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FOOD SHOPPING HABITS AND THE ASSOCIATION WITH DIET

THESIS

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Science in the
College of Agriculture, Food and Environment
at the University of Kentucky

By

Crystal Danielle West

Lexington, Kentucky

Director: Dr. Alison Gustafson

Department of Dietetics and Human Nutrition

Lexington, KY

2014

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ABSTRACT OF THESIS

FOOD SHOPPING HABITS AND THE ASSOCIATION WITH DIET

Research suggests that the connection between poor diet and obesity among rural residents may be partially explained by limited access to healthy foods including fruits and vegetables (F&V). Based on federal suggestions to improve access, the purpose of this study was to assess the relationship between food shopping habits food venues and dietary intake of residents in rural counties of Kentucky. In May, 2013, a telephone survey was conducted using random-digit dial methods among n=149 participants in all three counties. Results showed that grocery shopping at supermarkets had a moderate positive correlation with F&V intake ($r=.357, .348$). These findings suggest participants who shop at supermarkets also consume F&V. Our study's findings did not give a strong correlation between F&V consumption and farmers' market use, which could be due to the locations of these markets, price of produce, or other environmental barriers that were not looked at in this study. Although the results from our study do not show a correlation, the majority of previous research supports the need to improve farmers' market locations to help increase accessibility for groups with low F&V consumption and emphasize the importance of addressing economic barriers to food access.

KEYWORDS: Farmers' markets, obesity, food access, rural residents, fruits and vegetables

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7/23/14

FOOD SHOPPING HABITS AND THE ASSOCIATION WITH DIET

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Chapter One

Background

Obesity continues to be a co-morbidity which has in recent years garnered much attention at federal and state levels. The prevalence of obesity in the past 30 years has more than doubled among adults and tripled among youth (D. S. Freedman, Centers for Disease, & Prevention, 2011). One population disproportionately affected by the obesity epidemic is rural and low-income residents (Centers for Disease Control and Prevention, 2009b; Jackson, Doescher, Jerant, & Hart, 2005). Of the variables associated with obesity, one contributor to obesity is poor-quality diets, including inadequate fruit and vegetable consumption (He et al., 2004).

The World Health Organization (WHO) states that low fruit and vegetable intake is among the top ten selected risk factors for global mortality (World Health Organization, 2013). Nationwide fruit and vegetable intake remains low with 45.9% of adults in Kentucky reporting to consume fruits less than one time daily and 25.2% to consume vegetables less than one time daily. of adults in Kentucky reporting to consume fruits and vegetables less than one time daily (National Center for Chronic Disease Prevention and Health Promotion, 2013). Without access to healthy foods, especially fruits and vegetables, a nutritious diet and good health are out of reach for many Americans.

One suggested strategy for improving access and thus intake of fruits and vegetables among rural and low-income communities is to increase the number of farmers' markets within these communities (Centers for Disease Control and Prevention, 2011). This strategy is suggested since proximity to fruits and vegetables may improve

the amount of purchases. However, to date few studies have been examined on how farmers' markets in communities directly influences intake.

Problem Statement

One suggested reason for low intake in fruits and vegetables is that there is an overall lack of access to these foods, especially in rural and geographically isolated communities (Karpyn et al., 2010). Thus, obesity rates among rural residents may be partially due to less access to healthy and fresh foods including fruits and vegetables (Jilcott et al., 2010; Larson, Story, & Nelson, 2009). Grocery stores, farmers' markets, and other vendors that sell fresh fruits, vegetables and other healthy foods are scarce in many rural neighborhoods (Karpyn et al., 2010). On the other hand, what can be found, often in great abundance, are convenience stores and fast food restaurants that mainly sell cheap, high-fat, high-sugar, processed foods and offer few healthy options (Karpyn et al., 2010). National and local policy initiatives are being implemented to improve access to healthy food in underserved areas (Cummins, Flint, & Matthews, 2014). These initiatives are based on the assumption that encouraging supermarkets, grocery stores, and farmers' markets to open in these communities will result in improvements in individuals' diets and lead to a reduction in diet-related problems. However, there has been little research on the effect of these stores on a person's diet behaviors, which leads to the statement of purpose for this study.

Purpose Statement

The purpose of this study was to assess the relationship between food shopping habits and diet quality of participants in rural counties of Kentucky. This study examined the association between places participants shop for their groceries (farmers' markets,

grocery stores, etc.) 1) intake of fruits and vegetables; 2) Body Mass Index as secondary outcome.

Research Objectives

1. Determine the association between food shopping habits and fruit intake
2. Determine the association between food shopping habits and vegetable intake
3. Determine the association between farmers' market awareness, access, and use with BMI

Hypothesis

The hypothesis for this study was that those who practice frequent food shopping habits at farmers' markets consume more fruits and vegetables and have a lower BMI compared to those that do not frequently shop at farmers' markets.

Justification

There is a preponderance of studies linking diet with obesity (Black & Macinko, 2008; Jilcott, Keyserling, Crawford, McGuirt, & Ammerman, 2011; Ledoux, Hingle, & Baranowski, 2011; Liu et al., 2012; Ludwig et al., 1999; K. B. Morland & Evenson, 2009; M. K. Serdula et al., 1996; Togo, Osler, Sorensen, & Heitmann, 2001; Van Duyn & Pivonka, 2000; Vioque, Weinbrenner, Castello, Asensio, & Garcia de la Hera, 2008; Wiseman, 2008; World Health Organization, 2013). Within the complex construct of diet, fruit and vegetable intake has been associated with weight loss, weight loss maintenance, and an overall low rate of obesity (Ledoux et al., 2011). Several studies suggest that intake of fruits and vegetables may help reduce obesity in Americans (Jilcott

et al., 2011). However, improving intake of fruits and vegetables has been difficult among populations most in need (Cummins et al., 2014) . For that reason, recently there has been a focus on increasing individual consumption of fruits and vegetables by improving access, availability, and affordability (D. A. Freedman, Choi, Hurley, Anadu, & Hebert, 2013). One such strategy suggested as an approach to improve access has been increasing the number of farmers' markets, especially in rural remote areas.

Farmers' markets have become targeted approaches for improving access to fruits and vegetables (Centers for Disease Control and Prevention, 2011). Not only has the US government suggested farmers' markets as a way to improve access, there is also an increase in consumer demand for such markets. There has been an 84% increase in farmers' markets in the past ten years (United States Department of Agriculture, 2012), which is important because farmers' markets help to make produce more available to low-income, rural areas with few or no grocery stores or supercenters (A. Fisher, 1999; Larson et al., 2009; McCormack, Laska, Larson, & Story, 2010; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). With the recognition of the obesity epidemic in our nation and the increasing understanding of how the neighborhood environment including access to fruits and vegetables influences the nation's health, increasing the grocery stores, supercenters, and more importantly, farmers' markets could be an effective strategy to improve the health of the communities who have less access.

Assumptions

The following assumptions were made: First, it was assumed that the dietary variables were reported correctly by participants. Secondly, it was assumed that participants accurately and truthfully responded to the survey that was conducted over the phone.

Chapter Two

Literature Review

Current research has suggested that moving beyond individual level intervention is needed for public health impact to curb the tide of obesity. One such strategy for decreasing the rates of obesity has been to improve intake of fruits and vegetables, especially among rural and low-income residents. In order to improve intake among vulnerable populations, studies have begun to focus on how to improve access and availability to non-traditional food venues as a way to improve diet and ultimately improve weight status (Karpyn et al., 2010).

Studies have also shown that sub-populations most affected by obesity have limited access to fresh fruits and vegetables which may be a barrier to a healthy diet (Karpyn et al., 2010). The included research helps to support the addition of farmers' markets to low-income areas and those areas with few or no supermarkets or grocery stores as a commonly suggested method to make produce, especially fruits and vegetables, more accessible (Jilcott et al., 2011; Larson et al., 2009; McCormack et al., 2010; Story et al., 2008).

