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FARMERS' MARKET SHOPPING BEHAVIORS AND
THE ASSOCIATION OF FRUIT AND VEGETABLE INTAKE

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

Sarah Grace Perkins

Lexington, Kentucky

Director: Dr. Alison Gustafson, Professor of Dietetics and Human Nutrition

Lexington, Kentucky

2014

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ABSTRACT OF THESIS

FARMERS' MARKET SHOPPING BEHAVIORS AND THE ASSOCIATION OF FRUIT AND VEGETABLE INTAKE

Fruit and vegetable (FV) intake continues to decline among sub-population in the United States. Current policies and interventions have aimed to improve intake by improving access to fruits and vegetables. One Centers for Disease Control and Prevention suggested strategy is to improve access to farmers' markets in rural areas. The aims of this study were to determine if the frequency of shopping at Farmers' Markets is associated with fruit and vegetable intake, adjusted for age, income and education and to compare rural and non-rural areas frequency of Farmers' Market attendance based on Kentucky farmers' market interview participants (n = 102). The results of the descriptive, cross-sectional study determined that the Kentucky farmers' market customers Fruit and Vegetable Score was positively associated with frequency of purchase of locally grown fruits and vegetables at farmers' markets. However, the frequency of farmers' market attendance was most commonly limited to 'once a week' (as a result of participants attending 'Only attends market when need something'). It was concluded that alleviating the barriers customers face to use farmers' markets is the best way to increase the attendance of farmers' markets and as a result increase the purchases of fresh fruits and vegetables.

KEYWORD: Farmers' Markets, Fruit and Vegetable Intake, Healthy People, Barriers, Availability

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November 20, 2013

FARMERS' MARKET SHOPPING BEHAVIORS AND
THE ASSOCIATION OF FRUIT AND VEGETABLE INTAKE

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Chapter One: Introduction

The Dietary Guidelines for Americans 2010 recommend adults to consume larger amounts of fruits and vegetable in order to reduce the risk of chronic disease (U.S. Department of Health and Human Services [USDHHS] 2010). Increasing this intake slightly among adults as well as children at a young age can make an impact on the future. The majority of Americans are not meeting recommendations for fruit and vegetable consumption. According to the Centers for Disease Control and Prevention only 23.5% of adults in the United States consume fruits and vegetables 5 or more times a day. In other words, over three-fourths of Americans are not incorporating adequate fruits and vegetables into their diets. In Kentucky only 21.1% of adults consume 5 or more servings of fruits and vegetables per day (NHCS, 2010).

Healthy People 2020 recommends that Americans increase the contribution of fruits to the diets as well as increase the variety and contribution of vegetables to the diets of the population aged 2 years and older. As a result of this, Healthy People 2020 also plans to increase the number of States that have State-level policies that incentivize food retail outlets to provide foods that are encouraged by the Dietary Guidelines for Americans (United States Department of Health and Human Services [HHS], Healthy People 2020, 2011). Accompanied with this recommendation is nationwide attention aimed at improving access and availability as a way to meet these recommendations. The following thesis will outline how farmers markets may be one approach in Kentucky that may or may not improve fruit and vegetable intake among rural and non-rural areas of the state.

Justification

Farmers' markets may be particularly effective approach to increase access to healthy foods in rural areas, where improving the health status of rural residents may require more efficient development of the rural historical connection to agriculture and farming (National Association of Counties, 2005). However, despite this potential availability to sources of produce, research indicates that both fruits and vegetable consumption among rural residents is lower than non-rural residents (Liu et al. 2012, Etienne-Gittens et al. 2013). The current agricultural resources in rural areas may support the development of farmers' markets, which could improve access to more fruits and vegetables (National Association of Counties, 2005). There are a number of potential challenges to accomplishing this, which may include lack of farmers' market use and low customer base, due to low population density.

Statement of Purpose

The purpose of this study is to: (1) identify barriers and supports involved in access to fresh fruits and vegetables in Kentucky; (2) determine whether the access to fresh fruits and vegetables influence the consumption of fruits and vegetables; and, (3) examine the factors that influence Kentucky residents, who attend local farmers' markets, fruit and vegetable intake.

Research AIMS

To accomplish the purpose of this study the aims are to:

- 1) Determine if the frequency of shopping at Farmers' Market is associated with fruit and vegetable intake, adjusted for age, income and education.
- 2) Compare rural and non-rural areas frequency of Farmers' Market attendance.

Hypothesis

It is hypothesized that the education and income levels will be the most significant factors influencing fruit and vegetable intake of frequent shoppers (individuals who attend local farmer's markets at least once a week) of local farmers' market. Market accessibility will be the most significant factor influencing fruit and vegetable consumption for those Kentucky residents who do not attend farmers' markets.

Assumptions

The following assumptions were made:

- First that the information provided on the self-reported questionnaire was completed truthfully, and.
- Second that participants reported the dietary variables accurately.

Chapter Two: Literature Review

National Policy: Recommendations on the Consumption of Fruit and Vegetables

It is well known that fruits and vegetables are rich in essential nutrients that include: vitamins and minerals. Consuming a well-balanced diet rich in fruits and vegetables provide the body with water, dietary fiber, vitamin A, vitamin C, folate and potassium. The naturally low calorie, low fat and low cholesterol characteristics that fruits and vegetables have can be protection from many chronic diseases, such as heart disease, stroke, and some types of cancer. From the rich research data on the value of consuming fruits and vegetables, several national policies have been developed including the Dietary Guidelines for Americans and MyPlate. For good health, USDA and HHS urge American consumers to eat more fruits and vegetables and to choose a healthier, more varied mix of these foods. The USDA promotes the slogan “Eat 5 to 9 a day for better health,” this program encourages all Americans to eat 5 to 9 servings of fruits and vegetables a day for good health. Aim for at least 2 servings of fruits and 3 servings of vegetables every day (United States Department of Agriculture 2009). During the past 20 years, serving sizes have steadily increased, partly based upon meeting consumers desire to get more ‘value’ for your food dollar at restaurants. This has created confusion as to the definition of a serving size. Due to this portion distortion, national public policy statements have changed recommendations from the nebulous serving to defined measurements. Table 1 displays the daily amount of food from each group based on a variety of calorie intakes.

