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A PILOT STUDY OF A SUMMER SCHOOL FOOD BACKPACK PROGRAM FOR  
STUDENTS AND THEIR CAREGIVERS

BY  
BRITTANY THOMPSON

A thesis submitted in partial fulfillment of the requirements for the  
Master of Science  
Major in Nutrition and Exercise Science  
Specialization in Nutritional Sciences  
South Dakota State University  
2017

A PILOT STUDY OF A SUMMER SCHOOL FOOD BACKPACK PROGRAM FOR  
STUDENTS AND THEIR CAREGIVERS

BRITTANY THOMPSON

This thesis is approved as a creditable and independent investigation by a candidate for Masters of Science in Nutrition and Exercise Science degree, and is acceptable for meeting the thesis requirements for this degree. Acceptance of this does not imply that the conclusions reached by the candidates are necessarily the conclusions of the major department.

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## ABSTRACT

A PILOT STUDY OF A SUMMER SCHOOL FOOD BACKPACK PROGRAM FOR  
STUDENTS AND THEIR CAREGIVERS

BRITTANY THOMPSON

2017

**Background:** High levels of obesity among children have become the nation's most prevalent health condition. Individuals that live in low-income areas often face multiple risk factors that can lead to obesity. Few interventions have been conducted that include school-based nutrition education and food preparation classes that are paired with a backpack of food.

**Objective:** Determine if the program ingredients were used at home, if the necessary cooking tools were available and if the overall awareness and motivation to eat healthier was increased. Also, too determine if student and parent responses correlate for future research.

**Methods:** A convenience sample of student (n=146) and their parents (n=146) were surveyed following a school-based nutrition education, food preparation lesson, and backpack of food was provided to the students during the summer school program in low-income areas of rural South Dakota.

**Results:** Findings indicate that the condensed program identified that majority of parent used the recipe and know about commodity food programs, the correct tools were available for the families to make the recipe, and the program had a positive impact on awareness and motivation of the students and their parents to eat healthier. It was also found that student and parent responses can correlate for survey questions.

**Conclusion:** Using the survey responses it was found that condensing the school-based nutrition education and food preparation program into a shorter timeframe will produce positive outcome results for the students and their parents.

## **Chapter 1**

### **Literature Review**

#### **Obesity**

The Centers for Disease Control (CDC) defines overweight and obesity as having a higher than healthy weight when compared with the height of an individual. The screening tool that is used in adults and children over the age of two to determine weight classification is called the Body Mass Index (BMI), and it assesses an individual's weight in kilograms divided by their height in meters squared. Individuals are considered overweight with a BMI between 25 and 29.9, and obese with a BMI greater than 30.0 (1). In 2014, approximately 36% of all adults in the United States were considered obese; this rate has doubled over the last twenty years (2, 3). Results from the National Health and Nutrition Examination Survey (NHANES) showed that racial and ethnic groups, such as non-Hispanic white, African American, Hispanic, and American Indian/Alaskan Native (AI/AN) had a higher prevalence of obesity. In 2015, a report from the National Health Interview Survey estimated the rate of overweight and obesity for AI/AN adults as 31.2% and 43.7%, respectfully (3, 4).

#### **Childhood Obesity**

Over the past decade, childhood obesity has become so prevalent that many health professionals considered it the most common chronic health condition to affect children and adolescents. Classification of obesity in children and adolescents is also calculated using BMI for children older than two years old. According to the CDC, prevalence of obesity in children aged 6-11 increased almost three times over from 7% in 1980 to 18% in 2012. The same trend has occurred for adolescents aged 12-19 in which obesity rates increased from 5% to 21% in the same time frame (5). Reports also show that between

2011 and 2014 the prevalence of obesity among school-aged children and adolescents was 17.5% and 20.5%, respectively (2). In South Dakota, specifically, 28% of Native American school-aged children are obese compared to 13.9% of white children (6).

Obesity in childhood or adolescence has a higher risk of continuation of obesity into adulthood that can lead to increased risk of morbidity (7). Aside from increased risk of morbidities in adulthood there are multiple consequences in childhood from obesity as well. Many of the common conditions seen as a co-morbidity to obesity is type 2 diabetes, heart disease, high blood pressure, and cancer. There is also strong evidence that has shown that obesity can lead to the physical development of blood fats, liver disease, anxiety, depression, and low self-esteem are other health problems that are found with obesity. Children that are obese throughout their entire childhood are seeing these conditions that were once only found in adulthood. A decrease in life expectancy is also associated with long-term obesity (8).

### **Factors Related to Development of Childhood Obesity**

Childhood obesity is a condition that has a multifactorial etiology related to genetics, energy intake, physical activity level, and environment. The identification of the common risk factors is the first step in prevention and treatment in childhood obesity (9). In many cases, childhood obesity is caused by an imbalanced intake of calories and expenditure of calories. Lifestyle factors are found to have a great impact on the weight status of children where obese or normal weight. Obese children have been shown to have increased physical inactivity and increased consumption of energy dense foods that are high in sugar and fat (10).

