest number of items. The store that offered consistently lower prices than others was store C, which is located in a higher-poverty area than store F.

Four stores offered no fresh produce at the time this survey was conducted. Each of these stores was located in a different area. One in tract 302, which has a poverty rate of 24%; one in tract 402, in which the poverty rate is 45.1%; one in tract 602, where the poverty rate is 29.5%; and one in tract 207, a tract with a poverty rate of 37.6%.

Although Convenience Stores tend to retail only a limited line of fresh foods, most offer at least a few options for healthy snacks and some very basic staple foods. They do not, however, sell enough produce to be considered an acceptable substitute for a large grocery store or supermarket.

Small Grocery Stores

A total of 10 Small Grocery Stores were surveyed during this study. In order to be classified as a Small Grocer, stores had to retail a line of goods that consisted predominantly of food and food-related items. Small Grocers differ from Supermarkets in both size and selection, and from Convenience Stores in that their line of goods consists primarily of food to be eaten at home, whereas Convenience Stores usually sold only snacks or prepared foods. Table 2 displays the following data, gathered from all Small Grocers: the price and quality of each item in each store, the census tract in which the store was located, and the poverty rate of that census tract.

Table 4.2: Cost Per Pound of Survey Items in Small Grocery Stores

Small Grocery Stores Census Tract (Poverty Rate)																															
	A 104.01 (8%)			B 607 (48.9%)			C 301 (68.1%)			D 207 (37.6%)			E 204 (53.5%)			F 204 (53.5%)			G 505 (7.9%)			H 302 (24%)			I 109 (26%)			J 107 (18.2%)			Average Price
	Price	#	Qual.	Price	#	Qual.	Price	#	Qual.	Price	#	Qual.	Price	#	Qual.	Price	#	Qual.	Price	#	Qual.	Price	#	Qual.	Price	#	Qual.				
Apples	\$1.69	13	Fair	\$2.07	25	Good	\$1.77	2	Fair							\$2.67	15	Fair	\$1.99	20+	Good	\$3.00	20	Good	\$2.37	50+	Good	\$2.67	30+	Good	\$2.28
Bananas													\$1.50	40	Good	\$2.67	6	Good	\$0.69	20+	Good	\$2.07	90+	Poor				\$0.89	21	Good	\$1.56
Broccoli	\$3.69	1	Good																\$1.59	12	Good										\$2.64
Cantaloupes																			\$0.75	30+	Good										\$0.75
Carrots	\$0.89	1 bunch	Good	\$0.99	7 bunch	Good										\$1.69	0	N/A	\$0.89	12 bunch	Good				\$1.15	4 bunch	Good				\$1.12
Celery				\$1.69	6 stalks	Good																		\$1.89	15 stalks	Good	\$1.99	8	Good	\$1.86	
Cucumbers				\$0.79	15	Good													\$1.89	20+	Good				\$0.99	9	Good	\$0.99	3	Good	\$1.17
Grapes				\$2.59	6 lbs.	Good													\$3.50	8 lbs.	Good				\$2.79	5 lbs.	Good				\$2.96
Green Beans																			\$2.99	N/A	Good										\$2.99
Green Peppers	\$2.67	1	Poor	\$1.95	13	Good				\$0.99	3	Good							\$2.07	20+	Good				\$2.29	13	Good	\$2.97	6	Fair	\$2.16
Lettuce	\$1.39	3	Good	\$1.99	8	Good							\$2.29	8	Good	\$2.19	6	Good	\$1.39	11	Good				\$1.89	6	Good	\$2.49	4	Good	\$1.80
Mushrooms																			\$3.58	N/A	Good										\$3.58
Onions										\$0.35	15	Good	\$0.99	40	Good	\$1.29	20	Good	\$1.29	30+	Good	\$1.00	6	Good				\$1.00	50+	Good	\$0.99
Oranges	\$3.56	3	Good	\$3.56	30	Good	\$2.36	3	Good	\$3.16	1	Good				\$4.00	8	Good	\$3.56	50+	Good	\$5.00	40+	Good	\$3.16	30+	Good	\$2.76	20+	Good	\$3.46
Potatoes										\$0.69	6	Good	\$0.99	50	Good	\$0.80	10	Good	\$0.59	30+	Good	\$3.00	8	Good	\$0.60	24	Good	\$1.52	40+	Good	\$1.17
Tomatoes				\$1.19	25	Good				\$0.99	7	Good				\$2.99	9	Good	\$1.49	20+	Good				\$1.99	20+	Good	\$1.69	7	Good	\$1.72

The survey of 10 Small Grocery Stores in Richmond found that although the primary line of goods in each was food, in many cases these stores retailed large quantities of alcoholic beverages, soft drinks, and canned and frozen food, usually with small quantities of fresh produce. The store with the fewest checklist items available offered only two, apples and oranges, while all other stores offered between four and 15. Several Small Grocery Stores included in this survey also featured a deli or hot-food counter at which prepared meals could be ordered. An examination of the ready-to-eat selection in these stores showed that most offered fried foods and starches, with few or no healthy options.

The items most often available in Small Grocery Stores were oranges, available in nine stores, and apples, which were available in eight of the 10 stores surveyed. The rarest items sold in this sample of stores were cantaloupes and mushrooms, each available in only one store. Store G had the largest selection of fresh produce, retailing every item on the list except celery. Store C offered only two fresh options, apples and oranges, but had a large selection of canned goods.

The item with the largest variance in cost across Small Grocery Stores was oranges. The lowest cost of a pound of oranges was \$2.36, while the highest was \$5.00, a price at least \$1.00 higher than was charged in any other store. Oranges also have the highest average price of all items found in more than one store, \$3.46. The item with the lowest variance in price was celery, with a difference of only \$0.30 across three different stores. Other items for which the price varied less than one dollar were carrots, grapes, and onions. The item with the lowest average price, \$0.99 per pound, was onions, which were sold in six of the ten stores surveyed.

Small Grocers, overall, offered a wider variety of fresh fruits and vegetables than Convenience Stores. Every one of the Small Grocers surveyed in this study had at least a few items on the checklist in their store at the time the survey was conducted. Produce in this type of

store was also found to be in good condition, with very few exceptions. These stores also carried larger quantities of produce than Convenience Stores.

Fruits in Small Grocers were generally of good quality and widely available. Apples were widely available, found in eight of the ten stores and usually in quantities greater than 15. One store, though, had just two apples, both of which were only in fair quality. Bananas were rarer among Small Grocers, found in only five of the ten stores. One store had more than 100 bananas for sale, but all were in fair to poor condition. Bananas in other stores were generally available in quantities of more than 20, and all were in good condition. Grapes were generally sold in bunches, but priced by the pound. In the three four in which they were found, all of the 10 or more bunches of grapes in each business were of good quality. The one Small Grocer that sold cantaloupes had a large selection of them and all were in good condition. Oranges were available in the greatest number of Small Grocery Stores. Most were priced individually instead of by weight, which led to a higher cost per pound. All oranges were in good condition, and only three of the nine stores in which they were sold had a quantity of less than 20. The store with the fewest oranges had only one, while the store with the largest quantity had over 40.

Vegetables in Small Grocers, with only two exceptions, were found to be in good condition. Potatoes and onions were generally found in boxes of more than 30. Only one store had a small selection of onions, only six. Potatoes were widely available, usually in large quantities. There were two exceptions, stores D and H, one of which had only eight, and the other only six. Tomatoes were available in six of the ten stores, but only stores B,G, and I had more than 20 for sale; all others had between seven and 10 available. All tomatoes found in Small Grocers appeared to be of good quality. Broccoli, celery, green beans, and mushrooms were the items least frequently available in Small Grocers. Mushrooms were sold in only one

store; fresh but packaged in Styrofoam and wrapped in plastic. They appeared fresh and high in quality, and more than 10 packages of mushrooms were available. Green beans were also sold in just one of the ten stores. Priced by weight, and with what appeared to be several pounds available, green beans were of good quality and unpackaged. Broccoli was sold in two Small Grocery Stores. One store had a large selection of broccoli that was fresh and attractive, sure signs of a high quality product. The other store had only one stalk of broccoli, but it appeared to be in good condition. Lettuce and tomatoes were available in four stores; lettuce in quantities ranging from one to more than 15 and tomatoes in quantities of seven to more than 30.

The Small Grocer with the largest selection was store G, located in census tract 505, which has a poverty rate of only 7.9%. Two other stores, I and J, with large selections were also located in tracts with relatively low poverty rates. All items in these three stores were found to be in good condition. Store G offered the lowest price per pound on bananas, broccoli, and carrots, but the highest price for a pound of cucumbers, grapes, and onions. Store I had the lowest price for a pound of potatoes, and store J charged the highest cost per pound for celery, green peppers, and lettuce.

The store with the smallest selection was store C, located near a population with a poverty rate of 68.1%, the highest rate of poverty of all census tracts in which Small Grocers were surveyed. This store had the lowest price for a pound of oranges, and the price of apples was only three cents higher than the lowest price found in any other store.

Stores E, D, and H had four to five items on the survey checklist. Store E is located in a high-poverty census tract (53.5%), and although none of the items were the most expensive found among stores, most of its food was priced on the higher end. The poverty rate around store D is significant as well, 37.6%. This store had the lowest price per pound for green peppers,

onions, and tomatoes. The census tract in which store H is located has a lower poverty rate than the other two, only 24%. Store H had the highest price per pound for apples, oranges, and potatoes.

Overall, Small Grocery Stores surveyed in this study usually offered a good variety of good quality, fresh produce. While the availability of checklist items was better in most cases than that in Convenience Stores, most Small Grocers had less than 10 types of fresh produce. These stores offer more than just ready to eat snacks, but usually not enough produce to design and maintain a healthy diet.

Supermarkets

Supermarkets, for the purposes of this study, were defined as stores that offered a large selection of food products, including fresh, canned, and frozen produce, meat, poultry, dairy, fish, eggs, cereal, and other staple and non-staple foods. To be included in the Supermarkets category, stores also had to be larger than 15,000 square feet, and have an on-site parking lot covering more than 40,000 square feet. These qualifications were developed to ensure that there was no overlap or possibility of uncertainty in distinguishing the differences between Supermarkets and Small Grocers. Although some Small Grocers sold large quantities of fresh produce, they did not meet the size requirements for store or parking lot size, and were typically corner stores, located in walkable neighborhoods rather than on large lots, and served primarily local residents rather than large communities.

Seven Supermarkets were surveyed in this study. Effort was made to ensure that at least one store operated by each company in Richmond, including those that are independently owned, was surveyed.

Many companies have “Frequent Shopper” or “VIP” discounts for cardholders, but do not extend those lower prices to people without a program membership. Also, it was discovered that Supermarkets often offer “two for the price of one” deals, or bulk discounts on products they hope to sell quickly. In surveying Supermarkets, the price recorded on the checklist was the non-sale, non-discounted price of items; the maximum price that would be paid by any shopper on any day, regardless of club membership or ability to buy in bulk. Table 4.3 displays the following information of all surveys conducted in Supermarkets: the price and quality of each item in each store, the census tract in which the store was located, and the poverty rate of that census tract.

Table 4.3: Cost Per Pound of Survey Items in Supermarkets

Supermarkets Census Tract (Poverty Rate)															
	A		B		C		D*		E*		F*		G*		Average Price
	608 (31.3%)		205 (20.9%)		201 (73.6%)		408 (21.8%)		408 (21.8%)		704 (4.2%)		704 (4.2%)		
	Price	Quality	Price	Quality	Price	Quality	Price	Quality	Price	Quality	Price	Quality	Price	Quality	
Apples	\$1.49	Good	\$1.84	Good	\$3.49	Good	\$1.69	Good	\$1.79	Good	\$1.79	Good	\$1.79	Good	\$1.98
Bananas	\$0.69	Good	\$0.54	Good	\$0.89	Good	\$0.59	Good	\$0.59	Good	\$0.49	Good	\$0.49	Good	\$0.61
Broccoli	\$1.49	Good	\$2.99	Good			\$1.99	Good	\$1.43	Good	\$1.99	Good	\$2.29	Good	\$2.03
Cantaloupes	\$0.50	Good	\$0.63	Good			\$1.00	Good	\$2.48	Good	\$1.00	Good	\$0.50	Good	\$1.02
Carrots	\$0.99	Good	\$2.79	Good	\$1.59	Good	\$0.99	Good	\$0.99	Good	\$0.99	Good	\$0.89	Good	\$1.32
Celery			\$1.69	Good			\$1.99	Good	\$2.29	Good	\$5.00	Good	\$1.38	Good	\$2.47
Cucumbers	\$0.50	Poor	\$0.89	Good	\$0.79	Good	\$0.99	Good	\$0.78	Good	\$0.99	Good	\$0.72	Good	\$0.81
Grapes	\$1.59	Good	\$2.49	Good	\$2.49	Good	\$3.99	Good	\$1.99	Good	\$3.99	Good	\$2.49	Good	\$2.72
Green Beans			\$1.69	Good			\$1.99	Good	\$1.99	Good	\$1.99	Good	\$2.06	Good	\$1.94
Green Peppers	\$2.00	Poor	\$2.67	Good	\$2.37	Good	\$3.87	Good	\$2.37	Good	\$3.87	Good	\$5.37	Good	\$3.75
Lettuce	\$1.39	Fair	\$1.29	Good	\$1.99	Good	\$1.69	Good	\$1.59	Good	\$2.99	Good	\$1.27	Good	\$1.74
Mushrooms			\$2.99	Good			\$3.98	Good	\$4.00	Good	\$3.98	Good	\$3.40	Good	\$3.67
Onions	\$0.66	Good	\$0.66	Good	\$1.00	Good	\$1.69	Good	\$1.79	Good	\$1.69	Good	\$0.98	Good	\$1.21
Oranges	\$3.00	Good	\$3.49	Good	\$3.96	Good	\$3.00	Fair	\$2.36	Good	\$6.00	Good	\$2.00	Good	\$3.40
Potatoes	\$0.50	Good	\$0.40	Good	\$2.97	Good	\$1.49	Good	\$1.00	Good	\$1.49	Good	\$0.99	Good	\$1.26
Tomatoes	\$1.09	Good	\$1.49	Good	\$0.99	Good	\$1.79	Good	\$1.79	Good	\$2.99	Good	\$1.78	Good	\$1.70

* Denotes a supermarket that offered a club-membership discount on certain items.