Table 1: USDA Food Patterns

Daily Amount of Food From Each Group

Calorie Level	1400	1600	1800	2000	2200	2400	2600	2800	3000
Fruits (cups)	1.5	1.5	1.5	2	2	2	2	2.5	2.5
Vegetables (cups)	1.5	2	2.5	2.5	3	3	3.5	3.5	4
Grains (oz.)	5	5	6	6	7	8	9	10	10
Meat & Beans (oz.)	4	5	5	5.5	6	6.5	6.5	7	7
Milk (cups)	2	3	3	3	3	3	3	3	3
Oils (tsp.)	4	5	5	6	6	7	8	8	10

The amounts of food to consume from the basic food groups, subgroups, and oil are displayed in Table 1. These amounts are suggested to meet the recommended nutrient intake at 12 different calorie levels. Nutrient and energy contributions from each group are calculated according to the nutrient-dense forms of foods in each group (e.g., lean meats and fat-free milk). The table also shows the number of calories from solid fats and added sugars (SoFAS) that can be accommodated within each calorie level, in addition to the suggested amounts of nutrient-dense forms of foods in each group (USDA, 2009).

As previously mentioned, three-fourths of Americans are not incorporating adequate fruits and vegetables into their diets. In reference to Kentucky specifically only 21.1% of adults consume the appropriate over 5 servings (using traditional serving size this would equate to about 2.5 cups) of fruits and vegetables per day (NHCS, 2010).

As a result of the very low intake levels of fruits and vegetables among Americans, Healthy People 2020 created specific objectives for fruit and vegetable consumption. Healthy People is a national public policy document that is led by a federal

interagency workgroup whose goal is to provide science-based, 10-year national objectives for improving the health of all Americans. For three decades, Healthy People has established benchmarks and monitored progress over time in order to: encourage collaborations across communities and sectors, empower individuals toward making informed health decisions, and measure the impact of prevention activities. Specifically, the Healthy People 2020 objectives aim for at least 75 percent of Americans to eat the recommended two or more daily servings of fruit, and for at least 50 percent of Americans to eat the recommended three or more servings of vegetables daily (Healthy People, 2020). In response to these recommendations, the government and business leaders, coalitions, community-based organizations, and professionals have taken a stand to support American's nutrition by providing potential indicators and actions to promote healthy lifestyles.

National progress towards the fruit objective, vegetable objective, and both fruit and vegetable objectives have been assessed from the fruit and vegetable survey items included as a 6-item frequency screener in the 2007 Behavioral Risk Factor Surveillance System (adults aged ≥ 18 years) and the 2007 Youth Risk Behavior Surveillance System (adolescents in grades 9-12). Two key policy and environmental issues have been developed in response that include healthier food retail and food system support (Lucan, Barb, & Long et al., 2012).

Specific Policies To Increase Fruit and Vegetables Consumption

There has been a number of research studies completed that assess the correlation of fruit and vegetable intake, access to these foods, and potential policies to promote access. The first policy is to promote the availability of healthier food retail in

communities. This involves strategies to improve and market the food environment to aid fruit and vegetable access, availability, and affordability. According to Glanz, this incorporates Point of Purchase (POP) information in grocery stores using shelf labels and/or signage that specify healthy food choices. It is recommended that a POP specifically for fruit and vegetable intake involves menu suggestions and/or signage specifying that food items are good sources of fruit and vegetables, as well as integrating cooking demonstrations (Glanz et al., S 76).

Further research suggests another effective policy is to provide financial and nonfinancial incentives to food retailers to open new stores and/or to offer healthier food and beverage choices at existing stores, including fruits and vegetables, in areas with few healthy food options. Freedman and colleagues found that even a relatively small financial incentive was beneficial. It was determined that those who used financial vouchers for payment at farmers' markets were significantly more likely to increase fruit and vegetable consumption than individuals who used other forms of payment (Freedman et al., 291). This is associated with providing support for farmers' markets to purchase wireless electronic benefit transfer (EBT) devices to make it possible for them to accept Supplemental Nutrition Assistance (SNAP) and WIC Program EBT card. Another effective policy would include education to encourage residents of lower-income neighborhoods and SNAP and WIC recipients to use farmers' markets and farm stands where they are available (CDC, 2012).

The third policy is to improve access healthy food markets. Studies have suggested that the improvement of zoning and transportation policies to make supermarkets, grocery stores, and farmers' markets more accessible in communities can

be beneficial to the consumer (CDC, 2012). Upon close examination of locational access of supermarket access and fruit and vegetable consumption, Thornton and colleagues determined that there is a positive correlation between an individual's proximity to a farmers' market and an individuals' fruit and vegetable intake (Thornton et al., 10).

