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BROCCOLI OVER BROWNIES: FACTORS AFFECTING HEALTHY FOOD CHOICES FOR LOW INCOME RESIDENTS OF SIOUX FALLS, SOUTH DAKOTA.

BY

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A thesis submitted in partial fulfillment of the requirements for the

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This thesis is approved as a creditable and independent investigation by a candidate for the master’s degree and is acceptable for meeting the thesis requirements for this degree. Acceptance of this does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.
To Mirella, Nathan, and Joshua, never stop learning.

To my husband, Dragos, who taught me to chase lions.
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ABSTRACT

BROCCOLI OVER BROWNIES: FACTORS AFFECTING HEALTHY FOOD CHOICES FOR LOW INCOME RESIDENTS OF SIOUX FALLS, SOUTH DAKOTA.

AILEEN PATRICIA PROFIR
2021

The world is on the cusp of a nutritional crisis: malnutrition, in all its forms, now directly affects one in three persons on the planet. Chronic malnutrition is closely associated with a wide range of public health issues such as stunted growth, increased incidence of disease, school or work absences, and obesity. Access to proper nourishment for food insecure individuals is often evaluated as a measure of distance to market, yet a causal relationship between proximity to food resources and improved health outcomes is unclear. Multiple dimensions of food access influence fruit and vegetable consumption for those who are food insecure in Sioux Falls, South Dakota. A mixed method approach was used to determine the importance of spatial access over other factors of accessibility for fresh produce purchases. Results indicate that participants prioritize affordability, convenience, and quality of produce when considering where to shop for fruits and vegetables and are willing to travel outside their neighborhood to meet their needs. Increased cooking time for produce and mental health also influenced consumption. Addressing these issues can enable a more holistic approach to serving the needs of those who are food insecure to achieve a better quality of life through improved nutrition.

Keywords: Fruits and vegetables, low-income households, accessibility, food system, food insecurity, South Dakota
INTRODUCTION

We envisage a world free of poverty, hunger, disease and want, where all life can thrive...where food is sufficient, safe, affordable and nutritious. (UN General Assembly 2015)

This ambitious vision does not represent utopian words snatched from a children’s fairy tale. They epitomize the ultimate desire of heads of state and governments meeting at the United Nation Headquarters, embodied in seventeen Sustainable Development Goals (SDGs) meant to transform the world by 2030 (UN General Assembly 2015). Initial efforts to address world hunger have been met with success; despite continued world population growth, the number of undernourished people worldwide fell by 170 million people between 2003 and 2014 (FAO 2017). With less than 10 years left to meet the SDGs, there is reason to be concerned as the Food and Agriculture Organization (FAO 2020) reported that nearly 750 million people were exposed to severe levels of food insecurity in 2019, an increase of 160 million persons since 2015.

Along with inadequate food security, the world is facing a nutritional crisis as an estimated two billion people suffer from overweight or obesity, meaning that malnutrition impacts a third of the world’s population (Development Initiatives 2017). The inability to satisfy the basic human right of adequate, nutritious food for all members of society compromises our ability to achieve several other SDGs such as good health and well-being, quality education, economic growth, sustainable cities and communities, and peace. Chronic malnutrition is closely associated with a wide range of public health issues such as stunted growth, increased incidence of disease, school or work absences,
and obesity (Brown and Jameton 2000). No country is free from malnutrition. In the United States, the U.S. Department of Agriculture (USDA) estimates that food insecurity impacts 11 percent of households, including 24 million adults and 11 million children. The rate of food insecurity is substantially higher when considering low-income households, single-parent families, minority populations, and those residing in principal cities of metropolitan areas (Coleman-Jensen 2020).

Urban areas have a particularly high risk of malnutrition and obesity-related diseases. Rapid population growth rates often result in unmanaged growth, expansion of urban land use onto prime agricultural land, and large socio-economic gaps that create opportunities for food insecurity to take hold. Urban residents are more likely to be consumers of food rather than producers. Convenience, extended shelf-life, and availability of processed foods over fresh produce promotes their consumption nationwide. Although processed foods are not necessarily unhealthy, they generally contain higher levels of fat, sodium, and sugar, which have been identified as factors contributing to obesity (USDA and HHS 2010). Obesity has become one of the most important health concerns in the United States. It is estimated that obesity related health issues are responsible for between 10 to 27 percent of medical costs in the country, amounting to hundreds of billion dollars each year (Allcott, Diamond and Dubé, 2017; Finkelstein, Trogdon, Cohen, and Dietz 2009; Wang et al. 2015). Eating a healthy diet of whole grains, lean protein, fruits, and vegetables can help reduce the burden on individuals, families, and societies associated with obesity (USDA and HHS 2010). Despite this evidence, securing the components of a healthy diet can become a especially
troublesome for vulnerable subpopulations who have difficulty affording fresh produce and accessing food sources, especially in an urban context.

Food accessibility has often been investigated in terms of distance to commercial grocers, with shorter distances implying increased accessibility and affordability of goods from large scale retailers situated in metropolitan areas (Beaulac, Kristjansson, and Cummins 2009; Larsen and Gilliland 2009; Walker, Keane, and Burke 2010). Fewer studies have explored how other aspects of access such as acceptability of produce, available time for shopping, and culinary knowledge, which collectively influence healthy food consumption for low-income households. The City of Sioux Falls, South Dakota is no stranger to food insecure individuals. The metropolitan area is estimated to have nearly 25,000 food insecure individuals who experience an inability to access enough food to maintain a healthy quality of life (City of Sioux Falls 2019). It is well recognized that malnutrition exists and is a growing problem for Sioux Falls, but our understanding of the driving forces behind the issue is incomplete.

This study investigated the influence of availability, accessibility, quality, and stability of the food supply on fresh fruit and vegetable consumption for those who are food insecure in Sioux Falls. A clearer understanding of the barriers that may be preventing households from maintaining a healthful diet provides insight into how at-risk households prioritize their food choices. The results of this study may help community members and officials to make better informed decisions and create policies that can help increase fresh produce consumption and enhance physical well-being while reducing the burden of preventable diseases within the community.
Globalization of the Food System

Since the beginning of the Industrial Revolution, food production and land transformation have increased at a much more rapid pace (Steffen et al. 2015). Modern industrialized agriculture has established large monocultures that are dependent on fossil fuels and require high inputs of water and biocides in order to maintain yield (Khoury 2014; Durham and Archer 2003; Heady 1976). Fewer people work directly in agrarian occupations and are now employed in a food system that extends well beyond the farm. The flow of food from producer to consumer includes the need for storage, transportation, processing, trade, marketing, and retailing professionals that are often controlled by large corporations. Environmentally, agriculture now poses major threats to nature; food production accounts for more than 25 percent of total global greenhouse gas emissions, 70 percent of the world’s freshwater use, and causes significant losses in biodiversity and ecosystem services (Tilman and Clark 2015). Climate change also threatens the stability of the agricultural system since many crop yields decline at temperatures above 30°C (Fedoroff 2010). Moreover, the use of crops for livestock feed and biofuel is largely responsible for price volatility. In fact, only 55 percent of the world’s crop calories go directly towards feeding people; the rest are fed to livestock (36 percent) or turned into biofuels and industrial products (9 percent) (Foley 2014). Food-based feedstock such as corn, soy, sugar, and palm dominate the world markets for biofuels. The effects of this price volatility are evident in the 2008 U.S. wheat harvest, which was plentiful and yet, because of worldwide price increases, 49 million Americans found themselves unable to afford a basic meal and hundreds of millions of people
around the globe went hungry (Kaufman 2010). At the same time, large subsidies for food commodities have led to the creation of cheap unhealthy foods while making healthy foods, such as fruits and vegetables, more costly to produce (Beal and Ervin 2018). All these factors make the food system less resilient and less capable of withstanding external shocks and increasing global risk for food insecurity.

**Dietary Transition**

In 1800, only about two percent of the world’s population lived in urban areas. By the 1930s, the Green Revolution allowed for plant productivity to increase to such a point that food was essentially eliminated as a limiting factor in human population growth. With a surplus in agricultural products and a decreased need for farm labor, an increasing share of the world’s population began to congregate in urban areas. By 1960, 34 percent of the world’s population were city-dwellers, a number that surpassed 50 percent for the first time in 2007 and, of the 9 billion people predicted to be on Earth in 2050, 70 percent are expected to live in urban areas (United Nations Department of Economic and Social Affairs 2013). Urbanization results in major changes in demand for agricultural products (Satterthwaite, McGranahan, and Tacoli 2010). Along with projected natural population increase, developing nations are expected to shift their dietary habits towards a higher consumption of protein and dairy, thereby adding stress to the agricultural system (Smil and Kobayashi 2012). Studies suggest that the world will require a 70-100 percent increase in food production to meet the expanding needs of the global population (Crist, Mora, and Engelman 2017; Tilman and Clark 2015). One of the greatest challenges
facing humanity in the 21st century revolves around how to equitably feed the expanding world population without incurring irrevocable damage to the natural environment (Godfray et al. 2010). High rates of urbanization are a global concern as they increasingly drive land use change from productive farmland to impervious urban surfaces, reducing the amount of arable land available for agriculture (National Research Council [NRC] 2010). Low- and middle-income nations are particularly at risk for negative effects of the rapid rate of urbanization experienced in these areas. For example, the public service sector has been unable to keep up with the demand for affordable housing and basic services resulting in the establishment of slums and squatter dwellings where food security quickly becomes a serious issue (Satterthwaite, McGranahan, and Tacoli 2010).

**Food Security**

*Global Disparities in Food Security*

According to the 1996 World Food Summit, 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 lifestyle” (Barrett 2010). Low food security, or food insecurity, is the product of multiple overlapping environmental, economic, and social issues that take place at a variety of different scales (Shannon et al. 2018).

Globally, more than 690 million people are food insecure and within the United States at least 14 million households were food insecure at some point during the year
Food security encompasses several aspects including the availability of food supplies, physical and economic accessibility, dietary quality, and stability of both supply and access. These components are often referred to as the pillars of food security (FAO 2009). Many factors can threaten food security such as extreme weather, unsanitary production practices, cost of transport to market, changes in individual purchasing power, and depletion of regional food stocks. Furthermore, social unrest can often devastate food production, which threatens the ability of many countries to produce sufficient food for themselves.

Trends in food insecurity and malnutrition differ from country to country and even within countries because food systems and diets are continually changing. Globalization has allowed large corporations to dominate food markets. Capitalist goals of these companies encourage increasing efficiency and employing strategies to optimize economies of scale to maximize profit regardless of the social or environmental consequences. The proliferation of highly processed foods has displaced traditional food knowledge and diets are becoming more homogenized than ever before (Beal and Ervin 2018). Food insecurity may once have been thought to refer to instances of chronic hunger but is now recognized as encompassing a dual burden consisting of either extreme under- and overconsumption, in both developed and developing countries (Beal and Ervin 2018; Sonnino 2016). At a time when a majority of the world’s population lives in cities, food security has become an increasingly important issue.
Urban Food Insecurity

The problem of matching food supplies to food needs, especially for urban populations, has long been a source of social, economic, and political concern. Most cities rely upon imported foods from all around the world to meet their basic dietary needs, thus necessitating a growing role for supermarkets to supply food for urban populations (Grewal and Grewal 2012). The movement of food from producer to consumer has lengthened and includes aspects of transportation, storage, processing, trade, wholesaling, marketing, and retailing (Global Panel on Agriculture and Food Systems for Nutrition [GloPAN] 2016; Satterthwaite, McGranahan, and Tacoli 2010). Urban areas are particularly susceptible to food insecurity because of the congregation of low-income populations in certain areas within a city (Walker, Keane, and Burke 2010). Historically, in the United States, risk of food insecurity has been higher in the urban core since supermarkets tend to situate themselves in areas outside the inner core, which are considered more profitable. However, Shannon and his colleagues (2018) have found that this trend may be shifting to affect suburban communities where poverty rates, which are closely tied to food insecurity, are increasing while public transit remains unavailable and greater distance between food access points exist. Much of the world’s future population growth will occur in cities, increasing the need to address pressing issues of food insecurity in urban areas. Despite this knowledge, planning for equitable food access is relatively new to the urban planning discussion (Morgan 2015), and food access is still often regarded as a process of a free-market capitalistic system rather than a public service that needs to be conscientiously integrated into city planning.
Food Insecurity and Public Health

While food insecurity has often been framed around the question of how to equitably feed the world into the future (Godfray et al. 2010), the discussion must be reframed to include the concept of providing proper nourishment for the world’s growing population. This approach acknowledges the importance of promoting healthy diets and not merely an adequate caloric intake. The dual nature of adverse health outcomes, such as hunger and obesity, that result from food insecurity makes this problem especially difficult to address. While some people choose to cope with food insecurity by reducing their nutritional intake, others compensate through over-consumption of cheap, unhealthy foods. Neither solution is optimal for maintaining proper health. Under-nourishment often results in stunted growth, increased risk of disease, fatigue, loss of concentration for school children, and loss of productivity because of work absences. On the other hand, over-consumption in poor quality diets is closely related to increased incidents of non-communicable diseases such as diabetes, heart disease, and obesity (Martins et al. 2011). In fact, obesity is among the top health and health care challenges of our time, having tripled in prevalence since the 1980s and costing $69 billion in health care related costs in the United States in 2013 alone (Wang et al. 2015). Worldwide, continuing in a business-as-usual trajectory will result in half of the global population being overweight or obese by 2030 (Tremmel et al. 2017). While people may be adequately fed, they may not be well-nourished. Therefore, it is important to consider the need to expand conventional methods used to measure food insecurity to include not just a lack of healthy food but
also an over-abundance of unhealthy foods as a recognition of the systems and social
structures that act as barriers to healthy food choices.

