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# Farmers Market Education with Supplemental Voucher Improves Farmers Market Awareness in Elementary Children

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Farmers Market Education with Supplemental Voucher  
Improves Farmers Market Awareness in Elementary Children

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A Thesis  
Presented to  
The Graduate Faculty  
Central Washington University

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In Partial Fulfillment  
Of the Requirements for the Degree  
Master of Science  
Nutrition

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By  
Ali Papendick  
May 2018

CENTRAL WASHINGTON UNIVERSITY

Graduate Studies

We hereby approve the thesis of

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Candidate for the degree of Master of Science

APPROVED FOR THE GRADUATE FACULTY

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Dean of Graduate Studies

## ABSTRACT

### FARMERS MARKET EDUCATION WITH SUPPLEMENTAL VOUCHER IMPROVES FARMERS MARKET AWARENESS IN ELEMENTARY CHILDREN

by

Ali Papendick

May 2018

**Purpose:** The purpose of this pilot intervention study was to provide farmers market (FM) education coupled with FM voucher to assess FM awareness, attendance, and voucher use. **Methods:** Kindergarten through 3<sup>rd</sup> grade students attending a summer school program participated in this three-week FM pilot intervention study. A pre/post intervention questionnaire was distributed to students to assess FM awareness and attendance. In addition, an \$8 FM voucher was provided to children for purchases of fruit and vegetables at the local FM. The voucher was valid for two weeks and fruit and vegetable purchases were recorded each week. **Results:** This study reported improved FM awareness among K-3<sup>rd</sup> grade students at a statistically significant level post intervention ( $p=0.005$ ). Of the 75 students who received certificates, 21 students (28%) validated their certificate at the FM for an \$8 voucher. Due to small sample size, FM attendance and voucher use could not be determined significant. **Conclusion:** Participation in a FM education intervention improved FM awareness among K-3<sup>rd</sup> grade students. The strongest improvements in FM awareness, attendance, and voucher use were observed in 2<sup>nd</sup> grade students. **Future Implications:** This pilot study provided results that can guide future research in this area targeting specifically children.

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## CHAPTER I

### LITERATURE REVIEW

#### **Introduction**

Over the past thirty years, the obesity epidemic across America has continued to drastically increase (Wang & Beydoun, 2007). As defined by *The World Health Organization (WHO)*, obesity is a disease and/or condition of excess body fat to the extent that impairs one's health (Wang & Beydoun, 2007)(WHO, 2017). According to the 2015-2016 National Health and Nutrition Examination Survey (NHANES), the prevalence of obesity is 39.8% in adults and 18.5% in youth (Hales et al., 2017). Research suggests that there is an increased risk of developing chronic diseases, such as type II diabetes mellitus, cardiovascular diseases, and some cancers in overweight/obese individuals(Moore, Thompson, & Demissie, 2016)(Seguin et al., 2017). The Center for Disease Control (CDC) and Prevention report that in 2015, 8.7% of the U.S. adult population was diagnosed with diabetes, over 370,000 deaths are due to cardiovascular diseases, and more than one third of the U.S. adult population is considered obese (CDC Heart Disease, 2017)(CDC U.S. Diabetes Surveillance, 2017)(CDC Overweight & Obesity, 2017). A major concern related to the obesity and chronic disease epidemic is childhood obesity. Encouraging children to incorporate a healthy and balanced diet of fruits and vegetables (FV), whole grain carbohydrates, lean proteins, moderate intake of fat and 60 minutes of activity/day may help decrease obesity rates and risk of chronic disease(Ward et al., 2015).



Incorporating adequate intake of FVs promotes a healthy and balanced diet. FVs are packed with an abundance of under consumed nutrients among children and adults (Andersen et al., 2014). These nutrients include potassium, fiber, vitamin A, and folate (folic acid)(Moore, Thompson, & Demissie, 2016). Together these nutrients may help decrease the risk of developing chronic conditions, including cardiovascular diseases, obesity, type II diabetes mellitus, and some cancers(Moore, Thompson, & Demissie, 2016)(Seguin, 2017)(Mushi-Brunt et al., 2007). Despite the benefits associated with increased FV intake, children and adolescents in the U.S. fail to meet the FV intake recommendations(Moore, Thompson, & Demissie, 2016)(Mushi-Brunt et al., 2007). Nationally, less than10% of children and adolescents meet recommended fruit intake, while <3% meet recommended vegetable intakes (Moore, Thompson, & Demissie, 2016). In addition, low-income families are at an increased risk of low fruit and vegetable intake due to fewer financial resources for purchasing nutrient dense foods (Ward et al., 2015)(Okeke, Ekanayake, & Santorelli, 2017)(Olsho et al., 2015). Despite federal assistance programs that aim to help improve the nutrition of children, (i.e. National School Lunch Program (NSLP), School Breakfast Program (SBP) Fresh Fruit and Vegetable Program (FFV) and Summer Food Service Program (SFSP), nutrient intakes continue to fall short (Huang et al., 2016)(Voudrin et al., 2018). United States Department of Agriculture (USDA) government programs, such as NSLP and FFVP, aim increase fruit and vegetable consumption during the school year, however, access to these programs are stripped during summer, further increasing nutritional concern in

children receiving these benefits during these months (USDA Fresh Fruit and Vegetable Program, 2017)(Lin & Fly, 2016).

