Farm-to-Preschool in East Tennessee:

Evaluation of a Small-scale Farmer's Market at a Childcare Center on Household Fruit and Vegetable Availability and Preschoolers' Consumption of Fruits and Vegetables

A Thesis Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

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August 2016

DEDICATION

To my father, mother, sister, and brother

Shawn, Carla, Paige, and Ashton Parry

ACKNOWLEDGEMENTS

I would like to thank Dr. Marsha Spence for her continued guidance throughout this project and my graduate experience. I'd like to acknowledge my thesis committee and thank them for their helpful ideas, spot on editing, and flexibility throughout this process. I'd like to thank Kindall Aaron of the East Tennessee Children's Hospital Childhood Obesity Coalition for allowing me to not only be on her Health Happens team and work with the preschoolers of East Tennessee but also for supporting the creation and implementation of this project. I'd like to acknowledge my funding sources: East Tennessee Children's Hospital and the University of Tennessee Department of Nutrition Graduate Research and Outreach for Wellness (GROW) lab. I'd like to thank the Association of State Public Health Nutritionists (ASPHN) Healthy Places for Kids to Eat (HPKE) technical grant for their consultation and assistance and connecting the researchers with Lacy Stephens of the farm to preschool network who provided her knowledge and expertise on this project. Thank you to the participating farms that provided high quality produce each week. I'd also like to acknowledgement the students in the GROW lab for their help with the farmer's market, family workshops, and support throughout my work. And finally, I'd like to thank the preschoolers, parents, childcare directors, and teachers that were part of this project.

ABSTRACT

Background: Most preschool-aged children do not consume an adequate amount of fruits and vegetables (F&V). Accessibility to F&V and parental influence are important factors in determining fruit and vegetable consumption in preschool-aged children. The incorporation of farmer's markets at childcare centers as part of a farm-to-preschool program provides an opportunity to increase access to F&V and engage parents in supporting positive changes in their children's dietary behaviors. Gaps in the farm-to-preschool literature include a lack of well-designed intervention trials that include a control group and rigorous evaluation tools.

Methods: This was a pilot study with a quasi-experimental, pre-test, post-test design with an intervention and control group. Children and parents participated in a 12-week nutrition program at both the intervention and control childcare centers. Additional farm-to-preschool activities were provided at the intervention site including a small-scale farmer's market for two hours once per week for eight weeks at the childcare center. Parents were asked to complete a home food inventory (HFI) to assess F&V availability and a food frequency questionnaire (FFQ) to evaluate their preschooler's usual consumption of F&V. Paired-samples t-tests were used to analyze data.

Results: Results indicated that there were no significant differences between pre and post scores for fruit availability (7.57 to 7.0 P = 0.34), vegetable availability (11.79 to 11.07 P = 0.30), preschoolers' consumption of fruit (4.21 to 3.78 P = 0.36), and consumption of vegetables (4.86 to 5.5 P = 0.18), despite parents at the intervention facility spending an average of $6.04 per week on fresh produce at the preschool farmer's market. Similarly no significant results were found for the control group.

Discussion: The number of F&V in the home did not significantly change at post evaluation for either group, potentially indicating that the parents in the intervention group were purchasing their usual F&V at the small-scale farmer's market, and displacing what they usually purchased elsewhere. Future farm-to-preschool research may benefit from a mixed methods approach that captures how having local produce available at a childcare center could influence families in a variety of positive ways.

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CHAPTER 1: LITERATURE REVIEW

Introduction

Increasing consumption of fruits and vegetables is a key recommendation of the 2015 Dietary Guidelines for Americans.[1] Adequate intakes of fruits and vegetables in children supports growth and development and shields against preventable diseases such as cardiovascular disease, type 2 diabetes, cancer, and obesity.[1] Despite the need for children to consume adequate amounts of fruits and vegetables, their intake is often suboptimal. In a recent study conducted by the Centers for Disease Control and Prevention (CDC), although the amount of fruit intake among children, ages two- to- eighteen-years-old, has significantly increased from 0.55 cup-equivalents per 1,000 calories in 2003 to 0.62 cup-equivalents per 1,000 calories in 2010, vegetable intake has not changed significantly from 0.54 cup-equivalents per 1,000 calories.[2] However in a study published in 2009, 100% fruit juice was identified as the number one source of fruit in the diets of children, possibly explaining why fruit consumption appears to have increased.[3] Intake of fruit juice in place of whole fruit is an issue that continues to be debated, as research in this area is controversial.[3] Research has shown a correlation between fruit juice intake and overweight children; other studies have found no evidence of this relationship.[3] Despite these mixed findings regarding the relationship between juice intake and weight, the 2015 Dietary Guidelines for Americans recommends that fruit juice intake be limited because of its lack of important nutrients like fiber, and the easy chance of overindulgence.[1] The Healthy People 2020 goals for Americans are: increase vegetable intake to 1.14 cups equivalent per 1,000 per day and increase fruit intake to 0.90 cup equivalent per 1,000 calories per day in

all people over the age of two.[4] The CDC study looked at fruit and vegetable intake across different socioeconomic status groups and found that none of them met the Healthy People 2020 goal for vegetables, and only preschool-aged children, ages two- to five-years-old, met the goal for fruit.[2] A study conducted in 2010, found that more than 25% of their study sample of preschool-aged children were not eating a vegetable at all during a 24-hour period, and of those that did report eating vegetables, French fries were the greatest contribution to their vegetable consumption.[5]

The early childhood years are one of the primary times when food habits and dietary preferences are formed, including an inclination for or against F&V consumption.[6] There are various factors influencing the intake of fruits and vegetables in children. Preschool-aged children begin exerting increasing autonomy over their food choices and tend to select foods with which they are more familiar.[6] In America it is accepted that many young children are classified as picky eaters who may not be receptive to consuming more fruits and vegetables at this age.[7] For example, a prospective longitudinal study focused on the food variety of picky eaters, suggested that children should be exposed to a variety of fruits and vegetables at an early age.[8] The researchers suggested that the timing of introduction to fruits and vegetables plays an important role in helping children become familiar with certain types of foods and found that this behavior may be carried into adolescence and young adulthood.[8] Specifically, it was found that age three years might be a critical age for fruit and vegetable exposure.[8] Multiple exposures to different fruits and vegetables at this age could lead to the development of a greater preference for a variety of foods within these foods groups.[8,9] Leann Birch, the director of the Center for Childhood Obesity Research, states that the early childhood is the "optimal window for promoting the

development of healthy eating behaviors in children."[10(p5)] Therefore, the years children are enrolled in preschool might be an important time for fruit and vegetable exposure-based interventions.[11] The main goal of this study was to test an intervention designed to increase availability and consumption of fruits and vegetables in preschool-aged children. Prior to study implementation, a review of the literature that focused on factors that influence preschoolers' access to and consumption of fruits and vegetables, barriers to purchasing fruits and vegetables, accessibility of farmer's markets and fruit and vegetable consumption, connection to the local-food system and fruit and vegetable consumption, and farm-to-school and farm-to-preschool studies. The main findings of this review follow.

Parental influence on children's eating behaviors

Parents have been identified as a major influence in determining fruit and vegetable intake in children.[12,13] Parents play a significant role in what foods a child is exposed to, which foods children are willing to try, and what is offered to the children every day to eat.[14,15] Ventura and Birch conducted a review of the research on the relationship between parenting, children's diets, and weight; they found that if healthier options are made accessible and available to children when they are young, then a pattern of healthy eating is more likely to continue as they grow.[14] The review concluded that cross-sectional studies have shown that what a parent consumes, and how much a parent consumes can influence what his or her child(ren) consume.[14] In this same review, the authors noted that intervention studies indicated that children are influenced to eat certain foods based on the availability of the foods at home, in school, and at restaurants.[14] In an observational study, dietary recalls of fifth and sixth graders at private schools in Houston, Texas were collected

along with questionnaires filled out separately by the children and their parents regarding accessibility and availability of food including fruit, juice, and vegetables.[16] The availability of food includes what is stored in the home, provided in meals at various locations (home, school, restaurant), and the number of times the child is exposed to the food.[16] All of these outcomes depend on various factors including, the family income, knowledge about nutrients and calories needed, location of mealtime, and the distance from home to grocery stores, markets, etc. The study found that what the parents reported as accessible ($\bar{x} = 0.13$, $p < .05$) and what the children reported as available ($\bar{x} = 0.21$, $p < .05$) were significant indicators of the child's reported intake.[16] Children are dependent on their parents or caregivers to make food available for their consumption. Therefore, the type of food provided influences what and how much a child might consume.

Parents usually decide what and how much will be served for the meals eaten at home, especially for young children.[15] A cross-sectional study, published in 2014, used an objective measure (photographs taken in the home during dinnertime) to assess the influence of the portion sizes served to children by their parents on the actual amount the children ate.[15] They found that the amount parents served themselves and the amount they served their preschool-aged children was significantly connected (0.88, $p < .001$) with how much the child ended up eating.[15] Although exact causal conclusions cannot be drawn, and the suggested associations cannot be generalized to other populations, this study gave insight into what may actually go on at the table between parents and children. Cross-sectional and some longitudinal data also suggested that there is an association between parent modeling and portion sizes offered by parents to children, and the influence these factors had on what a child ate.[8-11] Although there is a need for evidence-based, conclusive

data on this subject, it is clear that what a parent eats, the foods they make available, and what they serve their children are important factors in what their children ultimately consume as part of their diet.

Barriers to purchasing fruits and vegetables

Parents help facilitate the food habits and preferences of their children; however, the majority of adults and children in America do not consume the recommended daily amounts of fruits and vegetables. A variety of barriers have been identified to purchasing and consuming those foods.[17] Nicklas and colleagues identified price, lack of accessibility, seasonality, taste, variety, spoilage, preparation, family habits, and competing foods as barriers to fruit consumption among ethnically diverse parent-child dyads.[18] In addition to the barriers identified for fruit intake, barriers to consuming vegetables also included: preference, unfamiliarity, perception of lacking nutrients, fear of new vegetables, lack of preparation ability, and lack of knowledge about recipes.[18] For low-income populations the barriers to purchasing and consuming fruits and vegetables can be even more burdensome. Environmental barriers such as, accessibility, availability, transportation, quality, and cost may be particularly oppressive.[19] Haynes-Maslow and colleagues conducted a qualitative study in North Carolina to identify societal barriers to fruit and vegetable consumption among members of low-income communities.[19] They found that many individuals wanted to purchase fresh fruits and vegetables and support local farmers, but stated that they lacked the means (money, transportation, and time) necessary to do so.[19] Participants also acknowledged that appealing to their children's preferences for convenient and fast food was a barrier to introducing their family to a variety of fruits and vegetables.[19]

Participating parents stated that they wanted to provide food their children liked rather than create an argument by offering fruits and vegetables to which they weren't familiar.[19] Similar barriers were identified in a study conducted by the Produce for Better Health Foundation (PBH).[20] In this study, 265 mothers with children 10 years old or younger were surveyed about their perceptions of fruits and vegetables via an online portal. Although this sample had a higher socioeconomic status than the previously mentioned studies, the participants also reported that their family's food preferences was a barriers to providing fruits and vegetables for their children.[20] Additional barriers included a need for recipes that incorporated fruits and vegetables and cost.[20] However, unlike lower-income populations, cost was not listed as the most pressing barrier.[20]

Leone and colleagues conducted a study of 341 low-income individuals in eight counties in North Carolina to assess the barriers and facilitators to fruit and vegetable purchases at farmer's markets.[21] The most common attitudes related to fruit and vegetable purchases were that the produce were too expensive to purchase, respondents desired easier access to local produce, and they needed simple recipes for increased consumption of these foods.[21] Respondents indicated that they did not use farmer's markets because they were not able to use Supplemental Nutrition Assistance Program (SNAP) and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) benefits at the markets (35.9%), and they were unaware of markets locations and hours (35.3%).[21] Respondents stated that they would be more likely to use farmer's markets if they had adequate transportation, more information about fruits and vegetables available for purchase, and if there were activities for their children at the markets.[21] The researchers also inquired about strategies to increase access to fruits and vegetables. They identified

that the majority of respondents would be more likely to use farmer's markets to purchase fruits and vegetables if they were located in convenient locations like health departments or work sites.[21]

Lack of accessibility to good quality, reasonably priced fruits and vegetables was a consistent theme throughout the literature. Facilitators of fruit and vegetable consumption included easier access, simple recipes, and cost-saving options. Parents may desire to provide their children with nutritious foods including fruits and vegetables, but many barriers seem to outweigh the perceived benefits, especially in low-income populations.[18,19,21] Behaviors, such as purchasing and consuming fruits and vegetables, may be explained by the Theory of Planned Behavior (TPB).[22] The TPB describes intention as the central component of behavior and behavioral change. The theory is made up of six constructs that influence intention and thus behavior including, attitudes, behavioral intention, subjective norms, social norms, perceived power, and perceived behavioral control.[22] Barriers, like those described in the previous studies on fruit and vegetable consumption, could be present and affecting the ability of these constructs to influence intention and ultimately behavior change.[23] Barriers such as cost, transportation, family preference, and lack of accessibility could all hinder a person from performing a particular behavior, like purchasing fruits and vegetables. With this understanding, interventions that aim to influence behavior may eliminate some of these barriers to allow for planned behavior to take place. For example, providing convenient and affordable access to fresh fruits and vegetables could help individuals exert more control over the desired behavior of purchasing and consuming more fruits and vegetables.

