

# Healthy School Food Collaborative

2016 Report



**SCHOOL HEALTH  
CONNECTION**

HEALTHY KIDS + HEALTHY COMMUNITIES

A Program of The Louisiana Public Health Institute



# Contents

- I. Executive Summary . . . . .4
- II. Meet the Team . . . . .6
  - Healthy School Food Collaborative . . . . . 6
  - Propeller: A Force for Social Innovation . . . . .6
  - Louisiana Public Health Institute’s Family Health Portfolio . . . . .6
  - External Partners . . . . .6
- III. Healthy School Food Collaborative Programming . . . . .7
  - Need for Healthy School Food Collaborative in Louisiana. . . . . 7
  - Healthy School Food Collaborative Phases I and II. . . . . 7
- IV. Phase III Program Evaluation Goals . . . . . 8
- V. Phase III Methodolog. . . . . 8
  - Plate Waste . . . . .8
  - Intervention. . . . .9
  - Menu Analysis. . . . .9
- VI. Phase III Results. . . . .10
  - Hypothesis 1 and 2. . . . . 10
  - Lunch Consumption. . . . . 10
  - Satisfaction Survey . . . . . 13
  - Focus Groups. . . . . 14
  - Lunch Time and Intervention Monitoring . . . . .17
  - Consumption Results Summary . . . . .19
  - Evaluation Goals 3 and 4. . . . .20
  - Assessment of Nutritional Content. . . . .20
  - Average Nutritional Content. . . . . 21
  - Assessment of Nutrtrional Stardards Among HSFC Contracted Foods Service Providers. . . . 23
  - Results. . . . . 23
  - Conclusion. . . . .24
  - Evaluation Goal 5. . . . .24
- VII. Discussion . . . . .25
- VIII. Limitations. . . . .26
- IX. Future Directions.. . . . .27
- X. Conclusion. . . . . 27

XI. Endnotes . . . . .28

XII. Appendix . . . . .30

    Appendix A: Additional Tables . . . . . 30

    Appendix B: Lanscape Analysis . . . . . 34

# Executive Summary

## Introduction

This report presents the Phase III results of a project aimed at assessing the Healthy School Food Collaborative (HSFC), whose mission is to provide healthy food to schools and promote the health of students. Phase III included both a research component and an evaluation component. The research component examined the effect of two different interventions on student consumption, and the evaluation component examined the nutritional and ingredient content of HSFC and non- HSFC school food vendors. Detailed results of Phases I and II are available upon request and they served as the impetus for examining student consumption. One consistent finding from Phases I and II was that students were consuming approximately half the calories that are recommended by the United States Department of Agriculture (USDA). Ultimately, the nutritional quality of food has less benefit if the students do not consume the full recommended amount. Thus, Phase III experimental component was designed to examine low cost interventions that may increase consumption. Several factors were identified as potentially influencing the consumption of school food by students. First, previous secondary research and Phase II findings suggest that having recess before lunch rather than after increases consumption. Second, research suggest that the quality of the cafeteria environment, including factors such as cleanliness, warmth, rapport with kitchen staff, and atmosphere created by disciplinary procedures are potential factors influencing consumption. Finally, findings suggest that nutrition education and social support for healthy eating are associated with increased consumption. Consequently two intervention protocols were implemented. The first intervention, is referred to as the “policy only intervention,” which switched recess from after lunch to before lunch. The second intervention, is referred to as “comprehensive intervention,” which included a variety of strategies that were designed to work together to increase consumption and is described fully in the report.

Three schools participated in Phase III, and all three had meals provided by the same food vendor. Participating schools had similar demographic and socio economic characteristics, with almost all (average 96%) of the students participating in free or reduced lunch programs. Of the three participating schools, one school provided recess after lunch and as part of the policy intervention, switched to recess after lunch in the spring. The other two schools received a “Comprehensive Intervention” which included cafeteria environment changes, staff trainings, nutrition education, and changes to cafeteria policies. Each of the schools served as its own comparison by examining student lunch consumption before and after interventions were implemented.

Baseline data was collected in the Fall of 2015. Several forms of data were collected pre and post intervention. At baseline, plate waste of the lunch meal was conducted at each school. The plate waste findings revealed equal consumption levels amongst participating schools (no significant difference in consumption). Student satisfaction with the food was assessed via surveys and focus groups. A common theme from the surveys and focus groups was student dissatisfaction with the food quality and flavor. Additionally, observational data was collected to assess the cafeteria environment for factors such as cleanliness, staff engagement with students, and presence of competitive foods. These environmental scans provided a baseline assessment of the environment and also informed school specific needs for the interventions.

Interventions were then implemented in the Spring of 2016. Each school was monitored for fidelity to the intervention. The two categories of intervention were: “Comprehensive Intervention” and “Policy Only Intervention.” The two schools that participated in the “Comprehensive Intervention” will be referred to as “Intervention School One” and “Intervention School Two” throughout the report. The school participating in the “Policy Only Intervention” will be referred to as the “Recess School” throughout the remainder of the report. Ongoing feedback and opportunities for technical assistance regarding implementation was provided to the “Comprehensive Intervention” schools.

The Recess School showed a significant increase in the number of calories consumed. Both schools that participated in the “Comprehensive Intervention” showed a significant decrease in the number of calories consumed. A regression analysis was conducted to examine the relationship between intervention fidelity and consumption. Results showed that higher fidelity to the intervention was associated with higher consumption.

# Healthy School Food Collaborative 2016 Evaluation Report

## Meet the Team

### The Healthy School Food Collaborative

The Healthy School Food Collaborative (HSFC), developed by Propeller: A Force for Social Innovation and funded by the W.K. Kellogg Foundation, is a School Food Authority for charter schools in New Orleans. A School Food Authority oversees the operations of a school feeding program by ensuring eligibility requirements are met for school food, in addition to receiving federal meal reimbursements. The Healthy School Food Collaborative was created in response to the national obesity epidemic with a shared belief among partners that Louisiana schools have a unique position to institutionalize healthy lifestyles through nutritional standards, nutritional education, and increased access to fresh and healthy food in schools. The HSFC holds school vendors accountable to raised nutritional standards and food quality standards.

### Propeller: A Force for Social Innovation

Propeller: A Force for Social Innovation is a New Orleans hub for collaboration and innovative change. As a New Orleans-based nonprofit organization founded in 2009, Propeller seeks to create social, environmental, and economic impact in New Orleans by incubating ventures that have the potential to solve our city's most pressing issues - including the ongoing obesity epidemic within Louisiana. The HSFC was initially a Propeller initiative.

### Louisiana Public Health Institute's Family Health Portfolio

Over the past three years, LPHI's Family Health Portfolio has provided programming and evaluation support to the HSFC. The investment has served to further Family Health's mission of promoting healthy school communities so that children and youth in the Greater New Orleans area can reach their full potential. Family Health works in schools throughout the Greater New Orleans area to support nutrition education programming, increase healthy eating and physical activity among school students and staff, and expand health services. A key component of Family Health's work is supporting changes in school nutritional services, with an ultimate goal of increasing consumption of healthy foods and decreasing the child and adolescent obesity trend. In 2013, the Family Health portfolio entered into a partnership with the HSFC to evaluate the initiative's impact in New Orleans public schools.

### External Partners:

- Arise Schools (Arise Academy, Mildred Osborne Charter School)
- ReNew Schools (McDonogh City Park Academy)
- Revolution Foods
- The Cookbook Project
- The Goldring Center for Culinary Medicine
- HSFC LLC (James Graham)

We would particularly like to thank the W.K. Kellogg Foundation for funding this program, evaluation, and ongoing efforts to increase consumption of healthy foods and reduce childhood obesity in New Orleans.

## Healthy School Food Collaborative Programming

### Need for Healthy School Food Collaborative in Louisiana

The state of Louisiana has one of the highest rates of overweight and obese children and adolescents in the United States. Louisiana is ranked fifth-highest in the country in obesity<sup>i</sup> with approximately one in three Louisiana children being overweight or obese.<sup>ii</sup> There is a growing number of young children that are becoming overweight and obese. Sixteen percent of Louisiana's children ages two to five, were overweight, and 12.3% were obese.<sup>iii</sup>

In New Orleans, 87% of residents live in “food deserts”, or locations more than one kilometer from a grocery store; many are primarily African American and live in lower socio-economic status neighborhoods.<sup>iv</sup> The food options of residents are often limited to the selection available at neighborhood convenience stores that typically offer a limited amount of fruits and vegetables and a higher snack to fruit/ vegetable ratio, than grocery stores or supermarkets.<sup>v</sup> Lack of access to nutritious foods has a detrimental effect on the health of all neighborhood residents, especially children and adolescents.

African American students comprise 90% of the New Orleans Public Schools' student population, and many of those students live in food deserts.<sup>vi</sup> School meals can constitute up to 47% of children's and adolescent's daily energy.<sup>vii</sup> In New Orleans, 82% of public school students qualify for free or reduced-priced lunch; thus, school lunches can provide an important opportunity to positively affect the food consumption patterns of this student population.<sup>viii</sup>

However, school meals need improvement. The Third School Nutrition Dietary Assessment Study found that less than one third of schools in the study offered lunches that met federal standards for total fat and saturated fat. In addition, 42% of school lunches did not offer a fresh fruit or raw vegetable daily.<sup>ix</sup>

### Healthy School Food Collaborative Phases I and II

LPHI's Family Health Portfolio, in partnership with the HSFC, collaborated to evaluate the impact of HSFC on student consumption of healthy school lunches. Phase I and II of the HSFC evaluation were conducted in 2013 and 2014 respectively. Phase I was a pilot phase that was designed to test the feasibility of using the plate waste method in local schools and compared different school food authority menus for nutritional content. Phase I included grades K-5 at eight schools and measured the food consumption at a single lunch-period per school. Phase II of the HSFC evaluation collected plate waste data at eight schools on 40 consecutive school days to enhance the reliability of the data. Instead of including all grades, Phase II only looked at students in grades 4<sup>th</sup> and 5<sup>th</sup>. Satisfaction surveys were also administered to students twice during the data collection period at each school and collected information about environmental characteristics of the cafeteria. Both Phase I and Phase II included schools across a variety of food vendors in New Orleans. The most critical finding that Phase I and II discovered was that students throughout the eight schools were consuming around 50% of the 550-650 calories that the USDA recommends for children in that age range. There were slight differences between what was being consumed across food vendors, such as students from one vendor consuming more vegetables and milk and another vendor consuming more of their entrée and fruit; however, all students (regardless of vendor) were consuming significantly less food than recommended.

## Phase III Program Evaluation Goals and Hypotheses

Phase III built on Phases I and II and included three charter schools that all used the same food vendor, all of which were members of the HSFC. Schools with the same food vendor were chosen to provide consistency in the food being served.

The main hypotheses of this initiative were:

- The comprehensive intervention will increase school lunch consumption.
- The policy change (recess) will increase school lunch consumption.
- Food served at HSFC schools has better nutritional content than food served at non-HSFC schools.
- HSFC membership improves the food quality of school meals.

An additional goal of the evaluation was:

- To determine if HSFC schools were serving food that exceeded USDA standards and met HSFC standards.

## Phase III Methodology

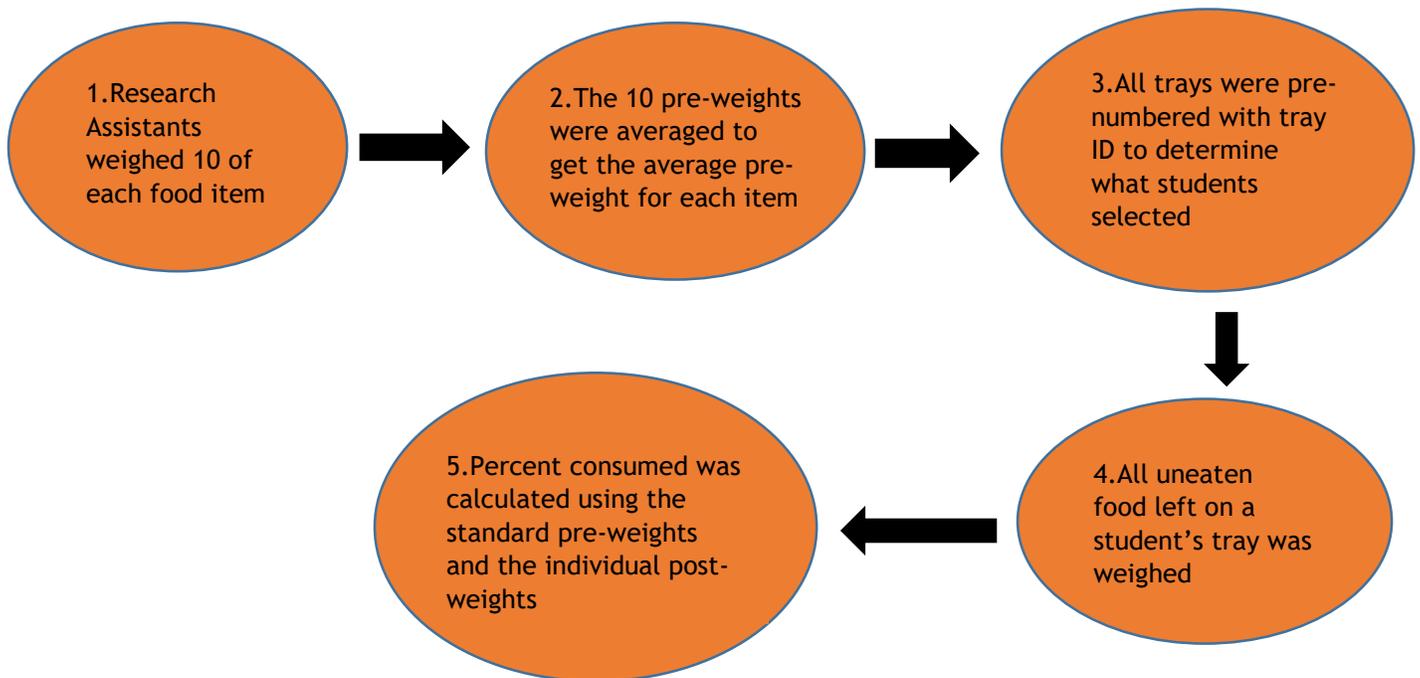
### Plate Waste

The plate waste methodology has become a powerful tool in school food research and allowed researchers to quantify participant consumption by measuring the participant's uneaten food and comparing that value to a "pre-meal" value. The current study used a weight methodology (see fig. 1), whereby a standard "pre-weight" for each food item was determined prior to the beginning of the meal and a "post-weight" measure of the weight of the leftover food for each student was measured at the end of the meal. These weight measurements were used to calculate the percent consumed of each item.

A team of nine research assistants were hired to assist the Family Health team with plate waste data collection. All research assistants and school lunch staff were trained on the study's protocol prior to data collection. Research Assistants were trained on their particular role during each of the weight days of the study period, what data to record, how to use the equipment (scales and computer) and the study's procedures for set up and clean up.

