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Eat Smart, Play Hard The Oyate Way: Impact of a Culturally Tailored Nutrition and Physical Activity Curriculum on Elementary Youth

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EAT SMART, PLAY HARD THE OYATE WAY: IMPACT OF A CULTURALLY TAILORED NUTRITION AND PHYSICAL ACTIVITY CURRICULUM ON ELEMENTARY YOUTH

BY

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

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CONTENTS

ABBREVIATIONS

AI	American Indian
AND	Academy of Nutrition and Dietetics
BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
DDT	Division of Diabetes Translation
DETS	Diabetes Education in Tribal Schools
FFQ	Food Frequency Questionnaire
IK	Indigenous Knowledge
MCC	Math in a Cultural Context
PA	Physical Activity
SEM	Social Ecological Model
SD	South Dakota
USDA	United States Department of Agriculture
U.S.	United States

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ABSTRACT

EAT SMART, PLAY HARD THE OYATE WAY: IMPACT OF A CULTURALLY TAILORED NUTRITION AND PHYSICAL ACTIVITY CURRICULUM ON ELEMENTARY YOUTH

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Objective: To assess changes in nutrition and physical activity (PA) knowledge and behavior in elementary-age participants from school districts with high American Indian enrollment after completion of a culturally tailored education curriculum.

Design: Pre-post intervention study assessing knowledge and behavior using quantitative methods.

Participants: A total of 248 participants (Kindergarten through 5th grade, n=248) throughout 13 elementary classrooms in tribal communities participated in *Eat Smart. Play Hard.: The Oyate Way*.

Intervention(s): Baseline and post intervention data from a culturally tailored nutrition and PA knowledge and behavior curriculum.

Main Outcome Measure(s): Dependent variables were nutrition and PA knowledge, and nutrition and PA behavior. Independent variable was the intervention (pre-post).

Analysis: Paired t-tests were conducted to determine if there was an overall change, as well as changes by grade by comparing pre and post-tests looking specifically at nutrition and PA knowledge and behavior. Proportion tests were used to examine the proportion of yes responses to determine if they differ pre/post for PA.

Results: A significant increase was found in PA ($p = 0.01$) and cultural ($p = 0.03$)

knowledge categories in first, fourth and fifth graders. No significant nutrition knowledge differences were found. All macronutrient intakes ($p < 0.05$) decreased significantly in the fourth and fifth grade levels. Individual food groups were also found to have significance in various grade levels. Meat, poultry and fish intake ($p = 0.02$) had a significant decrease in the fourth and fifth grade category. Fruit/fruit juice ($p = 0.03$), total fiber ($p = 0.04$), total sugars naturally occurring in foods ($p = 0.03$), as well as added sugar/syrup ($p = 0.01$) intake significantly decreased in the third-grade category. Significant decreases in physical activity behavior ($p < 0.01$) were found in the following categories for all grades: part-time work, activities like dance/drill team, biking/hiking, and physical education. Individual aspects were seen within specific grade levels for specified outcomes that were examined.

Conclusions and Implications: The present study incorporated culturally tailored education as it related to nutrition and PA knowledge and behavior. This study was the first to analyze culturally tailored education and its impact on nutrition and PA knowledge as well as behaviors. It identifies the need for interventions in this specific population. Further research should be done to incorporate this the culturally tailored education with multiple levels of the SEM specifically focusing on nutrition and PA to increase success for a long-lasting change in behavior. This behavior change could decrease the risk of comorbid diseases and increase a healthier lifestyle. The focus on this population is due to AI having higher risks for comorbid diseases such as obesity and diabetes. This study helps address the need for interventions, especially in this specific age group as these diseases are likely to carry on into adulthood.

Chapter 1

Introduction

Childhood obesity is an ongoing health issue that has shown prevalence in the United States (U.S.) as it affects one in six children.[1] This condition is complex and involves several factors that all contribute to the development of this disease.[2] Research shows that 60 percent of children, ages five to ten, affected by overweight have already acquired at least one risk factor for heart disease.[3] Additionally, children with overweight or obesity are more likely to continue this trend into adulthood.[4] Similar to adults with obesity, children affected by obesity have an increased risk of cardiovascular disease, diabetes, and hypertension.[4] Knowing that these comorbidities exist, demonstrates the importance of this health issue.

American Indian (AI) youth have the highest prevalence of childhood obesity in the U.S..[2] The 2016-2017 South Dakota (SD) School Height and Weight Report looking at students aged 5-19, reported rates of 15.2 percent with overweight and 13.7 percent with obesity in white youth, while overweight and obesity rates for AI youth were 18.4 percent with overweight and 29.3 percent with obesity.[2] The lack of culturally tailored educational materials related to nutrition and physical education may be a factor in this gap of overweight and obesity rates in the AI population when compared to other populations.