Lack of physical activity is one of the leading causes of obesity in children, and is linked to the increased number of sedentary hours among America's youth. The Children's Nutrition Research Center at Baylor University found that more than half of the children that were overweight ate their meals in front of the television and had declined family meals (10). A report for South Dakota showed that only 26.4% of school-aged children were physically active for the recommended sixty minutes per day and that 22.6% watched more than three hours of more of television each day (11).

Unhealthy dietary patterns that include energy dense foods over an extended period of time is a secondary factor that can lead to obesity. The 2015 Dietary Guidelines for Americans recommended daily consumption for children and adolescents of fruits and vegetables as 2-3 cups and 1.5-2 cups, respectively (12). However, a report completed by the CDC in 2012 found that approximately 89% of children ate one serving of vegetables less than three times per day and 74% ate fruits or drank juice less than two times per day in the previous seven days (11). Research has shown that education, income levels, and socioeconomic status can have a direct effect on dietary choices. The Childhood Obesity Action Network reported that 37.3% of South Dakotans that lived at greater than 100% of the poverty level were considered overweight or obese; providing that there is a direct correlation between income and weight status (13). Food insecurity has also been found to have an effect on overweight and obesity as food insecurity can contribute to overeating (14).

### **Food Security**

Food security, as defined by the World Food Summit of 1996, is "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active

life.” The concept of food security is built on three factors: food availability, food access, and food use (15). Food security is complex and affects health as well as economic development, environment, and trade. As shown in Figure 1 below, economic development, environment, and trade overlap to influence food processing distribution, and marketing, food production, and food consumption (16).



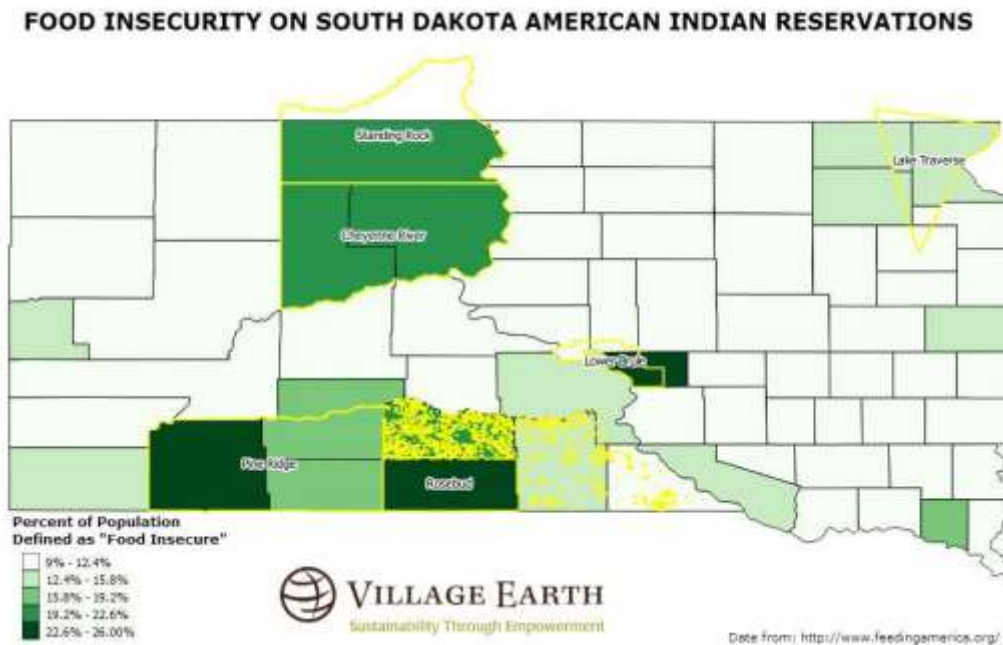
**Figure 1.** The Three Concepts of Food Security

The lack of any of the three concepts in the figure can lead to food insecurity where the acquisition and availability of nutritious, safe, and culturally acceptable foods are not present. Food insecurity has been shown to stem from insufficient income, parental health status, lack of cooking skills, parental education level, and familial social networks. Nationally, 21.3% of households with children experienced food insecurity at some time in the year. AI/ANs households with children are twice as likely than the national average to experience food insecurity (14). In 2012, approximately 27% of all AI/AN households were food insecure at some point in the year (17).

A major factor in the occurrence of food insecurity is the location of the household’s residence in relation to a grocery store, with the majority of the population

living a mile from the nearest grocery store, known as a food desert. The remote locations of the homes in AI/AN communities in rural South Dakota, and the inability to travel to grocery stores leaves residents in rural communities dependent on the local convenience store for food (14).

Specifically, in South Dakota there are nine Sioux or Santee Sioux Indian reservations: Cheyenne River, Crow Creek, Flandreau, Lower Brule, Pine Ridge, Rosebud, Sisseton Wahpeton, Standing Rock, and Yankton that reside on over 16,200 square miles of land (18). Approximately 24% of AIs living on the reservations are living below the poverty line, except for Pine Ridge where the prevalence reaches up to 50% of the residents (19). In 2008, approximately 23% of the AI/AN population that has reported being food insecure in the past year (19). Figure 2 below, from data collected by Feeding America, is a map of South Dakota with the counties in different shades of green to highlight what percentage of the county residents are food insecure. The darker the county, the higher the prevalence of food insecurity. As seen in the figure there is a direct correlation between counties that contain American Indian reservations and higher food insecurity (20).



