



University of Kentucky
UKnowledge

Theses and Dissertations--Dietetics and Human
Nutrition

Dietetics and Human Nutrition

2013

Nutrition Knowledge and Dietary Habits of Farmers Market Patrons

Lindsey M. Mayes
University of Kentucky, lindseym1024@yahoo.com

[Right click to open a feedback form in a new tab to let us know how this document benefits you.](#)

Recommended Citation

Mayes, Lindsey M., "Nutrition Knowledge and Dietary Habits of Farmers Market Patrons" (2013). *Theses and Dissertations--Dietetics and Human Nutrition*. 10.
https://uknowledge.uky.edu/foodsci_etds/10

This Master's Thesis is brought to you for free and open access by the Dietetics and Human Nutrition at UKnowledge. It has been accepted for inclusion in Theses and Dissertations--Dietetics and Human Nutrition by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

STUDENT AGREEMENT:

I represent that my thesis or dissertation and abstract are my original work. Proper attribution has been given to all outside sources. I understand that I am solely responsible for obtaining any needed copyright permissions. I have obtained and attached hereto needed written permission statements(s) from the owner(s) of each third-party copyrighted matter to be included in my work, allowing electronic distribution (if such use is not permitted by the fair use doctrine).

I hereby grant to The University of Kentucky and its agents the non-exclusive license to archive and make accessible my work in whole or in part in all forms of media, now or hereafter known. I agree that the document mentioned above may be made available immediately for worldwide access unless a preapproved embargo applies.

I retain all other ownership rights to the copyright of my work. I also retain the right to use in future works (such as articles or books) all or part of my work. I understand that I am free to register the copyright to my work.

REVIEW, APPROVAL AND ACCEPTANCE

The document mentioned above has been reviewed and accepted by the student's advisor, on behalf of the advisory committee, and by the Director of Graduate Studies (DGS), on behalf of the program; we verify that this is the final, approved version of the student's dissertation including all changes required by the advisory committee. The undersigned agree to abide by the statements above.

Lindsey M. Mayes, Student

Dr. Kelly Webber, Major Professor

Dr. Lisa Gaetke, Director of Graduate Studies

NUTRITION KNOWLEDGE AND DIETARY HABITS
OF FARMERS MARKET PATRONS

THESIS

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

By

Lindsey Marie Mayes

Lexington, KY

Director: Kelly Webber, PhD, MPH, RD, LD, Assistant professor of Dietetics and
Human Nutrition

Lexington, KY

2013

Copyright © Lindsey Marie Mayes 2013

ABSTRACT OF THESIS

NUTRITION KNOWLEDGE AND DIETARY HABITS OF FARMERS MARKET PATRONS

A balanced diet rich in fruits and vegetables has been strongly associated with weight management, improved overall health, and decreased incidence of chronic disease. Availability of locally grown produce is associated with a higher intake of fruits and vegetables; there were 7,864 farmers markets operating in the U.S. in 2012, a 9.6% increase from 2011. The purpose of this study was to evaluate the demographics, nutrition knowledge, and dietary habits of farmers market patrons at ten diverse markets in Kentucky. A total of 153 surveys were collected; the average age of study participants was 46 ± 21 year. Respondents reported consuming an average of 2.1 ± 1.3 fruit servings and 2.9 ± 1.6 vegetable servings per day. As well, 49% of the market patrons indicated they had an advanced or professional knowledge of nutrition. On a scale of 1-10, with 10 being "extremely important", 59% of the patrons ranked having nutrition information listed on recipes as an 8 or above. Market patrons are specifically interested in the salt (87%), fat (74%), and calorie (72%) content of recipes. Results indicate that most farmers market patrons have a good knowledge of nutrition and are interested in evaluating nutrition information.

KEYWORDS: Nutrition Knowledge, Dietary Habits, Farmers Market, Fruits and Vegetables, Recipe Samples

Lindsey Mayes

April 23, 2013

NUTRITION KNOWLEDGE AND DIETARY HABITS
OF FARMERS MARKET PATRONS

By

Lindsey Marie Mayes

Kelly Webber, PhD, MPH, RD, LD
Director of Thesis

Lisa Gaetke, PhD, RD, LD
Director of Graduate Studies

April 23, 2013

ACKNOWLEDGEMENTS

The following thesis would not have been possible without the help of some very important people. First, Dr. Tammy Stephenson provided me with the opportunity to participate in this exciting research project. Dr. Stephenson has been an amazing mentor and I am truly grateful for her guidance and support. Next, Dr. Kelly Webber provided timely and constructive feedback throughout the writing and editing process. Dr. Webber has a great passion for research and was a genuine asset to my thesis committee. I would also like to thank Dr. Sandra Bastin for being a reliable source of support and encouragement. Dr. Kwaku Addo consistently provided important feedback. Lastly, I owe a huge thank you to Dr. Laura Stephenson for allowing me to work extensively with the *Plate It Up!* Kentucky Proud project.

TABLE OF CONTENTS

| | |
|--|-----|
| Acknowledgements | iii |
| List of Tables | v |
| List of Figures | vi |
| Chapter 1: Introduction | 1 |
| Chapter 2: Review of Literature | 4 |
| Benefits of a Balanced Diet | 4 |
| Inadequate Fruit and Vegetable Consumption | 5 |
| Availability of Fruits and Vegetables | 5 |
| Increasing Accessibility and Interventions | 6 |
| Chapter 3: Research Purpose | 11 |
| Chapter 4: Methodology | 13 |
| Sample | 14 |
| Statistical Analysis | 14 |
| Chapter 5: Results | 15 |
| Sample | 15 |
| Nutrition Knowledge and Information | 15 |
| Consumption Patterns | 16 |
| Market Visits | 17 |
| Chapter 6: Discussion | 18 |
| Limitations | 21 |
| Chapter 7: Conclusion | 22 |
| Appendix | 23 |
| References | 28 |
| Vita | 33 |