The Research Assistants were responsible for on-site plate waste data collection, completion of the lunchtime monitoring tool, and completion of fidelity monitoring tool in the spring. Student satisfaction surveys and environmental scans of the cafeteria were completed by Family Health staff once during the fall data collection and once during the spring data collection.

**Figure 1: Weight Methodology: Steps for determining student consumption**



## Intervention

Between the fall and spring plate waste data collection, the HSFC implemented interventions at three charter schools. Intervention School One and Intervention School Two implemented multi-component interventions and the Recess School implemented a switch from recess after lunch to recess before lunch. The multi-component intervention that was implemented at Intervention School One and Intervention School Two ran for eight weeks in the spring, where the last four weeks of the intervention coincided with four weeks of plate waste. The multi-component intervention had four aspects: a student level, a staff level, a parent level, and a cafeteria level. The student level was a nutrition education class for all 4<sup>th</sup> and 5<sup>th</sup> graders that occurred twice a week for 15 minutes per class throughout the eight week intervention. The staff level provided school lunch vouchers to staff in order to model healthy eating behaviors. The parent level consisted of sponsoring a parent night event where school food was provided and parents were surveyed on their knowledge and their children's perceptions of the school food. The cafeteria component consisted of an inservice training for cafeteria staff, where staff were taught different ways to engage with students, the importance of posting the school lunch menu, preparation of food, and strategies to increase student consumption, such as placing vegetables first in the lunch line. Cafeteria staff were also given a checklist that they could follow every day to ensure that they were implementing the strategies learned during the inservice training. The Recess School switched recess prior to lunch for the duration of the intervention, eight weeks, and chose to maintain recess before lunch for the remainder of the school semester.

## Menu Analysis

A menu analysis is an investigation into the nutritional composition of all of the meal items that are served within a single menu. Nutritional content for all lunches offered during the months of October 2015, November 2015, February 2016 and March 2016 were requested and received for all food vendors. Daily averages per nutrient (sodium, carbohydrates, total fat, and saturated fat) were organized by date

and food vendor and then entered into a spreadsheet for comparison. One nuance to this methodology was that some food vendors offered more than one entrée, fruit, or vegetable option per day. Thus, in order to quantify the average of nutrients offered by food vendor for each meal on a particular day, daily weighted averages of each nutrient were constructed depending on the popularity of the item. These values were given to the researchers directly from food vendors and were based off of inventory calculations. Results can be seen in appendix A.

## Focus Groups

Focus group data was collected at each school. All three schools were supposed to participate in both the fall and spring, but Intervention School One did not participate in fall focus groups despite repeated attempts to schedule them. Two focus groups were completed with each grade and 5-10 students participated in each group. A total of 10 focus groups were conducted. Informed parental consent and student assent were obtained prior to participation.

## Phase III Results

### Hypothesis 1 and 2: To determine if an intervention (Hypothesis 1) and/or policy change (Hypothesis 2) leads to increased school lunch consumption

Baseline data was collected in the fall of 2015 and was scheduled for 20 days of data collection. Analysis of Phase II data suggested a minimum of 15 days of data was needed for stable results. Additional days of data collection were included in case days were missed or the data was invalid. During data collection there were days where inclement weather, field trips, state testing, or professional development prevented data collection, but more than 15 days of data was collected at each school. Four types of data were collected in the fall. Consumption data was collected as described above and student satisfaction surveys were administered. Lunch Time Monitoring tools were administered each day of data collection in the fall at all three of the schools. Lunch time monitoring tools were administered by research assistants and recorded the cleanliness of the cafeteria and kitchen, school lunch menu postings, visual quality of the food, silent vs. social lunches<sup>1</sup>, teachers eating lunch in the cafeteria, if recess was held as planned, and if students were given competitive food as a reward. “Competitive food” is the term used for any food present in the cafeteria that is not part of the provided meal. Finally, focus groups were conducted with students at two of the schools because scheduling and consent issues prevented completing focus groups at all three schools. Follow-up data collection in the spring followed the same protocol as in the fall baseline collection with the inclusion of the intervention fidelity monitoring tool.

All three schools shared similar demographics; over 90% African American and over 90% qualified for free or reduced lunch. The schools were approximately the same size (120 students from 4<sup>th</sup> and 5<sup>th</sup> grade combined), and all shared the same food vendor. Thus, the three schools that participated in the Phase III intervention were comparable.

**Lunch Consumption.** Baseline data was collected in the fall of 2015 to confirm that there were no significant differences in consumption between the schools at baseline (see fig. 2). All three schools used the same food vendor, and while individual items on specific days did vary, the overall menu for all schools was the same. The only significant difference at baseline was that one school only offered chocolate milk on limited days while the other schools offered it every day. To assess the differences in consumption an ANOVA analysis was conducted examining the difference in average calories consumed.

---

<sup>1</sup> Silent lunch refers to any lunch period where students are punished by being forced to eat in silence for a portion or all of the lunch period. Social lunches are those where this does not occur.

An ANOVA analysis looks at the variance in the data to determine if there is a difference in the means between two or more groups. The result was that there was no significant differences in consumption.

**Figure 2: Baseline Consumption: Average Calorie Consumption by School**

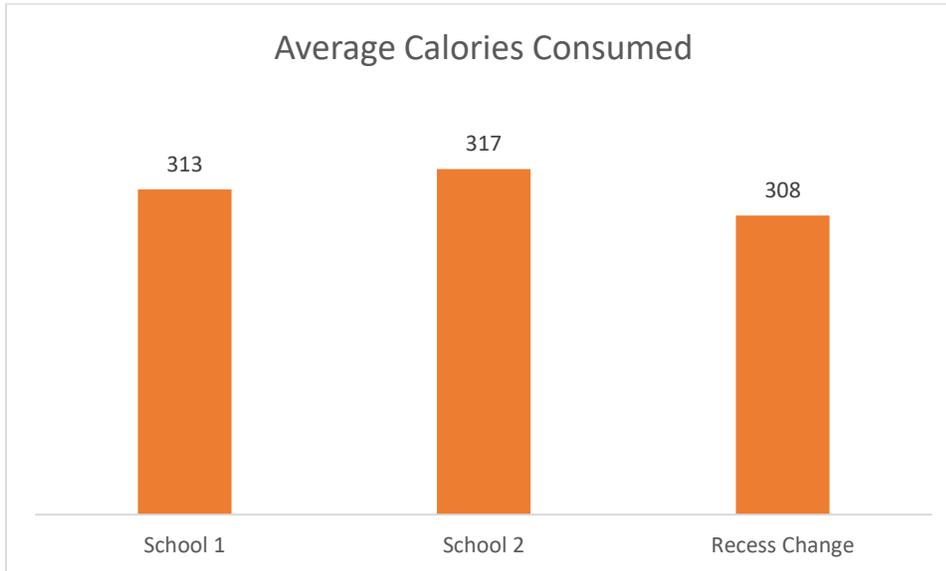
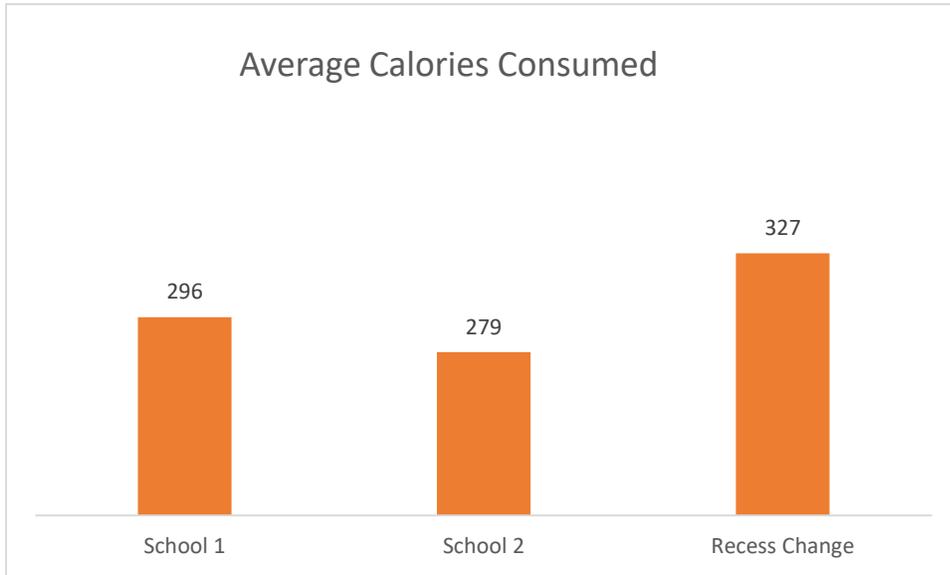


Plate waste was conducted in the spring following the recess switch at the Recess School and began during the last four weeks of the comprehensive intervention at Intervention School One and Intervention School Two. While there were no significant differences between the three schools' consumption in the fall (defined as average calories eaten), there were differences in the spring. In order to test if there was a change in student consumption as a result of the interventions, an independent sample T-test was conducted for each school. A T-test is a statistical test used to determine if the observed difference between two means (or averages) is a real or actual difference. The T-test found a significant increase in consumption at the school where the recess schedule was changed from after lunch to before lunch ( $t = 3.01, p < .05$ ), but the effect size was small ( $d = .12$ ) (see figure 4). There was a significant decrease in consumption for both schools that participated in the comprehensive intervention ( $t = -2.82, p < .05$  and  $t = -6.33, p < .05$ ), and the effect size for the first was small ( $d = .11$ ) and medium for the second ( $d = .24$ ) (see figures 5 and 6).

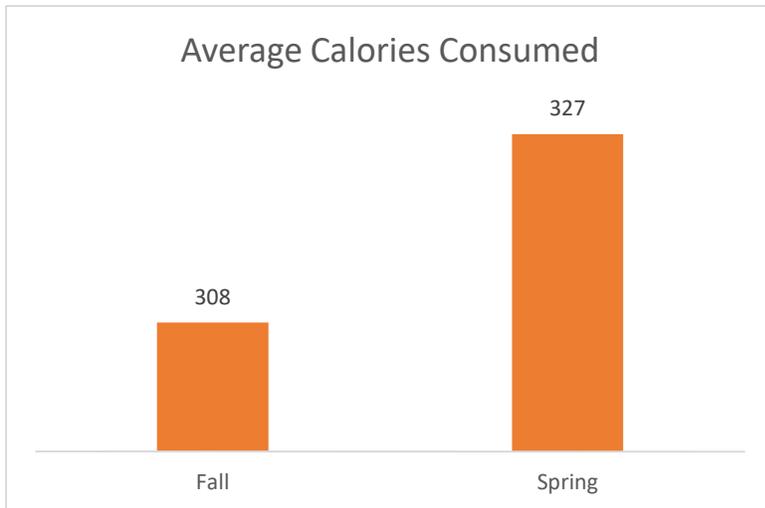
While the decrease in consumption at Intervention School One and Intervention School Two was counter intuitive, environmental variables that were previously discussed may have had an impact on consumption. Thus, a regression analysis was used to examine the relationship between student consumption and variables that were determined in the literature to impact lunch consumption. A regression analysis attempts to understand the complex relationship between an outcome and predictor variables of interest. The environmental predictor variables included in the regression analysis were competitive food as a reward, competitive food brought to school by students, occurrence of silent lunch, whether the menu was posted in the cafeteria, if the vegetable was placed first in the lunch line, the smell of the cafeteria, and whether spices were available. These variables were recoded so that higher scores represented greater fidelity to the intervention and increased factors that should promote consumption. For instance, competitive food presence and silent lunches both decrease consumption as

they increase in frequency, and therefore were reverse coded. After the variables were recoded they were combined into an index variable. The regression analysis found that the environmental factors, which the intervention sought to improve, had a significant positive effect on consumption ( $B = .06, p < .01$ ). This suggests that while the intervention had a positive association with consumption, it was not strong enough to overcome all external variables that had a negative effect on consumption.

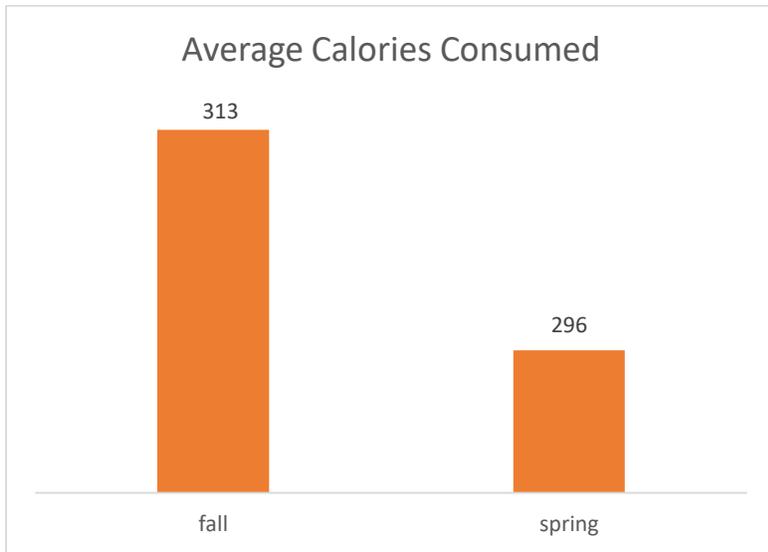
**Figure 3: Average Calorie Consumption in the Spring Semester by School**



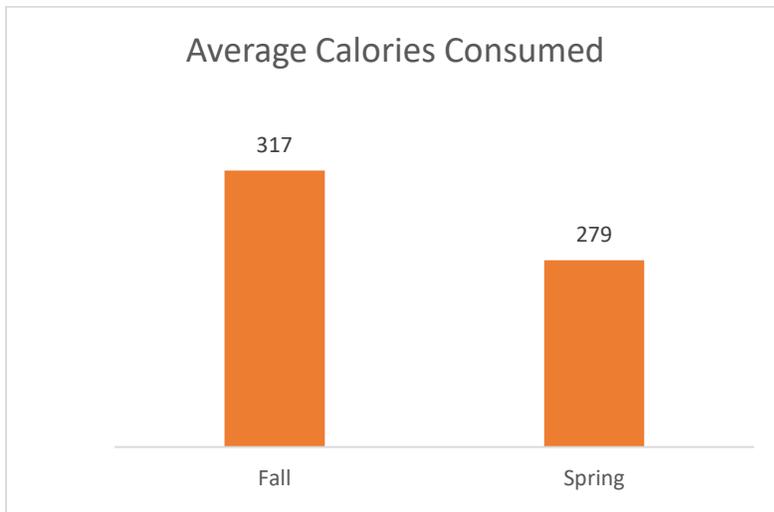
**Figure 4: Comparison of Average Calories Consumed at the Recess School Between the Fall and Spring Semester**



**Figure 5: Comparison of Average Calories Consumed at Intervention School One between the Fall and Spring Semester**



**Figure 6: Comparison of Average Calories Consumed at Intervention School Two Between the Fall and Spring Semester**



**Student Satisfaction Survey.** There were some significant differences between the schools at baseline. Intervention School Two students were more likely to say they never like the taste of food. Recess School and Intervention School Two students were more likely (81% and 69% vs. 63%) to bring their own snacks to school. Students at Intervention School Two were less likely to say they were

hungry after lunch (51% vs 42% and 35%) and more likely to say they are not able to name all the foods at lunch (53% vs 42% and 38%). Finally, students at the Intervention School One were more likely to describe the food as always healthy (40% vs 28% and 23%). To assess any changes in student satisfaction, a follow up survey was administered during the spring data collection. There were no significant changes. This is consistent with the focus group data concerning students' perception of the food as being of low quality.