**Figure 2.** Map of South Dakota and Food Insecurity

Supplemental assistance programs are an important aspect in the lives of many low-income Americans. Assistance programs such as the Supplemental Nutrition Assistance Program (SNAP), Women, Infants, and Children (WIC), and the Food Distribution Program on Indian Reservations (FDPIR) are a few of the programs that help to decrease the prevalence of food insecurity on the reservations. SNAP is the largest governmental assistance program in the U.S.; it provides monetary funds to participants to purchase grocery items to enhance dietary quality (21). In 2016, per month, SNAP provided assistance to approximately 21 million households nationally and 42,000 households in South Dakota (22, 23). WIC is a program that is specifically designed to provide nutritious foods and nutrition education to infants and children under the age of five and their mothers who are at nutritional risk (24). In 2014, South Dakota WIC provided assistance to over 17,000 women, infants, and children (25). Lastly, FDPIR provides monthly commodity food boxes to the AI households residing on the

reservations to help participants maintain a balanced diet with an average national monthly participation rate of 88,600 individuals (26). Typically, those eligible for FDPIR have to choose between the food boxes and SNAP benefits as both are not available to the household in the same month (26).

The Food Distribution Program on Indian Reservations is widely used in South Dakota. Over the past five years an average of 8,000 individuals each month were receiving FDPIR commodity food boxes, which makes South Dakota the third largest beneficiary (27). FDPIR allows the participants to choose from many healthful food items to make up their monthly boxes. Choices include frozen and canned meats, canned goods, like fruits, vegetables and beans, pastas, grains, cheese, shelf stable milk, flour, shelf stable beans and potatoes, juices, and peanut butter. The food items available are used to supplement the daily diet of the low-income individuals living on the reservations (26).

### **Nutrition Education**

Nutrition education directed towards children was shown to be effective in influencing their dietary choices as reported by their parents (28). There are many avenues in which nutrition education is provided to children and parents. Along with food assistance, WIC also provides children and parents with nutrition education monthly (29). FDPIR also provides funding to agencies that hand out the food boxes for nutrition education activities such as nutrition counseling, cooking demonstrations, and nutrition classes on how USDA foods contribute to a healthy diet (26). The third program that provides nutrition education is SNAP-Ed. An education course provided by SNAP-Ed



that was taught for four to ten weeks to households with children showed an increase in food security over time (30).

A federal nutrition education program that is separate from an assistance program that is conducted by universities in each state is the Expanded Food and Nutrition Education Program (EFNEP). EFNEP provides community-based, hands-on nutrition education to influence healthful behaviors in low-income households (31). In South Dakota, South Dakota State University's Extension program operates EFNEP for the citizens. In SD in 2015, EFNEP classes were taught to 6,042 youth in 15 counties and reservation areas. The children reported behavioral changes related to diet, safety in food handling and preparation by 81% and 47%, respectively. Budgeting for nutrient-rich foods and physical activity practices were increased after nutrition education classes, as well (32).

MyPlate is also a nutrition education program that is operated federally by the United States Department of Agriculture. MyPlate's educational focus is to help Americans find a healthy eating pattern through the use of educational materials and an easy-to-follow colorful graphic of what a balanced meal should look like, see Figure 3. The education materials were created for different levels of education for each of the five food groups that were made to be a resource for all (33). A study found that MyPlate was highest on ease of understanding among those who were familiar with both MyPlate and MyPyramid (34).



**Figure 3.** United States Department of Agriculture’s MyPlate Nutrition Education Graphic

Nutrition education that is culturally appropriate is important to the success of the education provided. Research found that AI youth’s diet preferences differed between youth on the reservation versus youth not living on the reservation, thus impacting the importance of providing culturally appropriate education to the community at focus (35). On the reservation, nutrition education that was provided to include culturally appropriate foods in the lessons showed that the children exhibited positive health changes in eating habits (36).

Nutrition education combined with hands-on food preparation lessons have been shown to be effective by improving the dietary quality of children and their parents. A twelve-week intervention study completed during the 2011 to 2012 school year, was taught by a trained chef and taught hands-on food preparation classes combined with nutrition education to 18 elementary and middle schools in Chicago. The schools that received the intervention were low-income sites with 80% of the students eligible for free or reduced lunch. The 271 students who completed the classes reported a significant

increase in consumption of fruits and vegetables, and their confidence and frequency of cooking at home. Parents reported that the students increased conversations with their family about healthier foods and the importance of the families eating meals together (37).

### **Backpack Programs**

According to The Healthy People 2020 report, 14.8% of all households were food insecure in 2008. The goal for 2020 is to have the rate of food insecure households decreased to 6% (38). While, in 2012, the rate of household with children food insecurity rate remained at 21.3% (14). Childhood hunger continues to be a problem for many households. Hunger affects the child's learning ability in school, behavior, and brain growth and development (39).

