Evaluating the Impact of Local Vegetable Messaging on Elementary School Students’ Vegetable Choice and Nutrition Behaviors

Jesse Chiero
University of Connecticut - Storrs, jesse.chiero@uconn.edu

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Evaluating the Impact of Local Vegetable Messaging on Elementary School Students’ Vegetable Choice and Nutrition Behaviors

Jesse D. Chiero PhD

University of Connecticut [2018]

Farm to school (FtS) initiatives within a school setting may include purchase of local foods, nutrition education, and school gardening. Previous FtS research has indicated a positive impact on child nutrition behaviors and body weight but less is known about how and what aspects of local foods within school meals impact child nutrition behaviors. The specific aims of this project were to: 1) Determine which benefit(s) of eating local vegetables are most salient to 3rd-5th grade students for a local vegetable message campaign intervention and compare if message preferences varied by age, gender and school district, and 2) Determine the impact of a local FtS food procurement and messaging intervention on changes in elementary school students’ local vegetable choices and nutrition-related behaviors.

Using an interactive survey in Phase 1, 3rd-5th grade students (n=202) ranked preferred messages regarding benefits of eating locally grown vegetables (freshness, health/strength, farmers, environment, community/school, and food safety). Chi-Square and Fisher’s Exact test results revealed that overall, students preferred messages about strength (p=0.03) and their school (p=0.03). Rural/suburban schools preferred the environment message compared to urban students (p=0.007), male students preferred the strength message compared to females (p=0.02), and older students preferred the fresh taste message compared to younger students (p=0.04).
Phase 2 consisted of a quasi-experimental study with three groups of 3rd-5th grade students: “Local Message (n=81),” “Nutrition Message (n=79),” and “Control (n=79).” Local vegetables (beets, butternut squash, zucchini, green beans, and kale) were served twice during lunch over 16 weeks in each group. In addition, bi-weekly nutrition education lessons and a tailored messaging campaign were included in the “Local” (“Strength” and “School” vegetable messages) and “Nutrition” (MyPlate messages) groups. An ANCOVA with post hoc Tukey analysis revealed students in the “Local” group had significantly improved vegetable attitudes (p=0.0001), preferences (p=0.001), overall vegetable behavior score (p=0.002), and local beet choice (P=0.004) compared to the control. Overall, the findings from this research provide preliminary evidence that local vegetable messaging in schools cafeterias may improve students’ food choices and nutrition behaviors but further research is needed to determine the generalizability of the results.
Evaluating the Impact of Local Vegetable Messaging on Elementary School Students’

Vegetable Choice and Nutrition Behaviors

Jesse D. Chiero

B.A., Ohio Wesleyan University, [2010]
M.S., University of Toledo, [2012]

A Dissertation
Submitted in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Philosophy
at the
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CHAPTER I: Introduction

Background and significance

Currently the national youth obesity rate is estimated at 18.5%, with socio-demographic variability.\(^1\) Youth obesity in low-income families is 19.4%, in Hispanic youth it is 25.8% and in African American youth it is 22.0%.\(^1,2\) Children from low-income communities have decreased access to foods consistent with healthy diet patterns, potentially increasing their risk of obesity and related diseases at younger ages. To address the rates of youth obesity, especially in high risk populations, revision and expansion in the National School Lunch Program (NSLP) has focused on increasing access to healthy foods such as whole fruits, vegetables, and dairy through farm-to-school (FtS) programs.\(^3\)

The potential for the NSLP and FtS programs to impact dietary pattern and obesity risk at the national level is evident considering: it serves 30 million students daily; it provides students with 47-51% of their daily calories; and 77% of Hispanic and 80% of African American students receive its meals for free or at reduced prices.\(^4-7\) Additionally, the annual federal support of this program makes it the third largest federally subsidized food assistance program in the country with strict legislative mandates on the foods it can provide.\(^4,8\) The use of Farm-to-School (FtS) programs serves to complement the NSLP meal offerings.

FtS initiatives within a school setting may include one or more of the following components: purchase of local whole or minimally processed foods (fruits and vegetables); hands-on experiential nutrition education related to food and agriculture; and, school gardening. Previous FtS related research has indicated a positive impact on
child nutrition behaviors and obesity weight status, but research is minimal and less is known about how and what aspects of the inclusion of local foods within school meals impact child nutrition behaviors.¹⁹⁻¹⁷ School procurement of local fruit and vegetables offers the distinct opportunity to use unique local message themes to increase appeal of healthy food options that come from surrounding community, state, and region. Of the potential areas of future FtS research, recent researcher and literature reviews cite the need to establish the effect of local fruit and vegetable marketing strategies on students’ fruit and vegetable choice during school lunch.¹⁸,¹⁹ This research can establish appealing and resonant local fruit and vegetable marketing and determine its effectiveness to improve students’ food choice behavior at school. Ultimately the results can be used to inform school nutrition policies on effective marketing strategies for local fruits and vegetables.

**Dissertation Purpose**

The purpose of this dissertation is to investigate how local vegetable procurement enhanced with a student-informed, local vegetable social marketing intervention influences local vegetable choice and nutrition behaviors in the cafeteria. To accomplish this purpose, this dissertation includes two studies targeting school-aged children.

**Research Objectives**

Overall Research Aim: To gain insight into how a school-based, student-informed local vegetable marketing intervention that includes local vegetable procurement is associated with local vegetable choice and nutrition behaviors of elementary school students in the cafeteria.
Study 1: Local vegetable message testing in 3rd-5th grade students

Aim 1: Determine which local vegetable messages 3rd-5th grade students prefer.

- Hypothesis: Messages focusing on freshness and benefits to the environment will be preferred by the 3rd-5th grade students. This is based on the only known published research on what aspects of local foods students prefer.\(^{20}\)

Aim 2: Determine if preferred messages about locally grown vegetables differ between 3rd-5th grade students from two Connecticut school districts.

- Hypothesis: Students from the suburban/rural school district will prefer local messages focused on benefits to the farmer and food safety compared to students from the urban school district. This is based on research indicating higher agriculture literacy, food systems knowledge and exposure to farms and farming in suburban/rural schools.\(^{21}\)

Aim 3: Determine if preferred messages differ by age, grade, and gender.

- Hypothesis: Younger, male students will prefer messages focused on taste. This is based on research showing younger, male children prefer foods based on taste compared to older children and adolescents.\(^{22,23}\)

Study 2: Local vegetable marketing’s impact on local vegetable choice in an urban school district

Aim 1: Using the student-informed local messages from Study 1 this study evaluated a local vegetable social marketing intervention in urban, low-income, ethnically diverse schools for its ability to impact local vegetable choice in the lunchroom and nutrition-related behavior.
Hypothesis: Intervention schools receiving local vegetable social marketing with local vegetables will have:

1. More students choosing the local vegetable served
2. Improved student nutrition-related behaviors

These findings are in comparison to schools receiving standard nutrition education messages with local vegetables and control schools receiving only local vegetables and no messages. These hypotheses are based on social marketing and fruit and vegetable branding research showing their effectiveness in increasing fruit and vegetable choice.24–26
CHAPTER 2: Literature Review

Youth Obesity and Diet

National data from the Centers for Disease Control and Prevention (CDC) has documented the increase in child and adolescent obesity rates over the past three decades. Over this period of time, childhood obesity has doubled and adolescent obesity has quadrupled elevating the number of obese children and adolescents to an estimated 12.7 million. Furthermore, the CDC cites children’s diet pattern as one of the leading behavioral risk factors linked to child obesity.

The normalization of a dietary pattern that fosters healthy weight maintenance and which promotes weight loss is one of the behavioral strategies in the primary prevention of chronic diseases. A healthy diet pattern is distinctly important because it modifies obesity risk and the risk of comorbidities such as type-2 diabetes, dyslipidemia, and hypertension. Categorizing all relevant constituents of a healthy diet pattern can be elusive. However there are evidence-based guidelines that outline the parameters of such patterns.

A healthy diet pattern is described by the United States Department of Agriculture (USDA) and detailed in the Healthy Eating Index (HEI) published by the Center for Nutrition Policy and Promotion (CNPP). The HEI is a list of 13 dietary intake categories known to mediate indices of nutrition related health status. These indices include factors such as B-Vitamin status and total antioxidant intake. The 13 intake categories are: total fruit, whole fruit, total vegetables, green and beans, whole grains, dairy, total protein foods, seafood and plant proteins, fatty acids, refined grains, sodium, added sugars, and saturated fats. This tool is based on the most current empirically
derived scientific evidence used to develop the recommendations for the USDA’s Dietary Guidelines for Americans.\(^\text{37}\)

The tool uses a numerical system to represent the quality of an individual’s dietary intake. This quantification is based on an individual’s reported intake for each intake category based on the extent to which the intake meets or surpasses the daily recommendation. The numerical score for each intake category is then summed, which represents the estimate of the overall diet quality in reference to the USDA’s daily recommendations.\(^\text{37}\) Importantly, fruit and vegetable consumption comprise nearly 25% of the HEI calculation of diet quality.\(^\text{35}\) The total of all categories is 100, which demonstrates a diet in full alignment with the Dietary Guidelines. A score greater than 80 indicates good; 51-80 needs improvement and less than 51 is a poor diet.

The average HEI score for an American adult in 2014 was 58 meaning that the diet needs improvement and is not align with the Dietary Guidelines.\(^\text{38}\) A concerning finding shows that children (6-11 years) and adolescents (12-17 years) had the lowest average scores across all age groups. Both age groups had an average score of 53.\(^\text{38}\) The data from this nationally representative sample provide evidence that a healthy dietary pattern is not being normalized in children and adolescents throughout this country, which may be contributing to increased risk and prevalence of chronic disease in youth populations.

**Consequences of Youth Obesity**

Traditionally risk and treatment of chronic disease has focused on adult and geriatric populations because these chronic diseases and their comorbidities occurred predominantly in older populations, but this has changed in recent decades. Prevalence of
obesity and type 2-diabetes are examples of chronic diseases that were uncommon in youth populations four decades ago, but are now increasingly more prevalent.\textsuperscript{39,40}

The development of obesity early in life has both short and long-term consequences for children and adolescents. Children with obesity have a greater likelihood of being obese adults, they have an increased risk of developing chronic diseases later in life, and they are at greater risk of premature mortality and disability.\textsuperscript{41,42} The chronic diseases associated with obesity include: type 2 diabetes, non-alcoholic fatty liver disease, cardiovascular disease (CVD), and cancer.\textsuperscript{41} CVD and cancers account for 46\% of all deaths in the United States and these diseases cost billions of dollars annually to treat.\textsuperscript{43} Collectively, these findings show: rates of childhood overweight and obesity have consistently been rising by 1-2\% per year for the past three decades, childhood obesity leads to progression of several chronic diseases, and obesity results in greater risk of early mortality and disability.\textsuperscript{44} This information points out the need for national attention and devoted resources to address the increase of obesity in youth populations through modifying child obesity behavioral risk factors.

The CDC, the National Institutes of Health (NIH), the Health and Medicine Division (HMD) of the National Academies of Sciences, Engineering, and Medicine and the American Academy of Pediatrics (AAP) each consider the current youth obesity trend a significant national health epidemic.\textsuperscript{1,45–47} Decreasing childhood obesity is the task of primary prevention strategies; its effectiveness in doing so has clear implications for the future health of the country. Therefore a focus on establishing primary prevention strategies, such as establishing a dietary pattern, which promotes healthy weight early in life has become a national focus.\textsuperscript{1,45–47}
Dietary Patterns and Health Outcomes

Only 25% of children between the ages of 9-13 years are meeting the recommendation of daily fruit intake. In addition only 1-15% of 4-13 year olds are meeting the daily recommendations for vegetable intake. More concerning is that most of these children are exceeding the daily recommendation for empty calorie intake. Collectively, these data support the claim that school-aged youth in this country exhibit a dietary pattern of overconsumption of calorie dense, nutrient poor, empty calories and are underconsuming healthy foods. This is a dietary pattern that has been consistently linked to increased risk of childhood and adolescent overweight and obesity.

Further National Health and Nutrition Examination Survey (NHANES) data illustrate the link between child and adolescent (6-17 years) diet and weight status. The research indicates that diet quality, measured by the 2010 HEI (2010-HEI), and physical activity status is predictive of childhood and adolescent overweight and obesity status. Those youth with “unhealthy” diets (HEI<60) characterized by high intake of refined grains, sodium, added sugars, and saturated fats and who are physically inactive have a 19% increased probability of being overweight and a 16% increased probability of being obese. This increased probability was compared to youth who were physically active and had healthy diet patterns high in fruit, vegetables, beans, whole grains, dairy, lean protein, seafood and plant proteins.

Importantly, research has shown diet quality by itself has a similar relationship to adiposity and weight status in youth populations. A low HEI score was significantly associated with higher percent body/abdominal fat in late childhood and through adolescence. Additionally, large cohort (n=12,181) longitudinal data on fruit and
vegetable consumption in school aged children (5-12 years), adolescents (13-18 years) and adults (19+ years) from the Continuing Survey of Food Intakes by Individuals (CSFII) provides more evidence for the link between diet pattern and weight status.\(^{50}\) The results indicated that as fruit consumption decreased, BMI increased in both children and adults. No relationship between weight status and vegetable consumption was seen, with researchers citing high-fat preparation methods aimed to increase palatability likely confounding the relationship.\(^{50}\) With the established link between healthy diet pattern and decreased risk of youth overweight and obesity, it is critical to understand how healthy diet behaviors, which underlie a healthy diet patterns, are formed.

**Dietary Patterns and Behavioral Theory**

Human food consumption is not simply based on biological hunger and satiety cues, but is a multi-faceted process. The initial goal of a diet behavioral theory or model is to identify the dietary behaviors important in determining one’s diet pattern and link the behavior to its psychological and social antecedents. Dietary intake is the sum of one’s diet behaviors. A dietary intake pattern consists of the repetition of food choice and consumption behavior. These behaviors are useful measures in the description and quantification of diet patterns, but accounting for what moderates these behaviors can be more useful. Food and diet behaviors have many psychological factors and constructs driving their execution.\(^{51}\) Delineating and subsequently addressing these moderators of diet behavior provide the basis to modify behavior. Ultimately this process can change food choice and food consumption, improve normal diet intake pattern, and potentially affect health outcomes.
To understand how to modify diet patterns in children and adolescents, it is important to consider determinants of dietary behavior. Fortunately, behavioral psychology has developed, tested, and established behavioral theories and models that have been aptly applied to describe the determinants and influences of healthy diet patterns in youth populations.\(^5^1\) These include the social cognitive theory (SCT), and the social ecological model (SEM) of health behavior (Figure 2.1). Other theories exist that describe development of health behaviors but are not as well suited for use in school-aged children because of the cognitive and developmental characteristics of this age group.

An example of a health behavior theory that is not well suited for school-aged children is the health belief model (HBM). This model of behavior acquisition relies on one’s ability to understand abstractions related to health such as perceived disease susceptibility in order to adopt the behavior.\(^5^2\) Considering Jean Piaget’s stages of cognitive development theory, the majority of children between 5-11 years old have not reached the formal operation stage of cognitive development. This age group has negligible ability to make decisions based on abstract concepts or on the basis of hypothetical constructs.\(^5^3\) Therefore it is not a particularly useful theoretical basis for a behavioral intervention in school-aged children.

Another example of a behavioral theory that is not always well suited for school-aged health behavior intervention is the theory of planned behavior (TPB). This theory relies primarily on the individual’s ability to use their intentions to control their behavioral.\(^5^4-5^6\) The combination of intention and subsequent behavioral control is not solidified in most school-aged children. Clinical research in school-aged children shows they are only beginning to demonstrate impulse control over food choice.\(^5^7,5^8\) Therefore
the TPB is not always suitable for use in this population. The use of the TPB is more typical in health behavior interventions in adolescent and young adult populations.\textsuperscript{51}

More appropriate theories that provide appropriate basis for child-health behavior interventions are the SCT and the SEM. Applying the SCT and the SEM to understand how individual behavior develops can be especially useful in understanding diet behavior acquisition in child-aged populations. One of the primary reasons the SCT is useful to help understand this age group’s nutrition behavior development is because it was established based on experiments in children to determine how a new behavior is acquired.\textsuperscript{59} However, it does not describe how these behaviors are molded and changed by all facets of the environment. The SEM is a helpful pair to the SCT. The SEM comprehensively defines the people and the environments imparting influence on diet behaviors. It outlines the different levels of influences from the intrapersonal to the organizational to public policy.\textsuperscript{60} Generally speaking, no single behavior theory or model is perfectly suited for accounting for all aspects of child diet behavior. Therefore, combining the SCT and SEM can be particularly useful at elucidating, explaining, and modifying the various influences of these behaviors in young populations.

Figure 2. 1. Social Ecological Model: Influences on School Children’s Nutrition Behaviors
Individual Level Determinants of Dietary Patterns

To identify the determinants of dietary behavior and food choice, it is useful to begin at the center of the SEM with the individual as the key agent within the layers of the ecological system of behavioral influences. Individuals are comprised of their biology or genetic make-up and their psychosocial constitution. Biologically based factors such as sex (male, female) or food allergies (celiac disease) can influence diet behavior. Similarly, diet behaviors are modified by psychological-derived factors. The commonly measured psychological factors of food choice in school-aged students include: food and nutrition knowledge, belief or attitudes toward the food, behavioral belief in one’s ability to choose food (behavioral self-efficacy), willingness to try a food, and food preference.

Previous research of school-aged students’ fruit and vegetable consumption has determined one of the most important psychological factors in food choice is taste preference. When children choose foods, hedonic factors (i.e. pleasurable taste) are more apparent considerations of taste preference and choice compared to cognitive factors (e.g. nutrition content). From this, it seems taste preference in children is driving food choice, which has a biological basis as a mediator of food choice. Research supports this basis and has demonstrated experimentally that beginning in infancy and throughout early childhood, food and drinks with high palatability (i.e. sweet tasting) generate positive affect and even reduce pain sensitivity.