**Measuring Food Security**

*Geographic Theory*

Geographers are uniquely positioned to contribute to the discussion of food systems,
food insecurity, and issues of malnutrition. Malnutrition is a problem that has complex
social, economic, and environmental aspects all interacting from local to global scales. A
geographical perspective allows for the identification of spatial patterns in the food
environment. A geographical perspective affords the ability to provide maps that enable
visualization of the problem at various scales and provide contexts that could otherwise
be missed.

The food system has been conceptualized through various theories that have evolved
and continue to evolve today. One of the earliest theories dealing with population and
food production was put forth by Thomas Malthus in 1803 in his *Essay on the Principle
of Population*. From Malthus’ perspective, malnutrition and famine were purely a
function of limited food production. Hunger existed because there was not enough food
for an increasing world population (Malthus 1803). It is now recognized that hunger is
not merely a symptom of inadequate supply but also a consequence of unequal
distribution and geographic access to available food sources (Godfray et al. 2010).
Deprivation,” found that famine is not always a reflection of food shortages but rather a socio-economic issue whereby the poor lack entitlements to food. Often, the poor are suffering, not because of a lack of abundance of food resources, but due to high food prices and low wages. In fact, Sen (1981) suggests that famines can occur without any substantial reduction in food availability and, instead, as a result of forces external from the production of food. Shortly thereafter, food security began to encompass the idea of not only sufficient physical access but also economic access to basic food resources.

The social ecology theory proposed by McLeroy (1988) has been widely adopted by public health professionals in describing the food system. This model emphasizes both the individual and the societal factors that influence health. In essence, the model recognizes neighborhoods as actors in the food environment rather than just containers of individuals who are food insecure. The focus shifted to how neighborhood characteristics establish and influence food consumption habits. In theory, a positive change in a neighborhood’s societal context would improve health benefits for residents (McLeroy et al. 1988). While the model considers many scales, factors, and stakeholders that influence individuals, the focus for public policy has mostly revolved around the simplified notion that improving neighborhood characteristics would improve individual health outcomes.

More recently, political ecologists have criticized the social ecology model for reducing the significance of an individual’s life history, cultural preference, mobility decisions, class status, and culinary knowledge in food purchasing decisions. Proponents of the political ecology model highlight the role of key stakeholders such as large retailers and distributors in creating spaces of limited food access through their
capitalistic model of situating themselves to maximize profit rather than providing equal service to all populations (Pickles and Watts 1992; Wolf 1972). The recognition of embedded power structures that shape the food system has resulted in an increased interest in the topic from both critical and feminist geographers and now takes on new forms and concepts such as food justice and food sovereignty (Bedore 2010).

![Social ecology framework for nutrition and physical activity](image)

**Figure 1.** Social ecology framework for nutrition and physical activity (USA HHS 2010).

**Pillars of Food Security**

The Food and Agriculture Organization (FAO) definition of food security established at the 1996 World Summit that “all people, at all times, have physical, social and
economic access to sufficient, safe and nutritious food” is widely used today (Jones et al. 2013). It incorporates three main pillars of food security: availability, accessibility, and utilization but, by incorporating a temporal element, the implication is that these pillars should be constant over time and thus highlights a fourth important but less recognized component of food security: stability.

Availability refers to and encompasses the supply of food in sufficient quantities over a range of scales from household cupboards and grocery store shelves in the community to national food stocks and global supply chains. This pillar includes the concept of having culturally appropriate foods available for consumption. Accessibility ensures that individuals and households have the resources to obtain food resources. It coincides with having equitable distribution networks and purchasing power. Geospatial food access research has worked most closely with this aspect of food security by investigating distances and travel times to sources of food. The utilization pillar of food security recognizes the allocation of food within a household, including food safety as well as the nutritional quality of the food and is more closely associated with ensuring that foods have adequate nutritional value to benefit a healthy lifestyle. Finally, stability refers to the resiliency of the overall framework to remain stable over time maintaining a permanent and secure access to food for all people.

**Barriers to Access**

Empirically, food insecurity has often been investigated in relation to specific races, socio-economic class, and spatial access to healthy food (Hallett and McDermott 2011;
Walker, Keane, and Burke 2010). Geographic Information Systems (GIS) are often employed to analyze relationships between the built food environment and spatial proximity of residents to food sources (Bao and Tong, 2017; Eckert and Shetty, 2011; Slater et al. 2017). Many research methods for investigating food insecurity also involve qualitative methods such as focus groups, interviews, or food diaries (Bono and Finn 2017; Walker, Keane, and Burke 2010; Beaulac, Kristjansson and Cummins 2009). An in-depth review of 38 studies on the food environment found that there have been a wide variety of methods used to measure food access for study participants but there is a lack of any standardized measure making it difficult to compare the results of any one study between space, time, and populations (Caspi et al. 2012)

In an effort to better understand and quantify the issue of urban food insecurity, the concept of food deserts was developed. The term “food desert” emerged in the early 1990s and is generally understood to be an area characterized by poor spatial access to healthy and affordable food (Beaulac, Kristjansson, and Cummins 2009). A review of the scientific literature highlights the lack of consensus on a precise definition of a food desert and exactly what variables should be used to identify them. Food deserts have been described in a variety of ways such as the absence of supermarkets in low-income neighborhoods, urban areas with ten stores or fewer, poor urban areas where residents cannot afford healthy food, or areas where competition from large chain stores has forced the closure of small, independent grocers (Walker, Keane, and Burke 2010). The USDA has created an online mapping tool for determining food access by census tract called the Food Access Research Atlas (Economic Research Service USDA 2015). The web map is
meant to be a guide for food research stakeholders to help identify areas that could be specifically targeted for intervention strategies addressing food security (Widener 2018).

To understand the limitations of food desert research, we must consider some of the underlying assumptions being made in the delineation of food deserts boundaries, including (1) only full-service grocery stores are considered, (2) consumers prefer to shop at their nearest retailer, (3) food deserts occur in areas of concentrated poverty, and (4) all customers have equal access to the same mode of transportation (Breyer & Voss-Andreae 2013). These assumptions have garnered sharp criticism from some experts who argue that they are too broad and prevent a true assessment of urban food insecurity (Apparicio, Cloutier, and Sheamur 2007; Short, Guthman, and Raskin 2007). They note that while increased geographic access could indeed be an enabling factor for good diets, there is no guarantee that residents will choose healthier foods simply because they are present in their neighborhood. Similarly, a food desert may “disappear” on the map with the introduction of a grocery store even though food may remain inaccessible for residents in terms of the variety of desired foods or the high economic cost of healthful foods (Breyer & Voss-Andreae, 2013). Food desert research tends to emphasize the spatial accessibility component of food insecurity and is an attempt to simplify the characteristics of an area to identify potential risk for the presence of food insecure households and neighborhoods.

While there remains some disagreement about how exactly to define a food desert, there is no doubt concerning the consequences of food insecurity in food deserts. Residents in these areas have an increased exposure to unhealthy, calorie dense foods of little nutritional value that are readily available at convenience stores and fast-food restaurants in closer proximity to their homes (i.e., food swamps) than supermarkets or
grocery stores. Compared to higher income households, residents in food deserts were found to be 24 percent less likely to eat the recommended servings of fruits and vegetables per day (Weatherspoon et al. 2015). They often experience poorer health outcomes because of diets consisting of a larger quantity of high fat, high sugar and sodium, and processed foods (Beaulac, Kristjannson, and Cummins 2009; Hendrickson, Smith, and Eikenberry 2006). Despite the somewhat contradictory body of evidence, policy and practice are moving rapidly and many community health departments actively seek to incentivize an increase in physical food access within food deserts while overlooking the importance of other factors of accessibility.

**Gaps in the Research**

Numerous studies have investigated how geographic distance from supermarkets for low-income residents adversely influences their ability to maintain proper nutrition (Caspi et al. 2012; Larsen and Gilliland 2009; McDermot, Igoe, and Stahre 2017; Walker, Kean, and Burke 2010). Increased spatial distance and low socio-economic status, however, are inadequate to explain why only 12 percent of the US population consumes the recommended fruit and vegetable consumption since many middle- to high-income individuals have the ability to easily access fresh produce and yet still do not meet the recommendation (Seung et al. 2017). There is still a general lack of understanding of the interaction of the physical environment and how it combines with social factors to create health inequalities among populations (Townshend and Lake 2009). Current research emphasizes the role of distance to market from the place of residence as a measure of
food security. However, it is becoming apparent that healthy eating habits, especially increased fruit and vegetable consumption, does not necessarily occur with the arrival of a new grocery retailer in what was previously defined as a food desert (Allcott, Diamond, and Dubé 2017; Dubowitz et al. 2015). Few studies document the perception of food access for those who are food insecure and how it affects their healthy food choices (Alkon et al. 2013). Similarly, little attention is given to what aspects of food security matter most or what strategies food secure households employ to acquire food despite the barriers in their built environment. Many studies evaluate access to products that have a long shelf-life while few discuss the added difficulty of consistently accessing fresh produce. There is an established need for more disaggregate data that investigates the food environment at a local scale including the use of nutritional surveys as a method of investigation (Beal and Ervin 2018). This project aims to address the need for local scale, detailed data and provide information about the interaction of low-access families with the physical and social aspects of the food environment. This research also seeks to help reveal the wide range of concerns that food insecure people face when selecting, purchasing, and preparing fresh fruits and vegetables.

**Framing the Problem**

Food security refers to the availability, accessibility, utilization, and stability of safe and nutritious food for people to maintain a healthy lifestyle (Sage 2016). While industrial agriculture is more productive on a yield per acre basis, it has considerable negative consequences for the environment, society, and the global economy which
threaten food security for millions of individuals globally. Global food security is facing pressures from both supply and demand sides that are creating conditions for greater vulnerability and instability in the food system. One of the greatest challenges facing humanity in the 21\textsuperscript{st} century revolves around how to equitably feed the expanding world population without incurring irrevocable damage to the natural environment (Godfray et al. 2010). Food insecurity can be categorized as a wicked problem (Rittel and Webber 1973; DeFries and Nagendra 2017) because of its complexity, the lack of a known or agreed upon solution, the interdisciplinary nature of the issue, and the urgency with which the problem needs to be addressed.

Projections suggest that by 2050, 70 percent of the 9.6 billion people on Earth will be live in urban areas (United Nations Department of Economic and Social Affairs 2013). Urban development concentrates human populations into smaller areas but increases the intensity with which resources are utilized to support them. As the rate of urbanization increases, infrastructure and services are not always able to keep up with the demand resulting in increased inequalities and the formation of slums. Matching food supplies to food needs, especially for urban populations, is a source of social, economic, and political concern. Reforms to the food system need to be considered to ensure the continued ability of urban areas to provide for their citizens.

Maintaining access to adequate, nutritious food for all members of society is important because it is a basic human right for all people (UN General Assembly 1948). Food insecurity is ubiquitous across the world with no single country being able to claim zero hunger. Within the United States, the right to food is not formally recognized. Still, food security remains an important issue because it affects 11 percent of urban
households, including 24 million adults and 11 million children, meaning they lack access to enough food for an active, healthy life (Coleman-Jensen 2020). Limited physical access to supermarkets, grocery stores, and other sources of healthy and affordable food is one of the barriers that makes it more difficult for low-income households to maintain their health. Diet-related, non-communicable diseases such as diabetes, obesity, and heart disease are quickly becoming overwhelming public health issues that will continue to incur significant financial costs in the future, if ignored. Food security needs to be addressed because it disproportionately affects vulnerable members of society including the poor, minority populations, children, and the elderly (Coleman-Jensen 2020).

Low-income households with children are especially vulnerable to food insecurity since they tend to prioritize other expenses over healthy food. Healthy eating can become a major endeavor, especially when unreliable transportation, small children, or winter weather may be involved. Unsurprisingly, low-income neighborhoods are often subject to poorer health since they are more likely to source their food from higher fat, high sugar, and high sodium foods available at convenience stores and fast-food restaurants which are sometimes more easily accessible than grocery stores (Evans et al. 2015). Fresh fruit and vegetable consumption is directly related to better health and reduced risk for non-communicable, diet-related diseases (Waterlander et al. 2018).

