

**IMPROVING THE NUTRITIONAL QUALITY OF THE LUNCHESES OF ELEMENTARY  
SCHOOL CHILDREN**

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Alisha R. Farris

## **ABSTRACT**

Over 50 million children attend public elementary and secondary schools in the United States each day. Children spend a substantial portion of their waking hours in school and consume one-third to one-half of their daily calories there, making schools a promising site to influence dietary quality and potentially the risk of childhood obesity. Important policy revisions have been implemented in the National School Lunch Program (NSLP) to improve the nutritional quality of school meals. In 2010, the Healthy, and Hunger-Free Kids Act updated the NSLP standards. The revised nutrition standards required schools to increase the availability of fruits, vegetables, whole grains, and fat-free and low-fat fluid milk in school meals; reduce the level of sodium, saturated fat and trans fat; and meet the nutritional needs of school children within their calorie requirements. About 60% of elementary children participate in the NSLP at least once per week, with the remaining 40% of children bringing a packed lunch from home. While school lunches are guided by national standards and regularly monitored to ensure standards are maintained, the remaining 40% are not guided by national standards. The ultimate purpose of this research was to assess the current school lunch environment and increase the overall nutritional quality of elementary lunches. Data collection procedures included school and packed lunch observations, elementary parent questionnaires, and a pilot intervention to assist elementary parents in providing healthier packed lunches. Results from these studies provide insight on the nutritional differences in school and packed lunches, provide knowledge concerning the parental motivations and barriers to participating in the NSLP or packing lunch for a child, and contribute

to the limited research on effective modalities for assisting parents in providing healthier lunches. This research has significant implications public policy and provides valuable information for health professionals, researchers, food service directors, parents, and elementary school administrators to encourage NSLP participation and/or develop interventions which assist parents in packing healthier lunches. Interventions can take the form of marketing strategies to potentially influence NSLP participation, interventions to increase the nutritional value of packed lunches, and/or improvements in school wellness policies.

Dedicated to

Zachary, Oliver and Fletcher – my favorites.

You may have made this process more difficult, but you have made it **so much better**. Thank you for always bringing me back to reality with your laughter, silliness, and love. My constant reminder that you are the most important people ever.

Olie and Fletch:

I really did search the whole world and ask everyone.

They confirmed it.

You are the best boys a mom could have.

Stop growing and be mine forever.

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## **Attribution**

A brief description of the contributions made by colleagues that assisted with the preparation of my dissertation chapters is outlined below. Contributions rose to the level of coauthor for manuscript publication for four of my chapters.

### **Chapter 2. Nutritional Comparison of Packed and School Lunches in Pre-Kindergarten and Kindergarten Children following the Implementation of the 2012-2013 National School Lunch Program Standards.**

Sarah Misyak (Department of Human Nutrition, Foods & Exercise, Virginia Tech) provided edits of the manuscript. Elena Serrano, Mary McFerren, Kiyah Duffey (Department of Human Nutrition, Foods & Exercise, Virginia Tech), Kathy Hosig (Department of Population Health Sciences, Virginia Tech), George Davis (Department of Agricultural and Applied Economics, Virginia Tech), and Naama Atzaba-Poria (Department of Psychology, Ben-Gurion University) provided study design, logistic and statistical assistance, and provided edits of the manuscript.

### **Chapter 3: A Comparison of Fruits, Vegetables, Sugar-Sweetened Beverages, and Desserts in the Packed Lunches of Elementary School Children**

Sarah Misyak and Georgianna Mann (Department of Human Nutrition, Foods & Exercise, Virginia Tech) provided edits of the manuscript. Elena Serrano, Mary McFerren, Kiyah Duffey (Department of Human Nutrition, Foods & Exercise, Virginia Tech), Kathy Hosig (Department of Population Health Sciences, Virginia Tech), George Davis (Department of Agricultural and Applied Economics, Virginia Tech), and Naama Atzaba-Poria (Department of Psychology, Ben-Gurion University) provided study design assistance and edits of the manuscript.

#### **Chapter 4: Results and Implications of an Elementary Lunch Survey: The Perceptions of Packing and the National School Lunch Program.**

Sarah Misyak (Department of Human Nutrition, Foods & Exercise, Virginia Tech) provided edits of the manuscript. Elena Serrano, Mary McFerren, Kiyah Duffey (Department of Human Nutrition, Foods & Exercise, Virginia Tech), Kathy Hosig (Department of Population Health Sciences, Virginia Tech), George Davis (Department of Agricultural and Applied Economics, Virginia Tech), and Naama Atzaba-Poria (Department of Psychology, Ben-Gurion University) provided study design assistance and edits of the manuscript.

#### **Chapter 5: Using education and social support to help parents pack healthier lunches: Lessons learned from a pilot study, PACK-IT.**

Sarah Misyak and Elena Serrano (Department of Human Nutrition, Foods & Exercise, Virginia Tech) provided edits of the manuscript.



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# Chapter 1

## IMPROVING THE NUTRITIONAL QUALITY OF THE LUNCHESES OF ELEMENTARY SCHOOL CHILDREN

### Introduction

In the United States, one-third of children ages 2-19 are overweight and 17.3% of children are obese.<sup>1</sup> Due to the rising prevalence of childhood obesity and its many adverse effects it is now recognized as a major public health concern. Rising rates of childhood obesity have led to an increased risk for immediate and long-term health effects. Childhood obesity is associated with increased cardiovascular disease risk, type 2 diabetes, respiratory problems, psychological trauma, associated quality-of-life issues, and increased risk for adult obesity.<sup>2-7</sup>

Poor dietary quality and lack of sufficient physical activity are the major contributors to childhood obesity.<sup>8-11</sup> In most instances research demonstrates that the home and social food environments, where children develop food preferences, eating behaviors, and physical activity habits, have the greatest impact on childhood obesity.<sup>8, 12-15</sup> In fact, by the time children are 3 or 4 years old, food choices and acceptance patterns begin to be influenced by environmental cues.<sup>16</sup> Moreover, these early developed habits in childhood appear to continue into adolescence and adulthood.<sup>17-19</sup>

A high energy, high fat, low fiber diet with increased consumption of sugar sweetened beverages has been associated with obesity in children.<sup>20, 21</sup> Reedy et al. (2010) showed nearly 40% of total energy consumed by 2 to 18-year-olds was in the form of empty calories from solid fat and added sugars (SoFAS).<sup>22</sup> Fewer than 15% of children between the ages of 4-8 years consume the recommended amounts of fruits and vegetables<sup>23</sup> and according to Lorson et al. (2009), intake unfortunately decreases with age.<sup>24</sup>



To diminish the rapidly increasing rate of childhood obesity in the country, other avenues outside of the home environment have been pursued including increased scrutiny of the school food environment.<sup>25, 26</sup> Over 50 million children attend public elementary and secondary schools in the United States each day.<sup>27</sup> Children spend a substantial portion of their waking hours in school and consume one-third to one-half of their daily calories there.<sup>28-30</sup> Therefore, schools are a promising site to influence dietary quality and potentially lower (or reduce) the risk of childhood obesity for many children.<sup>10, 29, 31</sup>

Important policy revisions have been implemented in the National School Lunch Program (NSLP) to improve the nutritional quality of school meals.<sup>32</sup> Most recently, in 2010, the Healthy, and Hunger-Free Kids Act<sup>33</sup> updated the NSLP standards which began in the 2012-2013 school year. The updates to the nutrition standards were meant to align the standards with the 2010 Dietary Guidelines for Americans and were based on recommendations made by the 2009 Institute of Medicine report “School Meals: Building Blocks for Healthy Children”.<sup>34</sup> The revised guidelines required schools to increase the availability of fruits, vegetables, whole grains, and fat-free and low-fat fluid milk in school meals; reduce the level of sodium, saturated fat and trans fat; and meet the nutrition needs of school children within their calorie requirements.<sup>32</sup> The NSLP is available to all children participating in public school and approximately 95% of all public schools participate.<sup>35</sup> It is estimated that approximately 60% of children participate in the NSLP program at least once per week.<sup>36</sup>

NSLP participation was consistently on the rise until 2012 when, according to the United States Department of Agriculture (USDA), participation decreased from 31.8 million average daily meals (based on 2011 figures), to 31.6 million average daily meals (based on 2012 figures), to now 30.3 million average daily meals (based on 2014 figures).<sup>37</sup> With NSLP participation

rates decreasing it is assumed that the number of packed lunches must be increasing, especially among elementary schools that do not offer “competitive” foods and do not have open campuses. While school lunches are guided by national standards and regularly monitored to ensure standards are maintained, the remaining 40% of meals of children who are “non-participants” (and most likely bring a packed lunch from home) are not guided by national standards.

To date, relatively few studies have been published on the nutritional quality of packed lunches.<sup>25, 28, 31, 36, 38-41</sup> Existing studies utilized a variety of data collection methods and timeframes, such as 24-hour recalls and one to three day food observations, and were conducted with a variety of ages ranging from kindergarten (K) to twelfth grade. No studies reported data over a full school week (five days), with pre-K classes attending public school, and in comparison to the new NSLP standards. Young ages are specifically important when comparing the NSLP to packed lunches. The data gathered would be less diluted for younger students because competitive foods and open campuses are less likely to be options at this age.<sup>28, 31</sup>

As the primary caregivers of elementary students, parents influence all of the environments where children encounter meals and snacks,<sup>42</sup> including the decision to pack lunches or consume school meals.<sup>43</sup> Parents additionally influence children’s exposure and preference for food items by controlling the availability and accessibility to those foods,<sup>42</sup> whether that includes participating in the NSLP or providing packed lunches from home. Determining the many factors that influence the parental decision to either participate in the NSLP or bring a packed lunch from home is vital to improving the overall nutritional quality of the lunches of elementary children.

A small number of studies have measured student and parent perceptions of NSLP and packed lunches.<sup>43-48</sup> These studies utilized questionnaires and focus groups with students

attending public school (kindergarten through twelfth grade) or their parents. However, to our knowledge, no studies have reported data from parents of pre-kindergarten (pre-K) through fifth grade students since the implementation of the HHFKA standards despite young ages being a valuable time to promote food acceptance.<sup>12, 17, 19, 49</sup> More research is needed to develop effective interventions on increasing the nutritional quality of packed lunches, and to determine if perceptions of school and packed lunches may have changed with the implementation of the HHFKA nutrition standards.

Parents have reported a lack of knowledge as a barrier for identifying healthy food options for their family.<sup>50</sup> Additionally, Sweitzer et al. (2011), found that parents participating in group interviews requested written nutrition information, new and easy menu suggestions, opportunities for interaction with other parents from whom they could learn and provide social support, nutrition workshops and activities, and support from local supermarkets to assist in packing healthier lunches.<sup>51</sup> Previous interventions aimed at packed lunches have found moderate to significant success in improving fruit,<sup>9, 52</sup> vegetable,<sup>9, 42, 52</sup> and whole-grain<sup>42</sup> consumption by providing education materials,<sup>9, 42</sup> lunch boxes/bags,<sup>9</sup> teacher training,<sup>42</sup> and the use of media influence<sup>52</sup> to improve the quality of packed lunches for children. Additional research is needed to ascertain which strategies would help parents in packing healthy lunches for their elementary children.

#### *Goals and Objectives:*

My ultimate goal was to understand the nutritional differences in National School Lunch Program meals and packed lunches of elementary children, and to improve the nutritional quality of packed lunches offered to elementary children. The following four chapters of my dissertation include detailed objectives, each designed to address this goal:

**Part I. Nutritional Comparison of Packed and School Lunches in Pre- and Kindergarten Children following the Implementation of the 2012-2013 National School Lunch Program Standards.**

Published in The Journal of Nutrition Education and Behavior, 2014;46(6):621-626.  
Authors: Farris A.R., Misyak S., Duffey K., Davis G.C., Hosig K., Atzaba-Poria N., McFerren M., & Serrano E.L.

*Objectives:*

1. Conduct observations of the packed and school lunches of pre-kindergarten and kindergarten children in three schools located in rural Virginia over five consecutive school days.
2. Examine the nutritional quality of packed lunches compared to school lunches served to pre-kindergarten and kindergarten children attending public elementary school following the implementation of the 2012 National School Lunch Program standards.

**Part II. Comparison of Fruits, Vegetables, Sugar-Sweetened Beverages, and Desserts in the Packed Lunches of Elementary School Children.**

In press for Childhood Obesity 2015.

Authors: Farris A.R., Misyak S., Duffey K., Mann G.R., Atzaba-Poria N., Hosig K., Davis G.C., McFerren M. Serrano E.L.

*Objective:*

1. Compare differences in the nutritional quality of packed lunches to National School Lunch Program lunches by the presence or absence of sugar-sweetened beverages, dessert items, and fruits and vegetable items brought by pre-kindergarten and kindergarten elementary school children.

**Part III. Results and Implications of an Elementary Lunch Survey: The Perceptions of Packing and the National School Lunch Program.**

Submitted to The Journal of Nutrition Education and Behavior 2015.

Authors: Farris A.R., Misyak S., Atzaba-Poria N., Hosig K., Davis G.C., McFerren M., Duffey K., Serrano E.L.

*Objectives:*

1. Explore factors influencing whether parents of elementary school children (pre-kindergarten through fifth grade) participate in the National School Lunch Program or pack a lunch for their child.
2. Examine differences in factors for schools with low and high free and reduced lunch eligibility.
3. Examine whether the National School Lunch Program standards affect participation.

#### **IV. Increasing the Nutritional Quality of Elementary Lunches with Education and Social Support: PACK-IT, a pilot study.**

Author: Farris, A.R., Misyak S., Serrano, E.L.

*Objectives:*

1. Use nutrition education and parenting modalities based on the Social Cognitive Theory to increase fruit and vegetable servings and decrease sugar-sweetened beverage, dessert, and salty snack servings in the packed lunches of elementary children.
2. Determine the extent to which nutrition education combined with support via social media would affect the nutritional quality of lunches offered to elementary children.

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## Chapter 2

### **Nutritional Comparison of Packed and School Lunches in Pre-Kindergarten and Kindergarten Children following the Implementation of the 2012-2013 National School Lunch Program Standards**

**Farris, A.**, Misyak, S., Atzaba-Poria, N., Hosig, K., Davis, G.C., McFerren, M., Duffey, K., Serrano, E.L. Nutritional Comparison of Packed and School Lunches following the Implementation of the 2012-2013 National School Lunch Program Standards. *Journal of Nutrition Education and Behavior*, 2014;46(6):621-626.

#### **Abstract**

Approximately 40% of children bring a packed lunch to school. Little is known about the quality of these lunches. This study examined the nutritional quality of packed lunches compared to school lunches for Pre-Kindergarten and Kindergarten children, following the implementation of 2012-2013 National School Lunch Program standards. Observational data for packed and school lunches were collected from three schools in rural Virginia for five consecutive school days and analyzed for macro and micro nutrients. Of the 1314 observations collected; 42.8% were packed lunches ( $n = 562$ ), and 57.2% school lunches ( $n = 752$ ). Energy, fat, saturated fat, sugar, vitamin C, and iron were significantly higher while protein, sodium, fiber, vitamin A and calcium were significantly lower for packed lunches than school lunches. Packed lunches were of less nutritional quality than school lunches. Additional research is needed to explore factors related to choosing packed over school lunches.