The biological drive to satisfy the pleasure-inducing aspect of food has health implications in children. Food choice behaviors that are primarily driven to placate
children’s hedonic desires are, in part, a function of how impulse-driven the child is. The impact of impulse-driven diet behaviors on weight status has been shown in research. A prospective longitudinal cohort study using a sample of 1,061 children linked impulsive behavior to child obesity.\textsuperscript{57} This research demonstrated that children who display a predisposition for impulsive behaviors (measured using a self-control and a delayed gratification tasks) have increased BMI z-scores throughout childhood compared to children who display less impulsive behavior.\textsuperscript{57} Additional research using a sample (n=805) of children from the same cohort had similar results.\textsuperscript{58} Results indicated that independent of income-to-needs ratio, four-year-old children who scored lower on a food-based, delayed gratification task were more likely to be overweight at age 11 than children who scored higher on the task. Both studies calculated child weight status based on measured height and weight, providing methodological rigor and validity to the difference in weight status. These data suggest that impulsive disposition and hedonic satisfaction modify obesity risk in children. This, combined with children’s biological preference for sweet-tasting foods, makes influencing food choice away from hedonic control, a difficult task.

Impulsive food choices driven by the desire to satisfy hedonic need are present and powerful in children. However, there is consistent evidence suggesting that modifying food attitudes, perceptions, self-efficacy, exposure, and willingness to try healthy foods, like fruits and vegetables, can alter food preference.\textsuperscript{10,75–80} This evidence illustrates a path by which child food preference and eventually choice and consumption can be guided. Shaping child food preference, to prevent the dominance of hedonic drive, is proving to be difficult based on current statistics showing low child and adolescent HEI
scores and rising obesity rates. This is, in part, because food preference may be informed at a young age by many factors in the surrounding food environment, including individuals occupying this environment.

**Determinants of Dietary Patterns of Children in School Settings**

Both the SCT and SEM suggest diet behavior is a function of the interaction among multiple factors including: individual characteristics of the child; the child’s behavior; the outcome of the behavior; the physical environment; peers; parents; and other individuals. Collectively, these impart influence and shape the child’s diet behavior and normalized diet pattern. As previously mentioned, the mechanism of diet behavior change is primarily through modifying the child’s psychological determinants of food preference (i.e. knowledge, attitudes, self-efficacy, willingness to try), which in turn modifies choice and consumption.

The SCT views behavior acquisition and development as a process of learning through directly observing other’s behaviors as they occur in dynamic social interaction and environments. The process of learning a behavior is dependent on the bidirectional or reciprocal influence of three factors: personal determinants (i.e., knowledge, attitude, self-efficacy), environmental determinants (i.e., normative behavior, food appeal/availability), and behavioral determinants (i.e., social cues, reinforcement).

The SCT perspective of behavioral learning and development is valuable in understanding diet behavior development in many settings, but is particularly relevant to understanding school children’s food choice and consumption behavior in the cafeteria. This environment can play a significant role in dictating food choice. For example, when a student views the foods their peers and friends choose from the lunch line, this informs
their own choices based on which food choices behaviors are normal.\textsuperscript{82} This is confirmed by a review of experimental studies investigating the role of social influence on diet behavior. The entirety of this research points to social modeling of food behavior (i.e. food choice) as the primary determinant of food choice and is strongest when eating in groups.\textsuperscript{82}

The behavioral domain of the SCT contributes more insights into child diet behavior. Behavioral reinforcement explains children’s food consumption behaviors. Research shows when consumption of a food is encouraged by the cafeteria staff or the student’s peers, this informs an outcome expectancy for future reproduction of the consumption behavior.\textsuperscript{82,83} This can be a strong force in influencing the repetition of that food behavior. Finally, the SCT posits that personal determinants such as behavioral self-efficacy underpin food choice. Efficacy determines what behavior will be attempted, the degree of effort that goes into the attempt, and how persistent the attempt will be when confronted by setbacks.\textsuperscript{59} If students’ feel unsure that they are able to perform a food choice in the school cafeteria, it may determine their subsequent choice. In fact, self-efficacy can explain up to 34% of the variance in selecting healthy foods in 3rd-4th graders.\textsuperscript{66} Yet none of these forces acts in isolation. This is important to realize because it is normal, especially in the school food environment, that these behavioral determinants occur simultaneously.

The SEM, like the SCT, accounts for many of the variables that play a role in influencing the individual factors of diet behavior. From the perspective of the SEM virtually every external diet behavior mediator is considered. The combination of the more narrowly focused SCT and the more broadly focused SEM makes them a fitting
theoretical pair. The SEM outlines that the people and environment an individual encounters are two significant behavioral modifiers. With children and adolescents, the two most common environments moderating food choice and consumption behavior are the home food environment (include home-prepared and non-home-prepared foods served in the home) and the school cafeteria.\textsuperscript{84,85}

In addition, the SEM accounts for the interpersonal interactions occurring in these feeding environments. Family, friends, peers, as well as cafeteria staff and teachers are most commonly present in diet behavior environments. Their diet attitudes, food preferences, biases and behaviors create the social food environment that permeates the physical feeding environment. It is useful to describe the physical food environments first and then build upon this understanding to describe the social interactions taking place within them. The elements of the physical food environment that influence diet pattern include: the type and quantity of foods available, how accessible each food is, and the appeal of the foods.

**Organizational Determinants of Diet Pattern**

**The School Food Environment**

The NSLP contributes to the school food environment serving millions of students daily, creating an important opportunity for improving diet behaviors and health outcomes in children. The students that participate in the NSLP regularly consume between one-third to one-half of their daily calories from school meals and snacks.\textsuperscript{5–7} Thus, examining the school cafeteria environment is important and can demonstrate how changes in the food served can improve dietary behavior. Research shows consistent exposure to healthy food is an effective environmental factor that modifies taste.
preference for healthy foods.\textsuperscript{6,86} Further, repeated taste exposure to fruits and vegetable tastings in the school cafeteria has been shown to increase vegetable taste preference in students who initially dislike their taste.\textsuperscript{87}

Additional school food environment research has shown that when a salad bar is used in the cafeteria and when both the quantity and variety of fruits and vegetables served is increased, more fruits and vegetables are chosen and consumed by the students.\textsuperscript{88–90} Fruit and vegetable marketing and branding can be used to increase the appeal of fruits and vegetables, which has been shown to increase student choice compared to when marketing was not used.\textsuperscript{25,91,92} Additionally, the physical quality and visual aesthetic of fruits and vegetables impact students’ choice and consumption. Both quality and preparation method have been shown to influence fruit and vegetable choice in the cafeteria. School-aged children have reported preferring fresh vegetables compared to canned or cooked vegetables.\textsuperscript{93–95} The condition of the fresh fruits and vegetables offered partly accounts for consumption, where students choose un-bruised, colorful, pre-cut, aesthetically appealing fruits and vegetables more frequently.\textsuperscript{93,96,97}

After the US legislative branch passed the 2010 Healthy Hunger Free Kids Act (HHFK), the USDA was mandated to update the regulations of the NSLP, School Breakfast Program (SBP) and competitive foods.\textsuperscript{98} Over the subsequent years, all schools participating in the NSLP were required to implement a number of healthy changes in the school environment.\textsuperscript{98} Researchers have found improved student diet behaviors in schools following the new meal and snack guidelines, including increases in students’ fruit and vegetable intake compared to pre-legislation levels.\textsuperscript{99–102} Collectively, the school food environment research shows schools can foster a physical food environment where
healthy food choices can become the norm. In summary, the above research shows methods that promote the normalization of healthy food choices include: eliminating empty calorie foods and beverages; repeatedly exposing students to the taste of fruits and vegetables; presenting aesthetically appealing fruits and vegetables in larger quantities and varieties; and marketing healthy foods to increase their appeal.

**The Home Food Environment**

When a food environment lacks the aforementioned health-promoting diet elements, hedonic-based food choices are likely to dominate diet behavior and result in unhealthy dietary patterns. Evidence shows that when the home food environment provides ready access to empty-calorie foods, it is associated with unhealthy dietary patterns in children and early adolescents even when nutritious foods are also readily accessible and available.³⁹

There is convincing evidence that the home food environment can and often does provide foods and normalize food behaviors that are in contradiction to the foods and behaviors in schools that follow the NSLP’s guidelines and practices. Research on the home food environment, of Hispanic, African-American, and Caucasian children and adolescents shows that the food available is often characteristically western diet-style food with predominantly high fat, high added sugar, calorie dense, and nutrient poor foods.¹⁰³–¹⁰⁵ This is especially true in households where eating-out at fast-food restaurants is habitual.¹⁰⁶–¹⁰⁸

Comparing home-based meal diet quality with school-based meal diet quality highlights the differences between the two environments. Home-provided “packed” lunches can be used to approximate how home meals compare to those provided by
NSLP compliant meals. The comparison points out that the NSLP school provided meals fall in line with healthy diet patterns. Additionally, a study using NHANES data to compare nutritional content of lunches from NSLP prepared lunches and lunches from other sources show students who bring their lunch from home or other food outlets consume more energy, more fat, more added sugar and fewer fruits and vegetables.

Public Policy Determinants of Diet Pattern

Food Marketing

Another mediator of dietary patterns embedded within children’s food behavior environment is the commercial marketing of foods. The commercial food market targets youth populations and promotes regular consumption of energy dense, nutrient-void empty calorie foods. Recent research shows that children as young as 2 years old view between 2.5-3.5 hours of television programming. Most of the programs these children are watching are shown on child/adolescent-targeted networks. These networks are dominated by food-based advertisements. Two-thirds of commercials viewed by children are advertising food- mot commonly, fast-food restaurants, breakfast cereals, candy and snack food. These are the foods with high hedonic effect. This elicits a strong, biologically based, attraction for these foods in the children viewing these advertisements.

Food companies devote significant resources on their products. A 2008 Federal Trade Commission report show that over $9.6 billion is spent annually on food marketing, with 17% of marketing budgets targeting youth. Food marketers focus their campaigns, tactically branding and packaging their products, to target their key consumer demographic. Content analysis of television commercials shown during children’s
programming demonstrates that food marketing associates the food with: fun and good
times, appealing taste, and feeling happy.\textsuperscript{113} Other researchers have shown child-centered
food advertisements are predominantly used for foods that were categorized as unhealthy
food, fast food and snack foods.\textsuperscript{115} The tactic used in child-targeted food advertisements
is to combine one message focused on health benefits for the caregiver, with another
fantasy-based message, often using cartoon characters. This dual messaging tactic is
likely used to make the child’s caretaker feel as though the food is a part of a diet that
fosters growth and health, while simultaneously capturing the child’s sense of
imagination to give them the notion that the food being advertised will satisfy this sense.

The well-formulated, thoroughly tested marketing of the characteristically high
calorie, low nutrient foods is made even more appealing by the qualities of the food itself.
These foods are overwhelmingly palatable with highly pleasing taste and texture.\textsuperscript{117} This
further drives children’s desire to consume these foods because they satisfy their well-
tuned hedonic pleasure system. The competitive prices and ubiquitous presence in the
food market makes these foods the easy, available, and apparent choices when time,
energy, effort, and resources are lacking. The combination of advertisements, taste, cost
and availability creates a food-choice marketplace where the consumer is unwittingly
influenced and healthy food choices are marginalized and unhealthy choices are
normalized. When the consumer is a child or adolescent, the desire to choose empty
calorie foods is often heightened because food choice is increasingly driven by hedonic
satisfaction with little cognitive interruption.
Social Marketing

Marketing that employs a set of strategies that profiles, segments, and targets populations to design, test, and refine messages and services to advance public health initiatives is termed social marketing. Effective social marketing catalyzes community action through modifying individuals’ behavior and can shape policy. The implementation of social marketing coincided with a transition from the predominance of epidemics of acute infectious disease to chronic disease. Historically, beginning the 1950’s, marketing began to expand into public health and has been applied to public health issues beginning in the 1970’s including: maternal health and child nutrition, family planning, chronic disease risk, antismoking, and substance abuse.

Commonly, social marketing is synonymous with mass media campaigns, which intend to shape attitudes and increase awareness to change collective behaviors, however mass media outlets (television, internet, social media) are not a prerequisite for such campaigns. Three principals that are required of social marketing efforts, are: a clearly defined objective, the target audience is segmented and heard from in order for formative message/service development, and the process is iterative with continued refinement to meet the change in the health promotion marketplace. In order to accomplish these efforts there are three phases. An initial research and planning phase, which analyzes the consumer needs, the marketplace, and the communication medium. Followed by a strategy design phase involving development and communication of marketing strategy by selecting the place/system of distribution with a specific promotion method. Finally an implementation and evaluation phase is undertaken, which includes: establishing collaboration and training key players to deliver message/service/program, followed by
both process and outcome evaluations. The level of success, reach, and sustainability of a social marketing initiative is based in large part on how well these steps are executed and how well aligned the campaign is with other established health agencies, organizations, and programs.\textsuperscript{118} A well developed social marketing campaign targeting healthy food choice and diet patterns embedded within the NSLP and promoted by school wellness policies are a promising component of primary obesity prevention in children and adolescents.

**Public Policy Level Determinants of Diet Pattern**

**School Wellness Policy: The school food environment**

Another influential level of the SEM on children’s food choice behavior is public policy focused on the school nutrition environment. School wellness policies hold great promise to improve diet behavior and food environments in children and adolescents.\textsuperscript{122} They provide the best opportunity to implement empirically tested, well-established programs shown to effectively change dietary intake pattern and weight status.

One of the best examples of policy change and legislation to improve school-aged students’ diet pattern on the national level came with the implementation of the HHFK.\textsuperscript{123} Its full impact on health outcomes is yet to be seen, but its effect on the food permitted into schools participating in the NSLP and thus the food accessible in these schools has undoubtedly improved. The NSLP currently reaches over 30 million student participants daily.\textsuperscript{4} It provides nutritionally balanced, low-cost or no-cost lunches to children each school day. In addition to lunches, NSLP includes the School Breakfast Program (SBP) serving nearly 13.5 million students breakfast daily. Both programs serve meals that must follow a meal pattern that is in greater alignment with the USDA’s established HEI.\textsuperscript{98}
Meal patterns must include options for whole grains, fruits and vegetables, and low-fat protein sources. Meals must also have reduced sodium content and follow age-appropriate caloric limits. This legislation is seen as a critical step to embed a primary obesity prevention program with national reach and the ability to slow the rise in childhood obesity. This is a critical step in the corrective process, but more policy implementation is likely needed.

**CDC’s Framework for Addressing the School Nutrition Environment**

The CDC has identified a comprehensive framework for establishing a healthy school nutrition environment (Figure 2.2). At the center of this framework is student access to healthy foods and beverages. This report outlines various measures to foster healthy diet behavior in students. This serves as a model and resource for schools to develop and implement their own nutrition-focused wellness policies. This model identifies seven ways the school nutrition environment influence students’ access to healthy foods and beverages. These serve as the areas of focus for establishing part of the school wellness policy centered on promoting healthy diet behaviors.

Figure 2.2. CDC’s Comprehensive Framework for School Nutrition Environment
Not surprisingly, most of the focus areas describe the entry points of food that are controlled or overseen by the school. These entry points function to provide all of the food options available to students for which the school exercises control over during the school day. Foods not included under the control of the school include foods brought into the school by students (i.e. packed lunch). Of these five entry points, four focus on the type and nutritional quality of “competitive foods” available in school, a term used because these foods can compete for student participation in the school meals programs. The fifth entry point for food is the NSLP school meal programs detailed previously.

National policy enacted in 2014 regulates the snacks (both food and drinks) available at school. School snacks must meet or exceed the “Smart Snack” nutritional standards. Prior to this legislation, competitive food venues commonly provided
empty calorie foods to students, which contributed to unhealthy diet patterns associated with increased weight status. Initial research indicates the regulation of competitive foods to “Smart Snacks” eligible foods has increased in the nutritional quality of these food offerings, although compliance is not 100%. A literature review of studies of schools with active policies for competitive foods found that having such a policy is correlated with greater student consumption of healthy foods and decreased probability of students being overweight or obese. This is evidence for the effectiveness of strongly worded and actionable food behavior policy that encourages normalization of healthy diet patterns in students. A recent joint position paper of the Academy of Nutrition and Dietetics (AND) and the Society for Nutrition Education and Behavior (SNEB), and School Nutrition Association emphasizes the need for more schools to include stronger language to clearly outline regulations for competitive foods.

The CDC’s report also emphasized two components of the school nutrition environment that can affect all seven areas of the school food environment: food and beverage marketing and healthy eating learning opportunities. The list of strategies to promote healthy food and beverage choices included the use of posters in highly visible areas of the cafeteria; the use of verbal prompts; and the placement of fruits and vegetables in highly visible and accessible locations on the lunch line. Empirically supported techniques include: eliciting the student’s input in development of the message, using bright colors, appealing to children’s sense of happiness, imagination, and social desire for acceptance, using branded fruit and vegetable characters that embody strength-giving qualities of the food, emphasizing the benefits of healthy eating and pro-social
behaviors. These efforts make up many of the strategies used in social marketing campaigns aimed at improving primary prevention health behaviors. Social marketing uses these strategies and the concepts of marketing to target specific audiences with input from the target population. In addition to use in the school cafeteria, social marketing can be especially effective when social and cultural norms are barriers to health behavior. In these cases social marketing can be used in mass media campaigns. These efforts have proven effective in targeting parents to begin to change social norms about food preference and choice. Examples of these campaigns include the CDC’s “VERB: It’s what you do” the 5-4-3-2-1-Go! and the “Pick a Better Snack” initiative. Although the use of social marketing for healthy foods is one of the newer areas of school food environment research, these findings provide initial direction for future school cafeteria marketing interventions.