**Focus Groups.** Focus groups were conducted with the 4<sup>th</sup> and 5<sup>th</sup> grade students at Intervention Schools and the Recess School in the fall and spring. Focus groups were not conducted at Intervention School One in the fall due to scheduling constraints and difficulty with obtaining consent for students to participate. The focus groups covered a variety of topics including the school lunch, cafeteria environment, nutrition knowledge and attitudes, and provided an opportunity to identify unanticipated factors that may influence student consumption.

**Fall Focus Groups.** Fall focus group themes included perception of food quality, length of the lunch period, understanding of diet related health outcomes, social v. silent lunch, availability of water, relationships with cafeteria staff and cafeteria aesthetics.

### Perceptions of Food Quality

While a small number of students described the food as ok or good the vast majority of students expressed dislike for the food. When asked to clarify what factors led to this assessment of the food,

---

*"I know the food can't taste good because it has to be healthy" Recess School*

---

several common factors emerged. Students expressed that the food was often not "properly prepared" with "soggy bread", "cold" items, "hard rice or pasta", and "discolored" or "moldy" food being the most common complaints. Students also described the food as "bland" or "flavorless". When students were

---

*"The food might hurt their stomach." Intervention School Two*  
*"It'd (the food) might make them sick" Recess School*

---

asked what they did like about the food, the most common answer was the fruit, but a few items like the nuggets were also popular. Students described the food as "healthy"; however, this was also associated with the "bad" taste of the food. Students stated that they would not try food if they didn't recognize it. Students expressed desire for spices to give the food more flavor. When students were asked if they would want their teachers to eat the school lunch, most said no.

### Length of the lunch period

Students stated that there was not enough time to eat. In addition, students described how discipline problems further exacerbate the short lunch times by delaying them from getting to the cafeteria.

---

*“Both 4<sup>th</sup> grade classes do not listen, that’s why we be running late (unintelligible) both 4<sup>th</sup> grade classes do not listen that’s why we have less time to eat lunch”  
Intervention School Two*

---

#### Understanding of Diet Related Health Outcomes

Students were asked to describe the health benefits of eating healthy, and the consequences of eating unhealthy foods. Students were better able to describe specific consequences to eating unhealthy foods such as diabetes, heart attack, and high blood pressure. The benefits of healthy eating were vague like “energy” or “nutrition” and were often stated as the prevention of negative consequences.

---

*“You eat healthy food so you won’t get fat.” Student  
Intervention School Two*

---

#### Social V. Silent Lunch

Students consistently said that being able to socialize with friends was the best part of lunch. In addition, the students at Intervention School Two stated that having to remain silent during lunch was a barrier to enjoying their lunch time.

#### Availability of Water

The students were inconsistent in their understanding of whether or not they were permitted to get water during lunch. Student responses included “yes,” “no”, or that permission from a teacher was required.

#### Relationship with Cafeteria Staff & Cafeteria Aesthetics

---

*“The cafeteria used to be gray, but now it has better style, kind of like a high school.” Recess School*

---

While there was consensus between the Intervention and Recess Schools, there were a few areas where the schools differed. Students at the Recess School had more positive perceptions of their cafeteria environment. In addition, Recess School students said that they liked the cafeteria workers. In contrast, students had negative perceptions of the cafeteria workers at Intervention School Two. However, students wanted to know the cafeteria workers better.

**Spring Focus Groups.** Focus groups were also conducted in the spring to assess students’ reactions to the interventions. In addition to Intervention School Two and Recess School, Intervention School One also participated in follow up focus groups. Focus group questions were centered around different components of the intervention and included similar topics that were discussed during the fall focus groups. There was consensus across schools on many topics, and the results were consistent with the fall focus groups. Spring focus group themes included perceptions of food quality, silent v. social

lunch, relationships with cafeteria staff and cafeteria aesthetics, policy change, comprehensive intervention components, and competitive foods.

### Perceptions of Food Quality

The perception of the food remained unchanged, and many of the same complaints about specific quality issues were still present, such as soggy buns and under cooked rice. Fruit remained the most popular food item.

### Social V.Silent Lunch

The ability to socialize remained students' favorite part of lunch.

### Relationships with Cafeteria Staff & Cafeteria Aesthetics

One change from the fall focus groups, was that students in the spring were more likely to describe the cafeteria as being dirty. Students at Intervention School Two also mentioned a strange smell in the cafeteria.

### Policy Change (Recess)

At the Recess School, HSFC staff asked several questions about the recess switch to gauge student reactions to the change. Students reported that they preferred recess after lunch. The students were then asked why they liked recess after lunch. Students liked having recess by themselves (that is, with no other grades). When the recess schedule was switched it meant that these students had to share the playground with older students. Unfortunately, this resulted in some bullying and inequitable sharing of playground equipment. When these issues were set aside, students, in general, preferred recess before lunch. Students also reported that they felt having recess before lunch made them hungrier.

### Comprehensive Intervention Components (Nutrition Education & Spices)

At Intervention School One and Two, overall students reported enjoying the nutrition education curriculum and learning a lot. One student stated, "I liked the activities, they were a good opportunity to express what you learned." Students identified learning about the origins of their food as their favorite activity during the nutrition education classes. While the students learned from the nutrition class, they did not feel it related to the cafeteria. One student stated, "What I learned from the class is that making healthier choices is good, but not at this school. At this school healthy choices means nasty food." An unanticipated consequence of the nutrition education program, was that some students upon graduating from the program, thought that they would get better food and were disappointed when there was no change in food quality. Students were given a "graduation" certificate as part of completing the program, which is a positive thing that they liked.

Students had mixed reactions to being offered spices at Intervention School One. An unintended consequence was that students had to use the spice station before leaving the lunch line. This reduced the amount of time that students could consume their lunch. Consequently, there was some social pressure not to try the spices. Also, while identified, the students were not familiar with using individual spices like "garlic powder." Students are familiar with pre-mixed spice blends, in particular Tony's and Slap Ya Momma, or hot sauce. Students said they would have used those spices more. However, these products are high in sodium and can't be included in school lunch. Nevertheless, one student said they tried the spices and liked that they were available.

## Competitive Foods

---

*"I always be hiding snacks and they never catch me. Look I have some right here." Intervention School One*

---

Students reported that when they chose not to eat the school lunch, some compensated by consuming calorie dense and nutritionally void foods. One student in particular described at length and with pride his ability to smuggle snacks into school (see above).

**Lunch Time and Intervention Monitoring.** Intervention School One's lunch periods were observed for 18 days in the fall. Intervention School One was rated as clean on 100% of the days observed (see table 4 in appendix B). Food quality was described as "good" 72% of the days observed and "fair" 28% of the days observed (see table 4 in appendix B). Note, food quality was a visual assessment, not a taste assessment. Silent lunch occurred during at least one lunch period on 22% of the days in the fall (see table 4 in appendix B). Silent lunch was a tactic that teachers used as punishment when students were bad in class or were loud in the cafeteria. In addition, on 50% of the days observed students were given competitive food as a reward during lunch, such as chips, pizza, or candy (see table 4 in appendix B). These rewards were given to students who performed well on a test or behaved well in class.

Lunch at Intervention School Two was observed on 19 school days in the fall. Intervention School Two's cafeteria was rated as clean on at least 90% of the days observed (see table 4 in appendix B). Floors were not always swept and the tables and benches were not always cleaned. The visual quality of the food was considered "poor" 5% of the days observed, "fair" on 68% of the days observed, and "good" 27% of the days (see table 4 in appendix B). Silent lunch occurred during at least one lunch period on 68% of the days observed (see table 4 in appendix B). During the four weeks that lunch was observed at Intervention School Two, there was a week when the students did not get to have recess as a punishment for being loud. The teachers at Intervention School Two never provided students with competitive foods as a reward (see table 4 in appendix B).

The Recess School's lunches were observed on 19 days in the fall. The Recess School was rated as clean on at least 90% of the days observed (see table 4 in appendix B). Floors at the recess school were not always swept, the cafeteria didn't always smell pleasant, and the serving area wasn't always kept clean. The visual quality of the food was described as "fair" on 50% of the days and "good" on 50% of the days (see table 4 in appendix B). There were no days at the Recess School that silent lunches occurred and teachers never provided students with competitive foods during lunch time.

Lunch time monitoring was conducted in the spring semester during plate waste data collection. Intervention School One did not see significant changes with regards to cleanliness of the cafeteria, with research assistants reporting a clean dining area, serving area, and kitchen on 100% of the days observed (see table 5 in appendix B). The visual quality of the food was described as "fair" on 6% of the days and "good" on 94% of the days (see table 5 in appendix B). Students were given competitive food during lunch as a reward in the spring semester, on 53% of the days observed, which is similar to the 50% of days observed in the fall (see table 5 in appendix B). A major difference between the fall and the spring at Intervention School One was that silent lunches occurred during at least one lunch period on 67% of the days in the spring, compared to 22% of the days in the fall (see table 5 in appendix B).

Intervention School Two saw similar results in the lunchtime monitoring tool in the spring as in the fall. One difference that was noted is that the cafeteria smelled pleasant only 80% of the time in the

spring, compared to 100% of the time in the fall (see table 5 in appendix B). The smell of the cafeteria was also noted by HSFC staff and the cafeteria was closed one day as a result of the odor. The smell was not easily described or compared to other known smells, but it was unpleasant. Visual food quality was described as “fair” 86% of the days and “good” 14% of the days observed (see table 5 in appendix B). Silent lunches was another difference in the spring verses the fall. Silent lunches occurred during at least one lunch period on 68% of the days in the fall and decreased to 53% of the days in the spring (see table 5 in appendix B). This is a significant amount of lunches affected by this disciplinary tactic.

The Recess School saw similar results with regards to the lunchtime monitoring tool in the spring as the fall. The dining area, serving area, and kitchen were clean on 100% of the days observed. The visual quality of the food was described as “fair” on 7% of the days and “good” on 93% of the days(see table 5 in appendix B). Unlike the other schools, lunches were social on 100% of the days observed (see table 5 in appendix B).

In addition to conducting lunchtime monitoring at all three schools in the spring, research assistants also completed intervention fidelity monitoring at Intervention School One and Intervention School Two. The Fidelity Monitoring Tool was completed in order to determine if the intervention was running as intended. While the same intervention was implemented at both Intervention School One and Intervention School Two, the fidelity monitoring responses identified differences in how the interventions were being implemented at the two schools.

A significant component of the intervention was the cafeteria environment. Menus were to be displayed on a white board in the cafeteria every day so that students knew what was for lunch and to create appeal for the item being served. The menu was posted accurately on the white board 83% of the days at Intervention School One and 52% of the days at Intervention School Two (see table 6 of appendix B). Engagement of the staff with the students was another component of the cafeteria environment intervention. This was defined as the staff talking to the students in any way besides requesting that they take the minimum number of food items in the cafeteria, such as asking how their day was going or talking about the food. The staff was described as little or somewhat engaged 67% of the days at Intervention School One and 28% of the days at Intervention School Two (see table 6 of appendix B). Availability of spices for students to use to make their food more flavorful was the third component of the cafeteria environment intervention. Spices were available for students to use 100% of the days at Intervention School One and 0% of the days at Intervention School Two (see table 6 of appendix B). The staff at Intervention School Two stated that they ordered the spices but that they were never delivered.

The second component of the intervention was the provision of teacher lunch vouchers. Free lunch was provided for teachers at both of the intervention schools during the intervention period. Teachers who received the lunch vouchers had to work directly with fourth and fifth grade students and be on duty during the period that these students were in the cafeteria eating lunch. Teachers were provided information on the recommended frequency to eat the lunch, two to three times a week, and provided with reminders to rolemodel healthy eating. Teachers were not required to eat the entirety of the lunch. The median number of teachers who consumed the school lunch on any given day at Intervention School One was three and at Intervention School Two was one. While the teachers were instructed to consume the lunch in the cafeteria with the students, the teachers at Intervention School One took the lunch out of the cafeteria on 33% of the days, while teachers at Intervention School Two ate lunch in the cafeteria 100% of the time (See table 7 of appendix B). Research assistants also observed what component of the lunch the teachers were most likely to eat. At Intervention School One, teachers consumed the entrée 82% of the days, the vegetable 47% of the days, and the fruit 76% of the days (See table 7 of appendix B). At Intervention School Two, teachers consumed the entrée 93% of the days, the vegetable 21% of the days, and the fruit 57% of the days (See table 7 of appendix B).

The third component of the intervention was the development and implementation of a nutrition education curriculum to increase awareness of the importance of healthy eating and relate healthy eating

to the food being served in the cafeteria. The nutrition education classes were observed on random days at both Intervention School One and Intervention School Two. Teachers were required to teach the nutrition education classes twice a week for 15 minutes. The average length of the class was 21 minutes at Intervention School One and 37 minutes at Intervention School Two (see table 8 of appendix B). Nutrition classes were completed 50% of the time at Intervention School One on the same day, while they were completed 100% of the time at Intervention School Two (see table 8 of appendix B). In addition, at Intervention School Two students were considered “very engaged” 100% of the time, while at Intervention School One students were described as “very engaged” 50% of the time and “somewhat engaged” 50% of the time (see table 8 of appendix B). Difference in the engagement could be attributed to the type of teacher providing classroom instruction for the nutrition education classes. Physical education teachers taught the nutrition education classes at Intervention School One, while at Intervention School Two the classes were taught by science and social studies teachers.

The final component of the intervention was parent engagement. In order to reach parents, HSFC sponsored existing parent night events at the intervention schools. The HSFC staff tried multiple times to arrange a parent night event with Intervention School One, but no event occurred. Two parent night events occurred during the intervention period at Intervention School Two: a STEM Night and a Literacy Night. These events included food provided by the school food vendor and informational resources on the school food being served. Surveys were distributed to parents during the event to gather their perception and their children’s opinions about the school food. When parents were asked what their kids thought about the school food, 49% reported that they did not like it (see figure 10 of appendix B). The parents were also asked about their own perceptions about the school food. Of the parents that took the survey, 37% thought that the school lunch was healthy and 30% thought the school lunch was of good quality (see figures 11 and 12 of appendix B) . While 64% of the parents thought that they were either somewhat or very familiar with what their kids were being served for lunch, 53% of parents believed that the parent night event increased their knowledge of the school food (see figures 13 and 14 in appendix B).