## **INTRODUCTION**

Over 50 million children attend elementary and secondary public schools in the United States each day.<sup>1</sup> These children spend a substantial portion of their waking hours and consume a substantial portion of their daily calories at schools.<sup>2,3</sup> For approximately 60% of children these calories are derived from the National School Lunch Program (NSLP), with the remaining 40% from packed lunches.<sup>4</sup> During the past few years, there have been significant shifts in NSLP participation, with decreases from 31.8 million average daily meals in 2011 to 31.6 million in 2012,<sup>5</sup> translating into more children consuming packed lunches. While the NSLP is mandated to meet nutrition standards, aligned with the 2010 Healthy and Hunger-Free Kids Act,<sup>6,7</sup> packed lunches are not required to meet any nutrition standards.

To date, relatively few studies have been published on the nutritional quality of packed lunches.<sup>2,4,8-13</sup> Existing studies utilized a variety of data collection methods and timeframes, such as 24-hour recalls and one to three day food observations, and were conducted with a variety of ages ranging from kindergarten (K) to twelfth grade.<sup>2,4,8-13</sup> No studies reported data over a full school week (five days), with pre-K classes attending public school, and in comparison to the new NSLP standards. The purpose of this study was to examine the nutritional quality of packed lunches compared to school lunches served to pre-K and K children attending public school over five consecutive school days following the implementation of the 2012 NSLP standards.

## **METHODS**

### **Recruitment of Schools**

Eight elementary schools in a rural area in Virginia were contacted via email and telephone. Of the eight schools contacted, three (37.5%) agreed to participate. Permission to

enter each elementary school was granted by the County Public School Research Office and each individual school administrator. The Institutional Review Board for Virginia Tech approved the study and did not require any child or parental consent.

### **Setting and Participants**

The three elementary schools spanned two counties: Montgomery, with a population of 95,194 comprised of white (87.9%), black (4.1%), and Hispanic/Latino (2.9%) individuals; and Giles, with a population of 16,928 comprised of white (97%), black (1.5%), and Hispanic/Latino (1.3%) individuals.<sup>14</sup> The three schools had free and reduced price school lunch participation rates of 33.3%, 46.6%, and 52.7%, respectively. No identifying information for any student was collected. Pre-K and K students were selected because young ages represent a malleable time to promote food acceptance.<sup>15-18</sup>

### **Observational Protocol**

NSLP menus need to meet nutritional requirements over the course of one week, therefore observational data were collected in each elementary school for five consecutive school days.<sup>7</sup> All pre-K and K students in each school were served NSLP meals consisting of similar portion sizes. An observational checklist reflecting the meal components of the day's specific menu and commonly consumed items from packed lunches were used to record data on the presence of all food and drinks served as part of the NSLP and brought from home with "write-in" sections for additional foods that may have not been part of the observational checklist. Each researcher was assigned a specific grouping of students to observe for a lunch period, approximately 10 students per researcher.

### **Observer Training and Reliability**

Undergraduate and graduate nutrition students were recruited and trained as observers in direct observation to assess lunch contents, specifically visual item identification and portion size estimation. The training was conducted by a doctoral-level registered dietitian. For checklist reliability testing, observations of five pre-measured sample packed lunches were conducted with researchers, for a total of 24 items. Food and beverage items selected represented commonly found items in elementary packed lunches. School lunches were not chosen due to their uniformity and ease of recording. Accuracy was determined by dividing the number of items accurately recorded by the total number of items (item identification = 93.8%, portion estimation = 92.1%). Inter-observer reliability was assessed with average pairwise percent agreement tests ran in JMP<sup>®</sup> (Version 11, SAS Institute Inc., Cary, NC, 2013). Observers demonstrated 90.7% agreement for item identification and 86.8% agreement for portion estimation. This was consistent with previous research showing that trained observers with prior nutrition knowledge can accurately and reliably assess packed lunch contents and intake by direct observation in an elementary school setting.<sup>19</sup>

### **Data Analysis**

Nutrient analyses for school lunches per food item were provided by the School Foodservice Director for the region or the Cafeteria Manager for the elementary schools. Packed lunch items were analyzed using Nutritionist Pro™ Diet Analysis software (version 5.1, Axxya Systems, Stafford, TX, 2009) based on serving sizes recorded at the time of observation. If an item was unavailable in the Nutritionist Pro database, the nutrition facts label per product brand and type was used for analysis. USDA reference items were recorded when available. Students who brought a packed lunch and purchased milk from the cafeteria were classified as a packed



lunch observation. Students who participated in the NSLP but also brought food from home ( $n = 5$ , 0.007% of total observations), were excluded.

Descriptive statistics were used to describe the nutritional quality of packed versus school lunches. The Shapiro-Wilk test was used to determine whether the data were parametric. Comparisons of mean quantities of macronutrients and micronutrients (calories, protein, fat, saturated fat, carbohydrates, sugar, fiber, vitamin A, vitamin C, calcium, and iron) were carried out in JMP<sup>®</sup> (Version 11, SAS Institute Inc., Cary, NC, 2013) using the Mann-Whitney-Wilcoxon test. Multiple comparison and *post hoc* comparison tests were carried out with Bonferroni adjustment of  $p < 0.0042$ . Tukey's Honest Significant Difference test was used to detect differences between groups.

## **RESULTS**

### **Nutritional Profile of Packed and School Lunches**

A total of 1,314 lunches were observed, with 42.8% from packed lunches ( $n = 562$ ) and 57.2% from NSLP ( $n = 752$ ). Energy, carbohydrate, fat, saturated fat, sugar, vitamin C, and iron were significantly higher for packed lunches compared to school lunches, while protein, sodium, fiber, vitamin A and calcium were significantly lower for packed lunches compared to school lunches (Table 1). The nutrient availability for children in both packed and school lunch groups almost entirely met the nutrition standards of the NSLP except for school lunches being 38 calories below energy and 0.4 mg below iron recommendations while packed lunches were 1.5 grams higher than fat and 0.3 grams higher than saturated fat recommendations.

Table 1. Comparisons of Nutrients between School and Packed Lunches among Pre-Kindergarten and Kindergarten Students in Three Schools

	School Meals (n = 752)			Packed Meals (n = 562)			Bonferroni Adjusted Significance level = 0.0042 <i>P</i> -value**	USDA Nutrient Goals: K-5 <sup>th</sup> grade & Pre-K
	Mean	Median	IQR*	Mean	Median	IQR*		
Energy (kcal) <sup>1</sup>	512	520	106	608	588	240	<0.001	550-650 kcal (K-5 <sup>th</sup> ) 517 kcal (Pre-K) <sup>5</sup>
Carbohydrate (g) <sup>2</sup>	66	67	25	88	85	38	<0.001	-
Protein (g) <sup>2</sup>	26	27	8	18	17	9	<0.001	9 grams (K- 5 <sup>th</sup> ) <sup>6</sup> 7 grams (Pre-K) <sup>5</sup>
Fat (g) <sup>2</sup>	13	13	5	21	20	14	<0.001	<19.5 grams (K-5 <sup>th</sup> ) <sup>7</sup> <17 grams (Pre-K) <sup>7</sup>
Saturated Fat (g) <sup>2</sup>	3.6	3	4	6.8	6.5	6	<0.001	< 6.5 grams <sup>8</sup> <5.7 grams (Pre-K) <sup>8</sup>
Sodium (mg) <sup>3</sup>	1021	1038	364	883	818	482	<0.001	< 1,230 mg <sup>9</sup>
Fiber (g) <sup>2</sup>	7.2	7	4.5	4.8	4.5	4	<0.001	-
Sugar (g) <sup>2</sup>	35	35	12	45	43	37	<0.001	-
Vitamin A (IU) <sup>4</sup>	3856	1350	4800	1375	502	715	<0.001	1000 IU <sup>6</sup>
Vitamin C (mg) <sup>3</sup>	24	17	22	43	29	59	<0.001	15 mg <sup>6</sup>
Calcium (mg) <sup>3</sup>	503	460	209	305	297	285	<0.001	267 mg <sup>6</sup>
Iron (mg) <sup>3</sup>	2.9	2.5	1.5	3.4	3	2	<0.001	3.3 mg <sup>6</sup>

<sup>1</sup>Calories, <sup>2</sup>Grams, <sup>3</sup>Milligrams, <sup>4</sup>International units

<sup>5</sup>Minimum requirement for Pre-K children served meals as part of the NSLP.

<sup>6</sup>1/3 of the RDA for age/grade group.

<sup>7</sup>Total fat not to exceed 30 percent of total calories over a school week; calculation based on mean calorie range.

<sup>8</sup>Saturated fat not to exceed 10 percent of total calories over a school week; calculation based on meal calorie range.

<sup>9</sup>Sodium guidelines not required until 2014-2015 school year.

\*Interquartile Range (measure of dispersion for non-parametric tests).

\*\*Based on Mann-Whitney-Wilcoxon test

## Nutritional Profile of Packed Lunches by School

Differences among schools for the nutritional profile of packed lunches for protein, fat, saturated fat, sodium, vitamin A and calcium were not statistically significant (Table 2). Energy

was significantly higher for packed lunches of students at the moderate (46.6%) free and reduced eligibility level compared to both other schools. Packed lunches of students at the school with the low (33.3%) free and reduced eligibility level were significantly lower for carbohydrate, sugar, and vitamin C and significantly higher for iron and fiber than packed lunches at both other schools.

Table 2. Nutritional Profile of Packed Lunches of Pre-Kindergarten and Kindergarten Students from Three Separate Elementary Schools by Free and Reduced School Lunch Eligibility.

	School 1 33.3% Eligibility (n = 210, 37% of all total packed lunch observations)			School 2 46.6% Eligibility (n = 94, 17%)			School 3 52.7% Eligibility (n = 258, 46%)			Bonferroni Adjusted Significance level = 0.0042  P-value**
	Mean	Median	IQR*	Mean	Median	IQR*	Mean	Median	IQR*	
Energy (kcal) <sup>1</sup>	570 <sup>b</sup>	559	235	676 <sup>a</sup>	649	276	614 <sup>b</sup>	590	244	<0.001
Carbo- hydrate (g) <sup>2</sup>	80 <sup>b</sup>	76	36	100 <sup>a</sup>	99	47	91 <sup>a</sup>	72	37	<0.001
Protein (g) <sup>2</sup>	19	17	10	18	18	7	17	17	8.5	0.121
Fat (g) <sup>2</sup>	20	19	20	24	22	11	21	20	19	0.028
Saturated Fat (g) <sup>2</sup>	6.5	6	6	7.6	7	5	6.8	6.5	5.5	0.043
Sodium (mg) <sup>3</sup>	861	782	513	887	847	372	899	838	497	0.203
Fiber (g) <sup>2</sup>	5.6 <sup>a</sup>	5	4.5	3.7 <sup>b</sup>	4	3	4.4 <sup>b</sup>	4	3.5	<0.001
Sugar (g) <sup>2</sup>	38 <sup>a</sup>	36	22	54 <sup>c</sup>	54	28	47 <sup>b</sup>	48	23	<0.001
Vitamin A (IU) <sup>4</sup>	1499	515	710	1080	500	603	1382	502	679	0.249
Vitamin C (mg) <sup>3</sup>	34 <sup>b</sup>	15	57	52 <sup>a</sup>	59	64	46 <sup>a</sup>	47	58	<0.001
Calcium (mg) <sup>3</sup>	330	327	309	295	285	309	288	258	260	0.033
Iron (mg) <sup>3</sup>	4.0 <sup>a</sup>	3.5	2	3.0 <sup>b</sup>	2.5	2	3.1 <sup>b</sup>	3	2	<0.001

<sup>1</sup>Calories, <sup>2</sup>Grams, <sup>3</sup>Milligrams, <sup>4</sup>International units

Means followed by the same letter are not significantly different at the 0.004 level (Bonferroni corrected significance), using Tukey's Honest Significant Difference.

\*Interquartile Range (measure of dispersion for non-parametric tests).

\*\*Based on Mann-Whitney-Wilcoxon test.

### Food Categories in Packed and School Lunches

Packed lunches were less likely to contain fruits (54% vs 67%), vegetables (17% vs 61%), no sugar added juice (10% vs 22%), and milk (20% vs 96%) than NSLP meals. They also contained more savory snacks such as chips and crackers (57% vs 5%) and sugar-sweetened beverages (40% vs 0%). Some of the most commonly brought food items in packed lunches were: peanut butter sandwiches ( $n=155$ ), single serving chips ( $n=145$ ), single serving yogurt items, including yogurt cups and yogurt tubes ( $n=117$ ), Capri Sun drink pouches ( $n=112$ ), and Lunchables (pre-packaged food and drink combinations) ( $n=102$ ). Dessert items were classified as grain-based desserts, chocolate bars, dairy-based desserts, gummies, and candy. Of the packed lunches, 61% contained a dessert item and 17% contained more than that one dessert item. The NSLP did not provide dessert items to students (Table 3).

Table 3. Comparison of Food items Included in School Meals and Packed Lunches of Pre-kindergarten and Kindergarten Students.

Food Item	School Meals ( $n = 752$ ) (% of students)	Packed Meals ( $n = 562$ ) (% of students)
At least one fruit item (not juice)	67%	54%*
At least one vegetable/bean item (not juice)	61%	17%*
At least one dessert item (i.e., grain based desserts, chocolate bars, dairy based desserts, gummies, candy)	0%	61%**
More than one dessert item	0%	17%**
At least one savory snack item (i.e., chips, crackers)	5%	57%*
No Sugar Added Juice	22%	10%*
Sugar Added Juice/Soda	0%	40%**
Milk (Flavored and Unflavored)	96%	20%*
*Statistically significant at the <0.001 level with Chi-Squared test.		
**Unable to determine statistical significance due to 0 percentage in school meal category.		

## DISCUSSION

This is the first known study to compare packed lunches to NSLP lunches over a 5-day period among pre-K and K, and following the implementation of new NSLP nutrition standards. Like previous studies, the nutritional profile for packed lunches was of less nutritional quality than NSLP lunches.<sup>2, 10</sup> School lunches were more likely to meet nutrition standards than packed lunches, especially for fat and saturated fat, which exceeded recommended levels in packed lunches. We expected to find more differences in the nutrition profile of packed lunches among schools given the various free and reduced lunch eligibility levels potentially indicating various socio-economic levels. The elementary school with the lowest free and reduced lunch eligibility level (33.3%) had the best nutrition profile compared to both other schools potentially indicating the nutritional value of packed lunches does differ significantly among schools based on eligibility for free and reduced school lunch. A wider variation in eligibility may be warranted to observe greater differences by level.

