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Evaluation of a Theory-Based Farm to School Program

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EVALUATION OF A THEORY-BASED FARM TO SCHOOL INTERVENTION

by

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ABSTRACT

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Fruit and vegetable (FV) intakes in MS children remain lower than recommended. Theory-based, multi-component nutrition education interventions like Farm to School (F2S) target FV consumption and utilize such interventions to improve children's dietary behaviors by incorporating nutrition and agriculture education. The current study was designed with Theory of Planned Behavior (TPB) as its framework. An intervention was implemented to enhance beliefs, norms, and self-efficacy regarding FV, thus potentially increasing the intention to consume more FV. The research objectives of this study are to describe changes over the course of the intervention in (1) nutrition knowledge; (2) norms, beliefs, and self-efficacy towards eating FV; (3) FV preferences; (4) assess relationships between (a) FV knowledge scores and preferences, (b) reported access to FV at home and reported intakes of FV, (c) FV-related information obtained from teachers and participants' beliefs or expectancies about consuming FV; and (5) determine the ability of norms, beliefs, and self-efficacy about eating FV in predicting intentions, and the ability of intentions to predict FV intake. Fifth grade students (N=124) were selected as the target of the intervention. Outcome data were collected regarding demographics, knowledge, preferences, norms, self-efficacy, intakes, beliefs, access, and intentions related to FV, via 84-item pre- and post-intervention surveys, which were administered before and one month following the intervention. Descriptive statistics, correlations, regressions, and Wilcoxon signed ranks tests were conducted using SPSS

v.21. Nearly all (n=120, 96.5%) 5th grade students participated in both surveys. Significant improvements were noted for students' FV beliefs (Z=-2.18; p=0.029). After a regression analysis of post-intervention TPB constructs, the overall model was found to be significant at $F(3, 88) = 7.2$, $p<0.001$, although it appeared that only self-efficacy significantly predicted intentions, $t(91) = 2.25$, p=0.027. In contrast to what would be expected when using the TPB, intentions did not significantly predict FV intakes. Future F2S interventions should utilize dietary intake instruments validated for use in children, longer interventions, or longer follow-up periods to allow for assessment of greater impacts.

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LIST OF ABBREVIATIONS

BMI ……...…….... Body Mass Index

CATCH ……...… Coordinated Approach to Child Health

CDC ……..…….. Centers for Disease Control and Prevention

CMHP …… Center for Mississippi Health Policy

CNPP ……..…….. Center for Nutrition Policy and Promotion

EFNEP ……..…… Expanded Food and Nutrition Education Program

F2F …….. Farm to Family

F2S ……...……... Farm to School

F2SW …… Farm to School Week

FFQ ……..……... Food Frequency Questionnaire

FFVP ……...……. Fresh Fruit and Vegetable Program

FNS ……..……... Food and Nutrition Services

FV ……...……... Fruits and Vegetables

MFPC ……..…… Mississippi Food Policy Council

NEL ……...……... Nutrition Evidence Library

NES …….. Nutrition Education Survey

NFSN ……..…… National Farm to School Network

NSLP ……...……. National School Lunch Program

PAT ……...……... Parents as Teachers

REUNHC …… Research and Evaluation Unit of the Network for a Healthy California

QATQS ……..…… Quality Assessment Tool for Quantitative Studies

SBP ……..... School Breakfast Program

SES …….. Socioeconomic Status

SNAP ……. Supplemental Nutrition Assistance Program

SNAP-ed ……..…… Supplemental Nutrition Assistance Program-Education

T2DM ……..…… Type 2 Diabetes Mellitus

TPB ……..……... Theory of Planned Behavior

USDA ……..…… United States Department of Agriculture

CHAPTER I

INTRODUCTION

According to the Centers for Disease Control and Prevention (CDC), chronic diseases make up one of the most expensive health concerns, the number one cause of death, as well as one of the few avertable health issues that burden the United States (U.S.). Additionally, various chronic disease rates have been on the rise since the mid-1900s. A nutritionally adequate diet has been shown to be an important factor in preventing many of the common chronic diseases, such as cancer, type 2 diabetes mellitus (T2DM), obesity, hypertension, and heart disease. Diet-related chronic diseases actually accounted for an extraordinary one-half of all deaths caused by all chronic disease, and evidence has supported the promotion of dietary approaches to prevent and sometimes treat diet-related chronic illnesses (CDC, 2012).

Obesity is not only considered to be costly to treat in the U.S. but is also very detrimental to the nation's future health and can be managed and possibly prevented with appropriate modifications of diet and exercise habits (Wolf, 1998). In Mississippi, obesity rates for adults and even children are among the highest in the nation (CDC, 2012). Since obesity greatly increases the risk of developing chronic diseases, maintaining a healthy weight with optimal dietary behaviors and exercise are keys to avoiding chronic disease diagnosis. In order to address the growing rates of chronic disease, healthy lifestyles must be emphasized to prevent obesity's co-morbidities like heart disease, stroke, and hypertension. Because the effect that childhood obesity may have on future health and chronic disease, it is important to consider how best to intervene upon this epidemic early in children's lives.

First, many different aspects of children's environments need to be assessed. Schools, afterschool activities, and the home environment all provide avenues upon which children may be educated about nutrition and given opportunities to practice healthy habits. Researchers have found that nutrition education interventions can have a large impact on a child's weight status, and educational or school-based nutrition interventions have been an effective means for addressing and treating childhood obesity as well as increasing fruit and vegetable consumption (Silveira, Taddei, Guerra, & Nobre, 2011). Therefore, utilizing results from studies that have investigated childhood obesity via school environments is crucial to improving and enhancing school wellness policies as well as other childhood obesity prevention initiatives.

A diet including regular and plentiful fruit and vegetable (FV) consumption may have preventive effects on obesity and chronic disease risks, as FV have been shown to be extremely beneficial to human health (Hung et al., 2004). Research has repeatedly shown an inverse relationship between low FV consumption and high chronic disease occurrence as well as high mortality rates (Boeing et al., 2012). The importance of a particular emphasis on FV interventions is now more imperative than ever, so introducing concepts of a healthy lifestyle should be done as early as possible and while children are still learning adequacy, balance, and moderation related to dietary intake. The United States Department of Agriculture (USDA) recommends between two and five cups of FV daily depending on an individual's age and gender. Despite these recommendations, the CDC reported that the average U.S. adolescent only consumes fruit about one time per day and consumes vegetables about 1.3 times per day. Further, Mississippi children consumed less than one fruit and one vegetable per day (39.8% and 42.4%, respectively).

The discrepancy in recommended intake versus actual intake leaves millions of children to be potentially nutrient deficient and at an increased risk for obesity, cancers, and other chronic diseases, as well as premature death (CDC, 2013).

Intakes of FV often remain low in children, but children tend to have higher intakes of FV when exposed to more variety early in life, as evidence has shown positive associations between FV intakes and exposure to FV through child-focused community programs (Glasson et al., 2013). Such evidence supports the need for increased exposure to FV in various aspects of children's environments at home, school, and any other areas children visit frequently. Without the necessary changes to children's entire food environment, whether at school, at home, in food service institutions, or in grocery stores, the future of public health will be at stake as children's likelihood for developing diet-related chronic diseases in adulthood, and perhaps sooner, increases. No single intervention will change dietary habits; doing so must take collaborative efforts from multiple levels within a child's environment. Further research is needed to determine what interventions work best in each environment a child may experience, especially in low-income environments where access and availability of FV and other healthy food items may be lacking (Chung & Myers, 1999; Hendrickson, Smith, & Eikenberry, 2006).

One initiative that often utilizes multi-level interventions to improve children's dietary behaviors, especially in terms of FV intakes, is the Farm to School (F2S) program. Administered by the USDA as part of the National School Lunch Program, F2S increases the awareness of the importance of nutritional, agricultural, and environmental sustainability (USDA, 2011). The National Farm to School Network (National Farm to School Network [NFSN]; 2013) suggests F2S programs often result in positive outcomes

such as improved nutrition and agriculture knowledge and awareness, increased FV intakes, expressed willingness to try new foods, support for the local community, improved access to FV among children who otherwise might not be exposed to local FV, and an abundance of other benefits.

It is concerning that in Mississippi, children's FV intakes remain lower than what is recommended even though more than 30% of the residents in Mississippi are employed by agriculture (Mississippi Department of Agriculture, 2012). However, Mississippi is making strides for improving the dietary habits of its children by initiating F2S Week. Governor Phil Bryant signed House Concurrent Resolution #112, which designated Mississippi's F2S week on May 3, 2012 (Mississippi Food Policy Council [MFPC], 2012). In October of 2012, the first F2S week was celebrated in Mississippi, and efforts during this week included encouraging schools to serve at least one local item during the week and recognizing local items that were available for Child Nutrition Programs (MFPC, 2012).

Often used as a guide to designing interventions that seek to improve FV intakes, the Theory of Planned Behavior (TPB) explains concepts behind individuals' dietary habits and behaviors that result from individuals' intentions to perform certain behaviors. These intentions are related to beliefs, subjective norms, and perceptions of control over the specified behavior (Ajzen, 1991). The TPB allows researchers to better understand why individuals practice certain behaviors because often the behaviors correspond to what is normal for the individuals, so bringing the behaviors to the individual's attention, raising the individual's awareness, and supporting the individual's knowledge of the behavior are done to consequently change the behavior (Contento, 2007). Understanding

children's intentions and behaviors regarding FV is a multifaceted issue, in which the continuation of research on FV interventions in child and adolescent populations is encouraged so that effective interventions can be developed and implemented to effectively increase FV consumption.

According to the TPB, if attitudes, subjective norms, and behavioral control are impacted, then intentions to perform the healthier behaviors, for example, to consume more FV in the case of current research, will likely improve as a result. The present study seeks to evaluate whether a local F2S intervention is a viable method for improving FV intakes. Often the goal of F2S interventions is to increase general nutrition knowledge as well as FV awareness in school children, which could enhance attitudes, norms, and behavioral control regarding FV, then perhaps F2S interventions could increase a child's intention to consume more FV. Thus, the purpose of this study is to determine children's knowledge, attitudes, behavioral control (self-efficacy), and preferences regarding FV before and after a local F2S intervention.

Research Objectives

1. To describe the changes in nutrition knowledge, specifically related to FV, of 5th grade students before and after a F2S intervention, known as F2S Week.
2. To describe norms, beliefs, and self-efficacy about eating FV before and after the F2S intervention.
3. To identify any changes in FV preferences over the course of the intervention.
4. To assess relationships between (a) FV knowledge scores and preferences; (b) reported access to FV at home and reported intakes of FV; and (c) FV-related

information obtained from teachers and participants' beliefs or expectancies about consuming FV.

5. To test TPB and determine the ability of norms, beliefs, and self-efficacy about eating FV in predicting intentions, and the ability of intentions to predict FV intake.

Assumptions

1. Students who participated in the survey reported truthful responses to the questions to the best of their abilities.

2. The instruments used to survey participants during this evaluation were tested for validity in the surveyed age group.

Limitations

1. All data were self-reported by the participants.

2. Survey questions on intake only asked participants about intakes of the previous day.

3. No long-term follow up data collection was implemented.

4. Very little rigorous research literature is available for comparison on evaluations of F2S programs.

5. The present study's intervention itself lacked an element of process evaluation of various components of the intervention.

6. The sample was relatively small, and results can truly only be generalizable across similar communities with similar agricultural products.

7. The pre-test survey questions were identical to the post-test survey questions, with the exception of the fill-in-the-blank question asking, "What was your favorite part of F2S month?" which was only asked at the post-test.

8. The intervention was designed as a weeklong program, but some intervention components (such as the F2S bulletin boards in the cafeteria and the weekly F2S lesson plans in health class) lasted one month. Therefore, confusion could have existed in distinguishing F2S week versus F2S month.

Definition of Terms

Theory of Planned Behavior: A theory, which seeks to explain concepts behind individuals' dietary habits and behaviors that result from individuals' intentions to perform certain behaviors. These intentions are related to beliefs, subjective norms, and perceptions of control over the specified behavior (self-efficacy) (Ajzen, 1991).

Intentions: An individual's readiness to perform or change the behavior of interest (Ajzen, 1991).

Beliefs: An individual's belief about the consequences associated with the behavior of interest (Ajzen, 1991).

Subjective Norms: An individual's perception about the normalness of the behavior of interest (Ajzen, 1991).

Perceived Behavioral Control: An individual's perceptions on the ease or difficulty of performing or changing the behavior of interest. This term is often inter-changed with self-efficacy (Ajzen, 1991).

Preference: How an individual selects the food in which they eat; can be driven by environmental, personal, behavioral, psychological, sociological, economic, or

sensory factors. In the case of the present study, preferences only pertain to fruits and vegetables.

Nutrition Knowledge: An individual's awareness and understanding of the relationship between food and health.

Intakes: An individual's reported history of foods consumed within a designated time period. In the case of the current study, intakes measured fruit and vegetable consumption over the day prior to being asked.

Access: Fruit and vegetable availability outside of the school environment.

Information Learned from Teacher: The information that a student has learned from their teacher concerning fruits and vegetables.

United States Department of Agriculture: The United States Department of Agriculture (USDA) is the federal executive department responsible for developing and executing federal government policy on farming, agriculture, forestry, and food. The National School Lunch Program and Farm to School are administered through the USDA.

Centers for Disease Control and Prevention: The Centers for Disease Control and Prevention (CDC) is a federal agency operated by the Department of Health and Human Services. The CDC focuses on infectious disease, food borne pathogens, environmental health, occupational safety and health, health promotion, injury prevention, and educational activities designed to improve the health of U.S. citizens.

Diet-Related Chronic Disease: Identified by the CDC as being among the most common, costly, and preventable of all health problems in the U.S., including heart disease, stroke, cancer, and diabetes. Physical activity and dietary behaviors have been

acknowledged as two of the four modifiable health risk behaviors responsible for much of the illness-related burdens and deaths.

Dietary Guidelines for Americans: Guidelines jointly issued and updated every five years by the USDA and the Department of Health and Human Services. These guidelines focus on balancing calories with physical activity and encourage Americans to consume more healthy foods like vegetables, fruits, whole grains, fat-free and low-fat dairy products, and seafood.

Farm to School: A school-based program that connects K-12 youth with local farmers through several methods, including schools purchasing food items that have been grown or raised locally, serving the local items to the youth through the cafeteria or classroom, and providing nutrition and agriculture education. In addition to purchasing local items from a local farm, some Farm to School (F2S) programs offer local fruits and vegetables that have been grown in school gardens. The goal of F2S programs is to create an environment that increases children and adolescents' exposure to fruits and vegetables, while supporting local farms.

Mississippi's Farm to School Week: Celebrated by Mississippi schools during the first week in October. Schools were encouraged to purchase and incorporate at least one local food item into school meals during the week.

National Farm to School Network: As a major supporter of F2S implementations, the National Farm to School Network (NFSN) focuses on F2S policy development, training and technical assistance, information development and dissemination, networking, marketing, as well as research and evaluation. The NFSN's vision is to ensure that the health of all school children, farms, the environment, economy, and

communities result from strong, effective, and influential F2S programs nationwide (NFSN, 2013).

National School Lunch Program: The National School Lunch Program is a federally assisted meal program operating in public and nonprofit private schools and residential child care institutions. The program, operated by The U.S. Department of Agriculture, through its Food and Nutrition Service, administers the program federally. At the state level, state education agencies work through agreements with local school districts to provide nutritionally balanced, low-cost or free lunches to children each school day (USDA, September 2013).

Food Insecurity: A household-level economic and social condition of limited or uncertain access to adequate food. Food insecurity can either be identified as low food security, or reports of reduced quality, variety, or desirability of diet with little or no indication of reduced food intake; or very low food security, which is an indication of disrupted eating patterns and reduced food intake (USDA, September 2012, 4b).

Food Desert: A geographic area where affordable and healthy food is difficult to obtain, particularly for those without access to an automobile. Often, food deserts exist in rural areas, low-income communities, and are sometimes associated with supermarket shortages and food insecurity (Hendrickson, Smith, & Eikenberry, 2006).

Nutrition Education Survey: A questionnaire created for use with elementary school children to assess fruit- and vegetable-related theory of planned behavior concepts (norms, beliefs, and self-efficacy), availability at home, intakes, preferences, nutrition knowledge, and information regarding fruits and vegetables learned from teachers. The

survey was compiled by the Research and Evaluation Unit of the Network for a Healthy California (Research and Evaluation Unit of the Network for a Healthy California, 2007).

CHAPTER II

REVIEW OF RELATED LITERATURE

Diet and Chronic Disease

According to the Centers for Disease Control and Prevention (CDC), chronic illness makes up one of the most expensive health concerns, the number one cause of death, as well as one of the few avertable health issues that burden the United States (U.S.), and it has been on the rise since the mid-1900s. Many of the common chronic diseases such as cancer, type 2 diabetes mellitus (T2DM), obesity, hypertension, and heart disease have been shown to be preventable by maintaining a nutritionally adequate diet. Research evidence has supported the promotion of dietary approaches to prevent and sometimes treat diet related chronic illnesses, which actually make up an extraordinary half of all deaths caused by all chronic disease (CDC, 2012).

As chronic disease has been on a steady incline, Anderson and Horvath (2004) stated that in the year 2000, nearly half (45%) of the U.S. population had a diagnosis of at least one chronic disease, and barely less than a quarter (21%) had been diagnosed with multiple chronic diseases. The prevalence of chronic disease has and is predicted to continue to escalate for upcoming decades.

In addition to the increasing prevalence of chronic disease, the cost of managing chronic diseases is also expected to increase. Individuals bearing the burden of these chronic diseases as well as taxpayers will be responsible for spending more money to manage such conditions. For example, the U.S. spent more than two trillion dollars on health care costs in 2006, and 75% of that two trillion dollars was spent on the care of patients with chronic illness, including those with just one illness and those with multiple

chronic illnesses (Homer, Hirsch, Minniti, & Parson, 2004). The U.S. currently spends approximately $8,000 per person per year on health care, which surpasses the health care spending of any other country in the world. While the U.S. has spent a great deal on the health care of chronically diseased patients, Homer et al. (2004) stated that the current health care system is not organized in a manner that provides the adequate treatment needs of the patients. Furthermore, the U.S. spends trillions of dollars supporting an unorganized, inefficient health care system. Either changing health care spending allocations or changing the dietary and lifestyle habits of the population in order to prevent chronic diseases must become a priority. Neither is an easy feat; however, changing eating patterns may be easier than having to change federal spending patterns (Gaines, 2012).