LIST OF TABLES

| | |
|---|----|
| Table 5.1, Average Number of Fruit and Vegetable Servings Consumed Per Day by Farmers Market Patrons..... | 16 |
| Table 5.2, Average Number of Fruit and Vegetable Servings Consumed Per Day by Farmers Market Patrons According to Nutrition Knowledge..... | 17 |

LIST OF FIGURES

Figure 5.1, Market Patrons Interested in Specific Nutritional Components
(% of patrons).....15

Chapter 1: Introduction

Poor diet and physical inactivity are the two most powerful behavioral determinants of chronic disease (Anderson et al., 2012). Diets rich in whole grains, lean proteins, low-fat dairy, and fresh fruits and vegetables are generally health promoting. Fruits and vegetables are nutrient dense and rich sources of essential vitamins, minerals, and fiber. Nationwide, fruit and vegetable consumption is low (Blanck, Thompson, Nebeling, & Yaroch, 2008). The World Health Organization (WHO) dietary guidelines recommend the minimum 5-a-day consumption of fruits and vegetables. Going beyond that recommendation, the 2010 United States Department of Agriculture (USDA) Dietary Guidelines for Americans recommend 4-5 vegetable servings per day and 4-5 fruit servings per day, based on a 2,000 calorie diet. Individuals have not, as of yet, adopted the minimum recommendations to consume five servings of fruits and vegetables per day despite their known benefits for improving health and reducing the economic burdens of chronic disease (Salehi, Mohammad, & Montazeri, 2011).

While fruit and vegetable consumption is low and prevalence of obesity is high across America, Kentucky had the 7th highest prevalence of adult obesity in the nation and an estimated 30.3% of Kentucky adults were classified as obese in 2008 (Hacker, 2008). Obesity prevalence among adults has been trending upward since 1995 when it was 16.9%. In addition to high obesity rates, fruit and vegetable consumption is low in Kentucky. Only 24.4% of Kentuckians reported consuming two or more fruit servings per day and only 29.4% of Kentuckians report consuming three or more vegetable servings per day (Hacker, 2008).

Kentucky Proud is Kentucky's official farm marketing program, administered by the Kentucky Department of Agriculture. The University of Kentucky Cooperative Extension Service has collaborated with the Kentucky Department of Agriculture and developed the *Plate It Up! Kentucky Proud* project. The goal of *Plate It Up! Kentucky Proud* is to get consumers to buy, prepare, and preserve more Kentucky Proud products. Healthy recipes featuring Kentucky Proud produce have been developed and educational materials are being distributed to encourage consumers to purchase fresh and local produce. Ultimately, the project helps to unite farmers with the local consumer in hopes of increasing fruit and vegetable consumption across the state of Kentucky.

Research has repeatedly shown that increased access to fruits and vegetables is correlated with increased fruit and vegetable intake (Zenk et al., 2009; Larson, Story, & Nelson, 2009; Morland, Diez Roux, & Wing, 2006) and also associated with decreased BMI in children and adults (Rundle et al., 2009; Jennings et al., 2011). Perception of the availability of fruits and vegetables has also been positively associated with fruit and vegetable intake (Inglis, Ball, & Crawford, 2008). Interventions to increase the accessibility of fruits and vegetables to both children and adults have been successful at increasing fruit and vegetable intake in the short and long term (Mayer, 2009). Access to fruits and vegetables from supermarkets or large grocery stores have been measured in previous studies. However, few studies, if any, have measured the impact of farmers markets on intake. Farmers markets could play a role in increasing the access and the perceptions of access to fresh fruits and vegetables.

Improved nutrition knowledge may also play a role in increasing fruit and vegetable intake. Research shows that food label use is positively related to nutrition

knowledge and fruit and vegetable intakes and negatively related to fat intake (Fitzgerald, Damio, Segura-Perez, & Perez-Escamilla, 2008). Fitzgerald et al. found that using food labels was related to about 62% less likelihood of consuming salty snacks, 49% less likelihood of consuming sweets, and about three times greater likelihood of consuming fruits and vegetables frequently. These findings are in agreement with previous reports showing positive associations of food label use with fruit and vegetable intake among ethnically mixed, nationally representative samples. Farmers market interventions that aim to increase fruit and vegetable consumption should also include a nutrition education component.

Chapter 2: Review of Literature

Benefits of a Balanced Diet

A balanced diet rich in fruits and vegetables has been strongly associated with weight management, improved overall health, and decreased incidence of chronic disease (“Fruit and vegetable consumption among high school students--- United States, 2010,” 2011). Diets high in fruits and vegetables have been associated with a reduced risk for several cancers and for cardiovascular disease (Serdula et al., 1996). In addition, eating more fruits and vegetables may lead to eating fewer high-fat foods (Glanz & Yaroch, 2004).

Research suggests that a ‘healthy’ dietary pattern, high in whole grains, vegetables, fruit, poultry, and fish, and low in refined grains, red and processed meat, high-fat dairy products, sweets and desserts, and sweetened beverages, is associated with both greater insulin sensitivity and a lower level of systemic inflammation when compared with other dietary patterns (Anderson et al., 2012). In Anderson et al.’s two-year Health, Aging and Body Composition study, dietary patterns were associated with specific indicators of insulin sensitivity and inflammation in a sample of 3075 older adults aged 70-79 years. This prospective cohort study clustered the participants based on their current dietary habits, which were determined using a 108-item food frequency questionnaire. With respect to diet, the ‘healthy foods’ cluster had a significantly higher percent energy from protein, higher intake of fiber, and lower percent energy from saturated fat than all other clusters. The ‘healthy foods’ cluster also had significantly lower fasting glucose values, significantly lower levels of fasting insulin and homeostasis model assessment of insulin resistance values, and significantly lower levels of inflammatory markers such as IL-6. Because indicators of insulin sensitivity and

systemic inflammation have been linked to risk of multiple chronic diseases, diets that promote higher insulin sensitivity and lower systemic inflammation should be encouraged in older adults. Dietary interventions to lower metabolic risk in older adults could be targeted to groups according to their current dietary patterns.