Obesity and Overweight Prevalence

The broader problem addressed in this study is the epidemic of obesity and the severity of this issue. This prevailing disease is a risk factor for a variety of chronic conditions including diabetes, hypertension, high cholesterol, stroke, heart disease, certain cancers, and arthritis (Malnick & Knobler, 2006). America has experienced an epidemic of overweight and obesity, and the percentage of the country that is obese and overweight continues to rise each year, with a plateau among some populations and

certain geographic areas. The following statistics emphasize the severity of this health issue in our nation. The higher prevalence of obesity in our nation were found in the Midwest (29.5%) and the South (29.4%), and lower prevalence were observed in the Northeast (25.3%) and the West (25.1%) (Centers for Disease Control and Prevention, 2012b). According to the Centers for Disease Control and Prevention (2012), more than one-third of U.S. adults are obese (35.7%). Approximately 32% of children and adolescents (aged 2-19 years) are overweight or obese (Centers for Disease Control and Prevention, 2012b), and 17% of women and 11% of men are severely obese (Berrington de Gonzalez et al., 2010).

In Kentucky in 2010, there were 66.2% of adults who were overweight and 31.3% were obese. Among Kentucky's adolescents, 15.6% were overweight and 17.6% were obese. The percentage of children (aged 2 years to less than 5 years) who were overweight and obese is approximately one-third of the population (Centers for Disease Control and Prevention, 2010). The Kentucky Behavioral Risk Factor Surveillance Survey conducted in 2012 reported 66.9% had a body mass index greater than 25 kg/m^2 which is the percentage of the population who are overweight or obese (Centers for Disease Control and Prevention, 2012a). These statistics support the need for studies such as this one in order to understand the underlying causes of obesity and combat this pandemic that is prevalent in Kentucky and America as a whole. Since fruit and vegetable consumption have been linked to lower adiposity rates, it is necessary to explore any methods that could increase produce accessibility and intake.

Government Guidelines and Benefits of Fruits and Vegetables

The United States Department of Health and Human Services (HHS), Healthy People 2020 (2010) is a federal program providing science-based, national objectives for improving the health of all Americans. Nutrition and weight status objectives for Healthy People 2020 reflect strong science supporting the health benefits of eating a healthy diet and maintaining a healthy body weight. It also emphasizes that efforts to change a person's diet and weight should address individual behaviors along with the environmental factors. Healthy People 2020 states that Americans with a healthful diet “consume a variety of nutrient-dense foods within and across the food groups, especially whole grains, fruits, vegetables, low-fat or fat-free milk or milk products, and lean meats and other protein sources; limit the intake of saturated and trans fats, cholesterol, added sugars, sodium (salt), and alcohol; limit caloric intake to meet caloric needs” (United States Department of Health and Human Services, 2010). The consumption of healthy foods is important to the growth and development of children and also helps Americans reduce their risk for many health conditions. Those who have a nutritious diet and are at a healthy weight are less likely to develop chronic diseases such as type 2 diabetes, heart disease, osteoarthritis, and some cancers (United States Department of Health and Human Services, 2010).

Due to the benefits of a nutritious diet that includes fruits and vegetables, one objective of HHS, Healthy People 2020 (2010) is to increase the contribution of fruits to the diets of the population aged two years and older. The baseline for persons aged two years and older in 2001-2004 was half-cup equivalents of fruits per 1,000 calories as the mean daily intake and the target for 2020 is 0.9 cup equivalents per 1,000 calories. An

increase in the contribution of total vegetables to the diets of the population aged two years and older is also an objective for Healthy People 2020. The baseline in 2001-2004 was 0.8 cup equivalents of total vegetables per 1,000 calories of the mean daily intake and the target for 2020 is 1.1 cup equivalents per 1,000 calories. These objectives support the focus of my study on the importance of accessibility of fruits and vegetables to the population including those counties in the Appalachian region of Kentucky.

The Dietary Guidelines for Americans 2010 addresses three main reasons to support the recommendations for Americans to consume more fruits and vegetables in their diet. Firstly, many nutrients that are under-consumed in the United States, such as folate, magnesium, potassium, dietary fiber, and vitamins A, C, and K, are present in most fruits and vegetables (United States Department of Health and Human Services, 2011). Secondly, the consumption of fruits and vegetables is associated with the reduced risk of many chronic diseases. Moderate evidence indicates that intake of at least two and one-half cups of vegetables and fruits per day are associated with a reduced risk of cardiovascular disease, including heart attack and stroke (United States Department of Health and Human Services, 2011). Lastly, most fruits and vegetables are low in calories. When prepared, if no sugars or fats are added, eating these nutritious foods instead of higher calorie foods can help adults and children achieve and maintain a healthy weight (Centers for Disease Control and Prevention, 2009c, 2011; United States Department of Agriculture, 2011; United States Department of Health and Human Services, 2011). Children ages 2 to 18 years, and adults ages 19 to 30 years consume more than half of their fruit intake as juice, and although 100% fruit juice can be part of a healthful diet, it lacks dietary fiber and adds extra calories.

There are many nutrients in fruits and vegetables that are needed for a healthy diet. Diets rich in fruits and vegetables are associated with decreased risk of cardiovascular disease, some cancers, obesity and numerous other chronic diseases (Centers for Disease Control and Prevention, 2013; M. K. Serdula et al., 1996; United States Department of Agriculture, 2011; United States Department of Health and Human Services, 2011; Van Duyn & Pivonka, 2000; Wiseman, 2008) Consumption of fruits and vegetables, which are low in calories, instead of higher-calorie foods may be useful in helping to lower overall caloric intake. Most vegetables and fruits are naturally low in fat and calories and contain no cholesterol. Thus, a growing body of research shows that fruits and vegetables are critical to promoting good health (Centers for Disease Control and Prevention, 2013; United States Department of Agriculture, 2011; United States Department of Health and Human Services, 2010, 2011). These government guidelines along with this growing body of research support my focus on increasing the availability of fruits and vegetables as a method to improving the health of the public.

Relationship of Fruit and Vegetable Intake with Obesity

Due to the nutrient content, fiber, water and low energy density of fruits and vegetables, consumption of these food groups has been proposed as an obesity prevention strategy (de Oliveira, Sichieri, & Venturim Mozzer, 2008; He et al., 2004; Nishida, Uauy, Kumanyika, & Shetty, 2004; Vioque et al., 2008). Evidence suggests that fruits and vegetables may aid in the prevention of obesity by the displacement of energy-dense foods (J. O. Fisher, Liu, Birch, & Rolls, 2007; Rolls, Ello-Martin, & Tohill, 2004), the satiating effect of fiber resulting in fewer calories consumed (Howarth, Saltzman, & Roberts, 2001; Ludwig et al., 1999), and the modulation of dietary glycemic load which

affects postprandial hormonal shifts (Ebbeling, Leidig, Sinclair, Hangen, & Ludwig, 2003; Livesey, Taylor, Hulshof, & Howlett, 2008). The CDC (2012) also identifies increasing fruit and vegetable intake as a proven strategy to prevent and reduce obesity. However, there is still limited research on the benefits of fruits and vegetables and the effects that they have in protecting against obesity. Some studies have shown no clear relationship between food intake patterns (including fruit and vegetable intake) and obesity (Hsiao et al., 2011; Togo et al., 2001). The variation in the results of studies concerning the relationship of fruit and vegetable intake with obesity emphasizes that there is a gap in the research. However, although some studies have not shown a direct causation, there is substantial evidence that overall a diet high in fruits and vegetables is beneficial for protective health which is an important factor in my study. Therefore, the accessibility and availability of fruits and vegetables to the population affects whether an individual is able to incorporate these nutrient-dense foods into their daily diets.