A recent study conducted by the Center for Disease Control (Seung et al. 2017) found that South Dakotans have the lowest rate in the nation of those meeting the daily recommended intake of fruits and vegetables. In the Sioux Falls metropolitan statistical area (MSA), nearly 11 percent of the population is food insecure (City of Sioux Falls...
A community health survey conducted in 2018 indicated that only 14 percent of adults consumed the recommended number of fruits and vegetables servings per day. Additionally, over two-thirds of adults in the Sioux Falls MSA are considered overweight or obese (City of Sioux Falls 2016). Limited access and availability of fresh foods are not the only cause of increased obesity rates; however, this is one aspect of a serious issue.

Factors contributing towards food insecurity in Sioux Falls have not been extensively researched, although a recent study conducted by the Augustana Research Institute found that affordability was often a more important factor in store choice than distance or convenience (Smith 2018). Other factors mentioned in the report included distance to market, lack of culinary knowledge, having a busy schedule, and experiencing higher levels of stress. To offer any type of intervention in the city, we must first have a better understanding of the strategies that food insecure individuals use when they make healthy food choices and their personal perception of food access.

Study Area: Sioux Falls, South Dakota

The City of Sioux Falls has experienced continued growth over the years and now boasts an urban population of 190,750 covering an area of 78 square miles (Figure 2) and is home to approximately 26,000 food insecure individuals (City of Sioux Falls 2016). As the population continues to increase over the next 10 years, it is expected that food insecurity will also increase unless initiatives are taken to help improve access and address social and cultural concerns. Results from a community resident survey found that only 8 percent of residents consumed the recommended daily vegetable intake and
only 6 percent consumed the recommended fruit intake (City of Sioux Falls 2016). Malnutrition in the form of overweight and obesity affects a majority of the population. Limited access and availability of fresh foods could be a factor influencing adverse health outcomes for lower income households in the area.

Within the City of Sioux Falls, there are 24 full-service grocery stores. These are stores that have a selection of at least ten types of fresh fruits or vegetables as well as several non-perishable goods. The city has eight community gardens, three school gardens and four seasonal farmers’ market (Figure 2). The farmers’ markets have struggled in attracting vendors and visitors and the Falls Park Market in central Sioux Falls is the only one that remains consistently open and well attended. Larger supermarkets such as Wal-Mart and HyVee are situated farther from the central business district nearer to the outskirts of the city.

Currently, food security data is aggregated at the census tract level, but these represent large swaths of area within the city and do not provide a clear picture of the problem. The USDA Food Access Atlas (2015) has identified five census tracts classified as having low access to food, where a significant number of residents is more than 1 mile from the nearest supermarket (Figure 2).

Individual and household scaled research may be too detailed to determine generalized patterns of food insecurity but will be helpful in discerning some of the social barriers to healthy diets. Approaching the issue of access to fresh fruits and vegetables for at-risk households from a city scale more accurately describes where these populations are located and how they interact with the food environment and make healthy food choices. With more refined data, deficiencies in the components of the food system that
do not support high quality diets can be addressed and improved to meet the goal of ending malnutrition by 2030.

Figure 2. City of Sioux Falls, South Dakota with the location of food sources and USDA low access census tracts.
**Research Questions and Objectives**

This study examined how the dimensions of food security influence the consumption of fruits and vegetables in low-income and low-access areas to gain a better understanding of how households living in these at-risk neighborhoods in mid-sized, growing cities such as Sioux Falls can increase their access to affordable, nutritious, fresh produce. With this information, the challenges of feeding a growing urban population can be addressed holistically and the potential for a more equitable and sustainable food system that improves community health can be realized.

Research Objectives:

- Compare how individuals in at-risk areas prioritize healthy food choices.
- Investigate the types of retailers at which vulnerable households purchase their produce.
- Determine barriers to increased fruit and vegetable consumption for individuals in these neighborhoods.

**METHODS**

Food insecurity is a complex issue with many interdependencies that make it difficult to quantify (Barrett 2010). Food access depends on more than just spatial proximity or affordability, yet other dimensions of food access are difficult to study without the use of qualitative methods (Alkon et al. 2013). The focus of this study was to determine what factors affect food insecurity based on the lived experiences of residents who live in food
insecure neighborhoods or who may be food insecure as a result of financial hardship. A mixed methods approach (Given 2008) that draws inferences from both quantitative and qualitative data collection and analysis was employed to facilitate a more complete understanding of the food environment and its influence on diet for low-income, low-access households in Sioux Falls, South Dakota. Qualitative research was necessary to uncover individual perceptions of the food environment that go beyond traditional quantitative measures of distance and cost and include the interplay of other, more nuanced, factors that affect food choice. The data was evaluated to determine how well it corresponded to the existing pillars of food security framework (Barrett 2010; Sage 2016) as well as to elaborate and extend upon any emergent themes. The study progressed in three phases: (1) an online survey, (2) personal interviews, and (3) focus groups with specific age demographics. Quantitative survey data regarding physical access and barriers to more healthful foods were collected from 87 adults living in low-income or low-access areas during the spring of 2019. Qualitative data in the form of ten interviews and four focus groups, with a total of 28 participants, were collected in the spring and fall of 2019. Specifically, participants were asked about factors influencing food purchasing decisions. Focus groups narrowed the sample population to gather the experiences of students and seniors, two groups that face distinctive challenges in food access based on income and mobility. Institutional Review Board approvals from South Dakota State University were obtained before commencement of the data collection.
Quantitative Methods

Survey Participants

For the quantitative portion of this study, participants were recruited using a postcard that was mailed to their residence inviting them to participate in an online survey. The U.S. Postal Service (USPS) Every Door Direct Mail (EDDM) online tool was used to target specific postal routes for the mailing based on their location within a USDA defined food desert or their average household income (Figure 3, Table 1). Four mailing routes were chosen: Hayward (LILA-1) and Norton (LILA-2) neighborhoods have low-income and low-access (LILA) and are within USDA defined food deserts, Whittier neighborhood has low-income with higher access (LIHA), and Roosevelt neighborhood which has a higher income but low-access to grocery stores (HILA). Low-access neighborhoods had no grocery stores within a 1-mile road network buffer of their center point. Low-income neighborhoods had household incomes below the 2018 US Census Bureau’s median household income of $59,017 for the City of Sioux Falls.

Data Collection

The mailed postcard invited residents to participate in an online questionnaire administered using the Esri ArcGIS Survey123 platform. Participants could access the survey via a scanned QR code on the postcard or by entering the survey web address into any internet browser. An option to call and have a postage-paid paper format of the survey mailed to them to complete was also offered. Each respondent was entered into a
drawing to win one of four $25 gift cards as an incentive to complete the survey. Information about the topic of study and consent to participate forms were agreed upon prior to entering the online survey. The questionnaire was designed to gain a better understanding of the relative importance of food access factors such as distance to market, affordability, and personal preference that influence food security for these low-income or low-access households. Along with demographic questions, participants were asked thirty questions related to their shopping patterns, food purchasing decisions, healthy diets, and personal food security. For example, participants were asked (1) to list or indicate on a map the location of their most frequented grocery store, (2) how they prioritize what to purchase when shopping for groceries, (3) what barriers prevented them from healthy eating, and (4) what, if any, coping mechanisms they use to deal with unaffordable grocery prices.

Data Analysis

To determine spatial access to food stores, a one-mile road network buffer from the centroid of the mailing route was calculated using a network analysis tool in the ArcGIS Pro (v.2.6.0) geographic information systems software package. Twenty-four full-service grocery stores that carry an assortment of canned and frozen foods, fresh fruits and vegetables, fresh meats, as well a variety of non-perishable goods, as of January 2019, were geocoded based on their addresses. The nearest grocery store to each mailing route surveyed was calculated as the nearest grocery store based on the road network to any edge of the mailing route polygon. Participant’s self-reported primary food store was then
compared to the nearest food retailer. Descriptive statistics were used to describe the differences between the three types of access groups: low-income low-access (LILA), low-income high-access (LIHA), and high-income low-access (HILA).

Figure 3. United States Postal Service (USPS) Every Door Direct Mail (EDDM) routes surveyed and their access classification.
Table 1. USPS descriptive characteristics of each mailing route surveyed.

<table>
<thead>
<tr>
<th>Access Type</th>
<th>Residential Households</th>
<th>Average Household Size</th>
<th>Percentage of Age 25-44</th>
<th>Household Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Income Low Access Roosevelt (HILA)</td>
<td>765</td>
<td>2.6</td>
<td>42%</td>
<td>$70,100</td>
</tr>
<tr>
<td>Low Income Low Access Hayward (LILA-1)</td>
<td>907</td>
<td>2.3</td>
<td>29%</td>
<td>$39,480</td>
</tr>
<tr>
<td>Low Income Low Access Norton (LILA-2)</td>
<td>416</td>
<td>2.8</td>
<td>31%</td>
<td>$37,870</td>
</tr>
<tr>
<td>Low Income High Access Whittier (LIHA)</td>
<td>612</td>
<td>2.4</td>
<td>29%</td>
<td>$37,220</td>
</tr>
</tbody>
</table>

Qualitative Methods

Interview & Focus Group Participants

Participants in the qualitative portion of the study were recruited through a snowball sampling using the follow-up question from the online survey, leads from the local food council, as well as from responses to flyers distributed at local post-secondary institutions and churches. Criteria for inclusion in the study were (1) they had to be a resident in the City of Sioux Falls and (2) they had to be the primary grocery shopper for their household. Focus groups participants were either over the age of 55 for the senior citizen group or actively enrolled in a post-secondary institution for the student group. Specific income levels were not a requirement for participation. However, based on their residence in areas of low-access or low-income or their status as a student, it was assumed that most were exposed to a low-income or low-access food environment. For
participating in an interview or focus group, participants were incentivized with a $20 gift card to a local grocery store.

Data Collection

Personal interviews were conducted using semi-structured, open-ended questions to collect qualitative data concerning the personal experiences of the interviewees as they navigate their food environments. The semi-structured nature of the discussion allowed for the participants to voice issues that were relevant to their own experiences rather than be led into speaking to predetermined themes. Focus groups used a similar method of semi-structured and open-ended questions that allowed for deeper discussion about the shared experiences of the participants in each group. The discussion guide was created considering the framework of the Food and Agriculture Organization’s (FAO 1996) definition of food security: “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 lifestyle” and the four pillars of food security: availability, access, utilization, and stability. Questions and prompts were developed to specifically examine the participants’ concepts of what they consider to be healthful foods and a healthful diet, factors that influenced food purchasing decisions, and barriers to accessing healthy foods. For example, questions in this portion of the study included: (1) What do you consider to be healthy eating? (2) What is the impact of a healthful diet in your life? (3) How do you prioritize what you will purchase at the grocery store?, and (4) Do you face any particular challenges or barriers in
obtaining fresh fruits and vegetables? At the start of each session, participants were asked to read through a consent to participate form and complete a short demographic information survey (e.g., age, ethnicity/race, household size, tenure, marital status, education, and employment). Interviews and focus group sessions were conducted in English, they ranged from about 45 minutes to an hour in duration, and were audio recorded. Interviews were held in public locations such as cafés or libraries where the participant felt comfortable meeting. Focus groups were held in a large room at a local church.

Data Analysis

Upon completion, interview and focus group session audio recordings were transcribed verbatim into a word processing program. A general inductive approach consistent with traditional grounded theory principles (Strauss and Corbin 1998) was used to guide the data analysis of the interview and focus group meeting transcripts. Raw transcript data were reviewed, and open coding was performed in a line-by-line analysis. Codes were grouped into categories relating to the condition, action, interaction, or consequence that was expressed. From these initial codes, patterns and relationships between categories were identified based on the frequency of certain coded topics and were grouped into emerging themes. The themes were then categorized into higher-level physical, social, or temporal aspects relating back to each dimension of food security.
QUANTITATIVE RESULTS

Table 2 summarizes the demographic composition of the 87 online questionnaire respondents who participated in the study. In total, 91 surveys were submitted and three were removed as they did not complete the questionnaire. Most of the respondents identified as female, which was expected because women are generally the primary grocery shopper for a household (Lachance-Grzela and Bouchard 2010; Bianchi et al. 2012). Respondents were mostly White, employed full-time, and had at least some college education. Despite surveying neighborhoods identified as low-income, most respondents had annual incomes above the federal poverty level that would allow them to qualify for state food benefits. All respondents had access to a vehicle for grocery purchases.

The top five priorities across all access types that influenced store choice were affordability, proximity to market, quality of the food, availability of organic produce, and the ability to purchase food in larger quantities (Figure 4). Affordability was the most important factor but, as income increased, the quality of the food became a more important priority than the proximity to market for the high-income group (HILA).

All respondents were asked to list or choose their preferred (most frequented) store on a map. If a respondent chose affordability or quality as an important factor in store choice, they were also asked to indicate which retailer they patronized that was most affordable or had the best quality produce. The nearest store to their neighborhood was the same as the preferred store for 23 percent of all respondents. Survey results indicate
that the preferred store is more closely associated with affordability than to the quality of
the produce available.