The findings also suggest that packed lunches may contribute to higher solid fats and added sugars (SoFAS) intake among young children due to higher prevalence of dessert items, savory snack items, and sugar-sweetened beverages. These findings mirror previous studies in which NSLP participants consumed fewer sugar-sweetened beverages and energy-dense, solid foods than non-participants.<sup>8, 20</sup> This trend may lead to increased caloric intake and ultimately higher body mass and childhood obesity.<sup>21, 22</sup> While consumption of energy-dense, low-nutrient foods continues to rise, fruit and vegetable intakes in children are below recommended levels and tend to decrease with age.<sup>23, 24</sup> In this study the NSLP provided increased exposure to fruits and vegetables compared to packed lunch which is critical for acceptance, especially in young children.<sup>15, 18</sup>

Sodium content was higher in school lunch than packed lunch despite packed lunches providing many processed foods in the form of pre-packaged ready-to-eat items, primarily due to the use of processed food items in preparation of NSLP lunches, specifically in entrée items. To allow food manufacturers time to reformulate products and schools more time to build student acceptance of lower sodium meals, the USDA will transition new sodium standards in the NSLP in 2014-2015.<sup>7</sup> Despite school lunch sodium levels being higher than packed lunch in this study, the NSLP was meeting the 2014-2015 school year recommended levels.

Unlike in previous studies, NSLP school lunches were found to be lower than the recommended level for iron and calories, which could be due to food selection by pre-K and K students.<sup>1, 11</sup> While many schools offer two to three fruit and vegetable choices per meal along with multiple options for a main entrée, under the new guidelines students are only required to take a minimum of three meal components (food groups) at lunch, and only one of those food groups must be a fruit or vegetable. This study compares the NSLP foods selected by students, not all the food items for a lunch menu. Therefore, this finding is not a reflection on poor adherence of schools in meeting the nutritional guidelines, but a reflection on which food groups or items are chosen (or not chosen) by NSLP participants.

This study was consistent with previous studies which found vitamin C to be higher in packed lunches.<sup>11, 13</sup> Both packed and NSLP lunches met recommended levels, however the higher amount of vitamin C in packed lunches is most likely due to fortification of sugar-sweetened beverages.

Several factors may limit the generalizability of this study. The sample is restricted to young elementary students in a rural area in Virginia and may not be applicable to urban, ethnically diverse, or older students. This study examined only foods and beverages served

and/or offered to children over the school lunch period. Lunches were analyzed using observation techniques and not weighted samples. Possibly the largest limitation of this study was in not measuring actual consumption of food items. Future studies should also consider gathering food waste data in order to compare food consumption across various schools and between packed and school lunches.<sup>25</sup> To protect the privacy of elementary students, the research team did not collect any identifying information to track students over the five-day study period, which would have allowed for student-level analyses. In previous studies, the longest observation period was three days. Five days is a more appropriate time-frame as the new nutrition standards provide guidance over a five day period, and there may be day-to-day variations in the nutritional quality of school and packed lunches which may not be detected during a three day observation period.

## **IMPLICATIONS FOR RESEARCH AND PRACTICE**

Habits develop in early childhood and continue into adolescence and adulthood.<sup>16, 17</sup> Therefore, this is a critical time to promote healthy eating. Determining the many factors which influence the decision to participate in the NSLP or bring a packed lunch from home is vital to addressing the poor quality of packed lunches. Recently, Ohri-Vachaspati (2014) reported that participation in schools meals was independently associated with whether parents perceived the meals to be healthy.<sup>26</sup> Additional research is needed to explore additional factors related to choosing packed over school lunches and/or decision-making regarding what is offered in packed lunches. Further, nutrition education programs targeting children, parents, and, perhaps even, school policy around packed lunches should be encouraged to promote healthier options within packed lunches and/or encourage participation and increase enrollment in NSLP.

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## **Chapter 3**

### **Comparison of Fruits, Vegetables, Sugar-Sweetened Beverages, and Desserts in the Packed Lunches of Elementary School Children**

#### **Abstract**

An estimated 40% of children bring a packed lunch to school. These lunches are not required to meet nutrition standards. The purpose of this study was to compare differences in the nutritional quality of elementary packed lunches by the presence or absence of sugar-sweetened beverages, desserts, and fruits and vegetables. Observational data for pre-kindergarten and kindergarten packed lunches were collected from three schools in rural Virginia for five consecutive school days and analyzed for macro and micro nutrients and by the presence or absence of food and beverage items. Of the 561 packed lunch observations collected, 41.7% contained no fruit or vegetable, 41.2% contained a sugar-sweetened beverage, and 61.1% contained a dessert. The nutrient profile of packed lunches with at least one fruit or vegetable had significantly higher levels of carbohydrate, fiber, sugar, vitamin A, and vitamin C. Packed lunches containing a sugar-sweetened beverage had significantly higher levels of sugar and vitamin C, and significantly lower levels of protein, fiber, vitamin A, calcium, and iron. Packed lunches containing a dessert had significantly higher levels of energy, carbohydrate, fat, saturated fat, sodium, sugar, vitamin C, and iron, and significantly lower levels of vitamin A. Additional research is needed to fully understand parent and child motivations for packing lunches and the decision processes that influence the inclusion of food items. The development of packed lunch interventions, encouragement of National School Lunch Program participation, or enactment of school policies to increase the nutritional value of packed lunches is warranted.

## **BACKGROUND**

Childhood obesity is associated with increased cardiovascular disease risk, type 2 diabetes, respiratory problems, psychological trauma, associated quality-of-life issues, and increased risk for adult obesity.<sup>1-6</sup> In the United States, one-third of children ages 2-19 are overweight and 17.3% of children are obese.<sup>6,7</sup> Increases in childhood obesity rates may be partially attributed to decreases in the nutritional quality of diets. Fewer than 15% of children between the ages of 4-8 years consume the recommended amounts of fruits and vegetables<sup>8</sup> while intakes of solid fats and added sugars have increased to nearly 40% of total calories.<sup>9-11</sup>

The National School Lunch Program (NSLP) is a promising avenue to influence the dietary quality of children.<sup>12,13</sup> However, while approximately 60% of children participate in the NSLP, 40% of children do not participate.<sup>14</sup> These children are presumably packing lunches, especially in elementary schools which most likely do not offer “competitive” foods and do not have open campuses.<sup>14</sup> Unlike the NSLP, which is mandated to meet nutrition standards aligned with the 2010 Healthy and Hunger-Free Kids Act,<sup>15,16</sup> packed lunches are not required to meet any nutrition standards.

A small number of studies have been published on the nutritional quality of packed lunches in a school setting.<sup>12,14,17-24</sup> These studies used a wide variety of dietary data collection methods covering different timeframes (e.g. 24-hour recalls and one to three day food observations) and were conducted with a variety of ages ranging from kindergarten to twelfth grade. To our knowledge, no studies reported data over a full school week (five consecutive days), with pre-kindergarten classes attending school or compared differences among packed lunches between students.

The present study was part of a larger research program that compared the nutritional quality of packed lunches to meals served by the NSLP. The purpose of these analyses were to compare differences in the nutritional quality of packed lunches by the presence or absence of SSBs, dessert items, and fruits and vegetables.

## **METHODS**

### **Participants**

Administrators from eight elementary schools in a rural area in Virginia were contacted via email and telephone. Of the eight, three (37.5%) agreed to participate. Permission was granted through the County Public School Research Office. The three schools had free and reduced price school lunch participation rates of 33.3%, with white (78.3%), black (6.4%), and Asian/Pacific Islander (6.2%) individuals, 46.6%, with white (94.9%), black (1.6%), and Hispanic/Latino (0.8%) individuals, and 52.7%, with white (78.9%), black (12.2%), and Hispanic/Latino (3.7%).<sup>25</sup> Pre-kindergarten and kindergarten students were selected because young ages represent a malleable time to promote food acceptance.<sup>26-28</sup> No identifying information for any student was collected. The Institutional Review Board for [blinded for review] approved all aspects of the study. Parental and student consent was not required.

### **Observational Protocol**

Observational data were collected in each elementary school for five consecutive school days. Observational checklists reflecting commonly brought items in packed lunches were used to record the presence of all food and drink items brought from home with open sections for additional foods not reflected on the checklist. Each researcher was assigned a specific grouping of students to observe for a lunch period, approximately 10 students per researcher.

Nutrition students were recruited and trained as observers in direct observation to assess lunch contents, specifically visual item identification and portion size estimation. Observations of five pre-measured sample packed lunches were conducted with researchers, for a total of 24 items. Food and beverage items selected represented commonly found items in elementary packed lunches. Accuracy was determined by dividing the number of items accurately recorded by the total number of items (item identification = 93.8%, portion estimation = 92.1%).

Inter-observer reliability was assessed with average pairwise percent agreement tests run in JMP ® (Version 11, SAS Institute Inc., Cary, NC, 2013). Observers demonstrated 90.7% agreement for item identification and 86.8% agreement for portion estimation, with adequate IOR defined in literature as at least 85% agreement.<sup>29</sup> Each researcher was assigned approximately 10 students to observe for a lunch period.

### **Data Analysis**

Nutrient content of packed lunch items was analyzed using Nutritionist Pro™ Diet Analysis software (version 5.1, Axxya Systems, Stafford, TX, 2009) based on serving sizes recorded at the time of observation. USDA reference items were selected when available. If items were not found in the Nutritionist Pro database, nutrition fact labels for product brand and type were used for analysis. Students who brought a packed lunch and purchased milk at school were classified as a packed lunch observation. Students who participated in the NSLP but also brought food from home (n = 5, 0.9%), were excluded. Students who brought more than one beverage category (i.e., Sugar-Sweetened Beverage (SSB) and water beverage) were excluded (n = 18, 3.2%) from the beverage comparison analysis only (Table 2) to compare students with an SSB to all other beverage categories.

Descriptive statistics were used to describe the nutritional quality of packed lunches with and without SSBs, dessert items, and fruits and vegetables. The Shapiro-Wilk test was used to determine whether data were parametric. Comparisons of mean quantities of macronutrients and micronutrients (calories, protein, fat, saturated fat, carbohydrates, sugar, fiber, vitamin A, vitamin C, calcium, and iron) were carried out in JMP ® (Version 11, SAS Institute Inc., Cary, NC, 2013) using the Mann-Whitney-Wilcoxon test.

## **RESULTS**

### **Nutritional Profile of Packed Lunches by Fruits and Vegetables.**

A total of 561 packed lunches were observed. Roughly 42% (41.7) contained *no* fruit or vegetable (n = 234) and the remaining 58.3% contained *at least one* fruit or vegetable (n = 327).

The nutrient profile of packed lunches with *at least one* fruit or vegetable had significantly higher levels of carbohydrate, fiber, sugar, vitamin A, and vitamin C compared to packed lunches *without* a fruit or vegetable (Table 1). Only 12.5% of packed lunches contained a fruit *and* vegetable (Table 3).

Table 1. Comparisons of Nutrients between Pre-Kindergarten and Kindergarten Students who Packed Lunch with or without a Fruit or Vegetable Present in Three Schools

	<b>NO Fruit or Vegetable Present (n=234)</b> <u>Mean</u>	<b>At least one Fruit or Vegetable Present (n=327)</b> <u>Mean</u>	Mann-Whitney-Wilcoxon significance test <b>P-value**</b>
Energy (kcal)	597 (Median = 589) IQR* = 243	618 (Median = 589) IQR* = 325	0.36
Carbohydrate (g)	83 (Median = 80) IQR = 41	93 (Median = 89) IQR = 38	<b>&lt;0.01</b>
Protein (g)	18 (Median = 17) IQR = 8.2	19 (Median = 17) IQR = 8.5	0.71
Fat (g)	22 (Median = 21) IQR = 14	20 (Median = 19) IQR = 14	0.04
Saturated Fat (g)	7.0 (Median = 6.5) IQR = 5.5	6.7 (Median = 6.0) IQR = 6.0	0.36
Sodium (mg)	924 (Median = 858) IQR = 499	856 (Median = 790) IQR = 478	0.02
Fiber (g)	3.3 (Median = 3.0) IQR = 2.5	5.8 (Median = 5.5) IQR = 4.0	<b>&lt;0.01</b>
Sugar (g)	40 (Median = 38) IQR = 28	48 (Median = 47) IQR = 26	<b>&lt;0.01</b>
Vitamin A (IU)	955 (Median = 500) IQR = 526	1680 (Median = 579) IQR = 773	<b>&lt;0.01</b>
Vitamin C (mg)	34 (Median = 12) IQR = 60	49 (Median = 42) IQR = 62	<b>&lt;0.01</b>
Calcium (mg)	297 (Median = 283) IQR = 257	311 (Median = 301) IQR = 297	0.36
Iron (mg)	3.1 (Median = 3.0) IQR = 2.0	3.6 (Median = 3.0) IQR = 2.0	0.08

\*Interquartile Range (measure of dispersion for non-parametric tests).

\*\*Significance <0.0, Mann-Whitney-Wilcoxon test, comparison of mean quantities

### Nutritional Profile of Packed Lunches by SSBs.

Of the 543 packed lunches with one beverage category, 58.7% *did not* contain an SSB (n = 319) while 41.2% *did* (n = 224). The presence of an SSB resulted in significantly higher levels of sugar and vitamin C, and significantly lower levels of protein, fiber, vitamin A, calcium, and iron compared to those without an SSB (Table 2). For lunches not containing an SSB, the most common beverages were milk (20.7%), water (16.4%), no beverage (11.0%), and juice with no sugar added (10.7%) (Table 3). There was not an association between the presence of an SSB



and the presence of a fruit or vegetable (Table 3) because approximately half of the lunches with an SSB also had a fruit and/or vegetable.