This survey found that all Supermarkets sold at least 11 of the 16 items on the checklist, and four stores sold every item. The foods available in every store were apples, bananas, carrots,

cucumbers, grapes, lettuce, onions, oranges, potatoes, and tomatoes. Four items, fresh mushrooms (whole or sliced), broccoli, and green beans were the least available, each offered in only five of the seven stores. Only one store did not sell cantaloupes. Because all supermarkets sold large quantities of items, 15 or more of each in all cases, quantity was not recorded.

Among Supermarkets, the item for which the price per pound varied the most was oranges. The highest cost of one pound of oranges was \$6.00, whereas the lowest price was only \$2.00. Other large disparities found among items across different Supermarkets were celery, for which the difference between highest and lowest cost was \$3.62, and green peppers, with a price difference of \$3.37 per pound. The lowest cost difference was for a pound of green beans, which sold for between \$1.69 and \$2.06, a deviation of only 37 cents. Bananas were similarly priced across separate stores as well, with a difference of only \$0.40.

On average, a pound of bananas was available for the lowest price, \$0.61. Cucumbers were only slightly more expensive, at an average cost of \$0.81 per pound. The items for which the highest prices per pound were charged were mushrooms, at \$3.67; oranges, which sold for \$3.40; and green peppers, at an average price of \$3.75.

Neither store A nor store C, the only two stores that did not sell every item on the checklist, are branches of a major corporation. All of the other Supermarkets that were surveyed are owned by companies that operate many stores around the region or nation.

Store A is located in tract 608, which has a poverty rate of 31.3%. This store had the lowest price per pound of seven items on the checklist; apples, broccoli, cantaloupes, cucumbers, grapes, green peppers, and onions. Store A is also the store in which the largest number of items were in less than good condition; cucumbers and green peppers were of poor quality, and lettuce was only rated fair.

Store C is located in the tract (201) with the highest rate of poverty, 73.6%. In this store, apples, bananas, carrots, and potatoes were priced highest among all Supermarkets. Prices for other items were generally close to the median. Although store C sold only 12 of the items on the survey, all food was in good condition.

Stores F and G are located in tract 704, the tract with the lowest poverty rate among those in which Small Grocers were surveyed. Store F had the highest prices for celery, cucumbers (same price as store D), grapes (also the same as store D), lettuce, oranges, and tomatoes. This store had the lowest price per pound of only one item, bananas, a price that was matched by store G. Store G also had the lowest prices on cantaloupes (same as store A), carrots, celery, lettuce, and oranges.

Supermarkets, as expected based on the literature and general nature of this type of store, had the largest quantities of fresh food available for purchase. Also, food in Supermarkets was generally found to be of the best quality; better than what was available in the other store types included in this discussion.

Average Price Comparison

Many studies report that low-income shoppers that rely on convenience stores and small grocers for fresh produce end up spending more money on food of lower quality (Clifton 2004, Stracuzzi and Ward 2010). The literature does not, however, present the kinds of food found in different stores, nor does it discuss to what extent food prices vary. This study intended to find out if price disparities did exist, how great those disparities actually were, and for which types of food they typically occurred. Table 4, displays the average prices of all items on the survey instrument as found in 13 Convenience Stores, 10 Small Grocers and seven Supermarkets in Richmond, Virginia.

Through surveys of 30 stores, it was discovered that Supermarkets did not have the lowest average prices on all items. Table 4.4, which displays the average price per pound of each item in each store type, are referenced throughout the following discussion; all prices compared are the average price of each item, not individual prices of items.

Table 4.4: Average Price of Survey Items in All Stores

Average Price Per Pound of All Items In All Stores			
	Convenience Stores	Small Grocery Stores	Supermarkets
Apples	\$2.39	\$2.28	\$1.98
Bananas	\$2.14	\$1.56	\$0.61
Broccoli		\$2.64	\$2.03
Cantaloupes		\$0.75	\$1.02
Carrots	\$1.99	\$1.12	\$1.32
Celery		\$1.86	\$2.47
Cucumbers	\$1.99	\$1.17	\$0.81
Grapes	\$5.14	\$2.96	\$2.72
Green Beans		\$2.99	\$1.94
Green Peppers	\$3.16	\$2.16	\$3.75
Lettuce	\$2.89	\$1.80	\$1.74
Mushrooms		\$3.58	\$3.67
Onions	\$1.08	\$0.99	\$1.21
Oranges	\$3.32	\$3.46	\$3.40
Potatoes	\$1.72	\$1.17	\$1.26
Tomatoes	\$2.83	\$1.72	\$1.70

Supermarkets, at the time this research was conducted, had the lowest average cost per pound for apples (\$1.98), bananas (\$0.61), broccoli (\$2.03), cucumbers (\$0.81), grapes (\$2.72), green beans (\$1.94), and tomatoes (\$1.70), and the lowest cost for a head of lettuce (\$1.74). Two items, however, were found to be more expensive in Supermarkets than in both Convenience Stores and Small Grocers. The average cost of pound of green peppers in Supermarkets was \$3.75 and a pound of onions cost an average of \$1.21. Prices for the rest of the items in the

Supermarket survey, carrots, celery, oranges and potatoes, were found to be the median asking price of the three categories.

It is important to note that broccoli and green beans were only sold in two Small Grocers, and cantaloupes and mushrooms were only found in one Small Grocery Store each; none of these four items were found in any convenience stores. Because of the limited frequency of which this items were found in other store types, and the limited number of stores in which this survey was conducted, it may be inaccurate to say that these products are more affordable in Supermarkets than in other stores.

Small Grocers charged the lowest price per pound for carrots (\$1.12), celery (\$1.86), green peppers (\$2.16), onions (\$0.99), and potatoes (\$1.17). Cantaloupes and mushrooms were also priced lower in Small Grocers than Supermarkets, but as mentioned previously, similar differences in price may not found if a larger sample of stores had been surveyed. Small Grocers, on average charged the highest price per pound for only one out of all 16 items on the survey. The average price of a pound of oranges in Small Grocery Stores was \$3.46, only six cents higher than in Supermarkets, and only 14 cents higher than in Convenience Stores.

Convenience Stores charged the highest price for the greatest number of items in the survey, and the lowest price for only one item. On average, a pound of oranges, \$3.32, cost less in Convenience Stores than in any of the other store types, but only by 10 to 14 cents. Apples, which were sold in nine Convenience Stores were priced, on average, 11 cents higher per pound than in Small Grocery Stores, and 41 cents higher than in Supermarkets. Bananas, sold in 11 out of 14 Convenience Stores, cost \$0.58 more than in Small Grocers and \$1.53 more than in Supermarkets. Potatoes were found in six of the 14 Convenience Stores and cost an average of

\$1.72 per pound; 55 cents more than in Small Grocery Stores and 46 cents more than in Supermarkets.

Carrots, cucumbers, grapes, lettuce, and tomatoes in Convenience Stores also cost more per pound than those found in Small Grocers or Supermarkets. Carrots and cucumbers were found in only one Convenience Store each, both \$1.99 per pound. Carrots, in that store, cost \$0.67 more per pound than the average price found in Supermarkets, and \$0.87 more than in Small Grocers. A pound of cucumbers, in the one Convenience Store in which they were sold, was priced \$1.18 higher than the average price found in Supermarkets, and \$0.82 higher than the average cost in Small Grocers, \$1.17. Grapes were the most expensive sold in Convenience Stores, with an average rate of \$5.14 per pound. Although they were sold in only two stores in this category, the average price was \$2.72 higher than grapes sold in Supermarkets, and \$2.18 higher than those sold in Small Grocery Stores. Lettuce, at an average price of \$2.89 per head was sold in only two Convenience Stores, but for over \$1.00 more than in Supermarkets (\$1.74 each) and Small Grocers (\$1.80 each). Tomatoes were also far more expensive in Convenience Stores than in Small Grocers or Supermarkets. At an average rate of \$2.83 per pound, tomatoes were priced \$1.11 higher than in Small Grocers and \$1.13 higher than in Supermarkets.

Summary

Although the literature reports that convenience stores and small grocers usually sell produce of lower quality than supermarkets, this is not necessarily the case in Richmond. The average prices of three items in supermarkets in Richmond were found to be higher than in both small grocers and convenience stores, but the average price of most items sold in convenience stores was the highest among all store types.

Small grocers and convenience stores generally offered large quantities of basic foods such as potatoes, onions, apples, bananas, and oranges, but very few stores sold other items in large quantities. It was found that supermarkets, across the board, had a much wider variety of produce for sale. All of the 10 corporate supermarkets sold all staple foods, and the two independent supermarkets sold most of them. Convenience stores had the smallest selection of fresh produce, and several sold no fresh fruits or vegetables. Small grocers, in general had a wider variety of foods than convenience stores, but most did not sell enough different types of produce to design and maintain a healthy diet.

Store Location Analysis

The demographic and socioeconomic analysis presented earlier in this study identified areas and populations in Richmond in which indicators of food insecurity were most prominent. The section that followed discussed the results of a survey conducted in stores various types to determine whether supermarkets, as the literature reports, offered the largest selections of high-quality produce at the lower cost. This final analysis builds on the foundation provided by the previous two by illustrating the locations of convenience stores, small grocers and supermarkets in relation to areas that displayed high rates of demographic and socioeconomic indicators common among food-insecure communities. Because low-income communities, areas with large minority populations, and single mother family households are often believed to be the most vulnerable to food insecurity, this analysis will focus on the tracts in which those traits are most abundant.

All Stores

During the course of this research, 236 stores in Richmond that sold food were identified.

Figure 4.16 illustrates the spatial distribution of all stores, as well as the number of the census tract in which they are located.

