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Farmers' Market Incentive Program as an Intervention for Improving Behavior Regarding Fruit and Vegetable Consumption in Children and Adolescents

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THESIS

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

By

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2022

ABSTRACT OF THESIS

Farmers' Market Incentive Program as an Intervention for Improving Behavior Regarding Fruit and Vegetable Consumption in Children and Adolescents

Background: Previous research shows that there is low consumption of fruits and vegetables in children and adolescents, specifically those residing in the state of Kentucky which is ranked the lowest of all states in fruit and vegetable (F/V) consumption. The lack of F/V in a diet of someone during their developmental ages can result in negative health outcomes in the future. **Objective:** To determine if the use of a farmers' market incentive program as a nutritional intervention affects the consumption of F/V in children and adolescents. **Methods:** 261 children and adolescents, ages 3-14, from 160 families participated in a 10-week long program POP Club, where they completed a different interactive activity each week at the Lexington Farmers' Market. **Results:** Survey results found an increase in meals prepared together as a family after participation in POP Club. There was no difference in reported F/V consumption pre- and post-intervention and no difference in reported F/V intake before the COVID-19 pandemic and during the COVID-19 pandemic. **Conclusion:** This study provides evidence that a nutrition intervention at the Farmers' Market can impact meal preparation and increase time spent as a family preparing meals, but more research is needed to determine impact on F/V intake.

KEYWORDS: children & adolescents, farmers' market, incentive program, nutritional intervention, fruit & vegetable consumption

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December 9, 2022

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Chapter One: Introduction

Background

Consumption of recommended amounts of fruits and vegetables (F/V) is pivotal for the health of children and adolescents. Most do not meet government guidelines for daily fruit and vegetable intake.[1] Consuming sufficient F/V is critical for the proper growth and development. According to the Centers for Disease Control and Prevention (CDC), the recommendations for the consumption of F/V for children and adolescents range from 1-2 cups of fruits per day and 1-3 cups of vegetables per day, depending on age.[2] Regular consumption of F/V can reduce a person's risk for obesity and obesity-related chronic diseases such as diabetes and cardiovascular disease. At a fundamental level, sufficient nutrition is required to provide the building blocks for the development and function of the body in children, including cell growth and replication, synthesis of DNA, neurotransmitter and hormone metabolism, and optimal nutrition is of importance for brain development.[4] On top of health concerns that can arise, low F/V intake has also been associated with low academic achievement.[1] As of 2021, Kentucky ranked the lowest of all states in terms of daily F/V consumption.[8] According to the survey, only 4.7% of people living in Kentucky reported consuming two or more fruits and three or more vegetables per day.[9]

Problem Statement

Poor F/V consumption in children and adolescents is a serious health concern that can increase an individual's risk of obesity and obesity-related chronic disease, as well as contribute to unhealthy dietary patterns for life.[1] Malnutrition is now the largest contributor to disability-adjusted life years lost globally. [1]

Research Questions

1. Does a nutrition-focused farmers' market intervention increase the number of F/V consumed per day in children and adolescents?
2. Does a nutrition-focused farmers' market intervention increase the likelihood and frequency of children and adolescents preparing and eating meals together as part of a family?
3. Will the use of participant feedback on their experiences with POP Club allow for a better understanding on the outcomes of the program?

Hypothesis

It was hypothesized that a nutrition-focused farmers' market incentive program would contribute to an increase in daily consumption of F/V and the number of meals prepared together as a family in children and adolescents participating in the intervention. As well, it was hypothesized that a nutrition-focused farmers' market incentive program would increase how often families eat meals together.

Chapter Two: Review of Literature

Introduction

This study aimed to evaluate the impact of a farmers' market nutrition education intervention on fruit and vegetable consumption amongst children and adolescents. The utilization of farmers' markets served as a method to expose the children and adolescents and their families to new F/V to increase their knowledge and perception of their importance to health and well-being, as well as to the community.

Low Fruit and Vegetable Consumption Among Children and Adolescents

Most children and adolescents do not meet government guidelines for daily F/V intake.[1] Yet, consuming sufficient F/V is critical for the proper growth and development. According to the CDC, the recommendations for the consumption of F/V for children and adolescents range from 1-2 cups of fruits per day and 1-3 cups of vegetables per day, depending on age range.[2]

Importance of Fruits and Vegetables on Development

Not consuming enough F/V can play a detrimental role in the health and wellbeing of children and adolescents. This is a critical age group for proper nutrition because they are rapidly growing and developing, both physically and mentally. Consuming adequate F/V can help prevent obesity and as well as reduce the risk for diseases such as diabetes and cardiovascular disease. On top of that, it can help to keep the immune system strong which will allow them to fight illnesses.[3]

At a fundamental level, sufficient nutrition is required to provide the building blocks for the development and function of the body in children and adolescents, including cell growth and replication, synthesis of DNA, neurotransmitter and hormone metabolism, and optimal nutrition is of importance for the brain development.[4] Consuming recommended amounts of F/V has been shown to support mental health and help to ease the stress and anxiety children and adolescents may experience daily.

Fruit and Vegetable Consumption among Kentucky Children and Adolescents

As of 2021, Kentucky ranked the lowest in all of the states regarding F/V consumption.[8] Only 4.7% of people who resided in Kentucky reported consuming two or more fruits and three

or more vegetables per day. Nearly 1 out of 2 Kentucky children, or 49.7%, reported consuming fruits less than once per day.[9]

Common Barriers

There are a lot of common barriers that can potentially decrease the consumption of F/V in children and adolescents. The first one is the lack of knowledge. According to the 2018 School Health Profiles Report released by the CDC, while the majority of US schools offer curriculum on the benefits of healthy eating and dietary guidelines, the percentage of urban classrooms in which these subjects are taught is significantly lower than the national average. [10] However, even in schools where nutrition education is being taught to students, they are still not spending adequate time on the subject.