The research data related to the policies to improve access, availability and affordability of fruit and vegetables has shaped the next decade of objectives for Healthy People 2020. The major goal under nutrition for this set of objectives is to promote health and reduce chronic disease risk through the consumption of healthful diets and achievement and maintenance of healthy body weights (Tohill, Seymour, kettle-khan& Rolls et al., 2004). Healthy People 2020 plan to increase the proportion of Americans who have access to a food retail outlet that sell a variety of foods was shaped by the Dietary Guidelines for Americans. Specifically Objective NWS-14 and NWS-15 incorporate fruit and vegetable consumption: to increase the contribution of fruits to the diets of the population aged 2 years and older, and to increase the variety and contribution of vegetables to the diets of the population aged 2 years and older. The baseline mean daily intake by persons aged 2 years and older in 2001 to 2004 was 0.5 cup equivalent of fruits per 1,000 calories. Based on this intake, the Healthy People 2020 target goal for fruit intake is 0.9 cup per 1,000 calories. In reference to vegetable intake NWS-15.1, Healthy People 2020 plans to increase the contribution of total vegetables to the diets of the population aged 2 years and older. The baseline mean daily intake is 0.8 cup of total vegetables per 1,000 calories by persons aged 2 years and older in 2001 to 2004. As a result, Healthy People 2020 has created a target goal to increase intake to 1.1 cup equivalent per 1,000 calories (Healthy People, 2020).

Farmers' Markets: Benefits to Farmers, Consumers, and the Community

Farmers' markets are becoming an integral part of urban-farm relationship and have grown drastically in popularity over the past decade. Growth in the number of farmers' markets over the past decade has been dramatic. In 2004 there were 3,706 farmers' markets operating in the United States, an increase of 53% since 1994 (USDA-AMS, 2004). In Kentucky the number of markets increased from 96 in 2004 to now nearly 150 farmers markets in use across the bluegrass in 2012. There are a vast number of products offered throughout KY, a few of the most common include: fruits, vegetables, dairy, meat, cheeses, wine, flowers, herbs and a collection of seasonal items (Kentucky Department of Agriculture, 2012DA). While each market is unique there are several commonalities as far as benefits to attending farmer's markets.

The growth in farmers' markets is attributable to the many benefits offered by direct marketing to vendors, consumers, and communities. Abel and colleagues suggest that farmers' markets can be an effective community development tool. The creation of close relationships between farmers and consumers can lead to increased producer incomes as well as improved consumer access to fresh foods, while communities benefit from boosts to local economies (Abel, Thomson, & Maretzki, et al. 1999). Social and economic benefits are documented by the community-building contributions of markets to social interaction, as well as the new economic activity stimulated by farmers' markets (Frentra, et al. 2007). Generally research shows that there are three common reasons' why individuals attend farmers' market. These include: the access to fresh produce, the ability to support local agriculture and the availability of inexpensive food (Andretta & Wickliffe, et al. 2002).

While examining consumer trends, preferences, and characteristics, it was shown that the quality and freshness of produce were important factors affecting purchasing decisions (Govindasamy, Italia & Adeleja, et al. 2002). The attributes most positively attributed to quality and value of produce include: fresher in appearance and taste, higher quality produce, more reasonably priced and better quality for the money, more likely to be nationally/locally grown, good for the environment and more easily traced to the processor and grower than in supermarkets (Wolf, McGaury, Sitler & Ahem et al., 2005).

The second common factor influencing individual's choices to attend farmers' market was the ability to support local farmers. Based on a consumer study conducted in northwestern Vermont, individuals felt a greater sense of satisfaction purchasing fresh produce from their local farmers than anywhere else. Most importantly consumers are explicitly supporting sustainability among local farmers (Baker, Hamshaw & Kolodinsky et al., 2009). By supporting local farmers the individual is giving back to the community and helping improve the economy. The support provided to local agriculture was the top motivator for consumers to visit the market and resulted in a greater ability to purchase nutritious foods (Eastwood et al., 1999).

The third important factor that drives individuals to attend local farmers' markets is the availability of inexpensive, quality produce. When purchasing directly from the farmer the consumer is eliminating the middleman/convenience store and therefore are saving money (Owainwa, Moijca & Wheelock, et al., 2006). This inevitably makes both parties happy because the consumer saves money while the farmer may make slightly more money. Research conducted in North Carolina showed that the market itself has an

important role in structuring the relationships between farmers and consumers and in determining whether the experiences of selling and buying at the market are satisfying to them. Therefore current research has begun to answer the grueling question ‘What drives the consumer to shop at a farmers market?’ Ultimately this involves the availability of fresh produce, support of local farms and inexpensive food and can be utilized to continue the growth and expansion of farmer’s markets. Knowing the characteristics of typical consumers allows vendors to identify unmet demand, coordinate among markets, and develop stronger and more strategic plans. Understanding what reasons motivate individuals to purchase goods from farmers' markets can guide marketing efforts (Owainwa, Moijca & Wheelock, et al., 2006).

According to research by Freedman, the individuals who benefitted most from the personal incentive intervention and farmers’ markets attendance were those who consume the lowest levels of fruit and vegetables (Freedman et al. 291).

Farmers’ Market Barriers

Farmers’ markets provide a vast number of benefits to not only the consumer and farmer, but the overall economy as well. However there are a number of barriers that make access and purchasing fresh fruits and vegetables difficult. Inaccessibility to nutritious, reasonably priced food in certain areas of the United States could be a key factor in major health problems. (Treuhaft, Karpyn, 2010). The Kentucky Department of Agriculture stated that ‘travel is limited by high gas prices and record high food prices’ which has a direct effect on local agriculture. Individuals living areas with limited access to nutritious affordable foods tend to face both geographical and non-geographical barriers.

The first and most common barrier that restricts individuals from attending farmers' markets is the geographic aspect; therefore location is key when developing a farmer's market. Many low-income families are not able to shop at local farmers' markets due to the location. "Food deserts" are areas or districts in urban or rural settings with little or no access to large grocery stores that offer fresh and affordable foods needed to maintain a healthy diet (Jiao, Moudon, Ulmer, Hurvitz, & Drewnowski, 2012). Without a form of transportation it is difficult for these individuals to shop at farmers' markets or other venues which have healthful foods. Based on Markowitz research it was suggested that the ideal scenario is to develop local farmers' markets throughout food deserts to give communities access to nutritious food options (Markowitz, 2010).