Accessibility to farmer's markets and fruit and vegetable consumption

In addition to parental influence, accessibility has been identified as a key component in determining fruit and vegetable intake in children.[12,13] The World Health Organization (WHO) defines food accessibility as "having sufficient resources to obtain appropriate foods for a nutritious diet."[24(p1)] Preschool-aged children, ages 2 to-5-years-old, rely almost exclusively on their parents and other caregivers to provide them access to certain foods. A review of quantitative literature identified accessibility as one of the major determinants for consumption of fruits and vegetables in children.[12] In 2011, a follow-up to the quantitative review used qualitative data to further identify the determining factors in children's fruit and vegetable consumption.[13] The review concluded that the main determining factors of children's consumption of fruits and vegetables include availability, such as variety, visibility, methods of preparation, quality of fruits and vegetables, and access to unhealthy foods.[13] Flournoy identified location and improvement of grocery stores, farmer's markets, community-supported agriculture (CSA), and community gardens as the best ways to increase access to and consumption of to healthier foods like fresh fruits and vegetables.[25]

One way to increase fruit and vegetable consumption is to increase accessibility to these food items through access to farmer's markets.[25] Farmer's markets provide consumers with a place to find seasonal goods, the majority being locally grown fruits and vegetables, as well as local meats, grains, and dairy products. Farmer's market stands are similar to farmer's markets; however, they are smaller than traditional markets, with as few as 2-3 farmers.[26] Farmer's markets have been identified as a way to increase purchase and consumption of fruits and vegetables; however, some populations, especially those that

are low-income, find the locations and hours of operation as barriers to shopping there.[19] Research has shown that when farmer's markets are located in convenient and readily accessible locations to community members, fruit and vegetable consumption increases.[26-28] Three studies published in the last two years found that increased access to farmer's markets and farmer's market stands had a positive effect on fruit and vegetable consumption.[26-28] Evans and colleagues set-up farm stands in low-income neighborhoods and found significant increases in fruit and vegetable intake among participants before and after the stands were placed.[26] Significant increases in intake included: fruit juice ($\bar{x}$ = 0.54 to 0.85, p = .000), whole fruit ($\bar{x}$ = 0.49 to 0.96, p = .000), green salad ($\bar{x}$ = 0.44 to 0.57, p = .017), tomatoes and salsa ($\bar{x}$ = 0.47 to 0.67, p = .006), and other vegetables ($\bar{x}$ = 0.52 to 0.75, p = .001).[26] Two of these studies, including that from Evans and colleagues, were longitudinal, [26,27] but the most recent one was cross-sectional, which made it difficult to determine if individuals that already consumed more fruits and vegetables were more likely to shop at farmer's markets, or if their increased consumption of fruits and vegetables was due to shopping at the farmer's market.[28] Many of the studies published on the relationship between farmer's markets and dietary intake consisted of interventions that place markets in close proximity to the target population. For example, a mobile food store (MFS) that provided fresh fruits and vegetables to an at-risk community in the United Kingdom, followed a specific route near the targeted population during the intervention.[29] In this study, a significant increase of 1.2 servings per day (95% CI 0.83-1.48, p < .001) in combined fruit and vegetable consumption was found after the implementation of the MFS. In addition, participants reported that the use of the MFS was the reason for this increase, and that they used the MFS because of accessibility more than price.[29] Interventions that

involve participation among community members have shown promise in increasing accessibility to fruits and vegetables and helping define areas of further research. "The Veggie Project" was an intervention that tasked Boys and Girls Club adolescents to run a farmer's market for their parents and community members.[30] The adolescents provided incentives like "Super Shopper" vouchers for their customers to use at the farmer's markets in return for filling out research surveys.[30(pg213)] The qualitative data collected during this intervention provided insight into the types of components that may be helpful in future farmer's market interventions. Specifically, these included the need for an incentive for purchasing fruits and vegetables at farmer's markets, involvement of youth for self-efficacy building, and the need for evaluation criteria in future research.[30] All of the reviewed studies lacked a control group, presenting limitations in the literature and an area for future research.

Connection to local-food system and fruit and vegetable consumption

Farmer's markets provide access to fresh fruits and vegetables for adults and children, which may increase consumption of these foods.[25-28] In addition, farmer's markets provide a way for consumers to get to know who produces the food they're purchasing. This relationship, coined by the phrase "know your farmer, know your food" is an initiative of the United States Department of Agriculture (USDA) that seeks to provide connections between local farmers and consumers while promoting healthy dietary intake and nutrition education.[31] For children and their parents, this connection can be made in many ways.

In a review of intervention studies that focused on increasing fruit and vegetable consumption in children, the most successful programs involved local food and farmers.[32] Another review, which looked at 10 studies that evaluated the effect of serving locally sourced fresh fruits and vegetables in the school cafeteria, found increased consumption of fruits and vegetables in participating children.[33] Although only limited research has been completed that connected families to the source of their food, positive changes that effected both child and parent dietary intake, have been demonstrated.[33] Parents reported changes in the way they shopped for groceries and what they cooked at home, which ultimately influenced what their children consumed.[33] Additionally, Nanney and colleagues found that parents and preschool-aged children who regularly consumed home-grown produce were 2.3 times as likely to eat the recommended daily servings of fruits and vegetables.[34] Registered dietitian nutritionists with the Center for Health Promotion and Disease Prevention concluded that this study suggests that eating locally sourced fruits and vegetables by increasing access to farmer's markets, gardens, and farm-to-school programs can help families increase their consumption of these vital foods.[35]

Gardening and farm field trips are additional ways to connect children with their food and help them understand the source of the fruits and vegetables. In 2009, 11 studies were identified that used garden-based nutrition education to influence various nutrition-related factors in children.[36] Of these factors, fruit and vegetable intake, willingness to try fruits and vegetables, positive changes in preferences, and an increase in nutrition knowledge related to fruits and vegetables were common measures.[36] The review concluded that gardening as part of nutrition education in schools provided an opportunity to increase fruit and vegetable consumption in children. This review's conclusions were

similar to other reviews concluding that the research is limited and needs improvement in evaluation tools and outcome measures.[36] A more recent review of the topic was conducted by Langellotto and Gupta, which included 20 studies that focused on garden-based nutrition education.[37] The most noteworthy result of their meta-analysis was the significantly positive impact gardening had on vegetable preference ($E^{++} = 0.10$, fail-safe number = 0) and fruit and vegetable consumption ($E^{++} = 0.08$, fail-safe number = 0).[37] In particular this review highlighted the difference in outcomes between groups that received nutrition education and groups that received gardening experiences. The authors found that participants that received only nutrition education increased their knowledge about nutrition, but did not increase their preference for or consumption of fruits or vegetables. Conversely, participants that received gardening interventions increased their preference for and consumption of fruits and vegetables, but did not increase their nutrition knowledge.[37] These review studies indicated that incorporating multiple components like nutrition education and gardening, instead of one or the other, enhanced the effects programs can have on fruit and vegetable knowledge, preference, and consumption in children.[37]

In addition to including gardening as part of nutrition education curricula, field trips to local farms may provide similar experiences for children. Moss and colleagues conducted a study with third graders and compared fruit and vegetable consumption in an intervention group that received nutrition education plus a farm tour to a control group that received only nutrition education.[38] They measured fruit and vegetable consumption and knowledge about nutrition and farms.[38] For both groups, there were significant differences in nutrition knowledge before and after the intervention. These included

increased knowledge about fiber (χ^2= 11.697, p < 0.001) and vitamins and minerals in fruits and vegetables (χ^2= 4.458, p <0.05).[38] Additionally, self-reported consumption of fruits and vegetables at school increased significantly for both groups (χ^2= 3.936, p <0.05).[38] There were no significant differences in self-reported fruit and vegetable consumption between the groups.[38] The measure used to assess fruit and vegetable consumption was a self-reported survey completed by the third graders, which may not accurately capture actual behaviors. Additionally, the authors indicated that the control and the intervention groups both had prior knowledge about farms and a farmer's role in growing fruits and vegetables, so this could have accounted for why the results were not significant for the group that went on the farm tour.[38] Moreover, a plate-waste assessment indicated that both control and intervention groups increased their fruit and vegetable consumption post nutrition education and the farm tour respectively.[38]

Bevan and colleagues conducted a pilot study that examined the effect that an interactive farm field trip had on knowledge of and willingness to try fruits and vegetables in low-income fifth graders.[39] Students answered more questions about vegetables correctly on the post-surveys compared with the pre-surveys, however it was only significant (statistics not included in article) for root vegetables.[39] This study only included a one-time experience for the students and did not have a control group.[39]

Farm-to-School and Farm-to-Preschool

Farm-to-School is a USDA initiative lead by the USDA Food and Nutrition Service (FNS) that strives to connect local food and farmers with schools to help children and their families make healthier food choices.[40,41] The National Farm-to-School Network started as a

grassroots movement in the 1990s with only a few schools participating.[40] Currently, farm-to-school programming is taking place in some capacity in all 50 states, and as of the 2013-2014 school year more than 42,000 schools in the United States had farm-to-school programs, reaching nearly 24 million children.[41] Farm-to-school focuses on getting local healthy foods into the school lunch environment, providing gardening experiences, and educating children about healthful food.[40]

Farm-to-Preschool is an arm of the National Farm-to-School Initiative with a focus on early childhood development.[42] The CDC has indicated areas in public health nutrition that could influence fruit and vegetable consumption in children.[2] The CDC highlighted the importance of the need for early childhood education and a concentration on young children's food environments.[2] Many approaches to the planning and implementation of farm-to-school programs exist.[41] The activities that can be implemented as part of farm-to-school or farm-to-preschool programs include: school gardens, taste tests of locally sourced foods, the use of salad bars and local produce in the meals served at school, farm visits, nutrition education, and farmer's markets or a CSA pick-up provided at the school.[42] Programs can implement one of these activities, some, or all of them. Reviews of the research have found that programs that only have one farm-to-school component tend to have less of an impact than those that combine multiple targeted approaches.[33,43] Farm-to-school programs and their activities give insight into what components should be included in farm-to-preschool programs. A recent review on the topic of farm-to-school, recommended that programs should include multiple activities within one intervention with a focus on the Social Cognitive Theory.[44] The Social Cognitive Theory is used in many nutrition programs as the basis for behavioral change.[31] It incorporates personal factors

and environmental experiences that may influence behavioral change.[44] The social cognitive theory can be incorporated into the Socio-Ecological Model, which theorizes that multiple levels outside the individual influence behavior.[45] Farm-to-school and farm-to-preschool programs seem to provide children and potentially their parents with opportunities for behavioral changes through modeling, self-efficacy, and positive reinforcement.[44] The combination of nutrition education and farm-to-school activities in a population that is at a critical age for learning and creating lifelong habits could be a way of increasing fruit and vegetable consumption. However, more research with more stringent evaluation should be completed to find out if these methods influence dietary behaviors.[44]

As stated previously, Moss and colleagues utilized the combination of nutrition education provided by the Coordinated Approach to Child Health Curriculum (CATCH) plus a farm-to-school activity in the form of a farm tour, which showed improvements in nutrition knowledge of third graders as well as their fruit and vegetable consumption while at school.[38] However, this study did not find a correlation between the farm tour and the third graders self-reported dietary intake. In addition, this intervention only lasted four weeks and included a control group for the farm tour, but not a control school, limiting the scope of the results.[38] Bontrager-Yoder and colleagues evaluated the effect of farm-to-school programming that involved nine schools and 1,117 third and fourth graders in Wisconsin.[46] This study utilized knowledge surveys and food frequency questionnaires along with objective measures like pre- and post-photographs of meals to assess knowledge, likeability, inclination to try, and consumption of fruits and vegetables after exposure to a farm-to-school intervention.[46] The farm-to-school programs had very different activities, and some programs had been implemented for a longer period of time

than others.[46] Significant results included: overall increases in scores for attitudes towards trying fruits and vegetables ($\bar{x}$ = 59.4 to 61.4, p = <.001), knowledge of nutrition and agriculture ($\bar{x}$ = 11.7 to 12.3, p = <.001), exposure to fruits and vegetables ($\bar{x}$ = 16.6 to 17.2, p = <.001), and willingness to try fruits and vegetables ($\bar{x}$ = 17.9 to 18.3, p = <.001) in all schools participating during the intervention period.[46] However, when results were stratified based on the number of years schools had been involved in farm-to-school programming, the schools that had been involved for one year or more significantly increased participants' knowledge of fruits and vegetables more than the schools that had begun programming that year ($\bar{x}$ = 11.3 to 12.7 for year one, p < .001 and 11.8 to 12.3 for year two, p < .001).[46] Additionally, children who were part of a new farm-to-school program indicated a decrease in liking of fruits and vegetables tasted.[46] The mealtime photographs did not indicate significant differences, but the variety of fruits and vegetables served at school mealtime increased through the years during the program.[46] This study was unique in that it included a large sample of students exposed to farm-to-school programming and incorporated a variety of measures related to fruit and vegetable knowledge, likeability and consumption. However, like many farm-to-school studies, a control group and the ability to randomize was lacking.[46] Additionally, these programs focused their farm-to-school efforts solely on the children participating and not on gaining parent support in helping their children make dietary changes.

Research is limited regarding fruit and vegetable intake in families who participated in farm-to-school programs. However, some studies have indicated positive changes when parents are engaged.[33] In 2008, three farm-to-school programs were identified that had

parent components.[9] The studies reported positive changes in behaviors, knowledge, and attitudes that could influence their children's diets.[33]

Although farm-to-preschool is a new area of research, some programs have been documented.[47-49] Hoffman and colleagues implemented a farm-to-preschool model called Farm to Family in four Head Start programs in Boston, Massachusetts.[49] Their project provided families the opportunity to participate in weekly, subsidized farm shares for pick up at Head Start centers. Parents and caregivers could use their SNAP benefits, cash, check, debit or credit card, or money order to purchase shares. Newsletters and recipes were provided in the produce boxes each week. Additionally, children participated in a farm field trip to help them understand where their food comes from. Twelve percent (n=42) of the families participated in the program and four percent (n=14) of the families completed pre- and post- surveys that evaluated perceptions of the program and family and child eating behaviors.[49] The majority of participating families reported already incorporating an adequate amount of fruits and vegetables into their family's meals and snacks with no statistically significant changes found between pre- and post- evaluation.[49] For those families who participated, the program was well accepted; however, there was a desire for more fruit from the farms and more vegetable variety in the weekly produce boxes.[49] Head Start staff and coordinators of the farm shares expressed satisfaction with the program in terms of providing families with affordable access to fruits and vegetables while also educating families about how to use them.[49] However, they reported challenges including a gap between the family's knowledge about local produce and the fruits and vegetables available seasonally from the participating farms.[49] One coordinator reported "the grocery stores have distorted our understanding of seasonality" and attributed this to some of the

dissatisfaction and dropout rates (52% overall) among families.[49(p172)] This study lacked a control group and rigorous evaluation tools, representing a gap in the literature.