School Nutrition Environment and Farm to School Programs

The CDC’s report and the AND and SNEB joint position paper also highlight the importance of creating healthy eating learning opportunities by using hands-on, food-based classroom and garden-based techniques. These techniques make up two of the three components of farm to school (FtS) related activities. FtS programming has evolved out of the HHFK Act and its programming is currently one of the most pervasive school-based nutrition education programs in the country. It reaches 23.6 million students in over 42,000 schools. The USDA defines FtS as efforts that bring locally or regionally produced foods into school cafeterias, hands on learning activities such as school gardening, farm visits, culinary classes and the integration of food related education into the regular, standards-based classroom curriculum. These programs increase students’
access to local, fresh, whole, and minimally processed fruits and vegetables to students. This is an important component because students’ reported fruit and vegetable preferences are aligned with these qualities. They also provide students with the FtS research has established strong links between the program’s ability to modify psychological determinants of diet behavior as well as food choice and consumption behaviors. Specifically, there is evidence that FtS programs influence students’ fruit and vegetable knowledge, attitudes, willingness to taste, preference, self-efficacy, fruit and vegetable consumption, and physical activity at school.9–11,13–15,75,139–151 Moreover, the FtS literature has shown that hands-on gardening and cooking is a more effective approach than traditional nutrition education curriculum.152–154 This is likely due in part to the increased exposure to fruits and vegetables, which has been shown to increase preferences.152–154

FtS programming exposes students to fruits and vegetables while delivering nutrition education. This method seems to be highly effective in changing knowledge, attitudes, self-efficacy, and preference towards healthy food. Hands-on, food-based lessons help to create an enriched experiential learning environment. This environment affords students the opportunity to be exposed to new foods they dislike or are uninterested in eating without explicit pressure to eat the food. Research on infant and toddler food acceptance shows initial exposures focused on familiarization can shift hedonic judgment and reduce food neophobic reactions.155–157 Thus, familiarizing students to food in a hands-on education setting may have the same beneficial effect.

Furthermore, the FtS learning environment is also beneficial to learning healthy food behaviors because its lessons are apt at engaging students with different learning
styles. Addressing variability in learning strategy is supported by the experiential learning theory (ELT) developed by David Kolb, a behavioral learning psychologist, who based his theory on the previous work of psychologists John Dewy, Kurt Lewin, and Jean Piaget. Learning styles can vary drastically. Some students learn by conceptualization, brainstorming, and through thought experimentation, while others learn through experimentation and concrete experience. Still other students learn through visual cues and images, and others by tactile interaction or repetition of auditory sound. Most students learn through a combination of styles, and a lively, experiential, and interdisciplinary learning environment can facilitate learning across learning styles. Considering the CDC’s report on school nutrition environment policy guide, FtS intervention research provides solid evidence for effective strategies of nutrition education in schools.

The central theme of FtS nutrition education is getting students involved in active, enriched, and engaging food-based lessons. FtS lessons can engage students who learn through conceptualization. For example, this is accomplished by a lesson on plant anatomy that asks how each part of the plant fits into different food groups, and how each part can be used in a healthy meal or snack. This same lesson can be reinforced by an experiential component such as gardening or cooking class. In the garden setting, the individual parts of each plant can be identified and tracked as they grow and eventually be used in preparation of a classroom snack. Furthermore, a food preparation demonstration can introduce the various parts of a plant and each part could be used in a “plant parts” salad, assembled by students. A multiple component FtS lesson including experiential and conceptual learning can promote nutrition behaviors through knowledge
and skill building, behavioral practice, and familiarization. Each lesson is an opportunity to repeatedly reinforce learning and engage in food behavior familiarization. This process reinforces behavioral self-efficacy and fosters normalization of healthy diet behaviors.159

**Marketing Local School Foods**

FtS programs use effective classroom and garden-based lessons to enhance the school nutrition environment through use of enriched, food-based nutrition education. Evidence shows these nutrition education methods play a significant part in cultivating behavior change in the school76,142,163; however, very little is known about the best practices for the third component of FtS programming -- local food procurement and marketing. Local procurement and marketing are the most common FtS activities reported by schools, highlighting the need for research in this area.164 Additionally, this research can be used to inform school nutrition policies on effective strategies to market healthy foods, local or otherwise.

To date, there is only one publication testing the impact of a local message intervention on fruit and vegetable plate waste.19 The study was conducted in low-income elementary schools and included locally source fruits and vegetables that were served in the lunch room with a message related to the local farm where the food came from. However this intervention did not report using social marketing techniques or food marketing research to inform their local messages. Research that applies these strategies in promotion of local fruits and vegetable can add to the knowledge of how schools can most effectively improve the appeal of healthy foods, and consequently the physical school food environment.
Local foods offer the opportunity to use unique local marketing themes to increase the appeal of healthy food options that come from the surrounding community, state, and region. These marketing efforts may influence personal determinants (food choice self-efficacy), environmental determinants (food appeal/availability), and behavioral determinants (reinforcement), which each contribute to learned behavior in the SCT. These efforts also address some of the SEM’s organizational level nutrition behavioral mediators, such as increasing appeal, visibility, and access to healthy food options in the lunchroom.

Of the potential areas of future FtS research, there is a need to establish the effect of local fruit and vegetable marketing strategies on students’ fruit and vegetable choice during school lunch.\textsuperscript{18,19} This research can establish local fruit and vegetable marketing strategies and determine its effectiveness in improving students’ food choice at school. Ultimately, the results can be used to inform school nutrition policies on effective and actionable marketing strategies for local fruits and vegetables.
CHAPTER 3: Development and testing of local vegetable messages for an elementary school social marketing campaign

INTRODUCTION

A 2016 report from the Centers for Disease Control and Prevention (CDC) indicates that the obesity rate of 6-11 year olds is 4.5% higher than 2-5 year olds.\(^1\) This is an important finding because this is a point when children begin to consume more of their meals away from home. Dietary intake patterns play an important role in childhood obesity risk.\(^{30,165}\) Unfortunately less than 15% of children ages 4-13 years are meeting the daily recommendation for vegetable intake and only 25% are meeting the recommendation for fruit intake.\(^1\) This pervasive low intake of fruits and vegetables is particularly concerning because the 6-11 year age group has a dietary pattern high in refined grains, added sugar and saturated fats, and low in fruits and vegetables, a pattern shown to increase risk of childhood obesity.\(^{37}\)

The increase in childhood obesity is occurring at a notable time of transition in childhood specifically between the ages of 4-6 is when most children begin school-based education. Therefore, creating a school food environment that reinforces healthy food choice and normalizes a healthy eating pattern while children are at school is especially important. One means to establishing healthy food choice and normalizing healthy dietary intake in school-aged children is to increase access to and appeal of fruits and vegetables at school.

Improving the school nutrition environment through marketing healthy food is a strategy emphasized in the most recent CDC report on school wellness policy comprehensive framework development.\(^{124}\) Food marketing research shows children are
especially responsive to food messages that: appeal to their sense of happiness, imagination, and desire for social acceptance, use bright colors and characters that embody the strength the food gives them, and emphasize the social desirability of the food.\textsuperscript{133,166,167} Research shows using messaging in the lunchroom increases student choice of fruits and vegetables especially when students are involved in the message development.\textsuperscript{91} Additionally, when fruits and vegetables were branded as action/hero characters students’ vegetable choice was improved.\textsuperscript{24,166} Considering this research and the ability for farm-to-school (FtS) programs to increase access of local, fresh, minimally processed vegetables, there is an opportunity to develop and evaluate a school-based social marketing campaign focused on local vegetable consumption.

Local produce has an intrinsic set of characteristics that may appeal to children and adolescents, especially considering that children’s food choice can be influenced through social acceptance and desirability.\textsuperscript{167} A formative study investigating student rationale and motivation for choosing local foods found that urban, low-income high-school students perceived local produce as fresh and better tasting, and beneficial to the environment.\textsuperscript{20} In addition, commonly purported reasons people choose local produce include its higher quality, greater environmental sustainability, and its ability to improve the local community.\textsuperscript{168,169} To date, only one school-based intervention has evaluated how having both local fruit and vegetables and local messaging in the lunchroom can influence student food choice.\textsuperscript{19} This study aims to expand this area of research and build upon its findings by involving student in the message development. Previous research has indicated when students engage in vegetable message development there is a two-fold
increase in student vegetable consumption compared to students consumption in non-student informed messages.\textsuperscript{91}

The primary objectives of this study were to: 1) determine which local vegetable messages 3rd-5th grade students prefer, 2) determine if preferred messages about locally grown vegetables differ between 3\textsuperscript{rd}-5\textsuperscript{th} grade students from two Connecticut school districts, and 3) determine if preferred messages differ by age, grade, and gender. This knowledge can inform future research and provide schools with effective local messaging themes to use when serving local produce.

**METHODS**

A cross-sectional survey was used to determine the local vegetable message preferences of 3rd-5th grade students (n=202) in two different school districts in Connecticut. A minimal sample size of 90 students per district was needed to achieve 80\% power at alpha =0.05 to detect an effect size of d=0.25 in message preference. The study was approved by the University of Connecticut Institutional Review Board for Human Subjects prior to recruitment (Appendix A). Prior to participant recruitment researchers acquired letters of support from each participating school from the school’s administrators. Additionally, prior to parental notification, logistical coordination of survey data collection was done to ensure each school had the space, resources, personnel, time, and adequate number of 3\textsuperscript{rd}-5\textsuperscript{th} grade students to meet the requirements of the data collection procedure. This included several meetings to establish collaboration with after-school program coordinators, school nurses, teachers, and school staff. Based on this process a number of schools and programs were not able participate in survey data
collection. An information packet was sent home with all potential participants for their parents/legal guardians. The packet contained a cover letter (Appendix B) and parental notification form (Appendix C) with a student ‘opt out’. The ‘opt out’ forms were collected over a two-week period and students were not evaluated if a form was received from their parent or guardian. Student assent (Appendix D) was verbally obtained prior to each message testing session.

The sample of students was purposefully chosen from two school districts in Connecticut that differed by urbanicity, size and student demographics. Approximately half the students were recruited from an urban, low-income, ethnically diverse school district and the other half of students were recruited from a suburban/rural, non low-income school district. The first school district was defined as urban because it is located in a city of 50,000 people or more and the second district was defined as suburban/rural because it was located in the suburbs or rural communities surrounding a city of 50,000 or more people.¹⁶⁶

To develop messages focused on the benefits of local foods, the scientific literature, and university and government agency reports were reviewed. Six main benefits of consuming local foods were identified: improved taste, nutrition/health benefits, greater food safety, strengthened local farming/agriculture, environmental sustainability, and improved sense of community.¹⁶⁰,¹⁶⁴,¹⁶⁵,¹⁶⁷–¹⁷¹ These six benefits were used as the basis for the development of appealing and age-appropriate messages appropriate for a school lunchroom social marketing campaign. The goal of the message development was to use child-focused food marketing techniques to increase the likelihood of appeal and build the connection between the local food and the student.
Previous research suggests that the most effective food marketing techniques for youth highlight that having the food increases happiness, promotes imagination, and fosters social acceptance. The local message themes in this study were based on benefits to local farming and agriculture/farmer, food safety, health/strength, community/school, the environment/earth, and freshness of taste. Table 3.1 includes the messages that were tested in this sample of 3rd-5th students.

Once the local messages were created, an age-appropriate, interactive procedure was developed to test the messages. A team of university researchers, evaluation experts, educators, school district administrators, and registered dietitians reviewed the survey and the tool was refined. The survey (Appendix E) was pilot tested with 3rd-5th grade students (n=4) to refine and develop the wording, formatting, and ensure survey item comprehension.

Six message “stations” were set up that included a colorful tri-fold poster board displaying one local message and an image of a local vegetable (Figure 3.1). Each student visited all of the stations once in random order. The student, accompanied by a trained research assistant, read the local vegetable message and rated how much they liked the image of the local vegetable on the survey. Survey responses were based on a 4-point Likert scale with answer choices ranging from “not at all” to “a lot.” After visiting all six stations once, the students revisited each station and ranked their 1st, 2nd, and 3rd favorite message. This randomized, two stage technique combined elements of the nominal group technique and the Delphi method to ensure each student read all six local messages prior to ranking, decreasing the likelihood of order-bias in message ranking. The survey included two additional questions - one asking if students had ever visited a farm, garden,
or orchard, and a second open-ended question asking, “What does local food mean to you?” The final section of the survey asked the student’s age, grade and gender.

There were several reasons the researchers decided to use a survey-based methodology to collect students’ message preferences instead of more qualititative, interview-based approaches. The survey method was highly structured and allowed for up to 6 students to participate in the data collection independently and simultaneously without peer-influence, potentially skewing the data. This is clear benefit compared to testing messages in a focus group setting, where it is common for a single students’ voice or opinion to overshadow or inform other students’ perspectives. Additionally, this survey technique was the most feasible based on; the low training burden placed on research assistants, the ease of implementation, and the efficiency of data collection. This is especially true when this method is compared to one-on-one interviews which; require greater training to ensure reliability between researchers, take more time to administer, and increase the likelihood of missing or irrelevant data. One additional benefit to the survey methodology is the reduced time needed to analyze the data and implement the findings for the subsequent messaging campaign. The most apparent setback to this method was that it did not elicit students’ thoughts on what the benefits of local foods, which may have left out highly resonant benefits not found in the review of reports and research.

Cross tabulation with Pearson Chi-Square and Fisher’s Exact Test were each used, when appropriate, to analyze which local messages received the greatest percentage of first favorite and least favorite to determine if significant differences existed between message preference based on school district and student age, grade and gender.
Significance was set at \( p \leq 0.05 \). Additionally, a Pearson Chi-Square test was used to determine if student participation in FtS related activities (gardening and local farm/orchard visits) differed between school districts. A Pearson Chi-Square test was also used to determine if there was a difference between school districts in the percentage of students who correctly identified the concept of local food as food grown on a farm or garden within relatively close proximity (town, state, region) to where they live.

The responses to the open-ended question, “What does local food mean to you?” were analyzed qualitatively using a deductive analysis approach. This approach was used instead of an inductive approach because student responses were likely biased by exposure to the survey tool. Therefore, the resultant findings were likely influenced by the research objectives rather than simply emerging from frequent or dominant themes based on unprompted responses.\(^{178,179}\) The responses to this question were generally short (1-8 words). One researcher coded the qualitative responses using a thematic analysis approach with the survey informing the initial code generation.\(^{180}\) Once responses were appropriately coded, themes among codes were reviewed, then defined, and finally each theme was named. This analysis determined how students conceptualized local food and if conceptualization differed across the two districts.

Accuracy of students’ response to this question was determined if the response stated the food was grown or from a farm in a community, town, city, state, or region near them. Correct responses were counted and proportions compared between school districts.
RESULTS

The completed surveys from students (n=202) across the two school districts were analyzed to determine overall local message preferences and to determine any differences in preferences based on school district and student demographics using IBM SPSS version 25. Descriptive statistics of survey participants’ age, grade, and gender are shown in Table 3.2. Student ethnicity and household income status was based on school district reports. Overall, 49.9% of students from the urban school district were Hispanic/Latino, 31.3% African American, and 12.2% White/Caucasian. The urban district was predominantly low-income with 84.6% of students qualifying for free and reduced priced lunches. Based on this, the urban district qualified as a community-based eligible school district, where all students receive free and reduced school meals. Only 21% of students from the suburban/rural district were eligible for free and reduced meals. Further, 73% of the suburban/rural school district students were White/Caucasian, 12.9% Asian/Pacific Islander, 11% Hispanic/Latino, and 2.6% were African American.

Figure 3.2 depicts the students’ message ranking percentages for each of the six local messages across the entire sample (n=202). A Pearson Chi-Square test of independence was used with a between-message z-test and Bonferroni correction to determine difference in ranking percentages between messages for 1st favorite and least favorite message rankings. Results indicated that 29% of students selected the “School” message as their 1st ranked message with the greatest percentage followed by the “Strength” message (26%). Both the “School” (p=0.01) and “Strength” (p=0.03) messages had significantly greater percentages of 1st rankings compared to the other
messages. Additionally, 19% of students selected the “Earth” message as their 1st ranked message, which was a significantly greater percentage than both the “Farmer” and “Taste” messages (p=0.04). This indicates the “Earth” message was the next most preferred message following the “School” and “Strength” messages.

When comparing the six messages and student ranking of least favorite, 68% of students selected the “Farmer” message as least favorite, which was a significantly greater percentage compared to the “School”, “Strength”, “Safe”, and the “Earth” messages (p<0.001). Additionally, the percentage of students who ranked the “Taste” message as their least favorite message was significantly greater compared to the “School” and the “Strength” message percentages (p=0.02). Collectively, these results indicate the “Farmer” and “Taste” message were not preferred based on analysis of the entire sample.

Figure 3.3 depicts the local message rankings stratified by district. A Pearson Chi-Square test with a between-message z-test and Bonferroni correction was used to determine message ranking differences by district. The percentage of urban students who selected the “Strength” message as their 1st ranked message (44%) was significantly greater than the suburban/rural students who selected it as their 1st ranked (9%)(p=0.002). Conversely, the percentage of suburban/rural students who selected the “Strength” message as their least favorite message (65%) was significantly greater than the urban student percentage (21%) (p=0.03). This indicates students from the two districts have markedly different preferences for the “Strength” message.

Comparing students’ 1st ranked results for the “Earth” message, the percentage of suburban/rural students who selected the “Earth” message as their 1st ranked message
was significantly greater than the urban students (10%)(p=0.007). The percentage of urban students who selected the “Farmer” message as their least favorite message (77%) was significantly greater than the suburban/rural students (58%)(p=0.02). This demonstrates additional marked difference in message preference between the districts.