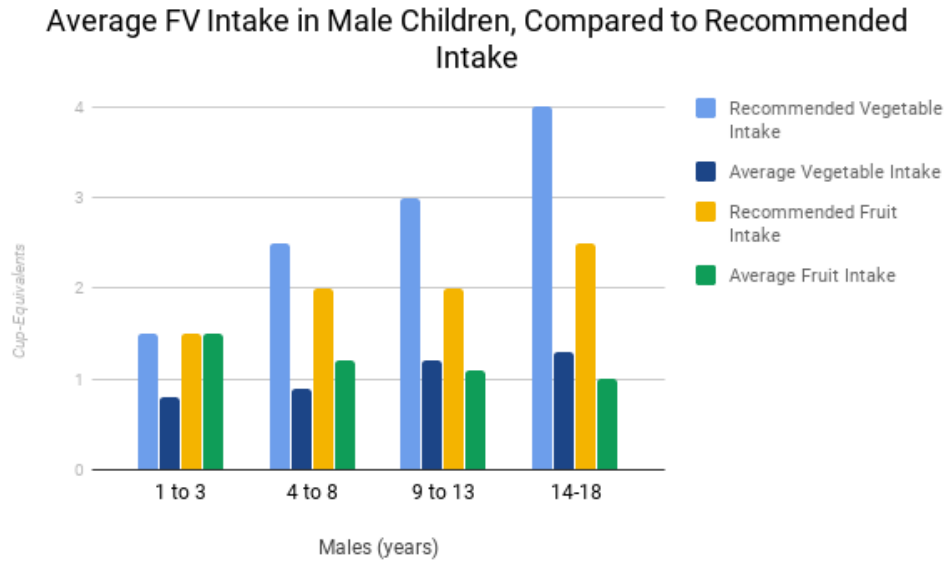
**Fruit and Vegetable Recommendations**

In 2011, USDA replaced the *Food Guide Pyramid* with *MyPlate*. *MyPlate* encourages healthy eating patterns throughout an individual’s lifetime. Fruits, vegetables, protein, grains, and dairy are five food groups that *MyPlate* recommends to achieve healthy eating patterns to promote weight management and avoid chronic diseases (USDA ChooseMyPlate, 2017). **Table 1** demonstrates the current fruit and vegetable recommendations for children aged 2-18 years old according to USDA *MyPlate*. Both FV intake may be increased beyond recommended intake when physical activity is increased (USDA ChooseMyPlate, 2017). **Figure 1** and **Figure 2** illustrates the average FV intakes compared to recommended intakes in males and females aged 1 to 18 years old (Office of Disease Prevention and Health Promotion, 2015).

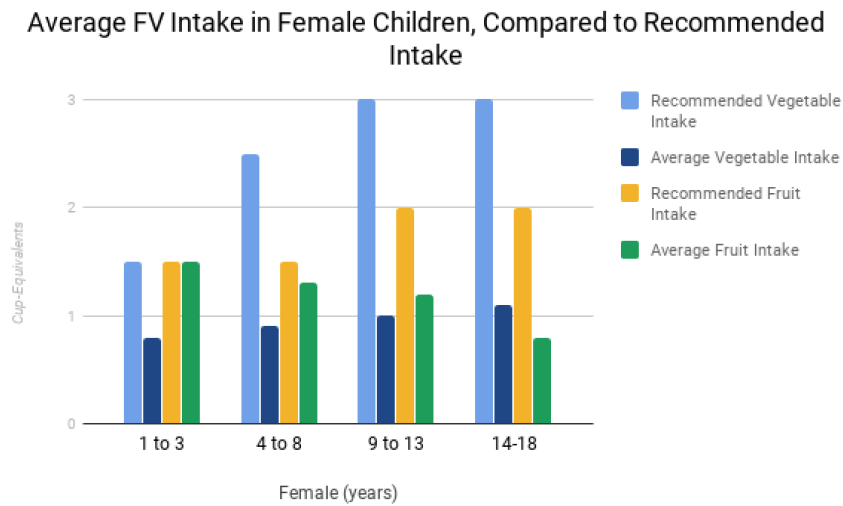
**Table 1: USDA *MyPlate* Fruit and Vegetable Daily Recommendations**

|                 | Age             | Fruit Recommendation/day | Vegetable Recommendations/day |
|-----------------|-----------------|--------------------------|-------------------------------|
| <b>Children</b> | 2-3 years old   | 1 cup                    | 1 cup                         |
|                 | 4-8 years old   | 1 to 1 ½ cups            | 1 ½ cups                      |
|                 | 9-13 years old  | 1 ½ cups                 | 2 cups                        |
| <b>Girls</b>    | 14-18 years old | 1 ½ cups                 | 2 ½ cups                      |
|                 | 9-13 years old  | 1 ½ cups                 | 2 ½ cups                      |
| <b>Boys</b>     | 14-18 years old | 2 cups                   | 2 ½ cups                      |