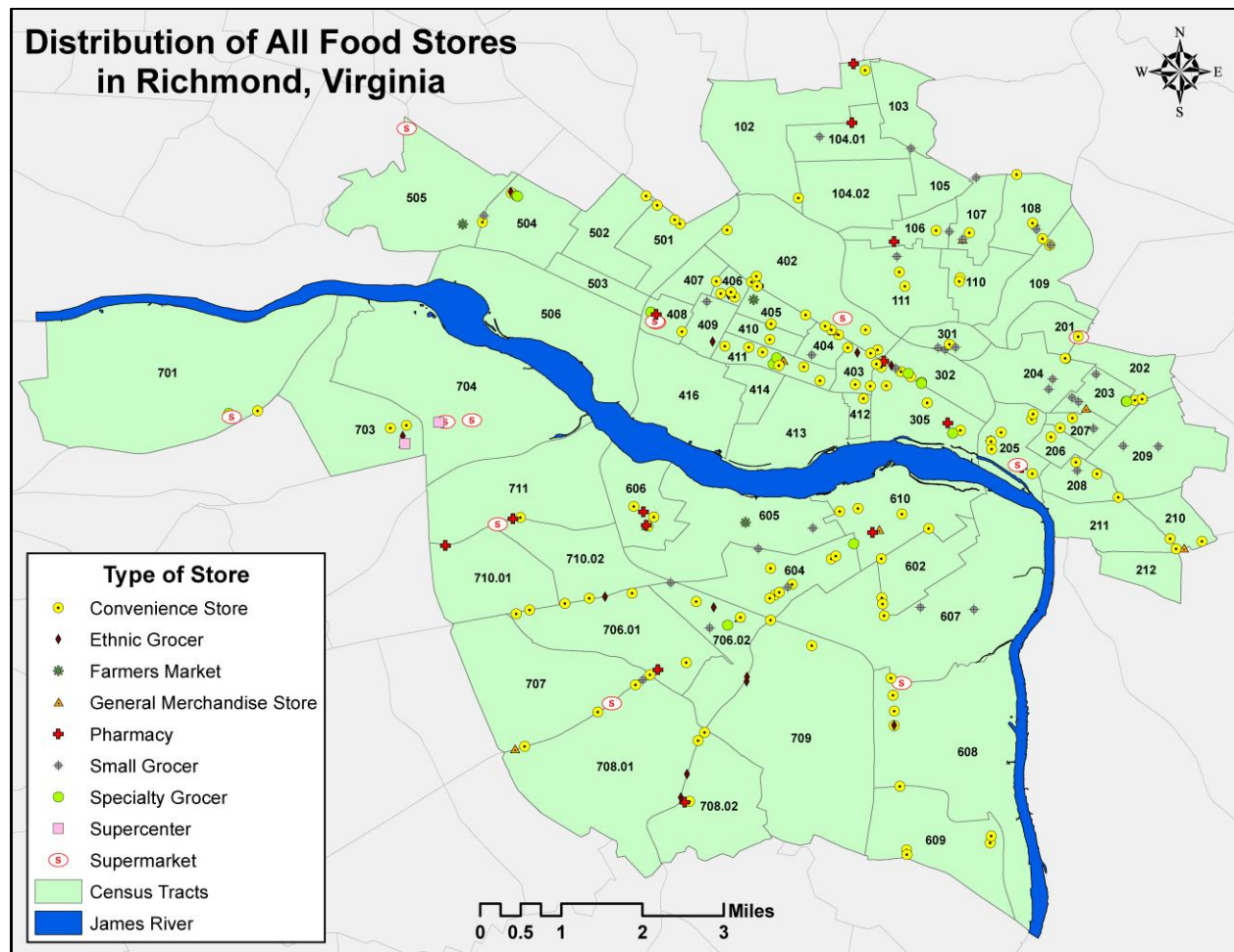


Figure 4.16: All Food Stores in Richmond

Figure 4.16 displays all nine types of food retailers found in the city of Richmond, however, this discussion will focus on only three; convenience stores, small grocers, and supermarkets; as these are the types discussed in the results of the food availability survey. These are also the three types of stores most commonly found in dense, urban areas, and those to which the literature devotes the majority of its attention.

Because they tend to serve only small neighborhoods, the analyses of the locations of convenience stores and small grocers will discuss the characteristics of the populations found only in the census tracts in very close proximity to stores. The discussion of supermarkets, however, will examine the total population surrounding stores; trends in income, race, and other household characteristics that are found within a one- and two-mile radius of each.

Convenience Stores

Convenience stores are found in 51 of the 66 census tracts in Richmond. Many tracts have only one or two within their boundaries, however some of the larger tracts encompass as many as 10. South of the river, stores are primarily found along major roads. Only one convenience store, located in tract 709, is farther than one-quarter mile from a bus stop. Figure 4.17 shows the spatial distribution of convenience stores in Richmond.

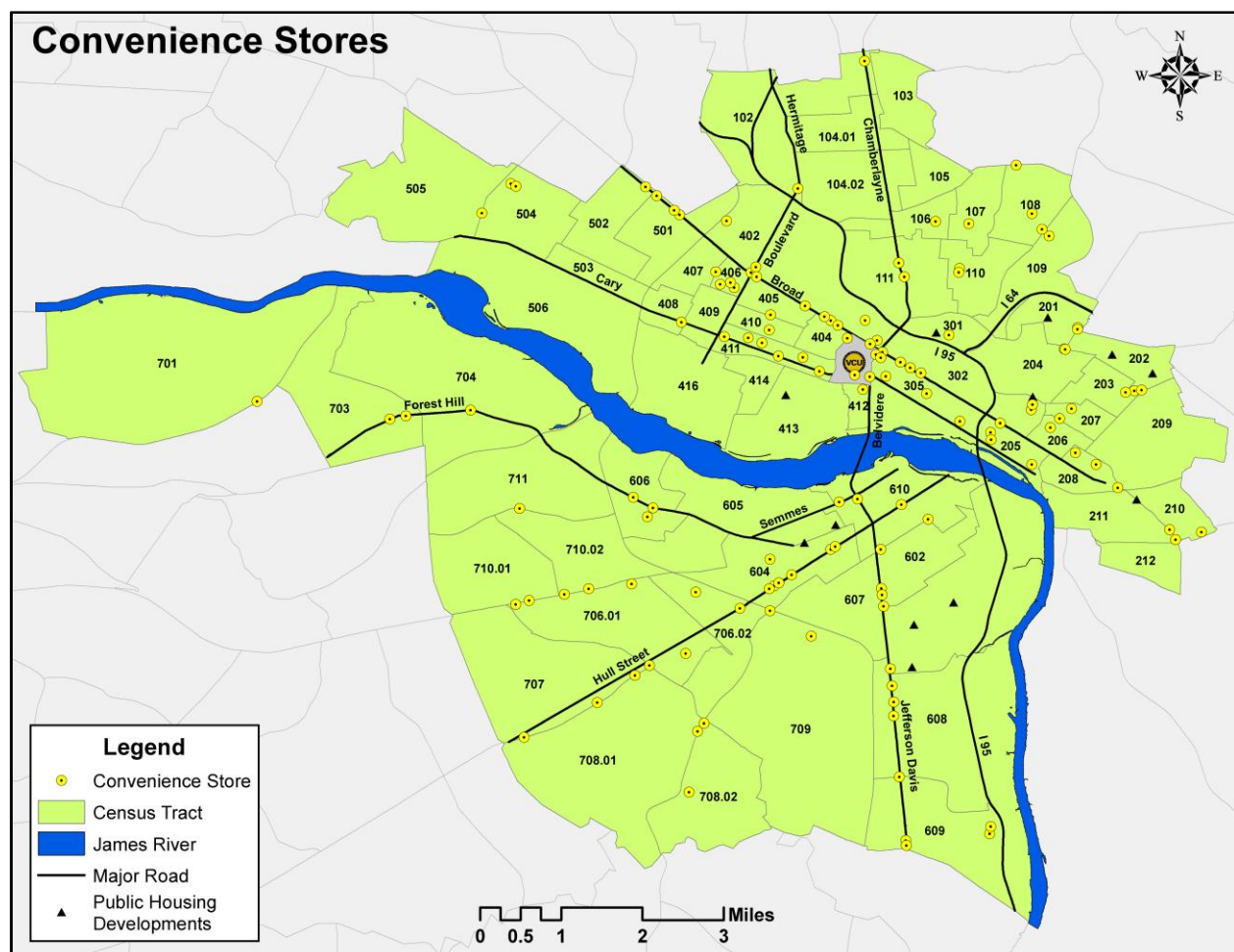


Figure 4.17: Convenience Stores

Although convenience stores tend to be placed along major thoroughfares, many located north of the James River are also found in densely populated neighborhoods. Twenty-seven stores are located within one mile of Virginia Commonwealth University, and several more in the neighborhoods nearby.

In the seven census tracts in which less than 20% of households are considered low-income, there are 12 convenience stores; five of these tracts have none at all. Of the other 117 stores, 80 are located in census tracts in which more than 50% of the population lives in low-income households, and 42 are placed in, or along the border of, tracts in which poverty rates are high.

In relation to demographic population traits, 62 convenience stores are located in, or along the border of, tracts in which African Americans comprise more than 50% of the population. Eleven convenience stores are located in tracts with African American poverty rates above 50%, and 47 are found in tracts in which the proportion of single mother families is above 50%.

Small Grocery Stores

Richmond has 34 small grocery stores operating within its boundaries, located in 23 census tracts. Twenty six are found north of the river, and eight to the south. The majority of all small grocers in the city are grouped in the northeastern region. Only one small grocery store, located in tract 607, south of the river is farther than walking distance from a bus stop. Figure 4.18 shows the distribution of small grocery stores by census tract.

Only three of the 34 total small grocers are placed in tracts where less than 25% of residents have low levels of income, one in the northwest, one in the east, and one near the northern boundary of the city.

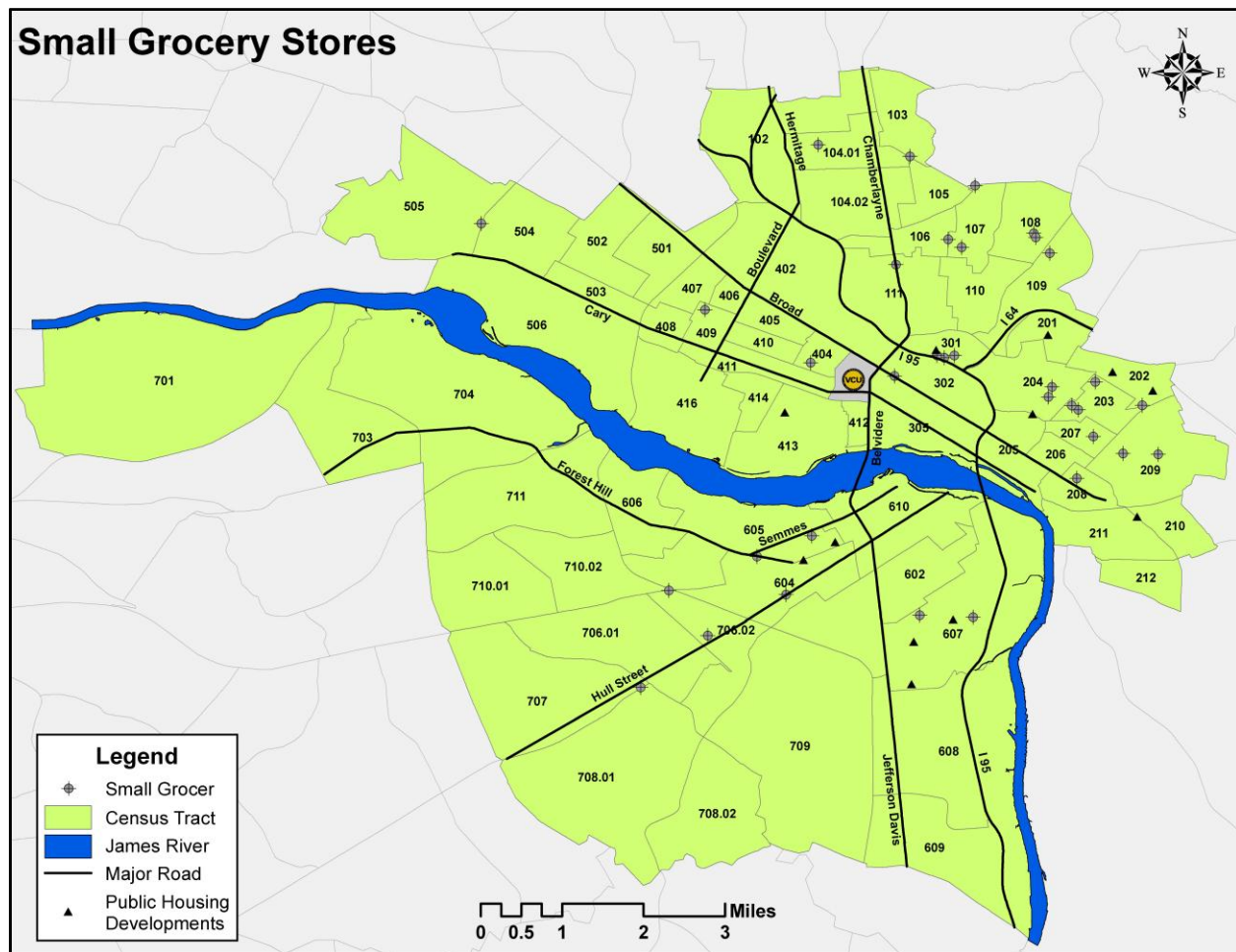


Figure 4.18: Small Grocery Stores

South of the James River, six of the eight small grocers are located in tracts in which more than 50% of the population is considered low-income; four of these are located in high-poverty census tracts. Tract 607, which has an African American poverty rate of 46.4%, as well as three public housing developments has two grocery stores. Both stores are less than one-half mile from the largest public housing development south of the river. Half of all stores south of the river are also located in tracts in which the proportion of single mother families is more than 60%.

Census tracts with a low-income majority and a high proportion of single mother families are home to 14 out of the 26 small grocers located north of the river. Eight of these are found in,

or very near high-poverty tracts, and four more are found in tracts with poverty rates above 35%. These same tracts, clustered in the central northeastern region of Richmond are also home to a population in which more than 35% of African Americans live in poverty. 20 small grocers are found in tracts in which more than 50% of families are headed by single mothers.

There are no small grocery stores in tract 201, which has the second highest rate of African American poverty in Richmond, as well as a public housing development with nearly 450 units. In nearby tract 301, however, there are three small grocers within one-quarter mile of the largest public housing development in the city. There are four other tracts with high rates of African American poverty in Richmond. Three of these are home to one small grocery store each, and one has no stores of this type.