Gibson and colleagues published a farm-to-preschool study in 2014, which also had a component that provided fresh produce to families at Head Start centers.[47] This study took place in Head Start programs in Kansas and compared the nutrient quality of locally sourced meals (meals served with local fruits, vegetables, whole-grains, and dairy products) and meals normally served in childcare centers using a plate-waste method.[47] The researchers found that the children who ate the locally sourced meals consumed a significantly higher amount of calories from protein (22.8% vs. 21.0%, $p = .001$), servings of whole-grains (1.2% vs. 0.2% $p < .001$), orange vegetables (20% vs. 9%, $p < .002$) and a significantly lower amount of calories from fat (25.7% vs. 28.5%, $p = .004$) and servings of fried potatoes (0% vs. 13%, $p < .002$).[47] This program also provided 22 weeks of nutrition education and fresh produce at the center once per month for parents to take home.[47] Additionally, the researchers aimed to characterize how the individuals involved, i.e., parents, teachers, and staff, felt about the farm-to-preschool program. This information was collected through in-depth interviews and focus groups.[47] The farm-to-preschool program was generally well accepted; however, lack of communication between the researchers and the childcare centers was identified as a barrier to the success of the program.[47] This study lacked a control group and only measured what the preschoolers ate while at the childcare center.[47] While childcare centers and preschools provide a significant amount of preschoolers' daily food intake, the food available at home is a crucial determinant of what children consume.[9,12,13]

Izumi and colleagues recently published a study (in 2015) that evaluated the effect of a farm-to-preschool intervention on the willingness to try and liking of fruits and vegetables in a Head Start program in Oregon.[48] Their study sample included 226 preschoolers who were non-randomly placed in either the control, low-intervention, or high intervention group. The low-intervention group received menu changes to the Head Start foodservice production, which included integrating carrots, butternut squash, sweet potatoes, cabbage, turnips, rutabaga, berries, beets, and asparagus into the preschoolers meals along with four hours of hands-on training for the foodservice staff.[48] The high-intervention group received the same foodservice modifications along with nutrition education through the Harvest for Healthy Kids curriculum. This gave the children additional opportunities to taste and experience the target fruits and vegetables in their classrooms. Teachers at the Head Start centers implemented the curriculum and received four hours of training along with an additional two hours mid-way through the intervention.[48] The intervention lasted for nine months and compared pre-and post-intervention data across groups. The children were presented with each target fruit or vegetable, and their willingness to try and liking of the foods were recorded.[48] Results indicated that the high-intervention group was more willing to try the target fruits and vegetables than the other two groups. The proportion of preschoolers willing to try the fruits and vegetables in the low-intervention group increased significantly ($p < 0.05$) from pre-to-post for cabbage (79% to 89.7% $p = 0.01$), turnips (65.8% to 80.8% $p = 0.02$), rutabaga (49.1% to 74.4% $p = 0.01$), and beets (64.9% to 80.8% $p = 0.01$) compared to the high intervention group who's proportion of preschoolers that were willing to try the fruits and vegetables increased significantly ($p < 0.05$) for all nine target foods including, carrots

(87.0% to 9.2% p = 0.04), butternut squash (71.1% to 88.5% p = 0.007), sweet potatoes (70.1% to 87.0% p = 0.007), cabbage (77.% to 96.2% p = <0.001), turnips (64.4% to 88.5% p = <0.001), rutabaga (55.4% to 84.4% p = <0.001), beets (60.8% to 89.7% p = <0.001), berries (72.2% to 92.3% p = <0.001), asparagus (61.3% to 85.9% p = <0.001).[48] There were no significant results found in the control group for willingness to try the target foods.[48] For the liking construct, the results for the low and high intervention groups were more similar. The proportion of preschoolers who liked the fruits and vegetables increased significantly pre-to-post for three foods; the low-intervention group's significantly increased liking for carrots (54.0% to 71.4% p = 0.04), cabbage (59.0% to 75.7% p = 0.03), and berries (69.7% to 84.7% p = 0.04), and the high intervention group significantly increased liking for carrots (61.5% to 76.0% p = 0.04), rutabaga (44.2% to 78.1% p = 0.004), and berries (77.2% to 95.8% p = 0.001).[48] The proportion of children who indicated liking the fruits and vegetables in the control group increased significantly pre-to-post for cabbage (90.9% to 70.3% p = 0.04) and asparagus (75.0% to 48.9% p = 0.01).[48] This study was the first to evaluate willingness to try and liking of fruits and vegetables after the implementation of farm-to-preschool program components. Their findings suggested that farm-to-preschool activities can be used to change liking for fruits and vegetables among three to five year olds in early childhood settings. However, this study used a quasi-experimental approach and the three groups differed slightly in their ethnicity and first-language makeup; thus the comparisons of the three groups were less reliable. In addition, willingness to try and liking of fruits and vegetables are a good start to understanding the effect of program implementation, but measuring preschoolers' consumption and the

availability of fruits and vegetables in the home could provide additional important information.

A component with the least amount of research as part of a farm-to-preschool program is the implementation of farmer's markets at childcare centers. Bringing a farmer's market to the location where parents are dropping off and picking up their children would provide them with opportunities to learn about and purchase fresh fruits and vegetables for their families. Because of parents' contribution to shaping their children's eating behavior and controlling what foods are available and accessible at home, parent involvement in farm-to-preschool programs is crucial.[9] Nutrition education programs that incorporate parent involvement on healthy lifestyle knowledge, local foods, and access to convenient sources of fruits and vegetables are needed. In nutrition education programs that use curricula such as CATCH, children learn various concepts about healthy foods. However, without parental and family involvement, behavioral changes may fall short of the intervention goals. Berkenkamp and Mader focused on the successes and barriers of farm-to-preschool programs and evaluated three organizations that provide examples of successful farm-to-preschool programs.[9] All three of the highlighted programs had some form of parent engagement.[9] This evaluation led to recommendations from the Institute for Agriculture and Trade Policy that encouraged parent involvement in future farm-to-preschool programs.[9] Through the evaluation of various farm-to-preschool programs and other programs that aim to increase fruit and vegetable consumption in preschool-aged children, researchers have suggested that parental involvement be a key focus in future research.[38,50] Additionally, there is a need for more innovative approaches that target parents as part of a preschool program aimed at

increasing fruits and vegetables in the diets of preschoolers.[50] Involving the whole family in supporting what children are learning at school about healthy and local foods could help motivate parents to incorporate more fruits and vegetables into their children's meals. This parental support and whole family involvement incorporates the interpersonal level of the Social Cognitive Theory and the Socio-ecological Model.[44,51]

Limited research is available regarding farm-to-preschool and dietary changes at home. Among the literature on farm-to-preschool and the implementation of farmer's markets in various communities, it is apparent that there is a need for randomized control trials to better evaluate the effect of such interventions on the consumption of fruits and vegetables in preschool-aged children.[52] Control schools that also receive nutrition education without the farm-to-preschool components are needed to better understand what components contribute to changes in dietary intake. The main question of concern is, "Does the nutrition education component or the combination of the nutrition education program with farm-to-preschool activities elicit change?" The lack of evaluation strategies like pre- and post-surveys of farm-to-preschool activities are a gap in the current literature.[28] The incorporation of parental involvement through childcare farmer's markets as part of a farm-to-preschool program with evaluation methods along with control groups could help determine if these types of interventions make a difference in fruit and vegetable consumption in children.

Conclusion

Accessibility and parental involvement have been identified as important factors in determining fruit and vegetable consumption among preschool-aged children.[12,13] Farm-to-

preschool activities provide an opportunity to increase access to fresh fruits and vegetables, connect with local farmers, and engage parents in supporting positive changes in their children's dietary behaviors.[7] The incorporation of farmer's markets at childcare centers along with other farm-to-preschool activities has the potential to engage parents and provide them with increased access to fresh fruits and vegetables. Ultimately, these types of multi-component programs could positively influence the consumption of fruits and vegetables in preschool-aged children; however, research assessing this is lacking. Thus, the implementation and evaluation of programs with rigorous evaluation tools and a control group that engage both preschoolers and their parents in farm-to-preschool activities to increase fruit and vegetable consumption is necessary.

Theoretical Framework

The Socio-ecological model (SEM) provides a theoretical framework for individual behavior change.[45] It is used in various health promotion programs as a guide to understanding how the interpersonal (parent and peer support), organizational (school and work environment), community (access and availability within environment), and policy (laws and regulations) levels can influence the intrapersonal level in terms of change.[51] This is especially important in the preschool population because of their reliance on parents, caregivers, teachers, and the school environment to shape their decisions and habits.

An enhanced version of the SEM will be utilized for this study.[51] The National Farm-to-School Network identified that a framework was needed for farm-to-school programs and sought to develop and test an appropriate model.[51] This model also incorporates other

theories like the Social Cognitive Theory and the Poly-theoretical, which have been recommended for use in these types of programs.[51,53] The farm-to-school network collaborated with key stakeholders to create the "Socio-Ecological Hybrid Model Applied to Farm to School" and has recommended it for use in planning, implementing, and evaluating future farm-to-school and farm-to-preschool programs (Figure 1).[51]

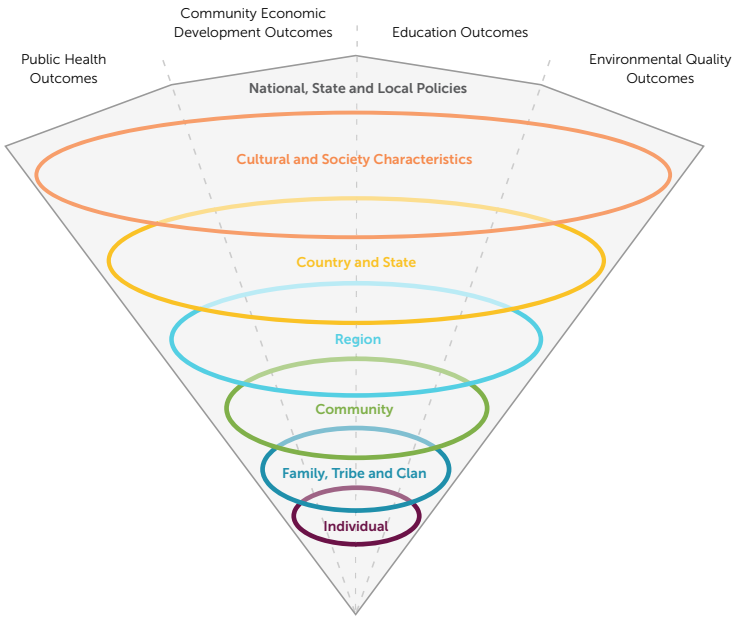

Figure 1. Socio-ecological hybrid model applied to farm to school. Adapted from Joshi a, Henderson T, Ratcliffe MM, Feenstra G. Evaluation for transformation: a cross-sectoral framework for farm to school. National farm to school network. 2014.

This model provides four "lenses" through which to view farm-to-school: public health, community economic development, education, and environmental quality.[51] Through a public health lens, farm-to-school and farm-to-preschool programs strive to provide children and their families with easy access to healthy and local foods.[51] Additionally, programs aim to provide nutrition education to help families make healthy

food decisions and foster healthy habits.[51] Thus, this project used a public health lens with a focus on the individual and family, tribe, and clan levels to guide planning, implementation, and evaluation processes. For this project, preschoolers were the central focus and target of the research questions; thus, they were considered the individuals in the intrapersonal level. Additionally, because individuals in the family, tribe, and clan level, specifically parents, have a strong influence on what is made available for consumption for their preschool-aged children, the interventions in this project also targeted parents. The researchers hypothesized that preschool-aged children would be influenced by their parents' behaviors because of the relationship between the intrapersonal and the family, tribe, and clan levels of the SEM.

Further, the Theory of Planned Behavior (TPB) can be considered as part of the SEM at the intrapersonal level and was used to implement and evaluate the parent-targeted portion of the intervention.[22] The TBP is a theoretical framework used to explain human behavior with intent being the most important driving factor.[22] As described earlier, parents play an important role in determining what their young children eat, and thus understanding their planned behavior, intentions, and attitudes towards purchasing fruits and vegetables is essential. The TBP applied to parent's purchasing fruits and vegetables is displayed in Figure 2.

Research Questions

The purpose of this study was to test if differences exist in household fruit and vegetable availability and preschoolers' consumption of fruits and vegetables between two modes of intervention. These interventions include 1) Health Happens! standard

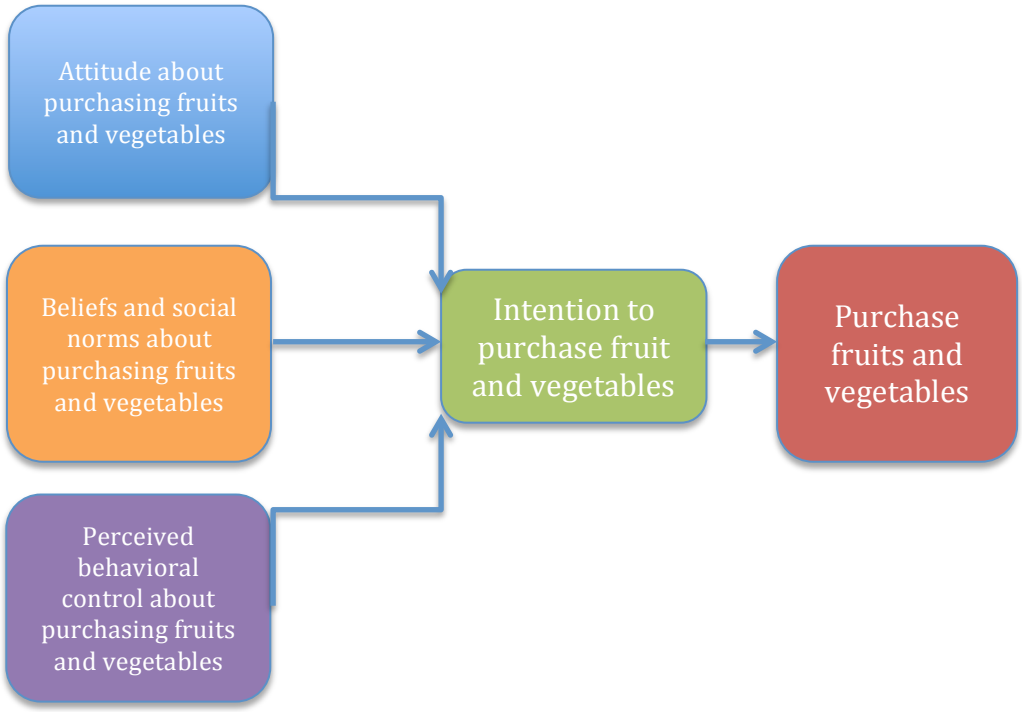

Figure 2. Theory of Planned Behavior applied to purchasing fruits and vegetables

intervention (control) and 2) Health Happens! intervention plus a small-scale farmer's market and gardening experiences for preschoolers (farm-to-preschool experimental intervention). The specific research questions were:

1. Does household fruit availability and fruit consumption in preschoolers significantly increase ($p < 0.05$) among preschoolers whose families participated in the farm-to-preschool experimental intervention compared to those who participated in the standard intervention (control group)?
2. Does household vegetable availability and vegetable consumption in preschoolers significantly increase ($p < 0.05$) among preschoolers whose families participated in the farm-to-preschool experimental intervention compared to those who participated in the standard intervention (control group)?

Secondary outcomes:

1. Is parental intention to purchase fruit correlated with reported home availability and preschoolers' consumption of fruit and do differences exist between the intervention and control groups?
2. Is intention to purchase vegetables correlated with reported home availability and preschoolers' consumption of vegetables and do differences exist between the intervention and control groups?

Aims

Specific aim: ***Increased access to and consumption of fresh fruits and vegetables of preschool-aged children by implementing farm-to-preschool activities that included a small scale farmer's market at the preschool for parents during pick-up***

time. This aim was measured through pre- and post-home food inventories and food frequency questionnaires completed by parents of the preschoolers. These were compared with home food inventories and food frequency questionnaires from the control group.

Hypotheses

The researchers hypothesized that the farm-to-preschool experimental intervention group would have significantly higher fruit and vegetable availability at home compared to the control group as assessed by a home food inventory. Additionally, researchers hypothesized that preschoolers in the farm-to preschool experimental group would have significantly higher fruit and vegetable consumption than preschoolers in the control group as assessed by a food frequency questionnaire completed by preschoolers' parents.