*Table 2.* Demographic composition of online questionnaire participants (n=87).

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>76</td>
<td>87%</td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
<td>13%</td>
</tr>
<tr>
<td>Ethnicity/Race</td>
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<td></td>
</tr>
<tr>
<td>Black or African American</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>White</td>
<td>82</td>
<td>94%</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>4</td>
<td>5%</td>
</tr>
<tr>
<td>26-35</td>
<td>13</td>
<td>15%</td>
</tr>
<tr>
<td>36-45</td>
<td>34</td>
<td>39%</td>
</tr>
<tr>
<td>46-55</td>
<td>10</td>
<td>11%</td>
</tr>
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<td>56-65</td>
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<td>15%</td>
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<tr>
<td>65+</td>
<td>10</td>
<td>11%</td>
</tr>
<tr>
<td>Skip</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>Household Size</td>
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<td></td>
</tr>
<tr>
<td>Single</td>
<td>24</td>
<td>28%</td>
</tr>
<tr>
<td>Couple</td>
<td>20</td>
<td>23%</td>
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<td>Family Unit (3 or more)</td>
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<td>49%</td>
</tr>
<tr>
<td>Tenure</td>
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<td></td>
</tr>
<tr>
<td>Rent</td>
<td>21</td>
<td>24%</td>
</tr>
<tr>
<td>Own</td>
<td>66</td>
<td>76%</td>
</tr>
<tr>
<td>Marital Status</td>
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<td></td>
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<tr>
<td>Married</td>
<td>58</td>
<td>67%</td>
</tr>
<tr>
<td>Single</td>
<td>29</td>
<td>33%</td>
</tr>
<tr>
<td>Highest Level of Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GED</td>
<td>14</td>
<td>16%</td>
</tr>
<tr>
<td>Some College</td>
<td>18</td>
<td>21%</td>
</tr>
<tr>
<td>Associate degree</td>
<td>12</td>
<td>14%</td>
</tr>
<tr>
<td>Bachelor's Degree or higher</td>
<td>43</td>
<td>49%</td>
</tr>
<tr>
<td>Employment Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>2</td>
<td>2%</td>
</tr>
</tbody>
</table>
Part-time at one job 9 10%
Part-time at multiple jobs 9 10%
Employed full-time 46 53%
Disabled 4 5%
Not employed 1 1%
Homemaker 3 3%
Retired 13 15%

Socio-Economic Status
Below Poverty Level 12 14%
Above Poverty Level 75 86%

Access Type
High Income Low Access - Roosevelt 27 31%
Low Income High Access - Whittier 27 31%
Low Income Low Access - Hayward 18 21%
Low Income Low Access - Norton 15 17%

Figure 4. Top five priorities in store choice by access type.
For low-income, low-access respondents (LILA) (n=33) in the Hayward and Norton neighborhoods, 40 percent of respondents chose Walmart as their preferred store. Only 18 percent shopped most frequently at their nearest store, HyVee in the Hayward neighborhood or Franklin Food Mart in the Norton neighborhood (Figure 5 & Figure 6). Affordability was a high priority for fruit and vegetable purchases with 85 percent of respondents placing this attribute in their top three priorities however neither Aldi nor Walmart, considered to be the most affordable stores, were the closest store to the survey area. Food quality was chosen as a top priority by 40 percent of respondents among the low-income low-access group and HyVee was considered to have the best quality produce. HyVee grocery stores in Sioux Falls are independently operated and there was variability as to which location carried the best produce. Some respondents were willing to travel significantly farther to obtain what they considered to be the best produce.

For low income, high access respondents (LIHA) (n=27) in the Whittier neighborhood, 40 percent of respondents chose Walmart as their preferred store. Thirty percent shopped most frequently at their nearest store, HyVee (Figure 7). Affordability was a priority for 67 percent of respondents. Aldi and Walmart were chosen most often as the most affordable stores. Thirty percent of respondents in this access group felt that quality was a priority for store choice when purchasing fruits and vegetables and HyVee was most often chosen as having the best quality produce although no one specific location stood out as the primary location with the best produce.

In the high-income, low-access respondents (HILA) (n=27) Roosevelt neighborhood, HyVee was chosen as the preferred store by 52 percent of respondents (Figure 8). The nearest store to this neighborhood was also a HyVee location and this location was
chosen as the preferred store for 22 percent of respondents. Affordability was a priority for 70 percent of respondents in this access group but neither of the two most affordable stores (Walmart and Aldi) were the nearest store to their residence. Quality of produce was a priority for 52 percent of respondents and HyVee was most often chosen as the store with the best quality produce. As in the other access groups, no single HyVee location stood out as the one with the best quality produce and respondents were willing to travel to more distant HyVee’s to get better produce.

While only traditional supermarkets are considered in most food desert research, alternative food sources such as convenience stores, drug stores, dollar stores, and warehouse stores also provide points of food access within a community. When surveyed on the frequency with which participants made purchases at these alternative food sources, the majority of respondents never shopped for food at convenience, drug, or dollar stores. The LILA access group was the most likely to utilize these other store options occasionally to obtain food, with the exception of warehouse stores (Figure 9). HILA households were the least likely to use convenience, drug, or dollar stores but more than 75 percent of respondents in this access group shopped at warehouse stores at least once a month.
Figure 5. Hayward neighborhood, low-income low-access (LILA-1), store choice by priority
Figure 6. Norton neighborhood, low-income low-access (LILA-2), store choice by priority.
Figure 7. Whittier neighborhood, low-income high-access (LIHA), store choice by priority.
Figure 8. Roosevelt neighborhood, high-income low-access (HILA), store choice by priority.
Similarly, small grocers such as ethnic food stores, natural food stores, and farmers’ markets are excluded from traditional food desert research. Other coping mechanisms that can supplement a household’s dietary needs such as food aid or gardens are difficult to assess using publicly available databases and thus are also left out of most spatial analysis studies of food access. However, at some point in the year, respondents from each neighborhood surveyed did use these small grocers as food access points or supplemented their diet in some other way than using solely supermarkets (Figure 10). Low-income groups were more likely to visit ethnic grocers, while the high-income
group was more likely to shop at the farmers’ market or a natural foods store. Food aid was used by those in the low-income neighborhoods while home gardens and community supported agriculture (CSA) were common in the high-income group.

Figure 10. Percent of respondents in each access group who purchased food from non-traditional food sources or used other coping mechanisms to supplement their household dietary needs.
When evaluating distance to market, the travel pattern is often assumed to be from an individual’s place of residence to the nearest store. Survey participants were asked to choose their most frequently used travel pattern when shopping for groceries. Most respondents (55 percent) shopped primarily starting from their place of residence (Figure 11). Those in the HILA access group were the most likely to group their shopping trips along with other activities or from their workplace. The LILA group was the most likely to travel from their place of residence to the store and the LIHA group was split between traveling mostly from their residence or from a non-residential starting point to the store.

*Figure 11. Most common starting point of travel to go food shopping.*

Participants were asked to rate how much influence other potential barriers played into their ability to maintain a healthy diet and achieve food security. The least significant barrier within all access groups was a lack of kitchen tools used for cooking, followed by proximity to store location and confusion about nutritional information (Figure 12). A lack of culinary knowledge was not a significant barrier to maintaining a healthy diet.
although 21 percent of the LILA group felt at least a moderate to significant lack of knowledge. The most significant barriers to healthy diets that were identified among all participants were the amount of time available to prepare meals, the cost of purchasing fresh produce, and not enjoying the taste of fruits or vegetables. Notably, time to prepare meals was at least a moderate barrier for a majority of respondents who lived in a low-access neighborhood. Cost was more of a barrier for respondents in low-income neighborhoods than in their higher-income counterparts.

<table>
<thead>
<tr>
<th>Time to Prepare Meals</th>
<th>Not a Barrier</th>
<th>Slight Barrier</th>
<th>Moderate Barrier</th>
<th>Significant Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>LILA</td>
<td>30%</td>
<td>12%</td>
<td>36%</td>
<td>21%</td>
</tr>
<tr>
<td>LIHA</td>
<td>15%</td>
<td>30%</td>
<td>19%</td>
<td>37%</td>
</tr>
<tr>
<td>HILA</td>
<td>19%</td>
<td>22%</td>
<td>37%</td>
<td>22%</td>
</tr>
<tr>
<td>Cost of Produce</td>
<td>LILA</td>
<td>27%</td>
<td>39%</td>
<td>9%</td>
</tr>
<tr>
<td>LIHA</td>
<td>28%</td>
<td>30%</td>
<td>7%</td>
<td>44%</td>
</tr>
<tr>
<td>HILA</td>
<td>33%</td>
<td>52%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Taste of Produce</td>
<td>LILA</td>
<td>48%</td>
<td>33%</td>
<td>18%</td>
</tr>
<tr>
<td>LIHA</td>
<td>48%</td>
<td>22%</td>
<td>15%</td>
<td>11%</td>
</tr>
<tr>
<td>HILA</td>
<td>56%</td>
<td>26%</td>
<td>15%</td>
<td>4%</td>
</tr>
<tr>
<td>Culinary Knowledge</td>
<td>LILA</td>
<td>42%</td>
<td>36%</td>
<td>12%</td>
</tr>
<tr>
<td>LIHA</td>
<td>67%</td>
<td>33%</td>
<td>7%</td>
<td>4%</td>
</tr>
<tr>
<td>HILA</td>
<td>63%</td>
<td>26%</td>
<td>7%</td>
<td>4%</td>
</tr>
<tr>
<td>Confusion about</td>
<td>LILA</td>
<td>48%</td>
<td>39%</td>
<td>9%</td>
</tr>
<tr>
<td>Nutritional Information</td>
<td>LIHA</td>
<td>74%</td>
<td>21%</td>
<td>7%</td>
</tr>
<tr>
<td>HILA</td>
<td>85%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Proximity to Store</td>
<td>LILA</td>
<td>61%</td>
<td>27%</td>
<td>9%</td>
</tr>
<tr>
<td>LIHA</td>
<td>93%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>HILA</td>
<td>67%</td>
<td>26%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Kitchen Tools</td>
<td>LILA</td>
<td>76%</td>
<td>15%</td>
<td>9%</td>
</tr>
<tr>
<td>LIHA</td>
<td>74%</td>
<td>4%</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>HILA</td>
<td>89%</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 12. Perceived barriers to maintaining a healthy diet by access group.

When asked specifically about how cost, preparation time, and taste influence their consumption of fresh fruits and vegetables, there were some similarities to the most
significant barriers (Figure 13). If fruits and vegetables were cheaper, results showed that they were more likely to be consumed in all access groups. However, 30 percent of low-income participants indicated they would not increase consumption of fruits and vegetables even if prices were lower. The two low-access groups (HILA & LILA) agreed that having more time to prepare meals with fruits and vegetables would increase their consumption whereas the high-access group did not seem to think that more time would be as beneficial. Most participants (59 percent) disagreed or strongly disagreed that taste was limiting their consumption of fruits and vegetables, but 27 percent of respondents agreed that not enjoying the taste of fruits and vegetables was one reason they did not consume more of them.

Figure 13. Likelihood of increasing fresh fruit and vegetable consumption based on affordability, time, and taste.

Low-income groups were more likely to employ various coping strategies in response to unaffordable food prices (Figure 14). The most common coping strategy employed by
low-income groups was to reduce other household expenses followed by reducing consumption for a specific individual in the family or for the entire household.

Purchasing less fruits and vegetables and shopping at different, less expensive stores, were also used frequently. High-income households were most likely to borrow money for food in order to cope with times of food insecurity. This group also coped by starting a garden to increase their food supply.

![Coping strategies used to deal with unaffordable food prices, by access group.](image)

*Figure 14. Coping strategies used to deal with unaffordable food prices, by access group.*

When asked in an open-ended question to describe healthy foods, fruits and vegetables were mentioned by the majority of respondents regardless of income or access as being an essential part of a healthful diet. Fifty-five words or phrases were used to describe healthy foods. In comparison, when asked to describe unhealthy foods, there
was more variability in the responses with 84 words or phrases. Words that were mentioned more than four times were mapped. Fourteen healthy words and seventeen unhealthy words had more than four mentions (Figure 15). Interestingly, words describing unhealthy foods often named the type of food itself. Healthier foods were described using more adjectives rather than focusing on individual types of food outside of fruits and vegetables.

*Figure 15.* Words or phrases mentioned at least four times to describe healthy or unhealthy foods.
QUALITATIVE RESULTS

A demographic summary of the participants for the qualitative portion of this study can be found in Table 3. In total, 28 individuals participated in either a one-on-one interview or a focus group session. Most of the respondents identified as low-income, especially the focus group participants who were either students incurring debt to pay for schooling or seniors living from a pension that was inadequate for their basic monthly expenses. For those living on a pension, it can be difficult to increase available income and cost of living adjustments on their pension may be insufficient to address the inflation of costs such as food, health care, and housing. All respondents had access to a vehicle for grocery purchases.