Table 2. Comparisons of Nutrients between Pre-Kindergarten and Kindergarten Students who Packed Lunch with or without a Sugar-Sweetened Beverage or Dessert Present in Three Schools

	NO SSB Present (n=319)	SSB Present (n=224)	Mann-Whitney-Wilcoxon test for SSB  <i>P-value</i> **	NO Dessert Present (n=218)	Dessert Present (n= 343)	Mann-Whitney-Wilcoxon test for Dessert  <i>P-value</i> **
	<u>Mean</u>	<u>Mean</u>		<u>Mean</u>	<u>Mean</u>	
Energy (kcal)	594 (Median = 578) IQR* = 224	617 (Median = 605) IQR* = 247	0.21	527 (Median = 525) IQR* = 208)	661 (Median = 642) IQR* = 246	<0.01
Carbohydrate (g)	85 (Median = 82) IQR = 38	91 (Median = 89) IQR = 39	0.02	75 (Median = 73) IQR = 32	97 (Median = 95) IQR = 37	<0.01
Protein (g)	19 (Median = 17) IQR = 10	17 (Median = 16) IQR = 8	<0.01	18 (Median = 17) IQR = 8.5	18 (Median = 17) IQR = 9	0.91
Fat (g)	20 (Median = 19) IQR = 14	22 (Median = 21) IQR = 13	0.09	18 (Median = 18.0) IQR = 13.5	23 (Median = 21.5) IQR = 14.5	<0.01
Saturated Fat (g)	6.5 (Median = 6.0) IQR = 5.5	7.2 (Median = 6.5) IQR = 5.5	0.03	5.5 (Median = 5.5) IQR = 5.5	7.7 (Median = 7.0) IQR = 5.0	<0.01
Sodium (mg)	876 (Median = 810) IQR = 464	872 (Median = 802) IQR = 488	0.87	816 (Median = 761) IQR = 484	928 (Median = 857) IQR = 496	<0.01
Fiber (g)	5.1 (Median = 4.5) IQR = 3.5	4.2 (Median = 4.0) IQR = 4.0	<0.01	5.0 (Median = 4.5) IQR = 3.5	4.6 (Median = 4.5) IQR = 3.8	0.15
Sugar (g)	41 (Median = 40) IQR = 26	48 (Median = 48) IQR = 24	<0.01	35 (Median = 36) IQR = 25.5	51 (Median = 49) IQR = 22	<0.01
Vitamin A (IU)	1457 (Median = 553) IQR = 700	1195 (Median = 492) IQR = 619	<0.01	1907 (Median = 583) IQR = 817	1041 (Median = 500) IQR = 647	<0.01
Vitamin C (mg)	38 (Median = 16.5) IQR = 60	49 (Median = 47) IQR = 62	<0.01	33 (Median = 15) IQR = 62.5	49 (Median = 49) IQR = 55	<0.01
Calcium (mg)	317 (Median = 312) IQR = 291	272 (Median = 235) IQR = 238	<0.01	309 (Median = 300) IQR = 275	303 (Median = 286) IQR = 296	0.62
Iron (mg)	3.7 (Median = 3.0) IQR = 2.0	2.9 (Median = 3.0) IQR = 2.0	<0.01	3.0 (Median = 3.0) IQR = 2.5	3.6 (Median = 3.5) IQR = 1.5	<0.01

\*Interquartile Range (measure of dispersion for non-parametric tests).

\*\*Significance <0.01, Mann-Whitney-Wilcoxon test, comparison of mean quantities

### Nutritional Profile of Packed Lunches by Dessert Items.

Of all packed lunches (n = 561), a majority *did* contain a dessert item (n=343, 61.1%), and 17% contained *more than one* dessert item (Table 3). Packed lunches with a dessert item had significantly higher levels of energy, carbohydrate, fat, saturated fat, sodium, sugar, vitamin C, and iron, and significantly lower levels of vitamin A compared to packed lunches without a dessert item (Table 2). Grain-based desserts (44.1%) followed by fruit snacks or gummies (28.3%) were the most frequently brought items. The presence of a dessert item was not

associated with the presence of a fruit or vegetable (Table 3) because approximately half of lunches with a dessert also had a fruit and/or vegetable.

Table 3. Observation of Food Items brought by Elementary Children in Packed Lunches among Three Schools

<b><i>Fruits and Vegetables</i></b>	
At least one Fruit OR Vegetable item (not juice)	58.3%
At least one Fruit AND Vegetable item (not juice)	12.5%
No Fruit or Vegetable items	41.7%
<b><i>Sugar-Sweetened Beverages and Other Drink Types</i></b>	
Sugar-Sweetened Beverage	41.2%
Juice with No Sugar Added	10.7%
No Beverage	11.0%
Water	16.4%
Milk (Flavored and Unflavored)	20.7%
<b><i>Dessert Items</i></b>	
At least one Dessert item (i.e., grain-based desserts, chocolate bars, dairy-based desserts, gummies, candy)	61.1%
More than one Dessert item	17.0%
No Dessert item	38.9%
<b><i>Item Combinations</i></b>	
Sugar-Sweetened Beverage with No Fruit and Vegetable Items	50.4%
Sugar-Sweetened Beverage with Fruit and Vegetable Items	49.6%
Dessert present with No Fruit and Vegetable Items	50.1%
Dessert present with Fruit and Vegetable Items	49.9%

## DISCUSSION

To our knowledge, this is the first study to compare the nutritional profile of packed lunches for pre-kindergarten and kindergarten children by the presence or absence of specific food and beverage items. The results suggest that lunches containing SSBs and dessert items, and do not contain fruits and vegetables, have lower nutritional quality. For example, the presence of SSBs in packed lunches resulted in lower calcium and higher sugar levels than lunches which did not contain an SSB. This is especially concerning due to the potential for

displacement of milk, which only accounted for one-fifth of beverages in our sample. Other studies have shown that SSBs negatively contribute to the diets of children and that SSB consumption is a marker of an overall poor quality diet.<sup>9, 10, 30, 31</sup>

Nearly two-thirds of the packed lunches contained at least one dessert item, and approximately one-fifth of those lunches contained two dessert items, which contributed to increased levels of energy, fat, saturated fat, and sugar compared to lunches that did not contain dessert. Our findings were consistent with previous studies that found that solid fats and added sugars are significant contributors to energy in children's diets.<sup>32, 33</sup> Therefore lunches containing desserts may lead to increased caloric intake and ultimately higher body mass and childhood obesity.<sup>34, 35</sup>

According to MyPlate,<sup>36</sup> half of a child's lunch should be comprised of fruits and vegetables; however our findings among pre-kindergarten and kindergarten students were that almost half did not bring any fruit and vegetables items in their packed lunch resulting in lower levels of fiber, vitamin A, and vitamin C when compared to children with a fruit or vegetable present. The presence of both fruit and vegetable items was even more rare, occurring in just one-tenth of pre-kindergarten and kindergarten packed lunches. The importance of exposure to fruits and vegetables is critical for acceptance, especially in young children, as childhood eating habits track into adulthood.<sup>26-28, 37</sup>

Several factors may limit the generalizability of this study. The sample is restricted to pre-kindergarten and kindergarten elementary students in a rural area in Virginia and may not be applicable to urban, ethnically diverse, older students, or other areas of the United States. This study only examined foods and beverages offered to children over the school lunch period. Students may compensate for nutritional deficiencies with food served at other locations or, the

packed lunches may not be indicative of overall diet. Possibly the greatest limitation of this study was in not measuring actual consumption of food items. Researchers were not permitted to use weighing techniques to approximate consumption, and thus we are not able to estimate the impact that packed lunches have on actual intake. To protect the privacy of elementary students, the research team did not collect any identifying information to track students over the five-day study period, which would have allowed for student-level analyses. Students who packed one day likely packed multiple days but may not have packed all five days. Thus, the influence of individual children on overall results is varied.

## **CONCLUSIONS AND IMPLICATIONS**

Packing lunches that do not contain fruit and vegetables, and do contain SSBs or desserts is a missed opportunity for parents to reinforce healthy habits and instill healthy food preferences that will carry into adulthood. Very few studies have interventions aimed at increasing the nutritional quality of packed lunches or attempted to discern the factors that motivates parents to pack,<sup>38-42</sup> and interventions that have done so have produced moderate results.<sup>38, 39</sup> Additional research is needed to fully understand parent and child motivations for packing lunches and the decision processes that influence the inclusion of certain food items before effective interventions to increase the nutritional value of packed lunches can be developed.

In addition to research, encouraging participation in the NSLP, through marketing strategies and educational campaigns, growth of farm-to-school opportunities, or collaboration with parents and students on NSLP menu options all represent other avenues to positively impact the nutritional profile of elementary children's lunches. Finally, changes in school policies may be another option that may help improve the nutritional quality of packed lunches for elementary children. On a national scale, the Healthy, Hunger Free Kids Act requires schools to strengthen

their wellness policies and maintain a healthy school environment.<sup>15</sup> Enacting county or state policies or recommendations aligned with MyPlate and the nutrition standards of the NSLP could improve the nutritional quality of packed lunches by encouraging fruits and vegetables with every meal and snack, substituting milk or water for SSBs, and using fruit as a dessert.

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## Chapter 4

### **Results and Implications of an Elementary Lunch Survey: The Perceptions of Packing and the National School Lunch Program**

#### **Abstract**

In 2010, the Healthy, and Hunger-Free Kids Act updated the nutrition standards for the National School Lunch Program (NSLP). The purpose of this study was to explore factors influencing parents to participate in NSLP or pack lunches. Parents from four elementary schools in a rural county of Virginia were provided a questionnaire assessing perceptions of NSLP and packed lunches. Chi-square tests and descriptive statistics were used to evaluate differences. A total of 516 surveys were collected, 55.2% from schools with higher free and reduced lunch eligibility rates ( $n = 285$ ); 44.8% from schools with lower rates. The most frequent motivational factors for NSLP participation were convenience and saving time; factors for packing were variety, nutritional quality, taste/food preferences, and providing organic or sustainable foods. Improvements to the nutritional quality of elementary lunches can be accomplished through NSLP marketing, parent interventions, and school wellness policies.

## **INTRODUCTION**

In 2010, the Healthy, and Hunger-Free Kids Act (HHFKA) updated the nutrition standards for the National School Lunch Program (NSLP).<sup>1</sup> In elementary schools, this impacts approximately 60% of children who participate in the NSLP, but not the remaining 40% of children who are bringing a packed lunch from home.<sup>2</sup> Recent research suggests packed lunches are lower in nutritional quality than NSLP lunches,<sup>3-6</sup> contributing to poor dietary profiles and higher risk of childhood obesity.<sup>3, 4, 6, 7</sup> More research is needed to determine factors influencing NSLP participation versus the decision to pack a lunch.

A small number of studies have measured student and parent perceptions of NSLP and packed lunches.<sup>2, 8-11</sup> These studies utilized questionnaires and focus groups with students attending public school (kindergarten through twelfth grade) or parents.<sup>8, 12-14</sup> However, to our knowledge, no studies have reported data from parents of pre-kindergarten (pre-K) through fifth grade students since the implementation of the HHFKA standards despite young ages being a valuable time to promote food acceptance.<sup>15-18</sup> The purpose of this study was to explore factors influencing whether parents of elementary school children participate in the NSLP or pack a lunch for their child and to examine differences in factors for schools with low and high free and reduced lunch (FRL) eligibility.

## **METHODS**

### **Participants**

Four Virginia elementary schools in a rural county, selected because they represented the two highest (65.5% and 51.9%) and lowest (19.2% and 18.8%) FRL eligibility rates for the county, agreed to participate in this study. The county had a population of 95,194, with white (87.9%), black (4.1%), and Hispanic/Latino (2.9%) individuals.<sup>19</sup> The Institutional Review Board

for [blinded] approved the study. A questionnaire was distributed within a single week. Upon completion, parents were entered into a drawing for a \$50 gift-card.

### **Questionnaire Design**

The anonymous, self-completion questionnaire used a five-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree) to measure motivating factors and barriers to NSLP participation and packing lunches. Questions were developed and adapted from previous research,<sup>9, 12</sup> input from a focus group of elementary parents, nutrition faculty, and the School Nutrition director for the study site; and pilot tested on-line with parents. The survey was comprised of three sections with questions pertaining to: 1) changes and frequency of NSLP participation; 2) motivating factors for NSLP participation; and 3) motivating factors for packing lunches. The survey provided two additional areas for written comment, one concerning NSLP participation and one concerning packed lunch participation. Parents were instructed to complete only one questionnaire per family.

### **Data Analysis**

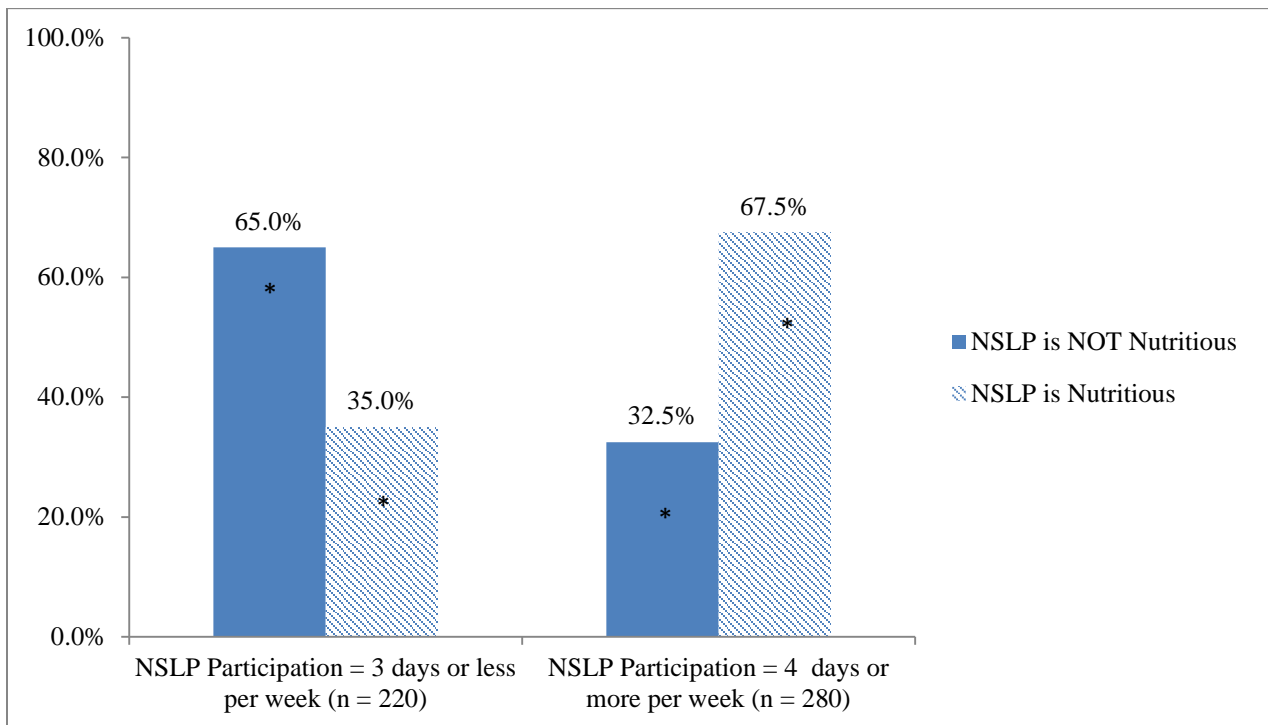
Analyses for quantitative data were carried out in JMP ® (Version 11, SAS Institute Inc., Cary, NC, 2013) using descriptive statistics and chi-square tests for significance. Responses were combined into three categories of agreement, disagreement, or neutral for detecting statistical significance. “Agree” and “strongly agree” were combined to determine and frequency of agreement for motivating factors. Written comments were coded, common themes identified, and the frequency of themes calculated.

## **RESULTS**

### **NSLP Participation**

Five hundred-sixteen of 1,447 possible questionnaires, (35.7% response rate), were returned, with 55.2% from elementary schools with higher FRL eligibility rates (n = 285) and 44.8% from elementary schools with lower rates (n = 231). Only 17.5% of parents reported their child never participated in school lunch and 55.0% participated four to five days per week (mean = 3.2 days). Parents of a child who participated in the NSLP four or more days per week were significantly more likely to perceive the NSLP as “nutritious” (67.5% vs 32.5%) (Figure).

Figure 1. Frequency of participation in the National School Lunch Program (NSLP) and perceived nutrition of school lunches by parents of elementary children\* $p < 0.01$ , Chi-square test for significance.