CHAPTER 2: MANUSCRIPT

Introduction

Increasing consumption of fruits and vegetables (F&V) is a key recommendation of the 2015 Dietary Guidelines for Americans.[1] Adequate intakes of F&V in children supports growth and development and shields against preventable diseases such as cardiovascular disease, type 2 diabetes, and cancer.[1] Despite the need for children to consume adequate amounts of F&V, their intake is suboptimal.[2-5] The early childhood years are one of the primary times when food habits and dietary preferences are formed, including an inclination for or against F&V consumption.[6] Research suggests that the timing of introduction to F&V plays an important role in helping children become familiar with certain types of foods and that eating habits and preferences formed at this age may be carried into adolescence and young adulthood.[8]

Parents help facilitate the food habits and preferences of their children.[12-15] They play a major part in shaping their children's food environment, specifically what is accessible and available for their consumption.[12-15] However, a variety of barriers have been identified to purchasing and consuming F&V.[17] For low-income populations the barriers to purchasing and consuming F&V can be even more burdensome. Parents may desire to provide their children with nutritious foods including F&V, but particular barriers may outweigh the perceived benefits, especially in low-income populations. Environmental barriers such as, accessibility, availability, transportation, quality, and cost may be particularly oppressive.[19] With accessibility being a key component in influencing F&V intake in both adults and children, finding ways to increase access to safe, affordable, high

quality F&V is essential.[12,13] Research identifies farmer's markets as an avenue to increase purchasing and consumption of F&V; however some populations, especially individuals with a low-socioeconomic status, find the location and hours of operation as barriers to shopping there.[19] Research indicates that the majority of participants are more likely to use a farmer's market to purchase F&V if it is located in a convenient location like the health department or workplace.[21]

Research shows that when farmer's markets are located in convenient and readily accessible locations to community members, F&V consumption increases.[26-28] Research suggests that preschool-aged children who regularly eat home-grown produce are 2.3 times more likely to eat the recommended daily servings of F&V than preschoolers who rarely or never eating home-grown produce.[34] Additionally, gardening as part of nutrition education in schools provides an opportunity to increase local F&V consumption in children.[36] Research indicates that incorporating multiple components like nutrition education and gardening, instead of one or the other, enhances the effects programs can have on F&V knowledge, preference, and consumption in children.[37]

Farm-to-school is a United States Department of Agriculture (USDA) initiative that strives to connect local food and farmers with schools and help children and their families make healthier food choices.[40,41] The combination of nutrition education and farm-to-school activities in a population that is at a critical age for learning and creating lifelong habits could be a way of increasing F&V consumption. However, more research with more rigorous evaluations need to be completed to ascertain if these methods influence dietary behaviors.[44] Three farm-to-preschool studies that incorporated access to local food to increase preferences and consumption have been published in peer-reviewed

journals.[47,48,49] Hoffman and colleagues implemented a farm-to-preschool model called Farm to Family in four Head Start programs in Boston, Massachusetts.[49] Their project provided families the opportunity to participate in weekly, subsidized farm shares for pick up at Head Start centers while also providing newsletters, recipes, and a farm field trip for the children.[49] The authors did not find any significant differences in family and child eating behaviors, including no change in reported F&V intake.[49] This study lacked a control group and validated tools to measure F&V intake, representing a gap in the literature. Gibson and colleagues compared the nutrient quality and consumption of locally-sourced meals and the meals normally served in a Head Start center in Kansas using a plate-waste method.[47] This program also provided 22 weeks of nutrition education and fresh produce at the center once per month for parents to take home.[47] Results indicated that the children who ate the locally-sourced meals consumed a significantly higher amount of calories from protein, whole-grains, and orange vegetables and a significantly lower amount of calories from fat and servings of fried potatoes.[47] This study lacked a control group and only measured what the preschoolers ate while at the childcare center.[47] While childcare centers and preschools provide a significant amount of a preschooler's daily food intake, the food available in the home is a crucial determinant of what a child consumes.[9,12,13] Izumi and colleagues evaluated the effect of a nine-month farm-to-preschool intervention on the willingness to try and liking of F&V in a Head Start program in Oregon.[48] This study compared results between three intervention levels and incorporated menu changes, food-service staff training, and the Harvest for Healthy Kids nutrition education curriculum.[48] Results indicated that the high-intervention group was more willing to try the target F&V than the other two groups.[48] Both intervention groups increased their liking of the targeted

F&V.[48] Willingness to try and liking of F&V are a good start to understanding the effect of program implementation, but measuring preschoolers' consumption and the availability of F&V in the home would provide increasingly important information.

There is a dearth of research on implementation of farmer's markets at childcare centers as a component of farm-to-preschool programs. The incorporation of farmer's markets at childcare centers along with other farm-to-preschool activities provide an opportunity to increase access to fresh F&V, connect with local farmers, and engage parents in supporting positive changes in their children's dietary behaviors.[9] The implementation and evaluation of programs with rigorous evaluation tools and a control group that engage both preschoolers and their parents in farm-to-preschool activities to increase F&V consumption is necessary.

The purpose of this manuscript is to describe the outcomes of a farm-to-preschool program that was designed to increase preschool-aged (three- to- five years old) children's consumption of F&V and to increase the availability of F&V at home.

Methods

Study Design

This was a pilot study with a two group, quasi-experimental, pre-test, post-test design. An existing nutrition and physical activity program for preschool-age children, Health Happens!, was used as the control group. The intervention group also participated in the Health Happens! program, but this group had additional farm-to-preschool components including: hands-on gardening education for the preschoolers and a small-scale farmer's market at the childcare center for parents to purchase fresh, local F&V. The University of Tennessee Human Subjects Research Office Institutional Review Board (IRB)

approved this study as a revision to the already existing Early Childhood Nutrition and Fitness Education program (IRB-14-09458 B-XP).

Participants and Recruitment

Childcare centers were eligible to participate in the Health Happens! program if they utilized the Child and Adult Care Food Program (CACFP) and had 15 or more children between the ages of three and five years old enrolled. Consent was obtained from the directors of seven childcare centers to participate in the Health Happens! program in fall 2015 and then one center was randomly assigned to receive additional farm-to-preschool components. Three of the seven childcare centers served as the control group for this project. For this study, the parents or guardians of the preschoolers were the main participants of the program and provided data for analysis. Information about participating in the study was sent to all parents at each childcare center. Parents were recruited to participate through flyers displayed at each childcare center, sent home in the preschoolers' folders, and through interactions with Health Happens! coordinators. Parents were given the opportunity to read and sign an informed consent form to participate in the program. Parents were considered participants if they had signed the informed consent form and completed the surveys provided. Surveys were provided through the same means as the flyers and also made available at the in-person Health Happens! family workshop held at each childcare center at the beginning of the program. Parents could continue to choose to enroll in the study throughout the program, as long as they had not been exposed to the parent components, which included attending family workshops or watching the online learning module videos. Parents were offered incentives through weekly drawings for participating in the program. Any parent could sign up for the drawing and was eligible

to win, regardless of participation in any of the intervention components. Control group participants were eligible to win $5 grocery store gift cards, a variety of cooking utensils, and physical activity equipment. Intervention group participants could win $5 vouchers for the preschool farmer's market, $5 grocery store gift cards, seeds, and mini tomato grow kits. Prizes were randomly selected for the drawing winners each week and left in the appropriate cubbies at the childcare centers for parents to pick up.

Evaluation Tools

Participants were asked to complete four surveys at both pre- and post-intervention. The first survey was a modified version of a validated Home Food Inventory (HFI).[54] Parents were encouraged to complete this survey at home based on what was in their kitchen, refrigerator, or pantry. The second survey was a modified version of the Bright Futures in Practice Food Frequency for Children Ages 1-10.[55] This survey was completed by parents and reflected what their preschooler consumed during the previous week. For the purposes of this study, only the F&V categories were analyzed from each of these surveys. The third was a brief survey used to evaluate the intention to purchase F&V, while also categorizing barriers that may exist for parents associated with purchasing these foods. Barriers were assessed by a question that asked participants to check any barriers that made it difficult for them to purchase F&V. The list of barriers included time, money, proximity of the store being too far, transportation, childcare, stores are dangerous, routes to stores are dangerous, none, or other. Participants could also write in additional barriers. To characterize all the barriers participants face when purchasing F&V, the barriers reported on both the pre- and post- surveys were combined together. This survey was adapted from the a pilot-tested evaluation tool used in a report regarding the attitudes and

beliefs of mothers related to F&V.[20] The survey was content validated by obtaining input from experts in the field along with cognitive interviewing of parents with young children before it was disseminated to participants. The fourth survey was a demographic survey.

Program Lessons

Through the Health Happens! program preschoolers in the control and intervention groups received 12 weeks of 60-minute Coordinated Approach to Child Health (CATCH) Early Childhood lessons.[56] The Health Happens! program provided six family workshops, focused on healthful foods and physical activity, for the parents of preschoolers at the childcare center. The curriculum was designed where the first and last workshops were held in-person, and the other four workshops were provided through a series of learning module videos that could be accessed through YouTube, allowing the participants the flexibility of participating in the parent program on their own time.

In addition to the standard preschool and parent lessons, the intervention group was provided with a gardener that established and maintained garden beds at the childcare center during the duration of the farm-to-preschool intervention. The preschoolers participated in hands-on learning experiences in the garden every other week with the gardener as the instructor and facilitator. The experiences included lessons about gardens, a chance for the children to harvest the vegetables, and hands-on activities such as making a healthy snack with the garden produce.

Farmer's Market Procedures

A small-scale farmer's market was established at the intervention childcare center through collaboration with two local farms. The project coordinator ordered produce from the farms each week based on what was seasonally available. Each week the coordinator

procured the produce and set up the market at the childcare center. The farmer's market operated at the preschool a minimum of one day per week for eight weeks, from 4-6 PM. The market was advertised using a large banner and yard signs. Additionally, a flyer with market information, hours of operation, and produce available for purchase was sent home with families and displayed in each childcare room two weeks before the first market and each subsequent week during the market as a reminder. Anyone at the childcare center could purchase produce from the market with cash, check, debit, or credit card. A tasting opportunity and corresponding recipe card was available at each farmer's market. The recipes were chosen based on seasonal F&V, simplicity of preparation for the farmer's market setting, and keeping in mind that they were for busy families. The tasting and recipe cards were designed to feature one or more fruit or vegetable that was available for purchase that week at the farmer's market. To try and increase participation at the market, fun activities for children were incorporated during the fifth week. These activities included F&V face painting and instant-printing pictures with "Cindy the Carrot," a character from the learning module videos. To assess utilization of the small-scale farmer's market, purchases at the farmer's market were recorded each week and the average amount spent per participant and per all customers (participants and non-participants combined) at the farmer's market was calculated and plotted across all eight weeks.

Statistical Analysis

Responses from participants who did not complete the informed consent form and then both a pre- and post-survey packet were not included in the data analysis. Survey data were entered and tested for normality. Baseline descriptive statistics were calculated and tested for between-group differences. Paired sample t-tests were performed using IBM's

Statistical Package for the Social Sciences (SPSS) Version 23.0 to assess differences within the intervention and control group's fruit availability score, vegetable availability score, fruit consumption score, and vegetable consumption score. Independent sample t-tests were conducted to assess the change in mean scores between groups for all variables. The intention to purchase data was not normally disturbed so a spearman's rank-order correlation was used to assess the relationship between intention to purchase F&V and the consumption and availability of F&V. An alpha level of 0.05 was used for all statistical tests.

Results

Overall, forty-four parents participated in the program. Twenty-one parents participated in the intervention group and twenty-three participated in the control. However, only 14 parents (67%) from the intervention group and 11 parents (48%) from the control group completed both pre- and post- surveys and were included in the data analysis. The children of the parents who completed all surveys in the intervention group were significantly older (mean age = 3.5 years SD = 0.58) than the children whose parents only completed the pre surveys (mean age = 2.8 years SD = 0.99) P = 0.05. No other demographic differences existed between parents who completed all surveys and those that only completed the pre survey in the intervention or control group. This was most likely due to the Health Happens! preschool program taking place in room for three- to-four year olds. However, there were infant and toddler rooms on site as well and any parent at the childcare center could participate in the program. This may show that retention rates were higher among parents whose children were participating in all components of the program.

The demographic characteristics of the participants are summarized in Table 1. No significant differences were found between the intervention and control group's demographic characteristics. A summary of parent participation in the program can be viewed in Table 2. All 21 original participants from the intervention group (those who signed the informed consent form) purchased produce at the small-scale farmer's market at least once during the program. Over the eight-week period, an average of five (24%) participating parents purchased produce at the small-scale farmer's market each week. Of the 14 parents who completed both pre- and post- survey packets, an average of four (29%) parents purchased produce at the farmer's market each week. Participants spent an average of $6.04 each week at the farmer's market. Seventeen individuals who were not participants, including parents who did not sign an informed consent form and teachers and staff from the childcare center, purchased produce at least once at the small-scale farmer's market during the eight-week period. All customers spent an average of $5.57 per week. Purchase data can be seen in Figure 3.

No significant differences were found between baseline and post evaluation for the reported mean number of fruit or mean number of vegetables available in the home (Table 3). Pairwise comparisons for the intervention and control groups indicated no statistically significant changes between groups for vegetable availability and fruit availability.

Results indicated that there were no significant differences pre- and post- in preschoolers' reported mean number of fruit or mean number of vegetables consumed in either the control or intervention groups. Table 4 provides a summary of these results. Pairwise comparisons for the intervention and control groups indicated no statistically significant changes between groups for either fruit or vegetable consumption.

Table 1. Demographic characters of participants in the control and intervention groups of the farm-to-preschool study (n = 25).

Characteristics	All n=25	Control n=11	Intervention n=14	p value*
Parent's Age (yr.)	33.1 ± 10.4	31.9 ± 11.7	34.1 ± 9.5	0.60
Child's Age (yr.)	3.4 ± 0.68	3.2 ± 0.78	3.5 ± 0.57	0.20
	----------n (%)----------			
Parent's Gender				0.19
Female	23 (92)	11 (100)	12 (86)	
Male	2 (8)	0	2 (14)	
Child's Gender				0.50
Female	11 (44)	4 (36)	7 (50)	
Male	14 (56)	7 (64)	7 (50)	
Parent's Race				0.66
White	22 (88)	10 (91)	12 (86)	
One or more	2 (8)	1 (9)	1 (7)	
Chose not to answer	1 (4)	0 (0)	1 (7)	
Child's Race				0.18
White	22 (88)	9 (82)	13 (93)	
One or more	2 (8)	2 (18)	0 (0)	
Chose not to answer	1 (4)	0 (0)	1 (7)	
Income				0.31
< $50,000/year	12 (48)	7 (64)	5 (36)	
> $50,000/year	12 (48)	4 (36)	8 (57)	
Chose not to answer	1 (4)	0 (0)	1 (7)	
Supplement				0.31
SNAP	1 (4)	1 (9)	0 (0)	
WIC	4 (16)	3 (27)	1 (7)	
Both	5 (20)	2 (18)	3 (21)	
Neither	15 (60)	5 (46)	10 (72)	
Education				0.84
High school grad or less	4 (16)	2 (18)	2 (14)	
Attended or graduated college	11 (44)	5 (46)	6 (43)	
Graduate degree	9 (36)	4 (36)	5 (36)	
Chose not to answer	1 (4)	0 (0)	1 (7)	

*p value indicates differences in demographics between groups at baseline.

Table 2. Summary of parent participation in program components from the parents in the control and intervention group who completed the informed consent form and both pre- and post- survey packets.

Parent Program Components	Control n=11	Intervention n=14
	----------n (%)*----------	
In-Person Family Workshop 1	8 (73)	2 (14)
In-Person Family Workshop 2	6 (55)	1 (7)
Learning Module Video 1	6 (55)	5 (36)
Learning Module Video 2	5 (45)	3 (21)
Learning Module Video 3	3 (27)	3 (21)
Learning Module Video 4	2 (18)	4 (29)
Farmer's Market Week 1	--	8 (57)
Farmer's Market Week 2	--	6 (43)
Farmer's Market Week 3	--	3 (21)
Farmer's Market Week 4	--	3 (21)
Farmer's Market Week 5	--	7 (50)
Farmer's Market Week 6	--	3 (21)
Farmer's Market Week 7	--	2 (18)
Farmer's Market Week 8	--	3 (21)

*Indicates number and percent of parents who attended workshops, watched videos, or purchased produce at the small-scale farmer's market.