Pandya, Gaziano, Weinstein, and Cutler (2013) noted that the U.S. is expected to see a considerable increase in health care costs as a result of increasing life expectancies, and some researchers believe that as chronic disease rates increase, the quality of life of these individuals will decrease. Also noted was that nutrition policies must be made to target treatment and prevention of chronic diseases in order to avoid increases in costs associated with caring for individuals with cardiovascular disease, obesity, and T2DM. In a study to measure the effect of T2DM on health care costs for hospitalized individuals with cardiovascular disease, Carral et al. (2003) observed 4,865 patients hospitalized for cardiovascular disease within a two year period. The authors retrospectively identified the subjects' number of hospitalizations, lengths of time for each stay, mortality rates, and costs. During the two-year period of the study, more than one-third (35.1%) were patients with T2DM, who had much longer hospital stays as well as more readmissions

than subjects without T2DM. In addition, the authors reported a significant difference between in-patient costs for patients with T2DM compared to those without T2DM (approximately $4,640 and $3,391 on average, respectively). All of the patients in the study were hospitalized with cardiovascular disease, the most prevalent chronic disease, but those with an additional disease like T2DM spent more on health care, stayed hospitalized longer, and were readmitted more often. The results of this study support previous studies' findings that patients with multiple chronic diseases such as cardiovascular disease and T2DM have increased hospital stays and increased health care expenditures (Denton & Spencer, 2010).

Relatively little research exists on the health care costs related to chronic disease prevalence in U.S. patients, but several studies have found that health education and nutrition counseling are more cost-effective strategies to address chronic diseases than simply treating the diseases once an individual is diagnosed. Cobiac, Veerman, and Vos (2013) stated that prevention techniques to avoid chronic illness are not only cost-effective, but are also successful and sustainable. In addition, a cost-benefit study by Rajgopal, Cox, Lambur, and Lewis (2002) on the Expanded Food and Nutrition Education Program (EFNEP), a federally funded nutrition and health education program for low-income families, found that EFNEP was a worthy application of federal tax dollars. Researchers estimated monetary benefits of EFNEP by observing potential savings in health care costs that are currently spent on medically treating chronic diseases. First, Rajgopal et al. (2002) distinguished certain behaviors that were taught by EFNEP. These teachings intended to prevent future chronic illness such as learning how to make food choices to enhance dietary quality of meals prepared for participants'

families. Data were then obtained on the reported costs of treating diet-related chronic illnesses, such as T2DM and cardiovascular disease, from recent literature publications. After approximating a dollar value to the associated benefits, benefit-to-cost ratios were developed, and researchers found that approximately ten dollars would be saved in health care costs for every dollar spent on the EFNEP program.

As a result of the study, one could argue that if nutrition education programs similar to EFNEP were emphasized, decreases in chronic diseases and unnecessary spending may be observed. However, it should be noted that the authors lacked important data on incidences attributable to diet for various diseases such as osteoporosis. An alternative sensitivity analysis was performed at 50% to account for some diseases not fully being treated by diet, instead of 100% that was used in the original sensitivity analysis. The total benefit/cost ratio was reduced to nearly six dollars ($5.91) saved for every dollar spent on the EFNEP program. In addition, another alternative sensitivity analysis was performed at 50% to account for uncertainties in long-term maintenance of the optimal dietary behaviors, which led to a five dollar ($5.32) savings for every dollar spent; if only 25% of the sample maintained the dietary behaviors taught by EFNEP, $2.66 would be saved for every dollar spent. In conclusion, the ten dollar savings may not be an entirely accurate portrayal of the savings associated with implementing and maintaining an EFNEP program, though monetary benefits do exist nonetheless. Also, the optimal nutrition behaviors were only measured as if the participants did practice what was taught by the program; therefore, the participants' dietary behaviors must change in order for the savings to be realized. Certainly, further research would be necessary to understand the legitimate monetary benefits of the EFNEP program in

savings of participant health care costs, but this cost analysis study revealed positive contributions for which nutrition education programs, specifically EFNEP, have potential.

Obesity

Obesity may be one of the most expensive chronic diseases in the U.S. and the most detrimental to the nation's future health. Obesity rates have been one of the primary causes for the increased health care spending that resulted from excessive consumption and sedentary nature among the population (Yang & Nichols, 2011). Additionally, researchers like Olshanksy et al. (2005) predicted that today's generation of children and adolescents might possibly be the first generation to die before their parents due to the alarmingly high childhood obesity rates that tend to follow into adulthood. Obesity, defined as having a body mass index (BMI) of greater than 30, increases one's chances of chronic disease development and other health problems. Fortunately, obesity can be managed and possibly prevented with appropriate modifications to diet and exercise habits (CDC, 2012). In Mississippi, obesity rates for adults and even children are among the highest in the nation. Even though recent findings by Levi et al. (2013) showed that Mississippi obesity rates have stabilized in the previous year and were recently exceeded by Louisiana rates placing Mississippi as the second most obese state in the nation, the state's obesity prevalence remains overwhelmingly high, at greater than 30%.

Obesity greatly increases the risk of developing chronic diseases, so maintaining a healthy weight with optimal dietary behaviors and exercise are keys to avoiding the associated maladies including T2DM, asthma, hypertension, stroke, liver disease, sleep apnea, gallbladder disease, and even coronary artery disease. In a study by Akil and Ahmed (2011), researchers assessed the associations among high rates of obesity, heart

disease, and hypertension within Mississippi and four other states (Louisiana, Alabama, Tennessee, and Colorado). Using prevalence and trends data from the CDC's Behavioral Risk Factor Surveillance System, researchers compared the rates of the three diseases in Mississippi to the three neighboring states, to the nation's rates, and to Colorado's rates as it was named the state with the lowest obesity, heart disease, and hypertension rates at the time of the study. Undeniably, Mississippi was found to have the highest rate of obesity, stroke, and hypertension. Specifically, African Americans in Mississippi had the highest rates of hypertension in the nation. In addition, a moderate association was found in obesity and stroke rates, and a strong association was found in obesity and hypertension rates. So in order to address the growing rates of chronic disease, healthy lifestyles must be emphasized, especially in Mississippi populations, to prevent obesity's co-morbidities like heart disease, stroke, and hypertension.

Researchers Zhang, Zhang, Penman, and May (2011) conducted a study to identify specific counties in Mississippi that were the most obese. In order to conduct this research, Zhang et al. (2011) obtained self-reported data from Mississippi residents to find associations between socioeconomic data and obesity prevalence at the county level. A method known as small-area estimation was used along with the Mississippi Behavioral Risk Factor Surveillance System, which provided data on obesity prevalence and socioeconomic and geographical trends. Results showed that the highest levels of obesity rates were along the Mississippi River and in the Delta regions. Upon observation of the prevalence of obesity in Mississippi in 2007 and 2009, researchers noted that all 82 counties experienced an increase in obesity rates between the two years, rising from 32.5% to 35.4%, respectively. Further, Zhang et al. (2011) found that

socioeconomic status (SES) had an inverse relationship with county obesity prevalence in Mississippi adults. The researchers recommended improving current obesity prevention campaigns as well as developing new ones. Since the publication of this study, a Year Three Report published by the Center for Mississippi Health Policy (CMHP) reported a slight decline in obesity rates among Mississippi inhabitants, particularly in the child and adolescent populations, which the CMHP stated was partly due to the nutrition and health policies that have since been implemented (CMHP, 2012). Though the decline was subtle, the state is on its way to a healthier future; however, obesity rates are still much higher than those of the rest of the country.

Childhood Obesity

Because the effect that childhood obesity may have on future health and chronic disease, it is important to consider how best to intervene upon this epidemic. Many aspects of a child's environment need to be assessed. Schools, afterschool activities, and the home environment all provide avenues upon which children may be educated about nutrition and given opportunities to practice healthy habits. Researchers have found that nutrition education interventions can have a large impact on a child's weight status, and educational or school-based nutrition interventions are a particularly effective means for addressing and treating childhood obesity (Silveira et al., 2011). Sbruzzi et al. (2013) reviewed 26 randomized controlled trials that specifically measured the effects of education interventions that addressed childhood obesity in either treatment or preventive methods. The review only included studies that assessed school-based, single- or multi-component interventions lasting six months or longer, while measuring BMI, BMI z-scores, weight, waist circumference, blood pressure levels, total cholesterol, or high-

density lipoprotein cholesterol. Once the final 26 studies were selected for review, the overall quality of the body of evidence was assessed based on the Grades of Recommendation, Assessment, Development, and Evaluation Working Group approach, which assessed the studies' limitations in study designs, consistency of results, directness, precision, and potential for publication bias.

The review revealed associations with decreased BMI values in participants of programs that lasted 12 months or longer, as opposed to the studies that lasted between six and twelve months, which had no observations of reduced BMI values among the participants. Eighteen of the 26 studies focused on prevention of childhood obesity whereas eight studies emphasized treatment instead. Significant associations were found between reduced waist circumferences, BMI values, and diastolic blood pressure in participants of treatment studies; however, no significant differences were found in the prevention studies for any of the outcome measures. The overall quality of evidence was declared to be of low quality since studies had limitations in study designs, precision, and consistency of results; therefore, further rigorous research is imperative to understanding ways to accurately address childhood obesity. Even so, the authors concluded that childhood obesity was more commonly treated than prevented, according to the results of this review, indicating that a high priority should be placed on childhood obesity treatment interventions in school-based programs.

Li and Hooker (2010) conducted a study to explore the various factors that affect childhood obesity by surveying students on school lunch participation, organization and sports team participation, parental exercise levels, television and computer exposure, SES, and whether a child attended a public school or private school. Using BMI as the

primary outcome, researchers obtained data on 62,880 subjects between the ages of 0 and 18 years. Findings showed significant relationships among age, gender, school-type, SES, and BMI measurements. The results implied that obesity prevention steps should be taken in public schools with an emphasis on children who do not participate in clubs, organizations, or sports, and who come from low SES households, since these factors were all found to be linked to the sample's obesity prevalence. Schools, for example, are generally thought of as an ideal place to target, educate, and intervene with children because so much of their time is spent in the school setting. Therefore, utilizing school environments and applying results from studies that have investigated childhood obesity are crucial to improving and enhancing school wellness policies as well as other childhood obesity prevention initiatives.

Fruit and Vegetable Consumption

Because fruits and vegetables (FV) contain a relatively abundant amount of nutrients such as antioxidants, phyto-chemicals, fiber, as well as a multitude of vitamins and minerals compared to other foods, FV are considered to be extremely beneficial to human health (Liu, 2013). Also, a diet that consists of regular and plentiful FV consumption may have preventive effects against chronic disease risk (Hung et al., 2004). A comprehensive review performed by Boeing et al. (2012) examined epidemiological literature focused on FV interventions and chronic illnesses including obesity, hypertension, coronary heart disease, cancer, stroke, arthritis, and T2DM among others. Results were considered *convincing* if two or more studies of high quality had consistent findings and results were deemed *probable* if epidemiological studies showed consistent associations among factors and disease. After reviewing the multiple studies that

evaluated risks associated with these various chronic diseases, evidence revealed convincing support for a reduced risk of hypertension, coronary heart disease, and stroke with increased FV intake. Other findings from the review supported probable evidence for reduced risks of other chronic diseases like cancer; however, the findings were not considered convincing enough to make recommendations towards specific FV intakes because of limited research on the quantity of intakes. Justifications were made for continuing the promotion of FV consumption for health, especially in Western civilizations that are most saturated with chronic disease.

In a study that estimated mortality related to insufficient FV intakes, Tobias et al. (2006) conducted a comparative risk assessment on risk factors and estimates of current chronic disease states. Doing so, the researchers sought to determine the approximate percentage of deaths during one year in New Zealand that represented deaths related to chronic disease and insufficient FV consumption. Upon comparing the estimated amount, researchers found that approximately 1,560 deaths during the year 1997 were attributable to inadequate FV intake compared to other causes of death such as the 520 deaths in one year from road- and traffic-related events. Results supported an inverse relationship between low FV consumption and high chronic disease occurrence as well as high mortality rates. It should be noted that increased FV consumption might very well be an accessible and affordable way to promote health and reduce chronic disease risk. This research illustrates the importance of FV intakes among the general population, especially in those who make decisions based on ease of access rather than based on health benefits. Therefore, the importance of particular emphases on FV interventions is now more imperative than ever. Additionally, the authors concluded that modest

increases in FV consumption, which would be a positive and achievable health message, could prevent a multitude of poor diet-related deaths. Perhaps future research should evaluate the most effective interventions and techniques for improving FV intakes with emphases on removing hindrances to unhealthy lifestyles such as conflicting health information and contradictory nutrition messages.

An interesting, but perhaps controversial benefit of increased intakes of FV was discussed by Reiss, Johnston, Tucker, DeSesso, and Keen (2012) who stated that cancer prevalence can be positively and negatively impacted by increasing one's FV consumption. These researchers gathered information from epidemiological studies in a meta-analysis published by the World Cancer Research Fund and American Institute for Cancer Research to estimate the consequences of increasing FV intake related to theoretical increased pesticide exposure (Robertshaw, 2007). Proposing that if just half of the U.S. population were to increase FV intakes by only one serving per day, doing so would result in approximately 20,000 avoided cases of cancer per year. Alternatively, the increase in FV intakes would inadvertently increase the number of cancer incidences caused by increased pesticide and residue exposures by only ten more cases per year. The magnitude of these findings is important for the future of public health nutrition since the benefits of avoiding so many cancer cases greatly outweighs the risks. Communicating the essential need for a diet high in FV is essential for building a healthier population.

Fruit and Vegetable Availability and Health

Evidence supports the importance of adequate FV consumption in maintaining a healthy lifestyle and preventing diet-related chronic illnesses. Regardless of the numerous

FV campaigns such as Fruits and Veggies - More Matters, launched by the Produce for Better Health Foundation, FV consumption rates continue to remain less than recommended (Produce for Better Health Foundation, 2013). Because of this gap between recommendations and intakes, environmental factors such as neighborhood access and FV costs are often targeted in order to address the lack of access to, or availability of, FV. Barriers such as little resources and access to FV may mean that lower income populations become the people to have the lowest FV intakes (Dong & Lin, 2009).

In a study of 9,830 adults, Kennedy, Paeratakul, Ryan, and Bray (2007) observed the relationship between SES and chronic illnesses. Because lower income and higher rates of chronic diseases have recurrently been found to be related, it is important to further investigate this association. After performing a cluster analysis, researchers found that rates of chronic diseases like T2DM, stroke, heart disease, and obesity were significantly higher in lower SES subjects. This cross-sectional study relied solely on self-reported data but still supported the relationship between SES and chronic disease prevalence.

Similar to results of Zhang et al. (2011), Metallinos-Katsaras, Must, and Gorman (2012) and Li et al. (2009) both reported that lower SES was associated with obesity. However, the research approaches differed in these studies. Li et al. (2009) developed a geographic variation method known as the small-area estimation model also used by Zhang et al. (2011). This method pinpoints communities that are of highest priority for obesity management. After estimating the prevalence of obesity in the area, the method was used to review what existing associations of obesity and community characteristics

were present. Since the communities with lower income and education levels generally had the highest rates of obesity, obesity prevention and management priorities should be targeted in those areas. These results emphasize the health burdens, in addition to the already existing financial burdens, that lie within low SES communities.

Another important health issue to consider is the hunger-obesity paradox discussed by Dietz (1995). An increased risk of obesity and chronic disease could be due to lack of sufficient funds to obtain healthy foods, especially fresh FV, when convenience and packaged foods continue to be seemingly less expensive and can remain on pantry shelves much longer than fresh counterparts. As research has shown, an excessive consumption of fat and calories combined with insufficient intakes of fresh FV, eventually leads to obesity and chronic illness (Boeing et al., 2012). Contrary to usual dietary recommendations in which obesity treatment would call for calorie restrictions, Dietz (1995) suggested that in order to prevent and manage the hunger-obesity issue, increased food supplementation as opposed to food restriction, would be necessary to reach more desirable patterns of dietary behavior. Thus, fresh FV should be emphasized in the diets of lower SES populations to maintain healthy lifestyles and prevent the likelihood of developing diet-related chronic illnesses in the future.

The definition of food insecurity used by the United States Department of Agriculture (USDA) and adapted from Anderson (1990), is limited or uncertain availability of nutritionally adequate and safe foods, or limited or uncertain ability to acquire acceptable foods in socially acceptable ways. On the other hand, food security can be viewed in various classifications based on different levels. These classifications include high food security, in which no problems or anxieties were present in obtaining

consistent and sufficient foods; marginal food security, in which problems or anxieties existed at times in obtaining adequate foods, though the amount or quality of the foods were not considerably reduced; low food security is a reduction in quality and desirability of foods in diet, but amounts of the foods were not considerably reduced; and very low food security, is a reduction in food intake due to lack of money or resources to obtain foods at times during the year. Both low and very low food security are considered food insecurity (USDA, Food Security in the U.S., 2012).

Although ostensibly paradoxical, recent studies have noted positive correlations among hunger, or food insecurity, and obesity. For example, Pan, Sherry, Njai, and Blanck (2012) surveyed 66,553 adults among 12 states using a single question on food security status ("How often in the past 12 months would you say you were worried or stressed about having enough money to buy nutritious meals?"), which served as a substitute for the more frequently used USDA Household Food Security Survey of 18 questions. After completing t-tests and a multivariate regression analysis, Pan et al. (2012) found that more than one quarter of the test subjects were classified as obese, and 19% were food insecure. In this particular sample, participants classified as obese had a significantly higher prevalence of food insecurity than those classified as having a normal body weight. Food insecurity and SES were indeed related to obesity in these adults.

Likewise, Metallinos-Katsaras et al. (2012) found similar results as Li et al. (2009), only in a sample of Massachusetts children. Metallinos-Katsaras et al. (2012) examined the relationship between food security, or consistent access to adequate foods to lead a healthy life, and weight status of children from infancy to later childhood. These researchers found that children living in food insecure households without hunger had

greater obesity rates. The evidence from Metallinos-Katsaras et al. (2012), Li et al. (2009), and Zhang et al. (2011) has suggested that some obesity prevention interventions may need to be emphasized in the populations that are more susceptible to food insecure situations. Food insecurity alone can lead to future health consequences such as physical, emotional, and developmental deterioration which all contribute to poorer health in some way (Alderman, Hoddinott, & Kinsey, 2006; Kirkpatrick, McIntyre, & Potestio, 2010). Further, obesity alone can lead to future health consequences such as T2DM, coronary heart disease, atherosclerosis, hip fracture, and gout (Maffeis & Tato, 2001). Therefore, obesity prevention methods should be emphasized in food insecure populations or food insecurity prevention methods should be emphasized in the obese population, since both populations tend to share common characteristics like frequent consumption of highly-processed foods or enduring periods of hunger between paychecks.

Stuff et al. (2006) explored the relationship between food insecurity and obesity in the Mississippi Delta, specifically. These researchers discussed that significantly higher rates of obesity were seen in food insecure adults, but after controlling for age, gender, and ethnicity, food insecurity was no longer independently linked to obesity rates, indicating that perhaps the relationship was not between food insecurity and obesity, but in some other underlying variable that the food insecure adults experienced. However, food insecure participants did present significantly higher rates of elevated cholesterol, heart disease, and metabolic syndrome, which may be managed by regular physical activity and a balanced diet rich in FV. Stuff et al. (2006) reported that obese adults in this region made up almost half (42.3%) of the food insecure adults who were included in the study sample of 1,457, but other factors such as income, race, and gender

also were related to the obesity prevalence. Even though food insecurity may not be the only issue in the obesity epidemic, a growing amount of evidence shows that food insecurity is indeed associated with obesity. Therefore, launching efforts to address hunger as well as obesity and chronic disease could positively influence overall health in a greater way. Chronic disease prevention methods that emphasize healthy lifestyles in low-income households should be given special attention because of the high rates of food insecurity combined with the rates of chronic illness.