## **Factors Affecting NSLP Participation**

While 48.3% reported the HHFKA standards had no effect on their child's NSLP participation, only 10.3% reported choosing school lunch more because of the HHFKA standards, and 14.4% were not aware of the revised standards. The two most frequent motivational factors for NSLP participation across all schools were convenience and saving time with the NSLP (Table 1). Motivational factors for packing lunch differed by FRL eligibility. The most frequent motivators for lower FRL schools were variety of foods, nutritional quality, and providing organic or sustainable foods (lower FRL eligibility schools), while frequent factors for higher FRL schools were child pickiness, variety of foods, and nutritional quality (Table 1). Barriers not included in Table 1 were: waiting in long lines to receive lunch (13.6%) and dietary restrictions (7.6%).

Table 1. Parental Motivating Factors in National School Lunch Program Participation or Packing Lunches for Elementary School Children by Free and Reduced Lunch Eligibility

<i>Motivations for National School Lunch Participation (NSLP) Participation</i>							
Motivation Indicators	Lower Free and Reduced Lunch Eligibility (18.8% and 19.2%)			Higher Free and Reduced Lunch Eligibility (51.9% and 65.5%)			Chi-square Significance* *
	Mean <sup>1</sup>	Median <sup>1</sup>	Frequency of Agreement*	Mean <sup>1</sup>	Median <sup>1</sup>	Frequency of Agreement*	
NSLP offers more variety of choices	3.1	3.0	39.6%	3.3	3.0	48.9%	0.11
I save money with the NSLP	2.9	3.0	26.7%	3.3	3.0	46.6%	<0.01
I want to support a program that my tax dollars support	3.2	3.0	34.4%	3.6	4.0	50.9%	<0.01
I save time when my child eats school lunch	4.2	5.0	79.7%	3.8	4.0	66.6%	<0.01
NSLP is more convenient	4.1	4.0	79.6%	3.9	4.0	67.6%	<0.01
NSLP is nutritious	3.1	3.0	41.2%	3.7	4.0	62.9%	<0.01
My child wants to eat school lunch because friends eat school lunch	2.7	3.0	26.1%	2.9	3.0	34.1%	0.16
NSLP offers enough food for my child	3.5	4.0	57.5%	3.5	4.0	55.0%	0.29
I want to support NSLP because it's an important part of school culture	3.1	3.0	39.6%	3.6	4.0	52.9%	<0.01
<i>Motivations for Packing Lunches (PL)</i>							
PL offers more variety of choices	3.4	3.0	48.8%	3.1	3.0	39.0%	0.08
I save money with PL	3.0	3.0	33.3%	2.7	3.0	26.9%	0.03
I do not want to support government sponsored program	1.9	2.0	4.7%	1.9	2.0	7.1%	0.40
I save time with PL	1.8	2.0	4.6%	2.0	2.0	9.4%	<0.01
PL is more convenient	2.0	2.0	8.7%	2.1	2.0	13.5%	0.02
PL is more nutritious	3.7	4.0	61.9%	2.9	3.0	28.2%	<0.01
My child wants to pack because friends pack	2.5	3.0	16.4%	2.4	2.0	20.4%	0.02
NSLP does not offer enough food	2.4	2.0	14.2%	2.7	3.0	31.1%	<0.01
NSLP is not organic or sustainable	3.5	3.0	47.7%	2.8	3.0	22.9%	<0.01
My child is a picky eater	2.8	3.0	35.9%	3.0	3.0	45.1%	0.11

\*Frequency of Agreement determined by combining responses from "agree" and "strongly agree" for each indicator.

\*\*p < 0.01, Chi-square test of significance, calculations based on responses of agreement, disagreement or neutral.

<sup>1</sup>Mean and Median calculated from Likert Scale responses (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree)

There were 138 written responses (26.7% of total respondents) concerning NSLP or packing lunch participation. Emergent barriers and supporting comments are presented in Table 2. The majority of comments (83.3%) addressed barriers to NSLP participation. The most prominent barrier (41.3%) was taste/food preferences. Many comments centered on a dislike of menu options or preference for other foods. The second most commonly cited barrier (31.2%) was nutritional or food quality. Parents were concerned about processed food and additives/preservatives, expressing interest in organic options. The third barrier (10.9%) was quantity of food. Some parents were concerned the NSLP did not provide enough food while others felt food was wasted.

Table 2. Emergent barriers to participating in the National School Lunch Program with supporting comments from parents of elementary school children (n = 138).

Barrier 1. Taste and Preference (41.3%, 57 responses)	<p>1.1 My children prefer packing because they can guarantee what they like in their lunch.</p> <p>1.2 My child says the food tastes different this year. Not in a good way.</p> <p>1.3 My child doesn't like some of the [school] lunch choices, thus his desire for a packed lunch.</p>
Barrier 2. Nutritional and Food Quality (31.2%, 43 responses)	<p>2.1 ...things like fried cheese sticks or corn dogs as main courses just don't meet our nutritional expectations. I let my daughter buy lunch a few times a month but...have to veto items which shouldn't be an option on a school lunch menu.</p> <p>2.2 I view highly processed foods (shrimp poppers, chicken nuggets, etc.) as not nutritious because of food additive/preservative content.</p>
Barrier 3. Quantity (10.9%, 15 responses)	<p>3.1 School lunches are very expensive compared to the servings given. My child throws away more than she eats.</p> <p>3.2 My kids beg me to pack so they will get full.</p>

## DISCUSSION

This is the first known study to assess the motivations and barriers related to NSLP participation and packing lunches by FRL school eligibility among parents of pre-K through fifth grade students, after implementation of the updated HHFKA standards. The results suggest that HHFKA standards had no effect on NSLP participation rates.

The findings mirror previous research where perceived nutritional quality of the NSLP was identified as both a barrier and motivating factor for NSLP participation depending on the perception of the NSLP as “nutritious” or “not nutritious”.<sup>10, 12, 13</sup> However, current research suggests packed lunches are less nutritious<sup>3-6, 20-29</sup> with students participating in the NSLP consuming more fruits, vegetables, and milk.<sup>30, 31</sup> Interestingly, processed foods, preservatives, and additives were significant barriers to NSLP participation in lower FRL eligibility schools along with nutrition.



Barriers to NSLP participation included taste/food preferences and variety for higher FRL eligibility schools, and variety was also identified for lower FRL schools. Conversely, food quantity was identified as a barrier in higher FRL schools, but a motivating factor for NSLP participation in lower FRL schools. In study sites, students were required to take a minimum of three meal components for the NSLP, though they were offered more.<sup>1</sup> The perception that children are not getting enough quantity or variety of food from the NSLP may stem from confusion between the minimum foods students must take compared to the total they are offered.

The convenience of school lunch and time required to prepare packed lunches were the two highest motivating factors for NSLP participation in both higher and lower FRL eligibility schools. This is consistent with other studies showing convenience and time are important to parents.<sup>2, 8, 9, 11</sup> While cost was a previously identified as a motivating factor for NSLP participation,<sup>2, 8, 11</sup> our results were not consistent with this. Parents were divided on which lunch option resulted in cost savings.

Several factors may limit the generalizability of this study. Data are from parents of elementary school-aged children in a rural area and may be not applicable to older, urban, or diverse populations. Self-selection for questionnaire completion may also limit the generalizability of the results. To protect the privacy of parents and children, no demographic or individual FRL eligibility information was collected which would have allowed for individual socio-economic analyses.

## **CONCLUSIONS AND IMPLICATIONS FOR RESEARCH AND PRACTICE**

Lunches, regardless of the source, are opportunities for parents and schools to reinforce healthy habits and food preferences that carry into adulthood.<sup>16, 17, 32</sup> As prior research indicates NSLP lunches may be healthier than packed lunch, these results combined with prior research

can be used to develop interventions to either improve the nutritional value of packed lunches or promote NSLP participation. Some examples of past initiatives that have successfully altered taste and food preferences for children and should be considered as potential strategies for encouraging NSLP participation are farm-to-school and garden initiatives,<sup>33</sup> taste tests of menu items,<sup>34</sup> student and parent involvement in menu development,<sup>35</sup> rewards for trying food items,<sup>36</sup> and using media to influence participation and consumption.<sup>37</sup> In line with these data highlighting the importance of convenience, time and nutrition to parents, parents have shown interest in nutrition information, easy menu suggestions, social support, and nutrition workshops.<sup>39</sup> Finally, school wellness policies could provide an opportunity for collaboration between the home and school to support the adoption of packed lunch policies or recommendations. More research is warranted on which of these strategies would be the most effective.

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## Chapter 5

### **Using education and social support to help parents pack healthier lunches: Lessons learned from a pilot study, PACK-IT**

#### **Abstract**

Recent research has shown packed lunches are potentially contributing to poor dietary quality and an even higher risk of childhood obesity. Since many parents and children prefer packing lunches, interventions aimed at increasing the nutritional quality of packed lunches are warranted. PACK-IT (PrepAring Complete lunches for KIDs Together) is a pilot-test program targeted at parents of elementary school children with the primary objective to increase the number of fruit and vegetable servings and decrease sugar-sweetened beverage, dessert, and salty snack servings, using nutrition education and parenting modalities based on the Social Cognitive Theory. A secondary aim was to determine the extent to which nutrition education combined with support via social media would affect the nutritional quality of lunches. In a non-randomized quasi-experimental design, parents were assigned to one (n = 7) of two (n = 8) intervention groups, or a control group (n = 7) with varying degrees of nutrition education and social support provided via social media. The contents of packed lunches were recorded at four separate time points, corresponding with administration of a child feeding practices questionnaire. A total of 22 parents completed the study, 7 in Intervention arm 1, 8 in Intervention arm 2, and 7 in the control group. Significant differences were observed for participation in social media among the intervention groups ( $p < 0.01$ ). No significant difference was observed for child feeding practices or packed food records. PACK-IT provides baseline data and promising trends that warrant further investigation. Further research with larger sample



sizes and longer duration are needed to assess if these strategies can encourage parents to improve the nutritional quality of foods included in packed lunches.

## **INTRODUCTION**

Approximately 40% of elementary children bring a packed lunch to school daily, with the remaining 60% of children participating in the National School Lunch Program (NSLP).<sup>1</sup> While NSLP lunches are guided by national standards and regularly monitored to ensure standards are maintained, packed lunches are not guided by such standards.<sup>2</sup> A handful of studies have been published on differences in the nutritional quality of packed lunches and meals provided by school.<sup>3-16</sup> Overall the research has shown packed lunches have been less likely to contain fruits, vegetables and dairy and more likely to contain fat, saturated fat, sodium and sugar.<sup>4, 6-9, 11-18</sup> These differences could potentially contribute to poor dietary quality and an even higher risk of childhood obesity.<sup>9, 19</sup>

As the primary caregivers of elementary students, parents influence the decision to pack lunches or consume school meals,<sup>20</sup> and influence exposure and preference for food items by controlling the availability and accessibility to foods.<sup>21</sup> Since many parents and children prefer packing lunches, interventions aimed at increasing the nutritional quality of packed lunches are warranted.<sup>4, 6, 9, 10, 12, 14, 15, 17, 18, 22</sup>

Very few studies have focused on interventions or programs which assist parents in packing healthier lunches for children.<sup>21-23</sup> Previous interventions aimed at packed lunches have found moderate to significant success in improving fruit,<sup>22, 23</sup> vegetable,<sup>21-23</sup> and whole-grain<sup>21</sup> consumption by providing education materials,<sup>21, 22</sup> lunch boxes/bags,<sup>22</sup> teacher training,<sup>21</sup> and the use of media influence<sup>23</sup> to improve the quality of packed lunches for children. Using group interviews with parents, Sweitzer et al. (2011), found that parents would like written nutrition

information, new and easy menu suggestions, opportunities for interaction with other parents, social support, and nutrition workshops and activities to assist in packing healthier lunches.<sup>24</sup>

The present study was a multi-faceted pilot-test program PACK-IT (PrepAring Complete lunches for KIDs Together) aimed at increasing the nutritional quality of elementary packed lunches through increased fruit and vegetable servings and decreased sugar-sweetened beverage, dessert, and salty snack servings, using nutrition education and parenting modalities based on the Social Cognitive Theory.<sup>25</sup> A secondary aim was to determine the extent to which nutrition education, combined with support offered via social media, would affect the nutritional quality of packed lunches offered to elementary children.

## **METHODS**

### **Participants**

Parents from four elementary schools in rural Virginia, who had previously stated via an elementary lunch questionnaire they would be interested in participating in further research, were contacted through telephone and email. Parents who had at least one child in elementary school and packed a lunch for that child a minimum of two days per week were eligible. Parents received \$10 to \$40 for participating in questionnaires and \$40 worth of packing materials and produce items for participating in education sessions. The Institutional Review Board of Virginia Tech approved this study. Parents provided written consent in advance of any data collection.

### **Study Design**

In a non-randomized quasi-experimental design, parents were assigned to one of two intervention groups, or a control group based on scheduling preferences and availability. Intervention arm 1 received three nutrition education sessions (one per week) and participated in

a PACK-IT Facebook group with targeted packed lunch messages. Intervention arm 2 received three nutrition education sessions (one per week) and participated in a General Facebook group with messages on a variety of health topics. Facebook groups began at the conclusion of education sessions and spanned 30 days. The control group received a delayed intervention of nutrition education sessions and did not participate in a Facebook group. Program evaluation included an end of program questionnaire and optional written comments provided by participants on useful or non-useful program components at the end of each nutrition education session. PACK-IT was developed from previous research highlighting food groups over-or-under-represented in packed lunches<sup>4,6</sup> and factors reported by parents that would help them pack healthier lunches for their children.<sup>24</sup> The Social Cognitive Theory guided the framework, activity, and message development of education sessions and Facebook messaging. Nutrition education sessions focused on educational handouts, learner-centered nutrition activities, and the sharing of strategies and photos. Facebook posts were commonly discussion questions, links to nutrition information, and shared photos.

Example nutrition session activity: Cost comparison of a packed lunch containing healthy foods with a packed lunch containing unhealthy foods.

Example PACK-IT Facebook post: “Don’t forget to send fruits and veggies in your packed lunches tomorrow! Here’s a pic of mine.”

Example General Facebook post: “Nice tips from MyPlate. My fav is #8. We always try to take a walk after the main meal to ease that “full” feeling”. [link to MyPlate attached]

### **Questionnaire Measurement**

An on-line questionnaire was delivered to parents via email at four separate time points. The first two questionnaires were both pre-test questionnaires, spanning a two week time period.

This was to account for any behavior change that may have occurred due to beginning a research study. The third questionnaire was delivered post the completion of all nutrition education sessions, and the fourth questionnaire was delivered post the completion of the assigned one-month Facebook group. The questionnaires were identical with the exception of demographic questions on the initial questionnaire and program evaluation components for the final questionnaire. The first section contained fourteen self-report Likert-scale (strongly agree, agree, neutral, disagree, strongly disagree) questions, using four subscales (encourage balance and variety, involvement, modeling, and pressure) from the Comprehensive Feeding Practices Questionnaire (CFPQ) which assessed parental practices regarding child feeding.<sup>26</sup> The CFPQ has been shown to be reliable and valid for use with parents of children ranging in age from two to eight years. The second section was an open dialog box for parents to record one week of packed lunch food records. This information was assessed for food group availability and to document increases or decreases in foods provided. Food item presence was recorded by count of item, not quantity, since exposure to fruit and vegetable items was encouraged and presence of sugar sweetened beverages, desserts, and salty snacks was discouraged.