Another common barrier is lack of exposure. Food preferences is shaped early in life and dependent on the experiences and exposures with food[11]. Because food preferences are highly influenced by their exposure to different foods it is vital to expose children and adolescents to a wide variety of healthy foods early in life.[11] The older they get, the harder it is to change or influence their preferences for new foods. They will often neglect the consumption of F/V because they are not familiar with them. A study conducted in 2015 found that children who reported more frequent exposure to F/V at home consumed a wider variety of F/V at school and were more likely to report selecting a healthier food option during meals at school.[12] Therefore, being exposed to a wider variety of food at home may increase the likelihood of consuming similar food items outside of the home setting.

A third barrier that could lead to the decrease in consumption of F/V is accessibility. When children and adolescents are constantly given options that lack nutritional density, they are less likely to make healthier choices in the future. However, most of the time their access to

food depends on their families. Numerous factors can affect the ability of caregivers to provide healthy food options, including the distance it takes to get to a grocery store or access to transportation to get them there. Food deserts are relatively common in low-income areas because these are often the areas that lack large retail food markets and, while they may have convenient stores, they rarely carry healthy food options.[13] Researchers at Yale University found that healthy foods are significantly less available and that produce tends to be of poorer quality in low-income areas than in wealthier neighborhoods.[14]

Affordability is another common barrier when it comes to providing nutritious food options for children and adolescents. This is a responsibility that is going to fall onto the caregiver. Compared to those with higher incomes, lower-income individuals consume fewer F/V.[15] With the lack of supermarkets in low-income neighborhoods, leaves shopping for food at smaller convince stores where the prices for high-quality foods will be much more expensive. This drives people to purchase cheaper, unhealthy food options. With a smaller food budget, the first to go are usually the healthier foods – high-quality proteins, whole grains, vegetables, and fruit.[16] These foods and nutrients are often replaced with the addition of low-cost energy-rich starches, added sugars, and vegetable fats.[16]

A final barrier that potentially affects the consumption of F/V is convenience. It is easy to turn to a convenient food option when caregivers lack time the time to shop, prepare and cook food for their entire household. Faced with greater time constraints from work, childcare, and commuting, they often turn to these convenience foods which are defined as types of foods that save time in food acquisition, preparation, and cleanup.[17] The easier route could be to grab fast food or to cook pre-packaged, processed foods. Many recent studies have found that convenience foods often have lower nutritional values than foods available at a larger

supermarket. It has been pointed out that diet quality is degraded, and health is adversely affected if convenience food is used to save time for food preparation.[18]

Interventions to Increase Fruits and Vegetables

By conducting interventions, steps can be taken to increase the consumption of F/V in children and adolescents. Interventions that target households as a whole are important for this age range because the purchasing and preparing of foods are typically out of the hands of the children and adolescents. Educating children/adolescents and their caregivers together, allows the child/adolescent to play a part in making some of their own nutrition choices that will benefit them both now and in the future.

Interventions That Work

In Ballard County, Kentucky children and adolescents are not getting nearly enough F/V in their diet.[19] To improve F/V intake in this population, nutrition education emphasizing the importance of having a balanced diet was presented The Ballard County Cooperative Extension service partnered with Ballard County schools to educate 97 second-grade students.[19] Lessons from the "From Farm to Table," "Literacy and Eating for Primary Health," and "Professor Popcorn" curriculum were presented by Cooperative professionals and volunteers.[19] After the completion of their nutrition education, the results indicated that 85% of students knew the correct amounts of F/V to consume each day for good health and 95% said they planned to ask their parents to provide more F/V in their meal planning.[19] Simply educating children and adolescents on the importance of consuming F/V is a huge step in the right direction to increasing their daily consumption.

In Cumberland County, Kentucky, the Cumberland County Cooperative Extension Services works with the local food systems to educate students on nutrition and introduce

students to healthy lifestyles.[20] The Family and Consumer Sciences agents provided students with nutrition education each month and the opportunity to sample fresh and canned F/V.[20] As a result, 95% of students stated that they tried a new food during the year and 100% of the students could correctly demonstrate food safety and handwashing techniques.[20]

Educating kids outside of the classroom gives them more of a real-life feel. Also, by letting them use their newly gained knowledge to pick out the F/V they liked at the farmers market, it allows them to take part in the decision-making that comes along with planning meals. They can use their newfound knowledge to help prepare meals with their families as a good way for quality time and family bonding. Most parents and guardians know the importance of teaching healthy eating habits to their children; almost 50% report difficulty ensuring their children practice these habits in a poll conducted by Harvard School of Public Health.[21] Evidence suggests that over the past few decades there has been shifts in dietary practices with less time devoted to food shopping, cooking, and in-home eating despite the benefits of in-home food preparation and eating.* Dining together has not only been shown to have health benefits but also benefits for self-esteem, promoting academic achievement, and the protection of substance abuse in adolescents.* Family-centered, hands-on cooking and nutrition programs are widely used strategies to encourage healthy eating habits among parents and their children.[21] Parents agreed that their meals at home are heavily influenced by their children's food preferences.[21] Therefore, the use of family-centered cooking classes can be used as a solution for helping children practice healthy eating habits. This type of program could involve activities such as how to pick healthy food options, how to prepare them, and how to read food labels. Parental involvement has been associated with more positive behavioral changes in these types of programs.[21]

Farmer's Markets Interventions to Increase Fruit and Vegetable Consumption

Farmer's markets have a positive impact on local economies, the community dynamic, customer health education, and healthy food consumption patterns.[22] They allow customers to not only purchase locally produced, farm-fresh food, but they also provide an opportunity to connect with and know the actual people growing the food that we eat in the state; Kentucky's farmers.[22]