Food deserts are defined as areas where few or no consumer food sources are available, and people living in food insecure situations often live in food deserts. Regardless of rural or urban areas, food deserts may be detrimental to health (Lang & Rayner, 2002). In a study to estimate the FV availability in both urban and rural low SES communities, focus groups, surveys, and inventories of the food stores within the communities were conducted (Hendrickson et al., 2006). In lower-income areas, focus group participants unanimously agreed that healthier food options were expensive and therefore unaffordable. These results demonstrated a lack of affordable, high quality, and healthy foods in low-income areas, which community residents thought prevented maintenance of healthy dietary habits. The authors concluded that the lack of access to a wide variety of fresh food items including more than just FV, but whole grains and dairy items as well may continue to lead to the growing prevalence of chronic illness. Thus, increased availability of nutrient dense foods is imperative for creating healthier nutrition environments in low-income communities.

Food deserts frequently appear in rural regions, and residents in such areas sometimes lack necessary transportation due to the impracticality of public transit, as

well as other reasons, when trying to purchase multiple grocery items. Often residents of low-income communities resort to purchasing highly processed foods from convenience stores (Monteiro et al., 2013). Chung and Myers (1999) noted that grocery store access is limited in rural regions, and food prices, regardless of nutrient density, can be significantly higher in locally owned stores. Researchers analyzed access of grocery stores to the rural community residents by obtaining a grocery store directory of the sample area. Prices were evaluated by collecting each store's annual revenue as well as prices from some individual items in the stores. The sample included 55 food stores separated into categories of grocery stores, convenience stores, and chain grocery stores. After comparing the distribution of stores, prices, and geographical locations, the researchers found that chain stores, which were least often located in inner-city areas, were twice as likely to provide some commodities like certain meat products and some fresh FV, than non-chain stores which were usually located nearer to inner-city areas. Also, chain stores were found to offer commodities at lower prices than the non-chain counterparts. In conclusion, the study revealed that lower income residents paid more for grocery items since large chain stores were not as accessible as those who had less variety and higher prices.

Cost is clearly a major factor for grocery selection among low-income individuals and can be the sole reason for avoiding the purchase, and thus consumption, of fresh FV **(**Monteiro et al., 2013). However, a report conducted by Projects for Public Spaces and Columbia University found that among low-income farmers' market shoppers in areas abundant in low-income households, price was not considered a barrier to shopping at the local farmer's market as many participants stated consistently lower prices were at

farmer's market when compared to grocery store prices. In addition, many of the sample farmer's market vendors accepted Supplemental Nutrition Assistance Program (SNAP) benefits, and offered youth programs that promoted healthy lifestyles. In this case, youth programs had lessons on eating well, food justice, and the importance of local food consumption while also highlighting leadership skills, professional development, and responsibility. Utilizing farmer's market foods and vendors to enhance each skill was a key part of the intervention. Authors noted that the youth program participants reported improvements in nutrition knowledge, self-confidence, and social environment support after engaging in the project (Project for Public Spaces, n.d.). Programs similar to the farmer's market youth programs where healthy behaviors, fresh FV as well as life skills are emphasized should be implemented and continued as a way to prevent chronic illnesses.

Fruit and Vegetable Availability among Youth

Introducing the importance of a healthy lifestyle should be done as early as possible and while children are still learning how to eat, how much to eat, and what to eat. Even though the USDA recommends two to five cups of FV every day, depending on age and gender, the 2013 State Indicator Report on Fruits and Vegetables published by the CDC reported that the average U.S. adolescent only consumes fruit about one time per day and consumes vegetables about 1.3 times per day. The discrepancy in recommended intake versus actual intake leaves millions of children to be potentially nutrient deficient and at an increased risk for obesity, cancers, and other chronic diseases, as well as premature death (CDC, 2103). Specifically, the same report illustrated that

nearly half (39.8% and 42.4%, respectively) of Mississippi children consumed less than one fruit and one vegetable per day (CDC, 2103).

A means of addressing childhood health issues with local FV was the Farm to Family (F2F) program, which was an initiative to combine healthy lifestyle promotions with an emphasis on supporting sustainable agriculture while aiming to create better access to local produce for low-income families with children participating in Head Start programs. Using a sample of 350 children, researchers noted that nearly half (48%) of the children were overweight or obese (Hoffman et al., 2012). In this research, F2F staff members were interviewed to discuss strengths, weaknesses, and values of the program, gather estimated time spent on the program each week, and to determine whether the F2F was worth continuing in the future. Questionnaires were sent home to parents to assess parental readiness to change in terms of FV intakes, child dietary habits, food preparation patterns, and whether the parents believed that children gained benefits from the F2F program. The F2F program consisted of five key components including (a) local produce offered at a low cost with bilingual educational materials and class farm field trips; (b) on-site staffing and support to receive deliveries, collect payments, and provide feedback for participants; (c) outreach to participants and Head Start staff members to communicate during the program; (d) financial elements to organize prices and payments; and (e) delivery logistics which included drop-off site schedules and delivery to shared kitchen sites.

Head Start staff members reported new and interesting ways to provide the low-income families with more affordable FV opportunities as well as nutrition education connections that were not otherwise made in the curriculum. Reported barriers to the

program were families not picking up packages as scheduled and discomfort among staff members when having to ask families for payment collections. There were no statistically significant differences in any of the questionnaire responses between pre- and post-test surveys during the F2F program period. The survey questions asked about meals cooked at home, daily FV consumptions, and daily sugar-sweetened beverage consumptions, among others. The average number of dinners cooked at home per week was 5.57 meals at pre- and post-test times. The average dinners reported eaten outside the home were 1.0 meal per week. Also, parents reported that children consumed between four and five FV per day and between one and two sugar-sweetened beverages per day, on average. Even though no statistical significance was found from the surveys, most (86%) parent participants reported optimistic opinions about the overall program as well as interest in participating in future years. Parents also reported that the program was beneficial in that more FV were consumed, more affordable FV were made accessible, more fresh FV were obtained, and wider varieties of FV were eaten. F2F was shown to be an effective method for making local produce easily accessible and even more affordable for parents and children.

Dietary Interventions to Increase Fruit and Vegetable Intakes

Teaching children healthy dietary habits while in the most impressionable learning period of life is an appealing way to address FV consumption and knowledge. Gripshover and Markman (2013) observed the initial knowledge that guided children to the understanding of the relationship between food and body, and identified key developmental characteristics for young children to conceptualize the importance of nutrition. In two experiments, researchers sought to reveal benefits of teaching young

children about the food-body relationship using intuitive yet complex theoretical frameworks, rather than simpler frameworks in which children are too often taught. Among the first study sample of 59 children aged four to five years old, was a control group (n=29) and an experimental group (n=30). The experimental group was taught complex nutrition concepts through storybooks over a 12-week period, and the control group was taught lessons based on the USDA Team Nutrition learning materials. Following story and learning times, children participated in a snack time where fruits, vegetables, crackers, and cheese were provided and researchers observed the food items chosen by the children. In a second sample of 103 children also four to five years old, an identical intervention was performed on the control group (n=50), receiving the USDA Team Nutrition materials. The alternative-treatment group (n=53) received a more intuitive-theory-based intervention using storybooks from a different source than the experimental group in the first experiment. Despite the difference in content between the two experimental groups, results from the second experiment mirrored the results of the first experiment. Both experimental groups increased vegetable consumption over the intervention period even though each received different nutrition-related information. The authors concluded that the results of the study illustrated the benefits of teaching children nutrition concepts while in such an important developmental stage in order to allow children to begin healthy diet patterns early on in life.

Interventions should be targeted to focus on younger children so that healthy behaviors can become customary practices at all ages. Teaching children early on to consume a healthy diet that is rich in FV might be necessary for attempting to create a more sustainable and healthy future not only for them, but for future generations.

With the disturbing rates of adult chronic disease in addition to the inadequate FV intakes across all ages, nutrition interventions are imperative. Many different approaches have been tested to reduce rates of chronic disease and to increase positive dietary behaviors. Likewise, multiple levels of interventions have been tested and include community and clinical settings. While clinical settings often focus on treatment of chronic illnesses, more screening and prevention techniques as well as services like outpatient behavior therapy programs that emphasize FV intake over the high-calorie, low nutrient dense foods have become popular (Kirschenbaum & Gierut, 2013).

Targeting positive dietary changes in the community setting often entails researchers utilizing environmental changes that may capture a larger audience. Many dietary interventions for children have been tailored to a variety of settings and groups. Interventions may often be designed by following existing behavior change theories like the theory of planned behavior (TPB). These theories attempt to shed light upon why individuals behave the way they do so that healthier changes can be introduced to the individual and potentially put in to practice.

Theory of Planned Behavior. Oftentimes when dietary interventions such as those intended to improve children's FV intakes are designed, a theory-driven approach is used to navigate the study's course. A study performed by Prelip, Slusser, Thai, Kinsler, and Erausquin (2011) evaluated a nutrition education program's influence on children's attitudes, beliefs, and behaviors with FV consumption using the TPB. The nutrition education program used as the intervention method for the sample of elementary schools (n=12) was applied by allowing all participating teachers to develop lesson plans based on the provided teaching activities. Even though students received various strategies for

nutrition education, the entire district attended events including a meet and greet with chefs and local farmers, arts and crafts activities, physical activity functions, and a program known as Harvest of the Month, which involved introducing new produce to students. Using pre- and post-test surveys composed of specific questions aligned with the TPB, nutrition-related behaviors were observed. Specifically beliefs, attitudes, and knowledge changes were observed over the course of the intervention. A significant change in teacher influence on the attitudes of the children regarding vegetables alone were found as well as attitudes towards FV. The authors inferred that the results of the intervention exhibited great success in changing children's FV attitudes, one of the key components of the TPB, following a school-based nutrition education program.

The TPB originated from the concept that dietary habits and behaviors result from one's attitudes or beliefs towards a behavior, which in the present study's case would mean FV intake behaviors; subjective norms, or the individual's perceived social pressure to consume FV; and perceptions, which encompasses the individual's self-efficacy to eat FV (Ajzen, 1991). Although the theory does not lead to clear explanations for individuals' dietary behaviors, the TPB has been deemed resourceful in leading to better understanding of dietary behaviors. Despite the TPB's name, the theory was not intended for giving rationale for the behaviors of interest, but simply gives rationale as to why the particular individual practices the behaviors since the behaviors correspond to what is normal for the individual. Ultimately, the TPB refers to identifying attitudes and beliefs that dominate particular behaviors, so bringing the behaviors to the individual's attention, raising the individual's awareness, and supporting the individual's knowledge of the behavior are done to consequently change the behavior (Contento, 2007). The TPB's key

constructs include behavioral intentions, which are controlled by individuals' subjective norms, beliefs, and perceived behavioral controls, which Ajzen claimed to be conceptually similar to self-efficacy, and so the terms are often used interchangeably. However, Armitage and Conner (2006) asserted that self-efficacy and perceived behavioral controls differed in how each influence the individuals' intentions to perform a behavior, although little evidence addresses this hypothesis further.

A study conducted by Gratton, Povey, and Clark-Carter (2007) compared two interventions where one was based on a volitional intervention and the other used a motivational intervention corresponding to the TPB, both of which aimed to address FV intakes in children. Through the course of the three-week study period, the researchers analyzed the effectiveness of the motivational intervention on children's FV intakes, analyzed the effectiveness of the volitional intervention on children's FV intakes, and then compared both interventions to determine the more effective method of increasing children's intentions to consume the recommended FV intakes. One school of 498 students was selected to participate in the study. In two phases, 198 participating children between 11-16 years old comprised the final sample and were randomly assigned to one of three groups. Experimental group A (n=103) received the volitional intervention, Experimental group B (n=52) received the motivational intervention using the TPB, and a control group (n=43) received the same activities as the experimental groups but different materials that taught homework corresponding to school rather than FV consumption like the experimental groups received. During the first week of the study, the entire sample completed a seven-day food diary and a TPB questionnaire. During the second week, group A participants developed an implementation plan for

when and where they would like to eat five FV servings during the rest of the week; group B participants completed a nutrition education activity involving their beliefs about eating five FV per day; control group participants developed an implementation plan for when and where they would like to execute homework for the rest of the week. At the beginning of the final week, the sample completed another seven-day food diary and another TPB questionnaire. The questionnaire assessed the four fundamental factors of the TPB including attitudes towards eating five servings of FV daily, subjective norms, perceived behaviors, and behavioral intentions to consume five servings of FV daily. Although the results were not followed up after the third week for long-term changes, significant differences in reported FV intakes were found at the end of the three-week duration among both intervention groups' pre- and post-food diaries. Only the volitional intervention, however, was found to produce a significant increase in FV intakes when compared to the control groups' intakes, whereas the motivational intervention with the TPB did not. The authors attributed the lack of statistically significant changes among group B, or the group that received the motivational intervention, to the idea that the children in the study may have been willing to consume more FV even if they did not intend to consume more FV, suggesting that children may use more reactive, as opposed to intentional methods. Understanding children's intentions and behaviors regarding FV is a multifaceted issue, in which the authors encouraged the continuation of research on FV interventions in child and adolescent populations so that effective interventions can be developed and implemented.

Home and community environments. Children's dietary behaviors, including FV intake, are highly affected by the communities and environments in which they live (Ding

et al., 2012). In a study to determine associations between home food environments and FV consumption, researchers surveyed 458 children (5 to 18 years old) and parents (mean age of 45 years old) of children in ethnically and geographically different regions. The survey included a series of food frequency questionnaire (FFQ) questions, as well as questions asking about home food environments and community food environments. Children's FV intakes were significantly associated with the home food environments; thus, FV availability in the home was significantly associated with children's FV consumption. Even though community food environments were not found to be related to home food environments, the authors concluded that there is still a very important relationship between FV availability and intakes.

A study conducted by Stubbs, Pallister, Avery, Allan, and Lavin (2012) in response to the limited amount of community-based, dietary intake research, observed adolescents participating in a commercial weight management program. The program was customized to fit the adolescent population in the United Kingdom and focused on improving participants' dietary behaviors rather than emphasizing weight loss outcomes. Each participant discussed and established weight goals with a parent and a doctor or nurse. Every three months for the duration of the study (approximately six months) the set goals were discussed again. Once per week, participants attended group sessions where encouragement for making small dietary changes and engaging in regular physical activity was given. Each week, participants were sent home with educational materials that supported topics like FV recommendations that were discussed in the weekly group sessions. Questionnaires were administered before and after the program to measure self-reported behaviors in relation to diet and physical activity. An inverse relationship was

found between FV intakes and BMI scores among the sample of 79 adolescent participants. Although commercial programs may not be practical, as they often require participants to pay a sum of money thus decreasing accessibility to the general public, an increase in FV intakes was observed nonetheless. Perhaps community-based FV interventions can be adapted from existing methods or developed to utilize similar practices and procedures as those used in commercial programs.

Parents have a larger role in children's dietary behaviors than just making FV available in the home; parents are also a major factor in the level of exposure to FV a child receives. Intakes of FV remain low in children, but children often have higher intakes of FV when exposed to a variety early on in life. For example, Sullivan and Birch (1994) observed new dietary experiences in a sample of 36 infants between four and six months of age, and randomly assigned each subject to one of two vegetables, either salted green beans or peas or unsalted green beans or peas. For ten days, participants were fed the vegetable at least once per day and were videotaped during feedings. Intakes of the test vegetable were measured prior to the ten-day period, immediately following the ten-day period, during the study period, and one week after the ten-day study period. All of the participants significantly improved their test vegetable intakes after the ten occasions, and the parents reported improved acceptance responses as more opportunities arose to eat the test vegetable. Even though this study was performed on infants, the results support the hypothesis that FV acceptance improves with increased exposure since the infants were more likely to be willingly accepting of the test vegetable as more exposure was provided. Also supported by this study was the hypothesis that parents play an enormous role in providing adequate exposure and access

to a variety of FV for children, especially early on in life while being in such an impressionable life stage. Constantly learning from infancy to early adolescence, young children begin to develop a sense of *self* at this particular time in life, while growing increasingly independent, and forming their own opinions, habits, and preferences (Brown, 2008).

Parents play critical roles in children's FV consumption, and often unknowingly impact children's dietary preferences; for instance, children generally like and dislike the same foods as parents, especially FV. A systematic review of 60 research articles was conducted to examine associations between the home food environments and children's FV intakes. Studies included in the review had to consist of subjects between the ages of 6-18 years, measurements of FV consumptions for at least one day, and measurements of at least one family member's FV consumptions for at least one day were peer-reviewed and published prior to March 2007. Quality was also assessed for each individual study based on reliability and validity of instruments and measures. Parent modeling and intakes were found to be consistently and positively associated with the children's FV intakes. Positive correlations were also found between FV availability at home, parental encouragement to consume FV, parental FV intakes, and children's FV intakes. As is evident in the research studies reviewed in this systematic review, healthy dietary promotions must target not just the child alone, but also the parents and the immediate family in order to result in increased and sustained FV intakes as well as overall improved dietary behaviors (Pearson, Briddle, & Gorley, 2008).

School environment. Children's school environments also play a notable role in dietary behaviors such that children who attend schools where a variety of, rather than

repeated, FV are served daily typically consume more FV on average (Hearn et al., 1998). The USDA provides FV for snacks to elementary schools in low-income areas for children through a program known as the Fresh Fruit and Vegetable Program (FFVP). The FFVP was intended to improve FV consumption in children since FV intakes among youth nationwide fail to meet recommended intakes. Researchers Ohri-Vachaspati, Turner, and Chaloupka (2012) hypothesized that FFVP schools yielded healthier school lunches than those schools who did not participate in the FFVP. Using a cross-sectional survey, researchers surveyed school administrators about FFVP participation and how often various meal components were offered in school lunches. Schools (n=620) across various geographical regions of the U.S. participated. Of the schools that participated in the FFVP, nearly 80% offered more fresh fruit (79.2%) and more fresh vegetables (81.9%) on a regular basis. The FFVP-participating schools offered more fresh FV to children through school lunches, which not only improved school food environments, but also the overall FV access for children and adolescents. Even though the FFVP leads to higher intakes in fresh FV, the program only reached a quarter (25%) of public elementary schools in the country at the time of the study. As is evident in many previous findings, when access and exposure to ample FV is improved in child and adolescent populations, intakes can be significantly improved, which may provide enough reason for a portion of the remaining 75% of schools to begin utilizing programs like the FFVP. Identifying the strengths and weaknesses to existing interventions and programs may be exceedingly beneficial for future attempts to improve children's dietary behaviors.