Availability of Fruits and Vegetables

A consistent body of research has shown that the neighborhood food environment may be an important determinant of fruit and vegetable intake in the United States (Baker, Schootman, Barnidge, & Kelly, 2006; Cummins & Macintyre, 2006; Kestens & Daniel, 2010; McKinnon, Reedy, Morrissette, Lytle, & Yaroch, 2009; Zenk et al., 2005). Low-income neighborhoods have been found to have poorer physical access to fruits and vegetables, and residents of these areas may have higher rates of obesity and diet-related chronic disease (Baker et al., 2006; Kipke et al., 2007; K. Morland, Wing, & Diez Roux, 2002). Several studies have shown that limited access to grocery stores, supermarkets, superstores and/or farmers markets result in a decreased intake of fruits and vegetables

and a higher prevalence of obesity (Jilcott et al., 2011; K. Morland, Diez Roux, & Wing, 2006; K. B. Morland & Evenson, 2009).

Certain studies have reported that limited access to supermarkets may reduce consumption of healthy foods, resulting in poor nutrition and increased prevalence of obesity (Michimi & Wimberly, 2010). One study indicated that the odds of obesity increased and odds of consuming fruits and vegetables decreased as distances to supermarkets increased (Michimi & Wimberly, 2010).

In one study designed to improve intake, a mobile veggie cart was launched within an urban setting. The Veggie Mobile program's findings suggest that making fresh produce more accessible will improve intake. (Abusabha, Namjoshi, & Klein, 2011). A study with similar findings that included a farmers' market incentive coupon program called Health Bucks in New York City was stated to be "one strategy to address the problem of obesity and was associated with higher fruit and vegetable access and purchases in low-income communities" (Payne et al., 2013). These studies suggest that increasing access to fresh produce could have a positive impact on the consumption of fruits and vegetables by the members of the community.

Although much evidence points to a relationship between the availability of fruits and vegetables and public health, not all research in this area is consistent. A study examined objective distance to the nearest supermarket and participant-report of supermarket access in relation to fruit and vegetable intake. Unlike other studies, the results indicated that the distance to a supermarket was not associated with fruit and vegetable intake (Caspi, Kawachi, Subramanian, Adamkiewicz, & Sorensen, 2012). Another study on neighborhood fruit and vegetable availability and consumption showed

that greater fresh vegetable availability within 100 meters of a residence was a positive predictor of vegetable intake. However, fresh fruit availability was not associated with intake (Bodor, Rose, Farley, Swalm, & Scott, 2008). The overall majority of previous research illustrates that the distance of fresh food suppliers, whether it be supermarkets, grocery stores, farmers' markets or supercenters, has a significant effect on fruit and vegetable intake as well as obesity prevalence (Jilcott et al., 2011; K. Morland et al., 2006; K. B. Morland & Evenson, 2009). This evidence supports the hypothesis of my study that those who practice frequent food shopping habits at farmers' markets will have better dietary intake of fruits and vegetables.

Rural Residents' Health

The Appalachian region has been marked by geographic isolation (Centers for Disease Control and Prevention, 2009b), which in turn may influence the health disparities experienced by residents relative to those living in more urban settings (Barker et al., 2010; Centers for Disease Control and Prevention, 2009b; Hendryx & Zullig, 2009). There is a growing body of evidence suggesting that rural populations who are in isolation from resources experience worse health outcomes such as certain cancers (Blackley, Behringer, & Zheng, 2012; Hutson, Dorgan, Duvall, & Garrett, 2011), diabetes prevalence and obesity rates (Pancoska et al., 2009) relative to those with greater proximity to health care (Pearce, Witten, Hiscock, & Blakely, 2007), food stores (Sharkey, Horel, Han, & Huber, 2009), and physical activity resources (Gordon-Larsen, Nelson, Page, & Popkin, 2006; Popkin, Duffey, & Gordon-Larsen, 2005). Therefore, rural residents may be at a marked disadvantage when it comes to meeting the Dietary Guidelines for Americans 2010 on fruit and vegetable consumption (Liese, Weis, Pluto,

Smith, & Lawson, 2007). This would include residents of the rural areas on which my study focuses.

Many rural residents live in ‘food deserts’, which have been identified as socially distressed neighborhoods with poor access to healthy food (Larsen & Gilliland, 2009). A study conducted in Appalachia, Kentucky, a possible food desert, had findings that suggest that neighborhoods with high neighborhood deprivation are associated with having certain store types that may promote less healthy food options (A. A. Gustafson, Lewis, Wilson, & Jilcott-Pitts, 2012). A lack of transportation is also a major barrier for residents in rural areas. Furthermore, unlike in most urban areas, rural communities must deal with major issues such as longer distances between retailers, the rapid rise of supercenters, and the impact of those supercenters on other food retailers (Karpyn et al., 2010). Within my study, some of the rural communities must deal with many of these issues that are associated with food deserts.

Farmers’ markets may be a particularly effective strategy to improve access to healthy foods in rural areas, where improving the health status of rural residents may involve more effectively leveraging the strong rural historical connection to agriculture and farming (National Organization of Counties, 2008). However, despite this potential access to sources of fresh produce, research indicates that both fruit and vegetable consumption among rural dwellers is lower than among urban dwellers (Ettienne-Gittens et al., 2013; Liu et al., 2012). The existing agricultural assets in rural areas may support the establishment of farmers’ markets, which could improve access to healthful foods (National Organization of Counties, 2008). This justifies my claim that farmers’ markets

could be an effective strategy to improve the health of the rural communities who have less access to fruits and vegetables.

Effectiveness of Farmers' Markets as a Way to Improve Access in Rural Areas

Farmers' markets have been framed as obesity-prevention strategies (Jilcott et al., 2011). The Centers for Disease Control and Prevention (CDC) developed recommendations to "reduce obesity prevalence through policy and environmental supports that improve access, availability, and affordability of healthy foods in communities" (Centers for Disease Control and Prevention, 2009c). One of the stated goals of the CDC is to increase the availability of food retail in communities, including access to farmers' markets, which is aimed at reducing obesity trends (Centers for Disease Control and Prevention, 2009c).

Previous studies have documented the characteristics of people who use farmers' markets, often finding that farmers' market customers tend to be of higher socioeconomic status, well-educated, and more likely to be female when compared to the general population (Byker, Shanks, Misyak, & Serrano; Elepu & Mazzocco, 2010; Kezis, Gwebu, Peavey, & Cheng, 1998). These demographics mirror the communities in which many farmers' markets are located (Brown, 2002). However, there have been a few farmers' markets that were purposefully developed in low-income and minority communities (D. A. Freedman, 2007; Suarez-Balcazar, Martinez, Cox, & Jayraj, 2006). The studies done in these communities showed that members were more satisfied with the quality, variety, and prices of produce offered at farmers' markets compared to options in local food stores (D. A. Freedman, Bell, & Collins, 2011). This supports the

idea that farmers' markets would also be utilized in lower income and more rural areas, such as some of those that were included in my study, if they were available.

In addition to these studies focused on the demographics of farmers' market shoppers, studies have been done on the relationship between the use of farmers' markets and fruit and vegetable intake. A study was conducted in eastern North Carolina that examined the associations between access to food venues (farmers' markets and supermarkets), shopping patterns, fruit and vegetable consumption and health indicators among women of reproductive age. A larger percentage of women who shopped at farmers' markets consumed five or more fruits and vegetables daily (42%) than those who did not (24%). This study concluded that those who shopped at farmers' markets were more likely to consume five or more servings of fruits and vegetables daily (Jilcott et al., 2012). Another study analyzed data from a subset of respondents in the National Cancer Institute's Food Attitudes and Behaviors Survey. The findings from this study suggest that farm-to-consumer venues, such as farmers' markets, have the potential to reach many Americans and can augment supermarkets and grocery stores as places to obtain fruits and vegetables (Blanck, Thompson, Nebeling, & Yaroch, 2011).

Farmers' markets have increased throughout the United States in recent years. The United States Department of Agriculture (USDA) has reported substantial increases in number of farmers' markets; there were 1,755 in 1994 and 5,274 in 2009 (United States Department of Agriculture, 2010) Several USDA farmers' markets were evaluated and the findings suggest that program participation is associated with several benefits including plans to consume more fruits and vegetables and, in most studies, improvement in fruit and vegetable consumption (Anderson et al., 2001; Herman, Harrison, Afifi, &

Jenks, 2008; McCormack et al., 2010). This supports my hypothesis that those who practice frequent food shopping habits at farmers' markets will have better dietary intake of fruits and vegetables.