Further, students reported different rates of visits and exposure to gardens, farms, or orchards. The percentage of suburban/rural students reporting exposure to garden and farm-based FtS activities (96%) was significantly greater than urban counterparts (70%) (p=0.006). There was also a difference in the percentage of students correctly defining local foods; where 24% of suburban/rural students defined it accurately versus only 7% of urban students (p=0.02). The qualitative analysis of responses to the open-ended question indicated that both urban and suburban/rural students viewed local foods positively or inherently good (Table 3.3). Additionally, responses from both districts indicate the survey tool biased their concept of local foods, with the greatest number of responses from both districts mentioning at least one of the six local themes.

Figure 3.4 illustrates cross tabulation data performed to determine differences in local message ranking percentages based on gender. Local message ranking between male and female students differed for the “Strength” message only. The percentage of male students who selected the “Strength” message as their 1st ranked message (34%) was significantly greater than the female student percentage (20%)(p=0.02). In contrast, the percentage of female students who selected the “Strength” message as their least favorite (55%) was significantly greater than male students (29%) (p=0.009). This indicates the “Strength” message has high preference in male students and conversely low preference in female students.
Figure 3.5 includes comparisons of the local message ranking by younger students (7-9 years) versus older students (10-12 years). Ages were grouped as dichotomous (younger, older) to provide enough power for statistical analysis. A Cross tabulation using Pearson Chi-Square test was performed to determine differences in local message ranking percentages based on student age group (young, old). There was a significant difference between message ranking and age group for the “Farmer” messages. The percentage of young students who ranked the “Farmer” message as their 1st ranked message (10%) was significantly greater than the older student percentage (2%) (p=0.03).

Figure 3.6 includes the comparison of local message ranking by grade. The “Taste” message was the only message with significant difference in ranking percentage between grade levels. The percentage of 3rd grade students who selected the “Taste” message as their least favorite (67%) was significantly greater than the 4th grade students (48%) (p=0.03). This indicates that 4th and 5th grade students preferred the “Taste” message more than the 3rd grade students.

**DISCUSSION**

The aims of this research were to determine which local vegetable messages were most preferred by students, to compare if differences in message preferences existed based on school district and location, and finally if message preference differed by student demographics. The findings show that overall, 3rd-5th grade students from the two school districts collectively preferred the local vegetable messages focusing on benefits to the “School” and their “Strength” the most. While students least preferred message was focused on the benefits to the “Farmer”. Further, urban school students and male
students preferred the message focused on benefits to personal “Strength” while suburban/rural students preferred messages focused on benefits to “Earth”. Finally, younger students preferred the “Farmer” message, while the “Taste” message was not preferred, and female students did not prefer the “Strength” message.

Although a message centered around school or community improvement has not been tested as it relates to students’ nutrition behaviors, increasing sense of community and school has been associated with improvements in students’ attitude towards school, academic motivation, expectation and achievement.\textsuperscript{181–184} Our finding that the “Strength” message is a preferred message for marketing local produce is consistent with research that found that using a ‘super-human’ strength message increased student vegetable choice from a lunchroom salad bar.\textsuperscript{25} Together these findings provide initial evidence for the use of school pride and superhero-like strength messages as preferred themes for local fruit and vegetable marketing aimed at improving the school food environment.

When the sample was stratified by district, differences in message preference were detected. More students in the urban district indicated the “Farmer” message was their least preferred compared to suburban/rural students but both districts ranked it as the least preferred. Differences in agriculture literacy and geographic location may help explain the between-district difference in preference for the “Farmer” message. Research shows suburban and rural school-aged students have greater exposure to agriculture and greater agricultural knowledge and literacy compared to urban students.\textsuperscript{21} The sample of suburban/rural students was from a small town with low population density near a large land-grant university, which likely impacted their exposure to farms and agriculture education.
The urban students indicated a clear preference for the “Strength” message, while suburban/rural students found it least preferred. A possible explanation for the difference in local message preference between the districts involves a similar theme of “Strength” that is used in food advertisements and marketing. Advertisements for empty calorie foods commonly use cartoons and superheroes to brand the food and sell the viewer on fantasy and adventure. Research also indicates socio-demographic differences in commercial food marketing exposure. Results from television exposure studies consistently find urban, low-income Hispanic and African American youth are exposed to more food advertising compared to white, non-low income suburban/rural counterparts. Our results, combined with previous food marketing analysis, indicate superhero themed messages are highly appealing and their use may increase the appeal of fruit and vegetables in low-income, ethnic minority school districts.

When compared to students in the urban school district, suburban/rural students preferred the messages focused on benefits to the Earth. Prior research shows that direct first-hand or experiential exposure to the natural environment is an important part of developing young student’s concepts of and connection to the natural environment. Research has also shown that urban students have less access and spend less time in natural environments compared to suburban and rural students, which may contribute to the difference in resonance of the “Earth” message between the two districts. While it is important to increase the exposure of urban students to natural environments, the use of an environmental or “Earth” focused local food message may not be salient to them, and our results provide evidence that this message may be best utilized when marketing local food to rural and suburban students.
Stratifying the sample by gender, the male students showed significant preference for the “Strength” message, while this message was least preferred by female students. Although the “Strength” message used the non-gender-specific term ‘Superhero,’ there is a clear male preference for this message. This may be due to the historical influence of a male-centric concept of superpower/super strength that has been shown to be reinforced in recent commercial food advertisements with most action characters depicted as male.\textsuperscript{115} However, this male-centric concept may not persist as female-based superheroes continue to grow in popularity in mainstream movies and cartoons. The health message could have focused on a different theme. For instance, a message focused on promoting the ability to be more active, or have more energy, or the positive feeling or affect the food provided, may have produce a different result in terms of preference. Nonetheless, this finding is of particular importance because male school-aged children have the lowest national vegetable consumption and increasing the appeal of vegetables using a “Strength” message may be an effective technique to improve their vegetable consumption behavior.\textsuperscript{27}

The results stratified by grade level indicate the local message touting the benefit of fresh taste was least preferred by 3rd grade or younger students. It is possible that the concept of foods having a fresh taste may not be a relatable descriptor and therefore may not appeal to younger students. Typically in younger children food is conceptualized on a dichotomous basis (good/bad, like/dislike, healthy/unhealthy) and more qualitative and evaluative characteristics may not be as understandable or relatable.\textsuperscript{190} Additionally, there is formative evidence that high-school students prefer local foods because of the perception of improved freshness, which our data suggest may begin in late childhood
and early adolescents. Therefore, a local message focused on the fresh quality of the produced is likely best suited in older school-aged children and adolescents.

When students were asked “What does local food mean to you?” the most common response after thematic analysis was local foods are “healthy” and “fresh.” The second most common theme was that students from both districts believe local foods are inherently good foods. This suggests that students view local food positively, and there is potential to leverage this to increase the appeal of local produce through marketing in the lunchroom. Despite this finding, the results also showed the majority of these students did not actually understand what local food meant. Thus, message themes targeted to this population may resonate and be more effective at modifying nutrition behaviors when they are benefit-focused and not conceptually-focused, unless the concept has been taught prior to message use. Even still, this lack of understanding presents an opportunity for school nutrition educators to teach this concept in their lessons. This may serve to further solidify students’ attitudes and beliefs about these foods, which may influence local food choice. Furthermore, if students are increasing their understand of local foods, nutrition educators and school food service members can reinforce students’ positive attitudes towards local foods in the lunchroom with confidence that the students understand and appreciate what local means.

In addition to the novel topic, a strength of the study was the inclusion two distinctly different school districts. A limitation of the study was that it included students from one geographic area of the United States, which may influence how translatable the results are to other children.
CONCLUSION

This cross-sectional study is the first to survey school-aged students regarding local produce, specifically local vegetable, message preferences. The qualitative findings suggest that although many students view ‘local food” as a positive term, education on the meaning of ‘local’ is needed so that the concept is more clearly understood when used in local food marketing efforts at school. Additionally, school districts should consider the setting, location and demographics of its students when considering local message use. Suburban/rural schools may improve student local food appeal and selection using messages focused on benefits to the school and the environment/Earth. Urban schools may improve local preference and selection using messages focusing on benefits to enhance their “superhero” strength or the school. The “Strength” message was also appealing to a school campaign focused on boys. If older students are the target for increasing the appeal of local produce, local messages focusing on fresh taste may prove useful.

Overall, a school themed local message may be uniquely suited for increasing appeal of local produce regardless of school location or setting due to its broad appeal across elementary school students from both school districts. These data may help future FtS efforts related to marketing local fruits and vegetables to maximize their appeal especially in 3rd-5th grade students. An important area of expansion for this research is to increase the sample size and diversity of students who participate in the local vegetable messaging survey for further generalization of results. Future studies in this area of research should also investigate the utility of the use of each of these messages in schools.
serving local produce to determine if differences between messages exist in their ability to modify food choice in the lunchroom.

TABLES and FIGURES

Table 3.1. Local vegetable themes used for local message testing in 3rd-5th grade students

<table>
<thead>
<tr>
<th>Local Theme</th>
<th>Connecticut Veggies…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer</td>
<td>1. “helps cows that moo… and our farmer friends too”</td>
</tr>
<tr>
<td>Food Safety</td>
<td>2. “puts food safety first… germs are the worst”</td>
</tr>
<tr>
<td>Health/Strength</td>
<td>3. “make me superhero strong… ready for action”</td>
</tr>
<tr>
<td>Community/School</td>
<td>4. “make my cafeteria fun… my school #1”</td>
</tr>
<tr>
<td>Environment/Earth</td>
<td>5. &quot;keep planet earth clean… safe for you and me”</td>
</tr>
<tr>
<td>Taste/Fresh</td>
<td>6. “make my taste buds say yum… flavors are fresh and fun”</td>
</tr>
</tbody>
</table>
Figure 3.1. Local vegetable message display
Table 3.2. Characteristics of elementary school students participating in a survey about messages containing benefits of locally grown foods (n=202)

<table>
<thead>
<tr>
<th></th>
<th>Urban School District (n=100)</th>
<th>Suburban/Rural School District (n=102)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean ± SD)</td>
<td>8.94 ±1.3 years</td>
<td>9.49 ±1.7 years</td>
</tr>
<tr>
<td>Grade % (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>45% (45)</td>
<td>35% (36)</td>
</tr>
<tr>
<td>4th</td>
<td>30% (30)</td>
<td>42% (42)</td>
</tr>
<tr>
<td>5th</td>
<td>25% (25)</td>
<td>22% (22)</td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>49% (49)</td>
<td>54% (55)</td>
</tr>
</tbody>
</table>
Table 3.3. Third through fifth grade students’ qualitative responses to open-ended “local food” question (n=202)

<table>
<thead>
<tr>
<th></th>
<th>Urban Students</th>
<th>Suburban/Rural Students</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inherently positive responses</strong></td>
<td>“it’s good”</td>
<td>“local food is awesome”</td>
</tr>
<tr>
<td><strong>Survey-biased responses</strong></td>
<td>“fresh and healthier fruit and veggies”</td>
<td>“safe healthy food”</td>
</tr>
<tr>
<td><strong>Correctly defined “local food”</strong></td>
<td>“food grown in Connecticut”</td>
<td>“food that grows in our area”</td>
</tr>
</tbody>
</table>
Figure 3.2. Local message preference based on entire sample of 3rd-5th grade students (n=202)
Pearson Chi-Square (n=202), df = 9, p<0.05
# Significantly different from Farmer, Safe, and Taste fresh
‡ Significantly different from Farmer and Taste
† Significantly different from School/Community, Strength/Health, Safe Food, and Earth
¥ Significantly different from School/Community, Strength/Health
Figure 3.3. Third through fifth grade students’ local message preference based on district (urban versus suburban/rural) Pearson Chi-Square (n=202), df = 5
* Significant difference within message, p<0.05
Figure 3.2. Third through fifth grade students’ local message preference by gender
* Significant difference within message at p<0.05, df=5 (n=202)
Figure 3.3. Third through fifth grade students’ local message preference by age
* Significant difference within message at p<0.05, df=5 (n=202)
Figure 3.4. Third through fifth grade student’s local message preference by grade. Fisher’s Exact Test used for Farmer, Safe, and Taste, due to expected cell counts of less than 5, df=6, (n=202), p<0.05. Pearson Chi-Square used for Strength, School, and Earth, df = 6.
CHAPTER 4: A local vegetable social marketing intervention increases local vegetable choice in elementary school students

Throughout the past six years, the school food environment in schools participating in the National School Lunch Program (NSLP) has undergone systematic changes to the foods it offers to students. These changes aim to increase the nutritional quality of food offerings and to ensure the meals are delivering the appropriate amount of calories based on age. The intended impact of improving the nutritional quality of school meals is to: improve students’ dietary intake pattern, maintain healthy weight, and reduce the risk of youth overweight and obesity. It is important to address obesity risk in school aged children because of the continual increase in obesity in this age group, and because risk of adult obesity is greater in children who have obesity.

Participation in Farm-to-School (FtS) activities provides schools with fresh, local fruits and vegetables and engages students in hands-on, food-based, classroom and garden-based nutrition education in schools. FtS has become the predominant programming used in schools to improve nutrition behaviors that influence both food preference and consumption. FtS engagement addresses intrapersonal, interpersonal, and organization levels of the Social Ecological Model (SEM) that influence individual nutrition behaviors. FtS builds fruit and vegetable knowledge, improves attitudes and beliefs, and increases exposure to and willingness to try these foods. These improvements help to shape taste preferences towards fruits and vegetables, which is key because of its consistent, positive relationship to consumption. FtS programs normalize fruit and vegetable choice and consumption. Schools that engage in FtS programs and activities increase fruit and vegetable calorie intake and decrease non-fruit and vegetable
intake of students.\textsuperscript{193} FtS programs improve the school food environment through increased availability of a greater variety of fresh, minimally processed produce.\textsuperscript{194,195} In fact, local procurement and promotion are the most commonly reported FtS activities schools participate in nationally.\textsuperscript{164}

Another promising measure that improves the school food environment and student nutrition behaviors is the marketing and messaging of healthy food options to increase their visibility and appeal. Prior interventions have effectively encouraged students to choose and consume fruit and vegetables from the school lunch line.\textsuperscript{24,166,196} Further, engaging students in the development of fruit and vegetable marketing materials is particularly effective at increasing choice and consumption of these foods in the school lunchroom.\textsuperscript{134} Emerging research indicates that the combination of local vegetable procurement and messaging increased students local produce consumption.\textsuperscript{19} However, there are no cafeteria-based intervention studies to incorporate food advertising and social marketing concepts in the development and delivery of a local vegetable marketing campaign, accompanied by local vegetables offered during school lunch. Therefore, this study aims to determine the impact of a student-tested, local vegetable marketing intervention on students’ local vegetable choice and related nutrition behaviors.

**MATERIALS AND METHODS**

The University of Connecticut Institutional Review Board for Human Subjects approved the study protocol (Appendix A). Parent or guardians of students in grades 3-5 from the six schools within one urban school district were provided notification (Appendix B) and the opportunity to opt their child out of study activities (Appendix C) via an information packet sent home two-three weeks prior to the study. Packets included
a cover letter (Appendix D), study information flyer (Appendix E), and parental notification form with the student “opt out”. Any returned “opt out” forms were collected and the students whose parents or guardians chose to opt their child out did not complete any study related assessments. Prior to each survey data collection period student assent (Appendix F) was obtained verbally. Once pre and post data collection was completed each school received a physical activity incentive, chosen by the school, worth $100.

**Sample size**

A minimum sample size of 90 students per experimental group (n=3) was estimated as sufficient for the pre-post survey to achieve 90% power at alpha = .05 to detect an effect size of 0.30 in differences between “groups.” Students in the 3rd-5th grade were chosen for this study because these students have the cognition to understand the health benefits of food. Additionally, their literacy level allows them to complete simple questionnaires and surveys with minimal guidance or entirely on their own.

**Study design and experimental groups**

A quasi-experimental, nested design was used to determine the impact of a local vegetable social marketing intervention on urban, low-income students’ local vegetable choice and vegetable-related nutrition behaviors (Figure 4.1). This design included three “fixed factor” or experimental conditions including; a local messaging “Local Message” condition, a nutrition messaging “Nutrition Message” condition, and a control condition. Within each experimental condition were the nested factors, consisting of the schools (n=6). Schools (n=2) were evenly distributed across the three experimental conditions. FoodCorps school nutrition education personnel delivered the messaging interventions at the intervention schools (n=4). Schools were randomly assigned to the two intervention
conditions. They were randomly selected from a group of schools within the district that indicated capacity for nutrition educators to deliver the intervention in the school. Researcher contacted a group of potential schools to participate as control schools and the schools first to respond were assigned. Therefore, the control group schools were non-randomly assigned.

**Experimental Conditions**

*Intervention*

During the fall school term (September-December), which immediately preceded the messaging intervention, local vegetable (kale, green beans, butternut squash, beets, and zucchini) choice data was collected in all six experimental schools. This data was collected from the foodservice daily production records and served as baseline data to be used to compare within and between group differences in local vegetable choice. Each of the five local vegetables was served on two separate days during the school term, amounting to ten local vegetable data collection time points. In total, this pre-intervention data was collected over a 16-week period. During the pre intervention period no messages were used in the lunchroom when local vegetables were served. Following this period the intervention began.

The intervention period was also 16-weeks and took place in spring school term (February-May) which followed the pre intervention fall term. At the beginning of spring term, prior to local vegetables being served at lunch, the vegetable-related behavioral survey was administered to students in each experimental condition, which served as pre intervention data. This survey was re-administered in each school at the end of the 16-week intervention, this data served as the post intervention data. During the intervention
the same local vegetables were served on the same day throughout the experimental groups. It is important to note that the other meal components (fruit, protein, grain, and dairy) offered with the local vegetables were the same across all experimental groups. Additionally, the fruit (fresh fruit medley) option offered at each school was constant throughout the pre-intervention and intervention periods. This is an important consideration when measuring vegetable choice given that students can choose either the fruit or the vegetable or both when assembling the meal components on their tray.