**Figure 1: Average FV Intakes Compared to Recommended Intake in Males (1 to 18 years old)**



**Figure 2: Average FV Intakes Compared to Recommended Intake in Females (1 to 18 years old)**



In January 2012, the NSLP and SBP meal patterns and nutrition standards were updated to align with the Dietary Guidelines for Americans via Healthy Hunger Free Kids Act. These changes increased requirements for fruits, vegetables, and whole grains in school meals (USDA Nutrition Standards in the NSLP and SBP, 2012). Other modifications included reduction in sodium, saturated fat and *trans* fat intake, along with specific calorie requirements for age groups (USDA Nutrition Standards in the NSLP and SBP, 2012). Pertaining to this study, the following are required under the NSLP and SBP, as defined by the USDA Federal Register:

- Fruit and vegetables are to be offered as two separate meal components
- Vegetables are to be offered daily as either a dark green, orange, legumes, or starch vegetable (limited)
- Fruit is to be offered daily at both breakfast and lunch

**Table 2** illustrates the meal component requirements for NSLP, including fruits and vegetables, by age. There are no vegetable requirements for the SBP, but fruit has a 5 cups/week (1 cup/day) requirement grades K-12 (USDA Nutrition Standards in the NSLP and SBP, 2012).

**Table 2: USDA National School Lunch Program Fruit and Vegetable Meal Pattern Requirements for Grades K-12<sup>th</sup>**

| <b>Meal Pattern</b>                          | <b>Grades K-5</b> | <b>Grades 6-8</b> | <b>Grades 9-12</b> |
|--|-------------------|-------------------|--------------------|
| <b>Amount of Food/week (Minimum per day)</b> |                   |                   |                    |
| Fruits (cups)                                | 2.5 (0.5)         | 2.5 (0.5)         | 5 (1)              |
| Vegetables (cups)                            | 3.75 (0.75)       | 3.75 (0.75)       | 5 (1)              |
| <i>Dark green</i>                            | 0.5               | 0.5               | 0.5                |
| <i>Red/Orange</i>                            | 0.75              | 0.75              | 1.25               |
| <i>Beans and peas<br/>(legumes)</i>          | 0.5               | 0.5               | 0.5                |
| <i>Starchy</i>                               | 0.5               | 0.5               | 0.5                |
| <i>Other</i>                                 | 0.5               | 0.5               | 0.75               |
| Additional Veg. to                           | 1                 | 1                 | 1.5                |
| Reach Total                                  |                   |                   |                    |

**School Nutrition Programs and Healthy Eating Education**

The NSLP and SBP are two federally assisted USDA government programs that help regulate the lunch and breakfast requirements for more than 30.4 million children per year in public schools, non profit private schools and residential child care institutions across the United States (USDA National School Lunch Program, 2017).

These programs were developed to help provide adequate nutrition for children aged K-

12<sup>th</sup> grade, specifically targeting low-income school-aged children who may qualify for a free or reduced meals (Huang et al., 2016) (USDA NSLP, 2017).

The availability of free and/or reduced meals to low income school-aged children is important because this may help reduce the risk of malnourishment and increase performance in school (Huang et al., 2016). Another benefit of these programs is that they work together to help drastically decrease food insecurity and increase nutrition intake in populations at the greatest nutrition risk. Those who qualify for the NSLP/SBP must meet the USDA Income Eligibility Guideline or currently participate in federal assistant programs such as Supplemental Nutrition Assistance Program (SNAP)(USDA NSLP, 2017)(Food and Nutrition Services, 2017). Defined by the USDA, food security status is broken into four subcategories: high food security, marginal food security, low food security, and very low food security. A 2016 study found that one in five children in the United States live in a food insecure household (Huang et al., 2016). Recent literature has shown an adverse association between children who fall under low food security and his or her physical health, nutritional, psychological, behavioral, and educational outcomes (Huang et al., 2016)(Huang, Kim, & Barnidge, & Kim, 2015).

The Fresh Fruit and Vegetable Program (FFVP) is another federally assisted program, that began in 2002, serving 4 states and one Indian Tribal Organization. Today, the program is available in select elementary schools throughout all 50 states, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands, prioritizing schools with the highest percentages of low-income children (USDA Fresh Fruit and Vegetable program, 2017). Qian et al., 2015 conducted a study in Arkansas, ranked as one of the

highest childhood obesity states, to look at the effects of the FFVP and obesity rates in children attending elementary schools. The study found that incorporating the FFVP may help decrease overall childhood obesity rates (Qian et al., 2015). Arkansas schools participating in FFVP were found to have a lower obesity rate (-3.0%), lower overweight rate (-1.8%), and lower average BMI z-score (-0.085 SD) than nonparticipating schools (Qian et al., 2015).

The goal of the FFVP program is to expand the access and consumption of fresh FVs by overcoming barriers associated with FV access and consumption in children. The FFVP aims to introduce and expose children to a variety of FVs to help increase acceptance and consumption of FVs through continuous exposure and nutrition education (Evans et al., 2012) (USDA FFVP, 2017). Incorporating the FFVP allows schools to select the type and origin of produce (i.e. wholesalers, brokers, local grocery stores, and/or local agricultural producers), number of days/week to serve fresh FVs, and time of day to offer fresh FVs (USDA FFVP, 2017).