Parents and preschool-aged children participated in a survey that addressed dietary behaviors and determining factors of those behaviors. Across eight counties in Missouri, 1,658 child participants and their parents already enrolled in the Parents as Teachers (PAT) program were recruited provided with materials on a 5 a Day the Color Way program to improve the variety and overall consumption of FV in the participants. Provided to each participant was nutrition education information pertaining to each group of colors, as the program highlighted consuming FV from the reds, greens, yellows/oranges, blues/purples, and whites groups, and the nutrients typically abundant in that color group. For example, the reds group included tomatoes, watermelons, and guava and nutritional information on these lycopene-rich FV was provided to show the participants the connection between health and lycopene in disease-fighting abilities through the consumption of red-pigmented FV. The researchers administered surveys to parents to gain insight on the adherence of the program. Less than half (40%) of all the parents and one-quarter (26%) of children reported to have consumed FV from all five color groups. Significant predictors for not consuming the recommended amounts of red, green, and yellow/orange FV groups included parents simply disliking some of the FV groups and parents not conventionally purchasing FV in such color groups (meaning if the FV are not purchased, then the FV are not available in the home for the family to eat). Parents evidently play a role in the child's FV consumption patterns in more than just enrolling them in schools that offer a variety of FV at meal times, but also they guide the child's preferences and control what FV are available to the child at home (Nanney, Schermbeck, & Haire-Joshu, 2007).

Another unique intervention to increasing FV intakes in children was training schoolteachers to provide nutrition education for students. Rosario et al. (2012) created a six-month long nutrition education program for school children that emphasized high FV intakes. Seven schools were randomly selected from a city's list of public elementary schools to participate in the study, and of the 574 elementary students in the seven schools, 464 students (6-12 years old) agreed to participate in the study. Half of the students (n=231) were assigned to be in the control group while the remaining half (n=233) made up the intervention group. Teachers of students in the intervention group attended 72 hours of training (12 three-hour sessions over the six-month study period) where they were taught (a) health promotion, overweight/obesity prevention; (b) food and nutrition with emphasis on the Dietary Guidelines; (c) importance of hydration; (d) appropriate physical activity levels and healthy dietary practices; (e) learning strategies on healthy eating in the classrooms; (f) strategies to reducing television viewing time; (g) global assessment of the training program; and (h) healthy cooking and ways to get families involved in healthy cooking. After each training session, the schoolteachers were allowed to develop activities and lesson plans according to what was learned through the use of innovative classroom activities. Surveys were administered to obtain anthropometrics, sociodemographic data, physical activity, and dietary patterns (via 24-hour recall) of the students before, midway through, and after the intervention. The intervention group of children reported a decrease in low nutrient energy dense foods, while the control group reported an increase. The reported FV intakes of the intervention group of children were significantly higher after the lessons received from the trained schoolteachers, which may suggest suitability in training schoolteachers to create a

pathway for increasing FV intakes in a child population. The authors discussed that even though the results cannot prove life-long dietary changes among the children, results clearly exhibited advantages of a nutrition education program in schools to affect dietary behaviors at a vital life stage where eating patterns are being developed.

In a study that sought to intervene on children's FV behaviors before certain behaviors were formed, a standardized, classroom-based intervention was implemented in order to evaluate its effectiveness on fourth grade students' vegetable intakes. Approximately 200 elementary schools were recruited to participate in the study and among the 108 schools that agreed to participate, 1,937 students comprised the fourth grade sample, and 51 schools (n=890) were randomly allocated to the control group and 57 schools (n=1,047) to the intervention group. The intervention was developed using Supplemental Nutrition Assistance Program-Education (SNAP-ed) materials and included lessons on surprising veggies, veggie math, the veggie subgroups, and vary your veggies, which were taught consecutively over a four-week period. Each participating fourth grade class teacher was provided with training and materials on lesson plans and survey administration, where intervention group classes received the vegetable lessons, and the control group classes received non-vegetable, or general health promotion, related lessons. Surveys included questions on food preferences, attitudes, knowledge, and self-efficacy towards vegetables and were administered prior to the first vegetable lesson and following the last, or fourth vegetable lesson. Independent t-tests for comparing intervention and control group differences revealed improved vegetable-related attitudes, self-efficacy, preference, and knowledge scores among the intervention students. The results supported the use of school settings as an effective means for

encouraging students to taste more vegetables while improving vegetable consumption behaviors (Wall, Least, Gromis, & Lohse, 2012).

Howerton et al. (2007) reviewed seven studies to assess the effectiveness of school-based nutrition education interventions on children's FV intakes through whole study- and individual-level analyses. Studies were selected based on publication date (between January 1990 and December 2002), measured child dietary behaviors, use of a control group, and measurement of FV intakes before and after interventions. Because the National Cancer Institute implemented the 5-A-Day for Better Health program in 1991, the authors wanted to review studies that preceded and followed the 1991 campaign that aspired to change dietary patterns of the American population. From the seven studies reviewed, 8,156 children were included and the various intake measurement tools that were used consisted of 24-hour recalls, plate waste methods, observations, and surveys. For the study-level analyses, a difference of 0.38 servings of FV per day and a 21% change (from 17% to 25%) were estimated. On the individual-level, 86% of the studies observed significant differences in FV intakes when intervention and control groups were compared. Using pooled data, intervention groups reported to have had nearly a half (0.45) of a single serving more than the control groups. On the individual-level analyses, the net relative change was 18%, and control groups actually decreased FV consumption (6%) where intervention groups increased FV consumption by 12%. Even though only a small number of studies using the 5-A-Day campaign were included in this review, moderate increases in FV intakes were observed in the sample from the seven studies, indicating that school-based nutrition interventions do contribute to improving dietary

behaviors in children who, as a whole, do not consume the FV recommendations established to promote healthy lifestyles.

Another systematic review on school-level interventions' abilities to impact students' FV intakes was performed by Delgado-Noguera, Tort, Martinez-Zapata, and Bonfill (2011), who analyzed various trials that evaluated school environmental changes, health education approaches, and the use of computer games to promote increased FV intakes. Studies were tested for quality based on the Quality Assessment Tool for Quantitative Studies (QATQS), and inclusion criteria consisted of studies utilizing interventions that promoted improved FV intakes in 5-12 year-old school children, interventions taking place in the school setting, and FV consumption before and after the interventions being the primary outcome measures. Nineteen studies fully met the criteria where only two were considered to be of strong quality, and 17 studies were of a moderate quality. A wide variety of dietary intake instruments were used in the studies including FFQ, dietary records, food diaries, and direct observations, but only limited ethnic groups were studied as the authors noted that eight of the studies only used children from the European American, African American, or Hispanic American descents, so several ethnicities were not represented in a vast majority of the studies. Also, multiple studies (n=17) did not express any use of randomization methods though all of the studies were considered to be of moderate to high quality based on the QATQS tool. Computer-based trials were found to be effective for improving FV intakes in the children from treatment groups of the three studies that used this type of intervention. No statistically significant differences were found from the pooling of the other studies that utilized health education and school environmental change interventions. Interestingly,

the use of computer-based interventions could show to be effective dietary interventions for children and adolescents as the use of technology in all aspects of school and life are becoming increasingly used. Certainly, further research is needed to evaluate the strengths and weaknesses of the various approaches, including computers, classroom education, cafeterias or any other school-related component, to changing children's dietary behaviors.

In an attempt to increase FV intakes in school children, Hendy, Williams, and Camise (2005) proposed that when students provide input regarding what is served within the school feeding programs, consumption rates may increase. Schools very often observe high amounts of wasted FV, so schools and food service programs could benefit from allowing children to determine what produce is served. An intervention known as the Kid's Choice program was implemented and involved token reinforcement for first, second, and fourth grade children who selected and consumed either fruits or vegetables at 12 designated lunch periods. At baseline, as well as during follow-ups and at the study period's end (approximately seven months after the program), the study sample's parents were interviewed to obtain children's preferences. Likewise, lunch observations were conducted and individual interviews were performed with each participant to obtain ratings of various FV. The school then provided the most popularly chosen FV, based on responses from the questionnaires and interviews, on designated lunch periods during the intervention. The researchers observed increased FV consumption as well as preference ratings in all participating students two weeks following the intervention. So, with a few changes in school meal development, presentation, and variety, perhaps students would increase FV intakes. Interventions to alter dietary habits in children should include

various levels of environmental changes, including the school setting, surrounding communities, marketing, and especially the home environment.

In a systematic review of literature, Evans, Christian, Cleghorn, Greenwood, and Cade (2012) focused on interventions that sought to assess the impact of school-based interventions on FV intakes in children. Using a sample of 27 different studies, the different school-based FV interventions included studies with either multi-component interventions or single-component interventions in order to review a diverse group of studies and interventions. Articles were selected based on the (a) interventions being conducted in school environments; (b) samples consisting of children between the ages of 5-12 years; (c) samples having greater than ten subjects; and (d) studies having used control groups and standard dietary assessment measures such as food diaries, 24-hour recalls, or FFQ. The primary outcome of the meta-analysis was the observation of portion differences of FV, including FV combined and separated. The various activities conducted by each individual study included school curriculum changes, communications between the school and parents and the students and teachers, food provisions, food marketing, culinary demonstrations, homework, school environment changes, and community involvement. Random-effects models were utilized to determine estimates of portion differences between control groups and intervention groups.

After reviewing 27 articles, a difference was found of 0.25 more FV portions per day among children who participated in the interventions than those in the control groups, and a difference was found of 0.32 more FV portions per day when fruit juice was included as a FV source. A median difference of 0.6 portions of FV was found among the intervention groups when compared to control groups among all the studies. The

authors noted that a large portion (81.5%) of the studies included in this review were found to be of poor-quality with a high risk of bias based on the criteria of (a) reporting of sequence generation criteria; (b) allocation concealment; and (c) blinding of participants, personnel, or outcome assessors. A high risk of bias was considered if none of the criteria points were met, a medium risk of bias if one to two criteria points were met, and a low risk of bias if all three criteria points were met. Despite the majority of the trials being considered of poor-quality, this review was the first meta-analysis, to the authors' knowledge, that examined the spectrum of influences that school-based interventions had on children's FV intakes between the ages of 5-12 (Evans et al., 2012, p. 1). The results of the review exhibited an improvement in children's FV intakes when participating in school-based interventions, so continued attempts should be made to enhancing the programs while reducing the hindrances to positive dietary behavior outcomes.

In a letter to the editor regarding the review by Evans et al. (2012), Kraak et al. (2013) furthered the recommendations of the continuation of school-based FV interventions discussed in the review by meticulously identifying several responsible parties including industry, government, and school authorities to making the necessary changes in children's FV intakes. Noting that minute, but positive changes in children's FV intakes have come about since the implementation of school-based interventions, the authors acknowledged that children in the U.S. still fall short of the five servings of FV daily, as recommended by the Dietary Guidelines for Americans. Great strides have no doubt been made in industry, government, and school settings, but bigger industries such as food marketing and social media have overshadowed the attention of the strides in

healthy promotions. The collective endeavors that have led to the modest increase in children's fruit consumption, but unfortunately excluding vegetable consumption, must be continued not only to further the FV exposure the children are receiving, but also to gain a shared perspective with the industries not currently working towards creating healthier children for the future. Without the necessary changes to children's entire food environment, whether at school, at home, in food service institutions, or in grocery stores, the future of public health will be at stake as children's likelihood for developing diet-related chronic diseases in adulthood, and perhaps sooner, increases. The authors proudly brought to the public's attention the promising aspects resulting from these school-based interventions, but also stated that schools cannot change dietary habits alone, as doing so must take collaborative efforts from multiple levels within a child's environment. Again, further research is needed in determining what interventions work best in each environment a child experiences.

National School Lunch Program. The National School Lunch Act was enacted in 1946 as a way to provide children with nutritious meals at an affordable cost, which is the same purpose today. Administered by the USDA, the National School Lunch Program (NSLP) is considered to be one of the more effective means for increasing FV intakes in children and adolescents as the program follows the Dietary Guidelines for Americans so that students can be guaranteed at least one-third of the recommended nutrients and food components, including those primarily found in FV (Food and Nutrition Services [FNS], 2013).

According to FNS, an agency under the USDA Food, Nutrition, and Consumer Services that seeks to address hunger and obesity with government-funded assistance

programs, the NSLP is available to public and non-profit private schools or child care facilities (FNS, 2013). The school or facility receives cash subsidies and foods for every meal served. Children may receive free meals if parents' incomes are 130% or below poverty level, and reduced-price meals can be received if the child's parents' incomes are 130% to 185% of poverty level. In 2012, nearly 32 million children received a lunch through the NSLP (USDA, 2013). The NSLP certainly has influenced participating children, whether a child received a meal that may not have otherwise been eaten at all, or a child received the recommended nutrients based on the Dietary Guidelines thus eating an appropriate balance of protein, dairy, whole grains and FV. From either perspective, the NSLP provides daily connections between children and healthy, hot meals.

Evidence from multiple studies has demonstrated associations between NSLP participation and increased FV intakes, especially in low-income communities (Gordon & McKinney, 1995; Howard & Prakash, 2012; Johnston, Moreno, El-Mubasher, & Woehler, 2012). In search of associations between school meal participation, specifically NSLP and School Breakfast Program (SBP), and FV consumption levels, Robinson-O'Brien, Burgess-Champoux, Haines, Hannan, and Neumark-Sztainer (2010) interviewed 103 fourth to sixth grade students in low-income areas who had previously participated in an obesity prevention program known as Ready. Set. ACTION!. The authors noted that nearly all subjects (99%) received lunch through the NSLP and more than half of the sample (59%) received breakfast through the SBP. Children's dietary intakes were measured with a multiple-pass approach 24-hour recall to assess total FV intakes. Mean intakes were produced for fruits, vegetables, and FV together as total daily

portions in addition to the portions only consumed at school. All FV portions corresponded to the servings based on the 2005 Dietary Guidelines for Americans, where half cup of chopped or canned fruit was equivalent to one serving of fruit and 1 cup of raw vegetables or half cup of cooked vegetables was equivalent to one serving of a vegetable. Total reported daily FV intakes were found to be 3.6 servings, on average. Also, children with a usual low FV intake consumed the highest proportion of total FV intakes at school. Eighty percent of the study participants consumed less than the recommended five FV per day, and more than half (54%) of all daily FV consumption took place at school. Even though children have not been consuming adequate amounts of vitamins and minerals that come from FV, school meals contribute much of the total FV children actually do consume. Although the 24-hour recall method is sometimes questioned in its use on children since over- and underestimations are common issues in this group, the conclusions still confirmed that children in the U.S. have not been regularly consuming the recommended five FV servings daily. These findings can be used to encourage faculty and staff members in the school environment to promote school lunches as a way to improve children's dietary intakes as well as overall health.

In a comparison between a school lunch and a packed lunch from home, researchers noticed that children eating school lunches consumed significantly more vegetables ($p<0.001$), thus receiving more protein, starch, carotene, and folate, most of which are all essential macro- and micronutrients found in many vegetables, than students who consumed packed lunches (Prynne et al., 2013). Nearly a thousand (n=927) students were recruited from a previous study known as the ROOTS longitudinal project that observed risks and patterns for psychopathology among children and adolescents

(Goodyer, Croudace, Herbert, & Jones, 2010). The entire sample consisted of 552 students (n=318 in the packed lunch group and n=234 in the school lunch group) who completed estimated dietary records for four days (two being school days) among 18 secondary schools. In addition to the protein, starch, carotene, and folate that school lunch participants received in greater quantities than the packed lunch counterparts, saturated fats and sodium intakes were also reported to be higher in the school lunch children. Also, greater amounts of vegetables and grains such as rice and pasta ($p<0.001$) were consumed among the school lunch participants when compared to the packed lunch group; however, the packed lunch group consumed more yogurt and cheese ($p=0.001$), as well as fruit ($p<0.001$), but also more sugar-sweetened beverages ($p<0.001$) than the school lunch group. The authors concluded that small differences existed in the overall qualities and nutrient compositions between school lunches and home-packed lunches, so the lunches served at school demonstrated to be the slightly superior route to feeding school children a nutritious, hot meal while also providing the opportunity for schools to improve the health of its children (Prynne et al., 2013).

In addition to the NSLP, other similar programs are available through the USDA help to feed hungry children. The School Breakfast Program, Afterschool Meals, and Summer Food Service Program, all examples of USDA funded programs, aim to improve dietary patterns for children in need during those times when the NSLP is not provided. A recently added initiative by the FNS is the Farm to School (F2S) program that specifically targets FV and attempts to increase FV consumption in participating schools (USDA, Child Nutrition Programs, 2012).

Farm to School. One program that often utilizes multi-level interventions to improve children's dietary behaviors, especially in terms of FV intakes is the F2S program. Though a broad term, F2S most often describes a means for providing a link between school children and local farms/producers. Focusing on healthy eating and sustainable living, F2S programs can be hosted by a wide variety of sources, but almost always incorporate nutrition education, agricultural lessons, local foods or snacks, farm or farmer visits, or any combination of these, in addition to a multitude of other fun and educational opportunities for school children.

F2S is a program administered by the FNS and seeks to provide agricultural and nutritional education opportunities at the national level. Stemming from the USDA Know Your Farmer, Know Your Food initiative, common goals were established to provide a connection between consumers and local farmers. Approaches to build on that connection include strengthening economic opportunities for small or local farmers while at the same time increasing the awareness of the importance of agriculture and environmental sustainability (USDA, 2011). During the 2011-2012 school year, an estimated 12,429 F2S programs took place in schools across all 50 states, reaching almost six million school students. Large programs, like those in California, involved 411 schools and in Texas, which reached 1,200 schools, regularly included classroom nutrition education, cooking demonstrations, farm tours, taste tests, school gardens, and many more activities that promote eating and buying locally grown products (National Farm to School Network [NFSN], 2013).

In a quasi-experimental study to evaluate the impacts of a Coordinated Approach to Child Health (CATCH) in combination with a F2S program, both programs

concentrated on nutrition education for third grade students to improve FV intakes. Researchers Moss, Smith, Null, Long-Roth, and Tragoudas (2013) recruited a sample (n=65) of elementary students to participate in the CATCH F2S intervention and were evaluated on nutrition knowledge, agricultural awareness, as well as FV consumption patterns via questionnaires. As part of the CATCH and F2S curricula, all subjects attended nutrition education classes, while a farm tour concluded the intervention. Post-survey results revealed significant changes in fiber intake from pre- to post-tests. Also, significant differences were found among vegetable intakes at school, vitamin- and mineral-related knowledge, and farm awareness was also increased. The authors concluded that the F2S program, in combination with the CATCH program, was found to be an adequate strategy for increasing FV awareness, knowledge, and intakes in elementary-aged students.