The use of farmers' markets is one potential strategy to increase access to and consumption of F/V, thus farmers' markets are thought to potentially improve population health and reduce population health disparities.[23] Current data shows that farmer's markets tend to be more commonly attended by those of higher socioeconomic status, but this program aims to bring in those of all socioeconomic stances. The rise of farmers' markets goes hand in hand with increasing public awareness of healthy eating, and buying local, along with mounting concerns about Americans' unhealthy diet and increasing rates of overweight and obesity.[24]

Local/Fresh Produce

There are many benefits both to buying local produce such as higher nutrient content, better for the environment, and supporting the local economy.[25] The relationship between local foods and healthy food items, such as fresh F/V, has led to claims that local food systems may provide health benefits from improved nutrition, obesity prevention, and a reduced risk of chronic diet-related disease.[26] Local food systems offer food items that are fresher, less processed, and retain more nutrients so while someone can purchase the same amount and type of produce from a nonlocal source since local foods are fresher, the nutrient content is improved.[26]

Nutrition Education Intervention

Nutrition education is a vital part of a comprehensive health education program and empowers children and adolescents with knowledge and skills to make healthy food and beverage choices.[27] Research shows that nutrition education can teach children and adolescents to recognize how healthy diet influences emotional well-being and how emotions may influence eating habits.[27] Teaching a child to have a positive relationship with food at a young age can benefit them into adulthood.

In Calloway County, Kentucky, Supplemental Nutrition Assistance Program Education (SNAP-Ed) found in a result of their Farm to School program, children and adolescents gained a new understanding of where their food comes from and in return encouraged their families to buy produce from local farmers.[28] SNAP-ED partners with state and local organizations to provide those eligible for SNAP benefits with nutrition education classes to help people lead healthy, active lives by teaching them how to save money as well as how to shop for and cook healthy meals.[29] SNAP-Ed aims to help low-income families with limited resources make healthy food choices. By getting families actively involved in the nutrition education interventions they are more likely to engage in the same practices outside of the intervention.

The Expanded Food and Nutrition Education Program (EFNEP) is another program that focuses on nutrition insecurity for children and their families who are in low-income areas. EFNEP offers hands-on interactive workshops to help participants improve food and physical activity behaviors, food resource management, food safety, and food security.[30] They offer different nutrition education workshops for adults and children to help them learn at their levels. Through an experimental learning process, adults learn how to make food choices to improve the nutritional quality of the meals they serve to their families by increasing their ability

to select and buy food, gain skills in food preparation, storage, and sanitation, and learn to better manage their food budgets and related resources.[30] Children and adolescents are engaged in a series of lessons designed to develop mastery, belonging, independence, and generosity in neutrino, food preparation, food safety, and also strategies for decreasing screen time and engaging in more physical activity.[30] It is important to provide different levels of nutrition education based on age that way they are learning relevant information that they can apply to their everyday lives. In 2020, data showed that children participating in EFNEP had an 84% increase in knowledge of the ability to choose healthy foods, 51% reported an increase in knowledge or ability to prepare low-cost nutritious foods, and 58% improved food safety and preparation knowledge and practices. (31)

Educating the families along with the children and adolescents, with a focus on hands-on education, will successfully allow the families to work together to choose foods that are not only healthy but appealing to the child. By participating in hands-on learning activities, they will be able to incorporate what they have learned and apply their knowledge and practices when choosing healthy food options and preparation of foods.

The Importance of Including Families During Nutrition Education

By using the knowledge that adults and children have gained about the importance of healthy food choices they can work together to incorporate these aspects into their households. Family involvement is an important element in effective nutrition education for elementary school students.[32] Family-based interventions are more effective in children older than twelve years old.[33]

At a young age, most food choices that are made in a household are made by the child's caregivers rather than themselves. They are the ones doing the grocery shopping, the cooking,

and also dictate when they go out to eat. By including aspects for the entire family during nutrition education, it allows for the child to feel more included in the decisions. It also allows them to practice healthy dietary habits that they will continue to use and build on into adulthood. With that being said children and adolescents can still be the drivers of their own food decisions. They model themselves on their parents' eating behaviors, lifestyle, eating-related attitudes, and satisfaction or dissatisfaction regarding body image. Dietary habits are shaped at a young age and maintained during later life with tracking over time.[34] Eating behaviors established in childhood persist, with implications such as fussiness and poor dietary variety, or high responsiveness to food cues and increased obesity risk.[35] Although eating behaviors and child weight are difficult to modify directly, parental feeding practices are potentially a good target for interventions to prevent unhealthy eating patterns and the development of excess weight in children.[36]

Chapter Three: Methods

Research Design and Setting

This study was conducted in the urban city of Lexington, Kentucky which is the second largest city in Kentucky.[37] Based on the last conducted census, there is a reported population of 322,570 people living in Lexington. [37] Of this population, approximately 21% are reported to be under the age of 18 years old.[37] This census also reported that roughly 74% of residents were white, 15% were African American, 4% Asian and 7% were Hispanic or Latino.[37] It is estimated that 16% of those persons living in Lexington are also considered to be in poverty.[37]

The Lexington Farmer's market consists of three local locations in urban Lexington. Typically, there are over 50 different vendors, representing over 30 counties in Kentucky in attendance weekly. Items that can be expected to be found during the summer markets include

F/V, meat, eggs, dairy, flowers, baked goods, herbs, and spices, as well as other food and beverages locally produced. On top of foods and beverages, one can find a variety of programs ranging from food accessibility to youth programs to wellness programs. One of the programs that can be found at all three farmers' market locations is The Power of Produce (POP) Club, a farmers' market incentive program that provides a fun opportunity for children and adolescents to engage in the local food system through conversations with farmers, educational games and demonstrations, and exposure to new F/V.[38] POP Club at the Lexington Farmers' Market is led by FoodChain, a local non-profit that aims to provide nutrition education to the community.