## Consumption Results Summary

All of the schools that participated in the Phase III intervention shared many similarities and few differences. At baseline there were no significant differences in consumption. Focus group data indicated that the majority of students had negative perceptions of the food. There were some differences in the cafeteria environment with the Recess School generally being the best and Intervention School Two the worst. Key findings are outlined in table 1 below. Table 2 illustrates key aspects and findings from the spring data collection.

**Table 1: Important Aspects from Fall Data Collection**

	<b>Intervention School One</b>	<b>Intervention School Two</b>	<b>Recess School</b>
<b>Silent Lunch</b>	Silent Lunch 22% of day	Silent lunch 68% of days	No silent lunch
<b>Competitive food as reward</b>	Competitive food as reward 50% of days	No competitive food as reward	No competitive food as reward
<b>Focus Groups</b>	Did not occur in the fall	Negative opinion of food  Negative perception of cafeteria workers  Silent lunch prevented them from enjoying	Negative opinion of food  Positive perceptions of cafeteria environment and described cafeteria workers as nice

		lunch as much as they could	
--	--	-----------------------------	--

**Table 2: Important Aspects and Findings of Spring Data Collection**

Intervention School One	Intervention School Two	Recess School
Comprehensive intervention	Comprehensive intervention	Recess switch from after lunch to before lunch
Decrease in overall consumption	Decrease in overall consumption	Increase in overall consumption
Silent lunch increased from 22% of the days in the fall to 67% of the days in the spring	Silent lunch decreased from 68% to 53%	
Food as a reward 50% of the days in the fall and 53% of the days in the spring	Smells pleasant decreased from 100% in the fall to 80% in the spring	
Spices available 100% of the days	Spices available 0% of the days	

**Evaluation Goals 3 & 4: To determine if HSFC schools were serving food that exceeded USDA standards and met HSFC standards (Goal 3), and to determine if the food served at HSFC schools had a better nutritional content than food served at non-HSFC schools (Goal 4).**

The overall goal of Phase III of the project is to implement and oversee interventions to increase consumption of healthy foods in New Orleans schools and provide evaluation of intervention efficacy and the HSFC program. A key component is to evaluate the quality of the food being served at HSFC schools and determine whether the lunches served at HSFC schools exceed the USDA school lunch requirements and contain higher nutritional content than schools that are not part of the HSFC, as well as determine whether the food service providers that contract with the HSFC are adhering to the HSFC standards. To achieve this goal the following was completed.

1. Assess nutritional content of daily meals with a menu analysis
2. Assess adherence to select HSFC standards among HSFC food service providers

### **Assessment of Nutritional Content**

To complete the first goal, daily menus were collected with detailed nutritional information for lunches served over a four week period among three food service providers serving HSFC schools. These menus provided details of the actual lunches served at HSFC schools from: Revolution Foods, Sodexo, and Chartwells. In order to compare the nutritional content of the HSFC meals with non-HSFC schools, Chartwells provided additional menus for the same time period for non-HSFC schools that they also

serviced. Analysis focused on calories, sodium, saturated fat, and total fat content of the meals and are reported below.

## Average Nutritional Content of 4<sup>th</sup>-5<sup>th</sup> Grade Lunches Over Four Weeks in October-November 2015

Table 3: Average Nutritional Content by Lunch Food Vendor

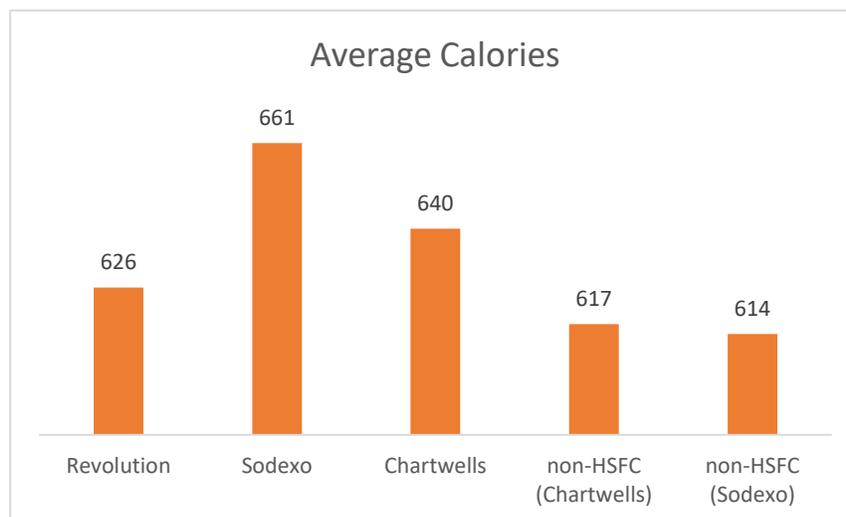
	Calories	Sodium (mg)	Total Fat (g)	Calories from Fat (%)	Saturated Fat	Calories from Saturated Fat (%)
Revolution	626	838	17.3	24.7	4.6	6.7
Sodexo	661	1024	21.1	28.7	6.2	8.4
Chartwells	640	914	17.1	23.8	5.1	6.9
non-HSFC (Chartwells)	617	976	18.9	27.4	4.4	6.4
non-HSFC (Sodexo)	614	676	18.5	27.1	4.2	6.2
USDA*	550-650	≤1230				<10%

\*Required weekly averages for school lunch

All schools met the USDA requirements for calorie, sodium, and saturated fat content for school lunches, with the exception of Sodexo with minor violation of the maximum calories. Sodexo’s HSFC school had the highest average sodium content (though still considerably lower than the maximum allowed) and Revolution’s HSFC school meals had the lowest sodium content. Sodexo’s HSFC High Fidelity Schools had the highest total and saturated fat content.

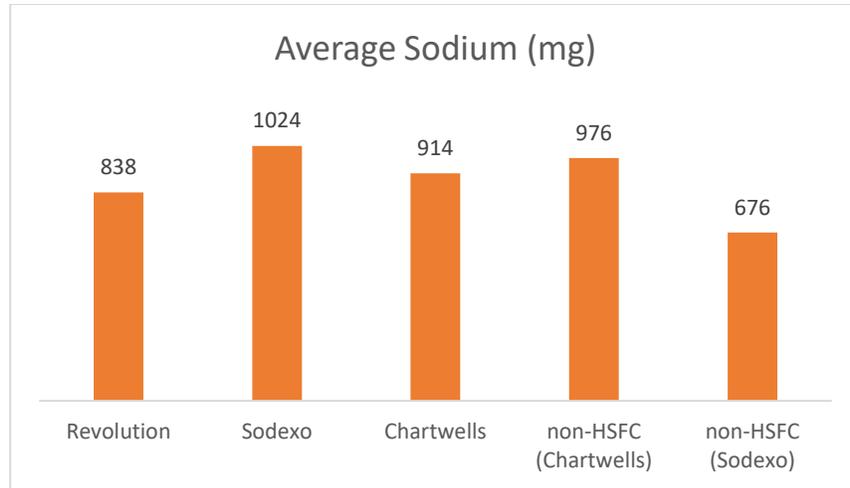
## Graphs of Average Nutritional Content for Nutrition Categories with USDA Requirements

Figure 7: Average Calories Provided by Food Vendor



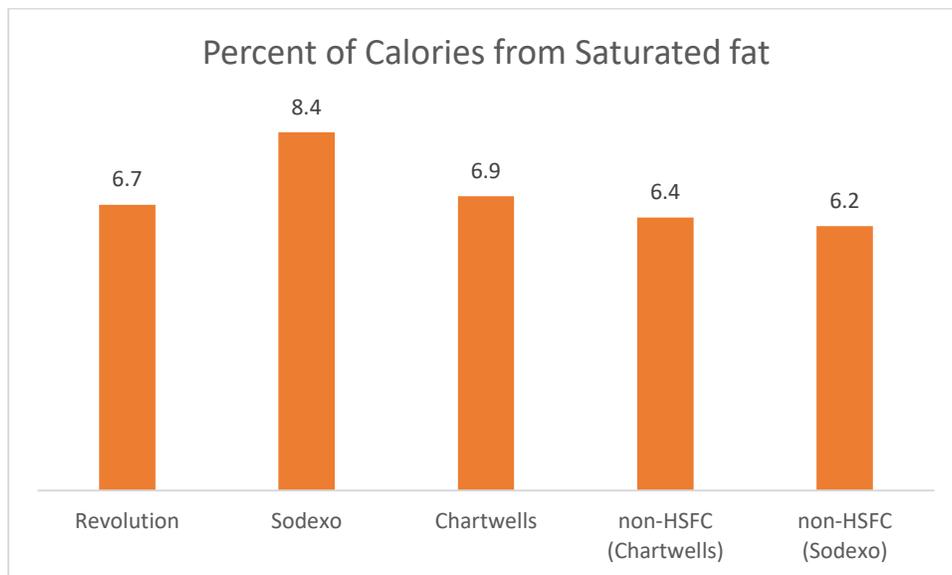
USDA requires 550-650 (weekly average)

**Figure 8: Average Sodium by Food Vendor**



USDA requires  $\leq 1230$  (weekly average)

**Figure 9: Percent Calories from Saturated Fat by Food Vendor**



USDA requires  $< 10\%$  (weekly average)

## Assessment of Adherence to Nutritional Standards Among HSFC Contracted Food Service Providers

Food service providers and schools who are members of the HSFC are contractually required to meet the HSFC school food standards that are designed to ensure students have access to fresh, healthy meals. To complete the fourth goal, adherence among one HSFC school for each food service provider was assessed. The four weeks of daily menus collected as part of the menu analysis were accessed, in addition to files containing the nutritional labels for foods served during the same time period that were provided by each food service provider. The nutritional labels contain ingredient information that was used to assess whether any canned fruits or vegetables, mechanically separated meat, or high fructose corn syrup was served. The HSFC identified five standards to assess for adherence:

1. Fruit: Fresh or frozen (no additives) fruits must be served at every lunch, no canned fruits allowed
2. Vegetables: Fresh or frozen (no additives) vegetables must be served at every lunch, no canned vegetables allowed
3. No mechanically separated meat
4. No high fructose corn syrup
5. 5% of HSFC "spend" will be used for local food products

### Results

The evaluation of adherence to HSFC standards found that food service providers largely adhered to the measured standards in the three schools over the four week assessment period. Note that evaluation assumes accurate records were provided by each food service provider. In addition, a non-HSFC school food menu was examined as a comparison.

#### Fruit:

All schools served a variety of fresh fruits and no canned fruits were offered as reported on served menus and nutrition labels.

#### Vegetables:

All schools served a variety of vegetables and at least one fresh or frozen vegetable each day as reported on served menus and nutrition labels. Sodexo served no canned vegetables. However, some schools offered a canned vegetable item, in addition to the fresh/frozen item, or had a canned vegetable as part of the entrée. These were limited to beans/legumes. In addition, two schools served instant mashed potatoes (i.e., not fresh or frozen). Cases are listed in table four.

**Table 4: Canned or Instant Vegetables by Lunch Food Vendor**

Food Service Provider	Violation Canned/Instant
Revolution	Canned kidney beans
Chartwells	Canned baked beans
Chartwells	Canned pinto beans
Chartwells	Instant mashed potatoes
Sodexo	Instant mashed potatoes
Non-HSFC (Sodexo)	Canned white beans
Non-HSFC (Sodexo)	Canned red beans
Non-HSFC (Sodexo)	Canned baked beans

#### Mechanically Separated Meat:

The evaluation of nutrition labels provided by the food service providers found some cases of mechanically separated meat (see table five). Revolution Foods served no mechanically separated meat.

**Table 5: Mechanically Separated Meat Violations by Lunch Food Vendor**

Food Service Provider	Violation Mechanically Separated Meat
Revolution	None
Chartwells	Smoked sausage
Chartwells	Turkey dog
Sodexo	Hot dog
Non-HSFC (Sodexo)	Hot dog

### High Fructose Corn Syrup (HFCS):

The evaluation of nutrition labels provided by the food service providers found some cases of high fructose corn syrup in meal ingredients (see table six). Revolution Foods served no foods that contained high fructose corn syrup. The most common item was for the non-HSFC school the chocolate milk that included HFCS, but all other items were not offered consistently at lunch.

**Table 6: High Fructose Corn Syrup Violations by Lunch Food Vendor**

Food Service Provider	Violation HSFC present
Revolution	None
Chartwells	Hamburger bun
Chartwells	Hot dog bun
Chartwells	Sliced bread
Sodexo	Salisbury steak
Non-HSFC (Sodexo)	Salisbury steak
Non-HSFC (Sodexo)	Chocolate milk
Non-HSFC (Sodexo)	Cranberry juice

## Conclusion

According to the menus provided all schools were in compliance with USDA standards with the exception of Sodexo exceeding calorie requirements by a small amount. There were differences in nutrition content for different providers, however, these differences were not significant. There were some violations of HSFC standards. However, no provider was in compliance less than 90% of the time. In addition, there was no significant difference between the food quality of HSFC school and non-HSFC schools in terms of compliance with the HSFC standards. In 2012 the USDA implemented increased nutrition standards and these standards are more closely aligned with the HSFC standards.

## Evaluation Goal 5: To determine if HSFC membership improved food quality of school meals.

Interviews were conducted to assess the school food environment prior to and after joining the HSFC. Two interviews were conducted and a third administrator declined to be interviewed. Both interviewees had been school administrators, but one of the two was no longer an employee of the school at the time of the interview. Overall both interviewees were positive about joining the HSFC and

administrative operations. There was a large amount of agreement between the two interviewees in response to the questions. Both interviewees felt that the food was of higher quality after joining the HSFC, but both schools also switched food vendors when joining the HSFC. Interviewees indicated that improvement over their previous food vendor was a very low benchmark to meet. In addition, one of the schools made the switch to the HSFC the same year that the new USDA standards were implemented. They described the students' reception to the food as resistant at first, but over time the students became more accepting. In addition, both participants acknowledged that the HSFC food vendor was receptive to feedback about their food and were willing to take steps to change their food based on feedback from students and teachers. Interviewees primary interaction with the school food and the HSFC was through administrative processes and logistics rather than direct cafeteria work. They described the process of working with the HSFC as being helpful and simple, and specifically cited that it was an improvement over working with the Recovery School District (a temporary school district created as part of the recovery from hurricane Katrina). They described their own food consumption and that of the teachers as a 'la carte where they selected items they liked but avoided those they did not, and felt their own consumption was too inconsistent to give an informed opinion about the taste. Overall, teacher consumption was described as similar both before and after the switch to the HSFC. Both interviewees stated that they understood the HSFC standards were supposed to be healthier, but neither was able to state specific standards or ways that the food was healthier.