Researchers Joshi, Azuma, and Feenstra (2008) sought to evaluate the impacts on students after implementation of multiple F2S programs by reviewing 38 different types of studies and reports. In search for more than dietary behavior outcomes, Joshi et al. (2008) assessed school meal participation as well as lifestyle changes, knowledge and attitudes of the students, anthropometrics, faculty or staff behavior changes, food service employee changes, farmer behavior changes, and even parent behavior changes. Among the variety of different study methods used in the reviewed research such as student surveys, parent surveys, polls, 24-hour recalls, school nutrition records, and meal-time observations, findings consistently observed increases in produce consumption in students whose school implemented a F2S program. Also noted was that studies

commonly reported increases in cafeteria meal participation as well as improved nutritional, agricultural, and environmental knowledge and attitudes among participants.

Outside of the school environment, F2S programs have been reported to benefit the participating farmers, the local economy, and even the community as a whole. From a qualitative point of view, Izumi, Alaimo, and Hamm (2010) obtained information on local F2S programs' impacts from food service employees', farmers', and food distributors' perspectives through focus groups. The largest reported impact was that students enjoyed having local foods at school since foods offered the students a feeling of eating a higher quality product. In addition, food service staff enjoyed the local foods as the program offered the opportunity to go to farms and pick some of the produce themselves to then be served at lunches. Another discussed effect was the direct relationship formed between school staff members and farmers and farm staff members, which harnessed the *local feel* to which many of the interviewees alluded. The food service staff also mentioned the benefit of the amount of specificity allowed when purchasing from farmers themselves. For instance, when purchasing produce by the crate, rather than by the pound, directors or managers were able to specify fewer stalks or less leaves on the produce being delivered, if necessary. Obviously the connection between the farmer and the school is very important and influential from various perspectives, including the students', faculty and staffs', as well as the farmers' perspectives.

F2S programs often use multiple approaches to interventions, as mentioned before, and the Nutrition Evidence Library (NEL) summarized advantages in doing such. Like the FNS, the NEL is also associated with the USDA and serves as a database for the

latest systematic reviews of research on nutrition-related programs and policies. In a review of studies of the effects on children's diets from combining changes to the school food environment along with integrated nutrition education to the use of either strategy independently, the evidence was consistent; however, the studies were few. This particular review only evaluated five studies, but each study supported the use of combined approaches (nutrition education in conjunction with changes to the school food environment). Combining the strategies resulted in more effective improvements of intakes in the child and adolescent populations, as opposed to the use of either approach alone. Knowing this, F2S programs often combine multiple strategies to change dietary intake behaviors such as nutrition education in the classrooms along with changing the school food environments or the cafeterias by offering local ingredients with the lunch menus (USDA, Center for Nutrition Policy and Promotion [CNPP], 2012).

Another review by the NEL examined 14 studies to determine whether multi-component interventions were more effective in positively changing children's dietary behaviors than single-component interventions. Interestingly, only limited evidence advocated the use of multi-component interventions such as classroom nutrition education combined with hands-on activities, in being more effective than the single-component interventions. Nonetheless, multi-component interventions still showed to be somewhat more effective than the single component counterpart (USDA, CNPP, 2012).

Barriers to Farm to School. Despite the numerous benefits that often accompany F2S programs, some research has shown several reported barriers from the administrative point of view, the staff's, and even the faculty's point-of-view. From all perspectives, the most commonly addressed obstacles to implementing or maintaining a successful F2S

program were lack of time, knowledge, and experience on the school staff's part. Increased work load on the food service staff's part, and of course, insufficient funding were other commonly reported barriers. In a survey of the Michigan F2S program impacts in the year 2004 compared to 2009, expenses were reported as being of higher priority in 2009 than in 2004. However at the same time, a desire to give the local farmers business was also a higher priority in 2009 than in 2004 while school participation jumped from 11% to 42%. So in Michigan F2S programs, challenges certainly existed, but the positive outcomes were considered more important than giving up because of a few obstacles (Colasanti, Matts, & Hamm, 2012). Because most F2S programs typically use interventions consisting of various components, as well as nutrition education in classrooms to be reinforced in school food environments, F2S efforts appear to be a valuable means to changing children's dietary patterns, attitudes, and behaviors. Even in settings saturated with barriers, like in Michigan programs, F2S activities and all of its associated benefits often counterbalance any challenges.

Measuring Children's Dietary Intakes

A plethora of dietary intake instruments are available for obtaining information on school children's meal and snack intakes, and even food preferences. Child Nutrition Directors and researchers can use the information obtained from these tools to modify foods and menus according to students' preferences, which could lead to increased intakes of FV as well as overall health improvements today and in the future. In order to determine intakes and preferences of children, an appropriate and viable instrument should be chosen based on the motivations for gathering the information so that the most accurate data can be collected.

McPherson, Hoelscher, Alexander, Scanlon, and Serdula (2000) reviewed 47 studies from 1970 to 1999 to evaluate various diet instruments for use on children for reliability, validity, individual challenges, and recommendations. The three review criteria included: being published in peer-reviewed journal between January 1970 and April 1999, utilizing children or adolescents (5-18 years of age) as participants in the sample (greater than or equal to 30 participants total), and reporting of reliability or validity tests. In studies that used 24-hour recalls (n=11), parents of children under the age of eight verbally performed the instrument with trained professionals, due to the child's lack of time conceptualization at that age. Also, since children can often be uncooperative when assessing dietary intake, the authors noted that the use of the child's parent(s) might be crucial to gaining the necessary accurate information. Whether the children or parents performed the recall, underestimation of energy intake was observed when the recalls were compared against a standard. Food records were also gathered from parents of young children; however, these studies had conflicting results with occurrences of misreporting from the subjects. The food records were also found to under represent energy intakes. The FFQ results varied among the studies in terms of which foods were listed, which nutrients were questioned, and the extent to how long ago the FFQ required the participant to think. The reviewed studies that used FFQ also differed in how the method was administered; for example, some were given by either a teacher in class, a parent at home, or performed by the children alone. Those studies using relatively detailed FFQ had the children utilize parental assistance with filling out forms due to the child's inability to recall previous instances from long periods of time. This type of measurement method often overestimated the children's energy intakes. With the

inconsistencies among the FFQ studies, the authors noted that no patterns were made in how the children were overestimating, which was likely due to the variability of the different FFQs used.

The diet history instrument was used in only one study, which was conducted in school children between 5-13 years old. One study compared the children's and parents' abilities to perform the diet history alone based on child's diet, and the results showed significant differences between the two (Rasanen, 1979). McPherson et al. (2000) also reviewed studies that utilized methods of observation for obtaining dietary intake information and concluded that this method is one of the more accurate methods for assessing intakes of children younger than third grade, but no reports addressed how to account for trading foods among the subjects. Overall, the food recalls and food records were the most popularly used; however, depending on the nature of a study, different methods, like observations, may be more useful in acquiring the most accurate information possible from the population that is often nescient and even non-compliant. Because of the variability of all the instruments evaluated in this review, the authors concluded that no generalizations could be made to direct researchers to the most suitable and appropriate method for measuring dietary intake in children. The review does, however, illustrate the need for further research of the reliability and validity of these instruments.

Lambert et al. (2005) evaluated the usefulness of smart card technology as a means of obtaining data on dietary behaviors through school lunches. Nearly 5,700 students were included in their study. Researchers uploaded the data on school lunch participation from the school cafeteria computer system. The noted strengths observed in

this study were accessibility of great amounts of information, complete nutrition analyses, affordable technology, and little human interaction thus, preventing human error. Limitations, however, included the inability to detect trading of foods between students, buying friends' meals, saving food items for later, cashiers selecting the wrong item on the screen, not accounting for foods thrown away or not consumed, and possible financial restraints since some money is required upfront, on either the students' or school's part to obtain new computer technology. Despite the potential impracticality of the system for use in rural, Mississippi schools and the ability to only account for one meal of the day, the smart card technology presented to be a very effective method for adequately gathering data on foods selected from school cafeterias among students, especially in a way that does not necessitate the subject to recall information for the researcher, Child Nutrition Director, or any other professional seeking dietary consumption information from children.

Tools used for more specific cases include those targeted precisely at FV intake, F2S interventions, or other similar programs. For example, Joshi and Azuma (2009) reviewed various aspects of F2S impacts in different areas of a child's environment, including schools, teachers, parents, and local communities. After reviewing multiple programs, six tools that were used for assessing the dietary intake behaviors of the students participating in any of the programs were described. Diet history questionnaires, 24-hour recalls, food recognition forms, and other forms were evaluated to identify the most ideal situations for the use of each. Researchers noted that the FFQ, for example, probably would not be well-accepted by subjects in culturally diverse populations since covering all the different traditional foods for each culture represented would be tedious

for every respondent to endure. The authors also noted that screeners were often used when more brief surveys were needed and were beneficial when searching for the data on specific nutrients or foods. In conclusion, the methods noted to have the strongest potential for measuring dietary intakes in children participating in F2S programs were food records, FFQ, 24-hour dietary recalls, and digital photographs of school meals.

Also in an effort to quantify impacts of the F2S interventions, school lunch recalls were developed and administered to 18 summer school students in third through fifth grades. Paxton, Baxter, Fleming, and Ammerman (2011) administered the recall and observed multiple school meals the children ate at school on the days the recalls were completed to gain insight on the recall's accuracy. The recall asked about specific menu items that were served the day surveys were completed. Questions asked about which items were chosen, how much was eaten, how much the item was liked (students could choose among dislike, like, or love), and whether the item would be chosen again in the future. After comparing the recall data to the observational data, a very high accuracy rate resulted from the recall's use in measuring intake, and although misreporting did occur, only means of a 10% intrusion rate and a 6% omission rate were observed. As a result of the study, the school lunch recall proved to be a valid instrument for evaluating students' dietary behaviors at school meals, specifically in third, fourth, and fifth graders participating in F2S programs. Even though this study only used a sample size of 18 participants, administering the recall uses very little time and resources. Also, the study took place during summer school, which according to the authors, led to the sample of students being academically challenged and with a high percentage of students eligible for free or reduced-price meals. Since the school lunch recall was developed to measure

intakes of children who consume school lunches, many of the students who eat the school lunch do so because they are eligible for free or reduced-price and school lunches may also be the main source of daily nourishment in students coming from low-income households. The school lunch recall exhibited great potential in adequately obtaining different aspects in children's school lunch consumption.

Measuring children's dietary intake remains difficult and further research is needed in order to determine the most appropriate method for various situations in which a researcher desires more information about dietary behaviors. Once the most appropriate methods are identified, researchers can then begin to pinpoint specific areas needing the most attention in certain issues such as FV intakes. Doing so will ultimately lead to the identification and targeting of children's specific FV preferences, knowledge, access, and consumption patterns to be able to develop successful, sustainable, and effective intervention strategies.

Conclusion

It is concerning that in Mississippi, children's FV intakes remain lower than recommended even though more than 30% of the people in Mississippi are employed by agriculture (Mississippi Department of Agriculture, 2012) and a wide variety of FV are grown in Mississippi including blueberries, tomatoes, cucumbers, kale, collard greens, zucchini, and peaches. Mississippi is making strides for improving the dietary habits of its children by initiating the recognition of F2S Week. In 2012, Mississippi policymakers designated the first week of October as the state's very own F2S Week in order to take steps towards growing a F2S presence statewide. House Concurrent Resolution #112, which designated the first week of October as Mississippi's F2S week, was signed by

Governor Phil Bryant on May 3, 2012 (Mississippi Food Policy Council [MFPC], 2012). In October of 2012, the first F2S week was celebrated in Mississippi, and efforts during this week included encouraging schools to serve at least one local item during the week and recognizing local items that are available for Child Nutrition Programs (MFPC, 2012). F2S-related activities vary from school to school and from state to state, but programs often result in positive outcomes such as improved nutritional and agricultural knowledge and awareness, increased FV intakes, expressed willingness to try new foods, support for the local community, as well as an abundance of other benefits (NFSN, 2013).

According to the TPB, if attitudes, norms, and self-efficacy are impacted, then intentions to perform the healthier behaviors, for example, to consume more FV, will likely improve as a result. Because F2S's purpose is to increase general nutrition knowledge as well as FV awareness, perhaps enhanced attitudes, norms, and self-efficacy regarding FV may result and potentially increase intentions to consume more FV. The present research seeks to evaluate whether a local F2S intervention is a viable method for improving FV intakes to potentially reduce the risk of chronic illness in the future. Upon examining a broad spectrum of literature focused on the importance of a healthy lifestyle to prevent future maladies such as heart disease, obesity, and T2DM, the TPB was used as a guide in designing the intervention methods used in the present study, which addressed the nutrition-related behaviors of children through attitudes, norms, and self-efficacy towards FV consumption.

Therefore, the five research objectives of the current study were to: (1) describe the changes in nutrition knowledge, specifically related to FV, of 5th grade students

before and after a F2S intervention; (2) describe norms, beliefs, and self-efficacy towards eating FV before and after the F2S intervention; (3) identify any changes in FV preferences over the course of the intervention; (4) assess relationships between FV knowledge scores and preferences, reported access to FV at home and reported intakes of FV, and FV-related information obtained from teachers and participants' beliefs about what they thought would happen if they ate FV; and (5) determine the ability of norms, beliefs, and self-efficacy about eating FV in predicting intentions, and the ability of intentions to predict FV intake.

CHAPTER III

METHODS

Study Design

Theoretical Framework

According to the TPB, intention to perform a behavior is a function of beliefs, subjective norms, and perceived behavioral control (self-efficacy). When intention is formed, behaviors result. Therefore, it is logical to think that impacting core constructs of TPB would affect behavior and one would be able to predict intention and behavior based on measurement of beliefs, norms, and self-efficacy. The current study was designed with the TPB as its framework in order to use theory-driven intervention techniques and thus effectively target positive FV intake behaviors in school children. The more favorable the beliefs, norms, and self-efficacy a person presents towards a behavior, the stronger the intentions become to perform the behavior. Since intentions are hypothesized to be the prompt for behavior, the current intervention was designed to influence beliefs, norms, and self-efficacy to form new, or to change, intentions to perform the desired behavior of consuming more FV.

Setting

The Stone County School District in which the Farm to School Week (F2SW) intervention was implemented consisted of four schools (two elementary schools, one middle school, and one high school). The year prior to the intervention, academic year 2011-2012, 388 faculty and staff members were employed, reaching approximately 2,700 students within this rural, southeast Mississippi school district. Targeted intervention elementary schools were Stone Elementary (kindergarten-5th grade; n=565) and

Perkinston Elementary (kindergarten-5th grade; n=718). The particular county in which the school district resides is home to many adults and children (15% and 30%, respectively) living below the poverty level (U.S. Department of Commerce, 2014).

Participants

Fifth grade students were selected as the target of the intervention based on current developmental stage characteristics including abilities to classify, generalize, and view others' perspectives. Children approximately aged 10-11 begin to enjoy strategy games and develop a sense of *self* as they grow increasingly independent and understand their role in school and family, as well as within the community (Brown, 2008). While the F2S intervention was conducted throughout the district comprised of various ages among the 2,700 students and 388 faculty/staff, only one elementary school from the school district was chosen for data collection with students because of resource limitations. Participants in the study were 124 eligible 5th grade students in the five classes at Stone Elementary School.

Farm to School Intervention Procedures

Pre- and post-intervention surveys were conducted to describe a sample of 5th grade students' experiences with FV before and after a F2S intervention. As a part of Mississippi's F2SW 2013, the surveys were administered immediately before F2SW and one month following the launch. Various intervention constituents were developed for the F2S intervention in the designated district, which were conducted as a multi-component intervention with collaboration between the district and the researchers. Multi-component interventions are generally thought to be more effective; therefore, the F2S intervention

methods included school curricula additions in the health classes of all grades and school nutrition environment changes like posters, bulletin boards, and menu changes.

The intervention included environmental and educational components designed using the TPB as a framework. Table 1 summarizes the intervention components' relationship to the TPB. Prior to Mississippi's F2SW, October 7-11, 2013, newsletters were sent home with every 3rd, 4th, and 5th grade student in the district to raise awareness among children and parents of the F2S-related events, though the 3rd and 4th grade students were not part of the study described here.

The intervention techniques used were designed to influence participants' nutrition knowledge, FV preferences, beliefs, subjective norms, and self-efficacy to result in increased intentions to perform the behavior of eating more FV (see Table 1 for theory aligned intervention components). Essentially, behavioral beliefs should produce favorable attitudes towards the behavior, normative beliefs should produce normal social pressure regarding the behavior, and control beliefs should produce a sense of control over the behavior; therefore, all three of these constructs (beliefs, norms, and self-efficacy) should produce desires or intentions to execute a behavior (Ajzen, 1991). Accordingly, the F2S intervention methods were planned to promote positive attitudes and beliefs regarding FV, normal environments for FV intakes to foster subjective norms regarding FV, and also to provide support for the subjects to allow them to perceive behavioral control regarding FV. Ultimately, the F2S intervention in the present study sought to influence the children's thoughts about FV through the school environment to make FV more normal, familiar, and valuable as to facilitate intentions to consume more FV.

Table 1

Intervention Methods and Corresponding TPB Constructs

	TPB Constructs		
	Belief	Norm	Self-Efficacy
Methods			
Curriculum changes	X	X	X
Bulletin boards		X	
Posters around school campus		X	
Assembly	X	X	X
Local foods on lunch menu		X	
Morning announcements	X	X	

Note. TPB = Theory of Planned Behavior.

The University of Southern Mississippi's Institutional Review Board approved the conduct of this study (Appendix A). The education and environmental components of the intervention were considered to be part of the school curriculum in which all students in the district participated regardless of consent. However, informed consent documentation was sent home attached to newsletters of the 5th grade students who attended the selected school in which this evaluation took place. Parents were informed that all responses and identifiable data would be kept confidential, and parents could sign and return if participation in the evaluation survey was denied. Essentially, parents of 5th grade students could choose to opt out of the evaluation/data collection component. No assent was needed from students. All data were stored in a secured file cabinet when not in use and only the researcher had access to the paper and electronic data.

Lesson Plans

Lesson plans were adapted from the USDA *Team Nutrition: Dig In!* materials to be more suitable for the local F2S activities (USDA, Team Nutrition, 2013). Four lesson plans were selected on various agriculture and nutrition-related topics. Selected lessons included material on "Choosing MyPlate," "Making Healthy Choices," "Farm to Plate," and "Fun Facts about Local Fruits and Vegetables." Each school's health teacher was provided a binder with lessons plans and materials of which they were asked to provide at least one lesson each week to students over the month of October (Appendix B).

School Environment Changes

The researchers collaborated with the Child Nutrition Director of the school district to determine which local FV items would be best to serve in school meals during F2SW. For example, in the previous year's F2SW, sweet potatoes were purchased from a local farmer's cooperative. Sweet potatoes were wrapped in aluminum foil and baked in the oven, which was simple and efficient for the food service employees to do within the short amount of time to prepare lunch (M. Rayburn, personal communication, August, 28, 2013). Therefore, sweet potatoes were selected and purchased again to be prepared in the same manner. Many other local foods were featured on the school lunch menu each day throughout F2SW 2013 including field peas, lima beans, collard greens, cucumbers, blueberries, and tomatoes. Menu items were created with these local foods and included items like southern collard greens and tomato-cucumber salads. Static cling signs (Appendix B) were placed on the sneeze guards along the lunch line above the local item of the day, which read, "From a Farm near You" so that the students would be able to distinguish the local items from the non-local items being served.