The club originated in Oregon City, Oregon in 2011 and has since spread to farmers' markets across the nation.[39] It was created by Jackie Hammond-Williams in response to a grant offered by Clackamas County, Oregon for programs that improve the community's health.[40] In 2017, FoodChain began offering POP Club in the summer as a program of the Fayette County Farm to School Coalition with the goals to improve the eating behavior of children and adolescents, increase family attendance at the Farmers Market, increase customer base and revenue for vendors, and to build healthy, prospering communities.[40] Activities include taste tests of a wide variety of local F/V, writing thank you notes to farmers, and art projects that are created using local produce.[38] The activities were either completed right at the POP Club booth or allowed children and adolescents to explore new booths and gain new knowledge. Nutrition education was shared with them and their parents or guardians as they completed the activities. Multiple activities went on at one time giving the children and adolescents the option to participate in activities that appeal to their age and preferences.

Participation in POP Club came at no cost and each time a child visited the POP Club they receive a $2 voucher which they can spend freely at the farmers' market. They were limited to $2 per day per child. The $2 voucher, also referred to as POP Bucks, started with the original

POP Club and has been carried on to other POP Clubs since. The Farmers Market Coalition (FMC) provides over 50 tools, guides, and templates to be used to engage the younger customers in the farmers' market experience.[41] A POP Club guidebook and activity guide was used for planning, organization, and development of activity criteria for each POP Club meeting. The FMC also provided prizes for participation which included stickers, temporary tattoos, and tote bags.[41]

This study was a 10-week long study with data collection occurring between May and August of 2021 at the Lexington Farmers' Market. Data collection occurred during the farmers' markets on Wednesday's 4 pm-6 pm and Saturdays and Sunday's 10 am-2 pm. A POP Club booth was used for on-site recruitment and participation in the study was completely voluntary. Staff and volunteers recruited in person at the farmers market by approaching families and giving a brief, verbal explanation of the POP Club activities. Participation in the study was completely voluntary and all study procedures were approved by the University of Kentucky Institutional Review Board (IRB).

Participants

Participants were recruited via on-site recruitment at the POP Club booth at the Lexington Farmers Market and open to all parents and guardians of child(ren) participating in the POP Club. 261 children and adolescents from 160 families participated in the weekly POP Club activities with an estimate of 30 new members having joined per week. Inclusion criteria included parents or guardians of children and adolescents, ages 3-14, who were a member of the POP Club. Those excluded included parents or guardians of children and adolescents outside of the target age range and adults without children. Before completion of the surveys, all subjects were provided with a consent form and could not participate until consent was obtained by the parent. During POP Club children and adolescents had the opportunity to

participate in various nutrition activities focusing on F/V such as taste testing, coloring sheets, creating healthy food plates, and scavenger hunts. On top of completing games and activities, children and their parents or guardians received verbal nutrition education on the importance of fruit and vegetable consumption for that age range.

Measurements

Pre-Survey

Data on behavior regarding F/V before the farmers market incentive program was collected using a pre-survey that was created by the research team at the University of Kentucky. The on-site research team included one undergraduate student fellow, two work-study students, one graduate student, and 2 student volunteers weekly to help with activities conducted during POP Club. There were approximately 2-3 people working the booth at a time. The pre-survey was only available in paper form and had to be completed in person at POP Club during the first visit. The same survey is used each year during POP Club. Pre-survey data was completed by the parent or guardian upon the child's first POP Club visit and consisted of 17 questions. No names were collected; instead, the research team coded all surveys per standard procedures. The pre-survey included questions regarding demographic information such as race/ethnicity, age, and gender of the child(ren). In addition to demographics, questions were focused on F/V consumption, meal preparation, and general POP Club information. The pre-survey took approximately 5-10 minutes to complete and volunteers and staff were nearby as questions arose. All responses were voluntary, and participants could choose not to answer specific questions or withdraw their participation in the survey at any time. Upon completion of the pre-survey, they received a $2 voucher per child to spend freely at the farmer's market.

Post-Survey

Data on behavior regarding F/V after the farmers market incentive program was collected using a 22-question post-survey. In-person post-surveys were completed during the last few weeks of the Lexington Farmer's Market. Like the pre-survey, the post-survey was also created by research team and used the same one each year. Participant surveys were again coded for matching with pre-surveys. The post-survey included questions about F/V consumption during and at the conclusion of the intervention. There were also questions specific to their experience at POP Club and any changes that could be made to ensure a positive experience for upcoming members. Parents and guardians also had the option to complete online post-surveys via an email sent out to all who completed the pre-survey, but who had not completed the post-survey. The post-survey recruitment email was sent up to three times to each participant. Upon completion of the post-survey, participants were directed to a follow-up survey where they were able to enter to receive a $50 check in the mail for participating. The $50 check was limited to the first 50 participants who completed the post-survey, and they must have completed the pre-survey to be eligible. They also must have provided the same identity markers for both the pre-and post-survey to receive the check that way both responses could be matched. If the data collected did not match a pre-survey the post-survey was disregarded.

Statistical Analysis

The statistical software JMP was used for all statistical analyses and the data collected was both qualitative and quantitative. We aimed to examine the association of farmers market incentive programs on improving behavior regarding the consumption of fruits and vegetables of children and adolescents. Descriptive statistics were used for participants' demographic

information and categorical data was used to assess meals prepared and consumed together as a family, servings of fruits and vegetables consumed per day, and farmers' market attendance at baseline pre-survey and post-intervention post-survey. Pearson chi-square analysis was used to examine changes from pre to post program for family meals prepared and eaten together per week. Nonparametric Wilcoxon rank sum test was used to examine differences in mean fruit and vegetables servings from pre to post program. Qualitative data was assessed by major themes and coded into 6 main themes. Two individuals coded the qualitative data and illustrative quotes were chosen to show examples of the main themes.