Conclusion

In order to improve the public health, researchers and government officials are beginning to focus on neighborhood availability of fresh produce. The creation of farmers' markets takes less time than adding supermarkets and grocery stores and could have a positive effect on a community's food supply and economy. Due to the promise farmers' markets hold for improving access to healthy foods in underserved areas, several federal initiatives focus on establishment of and enhancements to farmers' markets. Such farmers' market enhancements include increasing access to electronic benefit transfer (EBT) for the Supplemental Nutrition Assistance Program (SNAP) participants so that the benefits can be used at local markets. There are also initiatives to increase public transportation to markets and add cooking demonstrations, taste tests, recipe cards, and "kids corners" (McCormack et al., 2010). Such improvements to the food environment may aid people in making healthier dietary choices. This literature review supports research that suggests the potential of farmers' markets to increase access to fruits and vegetables, especially in low-income areas that have poor access to affordable, nutritious foods.

Chapter Three

Methodology

The purpose of this study was to assess the relationship between food shopping habits and diet quality of participants in rural counties of Kentucky. The research design that was used in this study is quantitative. An administration of a survey was used as the research methodology in this study in order to collect the information needed for data analysis.

Study Region

This study was conducted in the Appalachian region of Kentucky from January until July 2013. The study area was chosen as a rural area of the southern United States with high obesity prevalence and low access to fruits and vegetables (Centers for Disease Control and Prevention, 2009b; Ettienne-Gittens et al., 2013; Jackson et al., 2005; Liu et al., 2012). In addition, University researchers in the region had existing investigative collaborations related to the food environment. All portions of this study were reviewed and approved by the Institutional Review Boards of the University of Kentucky.

The counties in which this study was set are described in detail in Table 1. Three counties of interest in Kentucky included Fayette, Jackson, and Boone County. Fayette County was included because it is semi-urban. Jackson and Boone counties were selected as they are both rural and in the Appalachian region, and both counties had (1) at least one farmers' market in the county, (2) a high percent of the county residents living at or below federal poverty levels and (3) low population density.

Random Digit Dial Participant Recruitment and Survey Administration

In January, 2013, in Jackson, Boone, and Fayette County, Kentucky, trained interviewers conducted a telephone survey using random-digit dial (RDD) methods which was overseen by the Survey Research Center at the University of Kentucky at Lexington. Households were selected using a modified list-assisted Waksberg-Mitofsky random-digit dialing procedure, which ensures every residential telephone line in these Kentucky counties had an equal probability of being called. Cellular telephone lines were not included. Households were further screened to talk to one adult who was a primary food shopper. Up to 15 attempts were made to each number in the sample. In addition, up to ten scheduled callbacks were made to those we reached at an inconvenient time, and one refusal conversion was attempted. Of 425 calls made, there were 149 surveys completed, 236 refusals, and 40 not eligible due to language barriers, or no adult being home, for a final response rate of 39%. The completed interview lasted between 15 to 17 minutes. No gift card incentive was used.

Survey Instruments

The RDD used items from previous survey instruments regarding food shopping patterns, Behavioral Risk Factor Surveillance System (BRFSS) survey items, and items specific to farmers' markets. The survey instrument included series of socio-demographic questions, including age (in years), marital status, race, and education level. Questions assessed participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), WIC Farmers' Market Nutrition Program (FMNP), SNAP, and the Senior FMNP. Items also asked about food shopping practices (at discount

supercenters, grocery stores, and farmers' markets), farmers' market awareness, access, use, barriers, and facilitators.

Awareness, Perceived Access, and Use and Survey Questions Used in Analysis

Farmers' market awareness was measured by providing a list of all known farmers' markets in the county, and asking if the participant had heard of each market, knew the location (yes/no), and whether the participant shopped at the market. An awareness score was calculated by summing the number of positive responses to each item related to whether the participant had heard of the market (yes/no) and knew the location for each of 14 listed farmers markets (yes/no) (maximum score of 28).

Farmers market perceived access was measured by asking: "How far from your home is the farmer's market or produce stand where the primary shopper in your household does most of the shopping? (in minutes and miles)". This question was not pilot-tested prior to inclusion on the survey.

Farmers' market use was assessed by asking, "How often in the past 12 months did you buy fruits and vegetables locally grown such as from a farmer's market, CSA, roadside stand, or pick-your-own produce farm?" Responses to this question were the main outcome measure in regression analyses and were dichotomized into those visiting markets up to once per month versus 2-3 times or more per month. All of these assessments helped to determine the association between farmers' market awareness, access, and use with BMI (self-reported).

Among respondents, we asked the likelihood of shopping at farmers' markets given five scenarios related to enhancements to markets including more public transportation to markets, more nutrition education at markets, more promotion of the

market, additional parking, and more vendors. We also asked about potential barriers to fruit and vegetable consumption, including cost, preparation time, and lack of availability.

Table 1 shows the questions from the survey that was used in the analyses for this study. The questions provided answers about where and how frequent respondents shopped at certain establishments including farmers' markets, supercenters, and supermarkets. The consumption of fruits and vegetables on a typical day was also provided. These survey questions helped to determine the association between food shopping habits and fruit and vegetable intake.

Table 1: Survey questions and possible answers

Questions	Answers
Do you ever get groceries (food items) from a discount superstore such as Wal-Mart or Meijer's Foods?	yes; no; don't know
How often do you shop at these locations?	2 or more times per week; one time per week; once a month; 2-3 times per month; a few times per year
Do you ever get groceries (food items) from a supermarket such as Kroger or Aldi's?	yes; no; don't know
How often do you shop at these locations?	2 or more times per week; one time per week; once a month; 2-3 times per month; a few times per year
How often in the past 12 months did you buy fruits or vegetables locally grown such as from a farmers' market, CSA (community supported agriculture), roadside stand, or pick-your-own produce farm?	2 or more times per week; one time per week; once a month; 2-3 times per month; once a month; a few times per year; never
When you shop at a farmers' market, about what percentage is produce (fruits and vegetables) relative to other goods (e.g., baked goods, crafts, jams/jellies)?	100% produce; 75-99% produce; 50-74% produce; 25-49% produce; 0-24% produce
On a typical day, how many servings of fruits do you consume? (A serving of fruit is like a medium sized apple or half a cup of fresh fruit). *This does not include fruit juice.	1 serving; 2 servings; 3 servings; 4 servings; 5 servings; 6 or more servings
On a typical day, how many servings of vegetables do you eat, not including french fries? (A serving of vegetables is like one cup of green salad or half a cup of cooked vegetables)	1 serving; 2 servings; 3 servings; 4 servings; 5 servings; 6 or more servings
About how much do you weigh without shoes?	the respondent's weight in pounds
About how tall are you without shoes?	the respondent's height in feet and inches

Fruit and Vegetable Consumption and Body Mass Index

We assessed fruit and vegetable intake among all respondents using a validated Block fruit, vegetable, and fiber screener, provided by NutritionQuest (Berkeley, California) (Block, Gillespie, Rosenbaum, & Jenson, 2000; M. Serdula et al., 1993). Fruit and vegetable scores were calculated using the standard protocol, summing responses to the 7 fruit and vegetable items. Fruit and vegetable servings per day were calculated using the equation provided by NutritionQuest, using the MyPyramid gender-specific definition of servings per day. BMI was calculated from self-reported height (in pounds) and weight (feet and inches), which is considered a valid method to assess weight status (Brunner Huber, 2007; Spencer, Appleby, Davey, & Key, 2002).