Bulletin boards (Appendix B) were designed and posted for display in every cafeteria within the school district for the entire month of October, and included biographies on local farmers with references to some of their foods used as ingredients on the menu. In addition to pictures of an array of produce, the bulletin boards listed benefits of locally grown foods, the process of getting food from the farm to the plate in a local system, what students could do to get involved in the local system, and benefits of F2S programs. Posters were also placed within the hallways of commonly traveled areas in the school that participated in the evaluation study. These were intended to promote general benefits of consuming FV as well as fun and exciting ways to eat FV.

Lastly, morning announcements (Appendix B) were provided for the school principal to broadcast daily to all grades in the evaluation school for the duration of F2SW. The announcements included a brief statement each day that promoted some of the benefits of FV that were on the menu that day. Some of the announcements included, "Today, we will be having blueberries with lunch. Did you know that blueberries have a lot of antioxidants that help prevent cancer, heart disease, and other deadly illnesses?" and "Today, we will be having sweet potatoes with lunch. George Washington was a sweet potato farmer before he became our first president of the United States."

Assembly

On the very first day of F2SW, all fifth grade students within the evaluation school attended an assembly to introduce the upcoming week as well as some of the benefits of eating local foods, especially FV. During the assembly, students were asked to volunteer to taste-test some local FV that were being featured during the week. Students volunteered during the assembly to be given tasting cups with FV such as cucumber,

blueberries, and tomatoes. Students were asked to rate the FV by indicating *thumbs up*, *thumbs down*, or *thumbs sideways*.

Data Collection

Instrumentation

Preceding the F2SW assembly, consented participants completed the pre-test survey in the school cafeteria. Surveys were distributed by the researchers and identification numbers were assigned to each student. Four weeks passed between pre- and post-test surveys. Post-test surveys were administered the first Monday of the following month in order to give enough time for health teachers to teach one of the four F2S lessons per week during F2S month. For post-test surveys, participants completed questionnaires in homeroom classrooms as this process was more efficient than having all the 5th graders in the cafeteria. Among the 124 eligible 5th grade students, only one child's parents declined participation in the evaluation survey, leaving a potential 123 students from whom to obtain data.

The 84-item questionnaire (Appendix C) consisted of questions regarding demographics (age, gender, and ethnicity) and FV-related nutrition knowledge, preferences, social norms, self-efficacy, intakes, beliefs, access, and intentions. Scoring of the questionnaire was completed according to theorized constructs, and Table 2 includes descriptions of each variable's measurement and corresponding scoring procedures. The questionnaire was developed using selected questions from the Nutrition Education Survey, which was compiled from other studies by the Research and Evaluation Unit of the Network for a Healthy California (Research and Evaluation Unit of the Network for a Healthy California [REUNHC], 2007). The remaining questions

came from the Golden Eagle/Ginew Healthy U survey (Fila & Smith, 2006) and a FV intervention called Gimme 5 conducted with 4th and 5th grade students where alpha reliabilities for the items ranged from 0.71-0.89 (Baranowski et al., 2000).

Table 2

Description of Variables

Variable	Description of Measurement	Scoring
Knowledge	Seven multiple-choice questions, coded as correct or incorrect, and adapted from the NES survey (REUNHC, 2007)	Each response summed together for a score ranging from 0-7; the higher the score the greater the FV knowledge
Preferences	Twenty-one questions using a 4-point hedonic scale adapted from the NES survey (REUNHC, 2007) Two additional short-answer questions	Each response summed together for a score ranging from 21-84, the higher the score the more preference for the FV listed The two short answer questions gave participants a chance to provide FV they liked other than those listed
Subjective Norms	Six yes/no/don't know questions using a 0-2 point scale and two frequency questions using a 0-4 point scale, adapted from the NES survey (REUNHC, 2007)	Each response summed together for a score ranging from 0-20, the higher the score the more socially acceptable it was to consume FV
Self-Efficacy	Seven questions using a 5-point Likert-type scale adapted from the Gimme 5 survey (Baranowski et al., 2000)	Each response summed together for a score ranging from 0-28, the higher the score the more positive perception of their ability to consume more FV at home

Table 2 (continued).

Variable	Description of Measurement	Scoring
Information on FV Taught	Eight yes/no/don't know questions adapted from the NES survey (REUNHC, 2007)	Each response summed together for a score ranging from 0-16, the higher the score the greater the exposure to FV-related information from teachers
Beliefs	Seven questions using a 3-point Likert-type scale adapted from the NES survey (REUNHC, 2007)	Each response summed together for a score ranging from 0-14, the higher the score the more positive beliefs attributed towards consumption of FV
Intake	Four questions using a 6-point scale to identify intakes from the previous day of fruit, fruit juices, vegetables, and fast-food/take-out, adapted from the NES survey (REUNHC, 2007)	Each response summed together for a score ranging from -5-15, the higher the score the greater intakes of FV with less fast-food intakes. Intake score measured by (fruit + fruit juice + vegetable) – fast-food
Access to FV	Two questions using a 4-point Likert-type scale adapted from the NES survey (REUNHC, 2007)	Each response summed together for a score ranging from 0-6, the higher the score the greater the availability of FV at home
Intentions	Fifteen questions using a 3-point Likert-type scale adapted from the Golden Eagle/Ginew Healthy "U" survey (Fila & Smith, 2006)	Each response summed together for a score ranging from 0-30, the higher the score the greater the student's readiness to consume more FV
Demographics		
Gender	One multiple-choice question	N/A
Age	One short answer question	N/A
Race	One multiple-choice question	N/A

Note. FV=fruits and vegetables; REUNHC=Research and Evaluation Unit of the Network for a Healthy California; NES=Nutrition Education Survey

Survey items that addressed participant preferences (items 8-28) were revised to list FV that were more common to Mississippi agriculture. To evaluate the instrument's face validity, three registered dietitians reviewed the questionnaire and provided feedback. Next, a questionnaire pre-test was conducted with 23 students at a school that was similar demographically and geographically. Analysis of item non-response rates and interviewer debriefing were methods used to guide modifications to the questionnaire. For example, the demographics questions were revised since many of these pre-test students were unable to identify their own race based on a question asking, "what is your race?"; the revised question asked them to "check all that apply," and students were then able to choose an option for race and ethnicity.

Statistical Analysis

All data were analyzed with IBM SPSS version 20. Descriptive statistics including frequencies and measures of central tendency were used to describe the sample. The five research objectives of the current study were to: (1) describe the changes in nutrition knowledge, specifically related to FV, of 5th grade students before and after a F2S intervention; (2) describe norms, beliefs, and self-efficacy towards eating FV before and after the F2S intervention; (3) identify any changes in FV preferences over the course of the intervention; (4) assess relationships between FV knowledge scores and preferences, reported access to FV at home and reported intakes of FV, and FV-related information obtained from teachers and participants' beliefs about what they thought would happen if they ate FV; and (5) determine the ability of norms, beliefs, and self-efficacy about eating FV in predicting intentions, and the ability of intentions to predict FV intake.

Data distributions were used to assess center, shape, and spread while the Shapiro-Wilk test was used to test for normality of data. Data were found to be non-parametric, so Wilcoxon signed ranks test was conducted to address relationships between pre- and post-test. Scores for each variable's designated question responses were calculated, and scoring procedures can be found in Table 2 on all of the measures including knowledge scores, preferences, information learned from teachers, norms, beliefs, self-efficacy, intentions, access, and intake scores.

The second objective was assessed by calculating scores for norms, beliefs, and self-efficacy, and again conducting Wilcoxon signed ranks test to evaluate significant differences before and after the F2S intervention. The third objective tested preference scores for significant differences over time using Wilcoxon signed ranks test.

A Pearson's product moment correlation coefficient test of baseline data was used to assess relationships between FV knowledge scores and FV preferences, in addition to reported access to FV at home and reported intakes of FV, as well as reported FV-related information obtained from teachers and reported beliefs among the children about what would happen if they ate FV. Also, demographics, preferences, beliefs, and FV knowledge were tested for correlations.

Lastly, according to the TPB, changes in self-efficacy, norms, and beliefs should lead to changes in intentions, and changes in intentions should lead to changes in dietary behaviors or the FV intakes in the current study. In order to test the fifth research objective, a series of multiple regressions were used to model post-intervention self-efficacy scores, subjective norms, as well as belief scores in order to evaluate the ability

to predict intentions to consume FV. Then, intentions to consume FV were analyzed to determine predictive ability of reported FV intake.

CHAPTER IV

RESULTS

The majority (96.5%; n=120) of the intervention school's 5th grade students (N=124) completed both pre- and post-intervention surveys. The majority of the sample was White (66.7%; n=80) while 30% (n=36) of the participants were Black, 0.8% (n=1) Asian, and 2.5% (n=3) Hispanic or Latino. There were 56 females (46.7%) and 64 males (53.3%). The majority (65%; n=78) of the students were ten years old, and 32.5% (n=39) were eleven while 1.7% (n=2) were twelve years old.

Research Objectives

To address the first research objective, descriptive tests were used to examine changes in the participants' nutrition knowledge scores before and after the intervention. Using Wilcoxon signed ranks test, nutrition knowledge score means had no significant improvements from pre-test (3.55 ± 1.04) to post-test (3.62 ± 1.28). The second research objective was to describe the changes in the TPB constructs of norms, beliefs, and perceived behavioral control (self-efficacy) before and after the F2S intervention. Because data were non-parametric, a Wilcoxon signed ranks test was used to determine significant differences in the sample means of all scored variables in pre- and post-test surveys. As seen in Table 3, results of this analysis indicated significant differences between the pre- and post-test means both for students' beliefs scores (z=-2.183; p=0.029) as well as the information that was learned about FV from teachers during F2S (z=-2.023; p=0.043).

Table 3

Wilcoxon Signed-Ranks Test Results for All Scored Variables

Outcome	*Mean (SD) Pre-Test*	*Mean (SD) Post-Test*	*z*
Knowledge	3.55 (1.04)	3.62 (1.28)	-0.782
Norms	11.19 (3.72)	11.58 (3.95)	-1.386
Beliefs	10.28 (3.29)	10.74 (3.74)	-2.183*
Self-Efficacy	16.09 (8.02)	15.93 (8.55)	-0.309
FV Preferences	67.08 (8.82)	66.17 (8.30)	0.214
Teacher	12.35 (4.80)	11.60 (5.06)	-2.023*
Intentions	16.09 (6.53)	16.45 (6.76)	-0.709
Intake of FV	3.32 (3.32)	3.28 (3.85)	-0.476
Access to FV	3.04 (1.09)	3.23 (0.95)	-1.364

Note. * - indicates statistical significance at the $p<0.05$ level.

The third research objective was to identify changes in FV preferences over the course of the intervention. For this analysis, a higher preference score indicated more "liking" for the particular FV listed so that a higher total would mean that the participant liked more FV. No statistically significant changes were found (Table 3). Table 4 illustrates specific food preferences over the course of the intervention.

Table 4

Intervention Changes in Fruit and Vegetables Preferences

FV	Pre-Test n	(%)	Post-Test n	(%)	Change (+, -, or =)
Carrots					
"do not like"	38	(31.7%)	37	(30.8)	+
"like a little"	29	(24.2)	40	(33.3)	+
"like a lot"	44	(36.7)	34	(28.3)	-
Celery					
"do not like"	58	(48.3)	64	(53.3)	-
"like a little"	24	(20)	23	(19.2)	-
"like a lot"	20	(16.7)	16	(13.3)	-
Cucumbers					
"do not like"	36	(30)	41	(34.2)	-
"like a little"	25	(20.8)	22	(18.3)	-
"like a lot"	48	(40)	44	(36.7)	-
Greens					
"do not like"	50	(41.7)	44	(36.7)	+
"like a little"	19	(15.8)	31	(25.8)	+
"like a lot"	30	(25)	25	(20.8)	-
Potatoes					
"do not like"	11	(9.2)	16	(13.3)	-
"like a little"	27	(22.5)	32	(36.7)	+
"like a lot"	76	(63.3)	65	(54.2)	-
Corn					
"do not like"	11	(9.2)	11	(9.2)	=
"like a little"	21	(17.5)	19	(15.8)	-
"like a lot"	83	(69.2)	83	(69.2)	=
Squash					
"do not like"	53	(44.2)	58	(48.3)	-
"like a little"	14	(11.7)	21	(17.5)	+
"like a lot"	34	(28.3)	26	(68.3)	-
Peas					
"do not like"	33	(27.5)	39	(32.5)	-
"like a little"	27	(22.5)	36	(30)	+
"like a lot"	50	(41.7)	35	(29.2)	-
Tomatoes					
"do not like"	57	(47.5)	62	(51.7)	-
"like a little"	21	(17.5)	17	(14.2)	-
"like a lot"	34	(28.3)	32	(26.7)	-

Table 4 (continued).

FV	Pre-Test n	(%)	Post-Test n	(%)	Change (+, -, or =)
Broccoli					
“do not like”	43	(35.8)	45	(37.5)	-
“like a little”	28	(23.3)	31	(25.8)	+
“like a lot”	41	(34.2)	36	(30)	-
Lettuce					
“do not like”	31	(25.8)	34	(28.3)	-
“like a little”	33	(27.5)	33	(27.5)	=
“like a lot”	48	(40)	43	(35.8)	-
Green Beans					
“do not like”	25	(20.8)	23	(19.2)	+
“like a little”	25	(20.8)	29	(24.2)	+
“like a lot”	63	(52.5)	60	(50)	-
Zucchini					
“do not like”	50	(41.7)	43	(35.8)	+
“like a little”	16	(13.3)	20	(16.7)	+
“like a lot”	24	(20)	14	(11.7)	-
Peaches					
“do not like”	18	(15)	16	(13.3)	+
“like a little”	17	(14.2)	13	(10.8)	-
“like a lot”	79	(65.8)	82	(68.3)	+
Apples					
“do not like”	2	(1.7)	2	(1.7)	=
“like a little”	10	(8.3)	15	(12.5)	+
“like a lot”	101	(84.2)	95	(79.2)	-
Applesauce					
“do not like”	17	(14.2)	18	(15)	-
“like a little”	18	(15)	13	(10.8)	-
“like a lot”	75	(62.5)	78	(65)	+
Bananas					
“do not like”	20	(16.7)	22	(18.3)	-
“like a little”	14	(11.7)	13	(10.8)	-
“like a lot”	80	(66.7)	76	(63.3)	-
Berries					
“do not like”	13	(10.8)	12	(10)	+
“like a little”	11	(9.2)	13	(10.8)	+
“like a lot”	89	(74.2)	87	(72.5)	-
Grapes					
“do not like”	8	(6.7)	10	(8.3)	-
“like a little”	10	(8.3)	9	(7.5)	-
“like a lot”	98	(81.7)	91	(75.8)	-

Table 4 (continued).

FV	Pre-Test n	(%)	Post-Test n	(%)	Change (+, -, or =)
Oranges					
"do not like"	6	(5)	6	(5)	=
"like a little"	16	(13.3)	17	(14.2)	+
"like a lot"	94	(78.3)	88	(73.3)	-
Fruit Juices					
"do not like"	8	(6.7)	6	(5)	+
"like a little"	12	(10)	11	(9.2)	-
"like a lot"	95	(79.2)	94	(78.3)	-

Note. Changes form pre-test to post-test distinguished by positive change (+, more students liked the item or less students disliked the item), negative change (-, less students liked the item or more students disliked the item), or no change over the course of the intervention (=).

The fourth research objective was to evaluate the relationships between student's knowledge scores and FV preferences, student's beliefs and FV information learned from teachers, and FV access and FV intake. No significant correlations were found between knowledge and preferences at pre-test or at post-test (r=0.04, p=0.66; r=0.17, p=0.096, respectively) or between students' beliefs about FV and FV-related information learned from teachers (r=0.10; p=0.295, r=0.16; p=0.102, respectively). A significant correlation was found between reported intakes of FV and access to FV at pre-test (r=0.25; p=0.009) as well as at post-test (r=0.26; p=0.002).

Intakes

Participants were asked to report whether or not fruit was consumed in the previous day, and if so, how many times it was consumed (one, two, three, four, or five or more times). At the pre-test survey, 21.7% (n=26) students reported having consumed

no fruit in the previous day, while 37.5% (n=45) reported not consuming any fruit juice during the previous day, 29.2% (n=35) reported not consuming any vegetables during the previous day, and 44.1% (n=53) reported consuming fast-food or take-out more than once during the previous week (Table 5). No significant changes between pre- and post- test intakes were detected in any category of fruits, fruit juices, vegetables, and fast-food intakes.

Table 5

Pre- and Post-Test Intakes of Fruits, Fruit Juices, Vegetables, and Fast-Food

	Fruit Juice		Fruit		Vegetable		Fast-Food	
	Pre n (%)	Post n (%)	Pre n (%)	Post n (%)	Pre n (%)	Post n (%)	Pre n (%)	Post n (%)
None consumed in previous day	45 (37.5%)	44 (36.7)	26 (21.7)	33 (27.5)	35 (29.2)	37 (28.3)	34 (28.3)	31 (25.8)
One	27 (22.5)	24 (20)	26 (1.7)	24 (20)	25 (20.8)	29 (24.2)	26 (21.7)	32 (26.7)
Two	15 (12.5)	14 (11.7)	23 (19.2)	26 (21.7)	26 (21.7)	17 (14.2)	25 (20.8)	25 (20.8)
Three	16 (13.3)	11 (9.2)	20 (16.7)	13 (10.8)	18 (15)	14 (11.7)	17 (14.2)	15 (12.5)
Four	3 (2.5)	7 (5.8)	6 (5.4)	6 (5)	4 (3.3)	2 (1.7)	4 (3.3)	4 (3.3)
Five or more	7 (5.8)	10 (8.3)	13 (10.8)	9 (7.5)	7 (5.8)	13 (10.8)	7 (5.8)	5 (4.2)

Note. Survey questions asked participants to respond based on the previous day's intake, except for the fast-food question, which asked about previous week. Response options to questions asked how many times were (1) fruit juices, (2) fruit, (3) vegetables, and (4) fast-food consumed: none, one time, two times, three times, four times, or five or more times.

Theory of Planned Behavior

The final research objective was to test the relationships hypothesized from TPB. Two separate regression analyses were performed. The first analysis used post-intervention self-efficacy, subjective norms, and belief scores to predict intentions to consume more FV. While the overall model was significant at $F(3, 88) = 7.2$, $p<0.001$, only self-efficacy scores significantly predicted intentions scores, $\beta = 0.246$, $t(91) = 2.25$, $p=0.027$ (Table 6). The second model was not significant and thus no predictive relationship between intentions to consume more FV and actual FV consumption was found.