All of these programs are designed to increase access to healthy balanced meals to eligible children during the academic year. The implementation of these programs may help reduce obesity, malnutrition, and increase knowledge and school performance in children K-12<sup>th</sup> grade (Huang, Kim, & Barnidge, 2016)(Evans et al., 2012)(USDA FFVP, 2017).

### **Limitations to Federal Assisted School Programs**

A major limitation to the NSLP, SBP, and FFVP is that these programs are offered only to students during traditional academic school months (Huang et al., 2016).

Although the FFVP is designed to offer additional FV to students, these FVs are only to be offered outside of lunch and breakfast times, when NSLP and SBP aren't in effect (USDA FFVP, 2017). This time restriction may make it challenging for students to access. Huang, Barnidge, & Kim (2015) examined the implications of food insufficiency between NSLP participants and eligible nonparticipants during school months January-May and summer months June and July. NSLP participants averaged at a food insufficiency rate of 4% from January-May and increased >5% during summer months. Eligible nonparticipants remained approximately at 2% food insufficiency year-round (Huang, Barnidge, & Kim, 2015). To date, the Summer Food Service Program (SFSP) and Seamless Summer Option (SSO) are two entitlement programs established by the USDA that offer free meals and snacks to help low food security children during summer months, when NSLP or SBP are not available (Huang & Barnidge, 2016)(USDA Summer Food Service Program, 2017). Unlike the NSLP with participation rates above >30 million children, the summer programs serve an average of only 2.5 million children annually (Huang & Barnidge, 2016). Limitations to SFSP include limited availability in some communities, transportation and continued funding by local government agencies, private nonprofit agencies, or schools during summer months (Food Research & Action Center, 2017).

### **Fruit and Vegetable Access**

Access to fruits and vegetables to children outside of school is a major barrier, especially for children of low-income households. Although studies have been conducted looking at ways to increase access to fruits and vegetables for adults and their families, there is limited research assessing fruit and vegetable access for children



(Seguin et al., 2017)(Olsho et al., 2015)(Okeke et al., 2017)(George et al., 2016).

Although children may have some influence on their parent's food choices, the parents are the ultimate decision makers, making it difficult to conduct a study solely on children (Mushi-Brunt et al., 2007).

Okeke et al. 2017, conducted a study assessing New Jersey Supplemental Nutrition Program for Women, Infants, and Children (WIC) participants and the policy change on cash-value voucher (CVV) redemptions for fruit and vegetables. The change made to CVV redemptions was that all WIC participating health food stores maintain a minimum of two fruits and vegetables in store (Okeke et al., 2017). A health food store is defined as a supermarket or large grocery store by this program. Of the total 16,415 households, 90.9% lived within proximity to one health food store and 9.1% did not have access to a health food store. The results were significant when the complete CVV redemption threshold was set a 90% threshold ( $p=0.03$ ) and 80% threshold ( $p=0.06$ ) for households with health food access (Okeke et al., 2017). There were no significant findings among households without health food access. In conclusion, there was increased access to fruits and vegetables to households who lived with health food store availability, but barriers still exist to households without health food store availability.

Beets et al., 2014, conducted a three-year study (2011-2013) on 3,308 children aged 4-12 years old attending a 10-11 week summer day camp (SDC). The purpose of this study was to observe the effects of a healthy lunchbox challenge (HLC) over two years (2012-2013). The challenge encouraged children to increase consumption of fruit, vegetable, and water (FVW). Children could receive up to 3 points per day by

bringing/consuming FVW for the HLC. After HLC was initiated in 2012, both fruit and vegetable presence and consumption increased significantly ( $P < 0.01$ ). At baseline in 2011, 2.2% of children brought fresh vegetables to SDC while 28.2% brought fresh fruit to SDC. In 2012 after implementation of HLC, vegetable consumption increased to 16.5% and fresh fruit increased to 43.8% (Beets et al., 2014). Both of these results were statistically significant ( $P < 0.01$ ) and may suggest that implementing educational programs, such as HLC, may increase consumption of fresh fruit and vegetables in children during summer months.

### **Farmers Market and Community Gardens**

Additional resources to increase access of fresh FVs outside traditional academic months are through access and use of local farmers markets and community gardens. George et al. (2016) developed a study utilizing a local farmers market and community garden at Penn State Medical Center. Prior to starting the study, participants indicated that affordability and transportation were the biggest barriers to produce consumption. Participants were low-income with overweight/obese children (George et al., 2016). Over the course four weeks, each family was provided with \$50/week to purchase produce from the farmers market. A mentor would educate the families on choosing healthy foods, preparation of foods, and meal guides using USDA *MyPlate*. Children of the families handpicked produce grown in the community garden and were encouraged to help prep meals at home. Results indicated that families reported having increased access to produce, knowledge of food purchasing, child involvement of meal prep, and

that children were more likely to eat produce handpicked from the garden (George et al., 2016).

The Farm Fresh Foods for Healthy Kids (F3HK) is a five-year study that is currently being conducted to assess the impact of cost-offset community supported agriculture (CO-CSA) participation, coupled with nutrition education for low-income families (Seguin et al., 2017). CSA participants pay a farmer upfront for a “share” of their crop allowing consistent access to fresh produce throughout the growing season. These shares tend to lower the cost and increase the quality of fresh produce when compared to produce found at the grocery store (Seguin et al., 2017). The hypothesis of this study is that with CO-CSA participation and nutrition education, low-income families will have increased access to healthy foods leading to behavior change in children decreasing prevalence of obesity (Seguin et al., 2017).