Chapter Four: Results

Results

Table 4.1 shows the demographic characteristics of the in the 10-week program for n=157 based on the pre-survey results. Most families that participated had 2 children (44%) ages ranging from 3-14 years of age. Of those reported, 17 (11%), indicated they were of Hispanic ethnicity.

Table 1
Baseline demographic measurements of study participants.

	N	Percentage (%)
Number of Children Per Household		
1	50	32%
2	70	45%
3	20	13%
4	10	6%
5	1	1%
5 or more	6	1%
Ethnicity		
Hispanic	17	11%
Non-Hispanic	139	89%

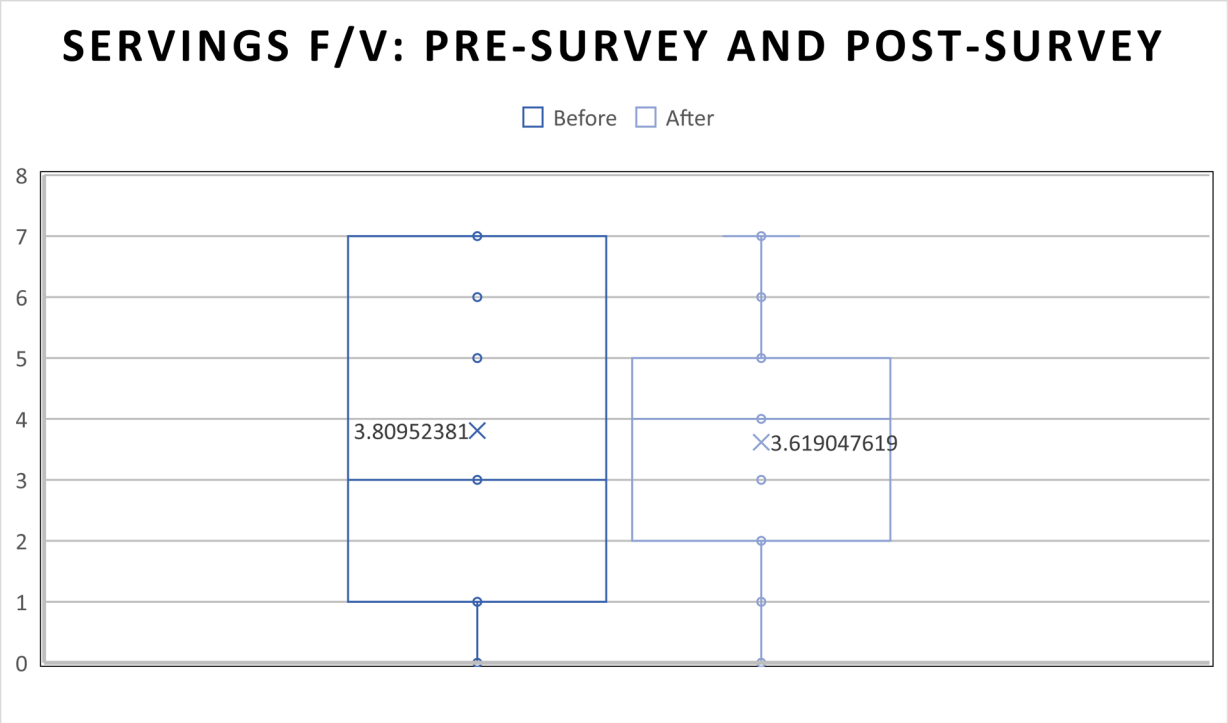
Table 4.2 show the comparison of pre- and post- survey data results regarding how many meals per week were reportedly prepared together as a family and how often families eat together per week. A total of 158 participants answered this portion of the pre-survey, while 21 completed this section of the post-survey. In the pre-survey, most participants (42%) reported consuming 6-10 of their meals together per week prior to the intervention. The post-survey results supported the pre-survey with 6-10 meals also being the most commonly seen meals consumed as a family per week (43%). From pre to post program, meal prepared per week did not significantly change (p=0.45). The pre-survey results found that a majority of the participants reported always (50%) eating meals together per week. The post-survey found that a majority reported often (43%) and always (43%) eating together, though no statistical differences were seen from pre to post (p=0.73)

Table 4.2
Pre- and post- survey results of meals prepared, and meals eaten together per week.

	Pre N (%)	Post N (%)	P-Value
Meals per week prepared as a family	158	21	
1-5	32 (21%)	6 (29%)	
6-10	62 (40%)	9 (43%)	
11-15	28 (18%)	1 (5%)	
16-20	21 (14%)	2 (10%)	
21+	12 (8%)	3 (14%)	0.4452
How often family eats together per week	158	21	
	15 (9%)	3 (14%)	
Sometimes	64 (41%)	9 (43%)	
Often	79 (50%)	9 (43%)	0.7259
Always			

Figure 4.1 looks at the comparison data of the participant's consumption of more than 4.5 servings of F/V per day before the intervention and the comparison of F/V servings consumed after participating in the intervention in a 7-day time period. Based on the data, the number of children and adolescents that were reported consuming more than 4.5 servings of F/V in the past 7 days during pre- and post-survey results was relatively unchanged due to the large amount of pre-survey responses and limited amount of post-survey responses. The maximum reported consumption of more than 4.5 servings of F/V pre-survey 7 out of the last 7 days, with the minimum reported being 0 days. The mean days consuming 4.5 servings, or more was found to be 3.81 days in the pre-survey results. The upper 95% mean was 4.22 days, and the lower 95% mean came out to 3.52 days. There was a total of 152 participants that answered this question of the pre-survey. Based on the results from the post-survey data, the maximum was also found to be 7 days and the minimum 0 days. The mean days consuming 4.5 servings, or more was found to be 3.62 days in the post-survey results. The upper 95% mean was 4.55 days, while he lower 95% mean was 2.69 days. Change in fruit and vegetable servings from pre to post program was not statistically different (p=.60). There were 21 responses received for this question on the post-survey.