The five local vegetables were featured on the cycle menu based on their availability, which was determined by the school districts food service department. These five local were also chosen based on degree of student likeability, which was informed by the school food service department. This resulted in the selection of five local vegetables that were neither highly disliked nor highly liked by students based on taste tests. This local vegetable inclusion method was used to increase the potential to detect difference in local vegetable choice throughout the intervention.

In the two intervention groups receiving lunchroom marketing, the placement and visibility of the vegetable campaign messages were similarly positioned within the school cafeteria. Typically, the signage was placed adjacent to where the students lined up to be served lunch as well as next to the local vegetable on the lunch service line (Appendix G). During the intervention the signage was displayed every day that the local vegetables were featured on the lunch menu, they were displayed for the entirety (90-120 minutes) of the lunch service. Signage was removed from the lunchroom when local vegetables were not on the menu. In total, the message signage was displayed for ten lunch services at the “Local Message” schools and the “Nutrition Message” schools.
These intervention schools also received hands-on food-based classroom nutrition education during the intervention, delivered by FoodCorps school nutrition education personnel. The lessons used in the classroom nutrition education were derived from the states FoodCorps curriculum, and each week, the nutrition educators worked to standardize the lesson for the upcoming week. These lessons incorporated healthy foods (fruits, vegetables, seeds, and nuts) in the nutrition education activities to reinforce the nutrition education lesson.

The “Local Message” intervention consisted of a marketing campaign in the school cafeteria containing messages about the local vegetables, featured five local vegetables each served on the school lunch menu on two separate days during the intervention, and included bi-weekly 30-45 minute, hands-on, food-based classroom, nutrition education for the entire 16 week intervention. The messages in this marketing campaign were previously tested with 3rd-5th grade students who were from the same school district but attended schools that were not participating in the intervention. The messages were chosen based on students’ preference as it related to encouragement of local food consumption. The message development was informed using food marketing and food advertising methods.\textsuperscript{132,133,166} During each local vegetable lunch service the local vegetable was accompanied by local vegetable marketing signage. The local messages used in this intervention were “Connecticut veggies… make me superhero strong and ready for action”, and “Connecticut Veggies… make my cafeteria fun and my school #1”. These messages were printed in both English and Spanish on brightly colored posters with non-branded comic book inspired design (Appendix H).
The second experimental group “Nutrition Message” intervention consisted of a marketing campaign in the school cafeteria containing general nutrition messages about fruits and vegetables, featured the same five local vegetables served on two separate occasions during the school term, and included bi-weekly classroom based nutrition education. The local vegetables served to this group were served on the same days as the “Local Message” group. However, the local vegetables were accompanied by nutrition messaging from USDA MyPlate. These messages also contained bright colors but focused on nutrition-based messages (i.e. “Make half your plate fruits and veggies”). After students had been seated and were eating their lunch, nutrition education personnel at both messaging interventions (Local and Nutrition) provided a small incentive (bookmark with the local message or vegetable sticker) to students who chose the local vegetable.

The third experimental group (control) received no vegetable marketing in the school cafeteria and no bi-weekly classroom based nutrition education, but did have the same five local vegetables served on the same two separate occasions as the intervention groups. Thus, for each of the five local vegetables, choice data was sampled on the same two days during the 16 week intervention at each experimental group school. The two samples of individual vegetable choice were averaged and standardized based on the total number of students at each school who were served the meal. These data were then used to compare differences between and within (pre-post) experimental groups. This experimental design allowed researchers to compare the influence of the two messaging interventions on local vegetable choice and vegetable-related nutrition behaviors across
three experimental conditions. The use of a control group provided a reference group for researchers to compare the intervention groups’ outcomes.

**Outcome Variables**

The validated Knowledge, Attitudes, and Consumption Behavior Survey was adapted and renamed the Connecticut Farm to School Survey, (Appendix N) to assess local vegetable behaviors prior to the intervention and again at post intervention.\(^{200-202}\) The vegetable-related nutrition behaviors measured in the original 83 item survey were derived from the social cognitive theory (SCT) including knowledge, attitudes, self-efficacy, and preference.\(^59\) The survey was adapted to align with FoodCorps nutrition education curriculum; focus on the agricultural produce available in the state and region; target vegetable preference for the local vegetables provide in the classroom; and accommodate classroom time restrictions. The adapted, 27-item survey contains four scales to assess vegetable knowledge, attitude, self-efficacy, preference, and overall nutrition-related behaviors. The Cronbach’s alpha was 0.64 for knowledge, 0.78 for attitude, 0.83 for preference, and 0.85 for overall behavior. The knowledge scale was removed from analysis due to having a Cronbach’s alpha of less than 0.70.

A trained research assistant and the school’s nutrition education personnel administered the survey twice (pre-post) in each school during the spring school term. The survey was read aloud to the students’ when indicated and researchers addressed any individual questions as they arose. Two additional items were added to the post-intervention survey. One item was related to student message exposure to determine the proportion of students who remembered seeing the messages in the lunchroom. The second item aimed to assess if, and to whom, students talked about the messages. These
items where added based on a review of social marketing post-program awareness and impact evaluation methods, which recommended to evaluate exposure rates and level of message communication.\textsuperscript{203–205}

During both pre-intervention and intervention students’ local vegetable selection was assessed using the school food service director’s daily production records. Specifically, this record keeps a count of the initial number of local vegetables servings prepared for the meal service. It then counts the number of local vegetable servings left after the meal service and it counts the total number of students who physically walked through the lunch service line. This data allows researchers to have an accurate count of the number of local vegetables taken during the meal service. This count can then be standardized to account for the number of students served on each day at each experimental school. This standardization protects against the possibility for local vegetable choice differences to be confounded by differences in school size across the experimental schools. In the meal service line, each student was required to choose three out of the five meal components (whole grain, dairy, protein, fruit, and vegetable) in order to exit the service line. They had the option of choosing the fruit or the vegetable or both. This offer-versus-serve model afforded researchers the opportunity to accurately measure changes in local vegetable choice. These data were then used to compare differences between and within (pre-post) experimental groups.

\textbf{Statistical Analysis}

All analysis was conducted using IBM SPSS version 25. The dependent variables included the standardized proportion of students choosing the local vegetable and the vegetable-related nutrition behavioral measures from the survey. General linear model
analysis, analysis of covariance (ANCOVA), paired samples T-test and independent samples T-tests were performed to determine between and within intervention group differences for the dependent variables. The level of analysis for this intervention focused on the intervention level rather than the school or individual level. Prior to ANOVA and independent samples T-test analysis, the assumptions of ANOVA were tested to determine normality of sample distribution, sample homoscedasticity, and sample independence of observation at the school (random factor) level (Appendices J-M).

An ANCOVA with post-hoc Tukey was used to determine if significant differences in students’ mean vegetable attitudes, self-efficacy, preference, and overall existed between the experimental conditions score, \((p \leq 0.05)\). To analyze differences in local vegetable choice a general linear model analysis was used, which included fixed (experimental group) and random (school) effects as well as covariates including pre vegetable choice, post vegetable choice and pre/post individual local vegetable choice. Since within school classroom sampling variance existed from pre to post, an independent samples T-test was used to compare within (pre-post) experimental group differences in vegetable-related nutrition behavior measures and vegetable choice. A paired samples T-test was used analyzed within (pre-post) differences in local choice, due to stable nature of student populations from fall to spring term at each school. The two additional post-intervention questions were analyzed using cross tabulation with Pearson Chi-Square test to determine differences in the frequency of students reported having seen messaging and differences in message relay/communication between intervention groups \((p \leq 0.05)\).
RESULTS

Participant Characteristics

Students completed baseline surveys from each condition: “Local Message (n=81)”, “Nutrition Message (n=79) and “Control group (n=79). The average age of the participants (N=239) at baseline was 9.52 ±1.1 years old, 36% were 4th grade students and 52% were female (Table 4.1). Additional student demographics were not collected with the survey, however school district reporting provides further detail. Overall, 49.9% of students from the school district were Hispanic/Latino, 31.3% African American, and 12.2% White/Caucasian. The districts’ students come from predominantly low-income households with 84.6% of household qualifying for free and reduced priced school lunches. Based on this, the district qualifies for community-based eligibility for free and reduced school meals. This district is categorically urban based on the districts location within a city or metropolitan area with 50,000 people or more.170

Messaging Effects on Local Vegetable Choice

An average of 380 meals were served per day in each school. Among all three groups, a total of 38,534 local vegetable meals were recorded by the foodservice staff and assessed by the researchers during the 10 local vegetable service days. At each of the three experimental groups there were between 11,500-14,000 local vegetable meals served during the study, which were used for data analysis. From these observations, data regarding students’ local vegetable choices were derived.

Results from the general linear model show that prior to the intervention there was a significant difference in local vegetable choices among groups (p ≤ 0.05) (Table 4.4). The model of pre intervention local vegetable choice had an adjusted R² of 0.959,
and included the fixed effect “experimental group”, and covariates “pre beet” choice, and “pre kale” choice. These variables were included in the modeling due to their significant predictive relationship to the dependent variable (pre intervention local vegetable choice). The analysis shows “Local Message” group had a greater selection of local vegetables compared to the other experimental groups (p ≤ 0.05). Additional general linear model analysis of both post-intervention local choice (adjusted R² = 0.929)(Table 4.5) and pre-post change in local choice (adjusted R² = 0.966)(Table 4.6) indicate there was no difference between experimental groups for the respective dependent variables listed. Similar to the pre intervention choice model, these models included the variables with a significant relationship to the dependent variable. The random effect (school) did not have a significant relationship in any of the local vegetable choice models.

Figure 4.2 reports results from the multivariate general linear model for individual local vegetable choice at post intervention. The variables included in this analysis were post kale choice, post green bean choice, post zucchini choice, post butternut squash choice and post beet choice. The fixed effect was experimental group to compare between group analysis. The figure shows that local beet selection was greater in the “Local Message” group (p=0.005) and in the “Nutrition Message” group (p=0.02) compared to the control at post intervention. This analysis further shows that the covariate “post beet” choice has an adjusted R² of 0.643, indicating it predicts a large amount of variability in the model. Figure 4.3 show results from the paired samples T-test determine within (pre-post) group differences in individual local vegetables choice. The analysis demonstrated that local beet choice increased significantly in the “Local
Message” group (p=0.029) from pre to post, and local zucchini choice increased in the “Nutrition Message” group from pre to post (p=0.001).

**Intervention Effect on Vegetable-Related Nutrition Behaviors**

Prior to analyzing the vegetable-related nutrition behavior survey internal reliability was determined for the behavioral scales of the Connecticut Farm-to-School questionnaire. Internal reliability of the scales (Cronbach’s alpha) were: 0.64 for knowledge, 0.78 for attitude, 0.83 for preference, and 0.85 for overall score. The preference scale’s internal reliability was originally below the acceptable Cronbach’s alpha and after removing the “would you try it” item from the scale the interval validity score was determined to be acceptable. Internal validity was not conducted on self-efficacy because this construct had one item on the survey. The knowledge construct was removed from analysis due to Cronbach’s alpha below 0.70.

When evaluating post intervention vegetable-related behavior scores, there were significant differences among groups for vegetable attitude score (p=0.001), vegetable preference score (p=0.001), and overall vegetable-related behavior score (p=0.01) (Table 4.2). Based on these results a post-hoc Tukey was conducted, revealing the “Local Message” group had a significantly greater vegetable attitude score (p=0.0001), vegetable preference (p=0.001), and overall score (p=0.002) compared to the control (Table 4.2). The “Local Message” group also had a greater vegetable preference score compared to the “Nutrition Message” group (p=0.003). However, the paired samples T-test shows there were no significant within group (pre-post) differences for any of the vegetable-related behaviors (Figure 4.3). These findings indicate there were between group
differences at post intervention but there were no difference within each group from pre intervention to post intervention.

When evaluating frequency of intervention message recognition at post intervention, the “Local Message” group had a significantly greater percentage of students who reported seeing the local messages compared to the “Nutrition Message” group (p=0.0002) (Table 4.3). Likewise, the “Nutrition Message” group had significantly greater percentage of students reporting having seen the nutrition messages compared to the “Local Message” group (p=0.0004). When intervention group students were asked about whether or not they discussed the messages from school with others, most (56-74%) reported not discussing the messages. Those students who did discuss the messages with others were most likely to communicate the message with their family, friends or other students (Table 4.3).

DISCUSSION

This study, to the author’s knowledge, was the first school cafeteria-based intervention to combine locally procured vegetables with a student-informed local vegetable marketing campaign to investigate their combined impact on student local vegetable choice and related nutrition behaviors. Researchers hypothesized that the “Local Message” group would have greater choice of local vegetables during lunch and improved vegetable-related behavioral variables. Findings show the “Local Message” group had improved vegetable-related behavioral variables compared to both experimental groups, however total local vegetable choice was not improved compared to the other groups as hypothesized. Further, results indicate that student-informed local messages and nutrition messages did increase individual local vegetable choice, although
they do not increase overall local vegetable choice. The non-significant increase in
overall vegetable choice between the messaging groups and the control group could be
due to large within-group variability in local vegetable choice seen from the data
analysis. There is strong likelihood that this high variability in choice was a consequence
of the small number of days of vegetable choice data sampling. Similar studies measuring
fruit and vegetable choice and consumption have had greater sampling frequency
yielding a greater total sample, demonstrate a lower variability in fruit and vegetable
selection data, and have shown more robust changes in choice and consumption.\textsuperscript{19,134,166}

After the intervention the “Local Message” intervention had in improvements in
vegetable-related behaviors, attitudes and preferences compared to the other experimental
groups. These results are similar to prior school-based vegetable marketing research that
has shown vegetable messages in the cafeteria can increase the appeal and choice of
vegetables served on the lunch line.\textsuperscript{25,196} Previous research has also shown that local
vegetables accompanied by local promotional material highlighting the farm where the
vegetables were grown increased cafeteria vegetable consumption in elementary school
students.\textsuperscript{19}

Emerging research confirms the importance of student engagement in the
development of vegetable promotional materials increases vegetable consumption in the
cafeteria.\textsuperscript{134} The current study had a similar finding, where beet choice increased in the
student-tested local message group compared to control. However results show the group
receiving more conventional, non-student tested, nutrition-based messages had an
increase in zucchini choice compared to the control. Together this suggests that both
types of messaging can increase choice when placed adjacent to the lunch line and at the point of selection on the service line.

The ability, although modest, for both local messages and USDA messages to improve local vegetable choice is an important finding considering local fruit and vegetable procurement is the most commonly engaged farm to school (FtS) activity in schools. Schools purchasing local foods can use this research to effectively promote student choice of locally purchased produce. This is important for the students’ dietary intake but is also important from the food service director’s perspective. Local procurement can often require additional time and effort in bid seeking and food processing, but this extra effort is worthwhile especially when students are choosing these foods. This finding is also particularly useful for school nutrition educators who not only deliver classroom nutrition education but also are typically present in the cafeteria and can reinforce healthy nutrition behaviors. For the nutrition educator these findings provide evidence-based local messaging themes and marketing techniques that can be used in the lunchroom to increase local vegetable choice.

In addition to improved vegetable choice, the local messaging group had increases in vegetable attitudes, preferences, and overall score compared to the control group. This finding can be attributed to the classroom nutrition education in the intervention schools, based on prior findings. Previous FtS research has established hands-on, food-based classroom and garden nutrition education effectively increase students’ fruit and vegetable; knowledge, attitudes/beliefs, exposure, self-efficacy, willingness to try, preference, and consumption. However, exposure to the local messaging and the local vegetables may also impact these behaviors. In fact, previous research has
demonstrated that school-aged students’ vegetable preferences increase after a period of repeated vegetable tastings exposures.\textsuperscript{87,207,208}

The “Nutrition Messaging” group did not have improved vegetable-related nutrition behaviors compared to the control group possibly due to differences in the delivery of the nutrition lessons and less focus on locally grown vegetables compared to the “Local Messaging” group. While each nutrition educator reviewed the lesson content on a weekly basis, the researcher did not measure the fidelity of lesson delivery. Therefore, without verifying the consistency of the nutrition education there may have been differences in content delivery that may explain this finding. This lack of fidelity across nutrition educators effectively decreases the extent of standardization between intervention groups, which introduces the chance for increased variability between groups. Although it may be the case that exposure to the local messages helped students to positively associate with local vegetables and this exposure may have accounted for some of the improvements in vegetable-related behaviors shown.

Notwithstanding, these findings provide school wellness policymakers with additional evidenced-based strategies that assist in the creation of a school food environment that promotes healthy food choice in students. This intervention illustrates messaging themes and marketing techniques that can produce effective school-based vegetable marketing, one of the key components of the CDC’s comprehensive framework for improving the school food environment.\textsuperscript{124} This framework identifies healthy food marketing as a means to build demand for nutritious foods at school, and serves to establish and normalize healthy eating habits.
There were several strengths to this study. These include a number of controls for many of the proximal influences of vegetable choice including: standardization of meal components served with the local vegetable across all study schools for all local vegetables, and the local vegetables were served on the same day across all groups. The standardization of local choice data based on the total number of students receiving school lunch allowed choice data to be compared across groups. Further, outcome assessments including the survey were administered by the same trained researcher, which increases survey administration consistency and test-retest reliability. Finally, methodological strengths include use of a control group to serve as a reference group for intervention group comparisons.