The Health Buck Initiative is a program that is funded by the New York City Department of Health and Mental Hygiene and the Human Resources Administration. One of the main goals of this program is to increase access and consumption of FVs by utilizing farmers markets by targeting low-income families who participate in SNAP. SNAP participants receive a \$2 Health Buck coupon for every \$5 spent with electronic benefit transfer (EBT) card. Olsho et al. (2015) conducted a study in 2014 assessing the impact of Health Bucks in participating and non-participating farmer markets. Of the 2,287 participants, 1,416 (95%) shoppers at participating Health Buck markets reported purchasing a FV compared to 91% at non-participating markets ( $P < 0.001$ ) (Olsho et al., 2015). Similar results were found in SNAP participants ( $n=524$ ) with 97.3% reported

purchasing a FV at participating markets while 91% reported a FV purchase at non-participating Health Buck markets ( $P<0.01$ ) (Olsho et al., 2015). There was also a significant difference ( $P=0.02$ ) found in purchasing FV that day among respondents who had previously used of Health Bucks (98%) and those who had never used Health Bucks (94%). However, there was no significant difference found in SNAP participants (Olsho et al., 2015). Also, this study was not able to determine if Health Bucks increased access or consumption of FV in low-income neighborhoods.

### **Barriers to Fruit and Vegetable Access**

Federally funded programs, farmers markets, and community gardens all promote access and consumption of FVs, nonetheless, significant barriers still remain. In a systematic review and meta-analysis by Evans et al. (2012), availability, taste preference, neophobia, knowledge, home support, and interest in healthy eating are barriers associated with a high fruit and vegetable intake (Evans et al., 2012). Transportation and affordability have also been identified as common barriers to adequate FV intake (George et al., 2016). Mushi-Brunt et al. (2007) suggested that although children may influence parent's decisions in food purchasing, ultimately parents make the decision, possibly making it difficult for adequate FV consumption in children (Mush-Brunt et al., 2007). As described, there are many barriers that exist that may affect not only on access, but purchasing of FV for children. Limited research has been done that specifically looks at access and barriers associated to FV intake in children during the summer months.

**Purpose of this Study**

The purpose of this pilot intervention study was to provide farmers market (FM) education coupled with FM voucher to assess FM awareness, attendance, and voucher use. It was hypothesized that participation in the farmers market education intervention would increase FM awareness and attendance in K-3<sup>rd</sup> grade students.

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CHAPTER II  
JOURNAL ARTICLE

# FARMERS MARKET EDUCATION WITH SUPPLEMENTAL VOUCHER IMPROVES FARMERS MARKET AWARENESS IN ELEMENTARY CHILDREN

## **Introduction**

Over the past three decades, the rate of obesity in adults and children has been a major concern. As defined by the World Health Organization (WHO), obesity is a disease and/or condition of excess body fat to the extent that impairs one's health (WHO, 2017)(Wang & Beydoun, 2007). According to the 2015-2016 National Health and Nutrition Examination Survey (NHANES), the prevalence of obesity is 39.8% in adults and 18.5% in youth (Hales et al., 2017). Research indicates that there is an increased risk of developing chronic diseases, such as type II diabetes mellitus, cardiovascular diseases, and some cancers in overweight/obese individuals(Moore, Thompson, & Demissie, 2016)(Seguin et al., 2017). To help reduce the risk of obesity and other chronic diseases, the United States Department of Agriculture (USDA) recommends that children consume a healthy and balanced diet consisting of whole grains, lean proteins, moderate fat intake, fruits and vegetables (FV), and participate in 60 minutes of activity/day may (Ward et al., 2015).

Incorporating adequate intake of FV promotes a healthy and balanced diet. FV contain an abundance of under-consumed nutrients among children and adults(Andersen et al., 2014). Despite the benefits associated with increased FV intake, less than 10% of children and adolescents meet recommended fruit intake, while <3%

meet recommended vegetable intakes (Office of Disease Prevention and Health Promotion, 2015)(Anderson et al., 2014)(Moore et al., 2016)(Mushi-Brunt et al., 2007). In addition, low-income families are at an increased risk of low FV intake due to fewer financial resources for purchasing nutrient dense foods(Ward et al., 2015)(Okeke et al., 2017)(Olsho et al., 2014). USDA government programs, such as National School Lunch Program (NSLP), School Breakfast Program (SBP), and Fresh Fruit and Vegetable Program (FFVP), aim to increase FV consumption during the school year, however, access to these programs are limited to the academic year, further increasing nutritional concern in children not receiving these benefits during summer months (USDA Fresh Fruit and Vegetable Program, 2017)(Lin & Fly, 2016).

To date, the Summer Food Service Program (SFSP) and Seamless Summer Option (SSO) are two entitlement programs established by the USDA that offer free meals and snacks to help low food security (i.e. reduced quality, variety, or desirability of diet) children during summer months, when NSLP or SBP are not available (Huang & Barnidge, 2016)(USDA Summer Food Service Program, 2017) (USDA Definitions of Food Security, 2017). Compared to the NSLP and SBP, which serve more than 30 million children, SFSP and SSO serve an average of only 2.5 million children annually (Huang & Barnidge, 2016). Limitations to SFSP include reduced availability in some communities, lack of transportation, and continued funding by local government agencies, private nonprofit agencies, and/or schools during summer months (Food Research & Action Center, 2017).