Supermarkets

Convenience stores and small grocers tend to serve only the population that lives within a few blocks of them. Supermarkets, however, draw from a larger community. For this reason, the bulk of the evaluation of demographic and socioeconomic population characteristics will consider the population in census tracts whose centroid falls within a two mile radius of each supermarket.

This portion of the study will discuss several demographic and socioeconomic characteristics of the populations found near these stores, including the total population of all blocks located within one- and two-mile radii of the store and the number of RRHA public housing developments within one and two mile radii of the store.

Previous studies have reported that households in minority and low-income communities, households with no vehicle access, and single mother families exhibit the highest rate of food insecurity (USDA 2009, Ruel, et al. 1998). Having already presented an in-depth analysis of the

socioeconomic and demographic traits of Richmond's population, the following discussion will briefly note the following characteristics of the population found within a two-mile radius of each store: the proportion of the population made up of African Americans, the proportion of residents living in low-income households, the overall poverty rate within the buffer area, the poverty rate among African American residents, the percentage of households that do not own a vehicle, and the proportion of single mother family households. Figure 4.19 shows all supermarkets in Richmond, along with census tract numbers and store identifiers to provide reference points.

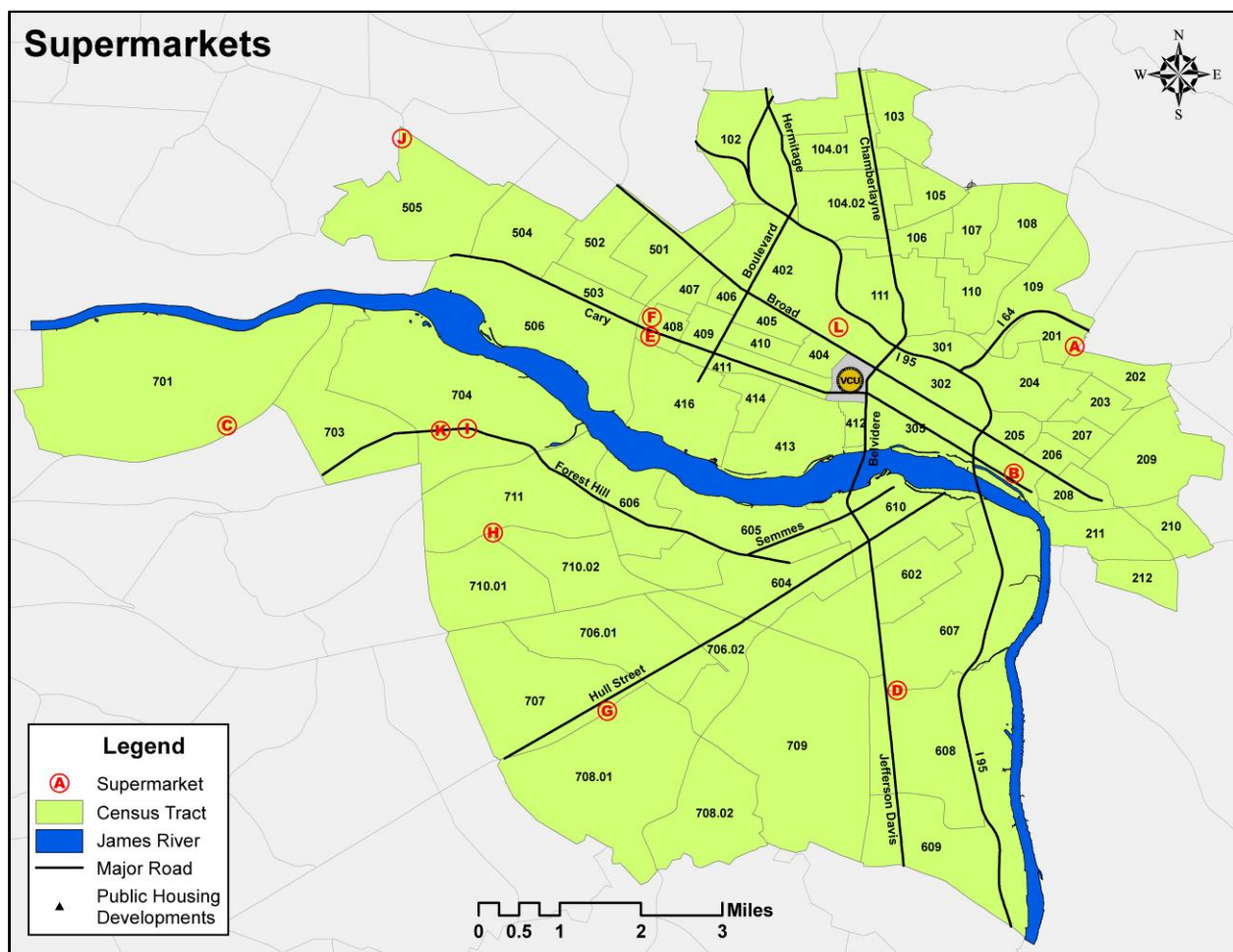


Figure 4.19: Supermarkets

In Richmond, Virginia there are 12 supermarkets. Figure 4.19 displays these stores, each represented with a letter in place of the name of the store. Stores A and D are both independently owned, while stores all others are operated by multi-store corporations. The company with the largest number of stores in Richmond owns stores C, F, J, and K. Another corporation owns stores E and L; and a third owns stores H and I. Store B is also operated by a multi-store corporation, but it is the only branch located in Richmond city. It is also important to note that the symbols for stores E and F, both located in census tract 408, have been moved slightly to prevent overlap in illustrating the locations of these stores.

Although the city of Richmond is the primary focus of this study, several of the supermarkets are placed near the city's boundary. To provide an effective analysis of all demographic and socioeconomic characteristics surrounding each supermarket, the following discussions will include census tract and block-level population data from the portions of Chesterfield County (CC), Henrico County (HC), and Richmond (RVA) that fall within the one- and two-mile buffer areas around each store. Figures 4.20 and 4.21 show the one- and two-mile buffers around supermarkets in Richmond, and table 4.5 displays characteristics of the population that fall within these buffers.

Figure 4.20: One Mile Buffer around Supermarkets

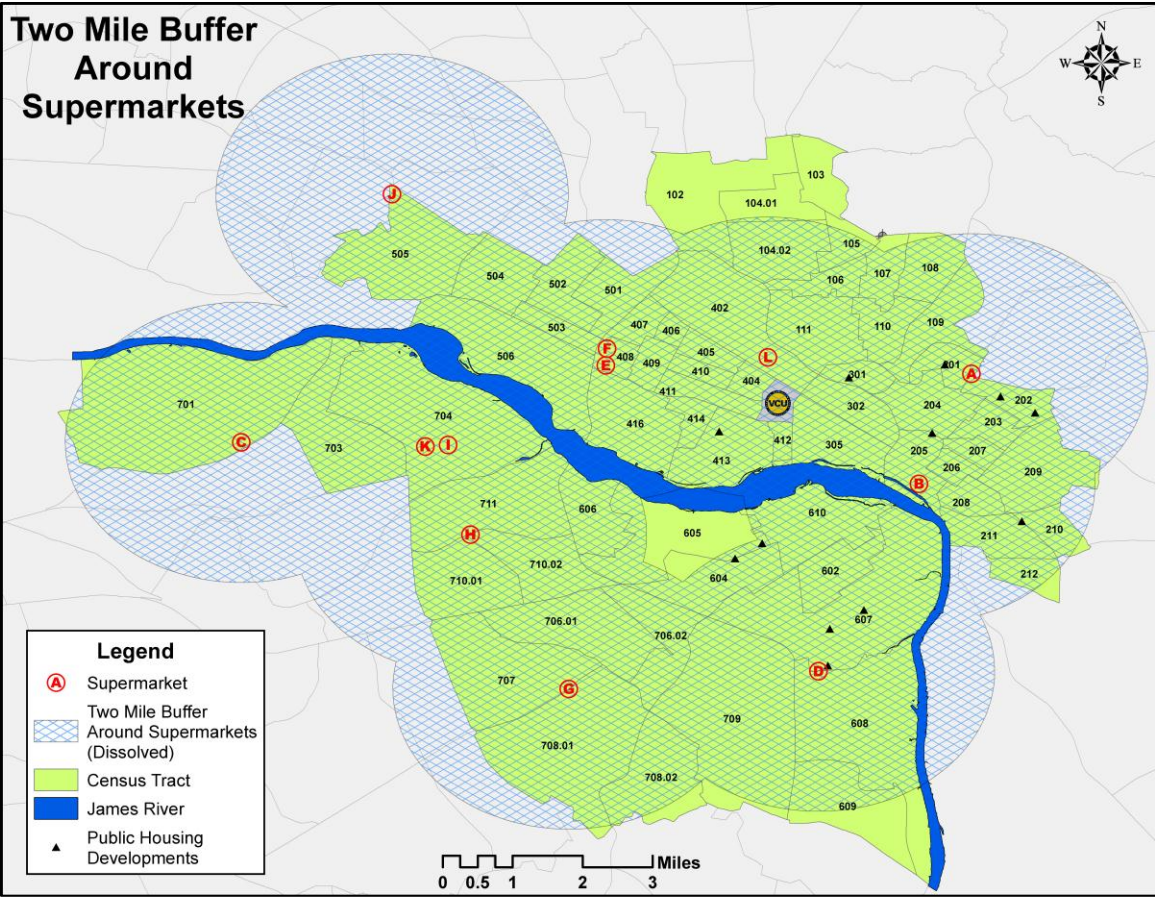
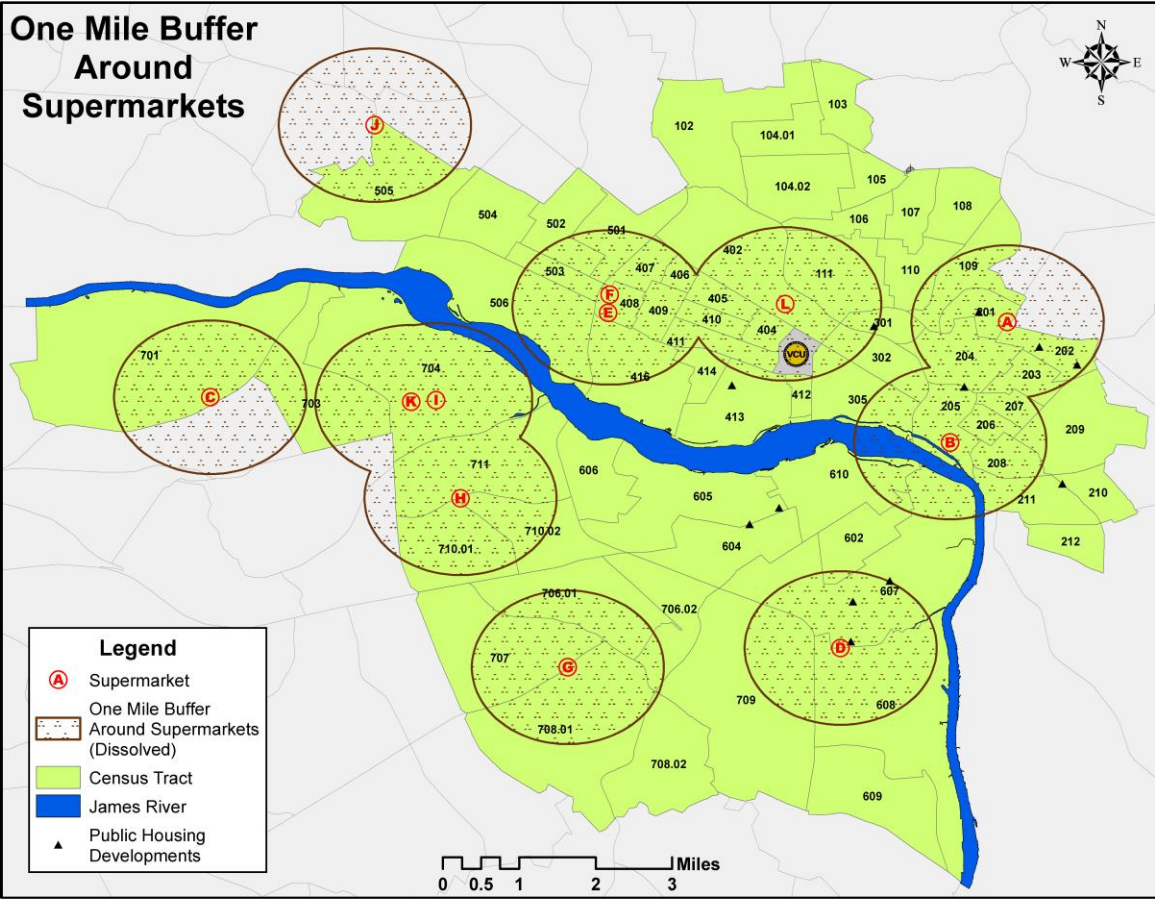