This study has several limitations. The general linear model analysis did not include many of the potential covariates that may account for vegetable choice such as age and gender, clear limitation of these models. The average experimental group sample was 84 students, which was slightly less than what was required based on the power analysis. This may, in part, have contributed to the non-significant between group differences seen in the vegetable-related nutrition behavior survey analysis. Study design and intervention methodology limitations include a relative small cohort of schools and a non-randomized assignment of schools to intervention groups. These limitations increase the chance of bias and weaken the generalizability of the study findings. The relatively low frequency of reported message exposure by students is another potential limitation on our findings. However, food marketing research has reported between 42-54% of children and adolescents report exposure to the various forms (commercial, print, digital/social media) of food marketing. ⁰⁹ Given that objective measurement (child-worn
video camera) of child food marketing exposure shows children are exposed to nearly 40 food advertisements per day, these data suggest children and adolescents may not be consciously aware of these exposures and therefore underreport exposure. Another limitation of this study was the lack of fidelity checking throughout nutrition education delivery. This limits the ability to assess the consistency of the nutrition education content across interventions, may have impacted the nutrition behavior survey outcomes. Despite controlling for some factors that could impact student local vegetable choice this study could not account for all covariates. Based on the limits to resource and time, collecting vegetable consumption data was not a viable option in this study. Finally, given that the messaging was only present on the days when local vegetables were served, the intervention period and the message exposure may not have been enough to produce change in vegetable choice.

CONCLUSIONS

The results from this study and other related research provide emerging evidence supporting the ability of healthy food marketing in school cafeterias to effectively expose students to these messages and to positively impact the school food environment through improved student food choices. Further research is needed to refine school-based marketing techniques and develop which message themes are most appealing and effective at improving choice and consumption of locally grown produce. These techniques and themes can then be implemented in schools and serve to improve nutrition behaviors and normalize healthy diets in school-aged children. Future research in this area should investigate a greater number and variety of local message themes on students’ local vegetable choice to determine which is most effective. Future research
that expands vegetable marketing to reach beyond the lunchroom may increase messaging exposure and lead to more robust findings. Also, researchers should be sure to sample data with regularity to decrease the potential for large within-school variability in student choice. Additionally, more rigorous study design methodologies, such as randomized controlled studies, are needed to increase methodological strength, experimental control, and generalizability of results.
Figure 4.1. Nested, quasi-experimental study design of local vegetable social marketing intervention in urban, low-income elementary schools

<table>
<thead>
<tr>
<th>Fixed Factor (Experimental group)</th>
<th>Random Factor (Nested group)</th>
<th>Dependent Variables (Outcomes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Message</td>
<td>School</td>
<td>Local vegetable choice</td>
</tr>
<tr>
<td>Nutrition Message</td>
<td>School</td>
<td>Nutrition-related behavior</td>
</tr>
<tr>
<td>Control (no message)</td>
<td>School</td>
<td>Local vegetable choice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nutrition-related behavior</td>
</tr>
</tbody>
</table>
Table 4. 1. Characteristics of 3rd-5th grade urban elementary students in a school-based local vegetable campaign intervention

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>Pre-Survey (n=266)</th>
<th>Post-Survey (n=239)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean ± SD)</td>
<td>9.52 ±1.1 years</td>
<td>9.88 ±1.3 years</td>
</tr>
<tr>
<td>Grade % (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>32% (85)</td>
<td>33% (80)</td>
</tr>
<tr>
<td>4th</td>
<td>36% (95)</td>
<td>33% (79)</td>
</tr>
<tr>
<td>5th</td>
<td>32% (86)</td>
<td>33% (80)</td>
</tr>
<tr>
<td>Gender: % female (n)</td>
<td>52% (137)</td>
<td>49% (118)</td>
</tr>
</tbody>
</table>
Table 4.2. Post-intervention survey analysis of covariance (ANCOVA) comparing group differences in vegetable-related attitude, self-efficacy, preference, and overall nutrition behavior between “Local Message (n=81)”, “Nutrition Message (n=79)” and “Control (n=79)” groups

<table>
<thead>
<tr>
<th>Vegetable-Related Psychosocial (Behavioral) Variable</th>
<th>Experimental Group</th>
<th>ANCOVA</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean ± SD</td>
<td>P-value</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>Local Message</td>
<td>22.91±4.9</td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Nutrition Message</td>
<td>21.10±5.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>19.44±5.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>Local Message</td>
<td>3.00±0.97</td>
<td></td>
<td>0.089</td>
</tr>
<tr>
<td></td>
<td>Nutrition Message</td>
<td>2.71±1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>2.66±1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preference</td>
<td>Local Message</td>
<td>17.10±5.6</td>
<td></td>
<td>0.0001</td>
</tr>
<tr>
<td></td>
<td>Nutrition Message</td>
<td>11.65±5.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>13.00±5.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>Local Message</td>
<td>56.10±11.2</td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Nutrition Message</td>
<td>46.45±13.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>46.42±96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ANCOVA, p ≤ 0.05, controlling for pre-intervention group scores
Post-hoc Tukey p ≤ 0/05

a denotes significantly greater than “Nutrition Message” group
b denotes significantly greater than Control group
Table 4.3. Students’ reported recognition and relaying of the cafeteria messages to family members, friends, and teachers

<table>
<thead>
<tr>
<th>Group</th>
<th>Message Type Recognition</th>
<th>Message Relay Audience</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None  n (%)</td>
<td>Nutrition  n (%)</td>
</tr>
<tr>
<td>Nutrition Message (n=79)</td>
<td>36 (46%)</td>
<td>35 (24%)</td>
</tr>
<tr>
<td>Local Message (n=81)</td>
<td>29 (36%)</td>
<td>3 (3%)*</td>
</tr>
</tbody>
</table>

Pearson Chi-Square (n=239), df = 3
* p<0.01
Table 4.4. Pre-intervention lunchroom local vegetable choice between "Local Message", "Nutrition Message", and Control groups: Estimated marginal means

<table>
<thead>
<tr>
<th>Students' local vegetable choice (standardized to students served)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Local Message</td>
<td>0.281</td>
</tr>
<tr>
<td>Nutrition Message</td>
<td>0.192</td>
</tr>
<tr>
<td>Control</td>
<td>0.226</td>
</tr>
</tbody>
</table>

General Linear Model Covariates: pre beet choice, pre kale choice, pre butternut squash choice
Model Adjusted R Squared = 0.959, random effect (school) was not significant
Based on total number of meal observations at each meal service
* Indicates significantly greater than “Nutrition Message” and Control groups, p ≤ 0.05
Table 4.5. Intervention lunchroom local vegetable choice between "Local Message", "Nutrition Message", and Control groups: Estimated marginal means

<table>
<thead>
<tr>
<th></th>
<th>Students' selecting local vegetable (standardized to students served lunch)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Error</td>
</tr>
<tr>
<td>Local Message</td>
<td>0.432</td>
<td>0.023</td>
</tr>
<tr>
<td>Nutrition Message</td>
<td>0.474</td>
<td>0.020</td>
</tr>
<tr>
<td>Control</td>
<td>0.424</td>
<td>0.022</td>
</tr>
</tbody>
</table>

General Linear Model Covariates: post kale choice, post green bean choice
Model Adjusted R Squared = 0.929, random effect (school) was not significant
Based on total number of meal observations at each meal service
* Indicates significant between group differences p ≤ 0.05
Table 4.6. Pre-post change in lunchroom local vegetable choice between "Local Message", "Nutrition Message", and Control groups: Estimated marginal means

<table>
<thead>
<tr>
<th>Students' selecting local vegetable (standardized to students served lunch)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Local Message</td>
<td>0.183</td>
</tr>
<tr>
<td>Nutrition Message</td>
<td>0.282</td>
</tr>
<tr>
<td>Control</td>
<td>0.166</td>
</tr>
</tbody>
</table>

General Linear Model Covariates: pre beet choice, post kale choice
Model Adjusted R Squared = .906, random effect (school) was not significant
Based on total number of meal observations at each meal service
* Indicates significant between group differences p ≤ 0.05
Figure 4.2. Post intervention difference in local kale, green beans, zucchini, butternut squash, and beet choice between "Local Message", "Nutrition Message", and Control groups: Estimated marginal means

Multivariate General Linear Model: Post kale, post green bean, post zucchini, post butternut squash, post beet choice (mean ± SE) Model controlled for schools (random factor)
Based on total number of meal observations at each meal service
*Significant between group differences p ≤ 0.05
**Significant between group differences p ≤ 0.01
Figure 4.3. Within group differences in local kale, green beans, zucchini, butternut squash, and beet choice from pre to post intervention

Paired samples T-test, p ≤ 0.05

** p ≤ 0.01

* p ≤ 0.05
Figure 4.4. Within group differences in vegetable-related nutrition attitude, self-efficacy, preference, and overall behavior at pre and post-intervention.

Independent samples T-test, $p \leq 0.05$
Chapter 5: Conclusions

Major Findings

The findings from this research provide evidence that testing of food marketing messages with elementary school students prior to their dissemination in the lunchroom can help to improve dietary behaviors and increase the choice of certain local vegetables in the cafeteria. In addition, qualitative evidence shows school-aged students, independent of school district characteristics, share the common belief that that locally grown vegetables are inherently beneficial either directly or through benefits to the broader community. Despite this, only a small minority of students understood the concept local food. Therefore, the salience of local messaging is likely owed to the belief that these foods are beneficial and not in the actual understanding of the concept of local food. Thus, message themes targeted to this population may be more effective at modifying nutrition behaviors when they are benefit-focused and not conceptually-focused, unless the concept has been taught to students prior to message use.

Further, students preferred messaging that highlighted locally grown vegetables’ benefit to the school/lunchroom across school districts. This finding illustrates a school-focused messaging theme is translatable to students more broadly than other local messages. Interestingly, our intervention study used a broadly appealing local message touting benefits to school/lunchroom alongside a district-specific appealing local message touting benefits to students’ strength. The synergistic effect of using a pro-social message, with broad appeal, and an individually focused message, with targeted district appeal, may be a potent combination in improving healthy food choice in the lunchroom. However, this research shows that there is enough group variability in local message
theme preferences that targeted messaging to groups of students requires message testing within the targeted population or, at minimum, thorough careful consideration of the school district and student characteristics.

**Strengths**

The strengths of the study include the rigorous methodology used to develop the local messaging survey and testing protocol, which included multiple iterations and several rounds of review by research experts, extension specialist, registered dietitians, school administration, and research evaluation experts. Another strength of the message testing was in the survey administration. A trained research assistant accompanied each participant ensuring students understood the messages, completed the survey accurately, and limited peer influence on survey responses. Finally, sampling students from two discrete school districts strengthened the potential to generalize results by increasing the sample size and broadening the sample in its demographic scope.

Additionally, there are various strengths of the local vegetable marketing intervention. These strengths include implementation of controls to reduce the influence of covariates of local vegetable choice, which could conflate the findings related to the local vegetable choice data. Control of covariates included: standardization of meal components served alongside the local vegetable across experimental groups, standardization of day of local vegetable service across groups, standardization and researcher verification of placement and visibility of messaging in the lunchroom between intervention groups, and all survey administration was completed by the same trained researcher. Intervention statistical analysis was improved by: multiple sampling of local vegetable choice data for each local vegetable, and standardization of local
vegetable choice data to the total number of students through the lunch service line. The strength of the study design was increased by inclusion of a control group, which received the same local vegetables on the same day throughout the intervention. Finally, the pre-intervention vegetable choice data collection was matched to intervention local vegetable data collection in terms of number of total data samples taken.

**Limitations**

The local message testing was limited based on the fact that the local messaging survey had never been used previously to test local messages in any student population. However, the survey was piloted in students of the same age and grade prior to use in data collection. The sampling technique was purposeful and non-random, which introduces possible sampling bias, impacting ability to generalize the findings. The sample is also somewhat homogenous due the fact that students were sampled from a single geographic location on the east coast of the United States. This impacts how well the results may translate to other region of the country.

There were also limitations of the local vegetable marketing intervention. The survey was adapted from a previously validated FtS survey. This impacts the validity of the adapted survey used in the current study. The survey adaptation was due to the nature local vegetable production in the region and limitations on time allocated to survey administration in the classroom. The small sampling of schools, and the non-randomized assignment introduce possibility of sampling bias, which could confound the findings. Another limitation, which could confound the findings between intervention groups, was the inability to assess the fidelity of the classroom nutrition education delivery between
intervention groups. Finally, the relatively small sampling of vegetable choice data limited the ability for the intervention to reduce variance and observe differences.

**Future Directions**

Future related message testing should be conducted to survey students from different regions of the country. This could help to determine if there truly are broadly preferred message themes, which could then be used by schools with a greater degree of certainty that the message will be appealing and resonate with students. Future research is needed to test adapted versions of these local themes in older student populations to determine if theme preferences transcend student age or if distinct variability exists between student age groups.

Future intervention-based research should test the ability for student-informed local messages to impact local food choice behavior without the presence of nutrition education. This would give a clearer understanding of the singular effect of local marketing interventions on student choice behavior in the cafeteria. Although a plate waste study of a local fruit and vegetable marketing intervention has been conducted, additional plate waste studies could help to further clarify if student-tested local messages have a greater influence on consumption than non-student tested local messages. Finally, since students report having somewhat low exposure to the lunchroom local marketing campaign, future research could expand the message scope within the school to include classroom marketing of local produce being served at lunch. This may increase exposure and have a greater influence on student choice of local offerings in the cafeteria.
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Appendix A
IRB Approval for local message testing
DATE: November 1, 2017

TO: Amy Mobley, Ph.D.
Nutritional Sciences

FROM: Diana Sobieraj, Pharm. D.
Institutional Review Board Member
FWA #00007125

RE: Protocol #: H17-178 “Connecticut Food Survey for Kids”
Please refer to the Protocol# in all future correspondence with the IRB.
Funding Source: PI Department
Approval Period: From: November 1, 2017 Valid Through: November 1, 2018

On July 27, 2017 the Institutional Review Board (IRB) reviewed the above-referenced research study by expedited review and determined that modifications were required to secure approval. Those requirements have been met, and the IRB granted approval of the study on November 1, 2017. The research presents no more than minimal risk to human subjects and qualifies for expedited approval under category # 7 - Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Enclosed is the validated parental notification form, which is valid through November 1, 2018. A copy of the approved, validated parental notification form (with the IRB’s stamp) must be used to consent each subject.

The IRB found that the protocol meets the criteria for approval stated in 45 CFR Part 46, Subpart D, Section 404: The research presents no greater than minimal risk to the minor subjects. The IRB has also determined that the study referenced above meets the criteria for Waiver of Informed Consent and assent stated in 45 CFR 46.116(d) as follows:

- The research involves no more than minimal risk to the subjects;
- The waiver or alteration will not adversely affect the rights and welfare of the subjects;
- The research could not be practicably carried out without the waiver or alteration; and
Whenever appropriate, the subjects will be provided with additional pertinent information after participation in the study. In this case, parents will be given the option of opting out of the study before it begins through the use of a parental notification form.

All investigators at the University of Connecticut are responsible for complying with the attached IRB “Responsibilities of Research Investigators.”

**Re-approval:** It is the investigator’s responsibility to apply for re-approval of ongoing research at **least once yearly**, or more often if specified by the IRB. The Re-approval/Completion Form (IRB-2) and other applicable re-approval materials must be submitted **one month** prior to the expiration date noted above.

**Modifications:** If you wish to change any aspect of this study, such as the procedures, the consent forms, the investigators, or funding source, please submit the changes in writing to the IRB using the Amendment Review Form (IRB-3). All modifications must be reviewed and approved by the IRB **prior to** initiation.

**Audit:** All protocols approved by the IRB may be audited by the Research Compliance Monitor.

*Please keep this letter with your copy of the approved protocol.*

**Attachments:**
1. Validated Parental Permission Form
2. Validated Recruitment Material
3. Validated Appendix A
4. Validated IRB-1 Application and Study Protocol Forms
5. “Responsibilities of Research Investigators”
Appendix B

Cover Letter for local message survey

- Your child is invited to do a research survey about what they think about foods grown in Connecticut. The survey is called “Local Food Survey for Kids.”
  - This is a one-time survey
  - The survey includes 10 questions about what they think about local foods.
  - The survey also asks about your child’s age, gender, and grade
  - Your child’s name or other personal information will not be included on the survey.

- We need to notify you before your child can do the survey.
  - The survey takes 10-15 minutes to complete
  - The survey will take place during your child’s lunch or afterschool program

- The results of the survey will help us plan activities about local foods in Connecticut schools.
- Your child will receive a UCONN drawstring bag that includes $5-10 summer physical activity/health items.

- Please review the enclosed Parental Notification form.
  1. If you allow your child to participate, no action is needed and you may keep the form.
  2. If you do not allow your child to participate, sign and return the Refusal form.
    a. You may return the form any of the following ways:
       1. Return the form in person at the afterschool program.
       2. Send the form to school with your child.
       3. Fax the form to: Amy Mobley at 860-486-3674 (fax number)
       4. Scan and email it to: jesse.chiero@uconn.edu

Please contact Jesse Chiero at jesse.chiero@uconn.edu or 614-692-5674 or Amy Mobley at amy.mobley@uconn.edu or 860-486-5073 with any questions.
Appendix C

Parental Notification form for local messaging survey

| Principal Investigator: Dr. Amy R. Mobley |
| Student Researcher: Jesse D. Chiero |
| Study Title: Connecticut Food Survey for Kids |
| Sponsor: UConn Collaboratory on School and Child Health |

**Introduction/Why is this study being done?**

Your child is invited to participate in a research study about local Connecticut foods. Your child is being asked to participate because he/she is entering, exiting or currently in 3rd-5th grade in a Connecticut school. The purpose of the study is to determine what aspect(s) of local foods 3rd-5th grade students prefer and to use this to promote students to consume local fruits/vegetables.