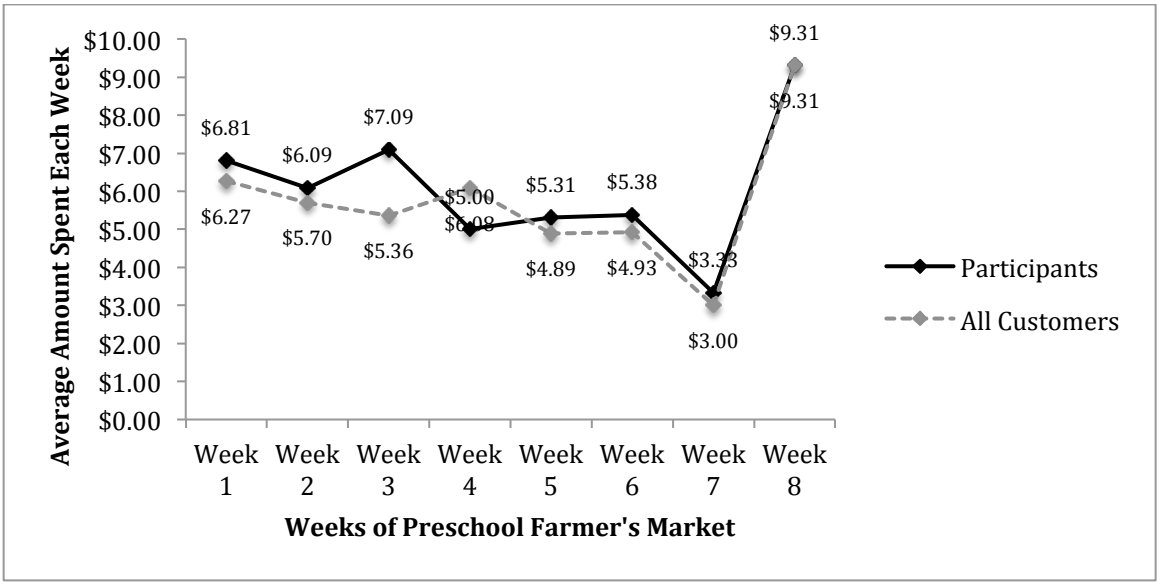

Figure 3. Comparison of average amount spent per participant and all customers on local F&V at the preschool farmer's market in the intervention group.

Table 3. Paired sample t-test comparisons of control and intervention group reported mean number of fruit and vegetables available in the home at pre and post evaluation.

	Vegetables		Fruit	
Time Point	Control Mean (Std. Deviation) n=11	Intervention Mean (Std. Deviation) n=14	Control Mean (Std. Deviation) n=11	Intervention Mean (Std. Deviation) n=14
Pre	12.45 (6.9)	14.21 (7.2)	5.64 (3.1)	7.57 (3.1)
Post	11.82 (6.8)	13.79 (6.9)	5.27 (3.3)	7.00 (3.5)
p value	0.52	0.77	0.57	0.34

Table 4. Paired sample t-test comparisons of control and intervention group preschoolers' reported mean number of fruits and vegetables consumed at pre and post evaluation.

	Vegetables		Fruit	
Time Point	Control Mean (Std. Deviation) n=11	Intervention Mean (Std. Deviation) n=14	Control Mean (Std. Deviation) n=11	Intervention Mean (Std. Deviation) n=14
Pre	4.82 (2.7)	4.86 (2.2)	3.27 (2.4)	4.21 (2.4)
Post	4.55 (2.2)	5.50 (3.0)	3.64 (2.5)	3.79 (2.1)
p value	0.60	0.18	0.63	0.39

Forty-three percent of participants in the intervention group reported at least one barrier to purchasing fruit, including time, money, proximity to the store being too far, transportation, off-season of farmer's market, and farmer's market/grocery store hours conflicting with work hours. Thirty-six percent reported at least one barrier to purchasing vegetables, which were the same as the barriers reported for fruit. Sixty-four percent of the participants in the control group reported at least one barrier to purchasing fruit, including time, money, transportation, childcare, seasonality, and poor selection of produce. The same percentage and list of barriers were found for purchasing vegetables.

Secondary outcomes included the relationship between the intention to purchase F&V and availability and consumption of F&V. For the intervention group, there was a statistically significant, positive correlation between parents' intention to purchase vegetables and preschoolers' consumption of vegetables ($r_s(13) = .541$, $p = .046$). There were no statistically significant correlations between parents' intention to purchase F&V and the availability of F&V or preschoolers' consumption of fruit in the intervention group. For the control group, there was a statistically significant, positive correlation between parents' intention to purchase vegetables and availability of vegetables ($r_s(10) = .701$, $p = .016$). However, no statistically significant correlation existed between parents' intention to purchase vegetables and preschoolers' consumption of vegetables in the control group. There was also a statistically significant, positive correlation between parents' intention to purchase fruit and availability of fruit ($r_s(10) = .782$, $p = .004$) and preschoolers' consumption of fruit ($r_s(10) = .615$, $p = .044$).

Discussion

This was the first study to measure the effect of a farm-to-preschool intervention on home availability and preschoolers' consumption of F&V as reported by their parents. The addition of a control group not receiving any farm-to-preschool activities to compare pre and post results strengthened the limited literature on this topic.[47-49] This study provided participants with a novel small-scale farmer's market at a childcare center allowing parents the autonomy to purchase local F&V while they picked up their children. Two other farm-to-preschool studies provided produce for parents at childcare centers; however, one used weekly subsidized farm shares that cost $5.00 per week[49] and the other only provided produce once monthly and it was not for purchase.[47] The results of this study indicated that home F&V availability did not change significantly after the twelve-week intervention, as measured by a HFI. The objective purchasing data that were collected each week at the farmer's market showed that participants were bringing local F&V home and spending an average of $6.04 each week on produce from the market. Although all 21 of the recruited participants purchased F&V at the farmer's market at least once during the program, on average only 24% (n=5) of participants who turned in the pre-surveys and 29% (n=4) of the participants who turned in both pre- and post- surveys purchased produce at the small-scale farmer's market each week. This participation number is similar to Hoffman and colleagues study which found recruitment and participation of families challenging with only 12% (n=42) of the families participating in the program and four percent (n=14) who completed pre and post surveys.[49] Head Start staff and coordinators of the farm shares expressed satisfaction with the way the program provided families with affordable access to F&V, while also reporting many challenges that may have led to 52% of families

dropping out of the program.[49] Challenges included: parents not picking up their orders that they had already paid for, staff being uncomfortable collecting payments from families, recruitment issues, food spoiling, and inclement weather influencing produce likeability.[49] The current study did not gather qualitative data from the parents and staff at the childcare center, which may have lead to insight into the challenges faced with the program and specifically the utilization of the small-scale farmer's market. The results from the HFI indicated that parents had F&V in the home at baseline in both the intervention (vegetable mean = 14.21 fruit mean = 7.57) and control (vegetable mean = 12.45, fruit mean = 5.64). The number of F&V did not significantly change at post evaluation for either group, potentially indicating that the parents in the intervention group were purchasing their usual F&V at the small-scale farmer's market, and displacing what they usually purchased elsewhere.

Following the intervention, preschoolers' consumption of fruits and vegetables did not change. Similarly, Gibson and colleagues found no change in consumption of total vegetables between local meals and regular meals, as measured by mealtime observations at Head Start centers.[47] However, their study did find statistically significant increases in consumption of vegetable subgroups once secondary analysis was conducted.[47] Hoffman and colleagues found a decrease in the frequency in daily F&V consumption of preschoolers (4.50 to 4.36 times per day) after a farm-to-preschool project that provided access to weekly farm shares.[49] These results were not statistically significant and they were only measured indirectly by asking parents how many times their children consumed F&V throughout the day.[49] Compared with national results from the Centers for Disease Control and Prevention (CDC) on F&V consumption, these results differ slightly.[2,11] Preschool-aged

children already meet the Healthy People 2020 goal for fruit consumption and overall children's fruit intake is increasing, while vegetable intake has remained stagnant and below goal.[2,11] In this study, preschoolers' consumption of fruit may not have changed due to the limited fruit available seasonally. Hoffman and colleagues reported that the participants in their Farm to Family program wished there was more fruit available in their weekly farm shares.[49] Interviews with Head Start staff and project coordinators revealed that they believed families had a distorted view of the types of fruit that should be available year round and a lack of understanding of seasonality.[49] In this current study, the only fruit available for purchase at the small-scale farmer's market was apples, due to the growing season. This is a fruit that most preschool-aged children are already familiar with and consume on a regular basis, thus it may have already been reflected at baseline on the HFI and FFQ.

Limitations

Although this study contributes to the farm-to-preschool literature, limitations exist. The first limitation is the quasi-experimental design and the inability to randomize groups. This is consistent with other farm-to-preschool studies. Gibson and colleagues compared nutrient content of regular meals and locally sourced meals served to the same group of preschoolers on different days, indicating no randomization or true control group.[47] Izumi and colleagues randomized classrooms into different levels of interventions based on classroom operating times and used a single, non-randomly assigned control group.[48] Despite, the quasi-experimental design of this current study, there were no significant differences in baseline demographics, availability, consumption, or intention to purchase F&V between the intervention and control group.

The second limitation is the small sample size. This study took place in conjunction with an already existing program that was limited to the number of preschoolers (and thus their parents) at each childcare center. Additionally, engaging parents to participate in watching the online learning module videos and complete both the pre and post evaluations proved to be challenging. Other research studies conclude that despite great efforts to engage parents in nutrition-related program activities, more needs to be done to harness their valuable participation.[9,47,50]

Thirdly, there are limitations with the evaluation tools. Because preschool-aged children are unreliable sources for what they normally eat, parents or caregivers must be used to obtain this information.[57] As with all dietary assessment methods, this approach has its limitations. Parents may not be present for all of their child's meals and snacks, especially if their child spends most of their day at preschool. Thus, parents may not have clear insight into what their child is actually consuming throughout the day. The HFI also has its limitations. To obtain an objective assessment of what F&V are available in the home, parents were encouraged to take the HFI home and complete it based on what was currently in their kitchen and pantry. However, it is possible that parents did not do this as accurately as hoped. Similar HFI's have been validated and used in previous studies and have been reported to be a successful way to measure availability of food, especially when participates complete the HFI in their home instead of by memory.[58,59] It may have been beneficial to incorporate qualitative measures into the evaluation in the form of in-depth interviews, focus groups, or open-ended survey questions. This would have provided additional information on how the participant's felt about the program and if they thought the farm-to-preschool activities changed what F&V they made available for their

preschooler and how this influenced their preschooler's consumption. This could have been compared to the studies current objective results and used to draw further conclusions. In addition, many positives aspects of the farmer's market being available at the childcare center may have not been captured with the evaluation tools used. Willingness to try and consumption of new F&V at the farmer's market tastings were not captured but could have lead to important findings.

Conclusion

This multicomponent program aimed to specifically engage parents as part of an overall farm-to-preschool program while also providing convenient access to local, affordable, fresh F&V. Although generalizable conclusions are limited due to the small sample size, results indicated that this program did not change the number of F&V available in the home from pre- to- post evaluation but perhaps changed where the participating parents in the intervention group were getting their produce. Additionally, results indicated that this farm-to-preschool program did not increase preschoolers' consumption of F&V. Because lower socioeconomic populations may have substantial barriers to accessing and purchasing fresh F&V, finding ways to create environments with convenient and affordable access to these foods is an ongoing and important pursuit. Other farm-to-preschool strategies with larger sample sizes that involve the whole family and incorporate appropriate evaluation tools should be investigated further. Future farm-to-preschool research may benefit from a mixed methods approach that captures how having local produce available at a childcare center could influence families in a variety of positive ways. Evaluation measures should be designed and used to gather information not only on availability and consumption of F&V but also acceptance of provided taste-tests,

preschooler's and parent's food literacy, knowledge of local food, and changes in families' meals and snacks.

CHAPTER 3: EXPANDED METHODOLOGY

Project Overview

This study was developed to strengthen the literature on farm-to-preschool while evaluating the effect a small-scale farmer's market at a childcare center on access to and consumption of fruits and vegetables. The study utilized an already established nutrition and physical activity program for preschoolers, Health Happens!. This program served as the control group. The intervention group also participated in the Health Happens! program with additional farm-to-preschool components including: hands-on gardening education for the preschoolers and a small-scale farmer's market at the childcare center for parents to purchase fresh, local fruits and vegetables. The parents or guardians of the preschoolers were the main participants of the program.

This study was approved by the University of Tennessee Human Subjects Research Office Institutional Review Board (IRB) as a revision to the already existing Early Childhood Nutrition and Fitness Education program (IRB-14-09458 B-XP) and registered with the Biomed Central Registry.

Recruitment of Preschools

The farm-to-preschool program that is the central topic of this thesis was implemented in conjunction with a well-established nutrition and physical activity preschool program. The Department of Nutrition at the University of Tennessee collaborated with East Tennessee Children's Hospital (ETCH) and the Childhood Obesity Coalition to implement a nutrition education and physical activity program called Health Happens! in preschools in East Tennessee. This program aimed to help preschool-aged

children learn to love eating healthfully and being physically active. Other purposes of the program included: educating teachers on how to be active healthy role models, encouraging parents to live healthier lives for themselves and their family, exposing children to healthy food choices, and providing childcare centers with curriculum and resources to create a healthier environment. These goals were met through the implementation of 60-minute Coordinated Approach to Child Health Early Childhood (CATCH) lessons that include nutrition and physical activity education once per week for twelve weeks, Let's Move Childcare teacher in-services for one-to-two hours before and after the start of the program, and six one-hour family workshops that utilize the Health Happens! nutrition and physical activity parent curriculum.

To recruit for Health Happens! preschools in Knox and surrounding counties were called by phone and the directors were informed of the program, and asked if their preschool would be interested in participating. If a director indicated that he/she is interested, a few qualifying questions were asked. The first question pertained to whether or not they were a preschool that utilized the Child and Adult Care Food Program (CACFP) meal patterns. The second question related to the number of three- to- five- year olds that attended the preschool. If the director confirmed that the preschool utilized CACFP meal patterns and had 15 or more children between the ages of three and five years old, then the center/school qualified to participate in the Health Happens! program.

Next, an ETCH employee visited the preschool and explained each aspect of the program to the director and invited him/her to sign an informed consent. Once preschool directors had signed the informed consent and their preschool had been identified as participating in the Health Happens! program, one preschool was assigned to receive

additional farm-to-preschool components. Based on budget parameters and feasibility, seven preschools participated in the Health Happens! program the semester of the farm-to-preschool study, although only four were used in evaluation for this thesis. The intervention preschool was chosen based on location, number of preschoolers, and scheduling logistics. The director at the intervention preschool was asked to provide a letter of support for the program for the IRB expedited review. Three preschools served as control schools and their data was compiled together as one control group. This was done because of the small size of the preschools enrolled in the program at the time of the study. The goal for study participation was 30 from the intervention preschool and 30 from the control preschools.