## Discussion

Louisiana has one of the highest rates of childhood obesity. School meals is one way to combat childhood obesity, as it can contribute to a large portion of a child's daily energy. The HSFC aims to impact obesity in Louisiana by ensuring that school meal standards and school food authority standards are being met by food vendors. Phase III of the HSFC began to look at not only ensuring school meal standards were being met but also the impact of policy change and a multi-prong intervention's impact on school food consumption. The HSFC believes that "commitment to nutritional standards, nutritional education and increased access to fresh and healthy food in schools will, over time, impact consumption of school meals as well as decrease childhood obesity".

The first two phases of this project had two major findings: 1) students were consuming approximately 50% of the 550 to 650 calories recommended by the USDA and 2) environmental factors may have a direct effect on consumption levels. Several environmental factors were identified, which became the basis for designing the intervention implemented in Phase III; when or if students had recess, the cleanliness of the cafeteria, the use of silent lunch to control behavior, and the engagement of the cafeteria staff. Thus, the interventions described above were designed to test if these factors did have an impact on consumption.

Phase III evaluation results showed that having recess before lunch had a significant positive effect on student consumption. The focus group suggests that students felt hungrier when they had recess before lunch. This effect is compelling when considering the students' negative perception of the food. It is also a useful finding because it is a zero cost intervention. Future research could examine this effect with food that is of higher quality to see if the effect is stronger.

The comprehensive intervention results were less clear than the recess switch. Two schools implemented the interventions, but one school followed the intervention protocol more closely than the other. Intervention School One had higher consumption than Intervention School Two. However, at both schools consumption decreased rather than increased. Regression analysis demonstrated that the interventions were positively associated with consumption, but were not robust enough to overcome factors that led to students consuming less. The nutrition education program was well received by the

students and the teachers. The interest from the students highlights that students are interested in knowing more about their food, and this desire is an opportunity to incorporate nutrition education in ongoing interventions.

The comparison of the nutritional content and food quality of the HSFC schools to non-HSFC schools did not demonstrate significant differences. When the HSFC was first formed the USDA standards for school meals were not as strict as they are today. At that time the HSFC standards were a significant improvement over the USDA standards, but in 2012 the USDA standards were raised. Food vendors are required to not only comply with increased nutrition standards, but, also, provide food at a low cost. Consequently the range of available food items that is both cost effective and of sufficient nutritional quality more closely resembles those of HSFC standards.

## Limitations

There were several limitations with the HSFC study. While many of the limitations were unavoidable, HSFC staff made an effort to lessen the impact of the limitations. The main limitations in Phase III were data collection, intervention adherence, significant differences in menus pre and post intervention, and silent lunch.

### Data Collection

Since each tray was not individually weighed instead using an average pre-weight, it is impossible to tell whether a child received a larger portion of the meal and ate some of it or did not eat it at all. Unfortunately, weighing each child's tray as they were served would have had a significant negative effect on their lunch by reducing the amount of time students would have to eat. In fact, it is likely attempting this would have resulted in many students missing lunch completely. It was impossible to completely control 4<sup>th</sup> and 5<sup>th</sup> grade students behavior during lunch, especially in regards to sharing food. While the students were told not to share food, there is no way to be sure that this was not occurring. This became an issue with missing food on the tray. If a child took a food item and it was not on the tray for the post-weight, it was counted as a finished food item. While many times this was probably the case, such as with fruit or snack when students took the item with them and ate it outside of the cafeteria (even though this was not allowed), there were other times when they probably did not finish their food item. Another limitation is that different research assistants were collecting the data at different schools (and it was not the same research assistants between the first and second rounds of data collection). While the research assistants received the same training by HSFC staff, there is always the chance that they were rating aspects of the cafeteria environment differently, such as engagement or cleanliness.

### Intervention Adherence

Intervention school one and two had varying levels of adherence to the intervention due to staff turnover within the schools, in addition to competing priorities for schools and partners. Moving forward additional allocation of time to enhance buy in of participants prior to initiation of the intervention and troubleshoot intervention scenarios may enhance adherence.

### Differences in Pre and Post Menus

A selection criteria for food vendors to participate in phase III was that menus pre and post intervention should be similar. Post intervention menus differed at minimum fifty percent of the time when compared to pre intervention menus for both the intervention and recess schools. The primary food item that differed post intervention was the main entrée. Moving forward memorandums of understanding with participating food vendors should be established to ensure that all parties are in agreement throughout the duration of the intervention.

## Silent Lunch

Phase II and III findings have shown that there is a correlation between silent lunch and food consumption. Assessments were implemented with administration of prospective schools prior to the start of phase III to ensure that silent lunch was not occurring. HSFC researchers were informed that silent lunch was not being implemented at the intervention schools and recess school. Based on observations during phase III it was determined that silent lunch was a common practice at intervention school one and two. Silent lunch occurred over 50% of the time at intervention school one and two during phase III, which may have impacted food consumption.

## Future Directions

Phase III results illustrate a need to further explore the impact of policies on food consumption. Changing recess prior to lunch led to an increase in food consumption, which is compelling based on the students' negative perception of the food coupled with the lack of improvement in food quality. Establishing implicit policies around silent lunch should be explored in future phases as a correlation has been observed between silent lunch and consumption. Policy change interventions would require zero cost on behalf of the school to implement and lead to sustainable changes.

Existing literature suggests it may be important to target children before they enter kindergarten, since a growing number of younger children are becoming obese and health habits established earlier are potentially more impactful if maintained. In Louisiana, 12.9% of children aged 2-5 are considered obese.<sup>x</sup> While there are many programs that target improving nutrition and physical activity in school children, and other programs that target mothers and their babies with regards to breastfeeding, very little is being done for children in the early childhood setting. The major issue with many early childhood programs is that there are problems with the nutrition and physical activity related policies, which may have an impact on the health of the children.<sup>xi</sup> Studies conducted in childcare centers found that they were not serving a variety of fruits, vegetables, whole grains, limiting saturated fat, implementing healthy celebration guidelines, involving children in mealtime, and referring families to nutrition assistance programs.<sup>xii</sup> When early childhood centers implemented positive changes regarding nutrition guidelines, there was a decrease in total and saturated fat, increased fruit and vegetable availability, and students' dietary intakes were improved. Since it has been shown that regulations in childcare are beneficial to a child's health, it is detrimental that there are limited regulations regarding nutrition and physical activity at childcare centers.<sup>xiii</sup>

Future interventions should concentrate on early childhood and include parents in order to have a bigger impact in both the school and home settings. Interventions should also focus on long-term impacts. Many interventions conducted previously only looked at short-term impacts up to one year, while maintaining healthy habits should stretch across the entire lifespan. Important components to incorporate are that interventions should focus on only two specific aspects to change. Focusing on multiple components makes it difficult to determine which aspects of the intervention are having an effect. In addition, studies found that single component interventions were not necessarily successful, especially in studies where they were trying to increase vegetable consumption.<sup>xiv</sup> Interventions should also include a nutritional component, since that was found to be a beneficial part of an intervention.<sup>xv</sup> Another important aspect should be increasing the length of time that children are given to eat lunch, since longer lunch periods lead to children eating more of their lunches. This can be done by having more staff supervision, providing students with ID cards to speed up the lunch line, or putting recess before lunch to decrease time wasted getting to the cafeteria. Overall, while there has been significant research done regarding school nutrition and childhood obesity, there is more work that must be done to get a fuller picture of the school health arena.

## Conclusion

Multiple factors affect consumption in both large and small ways. The interventions in Phase III were developed on the premise that by positively changing several small factors one can create a significant effect on consumption. The most important finding from Phase III is that having recess before lunch had a significant positive effect on student consumption. Changes in the recess policy required minimal resources, were sustainable for the duration of the school year, and lead to increase in food consumption despite the student perception of school food in the focus groups. Success of this policy change illustrates the ability to bring this change to scale in other schools throughout New Orleans, especially where food administration is decentralized.

## Endnotes:

- 
- i Trust for America's Health (2010, November). *F as in fat. How obesity threatens America's future.* Retrieved from <http://healthyamericans.org/reports/obesity2010/>.
- ii Pennington Biomedical Research Center (2013, October). *Reducing childhood obesity in Louisiana: An evidence-based approach to inform policy decisions.* Retrieved from <http://www.pbrc.edu/prism/>.
- iii Center for Disease Control and Prevention - National Center for Chronic Disease Prevention and Health Promotion. (2012) *Overweight and Obesity.* Retrieved from <http://www.cdc.gov/obesity/stateprograms/fundedstates/pdf/louisiana-state-profile.pdf>
- iv Rose, D., Bodor, N., Swalm, C., Rice, J., Farley, T., & Hutchinson, P. (2009). *Deserts in New Orleans? Illustrations of urban food access and implications for policy.* Ann Arbor, MI: University of Michigan National Poverty Center/ USDA Economic Research Service Research.
- v Ibid.
- vi Scott, S. Cowen Institute for Public Education Initiatives (2010). *The State of Public Education: Five Years After Hurricane Katrina.* New Orleans, LA. Tulane University.
- vii Briefel, R. R., Crepinsek, M.K., Cabili, C., Wilson, A., \* Gleason, P.M. (2009). School food environments and practices affect dietary behaviors of US public school children. *Journal of the American Dietetic Association*, 109(2), S91-S107.
- viii Scott, S. Cowen Institute for Public Education Initiatives (2010). *The State of Public Education: Five Years After Hurricane Katrina.* New Orleans, LA. Tulane University.
- ix Robert Wood Johnson Foundation. *The School Food Environment, Children's Diets, and Obesity: Findings from the Third School Nutrition Dietary Assessment Study.* *Journal of the American Dietetic Association*. February 2009; 109(2): Supplement. 18 United States Department of Agriculture Center for Nutrition Policy and Promotion. *Dietary Guidelines for Americans, 2010.* Report of the Dietary Guidelines Advisory Committee. <http://www.cnpp.usda.gov/DGAs2010-DGACReport.htm>.
- x Pennington Biomedical Research Center. *Physical activity in child care.* Retrieved from [https://www.pbrc.edu/prism/docs/PRISM\\_PhysicalActivityInChildCare.pdf](https://www.pbrc.edu/prism/docs/PRISM_PhysicalActivityInChildCare.pdf)

---

<sup>xi</sup> Foster, J. S., Contreras, D., Gold, A., Keim, A., Oscarson, R., Peters, P., . . . Mobley, A. R. (2015). Evaluation of nutrition and physical activity policies and practices in child care centers within rural communities. *Childhood Obesity (Print)*, 11(5), 506-512. doi:10.1089/chi.2015.0030 [doi]

<sup>xii</sup> Ibid.

<sup>xiii</sup> Robert Wood Johnson Foundation. (2011). Preventing obesity among preschool children: How can child-care settings promote healthy eating and physical activity? Retrieved from <http://files.eric.ed.gov/fulltext/ED541796.pdf>

<sup>xiv</sup> Mikkelsen, M. V., Husby, S., Skov, L. R., & Perez-Cueto, F. J. (2014). A systematic review of types of healthy eating interventions in preschools. *Nutrition Journal*, 13, 56-2891-13-56. doi:10.1186/1475-2891-13-56 [doi]

<sup>xv</sup> Ibid.

## Appendix

### APPENDIX A: Additional Tables

**Table 4: Lunchtime Monitoring Results Fall**

	Intervention School One	Intervention School Two	Recess Change
What percent of the days was silent lunch implemented?	22%	68%	0%
What percent of the days did the teachers provide students with competitive food as a reward?	50%	0%	0%
What percent of the time was the cafeteria described as clean?	100%	95%	95%
What percent of the time did the cafeteria smell pleasant?	100%	100%	94%

**Table 5: Lunchtime Monitoring Results Spring**

	Intervention School One	Intervention School Two	Recess Change
What percent of the days was silent lunch implemented?	67%	53%	0%
What percent of the days did the teachers provide students with competitive food as a reward?	53%	0%	0%
What percent of the time was the cafeteria described as clean?	100%	93%	100%
What percent of the time did the cafeteria smell pleasant?	100%	80%	100%

**Table 6: Fidelity Monitoring Cafeteria Intervention Results**

	Intervention School One	Intervention School Two
What percentage of time was menu posted on white board?	83%	52%
What percentage of time was staff engaged with students?	67%	28%
What percentage of time were spices available?	100%	0%
What percentage of time were vegetables placed as the first item in line?	11%	0%

**Table 7: Fidelity Monitoring Teacher Lunch Voucher Results**

	Intervention School One	Intervention School Two
Median amount of teachers who consumed cafeteria lunch on any given day?	3	1
Of the teachers who took the school lunch, what percentage consumed lunch in the cafeteria?	66%	100%
Of the teachers who took the school lunch, what percentage consumed the main entrée?	82% of days	93% of days
Of the teachers who took the school lunch, what percentage consumed the vegetable?	47% of days	21% of days
Of the teachers who took the school lunch, what percentage consumed the fruit?	76% of days	57% of days

Number of times Teacher Voucher Fidelity Monitoring Occurred at Intervention School One= 18

Number of times Teacher Voucher Fidelity Monitoring Occurred at Intervention School Two= 19

**Table 8: Fidelity Monitoring Nutrition Education Results**

	Intervention School One	Intervention School Two
Average time of nutrition education class	21 minutes	37 minutes
What percentage of time were sessions completed?	25%	100%
What percentage of time were students very engaged?	50%	100%
What percentage of time were students somewhat engaged?	50%	0%

**Figures 10-14: Parent Night Event Results**

**Figure 10: What does your kid think about the food?**

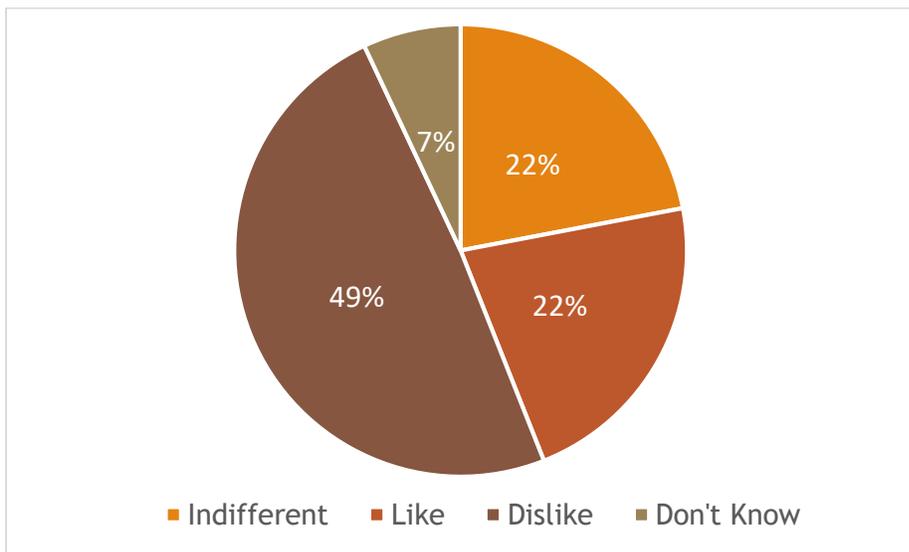


Figure 11: Do you feel that the school lunch is healthy?