Data Analysis

Descriptive statistics were computed (means, standard errors, percentages) to describe sociodemographic characteristics, food shopping practices, BMI, and farmers' market awareness of participants. We examined associations between the independent variable of farmers' market use and dependent variables of (1) fruit/vegetable consumption and (2) BMI, in two separate linear regression models. Final models for the two dependent variables (fruit and vegetable consumption and BMI) were based upon maximizing the number of observations included in the models, and maximizing R². In the adjusted model with fruit and vegetable consumption as the dependent variable, farmers' market use was examined as the independent variable of interest, along with fruit and vegetable consumption. Because few respondents in each county reported their perceived miles to reach the closest farmers' market, this variable was not included in any of the regression models.

The correlations were calculated using the Pearson product-moment correlation coefficient (r). This assesses the degree that quantitative variables are linearly related in a sample. The significance test for r evaluates whether there is a linear relationship between the two variables in the population. The appropriate correlation coefficient depends on the scales of measurement of the two variables being correlated. There are two assumptions underlying the significance test associated with a Pearson correlation coefficient between two variables. The first assumption is that the variables are bivariate normally distributed. If the variables are bivariate normally distributed, each variable is normally distributed ignoring the other variable and each variable is normally distributed at all levels of the other variable. If the bivariate normality assumption is met, the only type of statistical relationship that can exist between two variables is a linear relationship. However, if the assumption is violated, a non-linear relationship may exist. The second assumption is that the cases represent a random sample from the population and the scores on variables for one case are independent of scores on the variables for other cases.

RDD telephone survey data were weighted by the inverse of the probability of selection at the phone number level, and at the country-level household income, and education of the heads of households. Data from the RDD telephone surveys were analyzed using Statistical Analysis Software (version 9.2, SAS Institute Inc) with survey-specific procedures.

Chapter Four

Results

The mean ages of participants was 58.5 (Table 3). There were 79.4% of participants who were female. The majority of participants were white compared to other racial backgrounds. Approximately 35% of respondents were college graduates and 65% did not graduate from college. WIC participation was around 7% and SNAP participation was 10%. Fruit and vegetable intake reported was an average of 7.3 servings per day.

Table 4 shows participant shopping practices among participants in the three rural counties. The reported percentage of participants who shopped at a supercenter for their groceries was 87.9% compared to 96.1% for grocery store shopping. Twelve percent of participants reported shopping at a farmers' market or produce stand at least once per week in the past 12 months. The mean BMI was 27.4 kg/m² indicating that the majority of the participant population was overweight. The main barriers for respondents were market days and hours and the market being out of the way (location).

Correlations between food shopping habits and fruit and vegetable intake are shown in Table 5. Participants were asked "Do you every get groceries (food items) from a discount superstore such as Wal-Mart or Meijer's Foods?". There was a weak negative correlation of -0.043 for fruit intake and a weak positive correlation of 0.081 for vegetable intake. Participants were asked "Do you ever get groceries (food items) from a supermarket such as Kroger or Aldi's?". There was a moderate positive correlation of 0.357 for fruit intake and a moderate positive correlation of 0.345 for vegetable intake. Participants were then asked how often they shopped at supercenters, supermarkets, and

farmers' markets for their groceries. The frequency of supercenter shopping compared to fruit intake gave a weak positive correlation of 0.193 and a weak positive correlation of 0.157 when compared to vegetable intake. The frequency of supermarket shopping compared to fruit intake gave a weak negative correlation of -0.015 and a weak negative correlation of -0.136 when compared to vegetable intake. The frequency of farmers' market shopping compared to fruit intake gave a weak positive correlation of 0.049 and a weak negative correlation of -0.020 when compared to vegetable intake.

The participants were also asked the following question: "When you shop at a farmers' market, about what percentage is produce (fruits and vegetables) relative to other goods (e.g., baked goods, crafts, jams/jellies)?" The percentage results from this question were compared with fruit and vegetable intake. There were weak negative correlations for fruit and vegetable intake which were -0.130 and -0.228, respectively. There were no significant associations between BMI and the independent variables of interest. Therefore, when looking at the research objectives for this study, no significant results were found to associate participant's food shopping habits with their fruit and vegetable intake or to associate their BMI with awareness, access and use of farmers' markets.

Table 2: Description of study areas in Kentucky.

Characteristics	Fayette County, eastern Kentucky	Jackson County, eastern Kentucky	Boone County, eastern Kentucky
Population Estimate (2011)(United States Census Bureau, 2012a, 2012b, 2012c)	301,569	13,443	121,737
Percent rural dwellers (2010)(United States Census Bureau, 2010)	3.1	100	13.3
Percent black (2011)(United States Census Bureau, 2012a, 2012b, 2012c)	14.8	0.2	2.9
Percent white (2011)(United States Census Bureau, 2012a, 2012b, 2012c)	79.1	98.9	93
Percent living below poverty (2007-2011)(United States Census Bureau, 2012a, 2012b, 2012c)	17.9	35.6	7.2
Percent consuming five or more fruits and vegetables daily(2009*)(Foundation for a Healthy Kentucky, 2009)	22.1	16.4	17.7
Age-Adjusted Estimates of % Obese Adults (2009)(Centers for Disease Control and Prevention, 2009a)	30.7	33.4	30.8
BMI ≥ 30 kg/m ²			
Population density (Person per square mile, 2010)(United States Census Bureau, 2012a, 2012b, 2012c)	1,042.8	39.1	482.3

*The the data for the Kentucky Counties is from “County Group” 2005-2009 BRFSS data.(Foundation for a Healthy Kentucky, 2009)

Table 3: Demographics for participants.¹

Characteristic	Random digit dial participants in Kentucky (n = 149)	
	Weighted Mean	Standard Error

		of the Mean
Age in years	58.5	2.1
Fruit and Vegetable Servings per day	7.3	0.2
Self-reported height (inches)	64.9	0.5
Self-reported weight (pounds)	164.2	3.8
BMI (kg/m²)	27.4	0.5
	N	Weighted %, SE of %
Female, n (%)	111	79.4, 4.2
Race	N	Weighted %, SE of %
African American/ other	7	5.9, 3.1
White	142	94.1, 3.1
Education	N	Weighted %, SE of %
College graduate	60	35.2, 5.0
Non-college graduate	86	64.8, 5.0
Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)	5	6.8, 3.9
Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Farmers' Market Nutrition Program (FMNP)	9	7.3, 3.9
Supplemental Nutrition Assistance Program (SNAP)	18	9.5, 4.0
Senior Farmers' Market Nutrition Program (SFMNP)	3	5.8, 3.8

¹ For continuous weighted variables, the cells include the weighted mean and standard error of the mean; For categorical variables, the cells contain the true n, weighted %, standard error of %.

Table 4: Shopping practices for participants.¹

Shopping Patterns	Random digit dial participants in Kentucky (n = 149)	
Grocery shopping at supercenter	N	Weighted %, SE of %
	123	87.9, 3.0
Frequency of supercenter shopping	N	Weighted %, SE of %
a few times per year	18	13.6, 4.1
once a month	32	29.9, 6.2
2-3 times per month	37	26.2, 5.5
one time per week	21	13.0, 4.1
2 or more times per week	14	14.0, 4.8
Grocery shopping at supermarket	N	Weighted %, SE of %
	135	96.1, 1.6
Frequency of supermarket shopping	N	Weighted %, SE of %
a few times per year	8	1.6, 0.7
once a month	21	13.3, 4.5
2-3 times per month	31	25.6, 5.7
one time per week	36	22.2, 4.5
2 or more times per week	39	37.3, 6.0
How often in the past 12 months have you purchased fruits and vegetables from a farmers' market, CSA, etc?	N	Weighted %, SE of %

Table 4: Shopping practices for participants (continued)

Never	33	22.4, 5.1
a few times per year	58	34.8, 5.5
once a month	8	7.0, 3.2
2-3 times per month	22	14.5, 3.9
one time per week	17	12.1, 3.7
2 or more times per week	9	5.8, 3.1
Barriers to use of farmer's markets		
No EBT	0	0
Transportation barriers	1	3.8, 3.7
Prices	8	5.8, 2.4
Extreme weather	5	4.4, 2.2
Parking	1	1.1, 1.1
Market days and hours	36	28.6, 6.1
Out of the way	21	17.1, 4.8
I only come when I need something	13	10.4, 4.3
Other	25	23.7, 5.8
Perceived distance to closest market (minutes)	14.3	3.2
Perceived distance to closest market (miles)	11.7	3.4
Dollars spent at farmers' market per visit	23.89	2.25

¹For continuous weighted variables, the cells include the weighted mean (standard error of the mean); For categorical variables, the cells contain the true n (weighted %, standard error of %).