The Healthy, Hunger-Free Kids Act of 2010 put the National School Lunch Program (NSLP) and Breakfast program in place to help feed children during the school day. SNAP, WIC, and Summer Food Service programs help to provide food while the child is in the care of their parent or guardian (40). In order to decrease the rate of child hunger, backpack programs were created with the purpose of sending nutritious, ready-to-eat foods home with the child over the weekend while away from school meals during the school year (39). The largest backpack program in the U.S. is operated by Feeding America through partnerships with local food banks in the areas of need. Each year the program provides weekend meals to 230,000 children (40).

There are few research studies about weekend food backpack programs. One research study out of a food pantry in Little Rock, Arkansas found that the food in the backpacks given to the students in the area contained shelf-stable, easy open items with

low amounts of fat, sodium, or sugar that provided 1970 calories (39). Types of foods typically found in that backpack program were dried fruit, granola bar, peanuts, juice box, fruit cup, peanut butter or cheese crackers, popcorn, and milk. Children were determined to be eligible on referral based on observation of need related to behavior, physical appearance, school performance, and home environment. The backpacks were packed up to three months in advance by volunteers at the food pantry, then delivered to the sites where they are stored until they are given out to the students at the end of each academic week. It was the student's responsibility to bring the backpack back at the beginning of the following week (39).

Several backpack programs in Montana provided backpacks to 70 schools and a total of 2,900 students. They provided the same type of shelf-stable, nutritious food as was found in the Arkansas research study. The high number of backpacks needed allowed for the program to buy in bulk bringing the cost of all the food in one backpack to \$3.87. In this study in Montana, informants found that the program was effective and assisted in decrease the negative effects of hunger (40).

### **Backpack Programs with Nutrition Education Component**

Backpack programs have been proven to be effective in decreasing childhood hunger for students. Nutrition education has also been proven to be a successful activity in many ways relating to hunger and food security. The Backpack program in Arkansas combined both aspects with help from volunteers and dietetics students. The dietetic students helped to prepare educational materials to be included in the backpacks. The use of surveys prior to and after the program completed by the parents, children, and the site staff. A survey was distributed after three months and 50% of parents reported that they

felt their children who received the backpacks had an increase in energy and academic performance. Parents and staff both agreed that the program provided many benefits for the students that lead to better attitudes and higher standardized test scores in math and literacy. Access to nutritious foods and education had positive results (39).

## **Chapter 2**

### **Introduction**

There is a limited amount of research published on school-based nutrition education and food preparation lessons paired with a food backpack program. Prevalence of obesity is high among school-aged children and adolescents. A correlation between obesity and food security is often found.

The objective of this present study was to identify if the recipe and food sent home in the backpack with the student was utilized, and if the use of common food distribution program recipe ingredients was known. Also, to identify if limited resource families have the necessary tools in their kitchen to prepare the recipes and gather student and parent perception as to how the Bountiful Backpack program impacted their awareness and motivation to eat healthier.

## Chapter 3

### Manuscript

**Abstract:** A Pilot Study of a Summer School Food Backpack Program for Students and their Caregivers

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**Background:** Childhood obesity is a significant public health concern and has been linked with the presence of food insecurity. School-based nutrition education programs have shown positive results in increased healthy dietary behaviors and family conversation of healthy eating.

**Objective:** The aim of this study was to identify during a pilot of a summer school backpack program, if the recipes and foods sent home with students were utilized, assess knowledge of food distribution program items, identify if food preparation tools were available in the household, and if the program had a positive outcome on students' and parents' awareness and motivation to eat healthy. A secondary aim was to determine the correlation of child and parent responses to outcome questions.

**Design:** A convenience sample of 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> grade students (n=146), and their parents (n=146) from five limited resource communities in South Dakota were recruited for participation. Project sites were selected based on proximity of South Dakota State University (SDSU) Extension employee availability, the local school's availability for a nutrition education summer school program, and free and reduced national school lunch participation greater than 65%.

**Statistical Analysis:** Pearson correlation was used to evaluate the relationship between the parent and student responses. Frequencies were used to attain occurrence and percentage data of survey questions. Bivariate logistic regression was used to determine if responses varied between demographic variables.

**Results:** Parental responses showed that across all recipes, 85% of parents said they used the food items and recipes, while roughly 72% of parents knew that ingredients were commodity food items; however white participants and male participants were less likely to agree with these questions. Student responses showed that 96% had the tools available to make the recipes. Across all recipes, 69% of students reported a positive impact on awareness and eating healthier. Student and parent responses correlated with six of the eight questions.

**Conclusions:** This study suggests that dietary awareness and motivation to eat healthier can be positively impacted through school-based nutrition education and food preparation classes when coupled with a backpack of food. The program also found that student responses compare with parental responses eliminating the need to collect responses from parents.

## **A Pilot Study of a Summer School Food Backpack Program for Students and their Caregivers**

### **Introduction**

The prevalence of childhood obesity in the United States is a public health issue. According to the Centers for Disease Control and Prevention, between 2011 and 2014 the prevalence of obesity among school-aged children and adolescents was 17.5% and 20.5%, respectively (2). The etiology of obesity is considered multifactorial and a positive association between obesity and food insecurity is commonly found (14).