### **Social Media Measurement**

Participants in both intervention arms were required to join a closed, secret Facebook group which began at the conclusion of nutrition education sessions. Participants in intervention arm 1 were assigned to the PACK-IT Facebook group which provided only information related to packing healthy lunches. Participants in intervention arm 2 were assigned to General Facebook which provided general nutrition information on a variety of topics. Closed and secret groups were selected to protect privacy. Only individuals invited to join could find their assigned group and see member posts. The social media groups were intended to continue the social

support developed from in-person sessions, since parents had previously reported social support as an important component to packing healthier lunches.<sup>24</sup> Overall, 74% of US adults who are online use social networking sites,<sup>27</sup> and social media has proven useful by health professionals to facilitate social support, recruit participants, and disseminate information.<sup>28-30</sup> Parents were only required to join and participation was optional. Diagnostics from Facebook were collected, including: likes, comments and shares to assess participation levels and common themes.

### **Data Analysis**

Analyses for the CFPQ and packed lunch food records were carried out in JMP ® (Version 11, SAS Institute Inc., Cary, NC, 2013) using t-tests (CFPQ data only) and multilevel modeling techniques to determine if the intervention arms would 1) increase fruit and vegetables, 2) decrease sugar sweetened beverages, desserts, and salty snacks, and 3) change parental attitudes and beliefs toward feeding their child. Descriptive statistics and t-tests were used to describe and analyze Facebook participation and questionnaire program evaluation. Percent of change was used to describe increases or decreases in food group availability as the intervention progressed. Written program evaluation comments were coded, common themes identified, and the frequency of themes calculated.

## **RESULTS**

### **Characteristics of Participants**

Of a total of 53 parents who were contacted to participate in this pilot study, 26 (49.0%) consented and enrolled in the study. Four parents dropped out at the beginning of the study due to scheduling conflicts, for a total of 22 participants with 7 (31.8%) parents in Intervention arm 1, 8 (36.3%) parents in Intervention arm 2, and 7 (31.8%) parents in the control group. The

majority were female (95.5%), white (86.4%), and with higher education (95.5% college graduate or post graduate degree).

### Child Feeding and Food Records

A total of 88 questionnaires (CFPQ and Food Records) were returned (4 per parent), 100% of the study sample. There were no significant changes to child feeding practices or food item availability from both pre-tests, no significant changes as parents progressed through the study, and no significant differences among intervention groups and the control group from the multivariate model and t-tests. Responses to child feeding practices were overwhelming healthy at pre-test. Percent change was highly variable (Table 1). Dessert items were classified as grain-based desserts, chocolate bars, dairy-based desserts, gummies, and candy.

Table 1. Percent Change Differences among Control and Intervention Groups of Food Items Available to Elementary Children.

	Intervention Arm 1 <sup>1</sup> (n=7)		Intervention Arm 2 <sup>2</sup> (n=8)		Control <sup>3</sup> (n=7)	
	Change post Nutrition Education Classes	Change post Facebook Group	Change post Nutrition Education Classes	Change post Facebook Group	Change post Nutrition Education Classes	Change post Facebook Group
<u>Food Item</u>	<u>Mean Percent Change Values (± SD<sup>4</sup>)</u>					
<u>Availability</u>						
Sugar	+29%	-7%	-43%	+7%	+7%	0%
Sweetened Beverage	(±170%)	(±19%)	(±53%)	(±19%)	(±19%)	(±29%)
Dessert	-18%	-7%	-12%	+1%	-9%	+21%
	(±54%)	(±27%)	(±21%)	(±52%)	(±97%)	(±88%)
Salty Snack	+39%	+46%	-29%	27%	+18%	+19%
	(±132%)	(±124%)	(49%)	(±48%)	(±43%)	(±63%)
Vegetable	+42%	+40%	+57%	-34%	+1%	-9%
	(±79%)	(±70%)	(±124%)	(±54%)	(±58%)	(±37%)
Fruit	+6%	-7%	+100%	+26%	+30%	-28%
	(±49%)	(±37%)	(±177%)	(±125%)	(±57%)	(±51%)

<sup>1</sup>Received nutrition education classes and participated in a PACK-IT Facebook group with posts on packing healthier lunches for children

<sup>2</sup>Received nutrition education classes and participated in a General Facebook group with posts on a variety of nutrition topics

<sup>3</sup>Received delayed nutrition education classes and did not participate in a Facebook group

<sup>4</sup>Standard Deviation

## Facebook Diagnostics

All participants in both intervention arms joined their respective Facebook group. During the one month study period, the majority of posts were by the researcher (61.5% in PACK-IT Facebook, 96.8% in general Facebook). The researcher posted a consistent and equal amount on each page daily (1 post per day per group). Parents enrolled in the PACK-IT Facebook group with targeted healthy packed lunch messages participated in the group more frequently (Table 2). The PACK-IT Facebook group participants also had significantly more views, likes, and comments than the general Facebook group.

Table 2. Differences in Facebook Participation among Intervention Groups with or without Targeted Information related to Packing Healthier Lunches for Elementary Children

	<i>PACK-IT</i> Facebook* (Arm 1) ( <i>n</i> =7) (52 posts)	<i>General</i> Facebook** (Arm 2) ( <i>n</i> =8) (31 posts)	t-test Significance level = <i>p</i> <0.05
	<u>Mean Values ± SD<sup>1</sup></u>		
Viewed Post <sup>2</sup>	6.0 ±0.3	4.1 ±1.0	<b>&lt;0.01</b>
Liked Post <sup>2</sup>	2.0 ±1.3	0.6 ±0.8	<b>&lt;0.01</b>
Commented on Post <sup>2</sup>	1.4 ±1.9	0.5 ±1.1	<b>0.02</b>

\*PACK-IT Facebook provided only information related to packing healthy lunches  
 \*\*General Facebook provided general nutrition information on a variety of topics  
<sup>1</sup>Standard Deviation  
<sup>2</sup>Calculations based on average number of people who viewed, liked, or commented on each post

## Program Evaluation

There were no significant differences in program evaluation by the two intervention groups with the exception of one question pertaining to rating the program overall (Table 3). Parents in Intervention arm 1 (with PACK-IT Facebook) valued the Facebook group more than parents in Intervention arm 2 (with general Facebook); however the difference was not significant.

Table 3. Differences in Program Evaluation among Intervention Groups with or without Targeted Information related to Packing Healthier Lunches for Elementary Children

	Nutrition Education Sessions with <i>PACK-IT</i> Facebook* (Arm 1) (n=7)	Nutrition Education Sessions with <i>General</i> Facebook** (Arm 2) (n=8)	t-test Significance level = $p < 0.05$
<u>Mean Values <math>\pm</math> SD<sup>1</sup></u>			
How would you rate this pilot program overall? (1=poor, 2=OK, 3=Good, 4=Excellent)	4.0 $\pm$ 0.0	3.5 $\pm$ 0.5	<b>0.03</b>
To what extent was participating worth your time? (1=Not at all, 5=Extremely)	4.3 $\pm$ 1.1	4.1 $\pm$ 0.8	0.75
Of the nutrition education sessions, how much of the information/ activities were useful and usable (1=0-20%, 2=21-40%, 3=41-60%, 4=61-80%, 5=81-100%)	4.4 $\pm$ 1.1	4.9 $\pm$ 0.4	0.36
Of the Facebook posts and discussions, how much of the information / and social support was useful and usable (1=0-20%, 2=21-40%, 3=41-60%, 4=61-80%, 5=81-100%)	4.2 $\pm$ 1.6	3.4 $\pm$ 1.2	0.31
Please rate which of the aspects of this pilot program were the most valuable to you (1=Not at all Valuable, 2=Slightly Valuable, Fairly Valuable, Quite Valuable, 5=Very Valuable)			
Nutrition Session Informational Handouts	4.7 $\pm$ 1.3	4.0 $\pm$ 1.1	0.25
Nutrition Session Activities	4.4 $\pm$ 1.1	4.8 $\pm$ 1.0	0.58
Nutrition Session Sharing and Discussion	4.3 $\pm$ 1.0	4.5 $\pm$ 1.3	0.73
Facebook Group Posts and Discussions	3.7 $\pm$ 1.5	3.1 $\pm$ 1.4	0.44
Being part of a social network of other parents and feeling supported with the Facebook Group	3.3 $\pm$ 1.3	2.9 $\pm$ 1.6	0.59
Being part of a social network of other parents and feeling supported with the Nutrition Sessions	3.3 $\pm$ 1.3	3.3 $\pm$ 2.1	0.97
*PACK-IT Facebook provided only information related to packing healthy lunches			
**General Facebook provided general nutrition information on a variety of topics			
<sup>1</sup> Standard Deviation			



There were 61 written responses concerning program components that were or were not useful to participants. Emergent themes are presented in Table 4. The majority comments were positive (75.3%) and centered on useful program components. The sharing of strategies used by parents to encourage healthy eating behaviors and the sharing of lunch photos were the most commonly reported useful program component. The learner-centered nutrition activities were the most commonly reported non-useful program components by participants.

Table 4. Emergent themes for nutrition education session program components that were useful or not useful to participants of the PACK-IT pilot study. (n = 22, 81 comments total).

Reported as <i>useful</i> by participants (61 comments total over three educational sessions, 75.3%)	
Theme 1. Sharing (42.6%, 26 comments)	1.1 Enjoyed everyone’s ideas about meals & getting the children to eat healthy. 1.2 Pictures. More ideas. 1.3 Educating more about food groups and letting them make choices within [the groups].
Theme 2. Nutrition Activities (36.1%, 22 comments)	2.1 Learned about the realistic cost of lunches: prepackaged vs fresh. 2.2 [There is a] high amount of sugar in many products.
Reported as <i>not useful</i> by participants (20 comments total over three educational sessions, 24.7%)	
Theme 1. Nutrition Activities (50.0%, 10 comments)	1.1 Reading labels that I already knew were bad. 1.2 Ingredient search in products.
Theme 2. Educational Handouts (25.0%, 5 comments)	2.1 Waste [free] lunch ideas – already do these. 2.2 Already knew this [food safety].

### Sample Size and Power

Due to the lack of significant results, a post-hoc power analysis was performed to calculate an estimated sample size. To have 80% power to detect a difference between groups would have required 159 parents (53 per group).

### DISCUSSION

The PACK-IT pilot study highlights the difficulties and complexities in changing parent behavior related to packing healthier lunches for elementary children and the difficulties in recruitment of parents for behavior interventions. Despite the development of this pilot intervention being grounded in evidence, few results were significant. However, some interesting trends emerged from this study which can be used to further knowledge for future interventions.

Parents who joined the targeted packed messaging group (PACK-IT Facebook) were significantly more likely to post, view posts, like posts, and comment on posts than parents who joined the General Facebook group with nutrition messages on a variety of topics, not specific to packing healthier lunches. These findings confirm previous studies which have shown the importance of Facebook posts being meaningful and relevant to the group to facilitate interaction.<sup>30</sup> Despite this finding however, increased participation in PACK-IT Facebook did not lead to behavior changes in child feeding practices or food group availability in packed lunches. However, there was limited room for improvement in child feeding practices based on pre-test responses. There were percent changes in fruit and vegetable food items offered to children which could show a promising trend with an increased sample size and smaller variance of response.

Interestingly, parents in both intervention groups rated nutrition education sessions more valuable than Facebook groups, and highly valued the parent sharing aspects of the nutrition education sessions more than other program components. This confirms previous research showing parents value interactions with other parents and nutrition workshops.<sup>24</sup>

This study may highlight other driving factors in packed lunch preparation influencing the overall quality of packed lunches such as the convenience of less healthy items and the

perception of those items saving the parent time. More research is needed on changing parent perceptions regarding convenience and time and to what degree they affect packed lunch decision making.

Several factors limit the results and generalizability of this pilot study. The sample was very small and did not contain enough power to give significant results if there were changes in behavior. The study participants were also not diverse for gender, ethnicity, or education; however it is not known if that is typical or atypical of parents who pack lunches for their elementary children. Additionally, this study examined only available food items in packed lunches and not quantity of those items. Although the primary goal was to increase availability of fruits and vegetables while decreasing the availability of sugar sweetened beverages, desserts, and salty snacks, future studies should quantify food items by presence and amount to provide a more holistic nutritional picture of each packed lunch.

## **CONCLUSIONS**

Studies that assist parents in packing healthier lunches for their children should be developed due to the overall poor nutritional quality of packed lunches. Initial efforts should focus on identifying and recruiting parents packing lunches of poor nutritional quality. The pilot program PACK-IT, which was designed to target parent feeding behaviors and increase the nutrition of packed lunches, provided baseline data and promising trends which warrant further investigation. Further research with larger sample sizes and longer duration are needed to assess if these strategies can encourage parents to improve the nutritional quality of foods included in packed lunches.

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## Chapter 6

### Summary and Implications

#### Conclusions

Lunches, regardless of the source, are opportunities for parents and schools to reinforce healthy habits and food preferences which carry into adulthood.<sup>1-3</sup> Packing lunches that do not contain fruit and vegetables, and do contain SSBs or desserts is a missed opportunity for parents to reinforce healthy habits and instill healthy food preferences that will carry into adulthood. Many barriers to providing healthy packed lunches were identified which affect parental decisions beyond nutrition knowledge and information. A parent's perceptions of their child's taste and food preferences along with the importance of time involved to prepare a healthy lunch are issues that need further investigation into how these perceptions might be changed.

This research provides valuable information for health professionals, researchers, food service directors, parents, and elementary school administrators to encourage NSLP participation and/or develop interventions which assist parents in packing healthier lunches. Interventions can take the form of marketing strategies which detail the HHFKA standards to potentially influence NSLP participation, interventions to increase the nutritional value of packed lunches, and/or improvements in school wellness policies.

The findings of this dissertation research suggest that packed lunches may contribute to higher solid fats and added sugar intake among young children due to higher prevalence of dessert items, savory snack items, and sugar-sweetened beverages, while the NSLP provided increased exposure to fruits and vegetables which is critical for acceptance, especially in young children.<sup>4,5</sup> These findings have significant implications for public policy around school nutrition and contribute to the knowledge and argument for continued nutrition standards for the



NSLP. Research focused on how to impact parent perceptions of the NSLP is needed. Current research suggests that packed lunches are less nutritious compared to NSLP lunches,<sup>6-19</sup> with students participating in the NSLP consuming more fruits, vegetables, and milk.<sup>20, 21</sup> In the findings of this research, how parents perceived the nutritional quality of the NSLP greatly influenced their decision to participate in the NSLP program or pack a lunch for their child.