Table 5: Correlations between food shopping habits and fruit and vegetable intake

Food shopping habits	Fruit Intake	Vegetable Intake
Supercenter (yes/no)	-0.043	0.081
Supermarket (yes/no)	0.357	0.348
Farmers' market (% produce)	-0.130	-0.228
Frequency supercenter	0.193	0.157
Frequency supermarket	-0.015	-0.136
Frequency farmers' market	0.049	-0.020

Chapter Five

Discussion

Overall the population sampled was representative of the counties where residents lived. Less than one fifth of the respondents reported shopping at a farmers' market weekly or 2+ times per week. This finding suggests that more work is needed to encourage county residents to shop at such locations. Furthermore, farmers' market awareness scores were low, suggesting that efforts are needed to increase residents' awareness of existing local farmers' markets. Participants also reported living a significant distance from farmers' markets, which, coupled with lack of awareness, may present barriers to use of farmers' markets.

In this study, there were many weak correlations between food shopping habits and fruit and vegetable consumption; however, grocery shopping at supermarkets (such as Kroger or Aldi's) had a moderate positive correlation with fruit and vegetable intake. These findings suggest that participants who shop at supermarkets for their food items have a higher intake of fruits and vegetables. This result is not surprising, given that the type of person who shops at grocery stores most likely purchases fruits and vegetables. These findings suggest that in rural areas proximity to grocery stores may influence shopping habits which then ultimately influence intake. These results could support other research that has shown an increase in fruit and vegetable intake as the distance a participant lives from a supermarket decreases (Michimi & Wimberly, 2010). A study conducted in Leeds, England reported an increase in fruit and vegetable consumption, especially for people with the lowest levels of consumption at baseline (Wrigley, Warm, & Margetts, 2003). There is long-standing and consistent observational evidence base in the United States that suggests that lack of access to supermarkets is associated with poor

diet and an increased risk for chronic disease, including obesity (Black & Macinko, 2008). Therefore, structural interventions to improve access to healthy food in underserved areas are a major component of recent United States policy initiatives (Couzin-Franke, 2012).

These interventions are based on the idea that encouraging supermarkets, grocery stores, and farmers' markets to open in underserved neighborhoods will translate into improvements in individuals' diets and lead to a reduction in diet-related health problems. However, previous studies have found that proximity to grocery stores is not necessarily associated with fruit and vegetable intake (Cummins et al., 2014). A contradictory study conducted in Glasgow, Scotland found no net increases in fruit and vegetable intake after allowing for changes in the control group (Cummins, Petticrew, Higgins, Findlay, & Sparks, 2005; Cummins, Petticrew, Sparks, & Findlay, 2005). Cummins and colleagues conducted the first controlled study of the subject undertaken in the United States. The findings from this study suggest that although such programs may improve residents' perceptions of food accessibility, they might be less effective in changing diet and reducing obesity. This study concluded that simply building new food retail stores may not be sufficient to promote behavior change related to diet. Interventions that might help consumers bridge the gap between improvements in perception and action leading to behavior change, such as food shopping and cooking skills programs, should be considered and implemented (Cummins et al., 2014). The effectiveness of interventions to improve physical access to food and reduce obesity by encouraging supermarkets, grocery stores, and farmers' markets to locate in underserved areas therefore remains unclear.

Although our study's findings did not show a strong correlation between fruit and vegetable consumption and farmers' market use, most research has found an increase in fruit and vegetable intake with the usage of farmers' markets (D. A. Freedman et al., 2011; D. A. Freedman et al., 2013; A. Gustafson, Christian, Lewis, Moore, & Jilcott, 2013; McCormack et al., 2010; Payne et al., 2013; Pearson & Wilson, 2013). For example, a study in Lexington, Kentucky assessed the frequency of shopping at certain food venues in relation to fruit and vegetable intake. There was a significant finding that showed every day per week increase in shopping at a specialty market or farmers' market was associated with higher odds of consuming at least two servings of fruits and vegetables relative to consuming less than two servings (A. Gustafson, Christian, et al., 2013). Another study conducted in Fayette County had results that showed the distance that a participant lived from a farmers' market had an effect on their fruit and vegetable consumption (A. Gustafson, Lewis, et al., 2013). Studies from eastern North Carolina, Washington D.C, and Florida also found that fruit and vegetable consumption was positively associated with shopping at farmers' markets (Grin, Gayle, Saravia, & Sanders, 2013; Jilcott et al., 2012; Racine, Smith Vaughn, & Laditka, 2010). These multiple findings of positive correlations in past research show that our weak correlations could be due to factors that were not taken into account. The weak correlations between farmers' markets and fruit and vegetable intake could be due to the locations of these markets, price of produce, or other environmental barriers that were not looked at in this study. The contradictory finding in our study could also be due to a very small percentage who frequently shopped at these markets as well as the extremely low awareness scores of participants. Therefore, the weak correlations found in our study do not necessarily

refute the hypothesis that those who practice frequent food shopping habits at farmers' markets will have better dietary intake of fruits and vegetables.

When addressing the research objective of determining the association between farmers' market awareness, access, and use with BMI, no associations were found among participants of this study. This is contrary to previous findings of inverse associations between access to farmers' markets and obesity in an ecologic, national sample (Jilcott et al., 2011). It may be that rural consumers use farmers' markets differently than urban consumers, and these differences may be related to the lack of association between farmers' market use and BMI. Promotion programs could be implemented to increase the awareness of farmers' markets in these counties and educate community members on the importance of fruits and vegetables in their diet and the availability of fresh produce at the markets.

The results from our study and the limitations of those results along with previous studies that have been reviewed in this thesis support the need to improve farmers' market locations to help increase accessibility for groups with low fruit and vegetable consumption and emphasize the importance of addressing economic barriers to food access.

Policy

Advocates have been trying to draw attention to the critical issue of food access and have crafted policy solutions, but limited access to healthy foods is just now entering the national policy debate. For many years, impacted communities and their advocates have been implementing a variety of strategies to increase access to fresh, wholesome foods, including: attracting or developing grocery stores and supermarkets; developing

other retail outlets such as farmers' markets, public markets, cooperatives, farm stands, community-supported agriculture programs, and mobile vendors (and ensuring public benefits can be used at these venues); increasing the stock of fruits, vegetables, and other healthy foods at neighborhood corner stores or small groceries; growing food locally through backyard and community gardens and larger-scale urban agriculture; and improving transportation to grocery stores and farmers' markets (Karpyn et al., 2010).

Researchers and policymakers are finally coming to the consensus that this is a critical problem in our nation. In December 2009, 39 members of Congress from both political parties issued a resolution in the House of Representatives recognizing the need for national policy to address limited access to healthy food in underserved communities (Karpyn et al., 2010). More than \$400 million are called for by the President's 2011 budget to establish a national Healthy Food Financing Initiative. This initiative is a key component of the First Lady's "Let's Move" campaign to reduce childhood obesity (Karpyn et al., 2010). On June 12, 2013, the Healthy Food Financing Initiative Bill was assigned to a congressional committee. A summary of this initiative is as follows: "Amends the Department of Agriculture Reorganization Act of 1994 to direct the Secretary of Agriculture (USDA) to establish an initiative to improve access to healthy foods in underserved areas, create and preserve quality jobs, and revitalize low-income communities by providing loans and grants to eligible fresh food retailers to overcome the higher costs and initial entry barriers in underserved areas"(GovTrack, 2013). The committee will consider this bill before possibly sending it on to the House of Representatives or Senate as a whole.