Table 3. Demographics of interview and focus group participants.

<table>
<thead>
<tr>
<th></th>
<th>Interviews (n=10)</th>
<th>Focus Groups (n=18)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
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<tr>
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<tr>
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</tr>
<tr>
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<tr>
<td>18-25</td>
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</tr>
<tr>
<td>26-35</td>
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<td>46-55</td>
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</tr>
<tr>
<td>Household Size</td>
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</tr>
<tr>
<td>Single</td>
<td>5</td>
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</tr>
<tr>
<td>Family Unit (3 or more)</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>Tenure</td>
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<td></td>
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<td></td>
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<tr>
<td>--------------------------</td>
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</tr>
<tr>
<td>Rent</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>Own</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>Single</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>Highest Level of Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school diploma (GED)</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>Some College</td>
<td>1</td>
<td>10%</td>
</tr>
<tr>
<td>Bachelor's Degree or higher</td>
<td>3</td>
<td>30%</td>
</tr>
<tr>
<td>Employment Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>Part-time at one job</td>
<td>1</td>
<td>10%</td>
</tr>
<tr>
<td>Part-time at multiple jobs</td>
<td>1</td>
<td>10%</td>
</tr>
<tr>
<td>Employed full-time</td>
<td>3</td>
<td>30%</td>
</tr>
<tr>
<td>Homemaker</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>Disabled</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Retired</td>
<td>1</td>
<td>10%</td>
</tr>
</tbody>
</table>

The majority of participants considered fruits and vegetables an essential part of a healthy diet because, in their opinion, they provided proper nourishment, helped them look and feel good, and gave them a more positive outlook in life. Dietary health was often associated with both physical and psychological health. One participant mentioned that when eating healthy, “I definitely tend to have more mental and emotional clarity.” Similarly, the idea of what you eat influencing and connecting with other many aspects of life such as family relationships, success in the workplace, and school performance was identified as an important impact of maintaining a healthy diet. The words “fresh”, “organic”, and “local” were all mentioned in connection to fruits and vegetables and a healthful diet.

Themes, derived from the data, which fell within the scope of the current pillars of food security framework were: (1) accessibility is most often discussed in terms of socio-
economic access rather than geographic access, (2) availability is closely related to types of food available and in the appropriate quantities, (3) utilization encompassed obtaining and preparing foods that made up a high quality diet, and (4) references to stability corresponded to thoughts about maintaining a consistent supply of preferred foods and brands. Within each food security pillar, themes are presented with exemplar quotes in Table 4.

**Accessibility**

**Affordability**

In this study, interview and focus group participants were most focused on economic accessibility to healthy foods. When choosing where to shop, affordability was a stronger priority than proximity. Participants referred to “stretching my dollar to go the farthest,” and going to the “least expensive place.” HyVee was most often associated with higher prices to the extent that participants often excluded it as a place at which they would shop with the exception of specific items such as organic and health foods or brands that could not be found elsewhere. Although store choice was influenced by the overall perceived affordability of the retailer, price was often spoken of in terms of certain types of foods being more or less expensive. Participants recognized that unhealthy foods lacked nutritional value but were forced to choose between foods that would “last longer,” were “quick and convenient,” and would be the most filling over fresh fruits and vegetables.
Coupons had very little influence on store choice with the general consensus being that they did not save enough money to be worth the time to switch their entire shopping needs to an alternate store. Many participants noted that coupons were often for “junk” foods. Flyers and printed ads were mostly ignored and only influenced the types of food purchased in any given week as opposed to causing a person to deviate from their most frequent store choice.

Participants were conflicted over whether or not fruits and vegetables were actually more expensive than other foods. While some felt that “fruits and vegetables are more expensive” and “it [the price] makes you want to walk away,” others felt it was a matter of “priorities” and “making good choices,” with one participant summing it up as: “Bottom line is, if you want to eat healthy, you can make it happen.”

Menu planning and utilizing a shopping list were considered as helpful for sticking to a budget although not everyone utilized either of these two methods. Those who did not felt it was mostly because they were not “organized” enough while one participant noted that they were simply too poor to afford to vary their menu at all and thus purchased the same few items each week without needing a shopping list.

**Proximity**

Accessibility, in terms of spatial proximity to a grocery store, was considered convenient but often used as a last-minute supplement to their preferred store if the nearest store was considered more expensive than their preferred store. Commercial areas in Sioux Falls often have several grocery stores within close proximity to one another and
participants found that once they reach the area, they are able to choose the most affordable store. All interview and focus group participants had access to a vehicle for grocery shopping which likely negated much of the importance of having a grocery store within a reasonable walking distance or accessible by public transit. Several respondents mentioned grouping other activities with grocery shopping, or trip-chaining, as a mechanism for better time management when getting groceries as well as accessing stores that may be considered out of the way but having desired types of foods. Household dynamics played a role in trip-chaining with students and single-person households being the most likely to “stop on the way home from work,” while families with children coupled grocery shopping with other household activities mentioning that, “it is pretty rare that I leave from home just to go to the grocery store” and “I won’t go to some of the stores that are farther away until I know that we have to be over in that area anyway.”

Other Factors Affecting Accessibility

Another factor that made a store more or less accessible for participants was the in-store environment. Participants mention choosing one store over another because of its cleanliness, lack of crowds, or generally more pleasant shopping experience. One particular Walmart was consistently described as “dirty,” “crowded,” and “depressing,” resulting in participants going out of their way to avoid this location. “The east side one or the Louise [Ave] one, it’s a ghetto Walmart. I don’t go there unless I have to. I would never set foot in them again if I don’t have to. I’d rather drive the extra five miles,”
declared one interviewee. Another consistent complaint concerned the in-store layout and changing displays, which made the shopping experience “overwhelming.” Larger supermarkets, in terms of physical space, were a challenge for some of the elderly interviewees who had limited mobility or disabilities. They preferred to shop at a store that did not require as much walking to find everything they needed.

**Availability**

At the individual level, availability was associated with whether or not the type of food that a participant desired was available to purchase in quantities that were appropriate. There was a general agreement that any type of food desired is available somewhere in the city but that sometimes it may be too expensive or of too poor quality, compared to what they are accustomed to, to be worth purchasing. Ethnic food stores, natural food stores, and informal markets were mentioned as locations that carried those items that were more difficult to find in a traditional grocery store. Informal markets consisted of a network of individuals selling ethnic or cultural foods out of their homes via social media. Although gas stations were utilized as a food source, the consensus was that the food offered was “too expensive” or “twice as expensive for half the quality or just plain junk.”

Many participants felt that their individual dietary needs limited the types of foods that were available to them. Allergies, food sensitivities, diseases, diets, and foods that interacted negatively with medications were all taken into consideration and they sometimes influenced participants’ store choice. For example, bananas, dark leafy greens, grapefruit, high-carbohydrate foods, gluten-containing foods, and genetically modified foods were all mentioned as types of food that had to be eliminated from the participants’
everyday diets in order to maintain their personal health. While this mostly translated into a shift in the types of meals they could make, occasionally, participants also chose to shop at natural food stores or from online stores to access the types of food they needed to meet their specialized dietary needs.

The availability of an appropriately sized packages of fruits and vegetables was an aspect that participants considered when shopping. Household type played a strong role in the quantity of food desired. Single-person households expressed difficulty in balancing the cheaper cost of larger packages of produce with their inability to consume the entire package before it would spoil. Multi-person households valued the ability to buy larger quantities of produce to reduce the number of shopping trips required.

**Utilization**

When discussing the food security pillar of utilization, participants discussed the quality of the types of food available in store. While the quality of produce was an important consideration, with many participants describing themselves as “picky” about their produce, the affordability of perceived higher quality produce was generally a higher priority. Some were willing to pay more for specific types of food or for locally grown produce but most were either unable or reluctant to spend more money for produce that was only marginally better quality from one store to the next. Quality was often associated with the taste of a product, not just appearance. One participant regularly paid a premium for local, farm-fresh eggs saying, “They’re not cheap but they taste like eggs are supposed to taste,” a thought echoed by others referring to better quality food having
“100 percent more taste.” Poor quality foods were described as “not having any flavor.” Not everyone was convinced that the better quality was worth the extra cost, especially if it was likely to spoil quickly.

**Stability**

Participants spoke about stability in terms of consistent availability of preferred brands, cultural, or traditional foods that they were used to eating and being able to store foods in their homes for longer periods of time. Phrases such as “brands I can trust that I’ve been getting for years,” “things that I’m familiar with,” and “what I’m used to,” came up during the discussion and some participants described themselves as being “brand loyal” or “brand specific.” The ability to have food on hand without running out and having to make another trip to the grocery store was an important aspect of stability in food security for each household. Having an extra freezer or a pantry with additional storage space was identified as making life more convenient and easing the burden of running out of food at odd times in the week. Stability in price of food was only mentioned by one participant who thought that “every time you go in, the price is higher than before.” Occasionally, the paradox of having extra food on hand meant that it would be eaten unnecessarily quickly simply because it was on hand and then “I’m back at the grocery store and I’m out of money.”
Emergent Themes & Special Considerations

The following emergent themes were derived from the data: (1) time is an underlying factor affecting all the pillars of food security, (2) mental health has a strong influence on the quality of diets, and (3) nutritional education is an important part of changing diets. Special consideration should be given to the shift towards online grocery shopping and the hidden costs of unhealthy diets.

Temporal

An overarching theme that was discussed in multiple interviews and focus groups was time (Figure 16). A temporal aspect touched every pillar of food security.

Figure 16. How the word ‘time’ was referred to during interview and focus group sessions.

Under the availability pillar, participants discussed their desire for stores to carry more produce that was pre-cut or packaged ready-to-go style eliminating some of the preparation work involved in making meals and saving them time while allowing them to
make healthier food choices. Store hours were an important temporal factor in availability. Smaller stores and the farmers’ market had operating hours such as opening later, closing early, or only being open once a week, that made it more difficult to shop there. One participant said, “being able to shop when you are thinking about it, or when you are able to go, just takes priority.” A mother of three wanted to do her groceries after dropping off her children at school to save time and travel cost but the most affordable store didn’t open until well after her school drop-off time. Others mentioned how being strapped for time changed their focus from cooking at home to dining out for dinner and needing to have more healthy options to choose from when eating out.

The temporal aspect of accessibility affected store choice. Participants desired something “quick” and “easy” while being affordable. Having more time to shop influenced which store to patronize. The amount of planning prior to shopping, the household type, and a consideration of the trade-offs of what the participant could be doing rather than shopping were also temporal factors that influenced access. Menu planning was cited as a way to “save money because we know ahead of time what we need so we’re not buying fast food at the last minute.” It also reduced the number of trips to the grocery store since there was less tendency to be missing a necessary ingredient for a meal. Households with small children experienced more difficulty finding time to shop. “If the little one has to go to the bathroom three times, then that’s why it takes longer,” observed one mother. A father who did most of the family’s grocery shopping and cooking noted that while he would prefer to shop immediately after work, he had to balance the need to get home right away and relieve his wife from a day of childcare duties. Juggling nap times and after-school activities made shopping a more challenging
experience for these families. Trip-chaining was a time-saving measure used more often by households with children. Some participants indicated that shopping was not a priority for them, and they valued time spent doing other things with family and friends or even working overspending more time shopping for and preparing home-cooked meals. One participant stated concisely, “Time is money, too!” The idea of spending all day in the kitchen cooking was expressed as “not how I want to spend my life.” A busy lifestyle and having to “move on to the next thing” were other reasons for using more convenient meals and consuming less fruits or vegetables.

This mentality of having to make tradeoffs between time spent grocery shopping and preparing meals influenced the quality of participants diets. Participants sometimes found it “hard to find the time to cook” healthful meals at home. This was often related to the time it took to wash, cut, and cook vegetables for home-cooked meals. “With veggies there’s more time involved, it’s not as convenient,” stated one interviewee. Another said, “I would eat healthy and enjoy every second of it if someone else did all the thinking and prep work.” Taking the time to learn new recipes was sometimes stated as a barrier to changing meals towards more healthful diets.

The temporal aspect of stability in food security was associated with being able to purchase convenience foods such as frozen or packaged meals that could be purchased in larger quantities and stored so that they were available for a quick meal. Some participants also mentioned a society “promoting” a shift towards more convenience type foods that could, in the long term, affect the types of foods stocked and supplied by their local grocers.
Mental Health

A person’s mental health may have a significant impact on their desire to eat a healthy diet. Many participants described themselves as “emotional”, “stressed”, “lacking motivation”, or having “no energy” for eating in a healthy manner. Stress and anxiety not only affected the types of food eaten but also the quantities of food, sometimes more, sometimes less, as well as the timing of meals. “Usually, when I notice parts of my life are high stress, I’m either eating way too little, or way too much and too often and not the right things,” said one student from our focus group. Some participants described using unhealthy foods as a reward for making it through a stressful day or event. During times of increased stress, healthy eating was one of the first things to be set aside, followed by getting adequate sleep. One participant described the effect of mental health on their diet as a self-fulfilling cycle, stress caused them to not maintain a healthy diet or sleep enough which in turn resulted in higher stress levels and less energy or motivation to eat healthy. Anxiety over financial commitments also resulted in changes in the types and amounts of food eaten as participants felt that food purchases were a living expense that they had more control over than monthly rent or loans.