Figure 4.21: Two-Mile Buffer around Supermarkets

Table 4.5: Summary of Populations Surrounding Supermarkets

	Store A			Store B			Store C			Store D			Store E			Store F		
	Tract 201			Tract 206			Tract 701			Tract 608			Tract 408			Tract 408		
	HC	RVA	Sum	HC	RVA	Sum	CC	RVA	Sum	HC	RVA	Sum	HC	RVA	Sum	HC	RVA	Sum
Total Population Within One Mile	2,158	13,592	15,750	0	11,115	11,115	7,337	2,891	10,228	0	7,072	7,072	0	17,358	17,358	0	17,124	17,124
Total Population Within Two Miles	10,721	44,554	55,275	1,769	47,776	49,545	18,232	9,442	27,674	63	25,440	25,503	475	44,946	45,421	475	44,908	45,383
Public Housing Developments Within One Mile		4	4		1	1		0	0		2	2		0	0		0	0
Public Housing Units Within One Mile		1,856	1,856		458	458		0	0		50	50		0	0		0	0
Public Housing Developments Within Two Miles		5	5		8	8		0	0		5	5		1	1		1	1
Public Housing Units Within Two Miles		2,639	2,639		3,135	3,135		0	0		500	500		52	52		52	52
Population Characteristics of All Census Tracts Within Two-Mile Radius of Supermarket																		
Total Population All Tracts	8,949	46,023	54,972	0	52,009	52,009	13,179	8,116	21,295	4,916	26,165	31,081	3,311	44,451	47,762	3,311	44,451	47,762
Total African Americans	7,784	34,339	42,123	0	34,353	34,353	1,189	2,134	3,323	1,929	20,289	22,218	261	8,178	8,439	261	8,178	8,439
Proportion African Americans			76.6%			66.1%			15.6%			71.5%			17.7%			17.7%
Population for Whom Poverty Status is Determined	8,433	42,160	50,593	0	44,119	44,119	12,924	7,449	20,373	5,082	25,910	30,992	2,970	42,283	45,253	2,970	42,283	45,253
African American Population for Whom Poverty Status is Determined	7,466	32,189	39,655	0	30,977	30,977	988	1,979	2,967	2,153	20,652	22,805	115	7,191	7,306	115	7,191	7,306
Total African Americans in Poverty	799	11,651	12,450	0	14,020	14,020	161	190	351	0	7,166	7,166	0	2,264	2,264		2,264	2,264
Proportion African Americans in Poverty			31.4%			45.3%			11.8%			31.4%			31.0%			31.0%
Total Low-Income Residents	2,526	24,361	26,887	0	27,804	27,804	2,353	1,212	3,565	749	15,639	16,388	599	15,809	16,408	599	15,809	16,408
Proportion Low-Income Residents			53.1%			63.0%			17.5%			52.9%			36.3%			36.3%
Total Below Poverty	1,027	14,786	15,813	0	18,351	18,351	958	415	1,373	63	8,914	8,977	282	9,598	9,880	282	9,598	9,880
Proportion Below Poverty			31.3%			41.6%			6.7%			29.0%			21.8%			21.8%
Total Households for Which Vehicle Ownership was Measured	3,495	17,846	21,341	0	18,862	18,862	5,357	3,553	8,910	1,967	9,520	11,487	1,383	20,569	21,952	1,383	20,569	21,952
Total Households That Do Not Own a Vehicle	235	5,997	6,232	0	6,138	6,138	37	119	156	36	1,858	1,894	73	2,376	2,449	73	2,376	2,449
Proportion of Households That Own a Vehicle			70.8%			67.5%			98.2%			83.5%			88.8%			88.8%
Total Family Households With Children	1,226	4,829	6,055	0	5,441	5,441	1,690	747	2,437	561	3,587	4,148	318	2,903	3,221	318	2,903	3,221
Total Single Mother Family Households	617	3,042	3,659	0	3,543	3,543	322	155	477	94	1,996	2,090	56	648	704	56	648	704
Proportion of Single Mother Families			60.4%			65.1%			19.6%			50.4%			21.9%			21.9%

Table 4.5 Continued: Summary of Populations Surrounding Supermarkets

	Store G			Store H			Store I				Store J			Store K				Store L	
	Tract 707			Tract 710.02			Tract 704				Tract 505			Tract 704				Tract 402	
	CC	RVA	Sum	CC	RVA	Sum	CC	HC	RVA	Sum	HC	RVA	Sum	CC	HC	RVA	Sum	RVA	Sum
Total Population Within One Mile	0	11,463	11,463	0	12,075	12,075	0	0	4,558	4,558	8,999	2,921	11,920	0	0	5,783	5,783	27,331	27,331
Total Population Within Two Miles	480	35,570	36,050	35	27,780	27,815	1,247	12	23,213	24,472	25,930	8,085	34,015	2,796	12	19,819	22,627	66,544	66,544
Public Housing Developments Within One Mile		0	0		0	0			0	0		0	0			0	0	1	1
Public Housing Units Within One Mile		0	0		0	0			0	0		0	0			0	0	783	783
Public Housing Developments Within Two Miles		0	0		0	0			0	0		0	0			0	0	2	2
Public Housing Units Within Two Miles		0	0		0	0			0	0		0	0			0	0	835	835
Population Characteristics of All Census Tracts Within Two-Mile Radius of Supermarket																			
Total Population All Tracts	8,915	38,189	47,104	5,250	30,375	35,625	20,523	2,688	22,326	45,537	28,998	8,346	37,344	3,010	2,688	19,910	25,608	64,013	64,013
Total African Americans	4,385	24,267	28,652	1,067	14,508	15,575	8,675	14	8,420	17,109	2,590	454	3,044	255	14	8,097	8,366	27,626	27,626
Proportion African Americans			60.8%			43.7%				37.6%			8.2%				32.7%		43.2%
Population for Whom Poverty Status is Determined	8,917	38,756	47,673	5,288	30,531	35,819	16,778	2,643	21,703	41,124	26,894	5,711	32,605	2,932	2,643	19,523	25,098	59,730	59,730
African American Population for Whom Poverty Status is Determined	4,842	25,125	29,967	654	14,974	15,628	5,188	56	7,738	12,982	2,631	148	2,779	62	56	7,501	7,619	25,671	25,671
Total African Americans in Poverty	631	5,229	5,860	111	2,657	2,768	293	30	1,652	1,975	655	50	705	0	30	1,652	1,682	8,411	8,411
Proportion African Americans in Poverty			19.6%			17.7%				15.2%			25.4%				22.1%		32.8%
Total Low-Income Residents	3,318	19,774	23,092	1,505	12,598	14,103	4,230	151	5,813	10,194	6,590	743	7,333	335	151	5,507	5,993	29,377	29,377
Proportion Low-Income Residents			48.4%			39.4%				24.8%			22.5%				23.9%		49.2%
Total Below Poverty	1,148	8,723	9,871	385	5,437	5,822	1,030	110	2,366	3,506	2,488	393	2,881	50	110	2,268	2,428	18,021	18,021
Proportion Below Poverty			20.7%			16.3%				8.5%			8.8%				9.7%		30.2%
Total Households for Which Vehicle Ownership was Measured	3,279	14,924	18,203	2,265	13,206	15,471	1,360	973	10,194	12,527	11,749	2,486	14,235	1,175	973	9,173	11,321	27,851	27,851
Total Households That Do Not Own a Vehicle	118	2,034	2,152	88	1,509	1,597	247	25	768	1,040	418	46	464	0	25	737	762	5,829	5,829
Proportion of Households That Own a Vehicle			88.2%			89.7%				91.7%			96.7%				93.3%		79.1%
Total Family Households With Children	1,404	5,119	6,523	652	3,649	4,301	2,317	347	2,564	5,228	3,408	660	4,068	351	347	2,295	2,993	4,456	4,456
Total Single Mother Family Households	548	2,328	2,876	155	1,462	1,617	627	10	141	778	639	69	708	51	10	807	868	2,076	2,076
Proportion of Single Mother Families			44.1%			37.6%				14.9%			17.4%				29.0%		46.6%

Source: U.S. Census Bureau 2010

Because both independently owned supermarkets are located in high-poverty areas, characteristics of the populations surrounding stores A and D will be discussed first. Following those two analyses, the populations surrounding corporate supermarket branches will be evaluated.

Store A is located in tract 201. The total population of all blocks within a one mile radius of the store is 15,750. Within two miles, the population is 55,275 people, 76.6% of which is African American. Within one mile of the supermarket there are four public housing developments with a total of 1,856 units. Another RRHA development lies within a larger radius of store A, bringing the total number of public housing units to 2,639 within two miles.

The combined poverty rate of all census tracts within two miles of store A is 31.3%, but residents in low-income households make up 53.1% of the population. Among African Americans, the poverty rate is 31.4%. Vehicle ownership occurs in 70.8% of households, and 63% of family households with children are led by single mothers.

Store D, located south of the James River in tract 608 has a population of 7,072 people within one mile, and a population of 25,503 within two miles. There are five public housing developments within two miles from this store, with a total of 500 units; but only two developments, with a sum of only 50 units, within one mile.

Within two miles of Store D, the population is 71.5% African American. Low-income residents represent 52.9% of all people, and the poverty rate is 29%. Among African Americans, the poverty rate is slightly higher; 31.4%. The majority of households, 83.5% own a vehicle, and single mother families account for 50.4% of all family households with children.

Store B, found in census tract 206, is one of only two corporate supermarkets located in eastern half of the city. This store is owned by a company that operates multiple supermarkets in

the Commonwealth of Virginia, but it is the only one located in Richmond. The population of all blocks within one mile of this supermarket is 11,115, but a total of 49,545 people live within two miles of the store. One public housing development, with a total of 458 units is less than one mile from store B, however within two miles there are eight RRHA communities with 3,135 housing units.

The population within a two mile radius this supermarket is 66.1% African American, with an African American poverty rate of 45.3%. Of all residents, 63% live in low-income households and 41.5% live in households with income below the federal poverty threshold. Single mothers lead 65.1% of all family households with children, and 67.5% of all households own a vehicle.

Stores L and E are both branches of a supermarket chain that operates stores all over the country. Store L is located close to Virginia Commonwealth University in tract 402. The population within one mile is 27,331, and within two miles, 66,544. One public housing development with 783 units is located less than a mile from store L. Another RRHA community, with 52 additional units is within two miles of the store, bringing the total to 835 units.

Within two miles of store L, 43.2% of residents are African American; and 32.8% of African Americans living in that area are in poverty. Low-income residents make up 49.2% of the nearby population, yet the poverty rate is only 30.2%. Out of all the households within two miles of store L, 79.1% own a vehicle; and of all family households with children, single mother families account for 46.6%.

Stores E and F are owned by different companies, but because the two stores are situated so close together, the two mile buffer encircled the same census tracts. Therefore the populations nearby are essentially the same. The total population within a one mile radius of store E is

17,358; within the same distance of store F, it is 17,124. A two-mile buffer around store E encompasses a total of 45,421 people. For Store F, this two-mile buffer contains a population of 45,383. There are no public housing developments within one mile of these two stores, but within two miles, there is one, a community of 52 units.

The African American population within two miles of stores E and F makes up 17.7% of the total, and the poverty rate among this population is 31%. Low-income households make up 36.3% of those less than two miles away from the stores, and the poverty rate among households within this boundary is 21.8%. Among family households, 21.9% are single mother families, and only 11.2% of all households do not own a vehicle.

The company that owns store F also owns three other store, C, J, and K, all of which are placed very less than a mile from the western boundary of the city. These stores are all placed in census tracts, that have very low proportions of low-income residents, under 16%; and poverty rates below 7.9%.

In a one-mile circular buffer around store C live 10,228 people, more than two-thirds in Chesterfield County. The population within two miles of the store is 27,674, also primarily in Chesterfield. Of residents within two miles, 15.6% of are African American, and 11.8% of the African American population lives in poverty; nearly double the poverty rate of the total population, 6.7%. Residents in low-income households make up 17.5% of all people; and 98.2% of all households own a car. Single mother family households represent 19.6% of all families with children.

Store J is located in tract 505, at the northwest tip of the city. Only 25% of the population of 11,920 inside a one mile radius of the store lives within the city boundary; the rest of residents

close to the store live in Henrico County. Within the two mile buffer around store J, there are 34,015 people, but only 24% live in Richmond proper.

The population surrounding the store is 8.2% African American, of which 25.4% reside in households with incomes below the poverty line. Overall, 22.5% of residents live in low-income households, and 8.8% live in poverty. The vast majority of households, 96.7%, own a vehicle. Out of all families with children, single mother families make up 17.4%.

The final store branch of this corporation, store K, is found in tract 704, just south of the James River. The population within two miles, 22,627, spans three municipalities, Richmond City, Chesterfield County, and Henrico County. However, all of the 5,783 people living within one mile of this store are in Richmond.

The census tracts within two miles of the store have a combined poverty rate of only 9.7%, but low-income residents make up 23.9% of the population. Residents that identified themselves as African American account for 32.7% of all people within two miles, and members of this population experience a 22.1% poverty rate. 93.3% of households own a vehicle, and single mother families account for 29% of all family households with children.