School-based nutrition education and food preparation classes have the potential to create changes in food-related behavior, such as quality of diet, food preparation, and food safety skills. A study in Chicago found that nutrition education and food preparation classes increased students' consumption of fruits and vegetables, and the confidence to prepare food at home. The parents of these students reported that the education also increased the conversations with the family about eating healthier foods and the importance of family meals (37). Similar studies have shown comparable results in increasing diet-related behavior changes (31). Coupling the use of nutrition and food preparation education with backpack food programs has the opportunity to increase dietary knowledge along with increasing food security.

The research reported in this paper was part of a larger research study, the Bountiful Backpack program. The Bountiful Backpack program was designed to focus on the childhood obesity epidemic by including nutrition education and recipe preparation lessons offered once per week during a typical school calendar year, in a food backpack program for school-aged children and their families in South Dakota communities with greater than 65% free and reduced school lunch participation. The Bountiful Backpack



program consists of two components: an educational (classroom based) nutrition education and recipe preparation component, and the sending home of a backpack of food to practice the in-class recipe preparation component at home with their family. The results reported in this study are from the pilot intervention aimed at determining feasibility of condensing the Bountiful Backpack program and delivering during a summer school program with the outcome of the participants using the foods and recipes provided in the program and if participant increased their awareness and motivation to eat healthier. Aims were: 1) To identify if the recipe and food sent home in the backpack with the student was utilized, and if the use of common food distribution program recipe ingredients was known; 2) To determine if Bountiful Backpack program impacted student and parent awareness and motivation to eat healthier. 3) To identify if limited resource families have the necessary tools in their kitchen to prepare the recipes and food items that were sent home in the backpack; and 4) To determine if student and parent survey responses correlated.

We hypothesized that the program will 1) have a positive outcome for utilizing the recipes and knowledge of food distribution program items; 2) that a higher number of families will have the necessary tools to prepare the recipes than those that do not; and 3) will have a positive impact on the awareness and motivation to eat healthier; 4) that majority of the student and parent responses to the questions will correlate.

## **Methods**

### *Participants and Recruitment*

A convenience sample of 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> grade students, and their parents from five schools in limited resource communities in South Dakota were recruited for participation in the pilot study. Project sites were selected based on proximity of South Dakota State University (SDSU) Extension employee availability, the local school's availability for a nutrition education summer school program, and free and reduced national school lunch participation greater than 65%.

Participants were recruited with the support of the selected school systems. School administrators were contacted in person by SDSU Extension employees to obtain their consent. A total of five schools agreed to participate in the study. Student assent was obtained during the first session from all students, while parent/guardian consent was sent home with each individual student and returned to the school by the specified date. If the parent/guardian consent form was not sent back to the school by the specified date, contact was initiated via phone and/or email, and if contact was successful and if consent was given, then either verbal or written consent was accepted. Students that chose not to, or could not participate because parental consent was not obtained still received the nutrition education and food preparation component, however they did not participate in filling out the surveys. A total of 292 participants, 146 students and 146 parents, participated in the research study.

### *Instructional Delivery*

The Bountiful Backpack program was delivered as part of the summer school curriculum offered in rural, SD elementary schools. The first component of the Bountiful

Backpack program consisted of an educational (in class) nutrition education and recipe food preparation lesson. Each lesson lasted a total of 45 minutes; it varied by school as to time of day when the lessons were conducted (i.e. morning, afternoon, after school). Lessons were taught three times per week over a five-week period, with a total of 15 lessons implemented by a trained SDSU Extension employee.

Each nutrition education lesson was based on a specific recipe that correlated with a USDA MyPlate.gov food group (i.e. if they made 2-bean chili the nutrition lesson focused on protein). The lessons included components such as: nutrition facts, explanation of how the food group is important to a healthy diet, and education on the nutrition facts label. The recipe preparation aspect of the lessons included cooking and food safety skills that correlated with each recipe. The recipes developed for this program were based on increasing usage of food items present in these various federal assistance programs. The recipe preparation allowed each student to gain nutrition knowledge and cooking skills through hands-on learning. The students were involved in every step of the cooking process by sharing tasks between each student, and were also encouraged to taste test samples of the recipes made during class. Following the recipe preparation and tasting, the students were taught how to store leftovers safely and proper cleaning techniques.

The second component of the Bountiful Backpack program consisted of the sending home of a backpack of food to practice the in-class food preparation component at home with their family. In addition, a parental survey asking specific questions about the recipe was also sent home in the backpack and was asked to be returned the following

day. The returned surveys were collected at the beginning of each new class by an SDSU Extension employee.

The South Dakota State University Institutional Review Board for Human Subjects reviewed and approved the research protocol. Only data from parents providing consent and students providing assent are included in the analysis.

#### *Development and Description of Parental and Student Recipe Questionnaire*

Surveys were developed based on feedback collected from school and community stakeholders in limited resource communities. SDSU Extension employees who work with limited resource audiences in these communities were also included in the development of the final survey document. The purpose of the recipe survey was to determine how the food sent home was utilized, if the recipe will be used again in the future, and whether having the food and the recipe motivated and increased family awareness of eating healthier. The recipe survey included questions relating to food preparation, family participation, resources available, awareness/motivation to eat healthier, and knowledge of the commodity food distribution program. Overall, the student survey contained 12 questions and the parent survey contained 13 questions. The questions included both close-ended and open-ended questions, multiple choice, and a three-point scale.