Inadequate Fruit and Vegetable Consumption

The benefits of eating a healthy diet are well established, yet long-term dietary changes in the population remain elusive (O'Connell, Buchwald, & Duncan, 2011). Data from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) found that less than 1 in 10 Americans met their calorie-specific MyPyramid (now MyPlate) fruit or vegetable recommendations. The primary contributors to total fruit intake were whole fruits among adults and fruit juices among adolescents. The largest single contributor to overall fruit intake was orange juice. Potatoes dominated vegetable consumption, particularly among adolescents, in whom fried potatoes dramatically increased the median vegetable intake from 0.72 cup to 1.21 cups per day. Dark green and orange vegetables and legumes accounted for a small portion of vegetable intake (Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009). These data reveal that not only are Americans not consuming enough fruits and vegetables, but those fruits and vegetables being consumed are often times not health promoting.

Availability of Fruits and Vegetables

The majority of American children do not consume diets that meet the recommendations of the Dietary Guidelines for Americans (Story, Nannery, & Schwartz 2009). Research has shown that the availability of fruit and vegetable servings in home and school settings is positively associated with adolescent fruit and vegetable consumption (Di Noia & Contento, 2010). One hundred fifty-six African-American

adolescents attending a summer camp were offered 9 fruit and vegetable servings per day for 3 days. Observational data on youths' fruit and vegetable consumption were collected during meals served over the 3 consecutive days. Only participants present at each meal for all 3 days were included in the observational data. The mean 3-day intake of 5.41 daily servings was higher than the average intake found in a nationally representative sample of similarly aged youths. These findings demonstrate that increasing the availability of fresh fruits and vegetables in community-based settings is a promising strategy for encouraging adequate fruit and vegetable consumption.

Fruits and vegetables purchased at a farmers market might help to increase healthy fruit and vegetable consumption. Recent studies have identified socially distressed neighborhoods with poor access to healthy food as 'food deserts' (Larsen & Gilliland, 2009). When healthy foods like fruits and vegetables are not locally available, many people shop at convenience stores where food is typically more expensive and less healthy, contributing to an increased risk for chronic disease. Rural populations face great disparities in terms of many health outcomes and health behaviors because supermarkets selling fresh fruits and vegetables are often not available (Liese, Weis, Pluto, Smith, & Lawson, 2007). Farmers markets have been a commonly suggested method to make produce more available in low-income areas with few or no grocery stores or supermarkets (Jilcott, Keyserling, Crawford, McGuirt, & Ammerman, 2011).

Increasing Accessibility and Interventions

High cost and limited access to food have been associated with lower intake of fruits and vegetables in limited-income individuals as well. It is therefore crucial to identify and evaluate means for increasing intake of fruits and vegetables in low-income populations. Recruitment for a 12-month trial on increasing fruit and vegetable

consumption was conducted among individuals undergoing health examinations at a Social Security center. Three hundred and one low-income adults aged 18-60 years old were randomized into two groups: dietary advice alone and dietary advice plus fruit and vegetable vouchers for the farmers market. Self-reported data were collected over a three-month period. Between baseline and 3-month follow-up, mean fruit and vegetable consumption increased significantly in both groups. The group receiving vouchers only consumed slightly more fruits and vegetables than the group receiving advice only, but the difference was not significant. Therefore, an intervention program involving vouchers plus advice may help to increase consumption of fruits and vegetables in low-income populations (Bihan et al., 2012).

In an effort to address barriers and make fresh fruits and vegetables more affordable and accessible to lower-income residents, the Veggie Mobile was launched in New York. The Veggie Mobile was a produce aisle on wheels. The purpose of this study was to determine whether participation in the Veggie Mobile increased fruit and vegetable intake in a group of seniors. The intervention, buying fruits and vegetables from the Veggie Mobile, was implemented between April and October 2008 in two senior housing sites that had not previously received Veggie Mobile services. Participants were asked about fruit and vegetable intake using a modified six-item questionnaire based on the Behavioral Risk Factor Surveillance System at pre-intervention and again at 3-5 months. The post-survey also included questions about perceived benefits and barriers to using the Veggie Mobile. Mean intake of fruits and vegetables after using the Veggie Mobile increased by 0.37 servings per day. The research findings demonstrated a modest increase in reported intake associated with using

the Veggie Mobile program. As well, the impact on the population may have an important effect on reducing chronic disease rates. Few studies have examined the relationship between community access to produce and levels of fruit and vegetable consumption. The results have important implications for increasing fruit and vegetable consumption by making fresh produce more accessible, especially in low-income areas.

Caldwell, Miller Kobayashi, DuBow, & Wytinck aimed to develop an intervention for community members who ate below the recommended servings of fruits and vegetables per day. Community-based programs were initiated in Colorado to achieve the Healthy People 2010 objectives. Some programs sought to educate individuals about making healthy nutritional choices while grocery shopping, teaching label reading and interpretation, while others provided cooking classes or encouraged local restaurants to mark healthier meal options on menus. Target populations varied and included older adults, high-risk individuals and general community members, both adults and youth. Self-administered questionnaires were completed by participants when they started a program, finished a program and one year after program end. It was found that environmental factors, such as access to fruits and vegetables, could modify the effects of community interventions to increase consumption. At program start, only 11% of participants were consuming 5 fruits or vegetables daily and by program end, 18% were doing so. Interventions with the goal of increasing fruit and vegetable consumption should consider focusing on increasing access to fresh fruits and vegetables in target communities.

The Veggie Project was designed to address availability and affordability barriers to accessing fruits and vegetables and increase youth involvement in obesity prevention

efforts. To increase the availability of fruits and vegetables in target communities, 34 farmers markets were opened at Boys and Girls Clubs during the summer months of 2008. The Veggie Project was able to successfully attract youth to purchase produce from the farmers market as all of the youth participating in the program purchased fruits or vegetables at one of the farmers markets at least once. More research is warranted to examine the relationship between market use and dietary behaviors as well as other factors in influencing food access among adults (Freedman, Bell, & Collins, 2011).