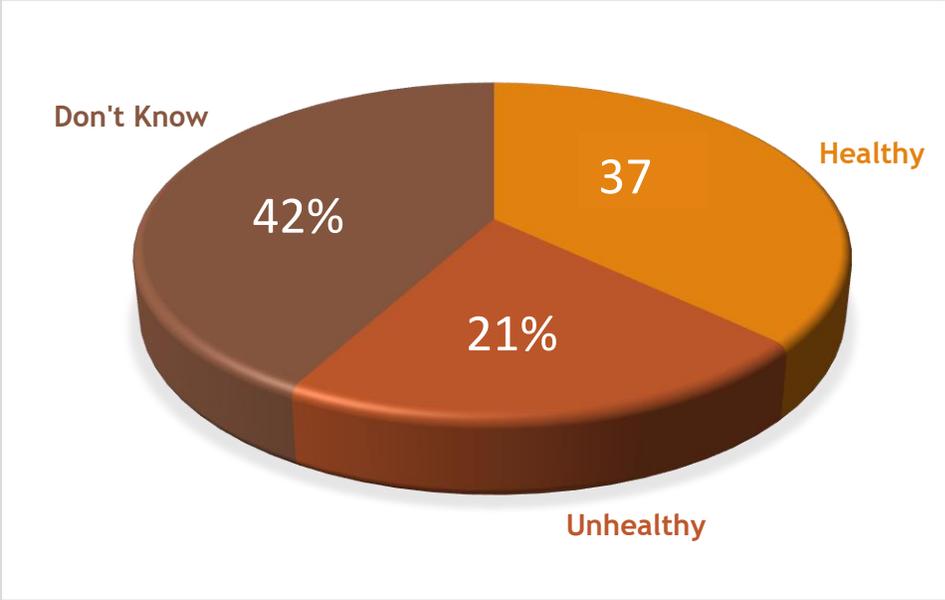


Figure 12: Do you feel that the school lunch is of good quality?

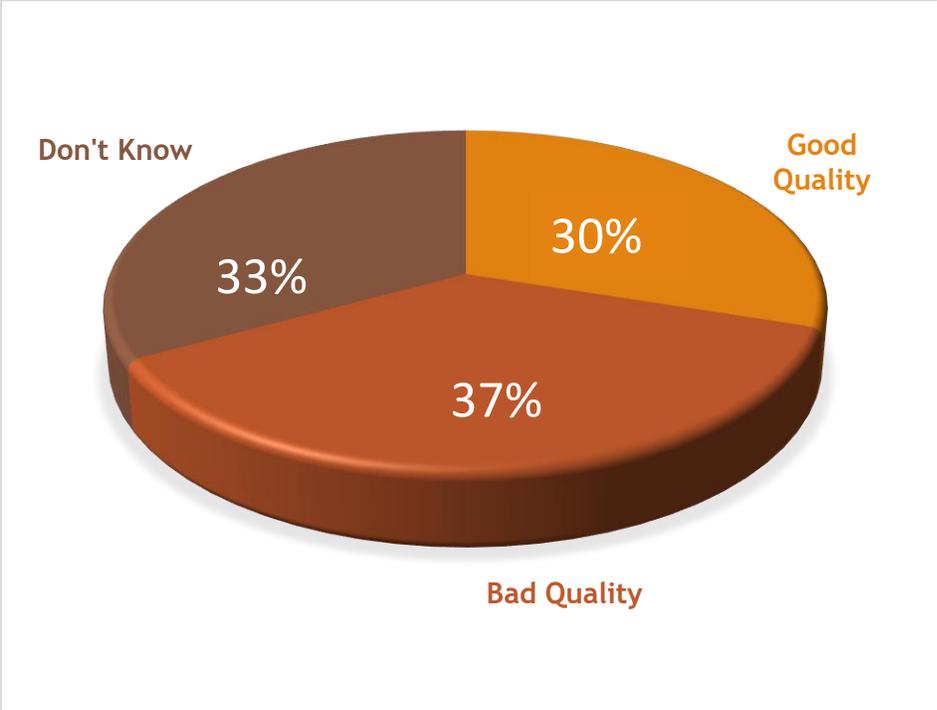


Figure 13: How familiar are you with what your child is being served for lunch?

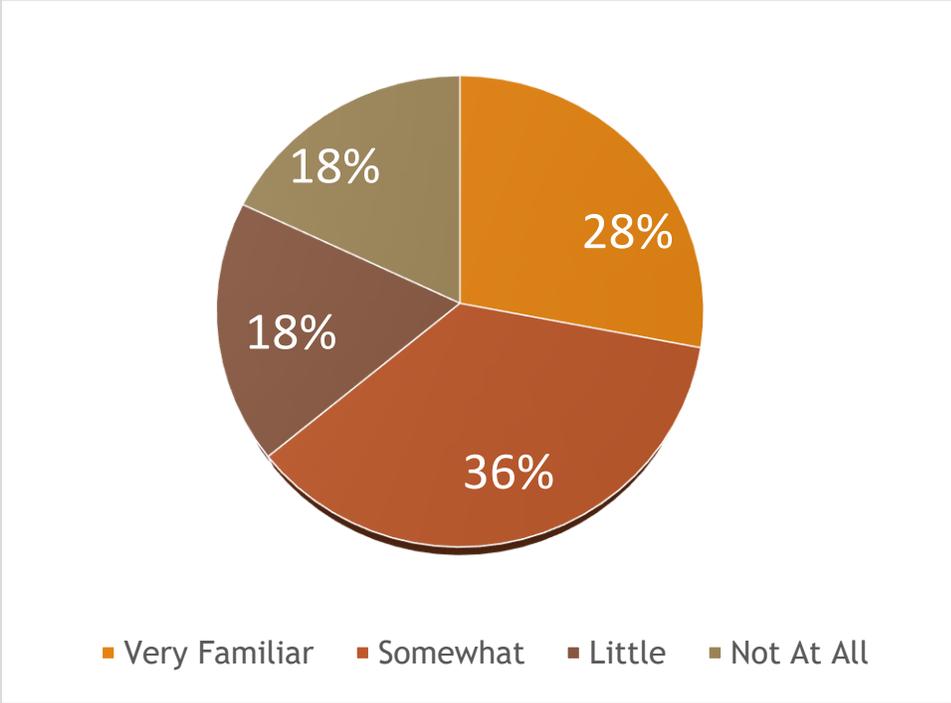
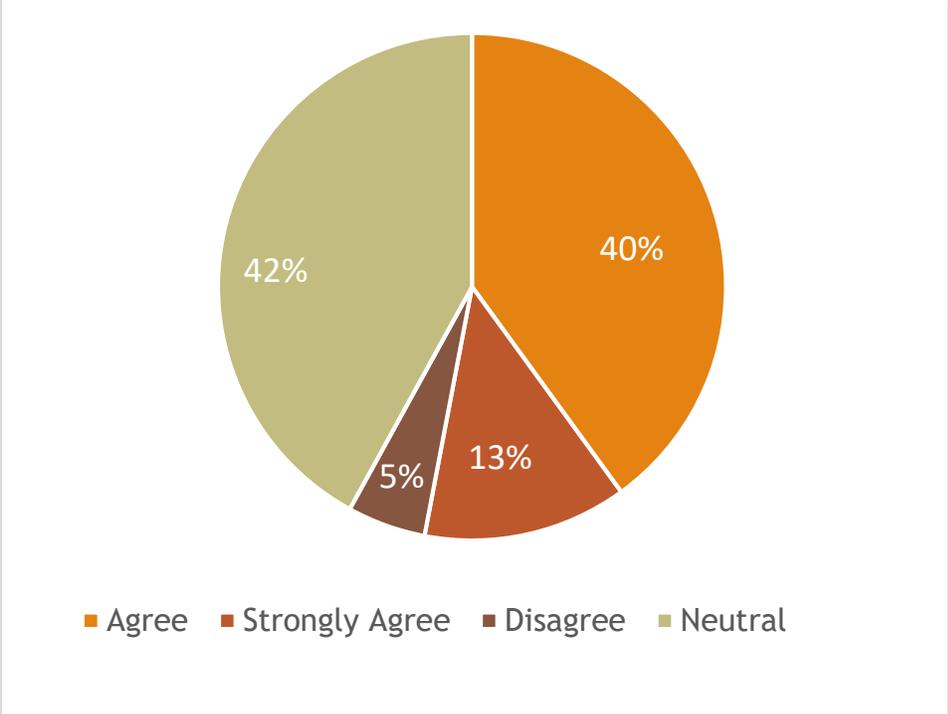


Figure 14: Did parent night increase your knowledge of school food?



## APPENDIX B: Landscape Analysis

Healthy school food options have been an important issue facing society that has engendered many discussions, new policy implementations, and scientific inquiry due to rising childhood obesity rates. School meals are a vital area for policy change because they can constitute up to 47% of children's and adolescent's daily energy intake (Briefel, Crepinsek, Cabili, Wilson, & Gleason, 2009). The government provides lunches to approximately 30.5 million students each day - 22 million of which are provided at a free or reduced price (USDA, 2016). Therefore, it is important that the lunches provided are healthy and nutritious. In the past school food was often unhealthy and frequently contained items such as french fries and pizza; however recent policy changes have been made to improve school lunches. The Healthy Hungry-Free Kids Act of 2010 required the USDA to update their nutritional standards for the first time in 15 years in order to make school lunches healthier (School Nutrition Association, nd.). These new regulations introduced sweeping changes, including: requiring cafeterias to offer more fruits, vegetables, and whole grains; limiting sodium, calories, and unhealthy fat in every school meal; increasing portion sizes; and regulating competing foods from other sources in the cafeteria (School Nutrition Association, nd.). These standards also required lunches to be between 550 and 650 calories (School Nutrition Association, nd.). However, this change did not come without controversy.

People criticized the new USDA nutritional standards because these standards increased the portion size and required students to select a fruit or vegetable (Mitka, 2012). Increased portion size is a counter intuitive solution to the growing issue of childhood obesity, however, recent research suggests that children who do not eat a sufficient amount of healthy food compensate by consuming low quality food that is calorie dense and nutritionally void (Guthrie, J. & Newman, C., 2013). In addition, bigger portions of fruits and vegetables meant meals were more expensive. Therefore the USDA provided an extra \$0.06 per meal for schools meeting the standards to address the higher costs of serving more fruits and vegetables (Guthrie, J. & Newman, C., 2013). Critics of the new nutritional standards also mentioned that new standards wouldn't necessarily mean students were eating more food. Instead, these critics suggested it would only result in increased waste. A plate waste study was conducted to determine if there was actually a difference in student consumption pre and post the USDA nutritional standards change (Cohen, Richardson, Parker, Catalano, & Rimm, 2014). Plate waste was conducted on two days during the school year in 2011 (pre-implementation) and two days in the fall of 2012 (post-implementation). There were no changes in entrée selection (both were 100%) and vegetable selection between the two time periods. However, there was a significant increase in fruit selection (52.7% to 75.7%) and a significant decrease in milk selection (79.8% to 55.1%). There was also some change in the consumption of the food items. Entrée consumption increased from 73.2% before the intervention to 87.9% after. Milk consumption decreased from 64.0% to 53.9%. Vegetable consumption increased from 24.9% to 41.1%. There was not a significant change in fruit consumption per individual, however more students selecting fruit meant that the same selection would result in more consumption overall (Cohen et al., 2014). While there was a decrease in milk consumption following the USDA standards change, this was likely due to requiring nonfat or 1% milk instead of the 2% or whole milk that was previously offered. In addition, for milk to be flavored it had to be nonfat milk (Cohen et al., 2014). This study offered valuable insight into the effects of the USDA standards change on student eating patterns.

The Healthy Hungry-Free Kids Act of 2010 affected more than just the nutritional content of lunches provided by the cafeteria. This act also set out to regulate competitive foods as well. Competitive foods are any food or beverage sold to students on the school campus during the school day that is outside of the federally reimbursable meal program (California Department of Education, 2016a). Competitive foods are important to regulate because they are typically much less healthy than the school lunches. In 2005, one in three elementary school students ate at least one competitive food item on a typical day, and this number increased to 53% when discussing secondary school students (Guthrie, J. & Newman, C., 2013). Since many of the competitive foods sold in school stores, vending machines, or available a la carte in the cafeteria are high-calorie, low-nutrient options, child health advocates argue

that the presence undermines efforts to promote a healthier school environment (Guthrie, J. & Newman, C., 2013). Building off of the Healthy, Hungry-Free Kids Act, in June 2013, the USDA's Food and Nutrition Service issued nutritional standards that limited the calories, fat, sodium, and sugar in competitive foods. (Guthrie, J. & Newman, C., 2013). While these regulations have limited what can be sold in schools and contributed to healthier school-time lunches, many students are still able to bring in snacks from home that are higher in calories, fat, sodium, and sugar and some teachers still offer competitive food as a reward for classroom behavior.

Nutritional standards are not the only battlefield where the war for healthier students is being waged. Rather than focusing on the nutritional content of the food itself, other studies have focused on the length of time provided for lunch. One plate waste study assessed schools in low-income environments with lunch periods ranging from 20 minutes to 30 minutes (Cohen et al., 2016). Results suggest that when lunch periods were at least 25 minutes students were more likely to select a fruit than when they had less than 20 minutes to eat (57% vs 44%). While there was no difference in the selection of entrée, milk, or vegetables, students with more than 25 minutes to sit and eat ate 13% more of their entrée, 10% more of their milk, and 12% more of their vegetable (Cohen et al., 2016). While these results lead to an acknowledgement across the country that school lunchtime should be increased, many school districts did not actually implement any change. To better understand the mechanisms behind this lack of change, the Nutrition Services Division gave surveys to elementary, middle school, and high school principals to determine the barriers to allowing students adequate time to consume their lunches (California Department of Education, 2016b). The biggest issues were long or slow lines, scheduling issues, not enough cafeteria space, student behavior, insufficient student supervision, food service staffing issues and kitchen delays, or long lines on days with popular food items (California Department of Education, 2016b). Since it is important to give students adequate time to finish their lunch, best practices were developed to aid schools in increasing the length of time for students to eat lunch. Some best practices were having students line up alphabetically or get barcode scanners, add a lunch period or have staggered lunches, lengthen lunch period by adding time to the end of the day, ask additional staff to supervise the cafeteria or lunch line, have recess before lunch, reward students with extra time to eat, require students to eat for a certain amount of time before they get up, or cut up fruits and vegetables to make them easier for students to eat (California Department of Education, 2016b).

Implementing healthier school lunches is just one part of the overall plan to combat the growing problem of childhood obesity in the United States. Currently, 17.2% of youth ages 2-19 (The State of Obesity, n.d.) are obese and approximately 1 in 4 preschool aged kids are considered overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014). This increase in childhood obesity has resulted in a number of studies implementing nutrition and physical activity programs for children, particularly in schools. With access to large sample populations and a captive audience, these studies aim to change the behavior patterns of children in order to improve their health. While the overall goal of these studies is the same, they take many different routes to their final destination: the improvement of the physical health of children in the United States.