Questions relating to the preparation of the recipe included whether the recipe was prepared by the family. Family participation included the following questions: who prepared the recipe, was anything changed in the recipe, what else did you eat, how many people ate with you, and did the family eat together at the same table. Questions based on

the resources available asked if the necessary tools were available to the family to make the recipe. Awareness/motivation to eat healthier included questions related to healthier foods discussion with the family, ideas for new meals, and talking about the Nutrition Facts label on the actual recipe card. The final question was about the knowledge of the foods included in the recipes availability as a commodity food distribution program item.

#### *Administration of Questionnaire*

The recipe survey was administered to both parents and students. The survey for the parent was sent home with the student the day the recipe was taught in class, and was to be returned to school the following day. The recipe survey was administered to the student upon their arrival in class the following day after taking the recipe and backpack of food items home. The student survey was then collected the same day. The questionnaires were coded with the student's identification number assigned following recruitment to ensure anonymity and to maintain location distinctions.

#### *Statistical Analysis*

Frequency tables were used to attain occurrence and percentage data of survey questions. Bivariate logistic regression was used to determine if responses varied between demographic variables. Pearson correlation was used to evaluate the relationship between the parent and student responses. *P* values <0.05 were considered statistically significant. Survey responses were imported into the IBM-SPSS Statistics version 24 and used for the analyses. The research data was gathered through the development and administration of a written questionnaire to students and their caregivers.

## Results

**Table 1.** Student Demographics

Student	
Grade	
3rd	33.6%
4th	27.3%
5th	39.1%
Sex	
Male	40.9%
Female	59.1%
Race	
White	14.9%
Non-white	85.1%
Hispanic	
Yes	8.9%
No	91.1%

**Table 2.** Parent Demographics

Parent	
Sex	
Male	14.1%
Female	85.9%
Age	
25-34	35.6%
35-44	27.2%
45-54	23.8%
55 and up	13.6%
Race	
White	15.2%
Non-white	84.8%

**Table 3** Frequency of Student Responses to Respective Recipe Questions

	Did you have the necessary tools in your kitchen to make the recipe? (n= 517) (%)		After making the recipe, did your family talk about eating healthier food? (n=506) (%)		Did this recipe give you ideas for new meals? (n=504) (%)		Did your family eat the recipe together at the same table? (n=516) (%)		Do you want to make this recipe again? (n=507) (%)		Did your family talk about the Nutrition Facts food label on the recipe card? (n=504) (%)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Take Along Trail Mix	90	10	64.9	35.1	63.6	36.4	55.4	44.6	89.7	10.3	45.3	54.7
Sweet Potato Pancake	94.4	5.6	58	42	56.9	43.1	66	34	91.8	8.2	42	58
California Potato Medley	95.1	4.9	63.4	36.6	72.5	27.5	62.2	37.8	79.5	20.5	50	50
Chicken Vegetable Soup	94.7	5.3	54.3	45.7	68.6	31.4	69.4	30.6	91.4	8.6	36.1	63.9
Easy Ramen Stir-Fry	97.2	2.8	51.4	48.6	64.9	35.1	73	27	86.1	13.9	40.5	59.5
Mexican Chicken Soup	96.3	3.7	65.5	34.5	75.9	24.1	85.7	14.3	89.3	10.7	53.6	46.4
Tuna & Vegetable Mac	100	0	66.7	33.3	58.3	41.7	76.9	23.1	80.8	19.2	60.9	39.1
MyPlate Pizza	96.8	3.2	51.5	48.5	69.7	30.3	77.4	22.6	87	13	39.4	60.6
Confetti Bean Salsa	96.3	3.7	46.4	53.6	63	37	77.8	22.2	88.9	11.1	48.1	51.9
Apple Grilled Cheese	94.6	5.4	60	40	69.4	30.6	68.4	31.6	91.9	8.1	48.6	51.4
Breakfast Burrito	100	0	60	40	69.7	30.3	85.7	14.3	97	3	54.5	45.5
Spring Chicken	90.5	9.5	66.7	33.3	66.7	33.3	90.5	9.5	95.2	4.8	52.2	47.8
2-Bean Chili	100	0	62.5	37.5	59.1	40.9	87.5	12.5	100	0	58.3	41.7
Ham & Brown Rice	94.4	5.6	80	20	83.3	16.7	95	5	94.7	5.3	71.4	28.6
French Toast Sticks	96.6	3.4	37.9	62.1	67.9	32.1	93.1	6.9	100	0	44.8	55.2
<b>Average Percentage</b>	<b>95.8%</b>	<b>4.2%</b>	<b>59.3%</b>	<b>40.7%</b>	<b>67.3%</b>	<b>32.7%</b>	<b>77.6%</b>	<b>22.4%</b>	<b>90.9%</b>	<b>9.1%</b>	<b>49.7%</b>	<b>50.3%</b>

### *Participant Characteristics*

Demographic characteristics for the participants were categorized into student and parent responses (See Table 1 for student and Table 2 for parent). Eighty-five percent of both student and parent participants were non-white, mostly Native American.

Approximately 91% of students were non-Hispanic. The grade level and sex for students is listed in Table 1. The mean age for parents was 47 +/- 20.8 years and 86% were female.