Nutrition education regarding the benefits of fresh produce intake can help to improve diet quality and increase participation in a farmers market nutrition program (Kropf, Holben, Holcomb, & Anderson, 2007). A cross-sectional survey of 829 women enrolled in Women, Infants, and Children (WIC) and 246 women enrolled in WIC and a farmers market nutrition program was used to determine food security, fruit and vegetable intake and behavior, and education level. Farmers market nutrition program participants reported higher education levels, greater vegetable intake servings and greater perceived diet quality. Previous studies show that food insecurity is negatively associated with diet quality, variety, and nutrient intake. Therefore, making fresh produce more readily available in food deserts may increase intake.

Improvements to the food environment include new store development and more farm-to-consumer approaches such as farmers markets, roadside stands, pick-your-own produce farms, and community-supported agriculture programs. These targeted approaches may aid Americans in making healthier dietary choices (Blanck, Thompson, Nebeling, & Yaroch, 2011). The development and promotion of farmers markets and community gardens is growing in popularity as a strategy to increase community-wide

fruit and vegetable consumption. Despite large numbers of farmers markets and community gardens in the United States, as well as widespread enthusiasm for their use as a health promotion tool, little is known about their influence on dietary intake (McCormack, Laska, Larson, & Story, 2010).

Chapter 3: Research Purpose

The purpose of this study was to evaluate the demographics, nutrition knowledge, and dietary habits of farmers market patrons at diverse (size, price, location, etc.) markets in the state of Kentucky. The average number of fruits and vegetables consumed by Kentucky farmers market patrons was determined and then compared to the average number of fruits and vegetables consumed by all Kentuckians.

Fruit and vegetable consumption is an important component of a healthful diet, yet fruits and vegetables are under consumed, especially among low-income groups with high prevalence rates of obesity (Jilcott, Keyserling, Crawford, McGuirt, & Ammerman, 2011). Several studies have examined supermarket access for low-income residents, but few have explored how access to healthy food changes when a new food retailer such as a farmers market opens in a place previously known as a 'food desert' (Larsen & Gilliland, 2009). There has also been a lack of research focusing on how the consumer food environment is associated with dietary patterns (Gustafson et al., 2011). In addition, the development and promotion of farmers markets and community gardens is growing in popularity as a strategy to increase community-wide fruit and vegetable consumption. Despite large numbers of farmers markets and community gardens in the United States, as well as widespread enthusiasm for their use as a health promotion tool, little is known about their influence on dietary intake (McCormack, Laska, Larson, & Story, 2010). Therefore, more research is needed to determine if access to farmers markets can help increase fruit and vegetable consumption among Americans.

The specific objectives of this research project were to:

1. Describe the fruit and vegetable consumption habits of individuals who frequent the farmers markets surveyed.
2. Identify the nutrients of highest importance to those who frequent the farmers markets surveyed.
3. Determine the level of nutrition knowledge of those who frequent the farmers markets surveyed.

Chapter 4: Methodology

Plate It Up! Kentucky Proud is a collaboration between the School of Human Environmental Sciences, Family and Consumer Sciences (FCS) Extension, and the Kentucky Department of Agriculture to create healthier recipes using local commodities. Each semester, FCS Extension chooses recipes to be modified by human nutrition and dietetic students enrolled in the DHN 304: Experimental Foods course. The project began in fall of 2009, when the original grant was received. The project provides FCS Extension Agents across the state access to the recipes featuring Kentucky products. Three of these recipes were selected for survey participants to sample: Apples and Sweet Potatoes, Asian Asparagus Salad, and Cucumber, Corn, and Bean Salsa.

Survey participants (n=153) were recruited over a 9-month period at ten diverse farmers markets in Kentucky. Market patrons were offered a sample of a Kentucky Proud recipe (Apples and Sweet Potatoes, Asian Asparagus Salad, or Cucumber, Corn, and Bean Salsa) and were given a recipe card for the sample they tasted. Patrons who tried the sample were asked for their email address in order to participate in the study at a later date. Surveys were emailed to participants two weeks later. Participants were asked for demographic information and about how many fruits and vegetables they consume per day, what nutritional information they usually look at when reviewing nutrition labels, their level of nutrition knowledge, and how important they believe nutrition information is on recipe cards. Approval for the study procedures was obtained from the University of Kentucky Institutional Review Board.

Sample

Farmers market patrons were surveyed in Fall 2010 and Summer 2011 at farmers markets located in Boone, Caldwell, Fayette, Hardin, Harrison, Jefferson, Mason, McCracken, Nelson, and Russell Counties in Kentucky. There were a total of 153 follow-up surveys received. The average age of study participants was 46.3 ± 21.1 years and 82% of the subjects were female.

Statistical Analysis

Data were entered in Microsoft Excel and all analyses were performed using Windows version 19.0 of the Statistical Package for the Social Sciences (SPSS, Chicago, IL). A p-value of 0.05 or less was considered statistically significant. Descriptive statistics were used to characterize survey respondent's demographics, fruit and vegetable consumption, and nutrition knowledge. Predictors of fruit and vegetable consumption were examined using the Pearson R coefficient.