There are a variety of outcomes that are associated with improving the physical health of children in the United States. In conducting this literature review, the majority of the studies assessed focused on an outcome measure of either BMI/ body fat (8 of 21) or fruit and vegetable consumption (13 of 20). Since some studies had multiple outcome measures, other studies aimed to get children to make healthier choices about food, increase nutrition knowledge, and increase physical activity participation. While the outcome measures differed between the studies, all of the interventions that looked at impacts past the end of the study were successful at least at the first benchmark (18 studies), even though the time between the end of the study and first benchmark differed between studies. However, some of the interventions did not see positive results for all outcome measures. For example, one study only saw reductions in BMI for students who were obese at baseline, which indicates it may be a regression to the mean effect (Bogart et al., 2016), another study did not see reductions in BMI at all but saw a decrease

in intake of unhealthy food and an increase in nutrition knowledge (two of their other outcome measures) (Nichols, Francis, & Dalrymple, 2014), and a third study saw an increase in fruit and vegetable consumption but no impact on BMI (Grassi, Evans, Ranjit, Pria, & Messina, 2016).

The studies that assessed fruit and vegetable consumption used a variety of different techniques. Of the 13 studies, nine used recall or questionnaires to determine what students were eating, one used plate waste, one monitored what students selected, and two used observation of what was consumed. Overall, plate waste is considered the gold standard for determining consumption. However, it can be expensive and, consequently, many studies used lower cost approaches to assess consumption instead.

Not only are there differences in outcome measures and study techniques, there are also differences in the target populations. Some nutritional interventions focus on early age, others target primary school students, and the rest target middle and high school students. The vast majority of the studies assessed focused on primary school students. Of the 21 studies assessed, 13 studies targeted solely primary school students and two studies targeted primary and middle school students. Only two studies focused on children before they entered kindergarten. Studies that targeted younger children were more likely to include parents in the study as a way to impact healthier eating and physical activity. In addition, studies that included older students found it difficult to get students to agree to participate and the students had less motivation with follow-up. They also found it difficult to determine whether students were selecting certain answers on questionnaires because of social desirability, so they found it more beneficial to use questionnaires as well as other mechanisms such as an Astrand test to determine physical activity. There was no research conducted about whether older students were more likely to consume higher calorie alternatives than younger students.

Another area where the studies differed is the type of behavior change being implemented. Most of the studies (15 out of 21) included nutrition as part of their behavior change. Of these, nine focused on solely nutrition, five studies mixed nutrition and physical activity, one study mixed nutrition and the cafeteria environment, and one study mixed nutrition, physical activity, psychology, and parental participation. Nutrition interventions were conducted in a variety of different ways, from teachers administering the course, to TV shows, to targeting parents with social media, to video games that children played at home. The way that the nutrition course was taught did not have an impact on the outcome. However, it was helpful to make the intervention interactive, such as discussing meal preparations, completing handouts or posters, or having children play a game. While there were many differences in the studies assessed, the results were overall positive in the short-term. Long-term follow ups were not conducted for many of the studies assessed. All in all, the differences between the studies highlight the large scope one is dealing with when attempting to implement programs to reduce childhood obesity in the population.

Like the aforementioned studies, the HSFC intervention focused on the school environment to impact children's health. A main outcome of the HSFC study was to increase school lunch consumption among fourth and fifth grade students at three charter schools in New Orleans. At one of the schools, recess was switched from after lunch to before lunch, while the other two schools implemented a comprehensive intervention. The comprehensive intervention had four target areas: nutrition education, teacher lunch vouchers, cafeteria engagement, and parent engagement. In order to see if there was an increase in school lunch consumption, the HSFC study used plate waste. The HSFC study also observed environmental aspects that could have an influence on school lunch consumption by administering lunchtime monitoring tools to assess other aspects of the cafeteria environment such as cleanliness, competitive food, food as a reward, and silent vs. social lunches. One aspect that was especially interesting was the competitive food that students brought in as well as the food that was provided as a reward. While students were not supposed to bring in chips, candy, etc. they discussed "smuggling" these food items in on a daily basis during student focus groups. In addition, teachers provided students with competitive foods during lunch time, such as pizza or chips as a prize for getting a certain grade on a test or behaving in class. In addition, results suggest that cafeteria environment factors were influencing

consumption: as the environment improved, consumption increased. Overall, the HSFC study found that the recess switch resulted in increased school lunch consumption while the comprehensive intervention resulted in a decrease in school lunch consumption. However, as mentioned previously, the decrease in consumption for the comprehensive intervention was determined to be due to environmental factors.

## References

- Bogart, L. M., Elliott, M. N., Cowgill, B. O., Klein, D. J., Hawes-Dawson, J., Uyeda, K., & Schuster, M.A. (2016). Two-year BMI outcomes from a school-based intervention for nutrition and exercise: A randomized trial. *Pediatrics*, 137(5), 10.1542/peds.2015-2493. doi:10.1542/peds.2015-2493 [doi]
- Briefel, R. R., Crepinsek, M. K., Cabili, C., Wilson, A., & Gleason, P. M. (2009). School food environments and practices affect dietary behaviors of US public school children. *Journal of the American Dietetic Association*, 109(2 Suppl), S91-107. doi:10.1016/j.jada.2008.10.059 [doi]
- California Department of Education. (2016a). Competitive foods and beverages. Retrieved from <http://www.cde.ca.gov/ls/nu/he/compfoods.asp>
- California Department of Education. (2016b). Ensuring adequate time to eat. Retrieved from <http://www.cde.ca.gov/ls/nu/sn/timetoeat.asp>
- Cohen, J. F., Jahn, J. L., Richardson, S., Cluggish, S. A., Parker, E., & Rimm, E. B. (2016). Amount of time to eat lunch is associated with children's selection and consumption of school meal entree, fruits, vegetables, and milk. *Journal of the Academy of Nutrition and Dietetics*, 116(1), 123-128. doi:10.1016/j.jand.2015.07.019 [doi]
- Cohen, J. F., Richardson, S., Parker, E., Catalano, P. J., & Rimm, E. B. (2014). Impact of the new U.S. department of agriculture school meal standards on food selection, consumption, and waste. *American Journal of Preventive Medicine*, 46(4), 388-394. doi:10.1016/j.amepre.2013.11.013 [doi]
- Foster, J. S., Contreras, D., Gold, A., Keim, A., Oscarson, R., Peters, P., . . . Mobley, A. R. (2015). Evaluation of nutrition and physical activity policies and practices in child care centers within rural communities. *Childhood Obesity (Print)*, 11(5), 506-512. doi:10.1089/chi.2015.0030 [doi]
- Grassi, E., Evans, A., Ranjit, N., Pria, S. D., & Messina, L. (2016). Using a mixed-methods approach to measure impact of a school-based nutrition and media education intervention study on fruit and vegetable intake of Italian children. *Public Health Nutrition*, 19(11), 1952-1963. doi:10.1017/S1368980015003729 [doi]
- Guthrie, J. & Newman, C. (2013). Eating better at school: Can new policies improve children's food choices? Retrieved from [http://www.ers.usda.gov/amber-waves/2013-september/eating-better-at-school-can-new-policies-improve-children%E2%80%99s-food-choices.aspx#.V\\_UthvkrLIV](http://www.ers.usda.gov/amber-waves/2013-september/eating-better-at-school-can-new-policies-improve-children%E2%80%99s-food-choices.aspx#.V_UthvkrLIV)
- Let's Move! Child Care. Let's move! child care: Help children develop healthy habits . Retrieved from <https://healthykidshealthyfuture.org/about/>
- Louisiana Department of Health. (2016). *Too much screen time can make children overweight*. <http://new.dhh.louisiana.gov/index.cfm/newsroom/detail/3831>
- Mikkelsen, M. V., Husby, S., Skov, L. R., & Perez-Cueto, F. J. (2014). A systematic review of types of healthy eating interventions in preschools. *Nutrition Journal*, 13, 56-2891-13-56. doi:10.1186/1475-2891-13-56 [doi]
- Mitka, M. (2012). Meal programs questioned. *Jama*, 308(18) doi:10.1001/jama.2012.33468.

NapSACC.Nap sacc. Retrieved from <https://gonapsacc.org/>

Nichols, S. D., Francis, M. P., & Dalrymple, N. (2014). Sustainability of a curriculum-based intervention on dietary behaviours and physical activity among primary school children in trinidad and tobago. *The West Indian Medical Journal*, 63(1), 68-77. doi:10.7727/wimj.2014.011 [doi]

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the united states, 2011-2012. *Jama*, 311(8), 806-814. doi:10.1001/jama.2014.732 [doi]

Pennington Biomedical Research Center. *Physical activity in child care* Retrieved from [https://www.pbrc.edu/prism/docs/PRISM\\_PhysicalActivityInChildCare.pdf](https://www.pbrc.edu/prism/docs/PRISM_PhysicalActivityInChildCare.pdf)

Robert Wood Johnson Foundation. (2011). Preventing obesity among preschool children: How can child-care settings promote healthy eating and physical activity? Retrieved from <http://files.eric.ed.gov/fulltext/ED541796.pdf>

School Nutrition Association. School nutrition standards. Retrieved from <https://schoolnutrition.org/AboutSchoolMeals/SchoolNutritionStandards/>

The State of Obesity. Obesity rates and trends overview. Retrieved from <http://stateofobesity.org/obesity-rates-trends-overview/>

USDA. (2016). Child nutrition tables. Retrieved from <http://www.fns.usda.gov/pd/child-nutrition-tables>

#### Summaries of Studies from Paper:

1. Baranowski T, Baranowski J, Thompson D, et al. Video Game Play, Child Diet, and Physical Activity Behavior Change: A Randomized Clinical Trial. *American journal of preventive medicine*. 2011;40(1):33-38. doi:10.1016/j.amepre.2010.09.029.
  - a. Children in this study were between 10 and 12 years old and in the 50<sup>th</sup> to 95<sup>th</sup> percentile for weight. This intervention used a two-arm randomized control design. The intervention was two video games called Diab and Nano, while the control group played diet and physical activity knowledge-based games on popular websites. Assessments occurred at baseline, immediately after the first game (Diab), immediately after the second game (Nano), and two months later. The outcome measures were servings of fruit, vegetable, and water and minutes of moderate to vigorous physical activity. At each of the four points of assessment, there were 3 nonconsecutive days of 24-hour recalls, 5 days of physical activity using accelerometers, and assessment of height, weight, waist circumference and triceps skinfold. This intervention found that playing Diab and Nano had significant effects on the amount of fruits and vegetables that the children were consuming.
2. Bartelink, N. H., Jansen, M. W., Kremers, S. P., Mulkens, S., & Mujakovic, S. (2014). Long-term effects of the RealFit intervention on body composition, aerobic fitness, and behavior. *Childhood Obesity (Print)*, 10(5), 383-391. doi:10.1089/chi.2014.0027 [doi]
  - a. RealFit is a 13 week weight reduction program for youth that focuses on nutrition, physical activity, psychology, and parental participation. This study used a quasi-experimental design. There were 7 groups of approximately 12 participants in each group, all between the ages of 13 and 18 years old. They assessed height, weight, waist circumference, aerobic fitness, and self-reported dietary and PA behavior at baseline (T0), immediately after the 13 week RealFit intervention (T1), after 5 months (T2), and after 1 year (T3). At baseline the RealFit groups had higher average BMI (56.7% were obese) than the control group (27.6% were obese). One year after the RealFit intervention, they saw a significant decrease in BMI z-score in the intervention group, while no change

was seen in the control group. Waist circumference had decreased significantly in the intervention group also while the opposite effect was found in the control group. Analyses of the aerobic fitness data showed a significant increase 1 year after RealFit in the 7 intervention groups compared with baseline, while no changes were found in the control group. The number of participants who joined a sports club significantly increased in the intervention group and they enjoyed PA significantly more than at baseline.

3. Blitstern, JL, Cates, SC, Hersey, J., Montgomery, D., Shelley, M., Hradek, C., Kosa, K., Bell, L., Long, V., Williams, PA, Olson, S., Singh, A. (2016). Adding a social marketing campaign to a school-based nutrition education program improves children's dietary intake: A quasi-experimental study. *Journal of the Academy of Nutrition and Dietetics*, 116(8), 1285-94. doi:10.1016/j.jand.2015.12.016.
  - a. This study included third graders and their parents. It hoped to determine whether solely a nutrition program, a nutrition program along with a social marketing intervention, and a control group would see differences in fruit and vegetable consumption. Outcome measures were parent's reports of their children's consumption of fruits and vegetables and use of low-fat/ fat-free milk. The results found that children who were just in nutrition education classes increased their mean consumption of fruit by 0.16 cups and children in nutrition education with the social media component increased fruit consumption by 0.17 cups and vegetable consumption by 0.13 cups. Children in nutrition with social media also were 1.3 times more likely to use low-fat/ fat-free milk.
4. Bogart, L. M., Elliott, M. N., Cowgill, B. O., Klein, D. J., Hawes-Dawson, J., Uyeda, K., & Schuster, M. A. (2016). Two-year BMI outcomes from a school-based intervention for nutrition and exercise: A randomized trial. *Pediatrics*, 137(5), doi:10.1542/peds.2015-2493.
  - a. This study randomly selected 10 schools from the Los Angeles Unified School District (assigned 5 to the intervention group and 5 to the control group) and measured the height and weight of the 7<sup>th</sup> graders. The height and weight was measured at baseline and 2 years post-intervention. The intervention was a 5-week intervention combining school-wide food environmental changes with a seventh-grade peer leader club that incorporated social media. Linear regressions were used to predict 9<sup>th</sup> grade BMI from 7<sup>th</sup> grade BMI percentile and school indicators, using an intention-to-treat, individual-level analysis that compared each student's BMI percentile in 7<sup>th</sup> grade versus his or her BMI percentile in 9<sup>th</sup> grade, and included school indicators and sociodemographic characteristics (child gender, age, Latino race/ ethnicity, US-born status, and National School Lunch Program eligibility). Although the intervention did not exhibit significant effects on BMI percentile overall, intervention students who were classified as obese in 7<sup>th</sup> grade showed significant reductions in BMI percentile in 9<sup>th</sup> grade compared with control students.
5. Brotman, L. M., Dawson-McClure, S., Huang, K. Y., Theise, R., Kamboukos, D., Wang, J. Ogedegbe, G. (2012). Early childhood family intervention and long-term obesity prevention among high-risk minority youth. *Pediatrics*, 129(3), e621-8. doi:10.1542/peds.2011-1568 [doi]
  - a. Participants were minority youth at risk for behavior problems who were randomly assigned to family intervention or control condition at age 4. Follow up study 1 included 40 girls at risk for behavior problems and follow up study 2 included 146 boys and girls at risk for behavior problems based on teachers ratings. Behavior family intervention took place during early childhood (ages 3-5) and included a series of weekly 2-hour parent and child groups over a 6-month period. In both study 1 and study 2, the BMI at follow-up were significantly lower in the intervention group compared to the control.