Figure 4.1
Consumption of more than 4.5 servings of F/V before and after intervention for the past 7 days.



Wilcox rank sum test for difference. P=0.0624

The feedback reported in the post-survey found many common themes. For the reported favorite part of POP Club, there was a lot of positive feedback on the interactive components. Families reported that their child found enjoyment out of being able to participate in hands on activities. Another commonly reported favorite was the $2 voucher received after participation in the activities. The children loved the opportunity to earn their own money to be used on produce of their choosing. It allowed them to feel involved and found the overall experience to be rewarding. Lastly, many families reported that the child enjoyed trying new F/V each week. The chance to sample a new F/V every week allowed them the opportunity to try new foods and expand their taste pallets. Many children and adolescents even went on to purchase the F/V of the week with the voucher they received for participating.

Another portion of the survey allowed the participant the option to leave feedback on suggestions to improve POP Club in future years. Some commonly reported improvements were that the program is not well advertised. In fact, this was the most common response. Families stated that had they not been physically at the farmers' market to see the booth they never would have known about POP Club. A suggestion in terms of future advertisement could include posting in Facebook Group's or even having a POP Club Facebook or Instagram page where they can post the times and locations as well as the weekly activities. Physical flyers around areas populated mainly by families, such as parks and school districts, could also be a way to spread the word of POP Club.

Another suggestion was having different activities for different age levels as some participants reported that children ages 4-5 could not participate in some activities due to being to advance. A final suggestion was an option for surveys online rather than on paper which could significantly help both the number of pre- and post-surveys collected as well as make the survey's overall more accessible. The online-post survey was eventually created in hopes of collecting more responses; however, the pre-survey was only offered in person, on paper.

Chapter 5: Discussion

Discussion

This study evaluated at the effects on the consumption of F/V in children and adolescents after the participation in a farmers' market intervention. It is an important area of research because a deficiency in F/V in children and adolescents is a serious health concern that can increase the risk of obesity and obesity-related illness.[1] After the farmers' market intervention, a large portion of the participants reported preparing more meals together as a family than they did in the pre-survey. The most common response in both the pre- and post-

survey found that families typically prepared 6-10 meals together each week. There was also an increase in responses of preparing 21 meals together or more, from 8% to 14%. While we did not find an overall increase in the reported F/V consumption in children and adolescents after the famers' market intervention, this could be due to limitations that this study faced such as poor retention, initial funding, self-reported bias, and being the first POP Club since the pandemic. Therefore, though limited inference from the supplied data, the study can be used as a basis for altering or improving logistics for upcoming POP Clubs at the Lexington Farmers' Market.

Daily fruit and vegetable intake vary based on gender and age. According to the CDC girls ages 2-3 years should eat 1 cup of fruit and 1 cup of vegetables per day.[42] Girls ages 4-8 years of age should eat 1-1 ½ cups of fruits and 1 ½ cups of vegetables per day.[42] Girls ages 9-13 should eat 1 ½ cups of fruits and 2 cups of vegetables per day.[42] Girls ages 14-18 years of age should eat 1 ½ cups of fruits and 2 ½ cups of vegetables per day.[42] For boys ages 2-3 years of age, they should eat 1 cup of fruit and 1 cup of vegetables per day.[42] Boys ages 2-8 years old should eat 1-1 ½ cups of fruit and 1 ½ cups of vegetables per day.[42] Boys ages 9-13 years of age should eat 1 ½ cups of fruits and 2 ½ cups of vegetables per day.[42] Finally, boys ages 14-18 years should eat 2 cups of fruits and 3 cups of vegetables per day.[42] Based on this data provided by the CDC, the results of this study actually show an adequate intake of daily F/V for children who get less than 30 minutes per day of moderate physical activity beyond their normal daily activities. With an average pre-survey response of the participant consuming more than 4.5 servings of F/V 3.81 days out of the last 7 days, and an average of 3.62 days in the post survey, results indicate that these participants are typically consuming right at if not more of their recommended daily F/V intake needs.

The Oregon City Farmers Market in Oregon City, Oregon housed the first ever POP Club in 2011. Through surveys and interviews, evaluations of Oregon City's program found that 72% of POP participants had tried a new fruit or vegetable throughout their time in their program.[43] Of the participants parents, 70% reported that their child requests produce that he or she tried through POP Club which conforms the influence of children on their parents' purchasing choices.[43] They also found a sales increase of 35% according to all the vendors interviewed.[41] The following year at the City Market in Charlottesville, Virginia a POP Club was piloted near a large subsidized housing neighborhood.[41] Results found that even with new demographics, the program still had similar effects on interest in healthy food among children and their parents.[41] According to the survey responses, 88% of children responding to the survey in Charlottesville reported that they tried a new food and liked it after experiencing healthy foods in different ways.[41]

Through web-based surveys conducted by the University of Minnesota, of 357 parents of POP Club children results found that, 67% of respondents state their children are eating, or at least trying, more fruits and vegetables.[43] In 2017, overall POP Club increased family attendance and spending with nearly $10,000 reimbursed to vendors at the Minnesota farmers markets.[43]

In Seattle, Washington at the Lake City Farmers Market, the POP Club program managers were eager to feature more unique vegetables and fruits, but they found that sampling familiar items first helped engage and create interest from the beginning.[41] They also found that both the children and the parents were equally excited and grateful for the POP bucks element of the program.[41] By making the POP Club experience enjoyable for both the children and the parents or guardians, it can encourage higher family retention as well as increasing the likelihood of families to spend more time preparing and eating meals together at home.