### *Parents*

A total of 392 parental responses for all recipes were included in the final analyses of the questions relating to the use of food items in the backpack to make the recipe and knowledge of the recipe ingredients offered as commodity food items. The responses exclude those with missing data. Across all recipes, 85% of parents reported that they used the food items and recipe that was sent home with their students and roughly 72% of parents reported having knowledge that ingredients were commodity food items.

Responses to these questions varied by demographics. White parents were less likely to use the food items to make the recipe ( $p=0.001$ ). Additionally, white parents were less likely to be aware that the recipe ingredients are available as items in the commodity food program ( $p=0.000$ ) Also true for male parents ( $p=0.015$ ). There were no differences in responses by age.

### *Students*

Frequencies of student responses to each survey question by recipe are presented in Table 3. The total number of student responses for each of the questions varied

between 504 and 517, and were included in the analyses excluding those with missing data. Across all recipes, 96% of students reported having the necessary tools in their kitchen to prepare the recipes. This ranged from 90% for the 'Take Along Trail Mix' to 100% for the 'Tuna and Vegetable Mac', 'Breakfast Burrito', and 'Two-Bean Chili'. No demographic differences were noted in response to this question.

When asked about conversation after making the recipe, 59% of students reported that their family did talk about eating healthier. White participants were less likely to talk about eating healthier with their families after making the recipes ( $p=0.001$ ); the same is true for non-Hispanic participants ( $p=0.047$ ) and male participants ( $p=0.038$ ). Nearly 70% of participants indicated that the recipe gave them ideas for new meals, however this was less likely in white participants ( $p=0.002$ ) and male participants ( $p=0.025$ ). While 78% of students reported that the recipe was eaten together with the family at the same table, it ranged from 55% for 'Take Along Trail Mix' to 87.5% for 'Two-Bean Chili'. Moreover, white participants were less likely to eat together at the family table compared to non-white participants ( $p=0.032$ ). Overall, 91% of students indicated wanting to make recipes again, ranging from 80% for 'California Vegetable Soup' to 100% for 'French Toast Sticks'. There were no demographic differences in response to this question. Finally, while approximately 50% of students reported talking about the Nutrition Facts food label on the recipe card, however white participants were less likely to do so ( $p=0.000$ ). Male students were also less likely to discuss the Nutrition Facts food label ( $p=0.037$ ).



*Correlation of Parent and Student Responses*

**Table 4.** Student and Parent Correlation and the Coordinating P-Value for Pearson

Correlation

Survey Question	P-Value
Did you make the recipe at home with your family?	0.01
Did you have the necessary tools in your kitchen to make the recipe?	0.514
After making the recipe, did your family talk about eating healthier food?	0.522
Did this recipe give you ideas for new meals?	0.524
Did your family eat the recipe together at the same table?	0.513
Do you want to make this recipe again?	0.533
Did your family talk about the Nutrition Facts food label on the recipe card?	0.52
Did you know that some ingredients are offered as commodity food items?	0.029

Fewer parent survey responses were received than students, so parent/student dyads were examined for correlation in their responses. All but two of the questions had responses that were correlated, and for those correlated, the student response was used, as there was a larger sample size to draw from. For the two questions that did not have correlated responses, parent responses were utilized as they were likely more reliable.

## Discussion

To the best of our knowledge, this study is among the first to examine the use of nutrition education with food preparation and a school backpack food program to examine if there is a positive increase in dietary knowledge. Several key findings emerged from the analyses. First, the study found that the majority of parents used the ingredients and recipe from the backpack and knew that the ingredients could be found in the commodity food program. However, white parents were less likely to use the ingredients and recipe, while white parents and male parents were less likely to know about the commodity food program.

Second, the study found that 96% of the limited resource households had the tools that were necessary to make the recipes. Third, the study found that the overall program had a positive impact on awareness and eating healthier with the average response of 69%. However, white participants and male participants were less likely to talk about eating healthy with their families, have new ideas for meals, and to talk about the Nutrition Facts food label following making the recipes. White participants were found to be less likely to eat together at the same table.

The first finding shows that many of the parents utilized the available recipe and that they are aware of the food distribution programs available. White and male participants were less knowledgeable about the foods in the commodity food program. This finding may be due the fact that whites and males are less likely to use the commodity food program. as current research has reported that there are higher numbers of single-mother household participants in commodity food programs when compared to single-father households (41). Secondly, the study was located in communities with a

large limited resource audience where it is often assumed that households do not have access to proper cooking appliances; however the utensils and appliances needed for the recipes were present in the majority of the households. Furthermore, this demonstrates that programs that require food preparation to be continued from the school into the home environment can be done without the need to send home additional equipment.

One impact of the study was to positively impact the awareness and motivation to eat healthier among the students and their families. The study findings indicate that the nutrition education along with the food preparation when paired with recipe ingredients in a school backpack program increases positive changes in the conversations relating to diet at home. Similar results were found through the few school-based nutrition education and food preparation studies; however, none included the take-home backpack portion (37). White participants and male participants were again the least likely to discuss the nutritional portion of the recipes with their families. The data for the previous objectives determined that the program can be condensed into a summer school program to yield positive results. The positive results show that the program improves student's dietary knowledge and cooking skills can improve dietary behavior among their family as well.