Recruitment of Parents

Parents were recruited to participate through flyers displayed at each preschool and sent home in the preschoolers' cubbies or folders. Graduate Research Assistants (GRAs) and ETCH employees greeted parents during pick-up hours at each preschool, informed them about the program, and asked if they would be interested in participating. If a parent was interested they were given the option to sign the informed consent (Appendix A and B) and complete the surveys in a private room at the preschool or take the survey packet home and return it to their child's preschool teacher. Additionally, survey packets, including an introduction letter, informed consent, and surveys were sent home with each preschooler. The first family workshop was held in-person at each preschool and gave parents another opportunity to decide to participate in the program. Similar recruitment strategies were used to recruit for the family workshops along with

encouragement and reminders from the preschool teachers. Flyers were sent home two weeks before the first workshop and then again one week before. The workshop combined in-person lessons and a series of online learning module videos. After the initial in-person workshop, parents were informed of the learning module videos each week through flyers. Flyers were displayed in the preschool center and sent home each week. These flyers included information about the learning module video and provided the link to access the video. Additionally, a Quick Response (QR) code was also printed on the flyer for parents that wished to easily access the video using their mobile device. Parents were considered exposed to the program once they had attended the family workshop or watched an online learning module video. For this reason, those who had not attended the in-person workshops or watched the online learning module videos were permitted to participate in the program on a rolling basis. Recruitment for participants continued as long as the parent had not been exposed to the parent component of the program. Parents were considered participants once they had completed the informed consent and surveys.

Incentives

The Health Happens! program provided parents at the participating childcare centers with incentives. Parents' names were placed into a drawing for prizes each time they returned a survey packet, attended a workshop, or watched a video. Any parent at the childcare center could sign up for the drawing and was eligible to win, regardless of participation in any of the intervention components. The incentives included a chance to win $5 grocery store gift cards, Frisbees, puzzles, and cooking utensils like cutting boards, vegetable peelers, potato bakers, etc. The grand prize for the control schools included a

gym bag with nutrition and fitness activities such as, an immersion blender, yoga mat, $25 gift card to a grocery store, and more. To enhance the farm-to-preschool intervention, more targeted incentives were used. These incentives included a chance to win $5 vouchers to use at the small-scale preschool farmer's market, seeds, mini-grow kits, and reusable grocery bags. The grand prize for the farm-to-preschool intervention included a share in a Community Supported Agriculture (CSA) from a local farm. A GRA kept track of surveys turned in, videos watched, and workshops attended by each participant through an excel sheet. Participants received one point for each activity. The points were totaled one week after each workshop or video was held or advertised and names were placed into a drawing for prizes. The points were totaled again at the end of the program and names were placed into a drawing for the grand prize. The drawing for the grand prize was done at each final in-person family workshop, however the participant did not have to present to win. If the winner was present he or she was given the grand prize before the end of the workshop. If they were not present the prize was given to the preschool teacher to deliver to the winner. Since the grand prize for the intervention group was not a physical prize, the winner was announced at the family workshop and contact information was exchanged so the distribution of the CSA to the participant and his or her family could be arranged once the farming season started again.

Evaluations

All parents who signed an informed consent were assigned a unique participant identification number based on the last four digits of their phone number. This was done to make it easier for participants to remember their identification number and ensure

privacy. Participants were asked to complete four surveys for the purposes of this project, before and after the intervention. The first was a modified version of a validated Home Food Inventory (HFI). This HFI had 118 items and 12 sections, each of which contained food items from different categories. These categories include milk and dairy; cheese; salad dressing, condiments, dips; cereals; breads, pastas, rice; baked goods; vegetables; fruit; fresh or frozen meat, sausage, and meat alternatives; crackers and chips; legumes; and drinks. For the purposes of this project, only the fruit and vegetable categories were analyzed for differences in household availability pre versus post.

The second was a modified version of the Bright Futures in Practice Food Frequency for Children Ages 1-10.[55] The food frequency questionnaire (FFQ) included 63 items and six categories. These categories include grains; vegetables; fruit (not including juice); meat and meat alternatives; fats and sweets; and dairy. For the purposes of this project, only the fruit and vegetable categories were analyzed for differences in consumption among preschoolers as reported by their parents, pre versus post. On both the HFI and the FFQ, parents also had the option to write in additional food items under an "other" section.

The third was a brief survey that assesses psychosocial factors in the Theory of Planned Behavior related to purchasing fruits and vegetables. This survey was adapted from the pilot tested survey used in the report "Moms' attitudes and beliefs related to fruit & vegetable consumption 2007-2014."[20] After a comprehensive literature review, an appropriate validated survey based on the Theory of Planned Behavior that evaluated the intention to purchase fruits and vegetables and shop at a farmer's market was not found. This survey was content validated by obtaining input from experts in the field along with

cognitive interviewing of parents with young children before it was disseminated to participants.

The fourth document for each parent to complete was a demographic survey that asked the parent's age, gender, race, ethnicity, income, education level, use of Supplemental Nutrition and Assistance Program (SNAP) and Special Supplemental Nutrition Program for Women Infants and Children (WIC) benefits, and their child(ren)'s age, gender, race, and ethnicity. See appendix C, D, E, F, and G for evaluation surveys.

Control Group Lessons: Health Happens!

The control group received the standard intervention as described above. The Health Happens! program provided six family workshops for the parents of preschoolers at each childcare center. These workshops utilized the Health Happens! nutrition and physical activity parent curriculum designed specifically for parents with preschool-aged children. The workshops ranged in length from 10 minutes to an hour. The first and last workshops were held in person and the other four workshops were provided through a series of learning module videos. This allowed participants the flexibility of viewing the videos on their own time. Parents were encouraged to watch the videos with their child or whole family. The lessons in the family workshops include:

Lesson 1: Introduction to Health Happens! (1 hour)

Lesson 2: Fruits, Vegetables, Local Food, and Exercise (20 minutes)

Lesson 3: Grains and Cardio (10 minutes)

Lesson 4: Dairy and Flexibility (15 minutes)

Lesson 5: Meats, Fats, and Strength-building (10 minutes)

Lesson 6: Conclusion to Health Happens! (1 hour)

After each video parents were prompted to complete a quick online survey to allow the researchers to keep track of which parents watched each video. The survey was developed using Qualtrics Research Suite. A GRA kept track of which parents watched each video through an excel sheet. This enabled the researchers to know who's name needed to be placed in a drawing each week for prizes. Each week the GRA performed the drawing and distributed the prizes through the appropriate preschool teacher or in the child's cubby at the childcare center. The learning module videos were pilot tested in Spring 2015 as part of the Health Happens! program with great success in engaging parents compared traditional methods.

Intervention Group: Farm-to-Preschool Lessons

The intervention preschool received the standard intervention along with additional farm-to-preschool components. These components targeted the parents through a small-scale farmer's market and the preschoolers through hands-on gardening experiences. The intervention preschool was provided with a gardener through the Childhood Obesity Coalition of ETCH. The gardener established and maintained garden beds at the preschool during the duration of the farm-to-preschool intervention and thereafter. The preschoolers participated in hands-on learning experiences in the garden every other week with the gardener as the instructor and facilitator. The experiences included a lesson on topics such as, plant growth, photosynthesis, and helpful insects, a chance for the children to harvest the vegetables, and a hands-on activity involving making a healthy snack with the garden

produce. Examples of vegetables grown in the garden included: tomatoes, peas, radishes, kale, broccoli, and cabbage.

Farmer's Market Procedures

To establish the farmer's market, relationships with local farmers were formed. A GRA identified potential farms that could be involved by searching the Internet, calling farms, meeting with farmers, and visiting local famer's markets in Knoxville to discuss the project. Two farms were interested and able to make accommodations for the project. The farmer's agreed to allow the University of Tennessee to order a specific amount of produce from them each week based on what they had available. The produce was sold to the University of Tennessee without a discount and the farmer's were paid through direct deposit. Each week the GRA emailed each farmer with the order and arranged to pick up the produce at a CSA drop-off location, a farmer's market, or directly from the farm depending on the week and schedule of each farmer. The GRA picked up the produce the night before or the day of the market to ensure the freshest fruits and vegetables were being offered. Neither farm had a wide variety of fruit available due to the season, however one farm was able to provide apples. The vegetables that were ordered from the farms each week were based on what was available and what the researchers thought would be acceptable to the families at the preschool. Additionally, during the first week of the farmer's market a sheet with a list of seasonally available vegetables was available for parents to indicate what they would be interested in seeing at the farmer's market in the following weeks. The produce that was made available at the small-scale farmer's market along with the corresponding taste-test and weekly activities can be seen in Appendix H.

Materials and equipment necessary to execute the market were purchased or created beforehand. Equipment included: folding table, tablecloth, canopy tent, baskets, scale, cash box, cart for hauling produce and market equipment, and a Square Inc Magstripe Reader to enable purchasing with a debit or credit card. A grocery store donated paper bags to be used for carrying produce after participants purchased it. Labels for produce and prices were created with laminated index cards for repeated use. Produce was priced based on the cost of each item from the farmer. For example, butternut squash was sold from the farm at $1.50 per pound and the researchers planned to sell it per pound at the preschool farmer's market thus it was sold at the same price. However, for produce that was to be sold at the preschool farmer's market per item or per bag but was sold by the farm per pound then the price was adjusted. For example, okra was sold at four dollars per pound by the farm and it was sold at the preschool farmer's market in ½ pound bags for two dollars each.

The small-scale farmer's market operated at the preschool a minimum of one day per week for eight weeks, from 4-6 PM. Two nutrition undergraduate students were assigned to help the GRA operate the farmer's market as part of their community nutrition class. One undergraduate was in charge of interacting with parents and helping them check out and the second undergraduate kept track of what was purchased. The purchases were tracked using a printed excel sheet with spaces to write the participant's ID number, what items were purchased, the quantity of each item, the price, and the form of payment (farmer's market voucher, check, cash, or card). The GRA supervised the market procedures and interacted with parents as they picked up their children at the preschool.

The GRA trained both nutrition undergraduate students in all procedures before the first farmer's market.

A taste-test and corresponding recipe card was available at each farmer's market. The recipes were chosen based on seasonal fruits and vegetables and simplicity of preparation for the farmer's market and for busy families. The taste tests and recipe cards were designed to feature one or more fruit or vegetable available for purchase that week at the farmer's market. The recipes were adapted from a variety of sources including: University of Tennessee Extension services, United States Department of Agriculture Food and Nutrition Services What's Cooking Mixing Bowl, Appalachian Sustainable Agriculture Project Growing Minds, Harvest for Healthy Kids Curriculum, and the Institute for Agriculture and Trade Policy Farm to Childcare Curriculum Package. These sources were included on each recipe card as references. The GRA, who was ServSafe Food Protection Manager certified, prepared the recipes the evening before the farmer's market. The taste-tests were brought to the market in a thermal food bag. Parents and preschoolers could taste free of charge with no obligation to purchase produce from the farmer's market.

The market was advertised using a large banner featuring fresh fruits and vegetables and a child enjoying carrots. Yard signs that stated "fresh, local produce today 4 p.m. to 6 p.m." were staked into the yard at the preschool the day of the market. Additionally, a flyer was mailed to each family at the childcare center to inform parents about the market, hours of operation, produce available for purchase, etc. The flyer was sent home with families and displayed in each preschool room two weeks before the first market and each subsequent week during the market as a reminder. The preschool farmer's market was used as a time to interact with parents, inform them of the family

workshops, and encourage them to watch the videos. The market also served as an opportunity for researchers to invite parents to sign the informed consent and complete the research surveys.

Statistical Methods

Participants who did not complete both a pre and post survey packet were not included in the data analysis. The HFI, FFQ, intention survey, and demographics survey data were entered into excel by GRAs and students in the Infant, Child, and Adolescent Nutrition's Graduate Research and Outreach for Wellness (ICAN-GROW) lab. For the HFI, parents indicated whether an item was available in their kitchen or pantry by checking yes or no next to each food item. For the food frequency parents indicated which food items their preschooler ate or drank the previous week by circling the food item. For both of these surveys the fruits and vegetables that were marked available or consumed were given a "1" and each item that was not marked available or consumed was given a "0". The intention survey was based on a 5 point- likert-like scale, which ranged from "strongly disagree" (1) to "strongly agree" (5). Additionally, there was a question asking parents to check any barriers that make it difficult for them to purchase fruits and vegetable.

All data was double entered and then checked by the lead GRA. When mistakes were found the GRA would refer to the original survey for clarification. IBM's Statistical Package for the Social Sciences (SPSS) Version 23.0 was used for data analysis. First, chi-square was used to test for differences in demographic information. Demographic data was analyzed using descriptive statics and frequencies. Next, baseline data was analyzed to identify any differences between groups at the start of the study by using independent sample t-tests.

There were no significant differences for any of the variables, including fruit availability, vegetable availability, fruit consumption, vegetable consumption, intention to purchase fruit, and intention to purchase vegetables.

To assess if the data was normally distributed a Shapiro-Wilk test was performed. The data was normally distributed for all variables in the HFI and FFQ. The data was normally distributed for the intention to purchase fruit score and intention to purchase vegetables score for the intervention group. However for the control group, the intention to purchase vegetables score at baseline and intention to purchase fruit score at post were not normally distributed.

Paired sample t-tests were used to assess differences within the intervention and control group's fruit availability score, vegetable availability score, fruit consumption score, and vegetable consumption score from pre to post evaluation. Then to assess changes in differences between group's scores, new variables were computed. The new variables were computed by subtracting the baseline score from the post score of each existing variable. Then, independent sample t-tests were run to see if the changes in score differed for the intervention and control groups. Descriptive statistics and frequencies were used to evaluate barriers participants indicated to purchasing fruit and purchasing vegetables. The relationship between the intention to purchase fruits and vegetables and the consumption and availability of fruits and vegetables were assessed. First scatter plots were charted to assess whether the relationship was positive, negative, or nonexistent. The scatter plots revealed the relationship between each variable and the intention scores was positive and non-parametric. A spearman's rank-order correlation was run to further assess the relationship between intention to purchase fruits and vegetables and the consumption and

availability of fruits and vegetables. An alpha level of 0.05 was used. See table 5 for a summary of statistical methods.

Table 5. Summary of statistical methods

Variables			
	Home Food Inventory and Food Frequency for Preschoolers		
Independent variables	Intervention: Health Happens! Standard Intervention (group 1), Farm-to-Preschool Intervention (group 2)		
Dependent variables	**Primary outcomes:** change in fruit and vegetable household availability and consumption of fruits and vegetables in preschoolers **Secondary outcome:** Intention to purchase fruits and vegetables		
Variable construction	Availability score: Calculated by summing the total points to determine the mean availability score for fruits and the score for vegetables. Denoted by: 1 = marked as available 0 = not marked as available **Fruit score:** maximum 14 points. **Vegetable score:** maximum 60 points. *All maximum scores may have variation for written in items	Consumption score: Calculated by summing the total points to determine the mean consumption score. Denoted by: 1 = marked as consumed 0 = not marked as consumed **Fruit score:** maximum 9 points. **Vegetable score:** maximum 14 points. *All maximum scores may have variation for written in items	Intention Score: Calculated by summing the total points to determine the mean intention score. Denoted by: 1 = Strongly disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree **Fruit intention score:** maximum 35 points. **Vegetable intention scor**e: maximum 35 points.