Although studies have explored ways to increase access to FV for adults and their families, there is limited research assessing FV access for children (Seguin et al., 2017)(Olsho et al., 2015)(Okeke et al., 2017)(George et al., 2016). Although children may have some influence on their parent's, children aren't the decision makers when it comes to food purchases, making it difficult to conduct a study solely on children and FV access (Mushi-Brunt et al., 2007). Local farmers markets (FM) and community gardens are additional resources to increase access to fresh FVs outside traditional academic months. Nonetheless, significant barriers still remain such as utilizing farmers markets, affordability, transportation, purchasing knowledge, home support, and taste preferences (George et al., 2016)(Evans et al., 2012). Research in adults suggests that a FM education intervention coupled with provision of a voucher/coupon may increase FV access and purchases, however few studies have focused on these interventions specifically aimed at children during summer months when other program supports may not exist (Olsho et al., 2015)(Seguin et al., 2017)(George et al., 2016).

According to the 2015 -2016 Ellensburg School District annual report, 77.5% of student population were classified as White, 17.0% Hispanic/Latino, 1.5% Asian, 1.3% Black/African American, 0.8% American Indian, 0.3% Native Hawaiian/Other Pacific Islander, and 1.5% are two or more races. Of the 1,482 students enrolled in elementary schools beginning in 2015, 37.0% were enrolled in free or reduced lunch. In 2015-2016, Mt. Stuart Elementary had a total of 486 students and 57.3% of those students were receiving free or reduced lunches. Of the three elementary schools in Ellensburg, Mt.

Stuart Elementary had the highest percentage of students participating in free or reduced lunches (Ellensburg School District, 2016).

The purpose of this pilot intervention study was to provide FM education coupled with a FM voucher to assess FM awareness, attendance, and voucher use. It was hypothesized that participation in the FM education intervention would increase awareness and attendance of FM among K-3<sup>rd</sup> grade students.

## **Methods**

### **Study Design**

This three-week pilot study on FM and nutrition education intervention was a convenience sample that included K-3<sup>rd</sup> grade students who attended a summer school program in central Washington. The first two weeks included a FM and nutrition education intervention plus distribution of a FM voucher certificate worth \$8.00 to each participating student. A nutrition education intervention consisting of 15-20 minutes sessions administered Monday through Thursday during the students' lunch period. The lessons explained the purpose and location of the local farmers market, what FV may be purchased at a FM, and the process of utilizing the voucher while attending the FM. Additionally, a participating FM vendor provided vegetables samples to students while explaining the importance of farming and growing fresh FV. The nutrition education intervention outlined the differences between FV and their health benefits.

The principle investigator and teachers administered a pre/post behavioral questionnaire to read out loud to participants individually and record their answers using a hedonic yes/no format (Chen et al., 1996). The questionnaire was designed to

assess the participant's FM awareness and FV preferences. The variables measured were participant's FM awareness and FV preferences at the FM. Pre-questionnaires were distributed to participating students during week one of the study. Each questionnaire was tracked with a three-digit code to protect the confidentiality of students and only the primary investigator had access to the key. An identical post-questionnaire following the same protocol as the pre-questionnaire was distributed to students during week 3 of the study.

Participating students received a FM voucher to be validated on site for a packet of \$1.00 vouchers (\$8.00 in total) to be used only at the FM. Each \$1.00 voucher contained a three-digit identifier number to track purchases. The voucher was valid during two Saturday markets following the interventions each week. The voucher was only valid for the purchase of fresh fruits and vegetables at participating vendors. Data was recorded at the FM regarding FV purchases at each vendor.

### **Subjects**

Students in a summer school program were recruited to participate and all racial and ethnic groups were included in this study and had an equal opportunity to participate. Prior to starting the study, subjects were recruited with permission of the school district administration. Parents of students were mailed a parent permission form explaining study protocol and were given the opportunity to opt out of participation.

## Data Analysis

Paired t-tests were conducted to measure differences between students' FM awareness and attendance at pre- and post-tests using Stata v.12. Due to the small sample size for voucher distribution, only summary statistics are provided in this analysis.

## Results

### Sample Characteristics

**Table 3** reports the sample characteristics. A total of 81 male and female students completed the pre-questionnaires while 65 students completed both pre and post-questionnaires, representing the final sample for this pilot study. Participants were evenly distributed across grade levels as indicated in **Table 3**.

**Table 3: Sample Characteristics (n=65)**

| <b>Grade Level</b>          | <b>N</b> | <b>%</b> |
|-----------------------------|----------|----------|
| <i>Kindergarten</i>         | 16       | 24.6     |
| <i>1<sup>st</sup> grade</i> | 11       | 16.9     |
| <i>2<sup>nd</sup> grade</i> | 24       | 36.9     |
| <i>3<sup>rd</sup> grade</i> | 14       | 21.5     |

### Farmers Market Awareness

**Table 4** represents FM awareness and use from pre/post questionnaires. FM awareness increased from 71% in the pre-questionnaire to 85% in the post-questionnaire ( $p=0.005$ ). Seventy-five percent of kindergarten students reported



awareness of the FM as compared to 90% among the other grades ( $p=0.136$ ). FM awareness did not appear to differ significantly by any other grade level.