Chapter 5: Results

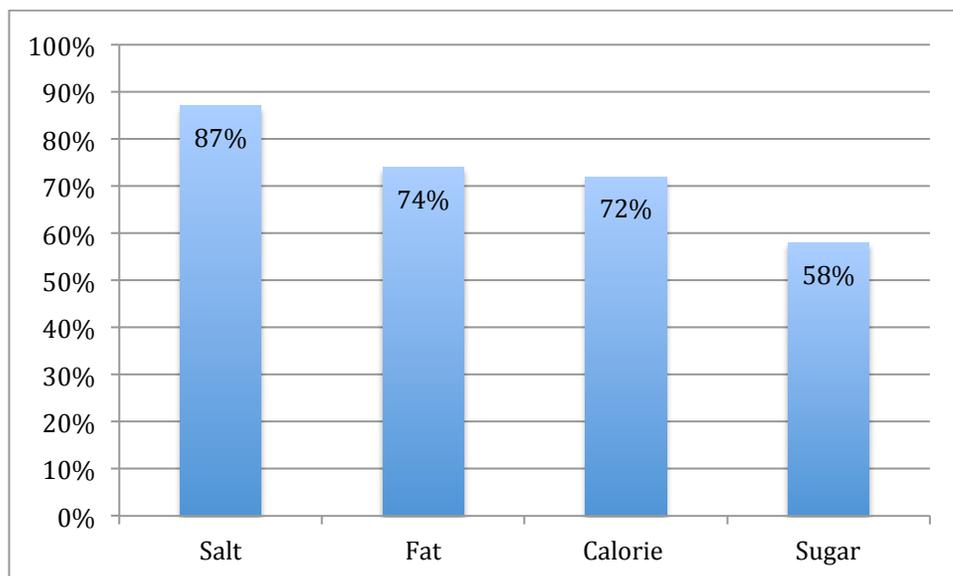
Sample

The average age of patrons completing the after-market survey was 46.3 ± 21.1 years and 82% were female.

Nutrition Knowledge and Information

Almost half (49%) of the market patrons indicated they have an advanced or professional knowledge of nutrition. On a scale of 1-10, with 10 being "extremely important", 59% of the patrons ranked having nutrition information listed on recipes provided at the farmers market as an 8 or above. Market patrons were specifically interested in the salt (87%), fat (74%), calorie (72%) and sugar (58%) content of recipes offered at the market. They were less interested in the vitamin (16%) and calcium (12%) content of recipes.

Figure 5.1: Market patrons interested in specific nutritional components (% of patrons)



Consumption Patterns

Survey respondents (N= 153) consumed an average of 2.1 ± 1.3 fruit servings per day and 2.9 ± 1.6 vegetable servings per day.

Table 5.1: Average number of fruit and vegetable servings consumed per day by farmers market patrons

| Commodity | Number of Servings |
|-----------|--------------------|
| Fruit | 2.1 ± 1.3 |
| Vegetable | 2.9 ± 1.6 |

The mean number of fruit servings consumed per day did not differ significantly between male and female patrons (1.9 ± 1.2 vs. 2.4 ± 1.2 , $p= 0.09$). The mean number of vegetable servings consumed per day did differ significantly by gender. Males consumed an average of 2.5 ± 1.2 and the mean consumed by females was 3.2 ± 1.5 , $p=0.03$.

In the overall sample there was a positive correlation between age and fruit consumption ($r=0.17$, $p=0.04$), and a positive correlation between age and vegetable consumption ($r=0.22$, $p=0.01$). Participants reporting professional knowledge of nutrition also reported a significantly greater daily intake of fruits ($p<0.001$) and vegetables ($p<0.001$) than those reporting lower levels of nutrition knowledge. There was a positive correlation between reported importance of seeing nutrition information on recipes and fruit ($r=0.30$, $p<0.001$) and vegetable consumption ($r=0.28$, $p<0.001$).

Table 5.2: Average number of fruit and vegetable servings consumed per day by farmers market patrons according to nutrition knowledge

| Nutrition Knowledge | Number of Fruit Servings | Number of Vegetable Servings |
|---------------------|--------------------------|------------------------------|
| Beginner | 1.9 ± 1.0 | 1.8 ± 1.2 |
| Practicing | 2.8 ± 1.3 | 2.0 ± 0.9 |
| Advanced | 3.4 ± 1.5 | 2.6 ± 1.1 |
| Professional | 3.7 ± 1.6 | 3.1 ± 1.9 |

Market Visits

The average number of visits to the market per month was 4.3 ± 4.6 and the average amount of money spent per trip was estimated to be $\$16.46 \pm \12.17 . The average number of visits to the market per month was positively correlated with total fruit and vegetable consumption ($r=0.16$, $p=0.05$). The average amount of money spent per visit was also positively correlated with total fruit and vegetable consumption ($r=0.24$, $p=0.002$).

Chapter 6: Discussion

The purpose of this study was to evaluate the demographics, nutrition knowledge, and dietary habits of farmers market patrons at diverse markets in the state of Kentucky. The average age of study participants was 46.3 ± 21.1 years and 82% were female. More research is needed on the demographics of farmers market patrons. Women have often been the targets of farmers market incentive programs, especially those who are provided with Women, Infants, and Children (WIC) coupons to purchase fresh, locally grown fruits and vegetables (McCormack, Laska, Larson, & Story, 2010). Adolescents are also an important group to target for nutrition interventions. Research indicates that consuming a nutrient-dense diet in young adulthood may protect against future chronic disease and excess weight gain. Larson et al. found that individual and socio-environmental factors, particularly food preferences and home food availability, during adolescence and emerging adulthood may influence fruit and vegetable intake in young adulthood (Larson, Laska, Story, & Neumark-Sztainer, 2012)

Survey respondents (N=153) reported consuming an average of 2.1 ± 1.3 fruit servings per day and 2.9 ± 1.6 vegetable servings per day. According to BRFSS data, only 24.4% of Kentuckians reported consuming two or more fruit servings per day and only 29.4% of Kentuckians report consuming three or more vegetable servings per day (Hacker BRFSS). Farmers market patrons participating in this study consumed at or above fruit and vegetable recommendations. It can be concluded that farmers market patrons in Kentucky consume more fruits per day on average than 75.6% of Kentuckians. We are unable to determine from this data if the availability of a farmers market

increased fruit and vegetable consumption or if those who already consumed more fruits and vegetables were more likely to go to the market and/or complete our survey.

Farmers markets sell fresh and local produce at a relatively affordable price. Farmers markets have been a commonly suggested method to make produce more available in low-income areas with few or no grocery stores or supermarkets (Jilcott, Keyserling, Crawford, McGuirt, & Ammerman, 2011). Kentuckians living in food deserts might not have regular access to fresh fruits at a local grocery or convenience store, making them more likely to shop at the local farmers market. In addition, produce at the farmers market looks fresher and more appealing making the patron more likely to purchase and consume.