Researchers from the University of Connecticut are conducting a research study at your child’s school. This form will give you the information you will need to understand why this study is being done and what you need to do if you DO NOT want your child to participate. We encourage you to take some time to read about the study and to discuss it with your child. We also encourage you to ask questions now and at any time. If you decide to allow your child to participate, no further action is required. Your child will automatically be enrolled in the study. However, if you decide that you DO NOT want your child to participate or if you decide later that you would rather not have your child’s data be used in the study, please sign the attached form and return it to your child’s teacher by (insert date).

**What are the study procedures? What will my child be asked to do?**

Your child will be asked to complete a one-time, short 10-item survey about his/her preferences for local foods at their school. Your child will also be asked his/her age, gender, and grade level.

We will explain the study to your child using an information sheet and ask your child for permission before beginning the interactive survey. The survey questions focus on students’ preferences that might encourage him/her to choose and eat local fruits/vegetables at school.

This survey will be take place in your child’s school during the afterschool program. The survey should take no more than 10 minutes. Your child’s name will not be on the survey. You and your child will not be contacted at any point after the survey.

If your child wishes to take a break or stop the survey, the research team will allow your child to stop at that point with the option to complete the survey if he/she wishes to do so. If you are present during the survey, you may stay with your child as they complete the survey.

**If you DO NOT want your child to participate, what will he/she do instead?**

If you do not want your child to participate in the survey during the afterschool program they will be able to participate in the normal afterschool program activities.

**What are the risks or inconveniences of the study?**
We believe there are no known risks to your child because of his/her participation in the research study; however, a possible inconvenience may be the time it takes to complete the study.

What are the benefits of the study?
Your child may not directly benefit from this research. However, we hope that your child’s participation may increase awareness and consumption of local foods, which may improve child health. The overall benefit to society may come from increased awareness of the health promoting aspects of locally produced fruits/vegetables.

How will my child’s information be protected?
During this one time survey, breach of confidentiality is a minimal risk. The following safeguard will be used to further minimize this risk. The survey completed by your child will not be assigned any personal identifiers such as your child’s name or birth date. We will do our best to protect the confidentiality of the information we collect from your child but we cannot guarantee 100% confidentiality. If, during the course of this research study, a UConn employee suspects that a minor (under the age of 18) has been abused, neglected, or placed at imminent risk of serious harm, it will be reported directly to the Department of Children and Families (DCF) or a law enforcement agency.

All documents will be stored in a locked file cabinet in Room 225 of the Jones Building, Storrs, CT. Data will be entered into electronic files (e.g. database, spreadsheet) on a University-owned computer in Room 225, Jones Building under the supervision of Dr. Amy Mobley and stored on a password protected computer within a locked room. Any computer hosting such files will also have password protection to prevent access by unauthorized users. Only the members of the research staff will have access to the passwords. Data that will be shared with others will have no personal identifiers or coding as described above. At the conclusion of this study, the researchers may publish their findings. Information will be presented in summary format and individuals will not be identified in any publications or presentations. Data records will be destroyed after 3 years.

You should also know that the UConn Institutional Review Board (IRB) and Research Compliance Services may inspect study records as part of its auditing program, but these reviews will only focus on the researchers and not on your child’s responses or involvement. The IRB is a group of people who review research studies to protect the rights and welfare of research participants.

Can my child stop being in the study and what are my and my child’s rights?
Your child does not have to be in this study if you do not want him/her to participate. If you give permission for your child to be in the study, but later change your mind, you may withdraw your child at any time. There are no penalties or consequences of any kind if you decide that you do not
want your child to participate. Your child does not have to answer any questions that he/she or you do not want them to answer.

**Whom do I contact if I have questions about the study?**

Take as long as you like before you make a decision. We will be happy to answer any question you have about this study. If you have further questions about this study or if you have a research-related problem, you may contact the project director, Dr. Amy Mobley at 860-486-5073 or amy.mobley@uconn.edu or the student researcher Jesse Chiero at 614-592-5674. If you have any questions concerning your child’s rights as a research participant, you may contact the University of Connecticut Institutional Review Board (IRB) at 860-486-8802.

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**Parental Notification Form Regarding Participation in a Research Study**

**Return Slip**

**Principal Investigator:** Dr. Amy R. Mobley  
**Student Researcher:** Jesse D. Chiero  
**Study Title:** Connecticut Food Survey for Kids  
**Sponsor:** UConn Collaboratory on School and Child Health

**Notification of Refusal:**
I have read this form and decided that **I DO NOT** give permission for my child to participate in the study described above. My signature also indicates that I have received a copy of this parental notification form. Please return this form to the child’s teacher by ____________.

Print Child’s Name: ____________________________________________________________

Parent/Guardian’s Signature: __________________________ Print Name: __________________________ Date: __________________________

Relationship (e.g. mother, father, guardian): __________________________

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Appendix D

Student Assent form for local message survey participation

Child Information Sheet

Project Leader: Dr. Amy Mobley
Project Name: Connecticut Food Survey for Kids

Your parents/teacher have talked to you about being in a study. Dr. Mobley and her helpers want to learn more about what you think about foods grown in Connecticut.

If you want to do the study, you will be asked to answer questions about food. There are no wrong or right answers. You will also be asked to write your age, if you are a boy or girl, and grade.

You can ask Dr. Mobley or one of the study helpers questions about the study. You don’t have to be in this study if you don’t want to. If you say yes, but change your mind, you won’t have to be in the study any more. You don’t have to answer any questions you don’t want to.

You can talk to your parents about the study before you decide if you want to be in it. You can keep this paper.
Appendix E

Local message survey

<table>
<thead>
<tr>
<th>Directions</th>
<th>1. How much do you LIKE this picture?</th>
</tr>
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<tbody>
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<td></td>
<td>not at all</td>
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<td></td>
<td>🙁</td>
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<tr>
<th>2. How much do you LIKE this picture?</th>
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<td>not at all</td>
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<th>3. How much do you LIKE this picture?</th>
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<th>4. How much do you LIKE this picture?</th>
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<tr>
<td>not at all</td>
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<td>😞</td>
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</table>

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<tr>
<th>5. How much do you LIKE this picture?</th>
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</thead>
<tbody>
<tr>
<td>not at all</td>
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<tr>
<td>🙂</td>
</tr>
</tbody>
</table>
Tell us what you think!

Directions
First. LISTEN to the reasons to like Connecticut fruits and veggies.
Second. THINK about what YOU like most about Connecticut fruits and veggies.
Third. Circle the 3 you LIKE the most!

6. CIRCLE the 3 reasons you LIKE the most! (Circle 3)

HELPs FARMerS  SAFE FOOD   SUPERHERO STRONG

SCHOOL     PLANET EARTH     TASTE/FRESH

7. Have you ever been to a garden, farm, or orchard?
   ☐ Yes
   ☐ No
   ☐ Maybe
   ☐ I don’t know

8. What does Local Food mean to you?

   ____________________________________________________________

9. What does Farm-to-School mean to you?

   ____________________________________________________________

10. Circle your answer.

I am a: Boy    Girl

I am in: 3rd grade 4th grade 5th grade

I am: 8 years old 9 years old 10 years old 11 years old 12 years old

Finished!

For office use only   Date:   Location:   ID#
Appendix A.

IRB Approval Document
DATE: December 11, 2017

TO: Amy Mobley, Ph.D.
NUCSC

FROM: Lisa Sanetti, Ph.D.
Institutional Review Board Member
FWA #00007125

Please refer to the Protocol# in all future correspondence with the IRB.
Funding Source: VPR Research Excellence Program
Approval Period: From: December 11, 2017 Valid Through:
December 11, 2018

On November 15, 2017, the Institutional Review Board (IRB) reviewed the above-referenced research study by expedited review and determined that modifications were required to secure approval. Those requirements have been met, and the IRB granted approval of the study on December 11, 2017. The research presents no more than minimal risk to human subjects and qualifies for expedited approval under category # 7 - Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

The IRB found that the protocol meets the criteria for approval stated in 45 CFR Part 46, Subpart D, Section 404: The research presents no greater than minimal risk to the minor subjects. The IRB has also determined that the study referenced above meets the criteria for Waiver of Informed Consent and assent stated in 45 CFR 46.116(d) as follows:

- The research involves no more than minimal risk to the subjects;
- The waiver or alteration will not adversely affect the rights and welfare of the subjects;
- The research could not be practically carried out without the waiver or alteration; and
- Whenever appropriate, the subjects will be provided with additional pertinent information after participation in the study. In this case, parents will be given the option of opting out of the study before it begins through the use of a parental notification form.
The principal investigator must notify the IRB immediately of any changes that may affect the status of the research study referenced above.

Enclosed is the parent notification form, which is valid through December 11, 2018. A copy of the approved, validated notification form (with the IRB’s stamp) must be used to consent each subject.

All investigators at the University of Connecticut are responsible for complying with the attached IRB “Responsibilities of Research Investigators.”

Re-approval: It is the investigator’s responsibility to apply for re-approval of ongoing research at least once yearly, or more often if specified by the IRB. The Re-approval/Completion Form (IRB-2) and other applicable re-approval materials must be submitted one month prior to the expiration date noted above.

Modifications: If you wish to change any aspect of this study, such as the procedures, the consent forms, the investigators, or funding source, please submit the changes in writing to the IRB using the Amendment Review Form (IRB-3). All modifications must be reviewed and approved by the IRB prior to initiation.

Audit: All protocols approved by the IRB may be audited by the Research Compliance Monitor.

Please keep this letter with your copy of the approved protocol.

Attachments:
6. Validated IRB-1 Application and Study Protocol Forms
7. Validated Parental Notification Form
8. Validated Appendix A Form
9. “Responsibilities of Research Investigators”
Appendix G.

Parental Notification

Principal Investigator: Dr. Amy R. Mobley
Student Researcher: Jesse D. Chiero
Study Title: Connecticut Farm to School Survey for
Sponsor: UConn Collaboratory on School and Child Health

Introduction/Why is this study being done?
Your child is invited to participate in a research study about local Connecticut foods. Your child is being asked to participate because he/she is entering, exiting or currently in 3rd-5th grade in a Connecticut school. The purpose of the study is to determine how promoting local Connecticut foods in the school cafeteria affects what 3rd-5th grade students know and think about local vegetables as well as how much they choose them from the lunch line.

Researchers from the University of Connecticut are conducting a research study at your child’s school. This form will give you the information you will need to understand why this study is being done and what you need to do if you DO NOT want your child to participate. We encourage you to take some time to read about the study and to discuss it with your child. We also encourage you to ask questions now and at any time. If you decide to allow your child to participate, no further action is required. Your child will automatically be enrolled in the study. However, if you decide that you DO NOT want your child to participate or if you decide later that you would rather not have your child’s data be used in the study, please sign the attached form and return it to your child’s teacher by (insert date).

What are the study procedures? What will my child be asked to do?
Your child will be asked to complete a survey with less than 30 multiple choice questions. The survey asks about local food/nutrition and vegetable consumption. Your child will also be asked his/her age, gender, and grade level. Your child will complete the survey once during the fall and again in the spring.

We will explain the study to your child using an information sheet and ask your child for permission before beginning the interactive survey. The survey questions focus on students’ knowledge, attitudes and consumption of vegetables.
This survey will be take place in your child’s school during their health education class. The survey takes between 20-30 minutes. Your child’s name will not be on the survey. Your child will be asked to complete the survey once in the fall and again in the spring.

If your child wishes to take a break or stop the survey, the research team will allow your child to stop at that point with the option to complete the survey if he/she wishes to do so. If you are present during the survey, you may stay with your child as they complete the survey.

If you DO NOT want your child to participate, what will he/she do instead? If you do not want your child to participate in the survey during health class they will be able to participate in another health science activity.

What are the risks or inconveniences of the study? We believe there are no known risks to your child because of his/her participation in the research study; however, a possible inconvenience may be the time it takes to complete the study.

What are the benefits of the study? Your child may not directly benefit from this research. However, we hope that your child’s participation may increase awareness and consumption of local foods, which may improve child health. The overall benefit to society may come from increased awareness of the health promoting aspects of locally produced fruits/vegetables.

How will my child’s information be protected? During this one time survey, breach of confidentiality is a minimal risk. The following safeguard will be used to further minimize this risk. The survey completed by your child will not be assigned any personal identifiers such as your child’s name or birth date. We will do our best to protect the confidentiality of the information we collect from your child but we cannot guarantee 100% confidentiality. If, during the course of this research study, a UConn employee suspects that a minor (under the age of 18) has been abused, neglected, or placed at imminent risk of serious harm, it will be reported directly to the Department of Children and Families (DCF) or a law enforcement agency.

All documents will be stored in a locked file cabinet in Room 225 of the Jones Building, Storrs, CT. Data will be entered into electronic files (e.g. database, spreadsheet) on a University-owned computer in Room 225, Jones Building under the supervision of Dr. Amy Mobley and stored on a password protected computer within a locked room. Any computer hosting such files will also have password protection to prevent access by unauthorized users. Only the members of the research staff will have access to the passwords. Data that will be shared with others will have no personal identifiers or coding as described above. At the conclusion of this study, the researchers may publish their findings. Information will be presented in summary format and individuals will not be identified in any publications or presentations. Data records will be destroyed after 3 years.
You should also know that the UConn Institutional Review Board (IRB) and Research Compliance Services may inspect study records as part of its auditing program, but these reviews will only focus on the researchers and not on your child’s responses or involvement. The IRB is a group of people who review research studies to protect the rights and welfare of research participants.

**Can my child stop being in the study and what are my and my child’s rights?**

Your child does not have to be in this study if you do not want him/her to participate. If you give permission for your child to be in the study, but later change your mind, you may withdraw your child at any time. There are no penalties or consequences of any kind if you decide that you do not want your child to participate. Your child does not have to answer any questions that he/she or you do not want them to answer.

**Whom do I contact if I have questions about the study?**

Take as long as you like before you make a decision. We will be happy to answer any question you have about this study. If you have further questions about this study or if you have a research-related problem, you may contact the project director, Dr. Amy Mobley at 860-486-5073 or amy.mobley@uconn.edu or the student researcher Jesse Chiero at 614-592-5674. If you have any questions concerning your child’s rights as a research participant, you may contact the University of Connecticut Institutional Review Board (IRB) at 860-486-8802.
Appendix H.

Parent/Guardian Refusal Form (Opt Out)
Parental Notification Form Regarding Participation in a Research Study

Return Slip

Principal Investigator: Dr. Amy R. Mobley
Student Researcher: Jesse D. Chiero
Study Title: Connecticut Food Survey for Kids
Sponsor: UConn Collaboratory on School and Child Health

Notification of Refusal:
I have read this form and decided that I DO NOT give permission for my child to participate in the study described above. My signature also indicates that I have received a copy of this parental notification form. Please return this form to the child’s teacher by (insert date).

____________________
Print Child’s Name:

____________________
_______
Parent/Guardian’s Signature: Print Name: Date:

Relationship (e.g. mother, father, guardian):_______________________________
Appendix I.

Parent/Guardian Cover Letter

- Your child is invited to do a research survey about local foods, nutrition knowledge and food behavior. The survey is called “Connecticut Farm to School Survey.”
  - This is a 2-time survey (fall/spring term).
  - The survey includes less than 30 multiple choice questions about local food/nutrition knowledge and food behavior.
  - The survey also asks about your child’s age, gender, and grade.
  - Your child’s name or other personal information will not be included on the survey.
- We need to notify you before your child can fill out the survey.
  - The survey takes 20-30 minutes to complete.
  - The survey will take place during your child’s classroom health education.
- The results of the survey help us understand 3rd-5th graders understanding of local foods and some food behaviors.
- Your child’s school will receive a $100 gift to promote physical activity or nutrition/health activities.

- Please review the enclosed Parental Notification form.
  1. If you allow your child to participate, NO action is needed and you may KEEP the form.
  2. If you do not allow your child to participate, SIGN and RETURN the Refusal form.
     a. You may return the form any of the following ways:
        1. Return the form in person at the afterschool program.
        2. Send the form to school with your child.
        3. Fax the form to: Amy Mobley at 860-486-3674 (fax number)
        4. Scan and email it to: jesse.chiero@uconn.edu

Please contact Jesse Chiero at jesse.chiero@uconn.edu or 614-692-5674 or Amy Mobley at amy.mobley@uconn.edu or 860-486-5073 with any questions.
Appendix J.

Study Flyer

**Kids Wanted for a Research Study**

We are conducting a pre/post 20-30 minute research survey asking 3rd-5th grade Connecticut students questions about local food/nutrition knowledge and food behaviors.

**Who can participate?**
- Children entering, exiting or currently in 3rd-5th grade.
- Children able to read and speak English
- Children who’s parents/guardians have been notified prior to the survey

**What does this project involve?**
- The 20-30 minute survey asks student’s about local food/nutrition knowledge and food behaviors
- The survey also asks about the child’s age, gender, and grade.

**What are the benefits?**
- Your child’s school will receive a $100 gift to promote physical activity or nutrition/health activities.

**How will I be notified about this survey or get more information?**
- We will send home the Notification form and an Information Sheet the week of September ___.

You can contact Jesse Chiero at the University of Connecticut at 614-592-5674 or jesse.chiero@uconn.edu or the project director, Amy Mobley at amy.mobley@uconn.edu or 860-486-5073
Appendix K.

Child Verbal Assent

Project Leader: Dr. Amy Mobley
Project Name: Connecticut Farm to School Survey

Your parents/teacher have talked to you about being in a study. Dr. Mobley and her helpers want to learn more about what you know growing foods, foods grown in Connecticut and what vegetables you like to eat.

If you want to do the study, you will be asked to answer questions about food. There are no wrong or right answers. You will also be asked to write your age, if you are a boy or girl, and grade.

You can ask Dr. Mobley or one of the study helpers questions about the study. You don’t have to be in this study if you don’t want to. If you say yes, but change your mind, you won’t have to be in the study any more. You don’t have to answer any questions you don’t want to.

You can talk to your parents about the study before you decide if you want to be in it. You can keep this paper.
Appendix L.