6. Cohen, J. F., Richardson, S. A., Cluggish, S. A., Parker, E., Catalano, P. J., & Rimm, E. B. (2015). Effects of choice architecture and chef-enhanced meals on the selection and consumption of healthier school foods: A randomized clinical trial. *JAMA Pediatrics*, 169(5), 431-437. doi:10.1001/jamapediatrics.2014.3805 [doi]
  - a. A school-based randomized clinical trial was conducted during the 2011-2012 school year among 14 elementary and middle schools in 2 urban, low-income school districts. They focused on students in grades 3-8. Schools were randomized to receive a professional chef to improve school meal palatability or to a delayed intervention (control group). They also assessed the effect of choice architecture (smart café), by randomizing all schools after 3 months to the smart café intervention group or the control group. The smart café intervention included previously successful techniques such as vegetables placed first, fruits in attractive containers, fruit next to the cash register, signage promoting fruits and vegetables, and white milk was placed before sweetened milk. After 3 months, vegetable selection increased in the chef vs control schools but there was no effect on the selection of other components or on meal consumption. After long-term exposure to the chef or smart café interventions, fruit selection increased in all 3 intervention groups compared to the control group and consumption increased in the 2 chef school groups. Vegetable selection also increased in the 3 intervention groups and vegetable consumption increased in the chef and chef plus smart café groups.
7. De Bock, F., Britenstein, L., & Fischer, J. (2011). Positive impact of pre-school-based nutrition intervention on children's fruit and vegetable intake: Results of a cluster-randomized trial. *Public Health Nutrition*, 3(15), 466-475. doi:10.1017/S136898001100200X
  - a. This study looked at children between ages 3-6 from 18 pre-schools in south Germany. The intervention was administered once a week by a nutrition expert for 6 months and consisted of joint meal preparation and activities for children and parents such as tasting and preparing nutritious, fresh foods. At baseline, 6 months, and 12 months, parents completed a questionnaire assessing fruit and vegetable intake and water and sugar drink consumption. The results saw a significant change in fruit and vegetable intake but not daily water intake or consumption of high-energy drinks.
8. Elsbernd, S. L., Reicks, M. M., Mann, T. L., Redden, J. P., Mykerezi, E., & Vickers, Z. M. (2016). Serving vegetables first: A strategy to increase vegetable consumption in elementary school cafeterias. *Appetite*, 96, 111-115. doi:10.1016/j.appet.2015.09.001 [doi]
  - a. Subjects were children in kindergarten through 5<sup>th</sup> grade at a public, urban elementary school in Minnesota. The way the study worked was that they did 1 control day, 3 intervention days, and 1 follow-up control day. On the intervention days, all students were offered a portion of peppers in the hallway prior to reaching the station where they gave the cafeteria staff their PIN number. The students were told "these sweet peppers are for you to eat right now". If students denied the peppers, they were offered them one more time before they were allowed to go through the line without them. When 5 minutes remained in lunch, the research team recorded each student's PIN and assessed how much remained in the vegetable cup (none, 1/4, 1/2, 3/4, or full). The mean number of students taking the peppers increased from 8% to 65% on the 3 days where the vegetables were offered first. The mean number of students eating school lunch that ate peppers increased from 34 on days without vegetable first to 139 on days when the vegetable was served first.

9. Gao, Y., Cai, C., Li, J., & Sun, W. (2016). Nutritional intervention and breakfast behavior of kindergartens. *Iranian Journal of Public Health*, 45(3), 297-304.
  - a. Nutrition education sessions were held over 2 semesters for Kindergarteners and their parents. They then used a validated questionnaire to record breakfast behavior over 7 days, where the parents recorded the children's breakfast pattern (frequency, time, and food selection) at baseline, the middle, and end of the study. At the end there were significant differences in the breakfast frequency and in the breakfast selection. The intervention children chose more high-in-nutrient breakfast foods (i.e. fruit) at the end of the intervention compared to the control group who chose more high-in-energy foods (i.e. biscuits).
10. Grassi, E., Evans, A., Ranjit, N., Pria, S. D., & Messina, L. (2016). Using a mixed-methods approach to measure impact of a school-based nutrition and media education intervention study on fruit and vegetable intake of Italian children. *Public Health Nutrition*, 19(11), 1952-1963. doi:10.1017/S1368980015003729 [doi]
  - a. This study looked at four classes of 5<sup>th</sup> graders, two classes were assigned to the intervention group and two classes were assigned to the control group. The intervention was a school-based program that was completed during 12- 2 hour sessions over a 10 week period. The 3 components were health promotion, which included interactive activities promoting the consumption of fruits and vegetables, media education, which included interactive activities on how to analyze advertisements, and a health communication media based campaign, during which children created different media products related to fruit and vegetables targeting their parents. The students put a poster in the kitchen and completed 2 homework assignments with their index parent. This intervention proved effective for children but not their parents. Children increased fruit and vegetable intake and psychosocial determinants.
11. Kaufman-Shriqui, V., Fraser, D., Friger, M., Geva, D., Bilenko, N., Vardi, H., Shahar, D. R. (2016). Effect of a school-based intervention on nutritional knowledge and habits of low-socioeconomic school children in Israel: A cluster-randomized controlled trial. *Nutrients*, 8(4), 10.3390/nu8040234. doi:10.3390/nu8040234 [doi]
  - a. A cluster-randomized controlled-trial examined the effect of a school-based comprehensive intervention on nutrition knowledge, eating habits, and behaviors among low SES school aged children ages 4-7 years. They recruited children and their mothers from 11 schools in 1 town. There were 3 levels to the intervention: children, mothers, and teachers. The intervention included nutrition classes for children, mothers, and teachers and physical activity classes for children. The control group received only physical activity classes. Food knowledge observations, packed lunch records, and anthropometric measurements were obtained in school at baseline, six months, and at the end of the school year. Only children in the intervention arm improved their nutrition knowledge and eating habits and increased the food variety and fruit and vegetable score.
12. Lazorick, S., Crawford, Y., Gilbird, A., Fang, X., Burr, V., Moore, V., & Hardison, G. T., Jr. (2014). Long-term obesity prevention and the motivating adolescents with technology to CHOOSE health program. *Childhood Obesity (Print)*, 10(1), 25-33. doi:10.1089/chi.2013.0049 [doi]
  - a. MATCH (motivating adolescents with technology to CHOOSE health) intervention integrates lifestyle behavior change curriculum with academic subjects taught in seventh grade. This study assesses obesity prevention in participants into high school. This study compared 4-5 year longitudinal data from a single site cohort (195 participants at baseline) pre- and post-intervention in a rural middle school with high obesity rates with data from the 2006 Child Survey and 2010 Child and

- Young Adult Surveys from the National Longitudinal Survey of Youth. At follow-up, change in percent overweight was significantly different between groups, with the MATCH group decreasing (20%-12%) and the comparison group increasing (17%-19%). Overall, the MATCH group had significantly higher decrease rates in BMI z-scores and BMI percentile.
13. Ling, J., King, K. M., Speck, B. J., Kim, S., & Wu, D. (2014). Preliminary assessment of a school-based healthy lifestyle intervention among rural elementary school children. *The Journal of School Health, 84*(4), 247-255. doi:10.1111/josh.12143 [doi]
    - a. A comprehensive school-based healthy lifestyle intervention was implemented at 4 rural schools in Kentucky. The intervention included 4 goals: improving physical education, health education, family/ community involvement, and school wellness policies. Children's physical activity was assessed by a pedometer and nutrition was assessed by a recall survey in January (baseline), February, March, April, and May. The intervention saw a significant increase in the percentage of children meeting the nutrition recommendations at all 4 follow-up measures.
  14. Mihas, C., Mariolis, A., Manios, Y., Naska, A., Arapaki, A., Mariolis-Sapsakos, T., & Tountas, Y. (2010). Evaluation of a nutrition intervention in adolescents of an urban area in Greece: Short- and long-term effects of the VYRONAS study. *Public Health Nutrition, 13*(5), 712-719. doi:10.1017/S1368980009991625 [doi]
    - a. This study used a 12-week teacher implemented intervention in combination with seminars organized for parents in order to improve children's diet and nutrition knowledge. The intervention took place between September of 2007 and January 2008 with 12-13 year old students in Athens, Greece. 12 months after the intervention, the program was effective in reducing various indices in the intervention group compared to the baseline findings, such as BMI, daily energy intake, total fat intake, and % of daily energy. Except for BMI, the above findings were also observed 15 days after the intervention. The intervention group also reduced their weekly consumption of red meat and non-homemade meals and increased their frequency of fruit and breakfast cereal consumption.
  15. Nichols, S. D., Francis, M. P., & Dalrymple, N. (2014). Sustainability of a curriculum-based intervention on dietary behaviours and physical activity among primary school children in Trinidad and Tobago. *The West Indian Medical Journal, 63*(1), 68-77. doi:10.7727/wimj.2014.011 [doi]
    - a. This study was a randomized, controlled, school-based nutrition and physical activity intervention in primary schools in Trinidad and Tobago. One hundred students were assigned to the intervention and non-intervention groups and were followed up for 18 months. The students in the intervention group were exposed to a curriculum of six one-hour modules followed by school-based activities geared at fostering healthy behaviors. They also calculated BMI and participants had to take an Eating Attitude Test - a 26 item measure that yields a single index of disordered feelings and perceptions towards eating. The questionnaire was administered 3 months and 18 months post intervention. The intervention was associated with lower intake of fried foods and soda and higher knowledge scores 18 months later but was not associated with improved physical activity or lower BMI.
  16. Reinaerts, E., Crutzen, R., Candel, M., De Vries, N. K., & De Nooijer, J. (2008). Increasing fruit and vegetable intake among children: Comparing long-term effects of a free distribution and a multicomponent program. *Health Education Research, 23*(6), 987-996. doi:10.1093/her/cyn027 [doi]
    - a. 6 primary schools were recruited and assigned to either a daily free distribution program for the whole school or a multicomponent program consisting of a

classroom curriculum and parental involvement (without free fruit and vegetable), and 6 schools were recruited to serve as controls. Follow-up measures were conducted at the end of the intervention and 1 year later. The results showed similar effects for the 2 types of interventions in increasing children's fruit consumption over time (using a recall approach) but the distribution group also saw an increase in children's consumption over time, which was not seen in the classroom curriculum group.

17. Simon, C., Wagner, A., DiVita, C., Rauscher, E., Klein-Platat, C., Arveiler, D., Tribby, E. (2004). Intervention centered on adolescents' physical activity and sedentary behaviour (ICAPS): Concept and 6-month results. *International Journal of Obesity and Related Metabolic Disorders : Journal of the International Association for the Study of Obesity*, 28 Suppl 3, S96-S103. doi:0802812 [pii]
  - a. This study investigated a 6-month impact of a physical activity multilevel intervention on activity patterns and psychological predictors of physical activity among 954 middle school adolescents in Eastern France. They then looked at the changes in physical activity, leisure organized physical activity, high sedentary behavior, self-efficacy, and intention towards physical activity. 6 months after the intervention they found that the number of adolescents not engaged in physical activity was reduced by 50% in the intervention group and unchanged in the control group. Leisure organized physical activity participation increased among the intervention adolescents while high sedentary behavior was reduced. The intervention also improved self-efficacy in girls.
18. Song, HJ, Grutzmacher, S., Munger, AL. (2016). Project ReFresh: Testing the efficacy of a school-based classroom and cafeteria intervention in elementary school children. *Journal of School Health*, 86(7), 543-51. doi:10.1111/josh.12404
  - a. This study included 4<sup>th</sup> and 5<sup>th</sup> graders and lasted for one academic year. It assessed whether a school-based nutrition program using cafeteria environment intervention and nutrition education could increase fruit and vegetable consumption, students selecting healthy food, and preference for healthy food. The intervention group had a significant increase in many outcome variables, such as eating vegetables for lunch, number of days eating fruits and vegetables in the past week, and self-efficacy in preparing fruits and vegetables at home. The food preference of food items such as oatmeal, whole grain noodles, and vegetables also significantly improved.
19. Thompson, D., Bhatt, R., Vazquez, I., Cullen, K. W., Baranowski, J., Baranowski, T., & Liu, Y. (2015). Creating action plans in a serious video game increases and maintains child fruit-vegetable intake: A randomized controlled trial. *The International Journal of Behavioral Nutrition and Physical Activity*, 12, 39-015-0199-z. doi:10.1186/s12966-015-0199-z [doi]
  - a. This study included 4<sup>th</sup> and 5<sup>th</sup> grade students and a parent. There was a four-group randomized design with 3 data collection periods (baseline, immediate post-intervention, and 3 months post intervention). All of the participants in the study were assigned to play a 10-episode online video game. The outcome was child fruit and vegetable consumption. The difference between the groups was whether the child created an implementation intention (none, action, coping, both) as part of goal setting. Action plans state "how" a goal will be achieved, while coping plans identify a possible barrier and a corresponding solution. The action group had significantly higher fruit and vegetable intake at both post-intervention time periods.
20. Upton, D., Upton, P., & Taylor, C. (2013). Increasing children's lunchtime consumption of fruit and vegetables: An evaluation of the food dudes programme. *Public Health Nutrition*, 16(6), 1066-1072. doi:10.1017/S1368980012004612 [doi]

- a. Six intervention primary schools and seven control primary schools were included in this study. The Food Dudes intervention was an initial 16 day intervention phase where the children watched a series of episodes of the Food Dudes' adventure - 4 superheroes who gain powers by eating their favorite fruits and vegetables. Teachers would also read letters to the children from the Food Dudes to reinforce the message. During the first 4 days of the intervention, children were given rewards for tasting the target fruit and vegetables and then for consuming both foods for the remaining 12 days. Following the intervention, a maintenance phase was implemented, where fruit and vegetable consumption was encouraged but with less intensity. Fruit and vegetable consumption was assessed at baseline, 3 months after the intervention, and 12 months after the intervention using plate waste. Fruit and vegetable consumption in the intervention schools was statistically higher at the 3 month follow up. By 12 months there was a statistically significant decrease in both intervention and control schools.
21. Wang, J. J., Lau, W. C., Wang, H. J., & Ma, J. (2015). Evaluation of a comprehensive intervention with a behavioural modification strategy for childhood obesity prevention: A nonrandomized cluster controlled trial. *BMC Public Health*, 15, 1206-015-2535-2. doi:10.1186/s12889-015-2535-2 [doi]
- a. This pilot study gave 438 overweight and obese children ages 7-12 from primary schools in Beijing a one-year intervention. There were 4 groups: comprehensive intervention, a physical activity only intervention, a diet only intervention, and a control group. The comprehensive intervention group had positive effects on body fat percentage and blood pressure but not on biochemical metabolism indicators.