Table 6

Self-Efficacy, Norms, and Beliefs in Predicting Intentions

Construct	Beta	t	Significance
Self-Efficacy	0.246	2.245	0.027*
Norms	0.190	1.874	0.064
Beliefs	0.171	1.647	0.103

Note. * - indicates statistical significance at the p<0.05 level.

Intervention Feedback

The post-test survey included one extra qualitative question, which was not part of the pre-test survey, that asked participants to describe their favorite part of the F2S-related events and the most common responses included the Mississippi-grown "blueberries" (n=28), "getting to eat FV" (n=27), and attending the "assembly and taste test" (n=6).

CHAPTER V

SUMMARY

Discussion

The purpose of this study was to describe the changes in students' FV-related knowledge, preferences, TPB constructs, and intakes that occurred following a F2S intervention. The target sample was located in a rural, southeast Mississippi county where 78.3% of residents are white, 19.8% African American, and 1.6% Hispanic. Demographic characteristics of this sample are representative of the county's demographics (66.7% versus 78.3%, 30% vs 19.8%, and 2.5% versus 1.6%, respectively; U.S. Department of Commerce, 2014).

Demographics

The majority (96.5%) of the targeted group of students participated in both pre- and post-intervention surveys. Tardiness, absence from school on survey dates, and parental denial for children to participate in the surveys were the most likely reasons the remaining 3.5% did not participate. In order to include students who might have been tardy or absent during the survey periods, the researchers considered sending home surveys with students rather than surveying them during school hours; however, it was assumed that a larger number of students would have been represented by surveying them in school to avoid the chance of parents forgetting to return the completed surveys by the pre- and post-intervention dates.

Research Objectives

Upon testing the first research objective for changes in nutrition knowledge over the course of the intervention, no significant change occurred from score means at pre-

test to score means at post-test. The lack of change in the nutrition knowledge category could be due to the very short amount of time in which students were measured from pre- to post-test, so perhaps greater changes might have been seen had the intervention lasted longer or the follow-up period came later than one month following the intervention. Also, the lack of change could be due to the relatively small sample size and evaluation of only one grade in one elementary school. Anderson and colleagues (2005) saw significant improvements in nutrition knowledge over time in a TPB-designed study that evaluated the effectiveness of a school-based intervention on children's (aged 6-7 and 10-11 years) FV intake changes. It was found that FV knowledge significantly increased, in addition to increased fruit intakes and FV-related norms, while preferences remained unchanged over the course of the intervention. The study did have a control group whereas the present study did not utilize a control group. Also, the sample size (n=511 in intervention schools; n=464 in control schools) was much larger than that of the current study, so the sample size differences may provide some explanation of the lack of significant changes in nutrition knowledge following the F2S intervention.

The second research objective was to describe the changes in the TPB constructs consisting of norms, beliefs, and self-efficacy before and after the F2S intervention. While norms and self-efficacy both remained unchanged over the course of the intervention, beliefs significantly improved (p=0.029). Prelip, Kinsler, Thai, Erausquin, and Slusser (2012) also found that only beliefs significantly improved in a study, but for consumption of vegetables alone. These researchers utilized a multi-component nutrition education intervention, similar to the intervention of the current study. However, the sample size was also much larger (n=399) and encompassed 3rd, 4th, and 5th grader

participation, rather than one single grade. Unlike the current study, a great emphasis was also placed on the role of schoolteachers in the intervention, so this was another way that the two studies differed in structure, though similar in findings.

Another TPB-designed intervention study promoting healthy eating in 335 high school students also found significant improvements in beliefs (or attitudes toward healthy eating) and in perceived behavioral control (Tsorbatzoudis, 2005). However, the subjects in the present study were 10, 11, and 12 year-olds; therefore, due to the possible developmental-period differences, it is difficult to compare the two samples and their results. Also, the larger sample size and longer intervention should be noted.

The third research objective was to identify changes in FV preferences over the course of the intervention. Scored by obtaining a sum of all points for each FV, preferences guided researchers to understanding the most well-liked FV and the most disliked FV because it was assumed that well-liked FV were consumed more often, and disliked FV consumed less often. No significant changes were identified from pre- to post-test surveys. It is possible that some of the increases in "I do not like this" responses from pre- to post-test surveys were due to participants having had little to no exposure or familiarity with the food, and following the F2S intervention, perhaps these particular participants had increased exposure or familiarity to the item, thus confirming their disliking for the item. However, participants were given the option to choose "I have never tried/heard of this" for each item, so this occurrence is unlikely. Preferences can be used to modify items served in the school lunch program and as Hendy et al., (2005) found, increasing the availability of these items increases FV intake in students.

The study mentioned before by Anderson et al. (2005) found similar results in preferences following a school-based intervention with elementary school students, which was also a short-term intervention (less than one year) resulting in unchanged preferences. It is likely that the lack of change in preferences could be due to changes in preferences requiring repeated exposure methods over extended periods of time. According to a review by Cooke (2007), preferences may be the most important determinants for children's consumption of FV. Familiarity and exposure to the food items were important for the increase in preferences and thus, increase in intakes of the foods. Furthermore, Cooke (2007) concluded that children who receive abundant exposure and opportunity to try FV early in life tend to practice healthier diets and eating behaviors.

Upon testing for the fourth research objective, significant differences between the pre- and post-test means were found for both students' beliefs scores (z=-2.183; p=0.029) as well as the scores calculated from the information that was learned about FV from teachers during F2S Week (z=-2.023; p=0.043); however, the information learned from teachers decreased, while beliefs increased. Again, Prelip et al. (2012) found improved beliefs, but towards vegetables alone, and improved information learned from teachers towards both FV following their multi-component nutrition education intervention in nearly four hundred 3rd, 4th, and 5th graders (n=399). Besides the difference in sample sizes, differences also existed among the a greater emphasis placed on involving teachers and parents of the participants in the behavior change approaches, which could explain the lack of positive change in the FV-related information learned from teachers in the present study. In addition, two different intervention groups were used to compare to a

control group whereas the present study only evaluated one intervention group. Also, significant improvements were noted from pre- to post-test variables specifically in nutrition knowledge, attitudes, and beliefs towards FV, whereas the current study only found significant improvements in beliefs.

Additionally, researchers hypothesized in the fourth research objective that the students' knowledge scores would be correlated with FV preferences because it could be assumed that the more one knows about the benefits and importance of FV, the more preferences for FV occur. Some studies have found significant relationships between high nutrition knowledge and high FV intakes, as well as high FV preferences and high FV intakes (Brug, Tak, Velde, Bere, & de Bourdeaudhuij, 2008; Loucaides, Jago, & Theophanous, 2011; Lytle et al., 2003; Wall et al., 2012). No significant correlation was found between these two variables at pre-test or at post-test (p=0.66, p=0.096, respectively) in the current study.

Researchers also hypothesized in the fourth research objective that a correlation would exist between students' beliefs about FV and FV-related information learned from teachers because it was believed that the more FV-related information and recommendations a student heard and learned from their teacher, the stronger, or higher the belief score. As mentioned earlier, Prelip et al. (2012) reported significant changes in a teacher's influence on students' beliefs towards FV following a school-based nutrition education program. Findings like these support interventions using a TPB-derived framework as well as school-based nutrition education. However, in the current study, no significant relationships were found for belief scores and information learned from teachers at pre-test (r=0.102; p=0.295) or at post-test (r=0.158; p=0.102). Since the F2S

intervention consisted of one lesson plan per week in the physical education/health classes during F2S month, it is possible that not enough time was allowed for significant changes to be seen or measured. The intervention conducted by Prelip et al. (2012) was administered for an entire school year, across nine intervention schools, and three control schools. Had the F2S intervention in the current study been financially sustainable to carry on for an entire school year and able to be delivered to multiple schools, perhaps significant relationships could have been found between students' FV beliefs and FV-related information learned from their teachers.

Lastly, researchers hypothesized in the fourth research objective that a correlation would exist between the students' reported intakes and reported access to FV. Significant correlations were found at pre-test ($r=0.251$; $p=0.009$) as well as at post-test ($r=0.297$; $p=0.002$) indicating that the access to FV a child has at home is related to the amount of FV a child actually consumes. These findings imply that children who do not have FV available to them at home do not eat as many FV as the children who do have FV available at home. In this study, no changes in availability were observed over time, and it should be noted that the questionnaire item's measuring ability of FV availability was limited.

A study conducted by Pérez-Lizaur, Kaufer-Horwitz, and Plazas (2008) found accessibility to FV as one of the major environmental factors influencing higher FV consumption ($p<0.01$) in a sample of 327 children between the ages of seven and ten years old. These findings relate to the current study in agreeing that children who have FV access at home likely have high FV intakes, which is consistent with other studies' findings (Baxter & Shroder, 1997; Cullen et al., 2003). Therefore, community

interventions and other resources should be put in place to promote higher FV accessibility.

Intakes

Overall, students' intakes did not improve over the course of the intervention. This lack of change could have been due to students having tried some of the featured FV of the intervention for the first time, such as cucumbers and tomatoes which were only on the lunch menu once during the intervention week, and not having been exposed to those items again a sufficient number of times between the pre-test and the post-test to allow for preferences to be acquired and developed.

Again, in the systematic review by Evans et al. (2012), school-based interventions often only minimally influence children's FV intakes, especially concerning vegetables. Examining 27 different school-based FV interventions, which involved over 26,000 students, the average improvement in fruit and vegetable intake was 0.32 and 0.25 servings, respectively. A need for further research still remains in what techniques are deemed most successful in improving children's dietary behaviors in regards to FV despite the numerous studies conducted each year in school settings. In the letter to the editor by Kraak et al. (2013), regarding the aforementioned systematic review, assertions were made indicating the importance of governmental involvement in the funding and implementation of FV promotions, especially those that enhance FV availability and access for children is critical.

Theory of Planned Behavior

Two separate regression analyses were performed to test the paths hypothesized in TPB. For the first path, as the TPB postulates, self-efficacy, social norms, and beliefs

about FV should predict intentions to consume FV. After a regression analysis of post-intervention TPB constructs, the overall model was found to be significant although only self-efficacy scores significantly predicted intentions scores. For the second path as the TPB hypothesizes, intentions to consume FV should predict FV intakes. However, no predictive ability was found of intentions to consume more FV to actual FV consumption. Even a study with 1,272 eight and nine year-old children found quite the same results. Researchers of the TPB-designed study noted that all TPB constructs significantly contributed to participants' intentions to eat healthily, with perceived behavioral control, or self-efficacy, being the most important contributor (Bazillier, Verlhiac, Mallet, and Rouëssé, 2011).

In a study that sought to compare gender differences in predicting snack food consumption among children, researchers noted that snack intakes could be predicted by intentions. Males' intentions predicted FV snack intakes, but not calorie-dense snack intakes, while females' intentions predicted FV snack intakes as well as calorie-dense snack intakes. Though different in purpose, the study used the TPB to explain snack intakes in 4th and 5th graders of both genders, while also utilizing a regression analysis for testing the aforementioned TPB predictions, similar to the present F2S study. However, unlike the F2S study, the researchers used a 24-hour recall to obtain intake information from the participants, so data were obtained on school snacks as well as snacks consumed out of school (Branscum & Sharma, 2014).

Intervention Feedback

The post-intervention survey asked participants to describe their favorite part of the F2S-related events and the most common responses included the Mississippi-grown

"blueberries" (n=28), "getting to eat FV" (n=27), and attending the "assembly and taste test" (n=6). Trying new FV appears to be one of the favorite aspects of the F2S intervention implemented in the Stone County school district, which should illustrate that children can enjoy FV, but perhaps allowing for more than only one F2S assembly and one week's worth of Mississippi-grown produce on the lunch menu is needed for students to create new FV eating behaviors or intentions to create new FV behaviors.

Other Findings

Although no significant changes in knowledge score means occurred from pre-test to post-test, it should be noted that more than half of the students (68.3%; n=82) correctly answered the nutrition knowledge question asking whether eating FV would help lower chances of developing heart disease or cancer, while nearly a quarter (21.7% and 29.2%, respectively) of the students did not eat a single fruit or vegetable the day prior to the pre-test survey, according to the reported intake responses. Despite the knowledge of FV health benefits, participants appeared to eat little to no FV, according to the intake responses, and this could potentially be due to a lack of support, accessibility, or understanding of the health impacts associated with increased FV consumption.

The 2013 State Indicator Report on Fruits and Vegetables published by the CDC, noted nearly half (39.8% and 42.4%, respectively) of Mississippi children consumed less than one fruit and one vegetable per day (CDC, 2013). Also, in a study on children living within rural communities in multiple southeastern states, including Mississippi, baseline FV intakes were 1.15 cups and 0.55 cups, respectively; control group children had virtually identical FV intakes (1.18 and 0.50 cups, respectively). These findings, like those in the current study illustrate a lack of adequate FV intakes in the diets of children

in southeast, rural regions of the U.S. (Cohen, Kraak, Choumenkovitch, Hyatt, & Economos, 2014).

In an aforementioned study, FV accessibility was found to be a major determinant of FV intakes (Pérez-Lizaur et al., 2008). In the present study, nearly half of the sample of students (47.5%, n=57 and 40%, n=48, respectively) did not have regular access to FV to eat at home at pre-test. Nearly half of the sample of students (44.1%, n=53) did not have regular access to fruits at home, while one-third of the sample (32.5%, n=39) did not have regular access to vegetables at home at post-test. So if no FV are accessible in the home, then the question of how these children will eat their recommended FV remains. The idea that even one student goes home to never having FV available to eat is disturbing, especially since the day's recommendation of FV intakes cannot be accomplished in the one or two meals potentially received from the NSLP and SBP. While children are at the age of developing food preferences in addition to opinions and attitudes towards FV (approximately 10-11 years of age), it is imperative to the future of a young individual's health that FV be consumed daily and in adequate amounts (Brown, 2008). Therefore, state- or national-level policy changes may be necessary to ensure that children like those in the current study's sample have adequate FV access at home. For example, incentive programs have been implemented in some areas of the U.S. to encourage SNAP recipients to purchase fresh and local produce and receive additional funds for these items. Known as the Healthy Incentives Pilot (HIP), the Farm Bill authorized $20 million dollars to fund the promotion and evaluation of the program (USDA, FNS, 2014). Programs like these, as well as others such as F2S, can aid in preventing the continuation of current diet-related chronic disease trends by providing the

resources to FV, thus making FV more accessible and more likely to be consumed. Raising awareness, though, may need to be initiated first within the community in order to give a positive rise to changes at state or federal levels.

The present F2S intervention may have had an impact on the participants' FV-related experiences. In terms of nutrition knowledge, FV preferences, intakes, access, as well as subjective norms and self-efficacy, the F2S intervention may not have resulted in significant improvements. The lack of change is likely attributable to the intervention's lack of intensity and duration necessary for significant improvements. However, significant improvements were made in beliefs towards FV so the participants' FV-related experiences were positively influenced.

Strengths

The present study was designed with the TPB as its conceptual framework, which Guillaumie, Godin, and Vézina-Im (2010) suggested was the preferred theory to explain behavioral intentions. Also, the use of a multi-component intervention is considered a strength to the present study as the NEL stated that multi-component interventions are superior to single-component methods (USDA, CNPP, 2012). Additionally, a validated instrument was used to collect all data from the sample, which ensures that the questionnaire assessed the information from the students that was intended to be measured. Finally, the current study had a high response rate (96.5% at pre-test; n=120; N=124) with minimal missing data, where the highest frequency of missing data for any single question was 10 responses (8.3%).

Limitations

As in any study, the limitations should be taken into consideration in interpreting the current study's findings. First, all data (except for gender and race, which were obtained by class rosters) were self-reported by the participants, which allowed the possibility for socially desirable responses, missing data, and possibly copying another student's responses. Either a teacher or researcher proctored both pre- and post-test surveys, providing an opportunity for students to ask questions if they needed help. Also, data on FV intakes only asked participants about their intakes on the previous day. Since the pre- and post-surveys were both held on Mondays, the survey only accounted for Sundays' FV intakes, and some studies have reported lower FV intakes on weekends when compared to weekdays (Krolner et al., 2011; Rothausen et al., 2012).

Second, no long-term follow up data collection was implemented. It is not known whether improvements were made and sustained, nor is it known whether the variables that tested statistically insignificant had sufficient time to be changed and sustained. For example, the post-intervention survey was only followed up after one month's time. It is possible that lack of change in knowledge, FV preferences, TPB constructs, and FV intakes was not seen simply because insufficient time was allowed for a change to occur in a certain variable. Perhaps students required longer than one month to accomplish significant changes. Researchers Upton, Upton, and Taylor (2013) evaluated the extent to which FV intake improvements were made by observing FV consumptions in children at six intervention schools. Each school carried out a Food Dudes program, which sought to increase children's FV consumption. Additionally, seven control schools were used to compare results to intervention schools. In children between four and eleven years old, a

significant increase was found in FV consumptions at a three-month follow-up. So perhaps an additional follow-up survey for the current F2S intervention study was necessary to capture significant changes. Another study, which used a theory-driven, 2.5-year intervention, resulted in improved FV knowledge but no impact on FV preferences. Interventions lasting longer than one month may be necessary for significant and sustained dietary improvements (Hoffman et al., 2011).

Third, very little rigorous research literature is available for comparison on evaluations of F2S programs. Although F2S programs have certainly increased over the recent years, rigorous evaluations of programs have not been collected (Joshi et al., 2008). Not only is there a lack of evaluations focused on F2S interventions among the current body of literature, but also the present study's intervention itself lacked an element of process evaluation of the various components of the intervention. The four F2S lesson plans were developed by the researchers and provided to teachers personally by the researchers; however, no continuous feedback was provided as to whether or not the lesson plans were actually implemented. The researcher sent routine email notifications to the teachers in the intervention school, though no responses were provided. It is assumed that the plans were utilized and implemented since each lesson aligned with the Common Core curriculum standards and having the F2S lessons meant that was four less plans for the teachers to develop themselves.

Another limitation of the current study is in the actual sample; despite the high response rate received for both pre- and post-test surveys, the sample was fairly small. With the demographics of the sample and even the FV that were emphasized throughout

the intervention, these results truly can only be generalizable across similar communities with similar agricultural products.

Also, the pre-test survey questions were identical to the post-test survey questions, with the exception of the fill-in-the-blank question asking, "What was your favorite part of F2S month?" which was only asked at the post-test. The post-test questions were not in the same order as the pre-test survey, but having the exact questions on the post-test survey poses the risk of participants remembering their answers from the pre-test survey in order to complete the survey faster or simply to answer with the same responses for each survey.

Lastly, the intervention was designed as a weeklong program, but some intervention components (such as the F2S bulletin boards in the cafeteria and the weekly F2S lesson plans in health class) lasted one month. So confusion could have existed in distinguishing F2S week versus F2S month. Many students reported their favorite part of F2S month as the time "they got to play with the parrot" and "see the parrot flying at school," even though no animals were included in the implementation of the F2S intervention. There must have been a lack of clearly defined constituents of the intervention to the subjects and school faculty where non-F2S events that seemed F2S-related, like zoo animal visits to the school, happened to fall in the same month as F2S.