The second barrier commonly restricting individuals is a non-geographic barrier. It is an economic barrier. Along with the geographic barrier, it is also becoming a more prevalent issue among consumers as the economy continues to suffer. As the economy continues to shift, food prices are directly affected. When there is less nutritious food being consumed, individual's health suffers as well. A direct result of this is seen in a study examining U.S. households, it was determined that those with an income of less than or equal to 130% of poverty line are most vulnerable for poor health outcomes as a result of less fruit and vegetable purchases (Reed, Frazao & Itsowitz et al., 2004).

Overall it is important to address these two major barriers in hopes to improve fruit and vegetable consumption and ultimately improve health in these communities. The Healthy Food Financing Initiative (HFFI) has recently been developed by the United States Department of Health and Human Services in order to counteract these barriers. HFFI supports projects that increase access to healthy, affordable food in communities

that currently lack these options. Through a range of programs at the United States Departments of Agriculture (USDA), Treasury, and Health and Human Services (HHS), there is hope to expand the availability of nutritious food, including building and preparing grocery stores, small retailers, corner stores, and farmers markets selling healthy food (United States Department of Health and Human Services, 2010). With the combined effort of government support working towards improving these barriers, the accessibility and utility of farmers' markets will hold great promise for the future.

In conclusion improving the problem of significantly low fruit and vegetable intake is a complex issue that needs to be further developed. With the increased negative implication of reduced fruit and vegetable consumption on chronic diseases, it is a prevalent health concern in the United States. Overall through this study the following is hoped to be determined: identification of factors that influence the intake of fresh fruits and vegetables in Kentucky; which of those factors are significant for those who attend local farmers' markets and those that do not attend local farmers' markets; how education level, income and age of the individual will influence purchasing habits and intake of fruits and vegetable, and; whether the market accessibility; location, distance and hours of operation influence Kentucky residents in their decision to attend local farmers' markets.

Chapter Three: Methodology

Study Design

The study design is a descriptive, cross-sectional study that measures the barriers and motivators among Kentucky residents who attend and do not attend local farmers' markets. Through a descriptive survey this study examines the phenomena of the current purchasing practices and fruit and vegetable intake to determine influential factors.

Study Setting

This study was conducted in both rural and non-rural counties in Kentucky; these locations included Lexington-Fayette County, Boone County and Jackson County. The studies were done in areas with a well-established base of local farmers markets. Ultimately this was a small portion of a much larger data study involving areas such as rural North Carolina and Appalachian Kentucky. The University of Kentucky had previously investigated the three different locations.

This study was conducted in Kentucky counties that 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. In 2011, Fayette County had a total population of 301,569, and approximately 17.9% of residents were living below poverty, 14.8% are black and 7% are Hispanic (USCB, 2012) and in 2009, 60.7% of adults were obese (CDC, 2009). In 2011, Jackson County had a total population of 13,443 with mostly white residents, 35.6% live below poverty, and 100% of residents are rural dwellers (USC, 2009. USCB, 2012), with 33.4% of adults being classified obese in 2009 (CDC, 2009) In 2011, Boone County had a total population of 121,737, with 93% White,

2.9% Black, 2% Hispanic or Latino, and 2.2% Asian (USCB, 2012) 7.2% live below poverty (USCB, 2012) and in 2009, 30.8% of adults were obese (CDC, 2009).

Farmers' Market Customer Recruitment and Survey Administration

In Fall 2012, IRB approved farmers' market customer surveys were distributed among approximately 100 Kentucky residents in Fayette, Boone, and Jackson counties. Potential participants were approached in the markets, asking about interest in participation. If interested, the survey was self-administered unless it was necessary for the researcher to individually read the survey to the participant. The interaction between the researcher and the participant varied, depending upon the number of customers interested in being surveyed at one time.

Cooking demonstrations were going on in the middle of both the Boone County and Jackson County farmers' markets while Fayette County Farmers' Market did not have any activity for residents to participate in. Free small giveaways were distributed as incentives for Boone County resident's market survey completion.

The Fayette County Farmers Market selected was the market on the corner of South Broadway and East Maxwell. This location is only in use on Tuesdays and Thursdays from 8am to 2pm. As a result of the low volume of shoppers, the surveys were distributed for two consecutive weeks. The participants filled the surveys out on their own, unless assistance was necessary due to hearing/vision problems. Surveys took approximately 20 minutes to complete and were returned immediately. The Boone County Farmers Market selected is operated by the Boone County Farmers Market Association and advertises as an educational program at the Boone County Cooperative Extension Service, and this location is used seven days a week from May to October.

While the market's highest volume of shoppers is Saturday from approximately 8 am to 12pm; data from this location was collected on a Saturday morning. As in Fayette County, the majority of individuals completed the surveys on their own, unless there was a hearing/vision disability and assistance was requested. Finally the Farmers market in Jackson County was in Bond Memorial park on a Friday morning at 10am. This is a much smaller market than Boone and Fayette Counties. Surveys here were most frequently done verbally.

Survey Instruments

The customer intercept survey was developed by researchers at the University of Kentucky at Lexington, East Carolina University, and the University of North Carolina at Chapel Hill. It was collaboratively developed using selected items from previous surveys regarding food shopping patterns, Behavioral Risk Factor Surveillance System (BRFSS) survey items, and items specific to farmers' markets.

The customer intercept surveys included a series of demographic questions, as in the BRFSS, 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.

Farmers' Market access and use

The survey assessed fruit and vegetable consumption among all respondents using a validated Block fruit, vegetable, and fiber screener (Block et al., 285. Ritenbaugh et al.,

258). Fruit and vegetable scores were calculated using the standard protocol, summing responses to the 7 fruit and vegetable items to yield fruits and vegetables consumed per day. In addition, the following two questions were included: (1) On a typical day, how many servings of fruit do you eat? (2) On a typical day, how many servings of vegetables do you eat? Examples of serving sizes (e.g., one medium-sized apple) were provided. Body mass index was calculated from self-reported height (in pounds) and weight (feet and inches), which is considered a valid method to assess weight status (Spencer et al., 562. Burnner Huber et al., 11).