Education

Another emergent theme that affected the quality of participant’s diets was that of their cultural education concerning food as well as having to learn to cook differently due to medical or dietary needs. The dominant type of meal described for the region consists
primarily of “meat and potatoes.” One participant described her childhood as “there couldn’t be a dish without meat,” and another pointed out that people “build their meals here picking their protein first and vegetables later.” This cultural education influenced the types of foods that participants search for as well as the types of meals that they prepare. Conversely, the desire to have a more healthful lifestyle or the diagnosis of health conditions requiring special dietary restrictions opened the door to expanding a participant’s nutritional knowledge and adopting new habits. One mother of three, whose youngest son had a variety of food sensitivities and allergies, commented that “what is ‘healthy’ in general, has been a journey with our son being allergic to a lot of foods and has kind of opened the door for us to being more aware. Reading more, studying more [about nutrition].” Prior to these types of health challenge, less thought was given towards the types of foods that were being eaten and meals that were being prepared. Other participants expressed changing long-held diets because of heart health issues, negative food and drug interactions, and the desire to follow certain weight loss plans. The popularity of low carbohydrate diets that eliminate most fruits and vegetables and concentrate on intaking higher amounts of fats and proteins to induce ketosis have had a particularly negative effect on the perception of the healthfulness of fruits and vegetables. When asked about their sources of nutritional information, participants often referred to their mothers, who spent time teaching them how to cook and often set the foundation for what was perceived to be healthy food. In terms of continuing nutritional education, many participants “just type it into good ol’ Google,” and consulted online internet blogs for recipes and menu plans. Others read magazines or watch cooking shows on television for meal ideas. Interestingly, when asked specifically about getting nutritional
information from their family doctor, some participants expressed distrust of medical professionals asking sarcastically “because doctors know everything, right?” and stating “It probably depends if I like the doctor or not. You’re [doctors are] not as smart as you think you are to tell me how to live my life.” It was more likely they would consult a family member, friend, or mentor whom they trusted and considered as living a healthy lifestyle for advice rather than take advice from their physician.

**Students vs. elderly**

When comparing food security and access between the student focus groups and the elderly focus groups it became clear that these two subgroups struggle with different barriers to accessing healthy foods. Students made much more mention of their mental health and being stressed because of various pressures such as finances, school assignments, and familial conflict. Having to manage these challenges affected the way they ate throughout the day with some students saying they put off eating at all and others saying that they snack on junk food excessively: “I mean when school gets intense with papers and tests and stuff, I’m not focused on healthy eating,” and “The stress of exams can make you eat purely out of emotion.”

This group considered time trade-offs more often than the elderly focus group. The need to work, study, or the desire to spend time with friends and “have a life” all made planning for meals and shopping for food seem like more of a chore than an integral part of maintaining their health. Convenience was important to them and they wanted foods that were “quick” and “easy” that will “fill you up” They were also more likely to
mention eating out as both a part of their social life as well as a source of day-to-day meals. Dining out was most often at fast food style restaurants with over-the-counter service. While there are healthier meal options at many of these places, they expressed wanting what tasted best, would keep them feeling full, and was worth the cost. Affordability was a barrier for this group and students often chose not to get fresh foods as frequently because of the cost and their short shelf-life.

While temporal and mental health issues were not as prominent in the senior citizen focus group, participants still faced barriers related to their mobility, increased isolation, and dietary health restrictions. Physical mobility was especially challenging for members of this focus group. One widow, living on her own, said “Shopping is a real effort for me because of the walking…things being out of reach…too high and no one around to help me so I have to resort to asking another customer to help me. They’re usually very polite about it, but I wish that I could just do it myself.” Social support networks for the elderly who are still living independently are fragile with family members often living too far away to be of regular help and few others checking in or offering their aid. The challenge of living alone and cooking meals for only one person appeared in the difficulty of purchasing a small quantity of food for a reasonable price. Participants mentioned that packaged greens were difficult to finish before they began to spoil. Reading nutritional information and ingredients to try and limit their intake sodium, fats, and sugars was a challenge for some, “…reading those tiny letters on each package, I’d need a magnifying glass,” and “who can understand what all those ingredients are anyways.” Several participants mentioned foods that they could no longer enjoy because of interactions with certain medications they needed to take for other health conditions. While most of the
student focus group felt that shopping was a burden and took too much time, those in the elderly focus group mostly enjoyed shopping and found that it was a time that they could socialize with other customers or even meet friends. An elderly veteran put it this way, “I’m getting more exercise. I might meet another veteran and say, ‘Thank you for your service,’ then back to going up and down the aisles.”

**Special Consideration: Online Groceries**

Online shopping is an available option at Walmart and HyVees throughout Sioux Falls but participants rarely utilized this service. They admitted that there was potential for time and cost saving, especially for those with mobility issues, but felt they “weren’t ready” and described themselves as being “picky,” needing to “have control,” “touch and feel,” or “see the produce.” Participants expressed concern that whoever would be choosing their groceries would not provide an acceptable quality or choose the freshest produce available and there would be no way of knowing if this was the case. Another factor limiting the use of online grocery shopping and pick up was the need for participants to be “more organized” and place their order nearly a day in advance of picking it up or having it delivered. For those participants who did utilize some form of online grocery shopping it was mostly for specialized items that could be purchased in bulk, resulting in cost savings, and stored for long periods of time rather than for more frequent grocery needs or perishable foods.
**Special Consideration: Hidden Costs**

Across all interview and focus group participants there was an underlying understanding that taking care of their health today could mean deferring or even eliminating unnecessary medical expenses in the future. People mentioned, “You gotta take care of your body, otherwise, next thing you know you’re having a heart attack and that is very expensive!” and eating healthy as being “cheaper than medical bills.” The idea that junk food was more expensive than fruits and vegetables because of its low nutritional value, was also mentioned. Parents indicated that they would change the way that they ate to benefit or be a good example for their children, “like I’m giving them another thing to set them up to be successful in life, right? If you eat healthy, you’re more likely to not need to go to the doctor, and you have energy and can concentrate better on schoolwork.” They understood that spending a little more on organic foods, fresh fruits and vegetables, and foods that were not highly processed might be slightly more expensive in the present but could pay off in the long run. While this understanding was evident, the actual action of spending that extra amount of money for a more healthful type of food was not easy to follow through on when finances were tight and the future outcome largely unknown. One father said, “If I knew for a fact, yes, this is going to make me feel so much better, then it probably wouldn’t be a question – of course, I’m gonna pay more for the more expensive stuff. But there is a lack of information, a lack of knowledge – I don’t know. Why would I throw away money, if I’m not sure what I’m throwing it at? I’m not gonna play the lottery.”
Table 4. Themes and subthemes with exemplar quotes from interviews and focus groups.

<table>
<thead>
<tr>
<th>Theme/Subtheme</th>
<th>Exemplar Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accessibility</strong></td>
<td></td>
</tr>
<tr>
<td>Unaffordable healthy food</td>
<td>The sad thing is they don’t hardly ever put the healthy food on sale but they’ll put the cheaper, unhealthy food on sale. Any person who looks at that price will say ‘Okay, if I can spend this on that, then I can spend more on that and get more bang for my buck.’ Peanut butter is two to three dollars more a jar for the no sugar added kind.</td>
</tr>
<tr>
<td>Stores close to one another</td>
<td>I live a little more towards the west edge of town and I have to drive a few miles anyway to get to a store. So, once I’m in town, I just go where I want to go. Like, once I’m in the retail area, I can go to Walmart or HyVee or Sam’s or even all three if I really need to.</td>
</tr>
<tr>
<td>In-store Environment</td>
<td>That’s why I go to Aldi instead of HyVee. Because HyVee is all over the place. The apples are going this way, the milk is way over here and going off in that other direction. I’m like, what the heck is going on in this place?</td>
</tr>
<tr>
<td><strong>Availability</strong></td>
<td></td>
</tr>
<tr>
<td>Special Dietary Needs</td>
<td>My second oldest daughter who has been diagnosed with a whole array of food allergies. She can’t have corn, wheat, oats, there’s just so many things that she can’t eat so she’s got some major challenges.</td>
</tr>
<tr>
<td>Appropriate quantity</td>
<td>Often it [the sale] is a Buy One Get One free deal or get 3 for $5 type and I don’t necessarily need the free one since it will spoil before I can finish it.</td>
</tr>
<tr>
<td><strong>Quality/Utilization</strong></td>
<td></td>
</tr>
<tr>
<td>Cost vs. benefit of organic foods</td>
<td>If I knew for a fact, yes, this is going to make me feel so much better, then it probably wouldn’t be a question – of course, I’m gonna pay more for the more expensive stuff. But there is a lack of information, a lack of knowledge – I don’t know. Why would I throw away money, if I’m not sure what I’m throwing it at? I’m not gonna play the lottery.</td>
</tr>
<tr>
<td>Prioritizing store choice</td>
<td>Quality influences my decisions about where to shop but price is still more important.</td>
</tr>
<tr>
<td><strong>Stability</strong></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Brand Loyalty</strong></td>
<td>I think a lot of people, in this area, are hesitant to try</td>
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<tr>
<td></td>
<td>something new – especially if it tastes just blah but it costs</td>
</tr>
<tr>
<td></td>
<td>so much more.</td>
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<tr>
<td><strong>Home storage</strong></td>
<td>We just bought a freezer for our garage, and now we have a</td>
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<tr>
<td></td>
<td>lot of freezer food, which again is not healthy but it’s</td>
</tr>
<tr>
<td></td>
<td>cheap – and convenient.</td>
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<table>
<thead>
<tr>
<th><strong>Emergent Themes</strong></th>
<th></th>
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<tbody>
<tr>
<td><strong>Temporal Trade-offs</strong></td>
<td>I could totally spend an entire day, every day, in the</td>
</tr>
<tr>
<td></td>
<td>kitchen. Like, oh, today I made this great breakfast, now</td>
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<td></td>
<td>I’m cleaning up from breakfast. Oh, now I need to make a</td>
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<tr>
<td></td>
<td>lunch, now I’m cleaning up from lunch and all of a sudden</td>
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<tr>
<td></td>
<td>it’s time to get started on making dinner. And you just go</td>
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<td></td>
<td>crazy. It’s not how I want to live my life.</td>
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<tr>
<td><strong>Availability of ready-to-go produce</strong></td>
<td>I buy the microwavable bags of broccoli because it's easier.</td>
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<td></td>
<td>With kale, I buy the already cut ones so that I don't have to</td>
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<td></td>
<td>deal with all the stems. It's just so much easier.</td>
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<tr>
<td><strong>Trip-chaining</strong></td>
<td>I would say that more often than not, I couple it with other</td>
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<td></td>
<td>activities. It is pretty rare that I leave from home just to go</td>
</tr>
<tr>
<td></td>
<td>to the grocery store.</td>
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<tr>
<td><strong>Mental Health</strong></td>
<td>Even though, I know I'm not hungry. I don’t need to eat!</td>
</tr>
<tr>
<td></td>
<td>And, it's not like I'm reaching for an apple. I want</td>
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<td></td>
<td>chocolate or chips, something rewarding. There is definitely</td>
</tr>
<tr>
<td></td>
<td>an emotional part to eating that can affect our health.</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td>What is ‘healthy’ in general, has been a journey with our</td>
</tr>
<tr>
<td></td>
<td>son being allergic to a lot of foods and has kind of opened</td>
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<tr>
<td></td>
<td>the door for us to being more aware. Reading more,</td>
</tr>
<tr>
<td></td>
<td>studying more.</td>
</tr>
<tr>
<td><strong>Online Shopping</strong></td>
<td>I want to look and touch and feel and pick out my own stuff.</td>
</tr>
<tr>
<td><strong>Hidden Costs</strong></td>
<td>You gotta take care of your body, otherwise, next thing</td>
</tr>
<tr>
<td></td>
<td>you know you’re having a heart attack and that is very</td>
</tr>
<tr>
<td></td>
<td>expensive!</td>
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DISCUSSION

This study set out to determine (1) how low-income or low-access individuals prioritize healthy food choices, (2) the types of retailers where low-income or low-access households commonly purchase their produce, and (3) what barriers are experienced by these households when accessing fresh produce?