The last three stores, G, H, and I, are operated by another corporation with stores in multiple states. All three stores lie south of the James River, near the western border of the city.

The population within a one mile radius of store G is 11,463. Within two miles, it increases to 36,050. African Americans make up 60.8% of the population of the census tracts surrounding this store, and 19.6% live in poverty. In tracts surrounding store G, the total proportion of low-income residents is 48.4%, and the poverty rate is 20.7%. Single mothers are the head of household in 21.9% of families, and 88.2% of all households own at least one vehicle.

A one mile buffer around store H encompasses 12,075 people. There are 27,815 residents within two miles, 43.7% of which are African American. Low-income residents make up 39.4% of the nearby populace, and the overall poverty rate in surrounding census tracts is 16.3%, slightly lower than the 17.7% of African American residents in poverty. Among households, 89.7% own a vehicle, and among family households with children, 37.6% are headed by single mothers.

Store I has the smallest population living within one mile, 4,558; however 24,473 people live within two miles. 37.6% of the surrounding population is African American, and 15.2% of nearby African Americans live in poverty. Low-income residents account for 24.8% of the population surrounding this store, but only 8.5% of all people live in households that fall below the poverty line. Of all family households with children, 14.9% are single mother families, and 91.7% of all households own a vehicle.

Summary

This analysis of the demographic and socioeconomic characteristics of the populations surrounding supermarkets presented some important findings. Among supermarkets, corporate stores are consistently located in wealthier areas, generally among populations consisting primarily of White residents. Independent supermarkets, on the other hand, are only found in high-poverty, minority communities. The one exception to this rule is store L, a corporate establishment that is placed close to a few high-poverty tracts, but midway between two universities from which it can attract a large customer base. The total population within two miles of store L is 27,331 people; 10,000 more than any other store in Richmond.

In tracts with high rates of poverty, Small Grocers and Convenience stores are found in much greater concentrations than in wealthier census tracts. Within a one-mile radius of tracts

201, 202, 204, and 301, the tracts which combine to form a large cluster of poverty in the central northeastern region of the city, there are 46 Convenience Stores, 18 Small Grocers, and three Supermarkets. When this buffer is reduced to one-half of a mile, it encompasses 25 Convenience Stores, 11 Small Grocers, and only one Supermarket.

In contrast to this, tract 506 has a poverty rate of only 1.3%, the lowest in the city, and is larger in land-area than the combination of all four high-poverty tracts previously discussed. The total land area of tract 506 is 1.876 square miles, whereas the combined land area of tracts 201, 202, 204, and 301 is 1.661 square miles (U.S. Census Bureau 2011). A one-mile buffer around tract 506 encompasses six Convenience Stores, two Small Grocery Stores, and three Supermarkets. Within a one-half mile radius, there are two Supermarkets, one Small Grocery Store, and one Convenience Store.

Population within Walking Distance of Supermarkets and Bus Stops

Excluding taxicabs and car-sharing services, the Greater Richmond Transit Company (GRTC) is the only form of public transportation available to Richmond residents. GRTC provides service to most places within Richmond and there are approximately 1700 bus stops inside the city boundary (GRTC 2011). Although GRTC primarily functions within Richmond proper, a few routes extend into the bordering counties of Chesterfield and Henrico. Service to the counties, however, is limited.

Because many low-income households do not own vehicles, shoppers often rely on public transportation as a means of getting to and from the grocery store. Even though mass transit may remedy the problem of physically accessing supermarkets, it is not effective for transporting large quantities of food from store to home. Also, public transit services are not always placed or designed in a way that helps those who are most likely to need them (Gottlieb,

et al. 1996). Finally, paying a fare for both the trip to the store and the trip home on every shopping venture, especially if a parent is traveling with one or more children, can add up quickly. In Richmond the fare for GRTC Local Routes is \$1.50 each way, resulting in a total of \$3.00 per person spent on every trip to the supermarket (GRTC Transit System 2012).

Using block-level population data from the 2010 Census and the geocoded locations of supermarkets and GRTC bus stops, the number of blocks and approximate number of people that are located within walking distance of a bus stop was calculated. This was done by placing a one-quarter mile circular buffer around the geocoded bus stops and summing the populations of the blocks whose centroids fell inside this buffer. This was then analyzed in relation to vehicle ownership rates to identify areas with limited access to transportation (Figure 4.22).

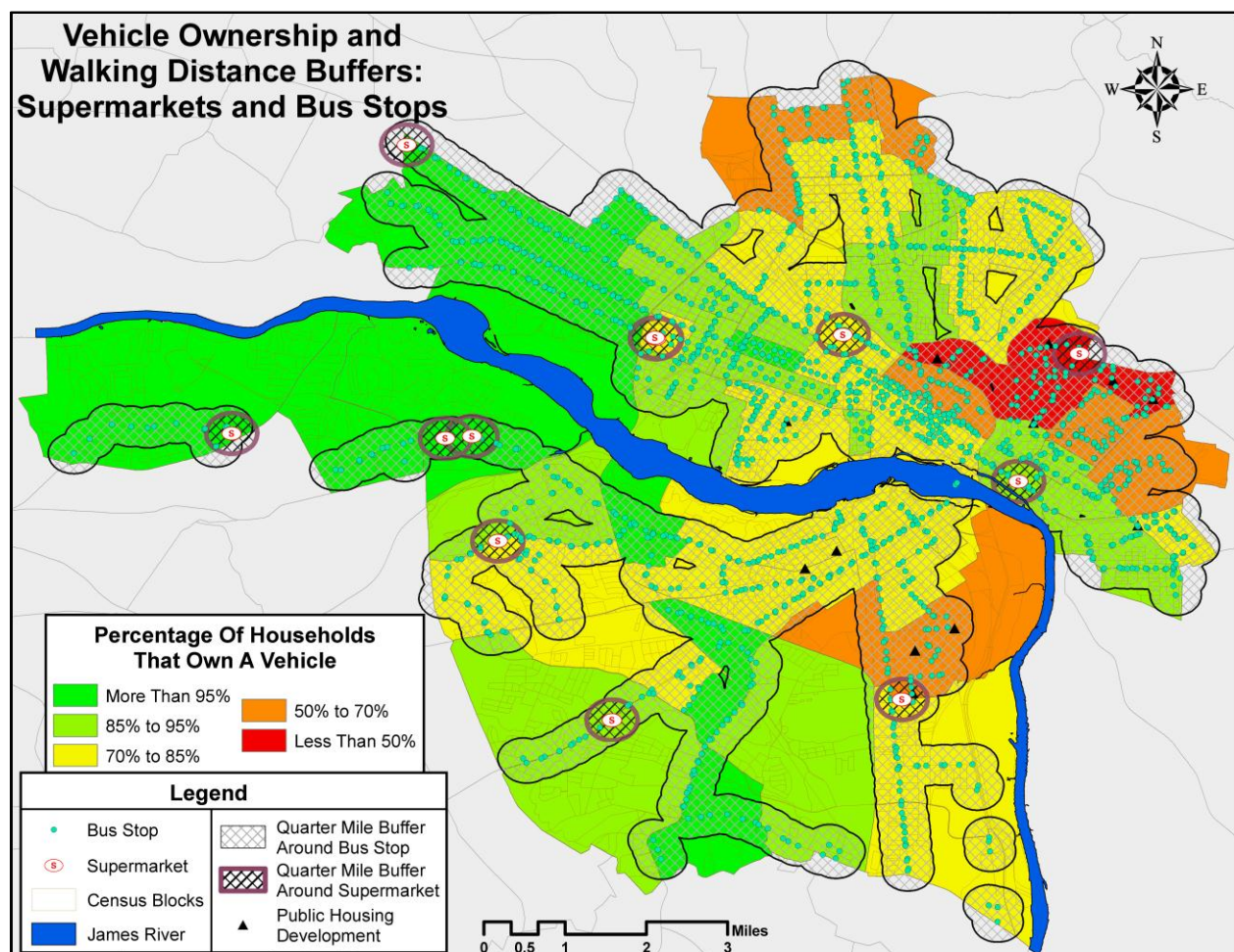


Figure 4.22: Walking Distance Analysis

Richmond has 5,213 blocks; 4,386 are within walking distance to a bus stop, and 827 are more than a quarter mile away from a stop. The sum of the populations of blocks that are located within one-quarter mile of all bus stops is 171,890, leaving 32,324 people, about 16% of the total population, without convenient access to public transit.

In 35 of Richmond's 66 census tracts, all people live within walking distance of a bus stop or supermarket. Also, all individuals in tracts in which less than 50% of households own a vehicle live have either a bus stop or a supermarket accessible.

GRTC bus stops are heavily concentrated in the portion of the city north of the James River. To the south, there are fewer and they tend to only provide service along major roads. In tracts in the northwestern region of Richmond, south of the river, where vehicle ownership rates are high there are relatively few bus stops.

There are three tracts in which between less than 70% of households own a vehicle that have populations that live farther than walking distance from a bus stop. Tract 102 in the north, tract 209 on the eastern border of the city, and tract 607, south of the river in the east. In tracts 102 and 209, there are 121 total people that live outside walking distance of a bus stop or supermarket. Tract 607, however, has 650 residents located in blocks more than one-quarter mile from a supermarket or bus stop.

In the 12 tracts in which 70% to 85% of households own a vehicle, the total population that lives farther than walking distance from a bus stop or supermarket is 5,290. The rest of the population without convenient access to a bus stop, 26,263 people, live in tracts with vehicle ownership rates above 85%.

Chapter V: Discussion

Since the 1970s, scholars, advocates, and society in general have struggled to assemble a concrete definition of food security that incorporates all of its many tangible and conceptual nuances. The scope of food security, which was initially thought of as a global matter, has come to be recognized as an issue that must be addressed at the household, and often, individual level.

Previous studies have found that racial minorities, low-income and impoverished households, households without personal vehicles, single mothers and their children, and individuals with low levels of education are often at risk for food insecurity. These traits, combined with the proximity of food stores, the selection of items available within those stores, and access to public transit, all contribute to the ability of a household to remain food-secure.

This study tested the hypothesis that urban, low-income communities lack access to retailers that offer sufficient varieties and quantities of high-quality, healthy foods. Although food insecurity among low-income individuals or households is a global occurrence, this research was concerned with the inequities in food access in the United States, a country that has not experienced widespread famine or drought in recent years. Despite this, the U.S. is still home to a large number of food-insecure households, a phenomenon that arises not from lack of resources, but from inequitable practices among food retailers, and lack of concern by planners and policymakers.

Using Richmond, Virginia as a case study, this investigation examined the spatial distribution of demographic and socioeconomic population characteristics frequently associated with food insecurity; differences in food availability, cost, and quality across various types and

locations of food retailers; the populations that surround supermarkets, small grocery stores, and convenience stores are most available; and the places that lie within walking distance of supermarkets and public transit stops. This was done to explore the relationship between communities that exhibit multiple food insecurity risk indicators and the food retailers to which they have easy access; to find out what kinds of stores and what kinds of food are accessible to minority, impoverished, and mobility-restricted populations. This chapter will summarize and interpret the results of these investigations and relate the findings to themes common in the literature surrounding food insecurity.

Summary and Interpretation of Results

Vulnerability Indicators

To identify tracts in which the population exhibits multiple vulnerability indicators, a table (5.1) listing the 10 tracts in which each indicator was most prominent was constructed. Because poverty is frequently associated with food insecurity, the following discussion will identify the tracts with the highest proportions of impoverished residents and analyze the relationship of poverty to other risk indicators. Based on the demographic and socioeconomic analysis, a cluster of four high-density census tracts was identified in which a large proportion of residents display high rates of a variety risk indicators. These four tracts are numbered 201, 202, 204, and 301. These tracts are clustered in the central northeastern region of Richmond and have a combined population of 13,490. Figure 5.1 illustrates this cluster and places it in the context of surrounding census tracts, the James River, and the eastern boundary of the city.

Compared to all other in Richmond, these four tracts have the highest proportions of the population living in poverty, the lowest annual median household incomes, the highest rates of

SNAP participation, the lowest rates of vehicle ownership among households, and the highest proportions of single mother families.