Study Population

Selection criteria included Kentucky residents above the age of 18. The participants of the study were limited to those residents who attended farmers' markets. The selection criteria were determined in order to utilize the information collecting from the questionnaires and compare the data effectively. Children and adolescents were excluded due to the vulnerability and limited opportunity of the population. There was no upper age exclusion for participation, and there is no pre-existing Kentucky data set to use as a comparison. Non-Kentucky residents were not included in the data said because they would not be applicable to a study on Kentucky residents. Both men and women were included in the sample.

Study Procedure

Data was gathered from questionnaires following survey completion. Participants were de-identified through numbers and id for each record. The data was then coded into indicator for input and statistical analysis by demographics and variables extracted from the data set such as shopping habits, fruit and vegetable consumption, age, gender, etc.

Data was coded and imported into Statistical Analysis System (SAS) and Statistic Package for the Social Sciences (SPSS) software to perform statistical analysis. The statistical analysis was completed through various forms. A multiple linear regression model of fruit and vegetable intake, shopping habits, frequency in which fresh fruits and vegetables are produced to determine which variables are most significant. A multiple linear regression model of education level, age, gender, income level and distance from grocery/farmers' market was also used to determine which variables were most significant.

Table 2: Description of Study Areas in Fayette County, Jackson County and Boone County Kentucky.

Characteristics	Fayette County, eastern Kentucky	Jackson County, eastern Kentucky	Boone County, eastern Kentucky
Population Estimate (2011) ^{19,21}	301,569	13,443	121,737
Percent rural dwellers (2010) ¹⁷	3.1	100	13.3
Percent black (2011) ^{19,21}	14.8	0.2	2.9
Percent white (2011) ^{19,21}	79.1	98.9	93
Percent living below poverty (2007-2011) ^{19,21}	17.9	35.6	7.2
Percent consuming five or more fruits and vegetables daily(2009*) ^{22,23}	22.1	16.4	17.7
Age-Adjusted Estimates of % Obese Adults (2009) ¹⁸ ; BMI \geq 30 kg/m ²	30.7	33.4	30.8
Population density (Person per square mile, 2010) ^{16,19,21}	1,042.8	39.1	482.3

*Data for the Kentucky Counties is from “County Group” 2005-2009 BRFSS data

Chapter Four: Results

Overall, from the three counties selected for the study Fayette, Jackson and Boone there were approximately 9,300 rural dwellers in Fayette County, 13,000 rural dwellers in Jackson County and 16,000 rural dwellers in Boone County (Table 1). All of the counties contained individuals of both black and white races. Fayette County was made up of 14.8% black and 79.1% white. Jackson County contained less than 1% black individuals and 98.9% white individuals. Boone County was made up of 2.9% black and 93% white. Of the counties included, all contained individuals living below the poverty level: 17.9% of Fayette County residents, 35.9% of Jackson County residents and 7.2% of Boone County residents.

The amount of participants consuming five or more fruit and vegetables daily was below 25% for all three counties. Only 22.1% of Fayette County residents consumed five or more fruits and vegetables a day, only 16.4% of Jackson County residents consumed adequate amounts of fruits and vegetables daily, while 17.7% of Boone County residents consumed the adequate five or more fruits and vegetables a day. From the study participants self-reported data the age-adjusted estimate of obese adults is approximately one-third of the population. Over 30% of Fayette county participants have a BMI ≥ 30 kg/m², 33.4% of Jackson County participants have a BMI ≥ 30 kg/m², 30.8% of Boone County participants have a BMI ≥ 30 kg/m².

Table 2 displays participant demographics for farmers' market intercept interview participants in Fayette, Jackson and Boone County. The mean age in years of participants was 50.8 SD \pm 16.8. The average length of time at current residence was 13.9 SD \pm 13.5 years. According to the self-reported survey Kentucky residents had an average Block

Fruit and Vegetable score of 11.6 SD±5.0. The self-reported height (inches) and self-reported weight (pounds) was used to calculate the average BMI (kg/m²) of Kentucky residents as 28.1 SD±6.1. Of the counties examined 72.6 percent of participants were female, in reference to race there was 1% black and 99% white participants. Not all individuals had a specific level of education and the only significant difference was seen comparing the non-college graduates at 44.6% and the college graduates at 55.5%. The survey examined participation levels of government-funded food assistance programs. Participants in Special Supplemental Nutrition Program for Women, Infants and Children (WIC) without FMNP had 1% of survey participation rate. WIC Farmers' Market Nutrition Program (FMNP) were 7.8% of survey participants. Only 5% of Kentucky residents surveyed participated in the Supplemental Nutrition Assistance Program (SNAP) and even less than that, 4% participated in the Senior Farmers' Market Nutrition Program (SFMNP).

Table 3 represents participants' shopping practices among farmers' market customers in Fayette, Jackson and Boone Counties. Of the 102 survey participants 75.3% of individuals reported grocery shopping at supercenters. Frequency of supercenters shopping was further broken down into how often individuals attend supercenters. Approximately 26.3% of Kentucky participants reported shopping at supercenters a few times per year, 18.8% reported shopping at supercenters once a month, 17.5% reported shopping at supercenters 2-3 times per month, 27.5% reported shopping at supercenters one time per week, and only 10% reported 2 or more times per week. Of the 102 survey participants 96% of individuals reported grocery shopping at supermarkets. Frequency of supercenters shopping was further broken down into how often individuals shop at

supermarkets. Approximately 6.2% of Kentucky residents reported shopping supermarkets a few times per year, 11.3% reported shopping supermarkets once a month, 10.3 reported shopping supermarkets 2-3 times per month, 43.3% reported shopping supermarkets one time per week, and 28.9% reported 2 or more times per week.