Participants were specifically interested in the salt (87%), fat (74%), calorie (72%) and sugar (58%) content of recipes offered at the market. They were less interested in the vitamin (16%) and calcium (12%) content of recipes. Driskell, Schake, & Detter also found that Americans are interested in the fat and calorie content of foods when reading nutrition labels (2008). Previous studies have shown that individuals who frequently read nutrition labels consume significantly higher amounts of fruits and vegetables than those who do not read nutrition labels. As well, frequent label readers demonstrate greater nutrition knowledge than infrequent label readers (Graham & Laska, 2011; Ollberding, Wolf, & Contento, 2010). Our study only asked about key nutrients that consumers look for when reading nutrition labels. However, other research has found that consumers more often use the list of ingredients, serving size, and health claims (Ollberding, Wolf, & Contento, 2010). This is likely due to the increased number

of food allergies and intolerances present today. In addition, health claims are often used to quickly decide if a product is healthy or not.

Participants reporting professional knowledge of nutrition reported a significantly greater daily intake of fruits and vegetables. Also, there was a positive correlation between reported importance of seeing nutrition information on recipes and fruit and vegetable consumption. Our findings support the work of Kropf, Holben, Holcomb, & Anderson (2007) who found that women enrolled in a WIC farmers market nutrition education program had greater vegetable intake servings and greater perceived diet quality than those women only enrolled in WIC and not the nutrition education program. Our research also supports the findings of Fitzgerald et al. who determined that increased nutrition knowledge resulted in greater food label use, which in turn was related to a more healthful food intake pattern (Fitzgerald, Damio, Segura-Perez, & Perez-Escamilla, 2008).

High cost and limited access to fresh fruits and vegetables have been associated with lower intake of fruits and vegetables. In 2012, there were 7,864 farmers markets operating in the U.S. and in Kentucky there is at least one farmers market in each of the 120 counties. Our research found that the average number of visits to the farmers market per month was 4.3 ± 4.6 and the number of visits was correlated with total fruit and vegetable consumption. Improvements to the food environment including more farm-to-consumer approaches such as farmers markets may aid Kentuckians in making healthier dietary choices and increasing fruit and vegetable consumption (Blanck, Thompson, Nebeling, & Yaroch, 2011). Increasing access to fruits and vegetables can be done using farmers markets or other interventions such as the Veggie Mobile. Our research supports

the findings of Abusabha, Namjoshi, & Klein (2011) who found that when fresh produce availability was increased, community members also had increased fruit and vegetable intake. The average amount of money spent per trip by farmers market patrons was estimated to be $\$16.46 \pm \12.17 , which is relatively low. However, more research is needed in low-income communities and food deserts to determine financial interventions to increase farmers market utilization and ultimately fruit and vegetable consumption.

Limitations

One important limitation is no control group was included in the study. In addition, there was a low response rate for the follow-up survey. The people who did not respond to the follow-up survey might consume less fruits and vegetables than those who chose to respond. Therefore, the average number of fruits and vegetables consumed by farmers market patrons might actually be lower. In addition, 82% of the subjects were female making the results less generalizable.

Chapter 7: Conclusion

Current patrons of farmers markets in Kentucky have higher than average fruit and vegetable intake and higher than average nutrition knowledge. Farmers markets can be a place for affordable fresh fruit and vegetable purchase, which may lead to overall greater consumption. However, these markets may not be reaching the populations at greatest need, particularly those living in poverty and in food deserts. There is a need for better marketing, education, and visibility of farmers markets within communities. Despite the large number of farmers markets operating in the U.S., they are still an underutilized resource. Lastly, further research on the impact of farmers markets on fruit and vegetable consumption at a national level could help dietitians and other community health professionals in their efforts to promote health.

APPENDIX



**Plate It Up, Kentucky Proud Follow-Up Email Survey
Asian Asparagus Salad**

Thank you for taking the time to sample “Asian Asparagus Salad” and complete a questionnaire at the Lexington Farmers Market a few weeks ago.

We want to learn about your experience since the sampling event. This will only take a few minutes.

A \$50 gift card will be given to one for every ten participants in this survey. Winners will be drawn randomly for the prizes, and you will be contacted via email if you are a gift card winner.

To be eligible for a \$50 gift card, you must confirm the email address to which this survey invitation was sent.

We do not share your information with anyone. Your comments will be kept completely confidential and separate from your personal information, which is securely protected under university privacy guidelines.

1. Confirm that you participated in the asparagus sampling event.

Your email address (the account where you received an invitation to this survey):

2. My overall impression of the sample was

Not at all favorable *Highly favorable*

1 2 3 4 5 6 7 8 9 10

Comments:

3. Rate your sampling experience with respect to: (poor, fair, good, excellent, doesn't matter to me)

- a. Ease of sampling instructions
- b. Sanitation of sampling area
- c. Presentation of sample
- d. Sample portion for evaluation
- e. Ease of sample evaluation

Comments:

4. Have you or someone in your household prepared the Asian Asparagus Salad recipe (since the day you tried a sample)?
- Yes
 - No
 - I don't recall

Comments:

5. How many times was the recipe made in your household, by you or someone else?
- Number of times by: You _____ Someone else in your household _____

If no one made the recipe, can you tell us any reasons why?

6. Would you have prepared the asparagus recipe if you had not tried the sample?
- Definitely not
 - Probably not
 - Somewhat likely
 - Highly likely
 - I haven't made the recipe.

Comments:

7. Do you plan on making this recipe in the future?
- Yes
 - No
 - Not sure.

Comments:

8. Before trying the sample, did you ever make a recipe similar to the Asian Asparagus Salad recipe?
- Yes
 - No
 - I don't recall.