The decision-making process when determining where to shop and what to shop for is far from binary and there are a range of thoughts, values, and biases, whether conscious or unconscious, that are weighed and eventually impact the final decision. This study found that shoppers consider many factors, employing a complex thought process that involves comparing elements of cost, geographical access, quality of the produce, and the quantity that can be purchased at a time. Additional aspects such as an individual’s mental health, education, personal health, available time, and conflicting responsibilities or priorities in life are also taken into consideration when deciding what types of foods to purchase and from which retailer. Solutions addressing food insecurity must acknowledge and engage with this complexity rather than remain focused on a piecemeal approach that treats each dimension of food access as separate and unrelated.

The most influential factor that emerged in this study was affordability. Across all income and access types, amongst all participants, the affordability of produce was an inescapable reality that influenced shopping behavior. Participants often prioritized the most affordable stores as the ones they frequented the most often. It appears from the results that an individual’s perception of the cheapest store was not always based on cost alone and was considered in relation to their activity space, the time it takes to get to the
store and shop there, and the level of customer service they received. Results also suggest that participants carefully consider the cost of different types of food. Fresh fruits and vegetables were not always the priority in the hierarchy of food purchases since they were often considered to be more expensive compared to other foods with a longer shelf-life or proteins that were considered more filling and sustaining. Affordability of a food product is not simply a comparison of the cheapest items available, participants considered dietary needs, personal preferences, the likelihood of other household members to consume the produce, brand loyalty, and seasonality. Each of these considerations appears to change the perceived worth of a product making it more or less expensive than the item’s actual cash value. At lower incomes, where to shop and what to shop for was more constrained and consumers were unable to always purchase the food items that they most desired. As income increased and affordability was less of a barrier, other factors such as the quality of the produce began to increase in importance. These findings correspond with other studies where affordability was identified as the most influential factor when deciding where to purchase healthful foods or fruits and vegetables. A CDC study (Haynes-Maslow et al. 2013) found that focus group participants talked about cost four times as much as any other factor in their food access research. Qualitative studies by Alkon et al. (2013) and Evans et al. (2015) observed that price was the most important factor participants considered when deciding where to shop while also highlighting the trade-offs and restrictions that low incomes placed on the variety of foods that could be purchased. Both studies indicated that residents often left their neighborhoods to obtain the foods they desired at more affordable prices. In a focus group study of low-income residents in Sioux Falls, Augustana Research Institute
reported that affordability was the most important factor in determining where an individual chooses to shop (Smith 2018). Similarly, participants expressed struggling with having to choose between the cost of fresh fruits and vegetables versus fresh meats.

Distance to a grocer appears to be an important element of the decision-making process, although no less complex than affordability. Proximity was reported as the second most important consideration when choosing a place to shop. This survey response was complicated by respondents who also indicated that the nearest store often did not correspond to their most frequented store. Further investigation of this observation during the interview sessions revealed that participants were not always aware of the closest store in terms of absolute mileage. Their perception of nearness was influenced by and included factors such as affordability, availability of the types of products desired, and the quality of produce. Distances, as perceived by consumers, did not equate to the Euclidean distance on a map and participants chose to shop at the nearest store that met as many of their needs as possible in the least amount of time required. Trip-chaining, coupling other activities with shopping trips, enabled residents to expand their retail choices, especially for specialty products with a longer shelf-life or that were not consumed on a weekly basis. The space in which individuals travel during their day-to-day activities, or activity space, influences the types of food environments to which individuals are exposed and have access to and could play a role in dietary health (Christian 2012; Li and Kim 2020; Zenk et al. 2011). In this respect, shoppers are not merely consumers of the nearest food options and this assumption becomes problematic in food desert research and many geospatial studies concerning food access.
Sioux Falls is not unique in its urban design of commercial areas with a higher concentration of various retailers. Participants pointed out that once they have reached a retail area, physical distance to any specific store becomes nearly irrelevant. For example, three locations of Walmart and Aldi, the two most commonly chosen retailers as the most affordable stores at which to shop, are within a half mile of each other negating the need to consider proximity when choosing between either store. Retail hubs challenge a meaningful differentiation of distance between food resources within the retail area. Aldi is a relatively new grocer with its first location opening in Sioux Falls in mid-2016 and two more locations opened by the end of 2018. These new stores quickly gained customer loyalty in the region. Nearly every interviewee mentioned shopping at an Aldi store because of the affordable produce despite having never heard of the retailer prior to their arrival in Sioux Falls. While Aldi’s entrance into the food retail market expanded consumer choice for affordable groceries, it did nothing to improve spatial access to food for residents since it occupies the same footprint already served by Walmart.

The issue of considering accessibility as a measure of distance and apart from other decision-making factors was also highlighted in the work of several other researchers who demonstrated that low-income households employ numerous coping mechanisms to access food sources outside their neighborhood and are not necessarily ‘takers’ of the nearest food retailer but also weigh factors such as quality, in-store selection, cultural acceptability, store hours, and the in-store environment into their decisions (Alkon et al. 2013; Li and Kim 2018; McDermont, Igoe and Stahre 2017; Zachary et al. 2013). Some studies show that residents do not always change their shopping behavior despite the introduction of a closer supermarket (Cummins, Flint and Matthews 2014). This is an
essential consideration for policymakers and stakeholders in food access who bestow unwarranted emphasis on proximity to market as a major influencer of store choice and expect an equally beneficial impact on community health as a result of decreases in distance to market. Consideration of spatial accessibility in a more abstract but realistic perspective that employs a fluid definition of place relative to a person’s experiences, needs, abilities, and desires may be a more effective approach to defining this aspect of food access (Vallée et al. 2020; Waterlander et al. 2018). Emerging research is beginning to shift away from location as a driving factor for food access and more towards a space in which multiple societal forces across many scales influence an individual’s everyday actions in healthy food choices (Craven 2017; Shannon 2020; Widener 2018).

Shoppers are not just looking for the closest cheapest foods, the quality available is important as well. Participants wanted to receive the best value for their money. While the desire is for high quality produce, this is a trade-off for affordability and at too high of a price point this factor drops in importance as customers settle for the best that they can get within their desired price range. Quality can be difficult to determine objectively between stores as it is influenced by seasonality, size, color, taste, and can even vary between shipments. Empirical studies of the quality of produce by store have found that it can vary greatly between neighborhoods (Hendrickson 2006; Short 2007). This variability can result in store loyalty for consumers that are unwilling to commit the time and energy necessary to visit multiple stores to find the best quality produce.

When addressing issues of food security, it is crucial to consider food access as a complex system rather than try to single out a specific factor and deal only with solutions that achieve results for that component of the food system. The heuristics associated with
food purchasing are complex and consumers juggle many concerns that often interact and compete with one another from cost and quality to ideals and household preferences (Askelson et al. 2018). The complexity of this decision-making process makes it difficult to guarantee the success of improving individual health outcomes when targeting only one type of intervention such as market interventions that increase spatial accessibility without taking into consideration the affordability of the food products available.

A second question addressed in this study was related to which types of retailers low-income or low-access households commonly purchase their produce from. Very few respondents mentioned using alternate food sources such as gas stations, convenience stores, or drug stores with any regularity. When they do, it was mostly out of the need for convenience, getting an item for a meal that they were missing, or being too tired after work or school to prepare a meal. The infrequent use of these alternate retailers is closely tied to the perceived or real increase in price and inferior quality of the produce available at these locations, both factors that heavily influenced store choice. Participants in this study, regardless of income and access, preferred to shop at large chain supermarkets and infrequently used alternate or non-traditional food sources as their main retailer of choice for procuring food. This finding agrees with research performed by others indicating that grocery stores are the most commonly accessed food location and only a small percentage of food expenditures are made at convenience-type stores (Alkon et al. 2013; Huang et al. 2012; Smith 2018; Ver Ploeg et al. 2009). Food desert research, such as that conducted for the USDA Food Access Research Atlas, excludes small retailers in their assessment of a neighborhood’s spatial access to food resources. This assumption appears
to be reasonable for this study as smaller retailers were not significant sources of food for these participants.

Growing a garden, utilizing a community supported agriculture (CSA) share, shopping at warehouse stores, or visiting the farmer’s market, were largely reserved for residents who owned land, had flexible schedules, and earned higher incomes. While often touted as additional solutions for increasing food access (Kortright and Wakefield 2011; Larsen and Gilliland 2009; Santo, Palmer and Kim 2016), the logistics of low-income individuals managing work or family responsibilities on top of juggling the upkeep of a garden or the sporadic schedules of farmer’s markets and CSA pick-up times renders these solutions less effective than desired in addressing food security for low-income households. While these solutions should not be dismissed, as they offer significant benefits in creating spaces of social bonding and networking within the community, they need to be better adapted to serve those who are food insecure. This may require additional public or private funding that allows local farmers to increase their available hours, provides delivery options, or even helps fund neighborhood level community garden space that is cared for and harvested by a paid individual and serves local community members.

Many food desert research studies examine spatial access from an individual’s place of residence to the nearest market (Cummins and Macintyre 2006; Glanz 2005). Further geospatial analysis acknowledges the complexity of an individual’s ability to acquire food within their day-to-day activity spaces (Chen 2017; Li and Kim 2018). Travel patterns in this study indicate that participants shop most often from their place of residence to their preferred retailer. When broken down by income level, higher-income
individuals traveled to the grocery store from a wider variety of different starting points whereas low-income persons traveled mostly from their place of residence. Both methods for evaluating spatial access are valid but since food insecurity is closely related to lower income areas, the assumption that travel most often begins from the place of residence is appropriate with regards to this study.

Finally, this study set out to identify barriers experienced by vulnerable households that prevent them from increasing their consumption of fresh produce. The ability of residents to secure adequate amounts of the food they desire is facilitated or impeded by a variety of factors operating across different scales. Participants agree, they can find whatever types of fruits and vegetables they want in Sioux Falls. Availability of produce was only mentioned in the context of the quality of produce available to purchase being too poor to merit buying rather than its absence in the marketplace. Just as affordability strongly influenced how consumers prioritize what they will purchase from which retailer, affordability acts as a barrier in obtaining fresh fruits and vegetables. The perceived affordability of fresh produce is weighed against other considerations such as its quality, the quantity available to purchase, the likelihood of other household members consuming the product, the relative health benefit it provides, how much time it will take to prepare, and how quickly it will spoil. Determining the value of a product is complicated by how to compare products against each other whether by edible weight, price per serving provided, or as a measure of how filling the product is.

Figuring out the best price while trying to balance all these other considerations can be overwhelming and could explain why some participants felt that purchasing fresh fruits and vegetables was too expensive. This sentiment is confirmed both quantitatively
and qualitatively in other studies that have found that food costs are higher in areas of high poverty (Hendrickson, Smith and Eikenberry 2006), that cost and not physical distance is the primary barrier to healthy food access (Alkon et al. 2013), that purchases of fresh proteins are prioritized over fresh produce (Askelson et al. 2018), and that shoppers consider multiple factors other than label price to determine the value of a product (Zachary et al. 2013).

A barrier that was repeatedly mentioned by participants in this study, but that is often overlooked in food access research, was time. In studies that do mention time, it is usually in reference to the increased time it takes for low-access households to travel to their nearest marketplace rather than the participants’ perceived pressure from a rushed pace of life (Ver Ploeg 2009). However, every pillar of food security is touched by the time crunch participants feel in their lives. Higher-income households with children are often involved in multiple extra-curricular activities that make meal preparation a challenge. Individuals in low-income households are sometimes working multiple jobs to make ends meet and find themselves grabbing an unhealthy snack while traveling between workplaces. Newly independent students with inconsistent schedules from day-to-day find themselves turning to fast foods for meals. Seniors with mobility or health challenges and doctors’ appointments struggle to find the time to prepare meals they are used to or learn new ways to cook to meet new dietary requirements. The barrier of time has the intriguing effect of impacting people across all income levels and age groups and should be considered more carefully in food access research. A CDC focus group study revealed that time was considered a barrier to consuming fruits and vegetables, particularly as related to finding the time to cook and food preparation time (Haynes-
Maslow et al. (2013). Mook et al. (2016) suggest that busyness accounted for lower consumption of fresh produce regardless of the status of food security of participants in their study. Askelson et al. (2016) noted that an increase in fresh fruit and vegetable consumption for most families would necessitate the implementation of entirely different shopping patterns allowing for more frequent visits to the grocery store to reduce spoilage of fresh produce items. Increasing the availability of healthy frozen, pre-packaged meals, or affordable, pre-cut fresh produce would enable more consumers to maintain a healthier diet while reducing the constraints of the time investment normally required to prepare meals from scratch.