The frequency of fruit and vegetable purchases in the last 12 months from a farmers' market, CSA, etc. was determined from the survey. Only 1% of participants never purchased fruits and vegetables from farmers' markets, CSA, etc., 10% of participants purchased items once a month, 16% of participants purchased items at least 2-3times per month. Participants who purchase fruits and vegetables from farmers' market, CSA, etc. once a week in the last 12 months accounted for 36.0% of our respondents and 19% reported making purchases at least twice per week in the last 12 months.

The top 8 barriers to use of Farmers' Markets are stated in table 3 as well. The most common barrier reported by 42.4% of participants was 'I only come when I need something,' second most common barrier reported by 20.7% of participants was 'Extreme weather,' and following the third most common barrier reported by 14.1% of participants was 'Market days and hours.' Closely following, 12.0% of participants stated that the market being located 'Out of the way' was a barrier. Less common barriers to use of Farmers' markets include 7.6% of participants reported 'Price,' and least reported items all at 1.1% of participants 'No EBT, Transportation barriers, and Parking' being barriers to use of Farmers' markets. In relation to these barriers, Awareness of farmers' markets in the county was not an applicable question for participants. Perceived distance to closest farmers' market (minutes) was 14.6 SD± 9.6 minutes from residents home. The

perceived distance to closest market (miles) was determined to be 12.6 SD± 15.9 miles from residents' homes. Finally the 'Dollars spent at farmers' market per visit came to be 20.64 SD± 13.27 dollars.

Among KY farmers' market customers, in adjusted models with fruit and vegetable consumption as the dependent variable, consumption was positively associated with use of farmers' markets (estimate = 0.8, standard error = 0.4, $p = 0.05$). This means those who visited a farmers' market at least 2-3 times a month consumed on average 0.8 serving of fruit and vegetable more than those who visited a farmers' market at most once a month. There were no significant associations between farmers' market use and fruit and vegetable consumption with BMI.

Table 3: Participant demographics for farmers' market intercept interview participants in Boone, Jackson, and Fayette Counties, eastern Kentucky.¹ NA = Not asked and thus not available.

Characteristic	Kentucky farmers' market intercept interview participants (n = 102)	
	Mean	Standard Deviation
Age in years	50.8	16.4
Length of time at current residence in years	13.9	13.5
Block Fruit and Vegetable Score	11.6	5.0
Self-reported height (inches)	66.3	3.5
Self-reported weight (pounds)	176.8	44.0
BMI (kg/m²)	28.1	6.1
	n	%
Female, n (%)	74	72.6
Race	n	%
African American/ other	1	1.0
White	100	99.0
Education	n	%
College graduate	56	55.5
Non-college graduate	45	44.6
Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)	1	1.0
Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Farmers' Market Nutrition Program (FMNP)	4	7.8
Supplemental Nutrition Assistance Program (SNAP)	5	5.0
Senior Farmers' Market Nutrition Program (SFMNP)	4	4.0

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. Participant shopping practices among farmers' market customers in Boone, Jackson, and Fayette Counties, Kentucky.*

Shopping practices	Farmers' market customers in Kentucky (n = 102)	
	n	%
Grocery shopping at supercenter		
	76	75.3
Frequency of supercenter shopping	n	%
A few times per year	21	26.3
Once a month	15	18.8
2-3 times per month	14	17.5
One time per week	22	27.5
2 or more times per week	8	10.0
Grocery shopping at supermarket	n	%
	97	96.0
Frequency of supermarket shopping	n	%
A few times per year	6	6.2
Once a month	11	11.3
2-3 times per month	10	10.3
One time per week	42	43.3
2 or more times per week	28	28.9
How often in the past 12 months have you purchased fruits and vegetables from a farmers' market, CSA, etc?	n	%
Never	1	1.0
A few times per year	10	10.0
Once a month	16	16.0
2-3 times per month	18	18.0
One time per week	36	36.0
2 or more times per week	19	19.0

Table 4 continued...

Barriers to use of Farmers' Markets	n	%
No EBT	1	1.1
Transportation barriers	1	1.1
Prices	7	7.6
Extreme weather	19	20.7
Parking	1	1.1
Market days and hours	13	14.1
Out of the way	11	12.0
I only come when I need something	39	42.4
Other	NA	
	Mean	Standard Deviation
Awareness of farmers' markets in the county	NA	NA
Perceived distance to closest market (minutes)	14.6	9.6
Perceived distance to closest market (miles)	12.6	15.9
Dollars spent at farmers' market per visit	20.64	13.27

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 %).

Chapter Five: Discussion

The results of this analysis suggest that over 50% of participants in the customer surveys reported attending farmers' markets 2 or more times a month in comparison to nearly 73% of respondents attending supermarkets 2 or more times a month. This was a surprisingly high level of attendance to farmers' markets than what was expected.

However, although the participants may have attended the farmers market monthly, it seems that they did not always spend a significant amount of money. According to the results there was an average of \$23.89 spent while attending the market. While there is not a specific amount expected for participants to spend, approximately \$24 dollars a month does not equate to an adequate amount of groceries for sustainability. Therefore it is apparent that farmer's markets are not the primary venue for grocery shopping.