### **Implications for School Nutrition Professionals**

Despite the HHFKA standards and current research on the nutritional quality of packed lunches, parents of elementary children still perceive nutrition quality as a barrier to participation in the NSLP. Education-based interventions are one strategy that should be considered by food service directors and school administrators to potentially influence NSLP participation.

Farm-to-school programs and school garden initiatives, which contribute to meal quality and increase NSLP participation,<sup>22</sup> often cannot produce all the fruits and vegetables needed for an entire school, but they could serve as an educational opportunity, address quality concerns, and provide fruit and vegetable tasting opportunities for children. Taste tests of menu items to influence food preferences and repeated exposure to foods,<sup>23</sup> student and parent involvement in menu options,<sup>24</sup> small rewards for trying food items,<sup>25, 26</sup> and using media to influence consumption<sup>27</sup> have previously been successful strategies to alter taste and food preferences for school children and should be considered. More research is warranted on which of these strategies will be the most effective in changing the perceptions of parents who choose to pack lunches for their children. Involving parents and students on the selection and implementation of these strategies is an important step to create buy-in and improve acceptability of the NSLP. Pilot testing new programs, initiatives, or foods are other avenues to evaluate implementation and acceptability.<sup>24</sup>

## **Implications for Research and Health Professionals**

This dissertation study provides valuable information to researchers and health professionals who are developing interventions to increase the nutritional quality of packed lunches for elementary students, or developing resources to educate parents on what to pack in their child's lunch. Previous interventions aimed at packed lunches have found moderate success in improving fruit,<sup>27, 28</sup> vegetable,<sup>27-29</sup> and whole-grain<sup>29</sup> consumption by providing education materials,<sup>28, 29</sup> lunch boxes/bags,<sup>28</sup> teacher training,<sup>29</sup> and the use of the media<sup>27</sup> to improve the quality of packed lunches for children. Since convenience, time, and nutrition were highlighted as very important to parents in our research and previous studies, providing parents with information regarding healthy yet convenient food items to pack for children is warranted. Evaluations of all of these practices or strategies for changing parent and child packing behaviors are needed to determine their effectiveness.

## **Implications for School Administrators and Parents**

School wellness policies provide an opportunity for engaging in collaboration between the home and school environment to support the adoption of healthful behaviors.<sup>30</sup> Collaborating with parents in decision-making allows for buy-in and reduces the resistance of implementing food policy changes.<sup>24</sup> Additionally, schools are encouraged to involve parents and students as key stakeholders in ensuring a healthy school environment,<sup>31</sup> and parents have previously shown interest in partnering with schools to improve lunches.<sup>32</sup> On a national scale, the HHS requires schools to strengthen their wellness policies and maintain a healthy school environment.<sup>31</sup> Enacting county or state policies or recommendations aligned with MyPlate and the nutrition standards of the NSLP could improve the nutritional quality of packed lunches by encouraging fruits and vegetables with every meal and snack, substituting milk or water for

SSBs, and using fruit as a dessert. More research is warranted on which of these strategies would be the most effective at improving nutritional quality.

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# Appendices

## Appendix A. Sample Observational Checklist

Circle: Male Female Identifier: \_\_\_\_\_

Date: 12/7/12  
Recorder: \_\_\_\_\_

Number in Class: \_\_\_\_\_ Grade: \_\_\_\_\_  
# School Lunches: \_\_\_\_\_ Male: \_\_\_\_\_ Female: \_\_\_\_\_  
# Packed Lunches: \_\_\_\_\_ Male: \_\_\_\_\_ Female: \_\_\_\_\_

**Instructions:** Please view each child on your tables' lunch and mark with an **X** the foods that child has. If **2 boxes**, mark quantity, if **3 boxes - for fruits and vegetables only**, use coding guidelines to determine consumption.

**Packed Lunch**

<b>Sandwich</b>	<b>X</b>			
PB & J on WHITE				
PB & J on WHEAT				
Grilled Cheese on WHITE				
Grilled Cheese on WHEAT				
Turkey on WHITE				
Turkey on WHEAT				
Ham on WHITE				
Ham on WHEAT				
Bologna on WHITE				
Bologna on WHEAT				
Tuna on WHITE				
Tuna on WHEAT				
<b>Toppings</b>				
Lettuce				
Tomato				
Cucumbers				
Cheese (not Gr Cheese)				
Mayo				
Mustard				
<b>LunchAbles/Food Kits</b>				
Crackers/HAM/Cheese				
Crackers/Turkey/Cheese				
Pizza Kit				
Nachos Kit				
Chicken Nuggets Kit				
BumbleBEE Tuna Kit				
<b>Leftovers</b>				
Pizza - Cheese				
Pizza - Pepperoni				
Pasta (red sauce/noodles)				
Mac & Cheese				
<b>Fruit</b>	<b>X</b>	<b>Amt</b>	<b>Code</b>	
Grapes				
Apple - Whole				
Apple - Slices				
Applesauce Cup				
Orange - Whole				
Orange - Slices				
Orange - Mandarin Cup				
Banana - Whole				
Banana - Half				
Strawberries				
Raisins				
Mixed Fruit Cup				
<b>Vegetable</b>				
Carrots				
Celery				
Cucumbers				
Cherry Tomatoes				
Ranch Dip for Veggies				
<b>Sides</b>				<b>X</b>
Yogurt Tube				
Yogurt Cup				
Yogurt - Activa				
Chips - Baked (pkg)				
Chips - Harvest Grain (pkg)				
Chips - Dorito (pkg)				
Chips - BBQ (pkg)				
Chips - Cheetos (pkg)				
Chips - Regular (pkg)				
Pretzels (pkg)				
Goldfish (pkg)				
Cheez-its (pkg)				
Cheese Stick				
Nutri-Grain Bar				
Crackers & Cheese				
Crackers & Cheese Dip (pkg)				
Popcorn (pkg)				
Mixed Nuts				
Trail Mix (mnm's, etc)				
Almonds				
Peanuts				
<b>Beverages</b>				
Milk Box - Horizon 1% Plain				
Milk Box - Horizon 1% Vanilla				
Milk Box - Horizon Chocolate				
Milk - Cup from Home (White)				
Milk - Cup from Home (Choc)				
Capri Sun - Fruit Punch				
Capri Sun - Wild Cherry				
Capri Sun - Apple				
Capri Sun - Grape				
FruitAbles - Berry				
FruitAbles - Apple				
MinuteMaid - Apple				
MinuteMaid - Grape				
MinuteMaid - Lemonade				
Hi-C - Fruit Punch				
Juicy Juice - Punch				
Fruit Punch from Home				
Sprite				
Coke				
Danimals Strawberry				
Danimals Banana				
Danimals Straw/Banana				
<b>Water</b>				

**Coding for Fruit and Vegetable Columns:**  
1 = entire food consumed  
½ = ½ of food consumed  
< = < half consumed  
0 = none consumed

<b>Dessert</b>	<b>X</b>			
Jello Pudding - Chocolate				
Jello Pudding - Vanilla				
Jello Pudding - Butterscotch				
Jello Cup				
Jello w/ Fruit Cup				
Rice Krispies (pkg)				
Gummy Bears				
Mini Candy Bar				
Fruit Snacks (pkg)				
Cookies - Oreo				
Cookies - Choc Chip				

Other items and quantity:  
\_\_\_\_\_  
\_\_\_\_\_

<b>School Lunch</b>				
<b>Main Tray</b>	<b>X</b>			
Turkey Wrap w/ Cheese				
Sub. Ham				
PB Sandwich				
<b>Potato Spears</b>	<b>X</b>	<b>Code</b>		
Carrot/Celery Sticks w/dip				
Mandarin Oranges				
Pears				
<b>Beverages</b>	<b>X</b>			
Milk - White FF (TruMoo)				
Milk - White (1%) (PET)				
Milk - Choc FF (TruMoo)				
Milk - Straw FF (TruMoo)				
Juice - Apple (SunCup)				
Juice - Orange (PET)				

Other items and quantity:  
\_\_\_\_\_  
\_\_\_\_\_



## Appendix B. Packed Lunch Observation Instructions and Inter-Rater Reliability Test

### Packed Lunch Observation Instructions and Inter-Rater Reliability Test

**Project Goal:** To assess the nutritional quality of packed lunches versus school lunches of pre-kindergarten and kindergarten students.

#### Instructions:

1. Fill out one observation sheet per packed lunch. The observation sheet is split into two main sections – packed lunch and school lunch. Check off all foods in the packed lunch on the observation checklist. If a food is not on the list, please list in the “additional foods” section.
2. Be as descriptive as possible and evaluate foods closely. If brand is available please list type, flavor, and etc.
  - For example, peanut butter crackers pack – Lance Brand – 6 or peanut butter and jelly vs peanut butter and honey on white or wheat
  - Look for hidden condiment items such as jelly, honey, mustard, etc.
3. For multiple items, if a count is possible please list the number.
  - For example – 6 green grapes or 2 chocolate chip cookies
4. Please be descriptive if it is a food that varies in size and estimate to the best of your ability.
  - For example, Raisin box – large or mnm’s package – snack size
5. When a count is not available and you must estimate size, please use standard cup measures.
  - For example, 1 cup of soup or ½ cup of peanut butter (creamy)
6. Be as invisible to the children as possible, however if you need to ask a child a question that is okay.
  - For example, “is that turkey or chicken on your sandwich?” or “is that milk in your cup or water?”
7. If you need help, please ask! I will be at every observation and when in doubt – ask!

## Appendix C. Packed and School Lunch Observation Research Protocol

### Research Protocol – Packed Lunch Project

#### PURPOSE:

- The purpose of the Packed Lunch Project study is to assess the nutritional differences between school lunch and packed lunch.

#### CHECKLIST:

- Use a pencil and clipboard provided by your lead researcher.
- Always mark your box with a distinct and legible X.
- Ensure all researchers can read and understand what you have written.
- Use coding guidelines for fruits and vegetables and mark the corresponding second box legibly.
- Use a separate checklist sheet for each child.

#### PARTICIPANTS AND STAFF:

- Be polite and respectful to all staff and participants.
- Do not interact with staff or participants unless asked a direct question.
- If asked a direct question, answer as concisely as possible.
- If needed, you may record small identifiers such as color of clothing, color of tray/lunch box, so as to locate a particular child again for additional observational information.
- All information collected and observed is strictly confidential. Do not record any personal identifiers outside of the above mentioned.
- Collect observational information as quickly and quietly as possible.

#### DRESS:

- No flip-flops, short shorts, hats, or any clothing that might stand out. Our goal is to be as unnoticed as possible, blending in with teachers and staff.

**Appendix D.** Parent questionnaire on the motivations and barriers to participating in the NSLP or packing a lunch for elementary school children.

**Please return to your child’s teacher by March 14<sup>th</sup> to be entered into the \$50 gift-card drawing!!**

Thank you for taking the time to complete this short survey. You have been invited to participate because you have at least one child who attends pre-K to fifth grade within the [REDACTED] Public School ([REDACTED]) division.

Please complete only ONE survey per family. The survey should take no more than 10 minutes to complete.

Your information will be kept confidential. Unless you provide contact information to participate in additional research, your information will also be anonymous.

Your feedback will help improve meals served to children at school in the MCPS division.

You will be entered into a drawing for a \$50 gift certificate to Target or Wal-Mart for completing this survey. You will need to provide contact information to be eligible.

Thank you for your time.

**Part 1** – The following questions are about lunch that is sold at school and packed lunch. Please choose **only one child** to answer for.

1. How many days a week does your child usually eat school lunch **this year**? Please check only one box.
  - 0 (Never or rarely)
  - 1
  - 2
  - 3
  - 4
  - 5
  
2. Has the number of days your child eats lunch at school changed **since last year**? Please check only one box.
  - More
  - Less
  - The same
  - Not applicable (i.e. my child did not attend elementary school last year, or we just moved to MCPS)

3. Did last year’s new nutrition standards affect how often your child eats school lunch (versus packed lunch)? The new standards require more whole grains and fruits and vegetables to be offered to students each day. Please check only one box.
- Yes - My child eats school lunch *more* often now
  - Yes - My child eats school lunch *less* often now
  - No – They did not effect how often my child eats school lunch
  - I don’t know about the new standards
  - Not applicable (i.e. my child did not attend elementary school last year, or we just moved to MCPS)

4. Please rate each of the reasons your child eats school lunch. **Circle the number** for each question that describes how much you agree or disagree with the statement. Please circle only one number for each row.

	1 = strongly disagree	2 = somewhat disagree	3 = neutral	4 = somewhat agree	5 = strongly agree
My child does <b>NOT</b> eat school lunch	1	2	3	4	5
My child prefers school lunches over what I pack	1	2	3	4	5
School lunches offer more variety of choices	1	2	3	4	5
I save money with school lunches	1	2	3	4	5
My child is likely to eat more food than if I pack a lunch	1	2	3	4	5
I want to support a program that my tax dollars support	1	2	3	4	5
I save time when my child eats school lunches	1	2	3	4	5
The school lunches are more convenient than packed lunches	1	2	3	4	5
The school lunches are nutritious	1	2	3	4	5
My child wants to eat school lunch because his/her friends eat school lunch	1	2	3	4	5
School lunches offer a good amount of food	1	2	3	4	5
I want to support school lunch because it’s an important part of school culture	1	2	3	4	5

If you would like to explain your reasons, please explain here. Also, if your answer varies by child, please explain here.

5. Please rate each of the reasons your child eats packed lunch. **Circle the number** for each question that describes how much you agree or disagree with the statement. Please circle only one number for each row.

	1 = strongly disagree	2 = somewhat disagree	3 = neutral or don't know	4 = somewhat agree	5 = strongly agree
My child <b>NEVER</b> takes a packed lunch to school	1	2	3	4	5
My child prefers to eat packed lunches	1	2	3	4	5
Packed lunches offer more variety of choices than school lunches	1	2	3	4	5
I save money by making packed lunches	1	2	3	4	5
My child is likely to eat more food if I pack a lunch	1	2	3	4	5
I do not want to support a government or USDA sponsored program like the school lunch program	1	2	3	4	5
I save time by making packed lunches	1	2	3	4	5
Packed lunches are more convenient than school lunches	1	2	3	4	5
I can pack more nutritious meals than school lunches	1	2	3	4	5
My child wants to pack a lunch because his/her friends pack a lunch	1	2	3	4	5
School lunches do not offer enough food	1	2	3	4	5
School lunches do not offer sustainable food choices, such as organic or farm-to-school options	1	2	3	4	5
My child does not like vegetables	1	2	3	4	5
I do not want my child to eat school lunches	1	2	3	4	5
My child does not like the school lunch choices	1	2	3	4	5
My child is a picky eater	1	2	3	4	5
I expect my child to pack his/her own lunch	1	2	3	4	5
My child has a restricted diet (i.e. allergies, celiac, diabetes, vegetarian, religious restrictions, other)	1	2	3	4	5
My child does not like waiting in line for school lunches	1	2	3	4	5

If you would like to explain your reasons, please explain here. Also, if your answer varies by child and you would like to explain, please explain here.