9. Did you buy asparagus at the farmers market on the day of the sampling?
- Yes, from the vendor with samples of Asian Asparagus Salad.
 - Yes, from a different vendor.
 - No
 - I don't recall

Comments:

10. Have you purchased asparagus at the farmers market since that day you tried the sample?
- Yes, from the same place I tried Asian Asparagus Salad.
 - Yes, from a different vendor.
 - No
 - I don't recall
- If yes, approximately how many times:

11. Was your decision to buy asparagus influenced by:
the recipe card:

| | |
|-------------------|----------------------|
| <i>Not at all</i> | <i>Significantly</i> |
| ----- | |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | 8 |
| 9 | 10 |

the sample:

| | |
|-------------------|----------------------|
| <i>Not at all</i> | <i>Significantly</i> |
| ----- | |
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |
| 7 | 8 |
| 9 | 10 |

Comments:

12. Rate the recipe cards with respect to: (poor, fair, good, excellent)
- Easy to read (size, font)
 - Colors and pictures
 - Nutrition information
 - Size of card
 - Instructions are easy to understand

Comments:

13. How would you respond to the following? (rarely, sometimes, often, always)
Recipe cards at the market would help me:

- Feel more comfortable trying unusual products
- Evaluate my nutritional needs
- Decide how much of a product to purchase
- Know what questions to ask vendors about their products
- Plan my future purchases at the farmers market

Comments:

14. How important is it for you to see nutrition information on recipes?

Not Important

Extremely Important

1 2 3 4 5 6 7 8 9 10

Comments:

15. What are you looking at specifically when evaluating nutrition information for a recipe? Check all that apply.

- a. Calories
- b. Sugar
- c. Carbohydrates
- d. Fat
- e. Fiber
- f. Cholesterol
- g. Vitamins
- h. Protein
- i. Salt
- j. Calcium
- k. None – I don't look at nutrition labels.

Other (please specify):

16. Do you look at NuVal™ scores when shopping at the grocery?

- a. Yes
- b. No
- c. I don't know what that is.

17. Do NuVal™ scores influence your purchasing at the grocery?

- a. Yes
- b. No
- c. I'm not sure.

18. Rate your knowledge of food nutrition:

- a. Beginner – Interested but don't know very much
- b. Practicing – I know some of the basics related to things like vitamins and fiber
- c. Advanced – I have a good knowledge of the nutritional value of most produce items
- d. Professional – Actually have had some classes or training in nutrition

Comments:

19. On average, how many servings do you eat per day:
 Fruit ____
 Vegetable ____
20. To learn more about our farmers market customers, we'd like to know about you.
 a. Miles from home to Lexington Farmers Market ____
 b. Average number of market visits per month (during June – Sept) ____
 c. Average dollars spent per visit ____
21. Gender
 a. Male
 b. Female
22. Your background:
 a. How many years of formal education have you completed beyond high school? ____
 b. What year were you born? _____

Congratulations! You are now eligible to be entered into our \$50 gift card drawing.

23. We will send an email to the winners, so confirm your email address here.
 (**the email for the account where you received this survey invite**)
 Again, all e-mails are kept in confidence. These are destroyed after we issue the gas cards.
 a. This email address is correct.
 b. I want to edit my email address. (Enter the correct info. here)
-

Any questions about the survey can be directed to Dr. Tim Woods, the lead investigator for the study. You may reach him at 859-257-7270 or 402 CE Barnhart Bldg, Dept of Ag Economics, University of Kentucky, Lexington 40546.

If you have any questions about your rights as a volunteer in this research, contact the staff in the Office of Research Integrity at the University of Kentucky at 859-257-9428 or toll free at 1-866-400-9428.

24. Leave additional comments here.
-

REFERENCES

1. Anderson, J. V., Bybee, D. I., Brown, R. M., McLean, D. F., Garcia, E. M., Breer, M. L., & Schillo, B. A. (2001). 5 a day fruit and vegetable intervention improves consumption in a low income population. *Journal of the American Dietetic Association, 101*(2), 195-202.
2. Blanck, H.M., Thompson, O.M., Nebeling, L., & Yaroch, A.L. (2011). Improving fruit and vegetable consumption: use of farm-to-consumer venues among US adults. *Preventing Chronic Disease, 8*(2), A49.
3. Salehi, L., Mohammad, K., & Montazeri, A. (2011). Fruit and vegetables intake among elderly Iranians: a theory-based interventional study using the five-a-day program. *Nutrition Journal, 10*(123).
4. Hacker, W.D. (2008). Kentucky Behavioral Risk Factor Surveillance System. 5-15.
5. Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2003.
6. Zenk, S. N., Lachance, L. L., Schulz, A. J., Mentz, G., Kannan, S., & Ridella, W. (2009). Neighborhood retail food environment and fruit and vegetable intake in a multiethnic urban population. *American Journal of Health Promotion, 23*(4), 255-264.
7. Larson, N. I., Story, M. T., & Nelson, M. C. (2009). Neighborhood environments: disparities in access to healthy foods in the U.S. *American Journal of Preventative Medicine, 36*(1), 74-81.
8. Morland, K., Diez Roux, A. V., & Wing, S. (2006). Supermarkets, other food stores, and obesity: the atherosclerosis risk in communities study. *American Journal of Preventative Medicine, 30*(4), 333-339.

9. Rundle, A., Neckerman, K. M., Freeman, L., Lovasi, G. S., Purciel, M., Quinn, J., . . . Weiss, C. (2009). Neighborhood food environment and walkability predict obesity in New York City. *Environmental Health Perspectives, 117*(3), 442-447.
10. Jennings, A., Welch, A., Jones, A. P., Harrison, F., Bentham, G., van Sluijs, E. M., . . . Cassidy, A. (2011). Local food outlets, weight status, and dietary intake: associations in children aged 9-10 years. *American Journal of Preventative Medicine, 40*(4), 405-410.
11. Inglis, V., Ball, K., & Crawford, D. (2008). Socioeconomic variations in women's diets: what is the role of perceptions of the local food environment? *Journal of Epidemiology and Community Health, 62*(3), 191-197.
12. Mayer, K. (2009). Childhood obesity prevention: focusing on the community food environment. *Family & Community Health, 32*(3), 257-270.
13. Fitzgerald, N., Damio, G., Segura-Perez, S., & Perez-Escamilla, R. (2008). Nutrition knowledge, food label use, and food intake patterns among Latinas with and without type 2 diabetes. *Journal of the American Dietetic Association, 108*(6), 960-967.
14. Fruit and vegetable consumption among high school students --- United States, 2010. (2011). *MMWR Morbidity and Mortality Weekly Report, 60*, 1583-1586.
15. Serdula, M. K., Byers, T., Mokdad, A. H., Simoes, E., Mendlein, J. M., & Coates, R. J. (1996). The association between fruit and vegetable intake and chronic disease risk factors. *Epidemiology, 7*(2), 161-165.
16. Glanz, K., & Yaroch, A. L. (2004). Strategies for increasing fruit and vegetable intake in grocery stores and communities: policy, pricing, and environmental change. *Preventative Medicine, 39 Suppl 2*, S75-80.