There was a positive correlation between student and parent responses for six of the eight questions, so it was determined that student responses would be used for those six correlated questions in the analyses. The study found that for future research only student surveys can be used, eliminating having to send home and collect parental surveys. In future research, the two questions that did not correlate between student and parent will more cognitive work with students to be able to word the questions so that

students will comprehend what the questions are asking so that student answers can be used for all eight questions.

The study also has limitations to be considered. This program was offered up to three times per week, when a school backpack program might only be offered once per week during the school year, so this might have had an impact on changes made.

Strengths of the study are that the nutrition education and food preparation classes were delivered by SDSU Extension personnel who are trained on the content of the education. Secondly, the population in which the study was developed for often do not trust outside researchers to be able to conduct research and from this; positive relationships were formed with community members thus may enhance participation. Lastly, the schools in these communities allowed the researchers to receive a large amount of school time to implement the intervention, as that is generally not the case.

## **Conclusions**

This study suggests that dietary awareness and motivation to eat healthier can be positively impacted through school-based nutrition education and food preparation classes when coupled with a backpack of food. Results provide that the Bountiful Backpack Program can be condensed into a shorter summer session and have positive outcomes. The study also found that student responses can account for parental responses eliminating the need to send surveys home to parents. Recommendations for future research include a randomized intervention to test the efficacy of the intervention to enhance dietary awareness and motivation to eat healthier.

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## APPENDIX

## Appendix A. Parent Recipe Survey

Student Name: \_\_\_\_\_



## Bountiful Backpacks Parent Recipe Survey (Take Along Trail Mix)

ID Code: 

1. Did your family make the Take Along Trail Mix recipe sent home with your child?  Yes  No

If Yes, please go to Question #2.

If No, why?  Did not receive a recipe  Recipe did not sound good  No time  
 Did not have ingredients at home  Other \_\_\_\_\_



Please go to Question # 12

2. Who prepared the recipe?  Student  Parent  Both Student and the Parent

Someone else \_\_\_\_\_

3. Did you make any changes to the recipe?

Added \_\_\_\_\_ Left out \_\_\_\_\_

4. Did people eat anything else with the Take Along Trail Mix? \_\_\_\_\_

5. How many people ate the Take Along Trail Mix? \_\_\_\_\_

6. Did your family have the necessary tools in your kitchen to make the recipe?  Yes  No

If No, what was missing? \_\_\_\_\_

	YES ▼	NO ▼	NOT SURE ▼
7. After making the recipe, did your family talk about eating healthier foods?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Did this recipe give any member of your family ideas for new meals?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Did your family eat the mix together at the same table?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Will your family want to make this recipe again?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Did your family talk about the Nutrition Facts food label on the recipe card?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Did you know that dried fruit and cereal are offered as commodity food items?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. If you receive commodity food items, will you use them in the future to make this recipe?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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# Thank you!



## Appendix B. Student Recipe Survey

Student Name: \_\_\_\_\_



### Bountiful Backpacks Student Recipe Survey (Take Along Trail Mix)

ID Code:

1. Did you use the items in your backpack to make the Take Along Trail Mix recipe?  Yes  No

If Yes, please go to Question #2.

If No, why?  Did not receive a recipe  Recipe did not sound good  No time  
 Did not have the ingredients at home  Other \_\_\_\_\_



Please go to Question # 12

2. Who prepared the recipe?  Me  My Parents  Me & My Parents  Brother or Sister

Someone else \_\_\_\_\_

3. Did you make any changes to the recipe?

Added \_\_\_\_\_ Left out \_\_\_\_\_

4. What else did you eat with the Take Along Trail Mix recipe? \_\_\_\_\_

5. How many people ate the Take Along Trail mix meal? \_\_\_\_\_

6. Did you have the necessary tools in your kitchen to make the recipe?  Yes  No

If No, what was missing? \_\_\_\_\_

	YES ▼	NO ▼	NOT SURE ▼
7. After making the recipe, did your family talk about eating healthier foods?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Did this recipe give you ideas for new meals?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Did your family eat the Take Along Trail Mix together at the same table?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Do you want to make this recipe again?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Did your family talk about the Nutrition Facts food label on the recipe card?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Did you know that dried fruit and cereal are offered as commodity food items?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



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# Thank you!

## Appendix C Recipe Card Provided in the Backpack



## Take-Along Trail Mix

Serves: 16    Serving Size: ½ cup



**Ingredients:**

- 2 cups unsweetened cereal (Cheerios®, Wheat Chex®, etc.) \*
- 2 cups sweetened cereal (Honey Nut Cheerios®, Frosted Mini-Wheats®, Life®) \*
- 2 cups small pretzel twists
- 1 cup dried fruit \*
- 1 cup peanuts

\* Indicates commodity food item.



**Directions:**

1. Wash hands.
2. Mix together all ingredients in a large bowl.
3. Store in an airtight container in cupboard for about 1 week, or freeze for several weeks.

**Helpful Hint:**  
Measure ½ cup amounts into snack-size plastic bags so they're ready to grab and go.



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