Limitations

This study's findings should be interpreted with caution. For one, this is a cross-sectional study design and thus no causality claims can be made, so only correlations can be inferred. In addition, participant responses may have been influenced by social desirability bias. Shopping patterns, fruit and vegetable consumption, and height and weight were self-reported among all respondents, and may be systematically biased. For instance, heavier individuals may under-report weight to a greater extent than normal weight individuals. Other limitations are the small sample size, large standard errors, and lack of inclusion of potential cofounders such as other dietary or physical activity factors that may influence BMI. Finally, responses for the question regarding how often the respondents purchased fruits and vegetables locally grown from a farmers' market, CSA (community supported agriculture), roadside stand, or pick-your-own produce farm may vary by the season in which the surveys were conducted and may lead to an underestimation or an overestimation of the 12-month average. Consideration of these limitations must be taken when interpreting and applying the results of this study.

Strengths

Strengths of this study included use of the validated Block Fruit and Vegetable Screener and RDD methods. Also, the frequency of farmers' market shopping was assessed using typical behavior over the past 12 months, and since shopping at a farmers' market may be a fairly unusual experience for most people, such shopping may be easier to recall compared to other behaviors. Another strength of this study was the examination of rural populations which have not been widely studied in farmers' market research.

Implications

The hypothesis for this study was that those who practiced frequent food shopping habits at farmers' markets would have better dietary intake of fruits and vegetables as well as a lower BMI. Although our findings did not provide strong correlations, the majority of research on farmers' market participation and fruit and vegetable intake refutes these findings due to positive associations between the variables (D. A. Freedman et al., 2011; D. A. Freedman et al., 2013; Grin et al., 2013; A. Gustafson, Lewis, et al., 2013; Jilcott et al., 2012; McCormack et al., 2010; Payne et al., 2013; Pearson & Wilson, 2013; Racine et al., 2010). These numerous past findings of positive associations suggest farmers' markets may be a viable method to increase population-level fruit and vegetable consumption in rural areas.

Barriers to the growth of farmers' market use include low awareness, distance, and hours of market operation. This study supports the need for these rural counties to make a greater effort to promote farmers' markets to their community members and to possibly change hours of operation and locations of these markets to help increase the number of customers. These changes could positively affect community members by increasing their access to fruits and vegetables, which, in turn, allows them to partake in a healthier diet. Researchers have found that residents who live in areas where food markets selling fresh produce, such as farmers' markets, outnumber food stores that generally do not, such as convenience stores, have lower rates of diet-related diseases than their counterparts in neighborhoods lacking food access (Karpyn et al., 2010). Therefore, these efforts to remove barriers to farmers' market usage could result in an increase in the overall health of these rural counties.

Recommendations for Future Research

Recommendations for future studies include the use of stronger study designs and valid, reliable, and widely accepted dietary assessment methods. In addition, multiple assessment periods, including baseline data, should be employed to examine longer-term dietary impacts, both during and outside of growing seasons. There is an especially high need for studies in low-income communities because of disparities in healthful food access in underserved communities. Also, it may be that individuals who prefer to eat fruits and vegetables are more likely to seek out farmers' markets as an alternative source of produce for their regular diet rather than these farmers' markets having a positive influence on availability and fruit and vegetable consumption preference (United States Department of Agriculture, 2008). Therefore, longitudinal study designs need to be implemented to answer these questions and are recommended for future research. Since farmers' markets are being framed as obesity-prevention strategies, it is crucial for future studies to assess the overall influences of energy intake, diet and weight.

Appendix: Phone Survey

Farmer's Market Phone Survey - LIVE

Q. Name of interviewer:

Q. Phone number dialed:

We are asking [Jackson, or Boone, or Fayette] County households to take part in a 10-20 minute survey. We are conducting a research study to learn more about where you shop for food, your eating habits, and health. The information we gather from this survey is aimed to help us understand the health impact of shopping at a farmers' market. This project will help us to develop a proposal aimed at improving access and availability to healthy food in your community. Although you will not get personal benefit from taking part in this research study, your responses may help us to understand more about the association between those who shop at farmers' markets and their dietary habits. Your participation is voluntary, and when you complete the survey. Your response to the survey will be kept confidential to the extent allowed by law. When we write about the study you will not be identified. If you have questions about the study, please feel free to ask; my contact information is given below. If you have complaints, suggestions, or questions about your rights as a research volunteer, contact the staff in the University of Kentucky Office of Research Integrity at 859-257-9428 or toll-free at 1-866-400-9428. Your telephone number has been chosen randomly, and I would like to ask some questions about health and health practices.

Q. Is this phone number correct? (Read the participant's phone number above) If number is incorrect, read the statement below and mark "No"; *Thank you very much, but I seem to have dialed the wrong number. It's possible that your number may be called at a later time.

- Yes
- No

If No Is Selected, Then Skip To End of Survey

Q1 Are you 18 years of age or older?

- Yes
- No

Q2. May we speak to someone 18 years of age or older?

- Yes
- No

Q3. When would be a good time to call back to speak with someone 18 or older? (Please provide information on appointment sheet)

If When would be a good time t... Is Displayed, Then Skip To End of Survey

Q4. Are you one of the primary food shoppers?

- Yes
- No

Answer If Are you the primary food shopper? No Is Selected skip to end of survey

Q5. May we speak with one of the primary food shoppers? If yes, confirm that primary food shopper is 18 years of age or older. If not of age, select no.

- Yes
- No

Answer If May we speak with the primary food shopper? If yes, confi... No Is Selected

Q6. May we please have contact information to get in touch with the primary food shopper? Primary shopper must be 18 or older

- Yes
- No

If No Is Selected, Then Skip To End of Survey

Answer If May we please have contact information to get in touch wi... Yes Is Selected

Q7. When would be a good time to call back to speak with a primary food shopper? (Please provide information on appointment sheet)

If When would be a good time t... Is Displayed, Then Skip To End of Survey

Answer If Are you one of the primary food shoppers? Yes Is Selected Or May we speak with one of the primary food shoppers? If ye... Yes Is Selected

Q8. Do you live in [Jackson, or Boone, or Fayette] County?

- Yes
- No

If No Is Selected, Then Skip To End of Survey

Q9. Do you speak English? (If not obvious)

- Yes
- No

If No Is Selected, Then Skip To End of Survey

Q10. You are eligible to participate in the survey. Are you still interested? (If participant agrees, thank them for participating)

- Yes
- No

If No Is Selected, Then Skip To End of Survey

Q11. Is this a convenient time to speak with you?

- Yes
- No

Answer If Is this a convenient time to speak with you? No Is Selected

Q12. Is there a more convenient time to reach you?

- Yes
- No

If No Is Selected, Then Skip To End of Survey

Answer If Is there a more convenient time to reach you? Yes Is Selected

Q13. When would be a more convenient time to reach you? (Record information on appointment sheet)

If When would be a more conven... Is Displayed, Then Skip To End of Survey

I would like to start by asking you about some of your food shopping habits.

Q14. Do you ever get groceries (food items) from a discount superstore such as Wal-Mart or Meijer's Foods?

- Yes
- No
- Don't know

Answer If Do you (or the primary food shopper in your household) ev... Yes Is Selected

Q15. How often do you shop at these locations?

- 2 or more times per week
- one time per week
- once a month
- 2-3 times per month
- a few times per year

Q16. Do you ever get groceries (food items) from a supermarket such as Kroger or Aldi's?

- Yes
- No
- Don't know

Answer If Do you (or the primary food shopper in your household) ev... Yes Is Selected

Q17. How often do you shop at these locations?

- 2 or more times per week
- one time per week
- once a month
- 2-3 times per month
- a few times per year

Q18. What is the name and location of the supermarket or other major food store where you do most of your grocery shopping?