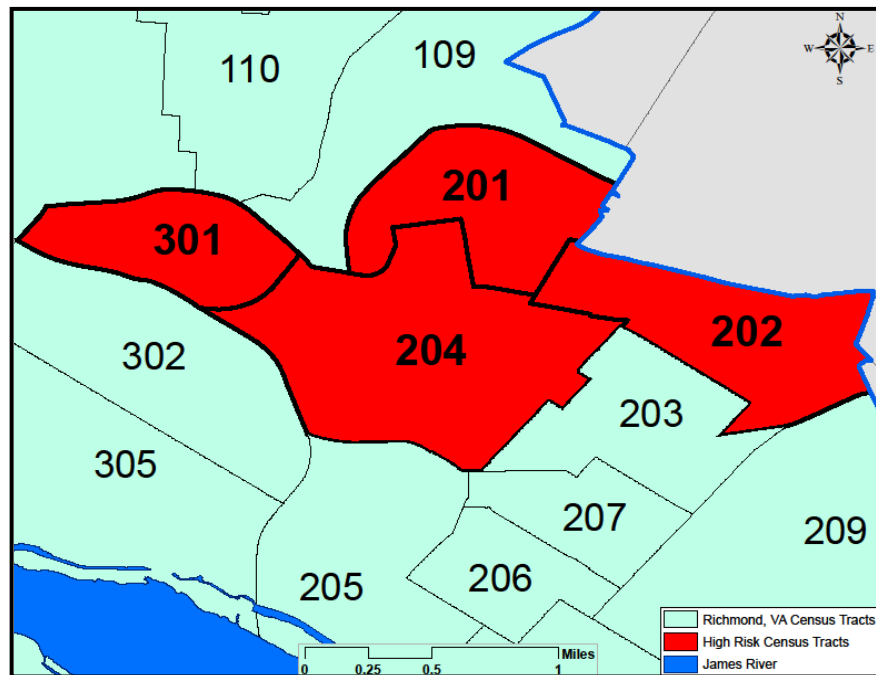


Figure 5.1: High Risk Census Tracts

Tracts 201, 202, and 301 have the highest proportion of African American residents, and tract 204 has the sixth highest. These tracts also display some of the highest rates of African American poverty. Tracts 201 and 301 rank second and third for highest proportions of African American poverty, falling short of the 100% African American Poverty rate in tract 505. Tract 505 is, overall, a wealthy census tract with a very low African American population, only 4.3% of its total. According to the American Community Survey, which included only 39 of the tracts 235 African American residents, the poverty rate among this population is 100%. Table 5.1 displays the population characteristics of these high-risk tracts, highlighted in red, in relation to the other tracts that top the list for vulnerability indicators.

Table 5.1: Top 10 Census Tracts for Risk Indicators

Rank	Highest Poverty Rate		Lowest Median Income		Highest SNAP Participation		Lowest Rate of Vehicle Ownership		Highest Proportion of Single Mothers		Highest Poverty Location Quotient		Highest Population of African Americans		Highest Proportion of African Americans		Highest African American Poverty Rate	
	Tract	Rate	Tract	Amount	Tract	Rate	Tract	Rate	Tract	Rate	Tract	LQ	Tract	Total	Tract	Rate	Tract	Rate
1	201	73.60%	301	\$10,641	201	72.9%	301	25.3%	301	80.2%	201	2.91	709	5025	201	97.5%	505	100.0%
2	301	68.10%	202	\$11,791	301	56.9%	204	38.8%	202	78.9%	301	2.69	708.01	4814	202	96.5%	201	72.7%
3	202	57.60%	201	\$13,864	202	50.4%	202	46.8%	201	76.1%	202	2.28	204	4747	301	95.7%	301	67.5%
4	204	53.50%	204	\$14,318	204	49.9%	201	48.5%	204	73.5%	204	2.12	607	4506	103	94.5%	404	65.3%
5	404	51.90%	207	\$14,891	609	40.2%	207	50.2%	103	68.9%	404	2.05	604	4286	108	93.2%	202	56.8%
6	305	49.80%	404	\$16,339	607	39.0%	103	63.9%	607	68.4%	305	1.97	710.01	3783	204	92.8%	409	55.6%
7	607	48.90%	305	\$21,134	103	31.4%	102	66.6%	210	66.2%	607	1.94	108	3743	203	92.8%	102	55.4%
8	402	45.10%	607	\$21,347	108	31.0%	302	66.9%	610	63.0%	402	1.78	202	3678	109	91.1%	204	53.7%
9	604	42.00%	210	\$23,425	210	30.9%	203	67.4%	604	62.3%	604	1.66	707	2996	107	90.8%	210	50.7%
10	610	41.60%	610	\$24,472	604	27.1%	209	67.8%	203	59.5%	610	1.65	301	2771	607	89.9%	305	49.4%

Although not displayed in table 5.1, tracts 202 and 204 both top the list for tracts with the highest rate of White poverty, 100% each. Tract 301 is a close second, with a White poverty rate of 85.7%; and tract 201 is ranked sixth, with 53.3% of White residents living in poverty.

Tracts 404, 305, and 607 are ranked five, six, and seven among tracts with the highest rates of poverty, and also occur in the top ten tracts with the lowest median household incomes. Tract 607 appears several other times on this list. It has a high rate of SNAP participation, 39%, a large proportion of single mother families, 68.4%, and a high proportion of African American residents. Tract 404 has a low median income, the fifth highest location quotient of poverty in Richmond, and the fourth highest rate of African American poverty. Tract 305 occurs least often on this list. It is tenth for African American Poverty rate, 49.4%, but has only a 2.2% SNAP participation rate, and relatively high rates of vehicle ownership.

Tract 402 is home to a population in which 45.1% live in poverty, making it the eighth highest poverty tract in the city. It ranks 21st among tracts with high rates of African American

poverty, only 33.1%. This tract does not, however have a high rate of SNAP participation, only 16.3%, or a low rate of vehicle ownership. 82.4% of residents own at least one automobile.

Tract 604, which has the ninth highest poverty rate in the city, 42%, as well as the tenth highest SNAP participation rate, 27.1%, and the ninth highest proportion of single mother families. It is among the top 20 for African American poverty and low rates of vehicle ownership, 76%.

Tract 610 has a poverty rate of 41.6%, the tenth highest of all census tracts in Richmond. It is also number 10 on the list of tracts with the lowest median household income, \$24,472. Single mother families comprise 63% of all families with children in tract 610, placing it eighth from the top of that list. Despite its high poverty rate, only 22.5% of households receive SNAP benefits, and 81.5% own a vehicle. Poverty in this tract is present among 22.7% of White residents, and 35.7% of its African American population lives in poverty.

Although risk factors manifest in a few other tracts displayed in table 5.1, these areas generally exhibit low levels of other food insecurity risk factors. Within them, food insecurity may exist in some portion of the population, but it is unlikely to be as pervasive as in tracts with high levels of multiple risk indicators

A key indicator of food insecurity that has received little attention throughout this discussion is participation in SNAP. On a fundamental level, individuals receiving benefits of this program have already demonstrated some level of food insecurity, inability to afford enough food to feed themselves or their family. This study found that SNAP participation is highest in areas in which populations display many other food insecurity risk factors. While SNAP may assist in affording food, it does not provide transportation, and there is some debate, and much

research to be done to determine whether the benefits of this program are used in the way they are intended (United States Department of Agriculture 2012).

Food Availability

The food availability surveys found that Convenience Stores in Richmond had limited selections of fresh fruits and vegetables for sale. The types of produce that were found in these stores are either foods that can be eaten quickly and require little to no preparation, or very basic staple foods such as potatoes and onions. Fruits were more widely available in Convenience Stores than vegetables, but selections were often limited to only apples and bananas.

The store with the highest prices for the largest number of items on the checklist was store A, surrounded by a population of with 18.2% are in poverty. In contrast, store C had the lowest prices on the most items. This store is in a tract with a poverty rate of 42%. In general, goods found in stores located in tracts with poverty rates below 20% were priced near the median, not towards either extreme. These same stores often had larger selections than those in high-poverty tracts.

In Small Grocery Stores, a larger selection of fresh foods was available, but most did not offer a wide enough variety for a transportation-deficient shopper to design a healthy diet. Prices were found, on average, to be lowest in tracts with lower poverty rates. Two Small Grocers are located in tracts with very low poverty rates. One (store A) is located in the northern region of Richmond, in tract 104.01, in which the poverty rate is 7.9%; and the other (Store G) is in tract 505, a tract on the city's western border which has a poverty rate of 8%. Store A had the lowest prices on three items. Store G had the lowest prices on four items, but the highest prices for three. Among stores in high-poverty census tracts, store F, which is located in a tract with 53.5%

poverty, had the highest prices on five out of the eight items that it sold. The other store in this tract did not have prices at either extreme.

Supermarkets, as expected, offered the largest selection and quantities of food. The two independent stores were somewhat limited in variety, but still provided plenty of options for a healthy diet. The overall quality of items in one independent supermarket, located in the tract with the second highest rate of poverty, was inferior to the rest. This store had three items in fair or poor condition. Among all other stores, only one item in one store was found to be in fair condition.

A comparison of prices between independent and corporate stores showed that the independent store in the tract with the uppermost poverty rate charged the highest prices for four items, a greater number of items than any other store. The two stores located in tracts with the lowest poverty rates varied greatly in their prices. One store had the highest prices among all supermarkets for three items, and the lowest price on only one. The other had the lowest prices for six items on the checklist.

The results of this portion of the survey reflect the findings of previous studies in that stores located in high-poverty areas often charge higher prices for fresh foods than those in wealthier areas. It was also found that among these supermarkets, small grocery stores, and convenience stores, the average prices of fresh foods in small grocers were closer, but still higher, to those found in supermarkets than to those in convenience stores.

Store Locations

This study found that, in Richmond, corporate Supermarkets tend to locate in wealthy areas, while high-poverty neighborhoods are served primarily by independent supermarkets. While the exact intentions behind the location practices of corporate supermarkets in Richmond

are not known, a few discriminatory trends are apparent. All but one of the corporate supermarkets in Richmond are located in wealthy census tracts; frequently on the other side of the city from Richmond's highest populations of minority and impoverished citizens. The one store that is bordered by high levels of poverty is also surrounded by a population of nearly 30,000 people and two large universities, indicating that while the nearby population may not have abundant financial resources, the sheer volume of prospective customers likely guarantees that the store will profit.

Another finding that validates racially motivated discrimination by corporate supermarkets was established through a comparison of their locations in relation to the tracts with the highest proportion of and African American residents and African American poverty and tracts with the highest rates of White residents and White residents in poverty. The populations of tracts 201 202, 204, and 301 are all more than 92% African American, and the African American poverty rates are 72.7%, 56.8%, 53.7%, and 67.5%, not the highest in the city, but the highest among all tracts with a large proportion of African American residents. The tracts with the highest levels of White residents and White residents in poverty are tract 305 (35.2% White, 41.9% White poverty), tract 402 (47.6% White, 46.8% White poverty), tract 404 (83.1% White, 47.5% White poverty), and tract 412 (86.8% White, 37.2% White poverty). These tracts do not form a perfect cluster like the others, however they all border at least one of the others.

It was found that within one mile of the tracts with the greatest proportions of African American residents and African American residents in poverty there are two corporate supermarkets and one independent supermarket. Within one-half of a mile of these tracts, there is only one supermarket, which is independently owned. Within both a one-mile buffer and a one-half-mile buffer of the tracts with high levels of White residents and White poverty, there are two

corporate supermarkets. These findings demonstrate that while corporate supermarkets avoid locating in high-poverty areas, they particularly eschew locations surrounded by high large populations of African Americans in poverty.

Unlike supermarkets, convenience stores and small grocers are much more highly concentrated in areas with large minority populations and high poverty rates. These stores, however, are less prominent in areas in wealthy, primarily White communities. Convenience stores, overall, tend to locate near major roads, as many are attached to gasoline stations. Small grocers are not typically located along important thoroughfares, choosing instead to locate in areas where they serve small, local populations.

The placement of supermarkets in relation to areas in the highest need is very important in increasing food security among communities, however the ability to access these stores, the design of the road network, is equally important. Although a supermarket may be located within a one- or two-mile radius of a low-income household, the actual distance that an individual must travel to the store could be much greater. This study used circular buffers to assess the populations within a certain distance of supermarkets, but was limited in that it was not able to fully evaluate actual distance or travel time from community to store.

Chapter VI: Conclusion

This study used demographic and socioeconomic data recruited from the 2010 U.S. Census and 2006-2010 American Community Survey to identify areas in Richmond, Virginia that exhibit many commonly recognized characteristics frequently associated with food insecurity, such as poverty, large presence of racial minorities, low vehicle ownership rates, and households headed by single mothers. The study also found that fresh, healthy foods are least available in convenience stores and small grocers, the retailers most commonly found in the communities exhibiting the greatest number of risk factors. Finally, an analysis of the populations surround corporate and independent supermarkets established that while independently-owned stores locate in high-poverty, minority neighborhoods, corporate supermarkets are most commonly found only in wealthy areas with primarily White populations.

Implications

Food insecurity results from a combination of factors that are both personal and structural. First, food insecurity can be a consequence of the inability of individuals and households to obtain food due to financial restrictions. Another aspect of this phenomenon is the discriminatory practices of food stores that will not locate in areas with high levels of poverty among minority populations. A third element is the ability of a mobility-restricted individual or household to access transportation that will carry them to retailers that sell nutritious food. The two most important components that contribute to food insecurity, however, are the lack of availability of healthy food in stores to which an individual does have access, and the decision of that individual as to what foods they will purchase.