An emerging concept that was not explicitly mentioned by participants as a barrier to food access but that strongly influenced shopping and eating behavior was mental health. An individual’s mental health is not formally addressed in any pillar but is an essential component of human wellness that, when lacking, hinders the ability and energy available for self-care and the will to make healthy food choices. Mentally stressed individuals may end up distancing themselves from established social support networks, feeling overwhelmed by the complexity of maintaining a healthy diet, and experience a reduced desire to even attempt to shop for and prepare healthy meals. A downward spiral of mental health can lead to a negative feedback loop of degrading physical health resulting in poor dietary health which, in turn, makes it more difficult to address issues of physical and mental wellness. Ignoring mental health as it relates to food choice behavior can compromise food access research and potential solutions. Just as physical health is not merely an absence of illness, an individual’s dietary habits alone do not ensure a healthy lifestyle and should encompass physical, dietary, and emotional wellness. The
ongoing epidemic of deaths of despair touches all age groups and crosses every income class. Systemic societal problems that jeopardize mental stability coupled with the stigma surrounding mental health issues and failing to acknowledge mental health as a barrier to food access may result in failed interventions, no matter how well-intentioned. Researchers have documented the link between food insecurity and higher incidence of depression, even among children (Althoff, Ametti and Bertmann 2016; Kolovos 2020). However, causal links as to whether food security leads to depression or depression as a predictor of food insecurity have not been established (Gundersen and Ziliak 2015).

Moving away from the framework of food security as separate pillars and recognizing the interconnectedness of all aspects of food security requires us to envision the food system in a new way (Figure 17). Each dimension of food security is influenced by a physical, socio-economic, and temporal element that impacts a piece of the food system which, in turn, is influenced by the lived experiences of each individual’s life. For example, healthcare expenses are a hidden cost that affect a person’s socio-economic ability to access food resources and maintain food security. Having to learn new recipes requires educational opportunities to be available and is only accessible when there is time for an individual to acquire new culinary skills. Factors such as personal preference can influence all the pillars since preferred foods must be available in the marketplace and accessible to purchase at a quality that meets expectations over time. While the network of food security is still imperfect, it offers a different way to visualize food security that reduces the emphasis on each dimension being separate and disconnected from one another. Recognizing the interconnectedness of each dimension of food security and the social, spatial, and temporal elements associated with each dimension reflects a
holistic approach to understand the food landscape of a region. Vonthron, Perrin, and Soulard (2020) describe the food landscape as not only the spatial distribution of food outlets but also a consideration of cultural and social experiences, perceptions of the food environment, and systemic policies in place that restrict or encourage food access. This concept is broader and more encompassing with its emphasis on the interconnections between people, food, and places. Food landscape studies require interdisciplinary cooperation involving geographers, social scientists, public health specialists, and urban planners. Likewise, interventions should include collaborative conversations between local governments, non-profit organizations, community residents, and business owners.
Figure 17. The network of food security.

There are several limitations as to the transferability of this research to other settings. In total, there were 87 survey respondents, considerably fewer than expected. Reasons for the low response rate include the abundance of “junk” mail, which may have caused the
postcard invitation to be overlooked, the incentive to participate was not large enough to motivate residents to join the study, possible language barriers, a lack of reliable internet to complete the survey, or possible failure of the online survey. The small number of surveys returned indicates that the study is not a statistical representation of the residents in the target areas and the results may not be indicative of the sample population. There was also a lack of any respondents who did not own a vehicle. While there were some with only one vehicle, making it more difficult to work around family and work schedules, all respondents had access to transportation. The results of this study would likely be completely different if it focused on people without a vehicle whose food access could be severely impacted because of the unreliable public transportation system and more research should be performed with this sub-group. The results of the study may be related to studies conducted in similar small, but growing cities, where most residents have a means of personal transportation. The use of in-depth interviews and focus groups offer insight into how people perceive their food environment and their interactions within that environment. The small scale of this qualitative research means that the results may not transfer to other cities, however, it provides invaluable insight about the lived experiences of lower income residents within the context of the food landscape in Sioux Falls.

Since this study was conducted, the arrival of the novel coronavirus, COVID-19, has made pre-existing challenges related to food access more visible and urgent. Food assistance programs are straining to meet the needs of hundreds more families who have become unemployed and require aid. Early in the pandemic, supply issues resulted in empty shelves at grocery stores and highlighted the danger of income inequalities that
enable those with financial means to stock up on food items for an extended amount of time while leaving those living from paycheck to paycheck without the ability to put food on the table for the current week. Families with children were thrown into chaos as school moved to a remote learning format that introduced new challenges for parents who were dependent on supplements such as free school meals, reliable and free internet access, and extended childcare that covered working hours. Worries about caring for elderly family members, inadequate sick leave, and unaffordable health care all increased the mental stress experienced throughout the year. When interviewed, many participants expressed concern about the loss of control, especially over choosing their own produce, when ordering groceries online. Since then, every store has expanded their online ordering, curbside pickup, and delivery options potentially changing the way people obtain groceries forever.

CONCLUSION

A plate of food is not just a few ingredients cooked and served together. It is the story of who you are, the source of your pride, the foundation of your family and community. Cooking isn’t just nourishing; it’s empowering. (Andrés 2018)

The words of Chef José Andrés (2018) convey the depth and meaning that food can have to individuals and communities. Beyond the act of nourishment, feeding oneself and others can be a deeply personal experience and an expression of love and care. For decades, food security has revolved around conceptualizing and measuring the pillars of accessibility, availability, utilization, and stability while failing to recognize the intimate
relationship people experience with food. As world populations continue to increase and urbanize, millions more people are experiencing food insecurity as they become dependent upon a globalized food supply vulnerable to disaster, corporate greed, geopolitics, and market swings. Food insecurity is resulting in an overwhelming global health burden as malnutrition from scarcity to obesity spreads to every corner of society.

Food insecurity, and its related consequences for community health, is a growing concern for Sioux Falls, South Dakota as the population continues to increase. This study explored factors that affect healthy food choices for low-income residents in at-risk neighborhoods of Sioux Falls. Based on both quantitative and qualitative analysis, it can be concluded that affordability had the greatest influence on decision making about where to shop and the types of foods to purchase, that the general assumption used in food access research that low-income residents shop at supermarkets and large grocery stores over smaller alternative stores holds true for this study, and that the time required to prepare meals from scratch as well as an individual’s mental health were barriers that restricted an increased consumption of fruits and vegetables.

A mixed-methods approach was employed for this research project to quantitatively target specific low-income, low-access neighborhoods versus high-income or high-access neighborhoods followed up by a qualitative, in-depth look at the perceived and lived experiences of low-income residents. While this method limits the generalizability of the results, this approach was able to provide valuable insight into the factors of food insecurity that are crucial to understand yet not well represented in the current scientific research. Food access research has mainly investigated the problem food insecurity in urban areas by focusing exclusively on geographic and economic access to food using
quantitative methods. This research provided additional qualitative research to supplement previous studies and placed food choice decisions within the broader context of an individual’s experiences within the food landscape. It also uncovered some of the lesser discussed barriers that affect food security such as the time constraint encountered when trying to balance a healthy diet and a busy lifestyle as well as the adverse impact of poor mental health on the ability to make healthy food choices. While many studies investigate access to all types of food or food retailers in general, this study attempted to narrow the type of foods specifically to fresh fruits and vegetables. This focus brought to the forefront issues of the quality of produce being a concern, the preparation time involved with fruits and vegetables, and the tradeoffs that people make over foods that will last longer or be more filling. By mapping participants’ preferred locations to shop compared to the nearest supermarkets, the study confirmed the anticipated result that low-income households often traveled outside of their immediate neighborhood to obtain the food that they desired.

Spatial models, no matter how sophisticated, will never account for all the complexities of access or address how individuals interact with and experience their food landscape. This research highlights the finding that access is more than just a binary concept of being in or out of food access. It encompasses more than only physical or economic access and is more complex than an individual choosing the nearest retailer or cheapest produce. To account for this complexity, areas of food insecurity would be better described using an average index that scores neighborhoods based on specific indicators within each pillar of food security. An affordability index could consist of not only the proportion of the population in poverty but also indicators such as the cost of
available produce, the average change in food costs per year, and the availability of food aid programs. Availability could incorporate not only the number of supermarkets within a mile but also the reliability of transportation networks, the presence of local food initiatives, and the prevalence of pre-cut fruits and vegetables. Quality could be a measure of food safety, the diversity of food items within an area, neighborhood safety, and in-store environment. These indicators combined with a consideration of local food policies, the prevalence of food insecurity, and health-related factors such as obesity and heart disease could yield a more holistic description of food access within a neighborhood and emphasize focus areas with the most potential impact for improving access.

Moving from brownies to broccoli more often will require an approach that ensures produce is readily available and affordable in a form that can be prepared quickly with minimal preparation time. The research clearly indicated that affordability was the most significant consideration for all household types but raised the question of how to introduce affordable options in under-served neighborhoods while overcoming the inherent bias against shopping at smaller alternative grocers. Policymakers and stakeholders should consider the need for affordable, high-quality fresh produce options when attempting to create equitable physical access to food markets. City governments are not helpless to market forces in urban planning and are able to draft codes that ensure healthy food is available for its citizens. For example, dollar stores that establish themselves in low income neighborhoods could be required to dedicate square footage to fresh fruits and vegetables, parking restrictions for grocers can be loosened, mobile grocers can be encouraged, and start-up costs for new grocers in underserved areas can be
defrayed. Local grocers could offer a wider variety of pre-cut, packaged produce to reduce meal preparation time which could be beneficial for most households if the cost is not prohibitive. Implementation of a mobile market bus, similar to that employed in Minneapolis, MN, which uses a refitted city bus to bring affordable fresh fruits, vegetables, dairy, grains and other groceries directly to neighborhoods with limited access to full-service grocery stores could be a viable solution to reduce food insecurity in Sioux Falls. The produce is sourced from local farms, when possible, forms of payment include food assistance such as SNAP/EBT cards, and the mobility of the bus would allow organizers to adapt to the most convenient schedule and location that meets customer needs without having to invest in permanent infrastructure. Customers could also suggest foods that may be more culturally appropriate that they have difficulty obtaining on a regular basis due to limited availability in the grocery stores they frequent the most. Free community cooking classes and cookbooks featuring recipes that demonstrate how to make nutritious meals in twenty minutes or less featuring fresh, frozen, or canned produce may be a way to encourage households to introduce healthier meals into their lives on a more regular basis.

To better understand the implications of these results, future research on the topic of food insecurity should make an extra effort to acknowledge and address the complexity and interconnectivity of the physical, socio-economic, and temporal factors that affect food access, availability, utilization, and stability at various scales. It may be time to distance ourselves from the imagery of a food system resting on pillars that remain static and separate from each other and recognize the relationships and interdependence of each pillar upon the other. Solutions should include an understanding of the human judgement
that takes place behind each decision concerning household food purchases. New methods that include mental mapping procedures can provide researchers with a better understanding of individual experiences within the food system and how they compensate for, adapt to, and cope with challenges to convert their available resources into accessible ones. Questions that need to continue to be asked in food research include not only: How are food resources spatially distributed, but also how do social and cultural factors influence the way people access, experience, and perceive food and how do local, state, or federal policies impact the food system? As cell phone mobility data becomes more widely available, researchers could harvest this type of big data to better understand traffic and travel patterns specific to each city. Using billions of anonymized cell network records combined with activity monitoring at retail locations could potentially provide detailed insight into how residents interact with the local food environment. In addition to real-time big data, there is an acute need for longer term, longitudinal studies that monitor how changes in food access affect overall community health.

The findings of this study challenge the existing assumption that equitable spatial access to a food retailer is necessary to solve the problem of food insecurity. Geographic and economic disparities have become a convenient focus to a much more complex problem that extends well beyond food and into entrenched systems of inequality. Everyone must eat to survive, but what we eat and what each person must do to get food varies enormously. We should accept and normalize food as a human right to address the structural problems that make food access an issue for millions of people. Food is not just an issue of proper nourishment, but an issue of climate change and ethics. How we approach food access changes how we view essential workers, minimum wage,
immigration issues, health care debates, and education. Refusing to satisfy the basic human right of adequate, nutritious food for all members of society inhibits our ability to achieve other noble goals for communities and nations including peace and economic growth. The exclusion of domestic household labor as a measure of a nation’s wealth has fundamentally changed our view of the inestimable social worth of human capital as expressed through the servitude, patience, nurture, and love that holds the world together over a plate of food. America has built an empire based on an unsustainable form of capitalism that tethers every person to the corporate machine in order to gain the privilege of health care, childcare, paid sick leave, retirement, or a safety net of any kind and other forms of labor are viewed as having little, if any, tangible worth or value to society. Paid work, when coupled to so many societal benefits that should be viewed as rights necessary to live a life of dignity, is broken for far too many people. We have come to disregard the dignity of preparing food and caring for one’s own family or self in pursuit of a career in a society that has not followed through by providing the opportunity for each worker to live a decent life with a living wage. Reconceptualizing the value and even pleasure of preparing and cooking a meal reintroduces the contributions that food stability, food sovereignty, and food security offer towards improving quality of life. Food can be a source of joy and power, a creative outlet, an expression of identity and culture, and a legacy that we leave for future generations. It is so much more than a plate of ingredients combined for a pleasurable palate, it is a fundamental element that binds us together and builds community. It is a message of love and a beacon of hope for a better future where food security is a right deserved by all people.
LITERATURE CITED


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