Name
Street
City

Boone County Stores

Rabbit Hash
Walmart SuperCenter
Kroger
Meijer
Sam's Club
Remke Markets

Jackson County Stores

Sav-A-Lot
Sand Spring Grocery
Annville Town and Country Market

Q19. How often in the past 12 months did you buy fruits or vegetables locally grown such as from a farmer's market, CSA (community supported agriculture), roadside stand, or pick-your-own produce farm?

- 2 or more times per week
- one time per week
- 2-3 times per month
- once a month
- a few times per year
- never

If never Is Selected, Then Skip To What is the main thing that keeps you...

Q20. What do you typically purchase at the farmers' market (be specific) [List below]? Refer to "Food Listing Cheat Sheet" for potential food prompts.

Vegetables

Cut flowers

Fruit

Berries

Fresh herbs

Dried herbs

Herb plants

Vegetable transplants
Bedding and potted plans
Hand-crafted items
Soaps
Bread
Muffins, cookies, cakes
Jams, jellies, pickles
Honey
Nuts
Eggs
Cheese
Meat
other

Q21. How far, in minutes and miles, is this market from your home?

Minutes

Miles

Q22. During a normal shopping trip, how much money do you typically spend on produce at a farmers' market?

DOLLAR AMOUNT \$ _____

Q23. When you shop at a farmers' market, about what percentage is produce (fruits and vegetables) relative to other goods (e.g., baked goods, crafts, jams/jellies)?

- 100% produce
- 75-99% produce
- 50-74% produce
- 25-49% produce
- 0-24% produce

Q24. Compared to other places you have purchased food, is the farmers' market more or less expensive?

- More expensive
- Less expensive
- The same price

Q25. What is the main thing that keeps you from shopping at a farmer's market? [Mark only one] (If the participant shops at farmers' markets, ask: "What is the main thing that keeps you from shopping more at a farmer's market").

- No EBT
- Have trouble getting to the market
- Prices
- Extreme weather
- Parking
- Market days and hours
- Out of the way
- I only go when I need something

Q26. Do recipe cards available at the market influence your buying of fruits and vegetables while at the market?

- No
- Somewhat
- Yes

Q27. Do recipe samples available at the market influence your buying of fruits and vegetables while at the market?

- No
- Somewhat
- Yes

Q28. What is/are the main features that you would use on a farmers' market mobile device "App"? Check all that apply.

- Map feature that shows location of markets
- Weekly update on the items available at the market
- Fruit and vegetable purchase and storage tips
- Healthy recipes using locally grown fruits and vegetables
- Nutrition information
- Interactive farmers' market game

Q29 Using the following scale (Read the Likert scale below) please rate how likely you would be to shop at a farmers market if there were:

	much less likely	less likely	neutral	more likely	much more likely
Public transportation to the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More nutrition education activities at the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More promotion of the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More parking at the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More vendors at the market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q30. On a typical day, how many servings of fruits do you consume? (A serving of fruit is like a medium sized apple or half a cup of fresh fruit). *This does not include fruit juice.

- 1 serving
- 2 servings
- 3 servings
- 4 servings
- 5 servings
- 6 or more servings

Q31. On a typical day, how many servings of vegetables do you eat, not including french fries? (A serving of vegetables is like one cup of green salad or half a cup of cooked vegetables).

- 1 serving
- 2 servings
- 3 servings
- 4 servings
- 5 servings
- 6 or more servings

Q32. Thinking about your eating habits over the past year or so, about how often do you eat each of the following foods? Remember breakfast, lunch, dinner, snacks, and eating out.

	less than 1/week	once a week	2-3 times a week	4-6 times a week	once a day	2+ a day
Fruit juice, like orange, apple, grape, fresh, frozen or canned (not sodas or other drinks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Any fruit, fresh or canned (not counting juice)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetable juice like tomato juice, V-8, or carrot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Green salad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potatoes, any kind, including baked, mashed or french fried	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetable soup, or stew with vegetables	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Any other vegetables, including string beans, peas, corn, broccoli or any other kind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fiber cereals like Raising Bran, Shredded Wheat or Fruit-n-Fiber	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Beans such as baked beans, pinto, kidney, or lentils (not green beans)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dark bread such as whole wheat or rye	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q33. For each statement listed below, please indicate how much you personally agree or disagree with the statement. (Review the scale with the participant) I don't eat fruits and vegetables as much as I like because:

	Strongly Disagree	Disagree	Agree	Strongly Agree
They cost too much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
They often spoil before I get a chance to eat them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
They take too much time to prepare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
They are not filling enough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My family doesn't like them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The restaurants I go to don't serve fruit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The restaurants I go to don't serve vegetables	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have trouble digesting them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't know how to choose fresh fruits and vegetables	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I just don't think of fruits and vegetables when I'm looking for something to eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
They are too messy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q34. In a usual week, do you do at least 10 minutes of vigorous physical activity, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate?

- Yes
- No
- Don't know

If Yes Is Not Selected, Then Skip To In a usual week, do you do at least 1...

Q35. How many days a week do you do these activities?

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Q36. On average, how many minutes per day do you do vigorous physical activity?

Q37. In a usual week, do you do at least 10 minutes of moderate physical activity, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate?

- Yes
- No
- Don't know

If Yes Is Not Selected, Then Skip To Thinking about your eating habits ove...

Q38. How many days a week do you do these activities?

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Q39. On average, how many minutes per day do you do moderate physical activity?

Answer If Are you male or female? (Only ask if not obvious from res... Female Is Selected

Q40. What year were you born?

Q41. Are you male or female? (Only ask if not obvious from respondent's voice)

- Male
- Female

Q42. What is your current physical address?

Street number and name
City
State
Zip

Q43. How long have you lived at your current address?

Years:
If known (Months):

Q44. Do you use the local transit service?

- Yes
- No

Answer If Do you use the local transit service? Yes Is Selected

Q45. Which service(s)?

- LexTran
- Other _____

Q46. Are you currently?

- Married
- Single
- Divorced
- Widowed
- Separated
- Never married
- A member of an unmarried couple
- Refused Do not read (DNR)

Q47. How many children less than 18 years of age live in your household?

of children _____

Q48. What is the highest grade or year of school you completed? (Only read the choices if necessary)

- Never attended school or only attended kindergarten
- Grades 1 through 8 (Elementary)
- Grades 9 through 11 (Some high school)
- Grades 12 or GED (High school graduate)
- College 1 year to 3 years (Some college or technical school)
- College 4 years or more (College graduate)
- Refused (DNR)

Q49. Are you currently? (If participant indicates more than one, ask their primary role)

- Employed for wages
- Self-employed
- Out of work for more than 1 year
- Out of work for less than 1 year
- A Homemaker
- A Student
- Retired
- Unable to work
- Refused (DNR)

Q50. About how much do you weigh without shoes?

Weight (pounds) ex. 150

Q51. About how tall are you without shoes?

Height (feet and inches) ex. 5'9"

Q52. What is your annual household income?

- \$21,000-\$39,000
- \$40,000-\$59,000
- \$60,000-\$79,000
- \$80,000-\$99,000
- >\$100,000

Q53. Do you currently receive WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) benefits?

- Yes
- No

Answer If Do you currently receive WIC (Special Supplemental Nutrit... Yes Is Selected

Q54. Have you ever redeemed WIC Farmers' Market Nutrition Program coupons at the farmers' market?

- Yes
- No

Q55. Do you currently receive SNAP (Supplemental Nutrition Assistance Program) or food stamps?

- Yes
- No

Q56. Do you currently participate in the Senior Farmers' Market Nutrition Program?

- Yes
- No

Q57. Are you Hispanic or Latino?

- Yes
- No
- Don't know/Not sure
- Refused (DNR)

Q58. Which one or more of the following would you say is your race?

- White
- Black or African American
- Asian
- Native Hawaiian or Other Pacific Islander
- American Indian or Alaska Native
- Other (specify) _____
- Don't know/Not sure
- refused (DNR)

Q59. Thank you for taking part in this survey.

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