Would you be interested in participating in a group discussion to provide additional input on school lunches and packed lunches? You will be compensated for your time. If so, please provide your contact information here.

Name \_\_\_\_\_

Phone Number \_\_\_\_\_ Email \_\_\_\_\_

Thank you for considering.

To be entered into the drawing for a \$50 gift certificate to Target or Wal-Mart, please provide your contact information here. We are using this information ONLY for the drawing.

Name \_\_\_\_\_

Phone Number \_\_\_\_\_ Email \_\_\_\_\_

Thank you!

## Appendix E. PACK-IT pilot study: Informed consent.

### VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY PACK-IT Pilot Study/Informed Consent

**Title of Project:** PACK-IT Pilot Study  
**Investigator:** Alisha Farris, Elena Serrano, Melody Bowen

#### I. Purpose of this Research/Project

The purpose of this study is to increase the nutritional quality of lunches offered to elementary children through the use of nutrition education and social media via facebook.

#### II. Procedures

This pilot study will contain three groups of participants which you would be randomly assigned to. The first group will complete questionnaires, attend nutrition education sessions, and join a closed secret facebook group for social support that will post nutrition messages targeting healthy packed lunches. The second group will complete questionnaires, attend nutrition education sessions and join a closed secret facebook group for social support that will post general nutrition messages. The third group will be a control group. This group will complete questionnaires and be offered nutrition education sessions after the first and second groups have attended.

#### Procedure Instruments:

- The questionnaires will ask you demographic questions, questions concerning your child feeding style, and will ask you to complete a food record of packed lunches you provided for your child in the past week. Each questionnaire should only take 10-15 minutes to complete and there will be a total of four questionnaires spanning the entire study. A link to the questionnaire will be sent to you via your email address and you will complete all questionnaires online. You will need to enter a 3-digit code provided to you by the researchers so you can remain anonymous.
- The three weekly nutrition education sessions focus on providing resources and tools to help parents pack healthier lunches along with strategies for encouraging your child to eat healthy foods. These sessions occur weekly for three weeks. You will be asked to share your personal thoughts and opinions on child feeding challenges and practices and packing lunches.
- The facebook group does not require activity and lasts for one month. This would be a closed secret group and the degree of participation is entirely decided by the parent. You are only required to join. We will post nutrition messages, links to nutrition information, nutrition pictures, and will post discussion questions. The facebook group begins after the last nutrition education session has been attended by groups 1 and 2.

#### III. Risks

The proposed research presents minimal risks to subjects. Your identity will be known to the other participants attending the nutrition education sessions and in your facebook group. To minimize risk, the facebook group will be secret and closed. Only members who are invited can join. To minimize risk, please do not share the identity of other members or the content of nutrition sessions and facebook outside of the group. Please do not invite others outside of the group to join.

#### IV. Benefits

Besides monetary compensation, there is a direct benefit or promise of benefit to participants in the study due to packing materials and food provided during the nutrition education sessions. Additionally, there may be some educational benefit to learning strategies and tools to pack healthy lunches and

some social benefit in exploring your thoughts on packed lunches, food, and health with others in similar circumstances.

The wider benefit of this research is in its contribution to the academic knowledge in the field of nutrition and health. The research will also help guide the development of educational programs and resources for parents on packing healthy lunches.

**V. Extent of Anonymity and Confidentiality**

There will be no audio recordings of the nutrition education sessions. To help maintain confidentiality your name will be assigned a code when any data is transcribed and coded.

We will carefully maintain procedures to protect confidentiality. At no time will the researcher release any identify information to anyone other than individuals working on the project without your written consent. Other participants who attend nutrition education sessions and participate in your facebook group will know your identity; however please do not share the identity of other members outside of the group.

Note: In some situations it may be necessary for an investigator to break confidentiality. If a researcher has reason to suspect that a child is abused or neglected, or that a person poses a threat of harm to others or him/herself, the researcher is required by Virginia State law to notify the appropriate authorities.

**VI. Compensation**

You will be compensated for your time if you choose to participate. You will be compensated with packed food items and packing lunch materials at the end of each nutrition education session, for a combined total of goods worth approximately \$40.

You will be compensated a \$10 gift-card for every questionnaire completed for a potential total of \$40.

**VII. Freedom to Withdraw**

You are free to withdraw from the study at any time without penalty.

**VIII. Subject's Responsibilities**

I voluntarily agree to participate in this study. I have the following responsibilities:

- Complete four questionnaires, attend three nutrition education sessions and join a facebook group for social support.

**IX. Subject's Permission**

I have read the Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

**Participant's Signature** \_\_\_\_\_ **Date** \_\_\_\_\_

Printed Name \_\_\_\_\_

**Researchers' Signature** \_\_\_\_\_ **Date** \_\_\_\_\_

Printed Name \_\_\_\_\_

A copy of this form has been given to me to keep. If I have any questions in the future about this project I can contact the following:



Dr. Elena Serrano,  
Principal Investigator  
serrano@vt.edu/540- 231-3464  
201 Wallace Annex (0430)  
Virginia Tech  
Blacksburg, VA 24061

## Appendix F. Facebook Protocol

### VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY PACK-IT Pilot Study/Facebook Protocol

**Title of Project:** PACK-IT Pilot Study  
**Investigator:** Alisha Farris, Elena Serrano, Melody Bowen

#### **Facebook Protocol:**

You may be asked to join a closed and secret facebook group as part of the PACK-IT pilot study. The group is intended for your benefit and as an avenue to provide social support beyond the nutrition education sessions. A closed and secret facebook group means:

1. You will receive an invitation to join the group by the researchers; a person cannot join without being invited or added by an existing member
2. Only members can see who else is in the group
3. Only members can see what is being posted or discussed
4. Only members can find the group in a search

To protect confidentiality, *please do not invite other people* to your assigned facebook group and *please do not share information* with others concerning comments and posts that could break confidentiality.

**For example:** Sharing with a friend that “someone posted their child attends Kipps Elementary” is breaking confidentiality. Sharing with a friend that “someone posted they like to add a small note to their child’s lunchbox to tell their child they love them” is not breaking confidentiality.

#### **Instructions for Facebook:**

Your facebook setting should alert you when someone has posted to the group to which you are a member. You can adjust the notifications you receive from group activity by editing your notifications settings for the group.

The researchers will post consistently every other day. We will post nutrition messages, links to nutrition information, nutrition pictures, and will post discussion questions. You are encouraged to participate as much as you would like to participate as if this was not part of a research study. Please comment, like, or post on topics you think are interesting and have relevance. Remember, the group is intended for your benefit and as avenue to provide social support beyond the nutrition education sessions. However participation is voluntary and you are only required to join.

A note about civility: The researchers will not allow inappropriate or argumentative posts or comments. If the researchers feel this has been violated then the post or comment will be deleted and removed immediately. Please contact the researchers if you feel a post or comment is inappropriate.

Note: In some situations it may be necessary for an investigator to break confidentiality. If a researcher has reason to suspect that a child is abused or neglected, or that a person poses a threat of harm to others or him/herself, the researcher is required by Virginia State law to notify the appropriate authorities.

## Appendix G. PACK-IT Questionnaire and Informed Consent

### VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY PACK-IT Questionnaires and Food Records/Informed Consent

Title of Project: PACK-IT Pilot Study  
Investigators: Elena Serrano, Alisha Farris, Melody Bowen

This questionnaire will ask you questions regarding your attitudes toward feeding your child and ask you to complete a packed lunch food record for your child. Please be as honest and truthful as possible.

You will be compensated a \$10 gift card for every questionnaire you complete during this study, with the opportunity to complete up to four questionnaires total. Each questionnaire may take approximately 10-15 minutes to complete.

Thank you for your time and participation!

Please enter your 3 digit code provided to you by the researcher. This is to protect your confidentiality and provide a record for compensation of completing the questionnaire.

\_\_\_\_\_

---

### 3 Following Questions for Questionnaire #1 ONLY – these will be omitted from the final Questionnaire #2,3&4

Please select the gender in which you identify.

- Male
- Female

Please select the ethnicity you believe best describes you.

- White
- Hispanic or Latino
- Black or African American
- Asian or Pacific Islander
- Native American or American Indian
- Other

Please select the highest degree or level of schooling you have completed.

- Some high school
  - High school graduate
  - Some college
  - Trade/technical/vocational training
  - College graduate
  - Some post graduate work
  - Post graduate degree
-

Please select the answer which represents how you feel about the statements below.

	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree
I encourage my child to eat healthy foods before unhealthy ones	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I encourage my child to try new foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tell my child that healthy food tastes good	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I encourage my child to eat a variety of foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I involve my child in planning family meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I allow my child to help prepare family meals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I model healthy eating for my child by eating healthy foods myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I try to eat healthy foods in front of my child, even if they are not my favorite	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I try to show enthusiasm about eating healthy foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I show my child how much I enjoy eating healthy foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My child should always eat all of the food on his/her plate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If my child says, "I'm not hungry," I try to get him/her to eat more	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When he/she is finished eating, I try to get my child to eat one more (two more, etc.) bites of food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----

Please complete a food record of lunches for this week. You do not need to have packed a lunch for your child all 5 days, simply list food items for the number of days that you did pack and if you participated in the National School Lunch Program (NSLP). You should have a range of 2 to 5 days for packed lunches. Record items sent in packed lunches regardless if they were consumed or not. Follow the format below:

- Monday - grilled cheese on wheat, red apple, Doritos chips, Capri Sun
- Tuesday - NSLP - chicken nuggets, green beans, apple, chocolate milk
- Wednesday - peanut butter and honey sandwich, cheese stick, raisins, water
- Thursday - NSLP - pasta, broccoli, roll, grapes, strawberry milk
- Friday - chicken nugget lunchable with fruit snacks, yogurt smoothie

Is this typical of how many days you usually pack a lunch for your child? If no, please explain below.

- Yes
- No \_\_\_\_\_

Thank you so much for completing this questionnaire!

---

**\*\*Additional questions added to Questionnaire #4 ONLY: There will be an opt out option for participants in Group 3 (Have you completed the nutrition education sessions? If so, please continue with this questionnaire. If not, please submit this questionnaire. You are finished! Thank you for participating!**

How would you rate this pilot program overall?

- Poor
- OK
- Good
- Excellent

To what extent was participating worth your time?

- Not at All
- Slightly
- Moderately
- Very
- Extremely

Of the nutrition education sessions, how much of the information and activities were useful and usable to you?

- 0-20%
- 21-40%
- 41-60%
- 61-80%
- 81-100%

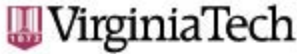
Of the facebook posts and discussions, how much of the information and support was useful and usable to you?

- 0-20%
- 21-40%
- 41-60%
- 61-80%
- 81-100%

Please rate which of the aspects of this pilot program were the most valuable to you.

	Not at all Valuable	Slightly Valuable	Fairly Valuable	Quite Valuable	Very Valuable
Facebook Group Posts and Discussions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Facebook Group Social Support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition Session Information Handouts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition Session Recipes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition Session Sharing and Social Support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition Session Activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Appendix H. IRB Protocol Approval Letter “Packed Lunch Project”



Office of Research Compliance  
Institutional Review Board  
2000 Kraft Drive, Suite 2000 (Q497)  
Blacksburg, VA 24060  
540/231-4606 Fax 540/231-0959  
email [irb@ut.edu](mailto:irb@ut.edu)  
website <http://www.irb.ut.edu>

### MEMORANDUM

**DATE:** March 7, 2013

**TO:** Grace Wilburn, Elena L Serrano, Brett Gwaltney, Linsey Jenkins, Shelbi Kaye Ratliff, Lauren Elaine Kennedy, Amal Sami Almohanna, Melody Bowen, Sarah Anne Misyak, Felicia Lorene Reese, Ramine Carrice Alexander, Lindsey Kummer, Elena L Serrano, Alisha Ruth Farris, Shacoria Winston

**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires May 31, 2014)

**PROTOCOL TITLE:** Packed Lunch Project

**IRB NUMBER:** 12-776

Effective March 6, 2013, the Virginia Tech Institutional Review Board (IRB) Chair, David M Moore, approved the Amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

<http://www.irb.vt.edu/pages/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

### PROTOCOL INFORMATION:

Approved As: **Exempt, under 45 CFR 46.110 category(ies) 2**  
Protocol Approval Date: **September 12, 2012**  
Protocol Expiration Date: **N/A**  
Continuing Review Due Date\*: **N/A**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

### FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

*Invent the Future*

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY  
*An equal opportunity, affirmative action institution*

**Appendix I. IRB Protocol Approval Letter “Motivations, Challenges, and Barriers to Packed and School Lunches”.**



Office of Research Compliance  
Institutional Review Board  
North End Center, Suite 4120, Virginia Tech  
300 Turner Street NW  
Blacksburg, Virginia 24061  
540/231-4606 Fax 540/231-0959  
email [irb@ut.edu](mailto:irb@ut.edu)  
website <http://www.irb.ut.edu>

**MEMORANDUM**

**DATE:** October 30, 2013  
**TO:** Elena L Serrano, Alisha Ruth Farris  
**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires April 25, 2018)  
**PROTOCOL TITLE:** Motivations, Challenges, and Barriers to Packed and School Lunches  
**IRB NUMBER:** 13-833

Effective September 25, 2013, the Virginia Tech Institutional Review Board (IRB) Chair, David M Moore, approved the New Application request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

<http://www.irb.vt.edu/pages/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

**PROTOCOL INFORMATION:**

Approved As: **Expedited, under 45 CFR 46.110 category(ies) 6,7**  
Protocol Approval Date: **September 25, 2013**  
Protocol Expiration Date: **September 24, 2014**  
Continuing Review Due Date\*: **September 10, 2014**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

**FEDERALLY FUNDED RESEARCH REQUIREMENTS:**

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

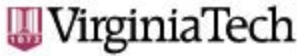
The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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Appendix J. IRB Protocol Approval Letter “PACK-IT Pilot Study”.



Office of Research Compliance  
Institutional Review Board  
North End Center, Suite 4120, Virginia Tech  
300 Turner Street NW  
Blacksburg, Virginia 24061  
540/231-4606 Fax 540/231-0959  
email [irb@ut.edu](mailto:irb@ut.edu)  
website <http://www.irb.ut.edu>

**MEMORANDUM**

**DATE:** September 30, 2014  
**TO:** Elena L Serrano, Alisha Ruth Farris  
**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires April 25, 2018)  
**PROTOCOL TITLE:** PACK-IT Pilot Study  
**IRB NUMBER:** 14-892

Effective September 29, 2014, the Virginia Tech Institutional Review Board (IRB) Chair, David M Moore, approved the New Application request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

<http://www.irb.vt.edu/pages/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

**PROTOCOL INFORMATION:**

Approved As: **Expedited, under 45 CFR 46.110 category(ies) 5,7**  
Protocol Approval Date: **September 29, 2014**  
Protocol Expiration Date: **September 28, 2015**  
Continuing Review Due Date\*: **September 14, 2015**

\*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

**FEDERALLY FUNDED RESEARCH REQUIREMENTS:**

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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