**Table 4: Farmers Market Knowledge/Use**

| <b>Pre/Post Questions</b>                   | <b>Sample Size</b> | <b>% Pre<br/>(yes)</b> | <b>% Post<br/>(yes)</b> | <b>p-value</b> |
|---|--------------------|------------------------|-------------------------|----------------|
| Do you know what the farmers market is?     | 63                 | 71%                    | 86%                     | 0.005          |
| Do you go to the farmers market?            | 45                 | 93%                    | 93%                     | 1.000          |
| Do you buy vegetables?                      | 40                 | 78%                    | 85%                     | 0.183          |
| Do you buy fruits?                          | 41                 | 76%                    | 85%                     | 0.159          |
| Does your family go with you to the market? | 42                 | 98%                    | 100%                    | 0.323          |

#### **Farmers Market Attendance**

Both 1<sup>st</sup> and 2<sup>nd</sup> grade had 100% of respondents report FM attendance post intervention compared to 87% and 82% of kindergarten and 3<sup>rd</sup> grades. Kindergarten and 3<sup>rd</sup> grade students reported a non-significant decrease in response to FM attendance post intervention when compared to other grades ( $p=0.07$  and  $p=0.10$ , respectively). While non-significant, virtually all students who reported attending the FM also reported that their family accompanied them, from 98% at pre-test to 100% at post-test ( $p=0.32$ ).

#### **Fruit and Vegetable Purchases and Voucher Use**

Although not statistically significant, FV purchases increased from 76% to 85% and 78% to 85%, respectively, across the sample ( $p=0.16$  and  $p=0.18$ ).

Of the 75 students who received certificates, 21 students (28%) validated their certificate at the FM for an \$8 voucher. Second grade students demonstrated the greatest participation with 9 voucher pick-ups (43%) totaling \$72 spent on fruit (\$28), vegetables (\$26), and FV combo (\$18). Third grade student participation was lowest, with two voucher pick-ups (9.5%) totaling \$16 spent on fruit (\$6), vegetables (\$7), and FV combo (\$3). Each student who received a voucher spent the full allotment of \$8 on fresh FV totaling \$168 in vouchers used. Of the total vouchers used, \$5 was spent on an unidentified purchase.

### **Discussion**

This pilot intervention study examined the efficacy of a FM nutrition education intervention on FM awareness in K-3<sup>rd</sup> grade students participating in a summer school program. Although FM awareness improved across the sample, 2<sup>nd</sup> and 3<sup>rd</sup> grade students appeared to achieve the highest improvement in FM awareness, suggesting that this may be the most effective age to target in future interventions. Kindergarten and 1<sup>st</sup> grade students actually reported less FM awareness post intervention, indicating that this intervention may not have been effectively designed for this age group. The observed decrease in FM awareness identified in kindergarten and 1<sup>st</sup> grade students may have been due to reading comprehension ability, errors in questionnaire administration, or comprehension level of FM intervention lessons plans.

To the best of the researchers' knowledge, this is the first study that specifically looks at FM awareness in young children. However, a study conducted by George et al., (2016) in adults, suggested that knowledge of FM food purchasing and access to

produce increased when FM education was provided. Additionally, that study also provided a series of garden activities to the participating adults' children, and parents reported that children were more likely to eat produce picked from the garden post intervention (George et al., 2016). These results suggest that incorporating a garden intervention to this pilot intervention study may further improve FM awareness in young children, as well as potentially lead to increased FV intake.

Another outcome of interest was FM attendance. Following the FM intervention, 1<sup>st</sup> and 2<sup>nd</sup> grade students reported attending the FM more than kindergarten and 3<sup>rd</sup> grade students. Kindergarten and 3<sup>rd</sup> grade students reported less FM attendance from pre to post intervention, suggesting that 1<sup>st</sup> and 2<sup>nd</sup> grade students may have had a stronger influence on parent's decision making compared to kindergarten and 3<sup>rd</sup> grade students. However, further research in this area is necessary to fully understand the most influential factors in FM attendance among children and families. Overall, this pilot study suggests that 2<sup>nd</sup> grade students may benefit the most, since both FM awareness and FM attendance gains were observed in this group. Second grade students also had the most voucher pick-ups and spent the most on FV, which further indicates that 2<sup>nd</sup> grade students continued to be the most appropriate group for this pilot study intervention. Creating an education intervention that is tailored to specific grades plus incorporating a parent/guardian education component may enhance FM awareness and FM utilization in all groups.