Implications and Future Research

Future research is necessary for bridging the gap from intentions for consuming FV to actually consuming FV as it was evident in these findings that while self-efficacy, subjective norms, and beliefs can predict intentions to consume more FV as a whole, intentions to consume more FV did not predict FV consumption, despite what the TPB

posits. Therefore, research on how effectively to bridge this gap will be important for future nutrition education interventions, such as F2S programs, especially those that are implemented in regions like Mississippi where adult and adolescent FV intakes are among the lowest in the nation (CDC, 2013).

Since children spend so much time in school, the use of school-based nutrition education programs could be extremely beneficial to the future of public health. If children can learn very early the importance of a diet rich in FV, the rates of chronic diseases such as heart disease, obesity, and T2DM have the potential to decrease; thus decreasing the amount of U.S. dollars spent on health care, decreasing the financial and health burdens on individuals, while increasing the health and quality of life of future Americans.

As mentioned before, policy changes can and should be made to make FV more accessible and available to children, especially those who were part of the near half of the present study's sample who did not have regular access to FV outside of school. Awareness must be raised within the local communities about the lack of FV access, knowledge, and consumption among the young children in the community, like those that took part in this study. Future research should also focus on methods to combating these issues as well as methods that successfully improve the diets of children in schools. According to the results of this study, the need for improving children's diets, especially in regards to FV, is apparent and imperative; therefore, sustainable changes must be developed, implemented, and maintained.

Conclusion

This study assessed TPB constructs associated with FV intakes of 5th grade students before and after a F2S intervention. According to the TPB, self-efficacy, norms, and beliefs should predict intentions to consume FV, and intentions should predict intake. However, these findings indicated that intentions did not predict intakes. Overall, only beliefs saw statistically significant improvements.

The FV intake measurement used only three questions to assess intake from the previous day, which along with sample size may have yielded limited ability to observe significant improvements in FV consumption. Future F2S interventions should utilize dietary intake instruments validated for use in children. Additionally, future research should also investigate successful methods to bridging the gap between intentions to consume more FV and FV consumption behaviors. Longer interventions, or a longer follow-up period, may have allowed for better assessment of impacts; nonetheless, these findings demonstrate a potential for effectively implemented theory-driven, school-based nutrition interventions in elementary school-aged students in rural Mississippi in increasing their awareness of the importance of FV consumption.

APPENDIX A

IRB APPROVAL

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.6820 | Fax: 601.266.4377 | www.usm.edu/irb

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: **13093001**
PROJECT TITLE: **Evaluating the Impact of Farm to School on Children's Fruit and Vegetable Intake**
PROJECT TYPE: **New Project**
RESEARCHER(S): **Rebecca Bishop**
COLLEGE/DIVISION: **College of Health**
DEPARTMENT: **Nutrition and Food Systems**
FUNDING AGENCY/SPONSOR: **N/A**
IRB COMMITTEE ACTION: **Exempt Approval**
PERIOD OF APPROVAL: **09/30/2013 to 09/29/2014**

Lawrence A. Hosman, Ph.D.
Institutional Review Board

APPENDIX B

F2SW INTERVENTION COMPONENTS

STONE COUNTY SCHOOL DISTRICT and THE UNIVERSITY OF SOUTHERN MISSISSIPPI present

Farm to School Week

OCT. 7-11, 2013

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

FARM TO SCHOOL WEEK

Grow. Taste. Learn.

The goals of Farm to School (F2S) Week are to expose children to a variety of fruits and vegetables, increase their nutrition-related knowledge, and hopefully their desire to eat more fruits and vegetables in order to grow up to be a strong and healthy adult!

F2S initiatives across the nation have blossomed because the program is known to integrate education, support, and fun all together to create a healthy school environment.

In response to the increasing obesity and chronic illness rates in the state, Mississippi officials have declared the first week of October as Mississippi's Annual Farm to School Week. Studies have shown that F2S programs are a great way to improve the dietary habits of children at school.

So, this year's 2nd annual F2S Week will be taking place in your school during the week of October 7-11, 2013! Look for F2S events and promotions around your school's campus.

Static clings will be displayed during F2S Week to label the foods that were grown on "a farm near YOU".

Remember to keep an eye out in the lunch line for the static clings that look like the one below:

Learn what Farm to School Week is doing in your child's school!

F2S Week will be incorporating a great deal of locally-grown ingredients in the lunch menu this week!

Look for bulletin boards, posters, F2S lessons in class, and maybe even some special guests!

The farms that will be providing produce this year are from all over Mississippi.

This year's local produce will include cucumbers, green bell peppers, collard greens, butterbeans, southern peas, sweet potatoes, blueberries, eggplant, and grape tomatoes!

**Be sure to ask your child how Farm to School changed their lunch choices at school!*

Try out this favorite local recipe!

Roasted Mississippi Pumpkin Seeds

1 1/2 cups pumpkin seeds (cleaned and rinsed)

2 tsp garlic powder

1 tsp salt

1 tsp pepper

1 tsp crushed red pepper

Preheat the oven to 350 degrees. Spray a baking sheet with cooking spray. Then, combine all the ingredients on the sheet by tossing it all until evenly coated. Bake for 15 minutes (or until the seeds are a crispy, golden brown) and cool before serving.

Farm to School Week 2013 Lesson Plans

Some materials adapted from the US Department of Agriculture's Food and Nutrition Service "Dig In! Standards-based Nutrition Education from the Ground Up" guide. Retrieved from: http://teamnutrition.usda.gov/Resources/dig_in.html

Morning Announcements:

- Wake up to fruit by adding an apple or banana to give you that needed energy for school.
- In a hurry? Grab a fresh fruit or veggie for a snack-on-the-run.
- Taste the rainbow and make a colorful plate full of fruits and vegetables every meal.
- Try crunchy veggies instead of chips when you want that chomping feeling.
- Try a parfait: A little yogurt, mandarin oranges, blueberries and sprinklings of granola will do ya.
- Try a twist with a banana split: Put some yogurt on a banana and just sprinkle with your favorite cereal.
- Spread some peanut butter on your apple slices for a yummy and simple snack.
- Today, we will be having blueberries with lunch. Did you know that blueberries have a lot of antioxidants that help prevent cancer, heart disease, and other deadly illnesses?
- Today, we will be having squash with lunch. "Squash" comes from the Native American term "askutasquash," which means "eaten raw" and it is one of the oldest known crops.
- Today, we will be having sweet potatoes and mustard greens with lunch. George Washington was a sweet potato farmer before he became our first president of the United States. And collard greens are a part of the cabbage family!
- Today, we will be having a tomato/cucumber salad with lunch. Did you know that the average person eats 23 pounds of tomatoes every year? Tomatoes and cucumbers are both packed with water and nutrients that are good for your eyes and skin!
- Today, we will be having zucchini with lunch. Did you know that a whole zucchini has more potassium than a whole banana?

Bulletin Board Materials:

APPENDIX C

PARTICIPANT SURVEY

5th Grade Students' Fruit and Vegetable Knowledge and Preferences

Hi, you were selected to take part in this survey to help researchers determine the common ideas that 5th grade students have about fruits and vegetables.

Please follow these instructions:

- Read the directions for each section of questions.
- Answer each question the BEST you can.
- Be honest!
- Your answers will not be shared so they will remain a secret.

What was your favorite part of Farm to School Month?

_____

_____

_____

Note. This first question was only asked as a part of the post-test survey.

Kids may sometimes know different things about different foods. For example: Jill may know that carrots are good for your eyes, while Jack may know that carrots grow in the ground.

We would like to know more about how YOU think about fruits and vegetables. This section of questions will ask you about fruits and vegetables. Answer the questions the best you can. Please bubble in one answer to each question.

1. Fruits and vegetables that are high in Vitamin A are _____ in color.
   - O Purple and white
   - O Blue and light brown
   - O Yellow-orange and dark green
   - O I don't know

2. Almost all fruits and vegetables contain a lot of vitamins and _____.
   - O Protein
   - O Fiber
   - O Fat
   - O I don't know

3. Which of the following fruits and vegetables are grown in Mississippi?
   - O Sweet potatoes
   - O Mustard greens
   - O Blueberries
   - O All of the above

4. Eating fruits and vegetables can help lower your chances of getting heart disease or cancer.
   - O True
   - O False
   - O I don't know

5. Fruits and vegetables, like apples and pears, are best when eaten with the peel because that is where most of the fiber and antioxidants are.
    - O True
    - O False
    - O I don't know

6. Fruits and vegetables are grown where?
    - O On farms
    - O At grocery stores
    - O In science labs
    - O I don't know

7. The recommended number of daily servings of fruits and vegetables for kids your age are:
    - O 0 servings
    - O 1-3 servings
    - O 5-9 servings
    - O 10-14 servings

Kids may have different preferences for different things. For example: Jill may like carrots and dislike celery, while Jack likes celery and dislikes carrots.

We would like to know more about what fruits and vegetables YOU like and dislike. These next questions will ask you about your preference towards a given fruit or vegetable. Please answer the questions the best you can. There is NO *right* or *wrong* answer. Please bubble in one answer to each question.

How much do you like the following fruits and vegetables?

	I like this a lot 	I like this a little 	I do not like this 	I don't know what this is nor have I tried this ?
8. Carrots	O	O	O	O
9. Celery	O	O	O	O
10. Cucumbers	O	O	O	O
11. Greens (collard greens, mustard greens, turnip greens)	O	O	O	O

	I like this a lot 	I like this a little 	I do not like this 	I don't know what this is nor have I tried this ?
12. Potatoes (regular potatoes or sweet potatoes)	O	O	O	O
13. Corn	O	O	O	O
14. Squash	O	O	O	O
15. Peas (green peas, sweet peas, English peas)	O	O	O	O
	I like this a lot 	I like this a little 	I do not like this 	I don't know what this is nor have I tried this ?
16. Tomatoes	O	O	O	O
17. Broccoli	O	O	O	O
18. Lettuce	O	O	O	O
19. Green Beans	O	O	O	O

	I like this a lot 	I like this a little 	I do not like this 	I don't know what this is nor have I tried this ?
20. Zucchini	O	O	O	O
21. Peaches	O	O	O	O
22. Apples	O	O	O	O
23. Applesauce	O	O	O	O
	I like this a lot 	**I like this a little** 	**I do not like this** 	**I don't know what this is nor have I tried this ?**
24. Bananas	O	O	O	O
25. Berries (blueberries, strawberries, blackberries, wildberries)	O	O	O	O
26. Grapes	O	O	O	O
27. Oranges	O	O	O	O
28. Juice (orange, apple, cranberry)	O	O	O	O

29. Are there any other **fruits** that you really like?

    If yes, what kind?
    _____.

30. Are there any other **vegetables** that you really like?

    If yes, what kind?
    _____.

The questions in this section ask what your friends think about eating fruits and vegetables. Please bubble in one answer to each question.

	Yes	**No**	**I don't know**
31. Do most of your friends like to eat fruit?	O	O	O
32. Do most of your friends eat fruit every day?	O	O	O
33. Does your best friend eat fruit every day?	O	O	O
34. Do most of your friends like to eat vegetables?	O	O	O
35. Do most of your friends eat vegetables every day?	O	O	O
36. Does your best friend eat vegetables every day?	O	O	O

The questions in this section ask how often your parents eat fruits and vegetables. Please bubble in one answer to each question.

	Never	A few days a week	Most days a week	Every day	I don't know
37. How often do your parents eat fruit?	O	O	O	O	O
38. How often do your parents eat vegetables?	O	O	O	O	O

The questions in this next section ask how sure you are that you can ask and shop for fruits and vegetables. Please bubble in one answer to each question.

How sure are you that you can:	I disagree very much	I disagree a little	I am not sure	I agree a little	I agree very much
39. write my favorite fruit or vegetable on the family's shopping list	O	O	O	O	O
40. ask someone in my family to buy my favorite fruit or vegetable	O	O	O	O	O
41. go shopping with my family for my favorite fruit or vegetable	O	O	O	O	O
42. pick out my favorite fruit or vegetable at the store and put it in the shopping	O	O	O	O	O

basket					
43. ask someone in my family to serve my favorite fruit at dinner	O	O	O	O	O
44. ask someone in my family to have fruits and fruit juices out where I can reach them	O	O	O	O	O
45. ask someone in my family to have vegetables cut up where I can reach them	O	O	O	O	O

The questions in this next section ask about what your teacher tells you about eating fruits and vegetables. Please bubble in <u>one</u> answer to each question.

Does your teacher tell you…	**Yes**	**No**	**I don't know**
46. …that vegetables are good for you?	O	O	O
47. …that vegetables are healthy?	O	O	O
48. …that vegetables taste good?	O	O	O
49. …to eat vegetables every day?	O	O	O
50. …that fruit is good for you?	O	O	O
51. …that fruit is healthy?	O	O	O
52. …that fruit tastes good?	O	O	O
53. …to eat fruit every day?	O	O	O

The questions in this section are about what you think will happen if you eat fruits and vegetables. Tell us how much do you agree or disagree with the following statements? Please bubble in one answer to each question.

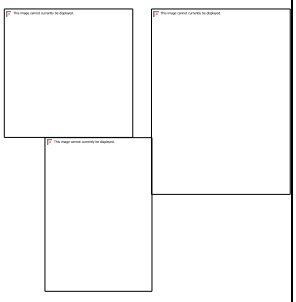
	Disagree	**Not Sure**	**Agree**
54. I will have more energy for playing (sports, recess, or after school) if I eat more fruits and vegetables.	O	O	O
55. I will get sick more often if I do **NOT** eat fruits and vegetables.	O	O	O
56. Eating fruits and vegetables will help me grow big and strong.	O	O	O
57. I will have healthier skin if I eat fruits and vegetables.	O	O	O
58. If I eat fruits and vegetables, I will have stronger eyes.	O	O	O
59. If I eat fruits or vegetables at breakfast, I will be able to think better in class.	O	O	O
60. Eating fruits and vegetables will keep me from getting cavities.	O	O	O

The questions in this next section ask about how much you eat. Please bubble in <u>one</u> answer to each question.

Since kids may have different preferences for different things, that means kids eat different fruits and vegetables every day. For example: Jill may like carrots so she eats carrots every day and since she dislikes celery she does not eat it as much; while Jack likes celery so he eats it every day and since he dislikes carrots he does not eat it as much.

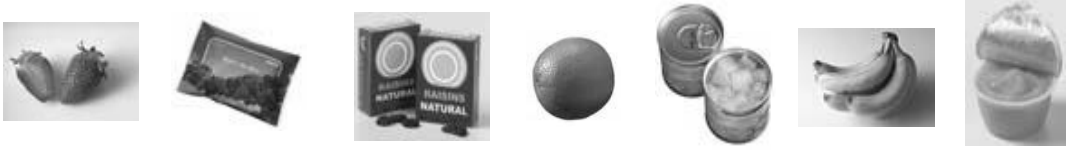
We would like to know more about how often YOU eat fruits and vegetables. These next questions will ask you about how many times you have eaten (or drank) fruits, vegetables, and/or juice. Answer the questions the best you can. There is NO *right* or *wrong* answer. Please bubble in <u>one</u> answer to each question.

61. Yesterday, did you drink fruit juice? Fruit juice is a drink, which is 100% juice, like orange juice, apple juice, or grape juice. *Do not count* punch, sports drinks, or other fruit-flavored drinks.



- O No, I didn't drink any fruit juice yesterday.
- O Yes, I drank fruit juice 1 time yesterday.
- O Yes, I drank fruit juice 2 times yesterday.
- O Yes, I drank fruit juice 3 times yesterday.
- O Yes, I drank fruit juice 4 times yesterday.
- O Yes, I drank fruit juice 5 or more times yesterday.

62. Yesterday, did you eat fruit? Include fresh, frozen or canned. *Do not count* fruit juice.



- O No, I didn't eat any fruit yesterday.
- O Yes, I ate fruit 1 time yesterday.
- O Yes, I ate fruit 2 times yesterday.
- O Yes, I ate fruit 3 times yesterday.
- O Yes, I ate fruit 4 times yesterday.
- O Yes, I ate fruit 5 or more times yesterday.

63. Yesterday, did you eat any vegetables? Vegetables are all cooked and uncooked vegetables; salads; and boiled, baked and mashed potatoes. *Do not count* French fries or chips.

- O No, I didn't eat any vegetables yesterday.
- O Yes, I ate vegetables 1 time yesterday.
- O Yes, I ate vegetables 2 times yesterday.
- O Yes, I ate vegetables 3 times yesterday.
- O Yes, I ate vegetables 4 times yesterday.
- O Yes, I ate vegetables 5 or more times yesterday.

64. Last week, did you eat fast food or take out?

- O No, I didn't eat any fast food or take out last week.
- O Yes, I ate fast food or take out 1 time last week.
- O Yes, I ate fast food or take out 2 times last week.
- O Yes, I ate fast food or take out 3 times last week.
- O Yes, I ate fast food or take out 4 times last week.
- O Yes, I ate fast food or take out 5 or more times last week.

Just like kids, parents (and/or guardians) sometimes have different fruit and vegetable preferences. We would like to know more about how often fruits and vegetables are available to YOU at home. Answer the questions the best you can. There is NO *right* or *wrong* answer. Please bubble in one answer to each question.

65. At your home, do you have **fruits** to eat?
    - O Never
    - O Sometimes
    - O Always
    - O I don't know

66. At your home, do you have **vegetables** to eat?
    - O Never
    - O Sometimes
    - O Always
    - O I don't know

We would like to know more about how you think about fruits and vegetables. Answer the questions the best you can. There is NO *right* or *wrong* answer. Please bubble in one answer to each question.

	Disagree	**Not Sure**	**Agree**
67. For the **next week** I plan to eat healthy every day.	O	O	O
68. For the **next week** I plan to eat 2 servings of **vegetables** every day.	O	O	O
69. For the **next week** I plan to eat 2 servings of **fruit** every day.	O	O	O
70. For the **next week** I plan **not** to eat fast food.	O	O	O
71. It is important to me to eat a healthy food every day.	O	O	O

72. I want to eat healthy every day, but I don't want to give up my favorite foods.	O	O	O
73. I think eating fast food is easier than eating fruits or vegetables.	O	O	O
74. Eating healthy every day is **not cool**.	O	O	O
75. The school cafeteria **always** serves healthy food.	O	O	O
76. Healthy foods don't taste good.	O	O	O
77. My friends make it hard to eat healthy.	O	O	O
78. My parents don't buy healthy food.	O	O	O
79. I don't eat healthy because healthy foods are not around.	O	O	O
80. It is hard for me to eat healthy foods because junk foods taste better.	O	O	O
81. I can eat healthy even if others around me are eating **unhealthy**.	O	O	O

Now you will answer a few questions about yourself.

82. Are you:

O Boy

O Girl

83. How old are you?_____

84. How would you describe yourself?

O Hispanic or Latino
O American Indian or Alaska Native
O Asian
O Black or African American
O Native Hawaiian or Other Pacific Islander
O White
O More than one of these

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