17. Anderson, A. L., Harris, T. B., Tylavsky, F. A., Perry, S. E., Houston, D. K., Lee, J. S., . . . Sahyoun, N. R. (2012). Dietary patterns, insulin sensitivity and inflammation in older adults. *European Journal of Clinical Nutrition*, 66(1), 18-24.
18. O'Connell, M., Buchwald, D. S., & Duncan, G. E. (2011). Food access and cost in American Indian communities in Washington State. *Journal of the American Dietetic Association*, 111(9), 1375-1379.
19. Kimmons, J., Gillespie, C., Seymour, J., Serdula, M., & Blanck, H. M. (2009). Fruit and vegetable intake among adolescents and adults in the United States: percentage meeting individualized recommendations. *Medscape Journal of Medicine*, 11(1), 26.
20. Story, M., Nannery, M. S., & Schwartz, M. B. (2009). Schools and obesity prevention: creating school environments and policies to promote healthy eating and physical activity. *The Milbank Quarterly*, 87(1), 71-100.
21. Di Noia, J., & Contento, I. R. (2010). Fruit and vegetable availability enables adolescent consumption that exceeds national average. *Nutrition Research*, 30(6), 396-402.
22. Larsen, K., & Gilliland, J. (2009). A farmers' market in a food desert: evaluating impacts on the price and availability of healthy food. *Health & Place*, 15(4), 1158-1162.
23. Liese, A. D., Weis, K. E., Pluto, D., Smith, E., & Lawson, A. (2007). Food store types, availability, and cost of foods in a rural environment. *Journal of the American Dietetic Association*, 107(11), 1916-1923.
24. Jilcott, S. B., Keyserling, T., Crawford, T., McGuirt, J. T., & Ammerman, A. S. (2011). Examining associations among obesity and per capita farmers' markets, grocery stores/supermarkets, and supercenters in US counties. *Journal of the American Dietetic Association*, 111(4), 567-572.

25. Bihan, H., Mejean, C., Castetbon, K., Faure, H., Ducros, V., Sedeaud, A., . . . Hercberg, S. (2012). Impact of fruit and vegetable vouchers and dietary advice on fruit and vegetable intake in a low-income population. *European Journal of Clinical Nutrition*, 66(3), 369-375.
26. Caldwell, E. M., Miller Kobayashi, M., DuBow, W. M., & Wytinck, S. M. (2009). Perceived access to fruits and vegetables associated with increased consumption. *Public Health Nutrition*, 12(10), 1743-1750.
27. Freedman, D. A., Bell, B. A., & Collins, L. V. (2011). The Veggie Project: a case study of a multi-component farmers' market intervention. *The Journal of Primary Prevention*, 32(3-4), 213-224.
28. Kropf, M. L., Holben, D. H., Holcomb, J. P., Jr., & Anderson, H. (2007). Food security status and produce intake and behaviors of Special Supplemental Nutrition Program for Women, Infants, and Children and Farmers' Market Nutrition Program participants. *Journal of the American Dietetic Association*, 107(11), 1903-1908.
29. McCormack, L. A., Laska, M. N., Larson, N. I., & Story, M. (2010). Review of the nutritional implications of farmers' markets and community gardens: a call for evaluation and research efforts. *Journal of the American Dietetic Association*, 110(3), 399-408.
30. Gustafson, A. A., Sharkey, J., Samuel-Hodge, C. D., Jones-Smith, J., Folds, M. C., Cai, J., & Ammerman, A. S. (2011). Perceived and objective measures of the food store environment and the association with weight and diet among low-income women in North Carolina. *Public Health Nutrition*, 14(6), 1032-1038.

31. Larson, N., Laska, M. N., Story, M., Neumark-Sztainer, D. (2012) Predictors of fruit and vegetable intake in young adulthood. *Journal of the Academy of Nutrition and Dietetics*, 112(8), 1216-1222.
32. Driskell, J. A., Schake, M. C., Detter, H. A. (2008). Using nutrition labeling as a potential tool for changing eating habits of university dining hall patrons. *Journal of the American Dietetic Association*, 108(12), 2071-2076.
33. Graham, D. J. and Laska, M. N. (2011). Nutrition label use partially mediates the relationship between attitude toward healthy eating and overall dietary quality among college students. *Journal of the American Dietetic Association*, epub ahead of print.
34. Ollberding, N. J., Wolf, R. L., & Contento, I. (2010). Food label use and its relation to dietary intake among US adults. *Journal of the American Dietetic Association*, 110(8), 1233-1237.
35. Abusabha, R., Namjoshi, D., & Klein, A. (2011). Increasing access and affordability of produce improves perceived consumption of vegetables in low-income seniors. *Journal of the American Dietetic Association*, 111(10), 1549-1555.

VITA

Lindsey Mayes was awarded a Bachelor of Science in Human Nutrition in 2010 from the University of Kentucky. She has held the following professional positions at the University of Kentucky: Dietetic Intern, Teaching and Research Assistant, Cooperative Extension Intern, Study Smarter Seminar Coordinator, and Student Program Coordinator. Scholastic and professional honors include being the recipient of the 2013 Breeding Smith-Edge Scholarship for Dietetic Interns and the 2012 Graduate Student of Excellence Award. She was also selected to present a research poster at the Academy of Nutrition and Dietetics annual conference. Lindsey has been an author on the following professional publications: “Engaging Students in Service Learning Through Collaboration with Extension” and “Electronic Textbooks Are Here: Are YOU Ready?”.