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APPENDICES

Appendix A Informed Consent Control Group: Health Happens! Nutrition Education

HEALTH HAPPENS! INFORMED CONSENT STATEMENT
Child Care Nutrition & Physical Activity Parent Education Program
Surveys: General (Except Mini-Farmers Market Pilot Site and Selected Control)

INTRODUCTION

You are invited to participate in a study to help researchers at the University of Tennessee evaluate a nutrition and physical activity program for parents and to learn more about what types of information parents need to help provide healthy foods and opportunities for physical activity for their children. The purpose of the study is to help determine the effectiveness of the child care nutrition and physical activity parent education program at your child's child care center. There will be an orientation meeting for one hour, then you will be able to view 4 online learning modules about planning healthy meals and physical activity. You'll be able to view the modules on your smart phone, notebook, laptop, or other computer. The parent education lessons are part of the Health Happens! Childcare Nutrition and Physical Activity Program, which your child is participating in as part of a collaborative initiative by East Tennessee Children's Hospital and the University of Tennessee, Department of Nutrition. At the end of the program, we will have a celebratory meeting with you and your child or children.

INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY

We will ask you to complete 2 surveys before we begin the parent nutrition education program and the same 2 surveys again after the program is completed. We will assign you an identification number (your first and last initials and the last four digits of your telephone number) so that we can keep track of the surveys, but only trained researchers will have access to the list with both your name and identification number, which will be kept on a password protected computer. The surveys will only have your identification number on them, so your answers will be kept confidential. Demographic information will be combined and used to describe the group.

RISKS

The risks associated with participation this study are minimal and are no more than those encountered in daily life. If you are uncomfortable with the surveys or any questions in the survey, you may stop at any time without penalty.

BENEFITS

There are no real benefits to study participants for completing the surveys, but participation in the parent nutrition education program may help you learn about healthier meal preparation and shopping and how to be more physically active with your child. If the program is successful, it may be used to help parents and children throughout East Tennessee.

CONFIDENTIALITY

Information in the study records will be kept confidential. Data will be stored securely and will be made available only to persons conducting the study. No reference will be made in oral or written reports which could link participants to the study.

_____ Participant's initials (place on the bottom front page of two-sided consent forms)

IRB NUMBER: UTK IRB-14-09458 B-XP
IRB APPROVAL DATE: 09/22/2015
IRB EXPIRATION DATE: 04/15/2016

COMPENSATION

There is no compensation for being in the program or answering the surveys, but your name will be included in a drawing each week for prizes such as water bottles, tee shirts, and gift cards to a local grocery store. We will be drawing for a $10.00 gift card every week and one $25.00 gift card at the end of the program. Your name will be entered in the drawing each time you attend a class, turn in a survey, or sign up for the drawing.

CONTACT INFORMATION

If you have questions at any time about the study or the procedures, (or you experience adverse effects as a result of participating in this study,) you may contact the researcher, Dr. Marsha Spence, at 1215 West Cumberland Avenue, Knoxville, TN 37996-1920; mspence@utk.edu; 865-974-6265. If you have questions about your rights as a participant, contact the Office of Research Compliance Officer at (865) 974-7697.

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at anytime without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before you have completed the surveys, your data will be returned to you or destroyed.

CONSENT

I have read the above information. I have received a copy of this form. I agree to participate in this study.

Participant's Name (please print)_____

Participant's signature _____ Date _____

Investigator's signature _____ Date _____

IRB NUMBER: UTK IRB-14-09458 B-XP
IRB APPROVAL DATE: 09/22/2015
IRB EXPIRATION DATE: 04/15/2016

Appendix B Informed Consent Experimental Group: Farmer's Market and Education

HEALTH HAPPENS! INFORMED CONSENT STATEMENT
Child Care Nutrition & Physical Activity Parent Education Program
Surveys: Mini-Farmers Market Pilot Site

INTRODUCTION

You are invited to participate in a study to help researchers at the University of Tennessee evaluate a nutrition and physical activity program for parents and to learn more about what types of information parents need to help provide healthy foods and opportunities for physical activity for their children. The purpose of the study is to help determine the effectiveness of the child care nutrition and physical activity parent education program at your child's child care center. There will be an orientation meeting for one hour, then you will be able to view 4 online learning modules about planning healthy meals and physical activity. You'll be able to view the modules on your smart phone, notebook, laptop, or other computer. The parent education lessons are part of the Health Happens! Childcare Nutrition and Physical Activity Program, which your child is participating in as part of a collaborative initiative by East Tennessee Children's Hospital and the University of Tennessee, Department of Nutrition. At the end of the program, we will have a celebratory meeting with you and your child or children. In addition, each week you will have the opportunity to buy fresh, local fruits and vegetables from a mini-farmers market that will be at your child's school during the program.

INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY

We will ask you to complete 3 surveys before we begin the parent nutrition education program and the same 3 surveys again after the program is completed. We will assign you an identification number (your first and last initials and the last four digits of your telephone number) so that we can keep track of the surveys, but only trained researchers will have access to the list with both your name and identification number, which will be kept on a password protected computer. The surveys will only have your identification number on them, so your answers will be kept confidential. Demographic information will be combined and used to describe the group.

RISKS

The risks associated with participation this study are minimal and are no more than those encountered in daily life. If you are uncomfortable with the surveys or any questions in the survey, you may stop at any time without penalty.

BENEFITS

There are no real benefits to study participants for completing the surveys, but participation in the parent nutrition education program may help you learn about healthier meal preparation and shopping and how to be more physically active with your child. If the program is successful, it may be used to help parents and children throughout East Tennessee.

CONFIDENTIALITY

Information in the study records will be kept confidential. Data will be stored securely and will be made available only to persons conducting the study. No reference will be made in oral or written reports that could link participants to the study.

_____ Participant's initials (place on the bottom front page of two-sided consent forms)

IRB NUMBER: UTK IRB-14-09458 B-XP
IRB APPROVAL DATE: 09/22/2015
IRB EXPIRATION DATE: 04/15/2016

COMPENSATION

There is no compensation for being in the program or answering the surveys, but your name will be included in a drawing each week for prizes such as seed, pots for planting, and gift cards to a local grocery store or farmer's market. We will be drawing for a $10.00 gift card every week. At the end of the program, we will have a drawing for a grand prize, which is a basket of local, fresh fruits and vegetables from a local farm (a Community Supported Agriculture share). Your name will be entered in the drawing each time you attend a class, turn in a survey, or sign up for the drawings.

CONTACT INFORMATION

If you have questions at any time about the study or the procedures, (or you experience adverse effects as a result of participating in this study,) you may contact the researcher, Dr. Marsha Spence, at 1215 West Cumberland Avenue, Knoxville, TN 37996-1920; mspence@utk.edu; 865-974-6265. If you have questions about your rights as a participant, contact the Office of Research Compliance Officer at (865) 974-7697.

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at anytime without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before you have completed the surveys, your data will be returned to you or destroyed.

CONSENT

I have read the above information. I have received a copy of this form. I agree to participate in this study.

Participant's Name (please print)_____

Participant's signature _____ Date _____

Investigator's signature _____ Date _____

IRB NUMBER: UTK IRB-14-09458 B-XP
IRB APPROVAL DATE: 09/22/2015
IRB EXPIRATION DATE: 04/15/2016

Appendix C Evaluation Tool: Home Food Inventory

Parent ID: _____

Home Food Inventory

Please use this check list to tell us which foods are present in your home right now. Be sure to look in all places where you store food. Please check "Yes" when you find a food present now. Check "No" when the food is not present now. Do not count frozen or canned food unless they are specified.

Milk/Dairy

Yes	No	
☐	☐	Whole Milk
☐	☐	Low Fat Milk (2%)
☐	☐	Low Fat Milk (1%) or Buttermilk
☐	☐	Skim Milk
☐	☐	Chocolate or flavored milk
☐	☐	Regular yogurt (made from whole milk, with or without fruit)
☐	☐	Low-Fat Yogurt
☐	☐	Non-Fat Yogurt
☐	☐	Sour Cream and Sour Cream Dips
☐	☐	Light, Low-fat, and Lean Sour Cream and Light Sour Cream Dips
☐	☐	Cream and Half and Half

Cheese

Yes	No	
☐	☐	Regular Cottage Cheese or ricotta
☐	☐	Low Fat (1% - 2%) or Dry Curd Cottage Cheese or ricotta
☐	☐	Regular Cream Cheese
☐	☐	Light Cream cheese
☐	☐	Reduced Fat Cream Cheese (Neufchâtel)

☐ ☐ Velveeta, Cheez Wiz, Cheese Food and spreads

☐ ☐ Shredded, block or sliced regular cheese (Colby, Cheddar, American, Swiss, Monterey Jack cheese)

☐ ☐ Shredded, block, or sliced reduced-fat cheese (low fat cheddar, low fat swiss)

☐ ☐ Fat-free cheese (block, sliced, fat-free feta)

☐ ☐ Blue, Brick, Limburger, Muenster, Provolone, Gouda, Brie, Romano, Parmesan

☐ ☐ Mozzarella cheese (made with skim milk)

☐ ☐ String Cheese

Salad Dressing, Condiments, and Dips

Yes No

☐ ☐ Regular Salad Dressing (blue cheese dressing, ranch, Caesar)

☐ ☐ Reduced Calorie, Low Fat, No Fat, or Light Dressing (light blue cheese, light Italian)

☐ ☐ Regular Mayonnaise

☐ ☐ Weight Watchers, Low Fat, or Light Mayonnaise

☐ ☐ Guacamole

☐ ☐ Salsa

Cereals

Yes No

☐ ☐ 100% Bran Cereals (Such as 100% Bran, all Bran, Fiber One, Quaker Oat Bran, Bran Buds)

☐ ☐ All other bran cereals (such as Raisin Bran, Bran Flakes, Nutrific, Bran Chez, Fruit and Fiber, Muselix Bran, Fruitful Bran)

☐ ☐ Oatmeal (Including Instant Oatmeal and Quick Oatmeal)

☐	☐	Shredded Wheat Types (Such as Shredded Wheat, Fruit Wheats, Strawberry Squares, Frosted Miniwheats, Quaker Oat Squares)
☐	☐	Cheerios
☐	☐	Rice Krispies
☐	☐	Kid cereals (Froot Loops, Chips Ahoy, Cocoa Puffs, Lucky Charms)
☐	☐	Corn, Oat or Wheat Flake Types (such as Corn Flakes, Wheaties, Honey Bunches of Oats, Granola)
☐	☐	Others: _____

_____

Breads, Pastas, Rice – do not count frozen foods

Yes	No	
☐	☐	Whole Wheat or Whole Grain Bread or Rolls (First ingredient should be whole wheat or whole grain flour)
☐	☐	Other Brown Bread or Rolls
☐	☐	White Bread or Rolls
☐	☐	English muffin (wheat)
☐	☐	Bagels (white)
☐	☐	Bagels (wheat)
☐	☐	Brown or Wild Rice
☐	☐	White Rice
☐	☐	Pasta (such as macaroni and spaghetti)
☐	☐	Whole Wheat Pasta (such as macaroni and spaghetti)
☐	☐	Whole Wheat or Corn Tortillas
☐	☐	Flour Tortillas

☐ ☐ Others: _____

_____

Baked Goods

Yes	No	
☐	☐	Pastry, sweet rolls, donuts
☐	☐	Regular muffins
☐	☐	Other cakes, brownies, and cookies

Vegetables

Yes	No		Canned	Frozen	Fresh
☐	☐	Peas	☐	☐	☐
☐	☐	Potatoes	☐	☐	☐
☐	☐	Corn	☐	☐	☐
☐	☐	Carrots	☐	☐	☐
☐	☐	Brussels Sprouts	☐	☐	☐
☐	☐	Green beans	☐	☐	☐
☐	☐	Sweet potatoes	☐	☐	☐
☐	☐	Onion	☐	☐	☐
☐	☐	Sweet peppers	☐	☐	☐
☐	☐	Beets, turnips	☐	☐	☐
☐	☐	Okra	☐	☐	☐

☐	☐	Spinach, kale, other greens	☐	☐	☐
☐	☐	Broccoli	☐	☐	☐
☐	☐	Cabbage	☐	☐	☐
☐	☐	Cauliflower	☐	☐	☐
☐	☐	Asparagus	☐	☐	☐
☐	☐	Squash (butternut, zucchini)	☐	☐	☐
☐	☐	Tomatoes	☐	☐	☐
☐	☐	Mixed Vegetables, with Beans or Corn	☐	☐	☐
☐	☐	Broccoli & Cauliflower Mix, California Blend	☐	☐	☐
☐	☐	Others (please specify) _____			

Fruits

Yes	No	
☐	☐	Apples
☐	☐	Applesauce
☐	☐	Pears
☐	☐	Oranges nectarines, tangerines or clementines
☐	☐	Bananas
☐	☐	Cherries
☐	☐	Berries (fresh or frozen unsweetened strawberries, raspberries, blackberries, blueberries)

☐ ☐ Berries (frozen and sweetened strawberries, raspberries, blackberries, blueberries)

☐ ☐ Grapefruit

☐ ☐ Grapes

☐ ☐ Pineapple

☐ ☐ Peaches

☐ ☐ Lemons or limes

☐ ☐ Melons (watermelon, cantaloupe)

☐ ☐ Fruit canned or packaged in own juice or water

☐ ☐ Fruit or fruit cocktail canned in syrup

☐ ☐ Others: _____

_____

Fresh or Frozen Meat, Sausage, and Meat Alternatives

Yes	No	
☐	☐	Extra Lean Ground Beef or turkey
☐	☐	Lean Ground Beef or turkey
☐	☐	Regular Ground Beef or turkey
☐	☐	Beef, pork, lamb (burgers, steaks, roasts, chops)
☐	☐	Chicken (baked or broiled)
☐	☐	Chicken (fried)
☐	☐	Chicken Nuggets
☐	☐	Sausage (such as smoked, links, Polish, Liver, Salami, Pepperoni, Bratwurst, Breakfast)
☐	☐	Bacon or breakfast sausage
☐	☐	Turkey Bacon
☐	☐	Bologna
☐	☐	Frankfurters (hot dogs or corn dogs)
☐	☐	Sliced turkey or chicken deli meat
☐	☐	Sliced ham or roast beef deli meat
☐	☐	Fish (canned, fresh, or frozen tuna, salmon, shrimp)
☐	☐	Eggs
☐	☐	Peanut Butter
☐	☐	Meat Substitutes (veggie burgers, tofu, soy products)

☐ ☐ Others: _____

_____

Crackers and Chips

Yes No

☐ ☐ Rye and Wheat Crispbread

☐ ☐ Triscuits

☐ ☐ Other Crackers

☐ ☐ Snack Foods (such as Potato, Corn, or Tortilla Chips: Corn puffs and curls

Legumes

Yes No

☐ ☐ Dried Peas, Beans, or Lentils

☐ ☐ Canned Beans (such as butter, garbanzo, kidney, navy, northern, pinto, red or baked beans)

☐ ☐ Chili with beans

Other Drinks

Yes No

☐ ☐ Regular soft drinks (like Coke, Pepsi, Mountain Dew, Sprite, Dr. Pepper)

☐ ☐ Diet soft drinks

☐ ☐ Sweet tea, Kool-Aid, Sunny D, or other fruit drinks

☐ ☐ 100% fruit juice

☐ ☐ Sports drinks (Gatorade, Powerade, MiO Fit, etc)

☐ ☐ Energy drinks (Red Bull, Rock Star, Full Throttle, Monster, etc)

Please answer the following questions by placing a check in the appropriate blank

Do you usually do the grocery shopping?