Local vegetable messages positioned in school lunchroom
Appendix M. Local vegetable message displays
Appendix N.

Nutrition Behavior Survey
Connecticut Farm to School
Survey

Welcome to the Connecticut Farm to School Student Survey. We want to hear what you think about fruits and vegetables – thank you for helping us!

This is not a test and it will not affect your grades. Please answer every question, telling us what you really think. If you have questions you may ask your teacher or the adult in charge during this survey.

Today’s date: ______________________________

Month / day / year

I am a: □ Boy         □ Girl

I am in: □ 3rd Grade    □ 4th Grade    □ 5th Grade

I am: □ 8 years old     □ 9 years old    □ 10 years old

□ 11 years old         □ 12 years old

For office use only

Date: Location: ID:
Please tell us how you feel about vegetables.

1. How much do you like vegetables? [ ] a lot [ ] a little [ ] not very much [ ] not at all

2. When you try a new vegetable for the first time, how much do you usually like it? [ ] definitely [ ] probably [ ] probably not [ ] definitely not

3. How much do you like tasting new vegetables? [ ] definitely [ ] probably [ ] probably not [ ] definitely not

How do you feel about tasting new vegetables.

4. Will you taste a vegetable if you don’t know what it is? [ ] definitely [ ] probably [ ] probably not [ ] definitely not

5. Will you taste a vegetable if it looks strange? [ ] definitely [ ] probably [ ] probably not [ ] definitely not

6. Will you taste a vegetable if you have never tasted it before? [ ] definitely [ ] probably [ ] probably not [ ] definitely not

7. When you are at school, will you try a new vegetable? [ ] definitely [ ] probably [ ] probably not [ ] definitely not

8. How many times have you tried a new vegetable since school started this year? [ ] Never [ ] 1 time [ ] 2 times [ ] 3 times [ ] at least 4 times

   [ ] As plants
   [ ] As animals
   [ ] As minerals
   [ ] Something else

10. What part of a plant is a carrot? Please check one
    [ ] Leaf
    [ ] Root
    [ ] Stem
    [ ] Flower

11. Do insects play an important role in growing plants?
    [ ] Yes
    [ ] No
    [ ] I don’t know

143
1. **Do PINEAPPLES grow in Connecticut?**
   - [ ] Yes
   - [ ] No
   - [ ] I don’t know

2. **Do GREEN BEANS grow in Connecticut?**
   - [ ] Yes
   - [ ] No
   - [ ] I don’t know

3. **Does SQUASH grow in Connecticut?**
   - [ ] Yes
   - [ ] No
   - [ ] I don’t know

4. **Do BANANAS grow in Connecticut?**
   - [ ] Yes
   - [ ] No
   - [ ] I don’t know

5. Imagine you’re in the school cafeteria and your lunch tray has a hotdog on a bun and a glass of milk. **What food group is missing? Please check one**
   - [ ] Dairy
   - [ ] Fruits & Vegetables
   - [ ] Meat
   - [ ] Grains

6. **Why do I need to eat food?**
   - [ ] I need food for energy and to grow.
   - [ ] I need food ONLY because it tastes good.
   - [ ] I don’t need food.
   - [ ] I don’t know.

7. **Why do I need to eat different kinds of foods?**
   - [ ] I can get a lot of the SAME nutrients.
   - [ ] I can get many DIFFERENT nutrients.
   - [ ] I don’t need to eat different kinds of food.
   - [ ] I don’t know.
1. How sure are you that you can eat vegetables served with school lunch?
   - ☐ I know I can
   - ☐ I think I can
   - ☐ I’m not sure I can
   - ☐ I know I can’t

2. Have you ever eaten summer squash (also called zucchini)?
   ☐ Yes →→→ Did you like it?
   ☐ No →→→ Would you try it?

3. Have you ever eaten broccoli?
   ☐ Yes →→→ Did you like it?
   ☐ No →→→ Would you try it?
1. Have you ever eaten a beet?

☐ Yes ⇨ Did you like it? ☐ not at all ☐ not very much ☐ a little ☐ a lot

☐ No ⇨ Would you try it? ☐ Yes ☐ No ☐ Maybe

2. Have you ever eaten a butternut squash?

☐ Yes ⇨ Did you like it? ☐ not at all ☐ not very much ☐ a little ☐ a lot

☐ No ⇨ Would you try it? ☐ Yes ☐ No ☐ Maybe

3. Have you ever eaten kale?

☐ Yes ⇨ Did you like it? ☐ not at all ☐ not very much ☐ a little ☐ a lot

☐ No ⇨ Would you try it? ☐ Yes ☐ No ☐ Maybe
1. Have you ever eaten green beans?

☐ Yes →→→ Did you like it?  ☐ Yes ☐ No ☐ Maybe

2. Have you ever eaten a carrot?

☐ Yes →→→ Did you like it?  ☐ Yes ☐ No ☐ Maybe

3. Have you ever eaten corn?

☐ Yes →→→ Did you like it?  ☐ Yes ☐ No ☐ Maybe

Finished!
Appendix O.

Tests of ANOVA Assumptions: Pre-Intervention FtS Survey

I. Test of Homoscedasticity
Homogeneity of error in FtS pre-survey

<table>
<thead>
<tr>
<th>Levene's Test of Equality of Error Variance</th>
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<tbody>
<tr>
<td>Dependent Variable</td>
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<tr>
<td>--------------------</td>
</tr>
<tr>
<td>Attitude Pre Score</td>
</tr>
<tr>
<td>Knowledge Pre Score</td>
</tr>
<tr>
<td>Preference Pre Score</td>
</tr>
<tr>
<td>Overall Pre Score</td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

Design: Intercept + School
School df = 5, Student df = 260

II. Test of Independence of Observations
Independence of knowledge pre-score between schools

<table>
<thead>
<tr>
<th>Test of Between-School Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: Vegetable Knowledge Pre Score</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>F</th>
<th>Sig.</th>
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School df = 5

Independence of attitude pre-score between schools

<table>
<thead>
<tr>
<th>Test of Between-School Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: Vegetable Attitude Pre Score</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>School</th>
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<th>Mean</th>
<th>Std. Deviation</th>
<th>F</th>
<th>Sig.</th>
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School df = 5

Independence of preference pre-score between schools
### Test of Between-School Effects

Dependent Variable: Vegetable Preference Pre Score

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<th>F</th>
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School df = 5

Independence of overall pre-score between schools

### Test of Between-School Effects

Dependent Variable: Overall Survey Pre Score

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<th>Std. Deviation</th>
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<th>Sig.</th>
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School df = 5

III. Test of Normal Distribution of Sample (Central Tendancy)

Distribution of knowledge pre score data

![Distribution of knowledge pre score data](image)

Distribution of attitude pre score data
Distribution of preference pre score data
Distribution of overall pre score data
Appendix P.

Tests of ANOVA Assumption: Post-Intervention FtS Survey

I. Test of Homoscedasticity

Homogeneity of error in FtS post-survey

<table>
<thead>
<tr>
<th>Levene's Test of Equality of Error Variances(^{a,b})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable</td>
</tr>
<tr>
<td>---------------------</td>
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<tr>
<td>Attitude Post Score</td>
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<tr>
<td>Knowledge Post Score</td>
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<tr>
<td>Preference Post Score</td>
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<tr>
<td>Overall Post Score</td>
</tr>
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</table>

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

Design: Intercept + School

School df = 5, Student df = 233

II. Test of Independence of Observations

Independence of knowledge post-score between schools

<table>
<thead>
<tr>
<th>Test of Between-School Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: Vegetable Knowledge Post Score</td>
</tr>
<tr>
<td>School</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>High1</td>
</tr>
<tr>
<td>High2</td>
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</tr>
<tr>
<td>Control1</td>
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<tr>
<td>Control2</td>
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School df = 5

Independence of attitude post-score between schools

<table>
<thead>
<tr>
<th>Test of Between-School Effects</th>
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<tbody>
<tr>
<td>Dependent Variable: Vegetable Attitude Post Score</td>
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<td>High1</td>
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<tr>
<td>High2</td>
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<td>Low2</td>
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<tr>
<td>Control1</td>
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<td>Control2</td>
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School df = 5
Independence of preference post-score between schools

<table>
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<th>Sig.</th>
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School df = 5

Independence of overall post-score between schools

<table>
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<th>Std. Deviation</th>
<th>F</th>
<th>Sig.</th>
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School df = 5

III. Test of Normal Distribution of Sample (Central Tendency)
Distribution of knowledge pre score data
Distribution of attitude pre score data

Distribution of preference pre score data
Analysis of normality of Fts Survey distribution

<table>
<thead>
<tr>
<th>Tests of Normality of Data</th>
<th>Kolmogorov-Smirnov*</th>
<th>Shapiro-Wilk</th>
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<td>Statistic</td>
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</table>

*Samples, n > 50 assumed to be satisfy central tendency for normal distribution (Ghasemi, 2012)
Appendix Q.

Tests of ANOVA Assumption: Pre-Intervention Vegetable Choice

I. Test of Homoscedasticity

Homogeneity of error in baseline and post vegetable choice

Test of Homogeneity of Variance

<table>
<thead>
<tr>
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<td></td>
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<td>PostAvg</td>
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II. Test of Independence of Observations

Independence of baseline beet choice between schools

Test of Between-School Effects

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<th>N</th>
<th>Mean</th>
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School df = 5

Data standardized to number of participants in “hot lunch service”
Independence of baseline zucchini choice between schools

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<tr>
<td>Low2</td>
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<td>0.143</td>
<td>0.12</td>
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<tr>
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<tr>
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</tbody>
</table>

School df = 5
Data standardized to number of participants in "hot lunch service"

Independence of baseline kale choice between schools

<table>
<thead>
<tr>
<th>School</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High1</td>
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<td>0.06</td>
<td>4.297</td>
<td>0.520</td>
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<td>High2</td>
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<td>0.01</td>
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<tr>
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School df = 5
Data standardized to number of participants in "hot lunch service"

Independence of baseline green bean choice between schools

<table>
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<th>School</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High1</td>
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<td>0.04</td>
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<td>0.11</td>
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<td>0.04</td>
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<tr>
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<td>Control2</td>
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</tbody>
</table>

School df = 5
Data standardized to number of participants in "hot lunch service"
Independence of baseline butternut squash choice between schools

### Test of Between-School Effects

<table>
<thead>
<tr>
<th>School</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High1</td>
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<td>0.14</td>
<td>4.144</td>
<td>0.056</td>
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<tr>
<td>High2</td>
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<tr>
<td>Control1</td>
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<td>0.309</td>
<td>0.12</td>
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<td></td>
</tr>
<tr>
<td>Control2</td>
<td>2</td>
<td>0.143</td>
<td>0.03</td>
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<td></td>
</tr>
</tbody>
</table>

School df = 5
Data standardized to number of participants in "hot lunch service"

### III. Test of Normal Distribution of Sample (Central Tendancy)

Distribution of baseline beet choice data
Distribution of baseline zucchini choice data

Distribution of baseline kale choice data
Distribution of baseline green bean choice data

Distribution of baseline butternut squash choice data
Analysis of normality of vegetable choice distribution

<table>
<thead>
<tr>
<th>Tests of Normality</th>
<th>Kolmogorov-Smirnov&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>Beet Baseline</td>
<td>0.093</td>
<td>12</td>
</tr>
<tr>
<td>Beet Post</td>
<td>0.134</td>
<td>12</td>
</tr>
<tr>
<td>Zucchini Baseline</td>
<td>0.156</td>
<td>12</td>
</tr>
<tr>
<td>Zucchini Post</td>
<td>0.148</td>
<td>12</td>
</tr>
<tr>
<td>Kale Baseline</td>
<td>0.132</td>
<td>12</td>
</tr>
<tr>
<td>Kale Post</td>
<td>0.136</td>
<td>12</td>
</tr>
<tr>
<td>Green Bean Basline</td>
<td>0.160</td>
<td>12</td>
</tr>
<tr>
<td>Green Bean Post</td>
<td>0.134</td>
<td>12</td>
</tr>
<tr>
<td>Butternut Squash Baseline</td>
<td>0.131</td>
<td>12</td>
</tr>
<tr>
<td>Butternut Squash Post</td>
<td>0.178</td>
<td>12</td>
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</tbody>
</table>

Data standardized to number of participants in "hot lunch service"

<table>
<thead>
<tr>
<th>Tests of Normality</th>
<th>Kolmogorov-Smirnov&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>PreAvg</td>
<td>0.148</td>
<td>12</td>
</tr>
<tr>
<td>PostAve</td>
<td>0.150</td>
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</tr>
<tr>
<td>AvgChangePrePost</td>
<td>0.214</td>
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</tr>
</tbody>
</table>

<sup>*</sup> This is a lower bound of the true significance.
<sup>a</sup> Williams Significance Correction
Appendix R.

Tests of ANOVA Assumption: Post-Intervention Vegetable Choice

I. Test of Homoscedasticity

Homogeneity of error in baseline and post vegetable choice

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Levene Statistic</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beet Baseline</td>
<td>0.284</td>
<td>0.759</td>
</tr>
<tr>
<td>Beet Post</td>
<td>3.995</td>
<td>0.57</td>
</tr>
<tr>
<td>Zucchini Baseline</td>
<td>0.466</td>
<td>0.642</td>
</tr>
<tr>
<td>Zucchini Post</td>
<td>0.261</td>
<td>0.776</td>
</tr>
<tr>
<td>Kale Baseline</td>
<td>4.029</td>
<td>0.056</td>
</tr>
<tr>
<td>Kale Post</td>
<td>2.097</td>
<td>0.179</td>
</tr>
<tr>
<td>Green Bean Baseline</td>
<td>0.353</td>
<td>0.712</td>
</tr>
<tr>
<td>Green Bean Post</td>
<td>1.697</td>
<td>0.241</td>
</tr>
<tr>
<td>Butternut Squash Baseline</td>
<td>0.378</td>
<td>0.658</td>
</tr>
<tr>
<td>Butternut Squash Baseline</td>
<td>2.558</td>
<td>0.132</td>
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</tbody>
</table>

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

Design: Intercept + School
School df = 5, Student df = 260
Data standardized to number of participants in "hot lunch service"

II. Test of Independence of Observations

Independence of post zucchini choice between schools

<table>
<thead>
<tr>
<th>School</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High1</td>
<td>2</td>
<td>0.336</td>
<td>0.26</td>
<td>4.147</td>
<td>0.056</td>
</tr>
<tr>
<td>High2</td>
<td>2</td>
<td>0.483</td>
<td>0.04</td>
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<tr>
<td>Low1</td>
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<td>0.00</td>
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</tr>
<tr>
<td>Low2</td>
<td>2</td>
<td>0.298</td>
<td>0.09</td>
<td></td>
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</tr>
<tr>
<td>Control1</td>
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<td>0.01</td>
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</tr>
<tr>
<td>Control2</td>
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<td>0.03</td>
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</tr>
</tbody>
</table>

School df = 5
Data standardized to number of participants in "hot lunch service"
Independence of post zucchini choice between schools

<table>
<thead>
<tr>
<th>School</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High1</td>
<td>2</td>
<td>0.686</td>
<td>0.19</td>
<td>0.194</td>
<td>0.954</td>
</tr>
<tr>
<td>High2</td>
<td>2</td>
<td>0.499</td>
<td>0.26</td>
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<td>0.17</td>
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<tr>
<td>Low2</td>
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<tr>
<td>Control1</td>
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</table>

School df = 5
Data standardized to number of participants in "hot lunch service"

Independence of post kale choice between schools

<table>
<thead>
<tr>
<th>School</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.855</td>
<td>0.03</td>
<td>2.744</td>
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<td>0.403</td>
<td>0.39</td>
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<td></td>
</tr>
<tr>
<td>Low1</td>
<td>2</td>
<td>0.156</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low2</td>
<td>2</td>
<td>0.240</td>
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<tr>
<td>Control1</td>
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<td>0.39</td>
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<tr>
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</tbody>
</table>

School df = 5
Data standardized to number of participants in "hot lunch service"

Independence of post green bean choice between schools

<table>
<thead>
<tr>
<th>School</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
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School df = 5
Data standardized to number of participants in "hot lunch service"
Independence of post butternut squash choice between schools

**Test of Between-School Effects**

<table>
<thead>
<tr>
<th>School</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High1</td>
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<td>0.302</td>
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<td>3.902</td>
<td>0.064</td>
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</table>

School df = 5
Data standardized to number of participants in "hot lunch service"

**III. Test of Normal Distribution of Sample (Central Tendancy)**

Distribution of post beet choice data
Distribution of post green bean choice data

Distribution of post butternut squash choice data
### Analysis of normality of vegetable choice distribution

<table>
<thead>
<tr>
<th></th>
<th>Kolmogorov-Smirnov&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>Beet Baseline</td>
<td>0.093</td>
<td>12</td>
</tr>
<tr>
<td>Beet Post</td>
<td>0.134</td>
<td>12</td>
</tr>
<tr>
<td>Zucchini Baseline</td>
<td>0.156</td>
<td>12</td>
</tr>
<tr>
<td>Zucchini Post</td>
<td>0.148</td>
<td>12</td>
</tr>
<tr>
<td>Kale Baseline</td>
<td>0.132</td>
<td>12</td>
</tr>
<tr>
<td>Kale Post</td>
<td>0.136</td>
<td>12</td>
</tr>
<tr>
<td>Green Bean Baseline</td>
<td>0.160</td>
<td>12</td>
</tr>
<tr>
<td>Green Bean Post</td>
<td>0.134</td>
<td>12</td>
</tr>
<tr>
<td>Butternut Squash Baseline</td>
<td>0.131</td>
<td>12</td>
</tr>
<tr>
<td>Butternut Squash Post</td>
<td>0.178</td>
<td>12</td>
</tr>
</tbody>
</table>

Data standardized to number of participants in "hot lunch service"