Although distributed vouchers were spent in full capacity, the sample size of voucher pick-ups was small. This may indicate that a larger voucher allotment may be

more effective in FM utilization (George et al., 2016). George et al., 2016 provided a \$50 FM spending allotment to adults and the results of this study indicated that the average spending was \$40.68 per visit and participants reported an increase in access to produce post intervention. This suggests that a voucher greater than \$8 may be more of an incentive to get students and families to utilize the FM. Although results were non-significant due to small sample size, purchasing trends were favorable, with students purchasing more FV post intervention. A similar study in adults, provided \$2 Health Buck coupon for every \$5 spent at the FM to SNAP participants (Olsho et al., 2015). That study found that participants reported purchasing a FV that day when provided a Health Buck coupon. Because participants received the \$2 Health Bucks while shopping at the FM, this may have been more of an incentive to purchase a FV that day. These findings suggest that this strategy could be adapted for future research targeting children.

Herman et al., (2008) researched the effects of a \$10 FM or supermarket FV voucher with WIC participants. The vouchers were provided bimonthly to adults ( $\geq 18$  years old) over a six-month intervention period. Following the intervention, participants in both the FM and supermarket groups reported an increase in FV intake by  $\sim 1.5$  servings per day. Unlike this pilot study, which targeted children, the study conducted by Herman et al., (2008) provides further support that a supplemental FM voucher may increase FV access.

Beets et al., (2015) conducted a three-year Healthy Lunchbox Challenge (HLC) study. The participants of this study were children aged 4-12 years old attending a 10-11 week summer day camp. At the beginning of the study, children were provided with

healthy education materials that included a description of the HLC, a 'Building a Better Lunchbox' guide, and a healthy lunchbox visual aid. Also, parents were continuously reminded and asked about the HLC during daily pick-ups and drop-offs. The mission of the HLC was to encourage children to pack a lunchbox consisting of fruit, vegetable, and water (FVW). Students were split into groups based on grade level (K/1<sup>st</sup>, 2<sup>nd</sup>/3<sup>rd</sup>) and each member of the group could receive up to three points per day (one for fruit, one for vegetable, one for water) by bringing/consuming FVW for the HLC. Points were tallied each week and prizes were awarded to the groups with the highest points. Over the course of three years, students significantly increased both FV intakes from a baseline of 2.2%/28.2% (fruit/vegetable) and post intervention 13.5%/44.3% ( $p < 0.01$ ). These results further support that that a longer intervention period of 10 - 11 weeks may provide more significant findings. Although this study researched consumption of FV in children, it did not target low-income children or examine FV purchasing trends in children.

Limitations to this pilot study included small sample size, duration and inconsistent administration of questionnaires. Due to the small sample size, a majority of the results lacked variation on certain outcomes, limiting our ability to test for differences between subgroups. The limited three-week intervention time period and two-week period to utilize FM voucher also proved to be a challenge. The short time period of two-weeks for students to validate FM certificate and receive FM voucher may have contributed to poor FM voucher utilization. Other challenges in this study may reflect issues such as losing the FM voucher certificate, not showing the

parent/guardian the voucher certificate, or transportation issues to the FM over the limited two-week utilization period (Okeke et al., 2017)(Evans et al., 2012). Due to inconsistent administration of questionnaires, questions that assessed students perceived barriers to FV such as transportation, FV taste preferences, and FV purchase preferences were removed from questionnaire.

A major strength of this study is that it is the first to examine the effects of FM awareness and FM voucher use among children during a summer school program. Other studies have focused on adults as the primary audience for FM interventions and determining ways to improve FV access (Okeke et al., 2017)(George et al., 2016)(Olsho et al., 2015)(Herman et al., 2008). Another strength of this study is that reported FM awareness improved from pre/post intervention. Of the grades studied, 2<sup>nd</sup> grade report improved FM awareness, attendance, and voucher use post intervention. Although voucher use could not be reported significantly due to small sample size, all vouchers that were distributed were spent in full capacity. When looking at FV purchases individually, children spent more of their voucher money on vegetables on fruit.

The implications of this pilot study offer important findings for future research efforts aimed at scaling up FM interventions to school-aged children. Suggestions for future research include a longer classroom-based intervention setting of 2-3 months, tailored intervention lessons, proper training of teachers administering the questionnaire, and a larger voucher allotment between \$10-\$50. A classroom-based setting would allow the information to be presented at a more desirable pace and would likely yield stronger findings. An intervention period of 2-3 months would allow

the principle investigator to administer a pre questionnaire prior to intervention, post questionnaire after voucher distribution to further assess voucher usage, and post questionnaire at the end of the intervention. Proper training of the teachers administering the questionnaire and longer lesson times would facilitate more consistent and complete questionnaires in the future. Efforts to define measurement items to specifically assess FM knowledge and awareness should be expanded. Full questionnaire administration would allow perceived barriers such as transportation, parental guidance, and FV purchase preferences to be fully examined and is identified as an area for future research.

## **Conclusion**

This pilot study hypothesized that participation in a FM education intervention would increase awareness about FMs among K-3<sup>rd</sup> grade students. The strongest improvements in FM awareness, attendance, and voucher use were observed in 2<sup>nd</sup> grade students, suggesting that this is a good age for future interventions' target audience. Despite the small sample size constraints on statistically significant results, on average, students reported improved FM attendance and FV purchases post-intervention. This pilot study provided results that can guide future research in this area targeting specifically children. A larger and more targeted sample, an improved questionnaire, larger voucher allotment, and a longer classroom-based intervention period would most effectively offer students an opportunity to expand their knowledge and awareness of FM as well as provide supportive resources to encourage FM utilization for healthier families and communities.

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