☐ Yes ☐ No

When did you or someone in the household last shop for groceries?
(Check One)

☐ Today

☐ Yesterday

☐ 2 days ago

☐ 3 days ago

☐ 4 days ago

☐ 5 days ago

☐ 6 days ago

☐ 1 week ago

☐ More than one week ago

Appendix D Evaluation tool: Food Frequency Questionnaire

Parent ID:_____ Pre/Post

Food Frequency Questionnaire

Which of these foods did your child eat or drink last week? (Circle all that apply and write in any others)

Grains	**Vegetables**	**Fruit (do NOT include juice)**	**Meat and Meat Alternates**	**Fats and Sweets**	**Milk, Cheese, and Yogurt**
Bagels	Broccoli	Apples	Beef/hamburger	Cake/cupcakes	Whole milk
Bread	Carrots	Bananas	Chicken	Chicken	2% milk
Cereal	Corn	Berries	Cold cuts/lunchmeat	Chips	1% milk
Crackers	French Fries	Grapefruit	Dried beans	Cookies	Fat free milk (skim)
Muffins	Green Beans	Grapes	Eggs	Doughnuts	Plain yogurt (whole fat)
Noodles/pasta	Green salad	Melon	Fish	Fruit-flavored drinks	Plain yogurt (low-fat)
Rice	Greens (spinach, collards, kale)	Oranges	Peanut butter/nuts	Kool-aid	Plain yogurt (fat-free)
Rolls	Peas	Peaches	Pork	Pie	Flavored yogurt (whole fat)
Tortillas	Potatoes	Pears	Sausage/bacon	Soft drinks	Flavored yogurt (low-fat)
Other Grains:	Tomatoes	**Other fruits:**	Tofu	Ice Cream	Flavored yogurt (fat-free)
	Sweet Potatoes		Turkey	Frozen Yogurt	Cheese (regular/whole fat)
	Other Vegetables:		**Other meat/meat alternates:**	**Other fats & sweets:**	Cheese (fat-free)
					Other milk, cheese, and yogurt:

Appendix E Evaluation Tool: Intention to Purchase Fruit Survey

Parent ID: _____ Pre/Post

Fruit Survey

Please indicate how much you agree with the following statements. (Circle one on each line)

1. As a parent, it is important that I include fruit in my family's meals and snacks.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

2. I intend to purchase fruit from a local farmer's market in the future.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

3. I don't know how to prepare fruit in different ways.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

4. In the next three months I intend to include more fruit in my family's meals and snacks.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

5. My family members believe it is important that we include fruit at meals and snacks.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

6. I intend to grow my own fruit in the future.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

7. Please check any barriers that make it difficult for you to purchase fruit:
   - ☐ Time (takes too long)
   - ☐ Money
   - ☐ Proximity to the store (too far)
   - ☐ Childcare
   - ☐ Transportation
   - ☐ Stores are dangerous
   - ☐ Route to stores are dangerous
   - ☐ Language barrier
   - ☐ Other obstacles:_____
   - ☐ None

Appendix F Evaluation Tool: Intention to Purchase Vegetables Survey

Parent ID: _____ Pre/Post

Vegetable Survey

Please indicate how much you agree with the following statements. (Circle one on each line)

1. As a parent, it is important that I include vegetables in my family's meals and snacks.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

2. I intend to purchase vegetables from a local farmer's market in the future.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

3. I don't know how to prepare vegetables in different ways.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

4. In the next three months I intend to include more vegetables in my family's meals and snacks.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

5. My family members believe it is important that we include vegetables at meals and snacks.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

6. I intend to grow my own vegetables in the future.

Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

7. Please check any barriers that make it difficult for you to purchase vegetables:
   - ☐ Time (takes too long)
   - ☐ Money
   - ☐ Proximity to the store (too far)
   - ☐ Childcare
   - ☐ Transportation
   - ☐ Stores are dangerous
   - ☐ Route to stores are dangerous
   - ☐ Language barrier
   - ☐ Other obstacles:_____
   - ☐ None

Appendix G Evaluation Tool: Demographics Survey

Parent ID_____ Date_____

Parent/Child Information

Your age:_____

Your sex: Male____ Female____

Are you…(check all that apply)

- ○ American Indian/Alaskan Native
- ○ Asian
- ○ Black or African American
- ○ White
- ○ Choose not to answer

Are you Spanish/Hispanic/Latino? (check one)

- ○ Yes
- ○ No
- ○ Choose not to answer

What is your family income?

- ○ Less than $25,000
- ○ $25,000-$50,000
- ○ $50,000-$75,000
- ○ More than $75,000
- ○ Choose not to answer

What is your highest level of education?

- ○ Less than high school
- ○ High school graduate
- ○ Some college
- ○ College degree
- ○ Some graduate school
- ○ Graduate degree
- ○ Choose not to answer

Do you currently participate in any of the following?

- ○ SNAP (Food Stamps)
- ○ WIC
- ○ None
- ○ Choose not to answer

Your child's age (oldest child that attends the childcare center or preschool)_____

Your child's sex (oldest child that attends the childcare center or preschool):
Male____ Female____

Is your child… (check all that apply)

- ○ American Indian/Alaskan Native
- ○ Asian
- ○ Black or African American
- ○ White
- ○ Choose not to answer

Is your child Spanish/Hispanic/Latino? (check one)

- ○ Yes
- ○ No
- ○ Choose not to answer

Your child's preschool or childcare center: _____

Appendix H Farmer's Market Produce and Activities

Table 6. Weekly produce, taste-tests, and activities at the small-scale farmer's market at the intervention preschool.

Week	Produce Available	Taste Test and Recipe Provided	Activity
1	Apples Bell peppers Butternut squash Eggplant Okra Radishes Sweet potatoes	Apple Salad	-Recruited parents -Passed out flyers for videos -Taste test
2	Acorn squash Apples Basil Bell peppers Butternut squash Eggplant Okra Spaghetti squash Sweet potatoes	Fall Casserole	-Recruited parents -Passed out flyers for videos -Taste test
3	Acorn squash Apples Bell peppers Butternut squash Eggplant Okra Spaghetti squash Sweet potatoes	Slow Cooker Sweet Potatoes	-Recruited parents -Passed out flyers for videos -Taste test
4	Apples Bell peppers Butternut squash Eggplant Italian peppers Kale Lunch box peppers Spaghetti squash	Spaghetti Squash with Tomato Sauce	-Recruited parents -Passed out flyers for videos -Taste test
5	Acorn squash Apples Bell peppers Eggplant Kale Lunch box peppers Spaghetti squash Sweet potatoes	Kale Chips	-Passed out flyers for videos -Taste test -Face painting for preschoolers -Polaroid pictures with Cindy the Carrot character

Table 6. Continued.

Week	Produce Available	Taste Test and Recipe Provided	Activity
6	Apples Bell peppers Kale Lettuce Lunch box peppers Spaghetti squash Sweet potatoes Tomatoes	Tri-Pepper Salad	-Passed out flyers for videos -Taste test
7	Acorn squash Apples Bell peppers Kale Lunch box peppers Radishes Tomatoes	Roasted Radishes	-Gave participating parents post survey packets to complete and return -Passed out flyers for videos -Taste test
8	Acorn squash Beets Bell peppers Broccoli Cauliflower Collard greens Kale Spaghetti squash Sweet potatoes	Sweet Acorn Squash	-Gave participating parents post survey packets to complete and return -Passed out flyers for final in-person family workshop -Taste test

Appendix I Changes in Availability of Vegetables and Fruits

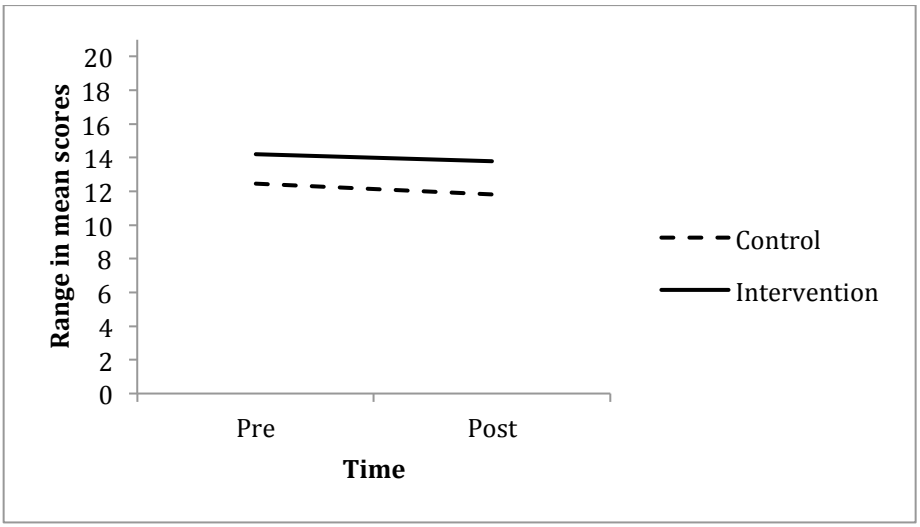

Figure 4. Changes in availability of vegetables at baseline to post evaluation.

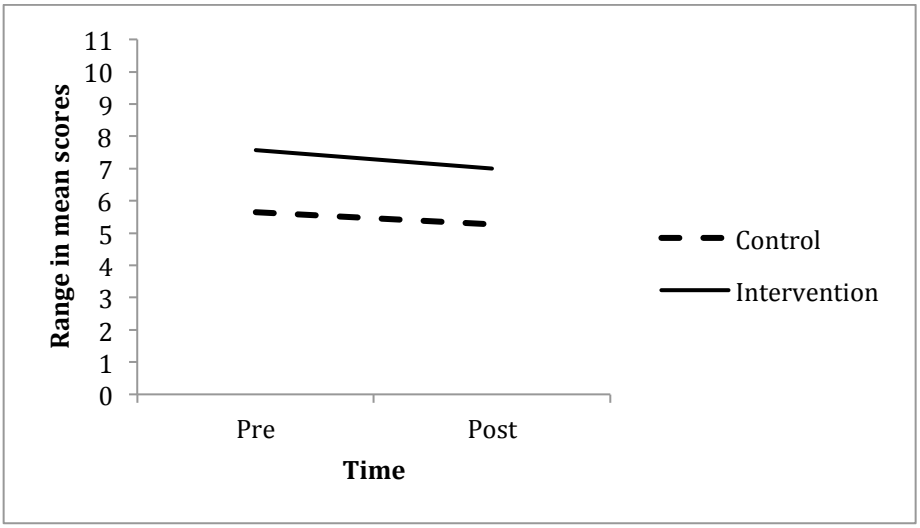

Figure 5. Changes in availability of fruit at baseline and post evaluation.

Appendix J Changes in Preschoolers' Consumption of Vegetables and Fruits

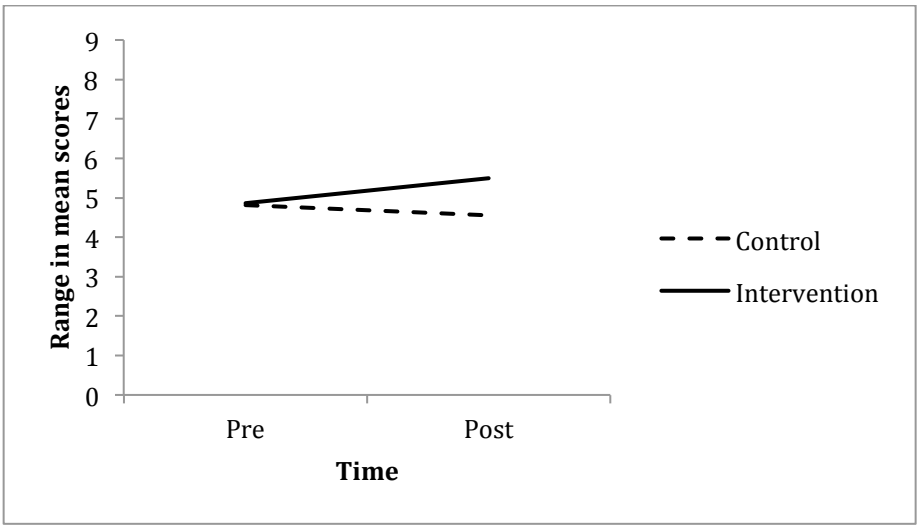

Figure 6. Changes in preschoolers' consumption of vegetables from baseline to post evaluation.

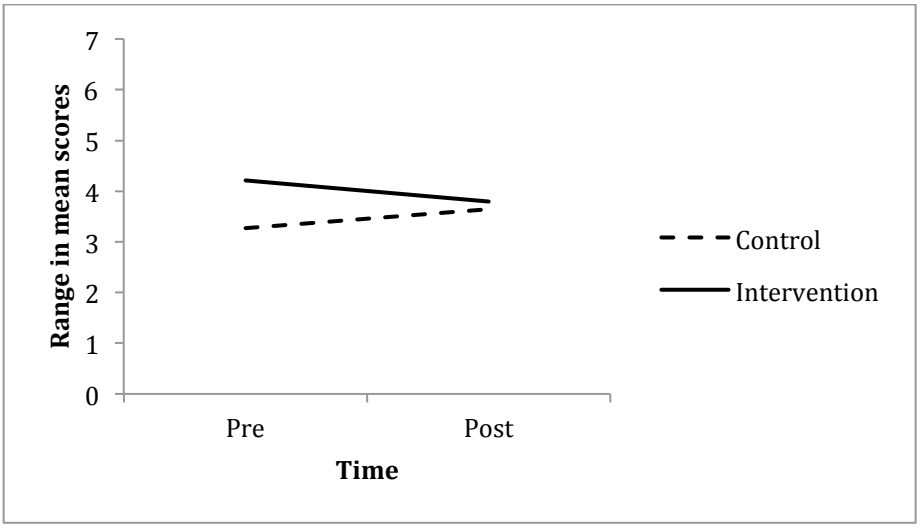

Figure 7. Changes in preschoolers' reported consumption of fruit from baseline to post evaluation.

VITA

Jade Parry was born in Lakeland, Florida to Carla and Shawn Parry. She graduated high school from Lake Gibson High School in 2009. She obtained her undergraduate degree in Food Science and Human Nutrition from the University of Florida in 2014. Jade is currently pursuing a Master's of Science in Public Health Nutrition from the University of Tennessee and is expected to graduate in August 2016. While at the University of Tennessee, Jade has held a position as a graduate research assistant and had the opportunity to collaborate with East Tennessee Children's Hospital and the Childhood Obesity Coalition on a comprehensive nutrition and physical activity program for preschoolers, Health Happens!. She presented Health Happens! research at the 8th biennial Childhood Obesity Conference in San Diego, California in the Summer of 2015. Additionally, Jade had the privilege of presenting her research at the Promoting Healthy Weight Colloquium at the University of Tennessee, the Tennessee Academy of Nutrition and Dietetics (TAND) annual meeting in Nashville Tennessee, and the Experimental Biology annual meeting in San Diego, California in the spring of 2016. She is currently in the dietetic internship at the University of Tennessee and will sit for the Commission on Dietetic Registration exam upon completion of the internship in the fall of 2016.