"Only attending when I need something" was what nearly a quarter of the participants agreed to as a barrier to use of a farmers market. As previously mentioned, participants in the study do not do the bulk of their grocery shopping at farmer's markets and therefore only attend when there is something that they need. A second major barrier reported by participants is "extreme weather". Due to famers' markets being outdoors, the weather has a major influence on the outcome of a market's success. Finally two other common barriers reported by individuals were 'market days and hours' as well as 'out of my way.' The limited hours and days that farmer's markets are open significantly affects the ability of individuals to attend. Fayette County was more available for participants due to the fact that there was one nearly every day of the week, however the location of these markets also varied depending on the day. This incorporates both a barrier and a strength but overall the different locations may make it difficult for regular

attendance. Research has determined that locating farmers' markets in areas that are accessible to low income neighborhoods or public transportation may also be an important way to attract more users. In addition, mobile markets, set up in convenient locations such as benefit offices or workplaces, may increase the likelihood of reaching new customers. One study completed in North Carolina determined that nearly half of all respondents said that they would be very likely to purchase fruit and vegetables at these convenient locations. According to researchers this may be particularly useful for reducing barriers in rural areas where geographic dispersion of customers' homes makes it even more difficult to choose one central location for a market (Leone et al. 6).

According to the survey results, the Kentucky farmers' market customers Fruit and Vegetable Score was positively associated with frequency of purchase of locally grown fruits and vegetables at farmers' markets and produce stands. This data shows that participants attending farmers' market are more likely to consume fruits and vegetables. This is in opposition to a study done by Jilcott and colleagues that found associations between access to farmers' markets and obesity in an ecologic, national sample. This was an earlier study that showed that individuals attending farmers' markets are less likely to consume fruits and vegetables (Jillcot et al., 570).

Limited studies have examined the variables that influence Americans purchases of fruit and vegetable intake. Zhifeng completed a study that recognized the rapid expansion of farmers' markets and what can encourage continuing the growth. Gaining a complete comprehension of individuals' insights and knowledge of farmers' markets, and their allegiance to them farmers' markets will give critical information which could help further the expansion of farmers' markets in the future. This study showed that improving

social amenities of farmers' markets can increase consumers attendance rate. As a result it is suggested that farmers' market managers should focus on improving the social atmosphere of the farmers' markets before making any other alterations (Zhifeng et al., 1106).

An additional study conducted by Hofman et al. examined the factors that influence the growth of farmers' markets. This research focused in Indiana counties similar to those in this study. It was found that there are three major reasons for a markets existence according to the 'master market customer' that visit farmers' market. It was reported that the major reasons in which farmers' markets are developed is 'to bring economic activity to the area.' Hofman found that while this is the reason for a market's development, some farmers' markets can be set up in a city or county, at a location that may have sufficient amenities for the market itself however may not be the most ideal location for the consumer. They typically are located further from densely populated areas (Hofman et al., 715). This may defeat the ultimate purpose of bringing economic activity to the area. This result is also similar to the current study's variable 'barriers to use of farmers' markets.'

It appears that alleviating the barriers customers face to use farmers' markets is the best way to increase the attendance of farmers' markets. Therefore by increasing the number of individuals who attend farmers market, there may simultaneously be an improvement of fruit and vegetable intake. This is based on the positive correlation between farmers' market attendance and fruit and vegetable intake in this study. It may be more impactful to focus on the location of farmers' market due to that being the number one barrier that consumers face. This is supported from another study by Racine

et al., which concluded that location and transportation are two major restrictions of consumers' ability to attend farmers' markets. The authors determine that even with WIC and SNAP programs established at various farmers' markets, the geographical barriers affect nearly 25% of participants (Racine et al., 444). It appears that it will take a more elaborate approach to improve farmers' markets location and lesson the current barriers that restrict customers. It is also critical to recognize that increasing the number of individuals who shop at farmers' markets has been shown to increase fruit and vegetable consumption.

Limitations

There are a number of limitations of this study. First, the descriptive correlation study creates limitations in what data is accurate. Second, the participants completed the surveys independently and may not necessarily provide completely truthful information. Also, the questionnaire does not ask probing questions. As a result the researcher is not able to further investigate certain information. It would be of interest to include children in a study due their poor diet, essentially low levels of fruit and vegetable intake. These limitations need to be taken into consideration upon the interpretation and application of the results.

Implications

A current guideline of fruit and vegetable intake is approximately five to nine servings of fruits and vegetables a day. However the reality is that nearly three-fourths of Americans are not reaching these levels. Therefore, it is important to examine ways in which to increase the amount of fruit and vegetables that individuals consume daily. According to this study the level of fruits and vegetables consumed is positively

associated with a person's attendance of local farmers' markets. However, the alleviating the difficulty of attending the farmers' markets is critical to their success. A complex approach of increasing motivators and decreasing barriers to use farmers' markets is needed to improve fruit and vegetable intake among adults.

Recommendations for Future Studies

Based on this study, there are several areas in which the research can be expanded. Recommendations include, long-term research on the benefits of attending farmers' markets and reducing barriers that individuals face to use farmers' markets. Further research is needed to determine what will motivate individuals to attend farmers' markets on a regular basis. While there has been some research on the topic, further examine of what motivates people to buy from local farmers' markets has the potential to increase the nation's fruit and vegetable intake. Long-term effects should also be studied on those who currently attend farmers' markets approximately once a week. More research is needed on lessening the barriers to use farmers' markets including expansion of items offered and providing more convenient times and locations of the markets.

Appendix

Appendix A: Customer Intercept Survey

We work at the University of Kentucky Department of Nutrition and are conducting a research study to learn more about where you shop for food, your eating habits, and health. We are asking customers to take part in a 10 minute survey. Are you interested in participating? Are you over 18 years of age? Do you speak English? Your participation is voluntary, and we thank you for your time.

[IF participant agrees:] Thank you for being willing to participate in this survey.