The Indianapolis City Market, in Indianapolis, Indiana, found the response to their first year of POP Club to be overwhelmingly positive.[41] They also found their highest success when they began to partner with local schools. Over the course of 4-weeks, they hosted 5 separate field trips for schools in the downtown area and each week the students were provided with a guided market tour, taste testing, and interactive activities.[41] Involving schools is a great way to boost attendance as well as reach students whose family may not attend their local farmers market due to inaccessibility or income.

The POP Club at the Glenwood Sunday Market located in Chicago, Illinois found their kid-specific program as an entry way into the markets for kids to explore and learn new things about food as well as what their likes and dislikes were.[41] They also found that the relationship between farmer and market and farmer and customer to be strengthened as farmers reported they were thrilled to converse with and educate their young clientele while receiving extra income.[41]

Overall, families reported a wonderful experience for both them and their children at POP Club. The results found in this study can be used to implement change in the upcoming years. The use of both positive and suggestive feedback, as well as incorporating the findings from other POP Clubs, will allow improvement to be put forth to ensure that POP Club only grows bigger and better for children and their families in the city of Lexington, KY.

Strengths and Limitations

This study had several strengths. It was an inclusive study involving families of all ethnicities and socioeconomic status to participate. It is an easy replicable study as the POP Club meets yearly and, therefore, results from this study can be used to improve the experience and results for the following years study. The survey's each only took about 5-10 minutes to

completed so it was also time-efficient. With the pre-survey vouchers being $2 it was also a very cost-efficient study.

Some limitations of this study included poor retention. While this study began with a large sample size (n=161), only 21 participants completed the post-survey. At the time of the initial study conduction, online post surveys were not available, which made it hard to collect post survey data from those who only attended one farmers market or those who did not attend during the last few weeks when the post survey was being conducted. Another study limitation was the funding for the initial incentives. With the voucher received for completion of the pre-survey being only $2, it was hard to attract interest in participation. With the post-survey compensation being added for $50 for completion of online post-surveys, it was predicted that more survey responses would be received. However, only a few more post-surveys were actually completed even with the increased incitive. With further funding in the upcoming POP Club season an increase in worth of pre-survey vouchers could bring in a wider variety of members and increase motivation for participation. Another limitation is self-reported bias. Because the factors of the survey are not controlled, the results reported in the pre- and post-survey are completely based on the honesty of the study participant. One big challenge this study faced was it was the first POP Club post-COVID-19. This could be a reason for the smaller sample size as many local citizens were still being cautious going out in large group settings. The farmers' market, as well as POP Club's, number one concern since the pandemic was the safety of the customers. Booths began to supply hand sanitizer as well as anti-bacterial wipes to use after each visitor to decrease the spread of germs. Market staff and vendors continued to wear masks when necessary, as well as encouraged customers to. Maintaining physical distance was also a priority. With the farmers' market taking place outdoors, it did have a more positive benefit than shopping for produce indoors. However, since children are more susceptible to

sickness due to their underdeveloped immune system, families still may not have wanted to risk their young child's health.[44] All of these strengths and limitations listed above can be used in future POP Club programs to increase the successfulness and overall experience of all families attending the Lexington Farmers' Markets.

Appendices

Pre-Survey

Pre-survey

First two letters of first name: _____
First two letters of last name: _____
Month and Date of birth (ex: April 1 would be 0401): _____

1. How many children do you have?
   1 2 3 4 5 or more

2. My child(ren) is/are (select all that apply)
   - White
   - Black/African American
   - Hispanic/latino
   - Asian
   - Pacific Islander
   - American indian or Alaskan native
   - Other
   - Prefer not to answer

3. How old is/are your child(ren)?

4. What is/are your child(ren)'s gender(s)?

5. How many meals a week do you prepare with family?
   - 0
   - 1-5
   - 6-10
   - 11-15
   - 16-20
   - 21+

6. How often does your family eat together per week?
   - Never
   - Rarely
   - Sometimes
   - Often
   - Always

7. How many servings of fruits do you usually eat per day? (ex. a medium apple is a serving of fruit)

	1 serving	2 servings	3 servings	4 servings	5 servings or more
Before COVID-19 pandemic					

Since COVID-19 pandemic					

8. How many servings of vegetables do you usually eat per day? (ex. 1 cup of spinach is a serving of vegetable)

	1 serving	2 servings	3 servings	4 servings	5 servings or more
Before COVID-19 pandemic					
Since COVID-19 pandemic					

9. In the last SEVEN DAYS, how many days did you eat 4.5 servings or more fruits AND vegetables per day?

0 1 2 3 4 5 6 7

10. How long has your family been going to the Farmers Market (either here in Lexington, or anywhere else)?

- This is our first year
- 2-5 years
- 6-9 years
- 10+ years

11. Did your child(ren) participate in the POP Club last year?

- Yes
- No

12. Did your family start attending the Farmers Market because of the POP Club?

- Yes
- No

13. How did your family hear about the POP Club? (select all that apply)

- Friend
- Relative
- Co-worker
- Farmers market email newsletter
- City mailing
- Newsletter
- Calendar
- Farmers market attendance
- Farmers market website
- Social media page (ex. Facebook, Instagram, Twitter)
- Media coverage
- POP club flyer poster
- Other

14. Did you work for pay before the COVID-19 pandemic?

- Yes
- No

15. Since the start of the COVID-19 pandemic, did you do any work for pay at a job or business?

- Yes, I worked for someone else for wages, salary, piece rate, commission, tips, or payments in food or lodging
- Yes, I worked as self-employed in my own business, professional practice, or farm
- I was laid-off temporarily or furloughed due to COVID-19 pandemic
- No, I have not worked for pay due to other reasons

16. Since the start of the COVID-19 pandemic, have you either received, applied for any of the following forms of income and/or food assistance, or not?