In Richmond, the areas in which affordable, high quality food is needed most are the areas that are home to people with the greatest number of restrictions on their ability to access that food. While many kinds of foods are available in the small grocery and convenience stores that occupy low-income neighborhoods, these stores lack fresh foods that are affordable to people with severe financial limitations. Supermarkets, especially those that are operated by large corporations have the widest selections and the lowest prices. These same stores are conspicuously absent in neighborhoods with disproportionately high concentrations of racial minority and impoverished populations; neighborhoods in which many households do not own an automobile; and neighborhoods in which a majority of families are headed by single mothers that lack both resources and time.

Conceptual Relevance of Findings and Relationship to Prior Research

There are two overarching themes in the literature surrounding food security. The first is that food insecurity is a result of an individual or household failing to establish entitlements, assertions of ownership, to food (Sen and Sen 1982, Kent 2005, Sen 1982). Low-income and impoverished individuals are frequently unable to establish ownership of healthy foods due either to their inability to afford or access these items. Lack of transportation, high food costs, distance to stores, and lack of dietary knowledge are all barriers to establishing ownership of food (Beaulac, Kristjansson and Cummins 2009, B. Cohen 2002).

The second theme, one that is perhaps even more prevalent than the concept of entitlements, is structural violence, the tacit inequality that results in an unfair distribution of social, political, and economic capital. In terms of food insecurity, structural violence manifests in the practices of large food stores abandoning or refusing to locate in high-poverty, minority communities. Although only a few authors acknowledge this model directly, many discuss the

lack of supermarkets, but abundance of small grocers and convenience stores, in poverty-stricken areas that arises from discriminatory and exploitative forces (Raja, Ma and Yadav 2008, Beaulac, Kristjansson and Cummins 2009, Rose and Richards 2004, Vallianatos, Shaffer and Gottlieb 2002).

These two concepts are apparent within the findings of this study. The spatial analysis of food insecurity risk indicators demonstrates that minority communities in Richmond are also communities in which there are high levels of poverty, larger proportions of single-mother families, low levels of education, low rates of vehicle ownership, and high SNAP participation rates. The food availability survey found that, compared to supermarkets, convenience stores and small grocers offer smaller quantities and less variety of fresh fruits and vegetables, and charge higher prices for the items that are available. The store location analysis portion of this survey found that convenience stores and small grocers are much more prominent in high-risk areas than supermarkets, especially corporate stores, which offer low or discounted prices, larger selections, and higher-quality foods.

Households in Richmond that are already restricted by insufficient finances or mobility are placed in environments in which there are few options for purchasing healthy food. Entitlements to adequate foods cannot be established because, to many households, stores that offer healthy options are physically and financially out of reach.

Structural violence is evident here in two ways. First, low-income, minority populations are clustered together to form large communities of vulnerable residents. This is partially due to the placement of public housing developments, but may also result from these areas offering housing that low-income residents can afford, guaranteed access to public transit for those without vehicles, and various other socioeconomic and cultural influences.

The second structural aspect that contributes to food insecurity among these populations is the practice of corporate supermarkets locating primarily near wealthy, non-minority communities. Corporate decisions to place stores far away from low-income, minority populations, have led to the creation of areas that are limited not only in resources but in access to healthy food as well.

Recommendations for Policy and Practice

Based on the findings of this study, there are several ways that policies and practices can be adjusted to comprehensively address food insecurity in Richmond. One is to identify blocks or block groups in which vehicle ownership rates are low and design public transit routes so that they are accessible to people who need them most. The addition of strategically-placed bus stops in these areas would significantly improve accessibility. Furthermore, ensuring that transit routes and road networks are designed in a way that provides direct, unimpeded travel to stores can greatly increase the ability of an individual to obtain food.

Another recommendation is that planners endorse policies and land use codes that will, over time, decentralize poverty. This can be done by locating future public housing developments in areas that are close to food retailers and stores that sell other basic necessities, and/or by redeveloping existing developments into mixed-use, mixed income communities. Communities with diverse land uses and populations can provide disadvantaged citizens with greater resources to build social and financial capital, resulting in people that are less dependent on safety nets for obtaining food, and more able to create their own entitlements to it. As Sen and Sen (1982) stated, moving food into vulnerable areas will not alleviate food insecurity, instead people must become self-sufficient and able to obtain their own.

Planners that are concerned with eliminating food insecurity should perform an in-depth community food assessment that examines the type and quality of food retailers within communities. This assessment should also involve as much community participation as possible to identify latent food insecurity, survey public opinion and needs, and align future actions with the concerns of residents.

Finally, while food insecurity has a direct effect on the health of an individual, this study found that, often, at least some nutritious foods are available in many types of stores that are typically found in low-income neighborhoods. Access to food is one component in maintaining a healthy diet, but perhaps equally important is an individual's knowledge of how and what to eat. It is the responsibility of the municipality to ensure that schoolchildren obtain an understanding of basic nutrition and are exposed to healthy foods during the course of their education. Schools should reinforce and actively promote healthy eating among their students. This could, over time, create greater demand for high-quality foods; a demand that food retailers would have to accommodate.

Limitations of This Study and Recommendations for Further Research

One of the inherent limitations of working with data at the census tract level quickly became apparent in the course of this population analysis. Because each tract is different in land area, population, and density, comparing figures representative of areas as large as census tracts can be misleading. Tracts in Richmond range from .116 square miles in land area (tract 406), to 3.965 square miles in area (tract 701). Population density occurs at its lowest in tract 609, 1,082 people per square mile; and at its highest in tract 404, a rate of 22,153 people per square mile. Future efforts to analyze food insecurity should examine populations at the block-group or block

level to more accurately pinpoint areas in which the population experiences restrictions on access to food.

Also, in the early stages of this undertaking, it was the author's sincere hope and intention to conduct a survey of supermarket shoppers to obtain subjective, qualitative data on food access in Richmond. The survey would be administered to shoppers outside of supermarkets. The survey questions concerned the shopper's primary mode of transportation to the supermarket, round-trip travel time, the number of household members and children, approximate household income, and the approximate location of their home. The Institutional Review Board of Virginia Commonwealth University found that the survey was unobtrusive, ethical, and appropriate for execution.

In hopes of conducting this survey ethically and legally, the author set about obtaining the necessary approval from the public relations managers of corporations operating supermarkets in Richmond. Upon receiving a letter of intent and a request for permission, one company consented, but only on the condition that if the survey was carried out, their office would be given the results of all interviews conducted at all stores.

It was the author's highest priority while designing the shopper survey to ensure that no personal or identifying information would be obtained from participants, and that all results would be seen by no one else. Due to the nature of the company's demand entailing the ethical violation of privacy, the decision was made to abandon the survey.

In order to gain a more comprehensive understanding of food insecurity, future research should include interviews with patrons of many types of food retailers, as well as residents of food deserts or food-insecure communities. Interviews with shoppers at various types of stores can be used to identify trends in how people of different income levels access food, what kinds

of food they commonly consume, and subtle limitations to accessing healthy foods. In-depth interviews with residents of food deserts can elucidate not only barriers to food access, but also the effects of food insecurity on the welfare and health of these individuals.

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Appendix 1: Food Availability Survey Instrument

Fresh Food Availability Survey

Hello. My name is Stephen Brown and I'm a Graduate Student from the Department of Urban and Regional Planning at VCU. I am conducting a survey to gather data for my master's thesis and I would like to analyze the selection of food in your store.

My aim in this project is to understand the availability of specific foods in various types of food stores in the City of Richmond. With your permission, I will record data concerning the availability, cost, and general appearance of the food in your store.

My research and results will remain completely confidential. All business names, locations, and manager/owner names will remain unknown to everyone except myself. Only the information in **Bold Print** and the accompanying tables below will be presented. **No information specifically about your business will be distributed or published.** If you have any questions feel free to contact Dr. Michela Zonta at 804-827-0787.

Thank you for your time.

Date: ____/____/____

Name of Store: (for my records only) _____

Address: _____

Business Type: (circle)

Convenience Store Ethnic Grocer

General Merch. Store Pharmacy

Small Grocer Specialty Grocer

Supercenter Supermarket

Item	Present (Y/N)	Quantity	Cost (Item or Pound)	Appearance G = Good F = Fair P = Poor
Fresh Fruits and Vegetables				
Apples				
Bananas				
Broccoli				
Cantaloupe				
Carrots				
Celery				
Cucumbers				
Grapes				
Green Beans				
Green Peppers				
Lettuce				
Mushrooms				
Onions				
Oranges				
Potatoes				
Tomatoes				
Proteins				
Cheese				
Beef				
Chicken				
Milk				
Eggs				

Appendix 2: Sources for Map Data

Sources for Census Data

- Census Tract Shapefile: Richmond City, Virginia 2010 Census Tracts
 - <http://www.census.gov/geo/www/tiger/tgrshp2010/tgrshp2010.html>
 - (U.S. Census Bureau, Geography Division 2010)
- Census Block Shapefile: Richmond City, Virginia 2010 Blocks
 - <http://www.census.gov/geo/www/tiger/tgrshp2010/tgrshp2010.html>
- Block Population: Total Population (U.S. Census Bureau 2010)
 - Table P1
 - 2010 Census Summary File 1
 - Universe: Total Population
- Census Tract Population: Total Population (U. S. Census Bureau 2010a)
 - Table P1
 - 2010 Census Summary File 1
 - Universe: Total Population
 - http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_SF1_P1&prodType=table
- Educational Attainment: (U.S. Census Bureau, 2006-2010 American Community Survey 2010)
 - Table S1501
 - 2006 – 2010 American Community Survey 5-Year Estimates
 - http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_5YR_S1501&prodType=table
- Food Stamps/SNAP: Food Stamps/SNAP (U.S. Census Bureau, 2006-2010 American Community Survey 2010a)
 - Table S2201
 - 2006 – 2010 American Community Survey 5-Year Estimates
 - http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_5YR_S2201&prodType=table
- Household Structure: Households and Families: 2010 (U.S. Census Bureau 2010b)
 - Table QT-P11
 - 2010 Census Summary File 1
 - http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_SF1_QTP11&prodType=table
 - Note: The percentage of Female Headed Households with children was obtained by dividing the number of “Female householder, no husband present families (With related children under 18)” by the total number of “Families (With Related Children under 18)” in the census tract. Both are found under the heading “FAMILY TYPE AND PRESENCE OF RELATED AND OWN CHILDREN”

- Household Structure: Single Mothers With Children Under 18 (U.S. Census Bureau 2010c)
 - Table PCT19: Husband-Wife and Unmarried Partner Households by Sex of Partner by Presence of Related and Own Children Under 18 Years
 - 2010 Census Summary File 2
 - Universe: Households
 - PopGroup: Total Population
 - http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_SF2_PCT19&prodType=table
- Median HH Income: Median Income in the Past 12 Months (In 2010 Inflation-Adjusted Dollars). (U.S. Census Bureau, 2006-2010 American Community Survey 2010b)
 - Table S1903
 - 2006 – 2010 American Community Survey 5-Year Estimates
 - http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_5YR_S1903&prodType=table
- Poverty Status: Poverty Status in the Past 12 Months (U.S. Census Bureau, 2006-2010 American Community Survey 2010c)
 - Table S1701
 - 2006 – 2010 American Community Survey 5-Year Estimates
 - http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_5YR_S1701&prodType=table
- Race: Race (U.S. Census Bureau 2010d)
 - Table DP1
 - Profile of General Population and Housing Characteristics: 2010
 - 2010
 - http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_DPDP1&prodType=table
- Vehicle Ownership: Number of Workers in Household By Vehicles Available. (U.S. Census Bureau, 2006-2010 American Community Survey 2010)
 - Table B08203
 - 2006 – 2010 American Community Survey 5-Year Estimates
 - Universe: Households
 - http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_5YR_B08203&prodType=table

Sources of Richmond, VA GIS Data

- City of Richmond Geographic Information Systems FTP GIS Data Download Site: <ftp://ftp.ci.richmond.va.us/GIS/Shapefiles/>
 - Basemap (City Boundary, River):
<ftp://ftp.ci.richmond.va.us/GIS/Shapefiles/Basemap/Basemap.zip>
 - (City of Richmond 2010)
 - Centerlines (Major Roads):
<ftp://ftp.ci.richmond.va.us/GIS/Shapefiles/Centerlines/Centerlines.zip>
 - (City of Richmond 2011)

Appendix 3: Conversion Table

Item*	Number per Pound
Apples	3 - Medium
Bananas	3 – Medium/Large
Cantaloupe	1 = 4 pounds
Cucumbers	1 - Large
Green Peppers	3 – Standard Size
Onions	1 – Large/ 2 - Small
Potatoes	3 – Medium
Tomatoes	3 - Large

*All other survey items were priced by the pound in all stores.

Vita

Stephen Shaun Brown was born on September 13, 1984 in Richmond, Virginia. He received a Bachelor of Arts in Religious Studies in 2009 from Virginia Commonwealth University, Richmond, Virginia.