Questions about you:

1. What is your gender ?
 - Male
 - Female

2. What is your age in years? _____

3. How long have you lived at your current address?
Years: _____
(If known)Months: _____

4. Do you use the local transit service?
 - Yes
 - No

- 4a. **If yes**, which service?
 - LexTran
 - Other

5. What is your current marital status? [Mark only one choice.]
 - single
 - living with my partner (unmarried)
 - married
 - separated
 - divorced
 - widowed

6. What is the highest grade of school you completed?
 - 0-5
 - 6-8
 - 9-12
 - high school graduate or GED
 - some college
 - college graduate

7. Do you currently receive WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) benefits?
 - Yes
 - No

7a. IF YES: Have you ever redeemed WIC Farmers' Market Nutrition Program coupons at the farmers' market?

- Yes
- No

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

- Yes
- No

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

- Yes
- No

10. What is your race? **[Mark all that apply.]**

- American Indian
- Asian
- Black
- Native Hawaiian/Pacific Islander
- White
- Unknown

11. What is your ethnicity? **[Mark all that apply.]**

- Hispanic Cuban
- Hispanic Mexican American
- Hispanic Other
- Hispanic Puerto Rican
- Not Hispanic/Latino
- Unreported

12. What is your annual household income?

- <\$20,000
- \$21,000-\$39,000
- \$40,000-\$59,000
- \$60,000-\$79,000
- \$80,000 - \$99,000
- >\$100,000

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

___ Minutes

___ Miles

14. Are you the primary food shopper in your household?

- Yes
- No

Where You Shop for Food – These next few questions will be about the primary shopping habits in your household.

15. Do you (or the primary food shopper in your household) ever get groceries (food items) from a **discount superstore** such as WalMart or Meijer's?
- yes
 - no
 - don't know

15a. **If yes**, 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

16. Do you (or the primary food shopper in your household) ever get groceries (food items) from a **supermarket** such as Kroger or Aldi's?
- yes
 - no
 - don't know

16b. **If yes**, 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

17. What is the name and location of the supermarket or other major food store where you (or the primary shopper) do most of your grocery shopping?

Name: _____

Location: _____

18. 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
 - once a month
 - 2-3 times per month
 - a few times per year
 - never

19. What do you typically purchase at the farmers' market (be specific) [List below]?

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

_____ DOLLAR AMOUNT

21. When you shop at a farmers' market, how much produce (fruits and vegetables) do you purchase, 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

22. Compared to other places you purchase food, is the farmers' market more or less expensive?

- More expensive
- Less Expensive
- The same price

23. What is the main reason you come to this market [Mark only one choice]?

- Support local farmers
- Fresher produce
- Produce tastes better
- Better Prices
- It is close to home
- It is close to work
- Produce is grown with fewer pesticides
- Good service
- Quality of the products
- Variety of the products
- Consistency of the products
- Convenient location
- Friendly atmosphere

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

- No
- Somewhat
- Yes

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

- No
- Somewhat
- Yes

26. 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

27. What is the main thing that stops you from coming to the market more frequently? [Mark only one]

- No EBT
- Mode of transportation (walked, biked, or rode bus)
- Prices
- Extreme weather
- Parking
- Market days and hours
- Out of the way
- I only come when needed

28. What is the main thing that prevented you from buying more today at the market? [Mark only one]

- No EBT
- Nothing else I wanted
- Couldn't carry more
- Out of money

29. Please indicate how often you or the primary shopper in your household have purchased the following items from this or another farmers' market during this season. Check one box to the right of each item.

	Never Purchased	Occasionally Purchase	Regularly Purchase
Vegetables			
Squash			
Cucumbers			
Tomatoes			
Peppers			

Corn			
Onions			
Zucchini			
Peas			
Potatoes			
Leafy Greens			
Other _____			
Fruit			
Berries (all types)			
Melons (all types)			
Grapes			
Peaches			
Apples			
Other _____			
Fresh Herbs			
Dried Herbs			
Herb Plants			
Vegetable Transplants			
Cut Flowers			
Bedding and Potted Plants			
Hand-crafted Items			
Soaps			
Bread			
Muffins, Cookies, Cakes, etc.			
Jams, Jellies, Pickled Items			
Honey			
Nuts			
Eggs			
Cheese			
Meat			
Other			

NOTE: If customers happen to mention any items they frequently buy that is not listed, list here (you do not need to ask this question though):

Fruit and vegetable consumption

30. 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
31. 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
32. As a result of your shopping at this Farmers' Market, have you been eating more fruits and/or vegetables than before you started to shop here?
- No change
 - A lot more fruits/vegetables
 - A little more fruits/vegetables
 - This is my first time at this market
33. As a result of shopping at this Farmers' Market, have you been eating more different kinds of fruits and/or vegetables than before you started to shop here?
- No change
 - A few more kinds
 - Many more kinds
 - This is my first time at this market

Section F: Eating Habits

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.

	<i>less than 1/WEEK</i>	<i>once a WEEK</i>	<i>2-3 times a WEEK</i>	<i>4-6 times a WEEK</i>	<i>once a DAY</i>	<i>2+ a DAY</i>
1. Fruit juice, like orange, apple, grape, fresh, frozen or canned (not sodas or other drinks)	F1 <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. How often do you eat any fruit, fresh or canned (not counting juice)?	F2 <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Vegetable juice like tomato juice, V-8, or carrot	F3 <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Green salad	F4 <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Potatoes, any kind, including baked, mashed or french fried	F5 <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Vegetable soup, or stew with vegetables	F6 <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Any other vegetables, including string beans, peas, corn, broccoli or any other kind	F7 <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Fiber cereals like Raisin Bran, Shredded Wheat or Fruit-n-Fiber	F8 <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Beans such as baked beans, pinto, kidney, or lentils (not green beans)	F9 <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Dark bread such as whole wheat or rye	F10 <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

34. What is your height (self-reported)?
 ___FEET ___INCHES

35. What is your weight (self-reported)?
 _____POUNDS

36. BMI? (We will calculate and fill in later) _____

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