	Received	Applied for	Tried to apply for	Did not receive nor apply for any
Unemployment insurance	•	•	•	•
SNAP (Supplemental Nutrition Assistance Program)	•	•	•	•
TANF (Temporary Assistance for Needy Families)	•	•	•	•
Social Security	•	•	•	•
Supplemental Social Security	•	•	•	•
Other aid from the government	•	•	•	•
Assistance from a church or religious organization	•	•	•	•
Assistance from another community organization	•	•	•	•
A food pantry or soup kitchen	•	•	•	•
Other assistance	•	•	•	•

17. How often have you utilized such resources since the start of the COVID-19 pandemic?

- More than once a day
- Every day
- More than once a week
- Once a week
- More than once a month
- Once a month

Post-Survey

Post survey

First two letters of first name: _____
First two letters of last name: _____
Month and Date of birth (ex: April 1 would be 0401): _____

1. How many of your children registered for the POP Club?
   1 2 3 4 5 or more
2. After participating in the POP club, we attend the farmers market as a family:
   - Much less than before participating in POP Club
   - Somewhat than before participating in POP Club
   - About the same than before participating in POP Club
   - Somewhat more than before participating in POP Club
   - Much more than before participating in POP Club

3. Please select the response that best describes your family's spending at the farmers market AFTER the POP Club compared to BEFORE the program.
   - We spend much less than before participating in POP Club
   - We spend somewhat less than before participating in POP Club.
   - We spend about the same as before participating in POP Club.
   - We spend somewhat more than before participating in POP Club.
   - We spend much more than before participating in POP Club.

4. In addition to the POP Club voucher(s), about how much, on average, did your family spend at the farmers market each week?
   - $0
   - $1 to $5
   - $6 to $10
   - $11 to $15
   - $16 to $20
   - More than $20

5. What items did you purchase with the POP Club voucher(s)? Check all that apply.
   - Fruits; please provide examples: _____
   - Vegetables; please provide examples: _____

6. In the last SEVEN DAYS, how many servings of fruits do you usually eat per day? (ex. a medium apple is a serving of fruit)

   1 2 3 4 5 or more

7. In the last SEVEN DAYS, how many servings of vegetables do you usually eat per day? (ex. 1 cup of spinach is a serving of vegetable)

1 2 3 4 5 or more

8. In the last SEVEN DAYS, how many days did you eat 4.5 servings or more of fruits and/or vegetables?

0 1 2 3 4 5 6 7

9. After participating in the POP Club, we prepared meals together, as a family:

- Much less than before participating in POP Club
- Somewhat than before participating in POP Club
- About the same than before participating in POP Club
- Somewhat more than before participating in POP Club
- Much more than before participating in POP Club

10. After participating in the POP Club, how many meals a week do you prepare with family?

- 0
- 1-5
- 6-10
- 11-15
- 16-20
- 21+

11. How often does your family eat together in a week?

- Never
- Rarely
- Sometimes
- Often
- Always

12. After participating in the POP Club, **my children are interested in attending the farmers market**:

- Much less than before participating in POP Club
- Somewhat than before participating in POP Club
- About the same than before participating in POP Club
- Somewhat more than before participating in POP Club
- Much more than before participating in POP Club

13. After participating in the POP Club, **my children enjoy the Farmers Market**:

- Much less than before participating in POP Club
- Somewhat than before participating in POP Club
- About the same than before participating in POP Club

- Somewhat more than before participating in POP Club
- Much more than before participating in POP Club

14. After participating in the POP Club, **my children help to choose the fruit or vegetables we buy at the Farmers Market**:
    - Much less than before participating in POP Club
    - Somewhat than before participating in POP Club
    - About the same than before participating in POP Club
    - Somewhat more than before participating in POP Club
    - Much more than before participating in POP Club

15. After participating in the POP Club, **my children interact with Farmers Market vendors**:
    - Much less than before participating in POP Club
    - Somewhat than before participating in POP Club
    - About the same than before participating in POP Club
    - Somewhat more than before participating in POP Club
    - Much more than before participating in POP Club

16. After participating in the POP Club, **my children help to prepare the fruits and/or vegetables we buy at the Farmers Market**:
    - Much less than before participating in POP Club
    - Somewhat than before participating in POP Club
    - About the same than before participating in POP Club
    - Somewhat more than before participating in POP Club
    - Much more than before participating in POP Club

17. After participating in the POP Club, **my children are trying new fruits and/or vegetables at home**:
    - Much less than before participating in POP Club
    - Somewhat than before participating in POP Club
    - About the same than before participating in POP Club
    - Somewhat more than before participating in POP Club
    - Much more than before participating in POP Club

18. After participating in the POP Club, **my children eat more fruits and/or vegetables at home**:
    - Much less than before participating in POP Club
    - Somewhat than before participating in POP Club
    - About the same than before participating in POP Club
    - Somewhat more than before participating in POP Club
    - Much more than before participating in POP Club

19. After participating in the POP Club, **our family has fruits and/or vegetables in our home**:

- Much less than before participating in POP Club
- Somewhat than before participating in POP Club
- About the same than before participating in POP Club
- Somewhat more than before participating in POP Club
- Much more than before participating in POP Club

20. What was your family's favorite part of participating in the POP Club?

21. What are some ways we can improve the POP Club for future families?

22. Is there anything else you would like to share about your family's experience with the POP Club?

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