Culturally tailored nutrition and physical education materials have potential to positively change diet and physical activity (PA) behavior as well as knowledge. AI communities have longed for the development of culturally tailored Indigenous Health programs where culture is the main component in the design, development, and

implementation of intervention.[5] Although, much of AI research that utilizes Indigenous Knowledge (IK) ignores the many different expressions of IK, which includes traditional, empirical, revealed, and contemporary knowledge.[5] All four types are important in understanding how IK is relevant to designing and implementing health interventions in AI communities.[5] In addition, physical education is the basis of positively impacting PA levels, therefore leading to decreased body fat percentages.[6,7] Previous research that was conducted includes the Math in a Cultural Context (MCC), which is a culturally based mathematics curriculum for AI students of both urban and rural communities.[8] The MCC project showed improvements in math skills when local tribal knowledge was intertwined into a curriculum for students in the sixth grade level.[8] Qualitative data that was collected showed how local culture and curriculum improved student learning.[8]

The *Eat Smart, Play Hard: The Oyate Way* nutrition and PA curriculum utilized a six-part series of colorful posters with coordinating educational lessons in tribal schools.[9] The purpose of the posters was to create discussion and serve as an educational reminder in relation to nutrition education.[9] The accompanying lessons included Visual Thinking Strategy,[10] culture, and Lakota and Dakotah language-infused activities as well as common core content standards, including key understandings about the history of the Oceti Sakowin--Great Sioux Nation.[9] Those that implemented the *Eat Smart,Play Hard: The Oyate Way* curriculum showed that 94% of children improved their skill to select foods or gained comprehension in at least one area of nutrition education.[9] Also, 58% of the same population improved PA scores.[9] Teachers found this curriculum easy to implement in their classrooms and simple to use.[9]

To summarize, the need for culturally tailored education in more areas of learning is large. Combining culture with education could have an impact on knowledge and/or behavior. This research focuses on the *Eat Smart, Play Hard: The Oyate Way* culturally tailored curriculum, versus just testing efficacy and implementation strategies. Therefore, the purpose of this study was to examine changes in basic nutrition and PA knowledge and behavior in elementary-aged participants from school districts with high AI enrollment after completion of the *Eat Smart, Play Hard: The Oyate Way* curriculum. Furthermore, this research will help inform the following research question, does the culturally tailored *Eat Smart, Play Hard: The Oyate Way* curriculum have a positive effect on nutrition and PA behavior as well as knowledge?

Chapter 2

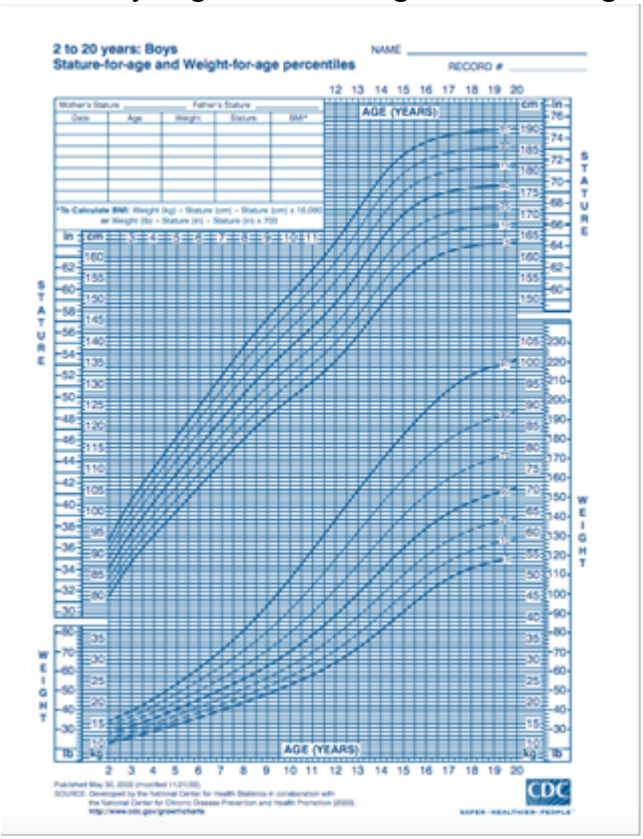
Literature Review

Obesity is defined by the Centers for Disease Control and Prevention (CDC) as a weight that is greater than what is considered a healthy weight for a specified height.[11] Body Mass Index (BMI) is the screening tool used to define an individual's specified weight range; dependent on their height, weight, and years of age.[11] An individual is affected by overweight if their BMI is between 25.0 and 29.9, or affected by obesity if their BMI is 30.0 or greater.[11]

Childhood Obesity

Although obesity is generally associated with adults, obesity is an issue that also affects children and adolescents. In the U.S., obesity affects one in six children.[1] BMI is also the tool used to measure child and adolescent overweight and obesity.[1] Although, BMI does not measure body fat directly, it is linked to other direct measures of body fat.[1] For children and adolescents, BMI is sex and age specific and is generally referred to as BMI-for-age.[1] This is due to varying body composition between males and females as they mature.[1] BMI-for-age is plotted on gender-specific growth charts, shown in Figure 1 below, and is utilized for children and adolescents between the ages of two and twenty.[1]

Figure 1. Growth chart for boys, aged 2-20 looking at stature for age and weight for age.



A child who has a BMI at or above the 85th percentile and below the 95th for the same sex and age is affected by overweight.[1] A child who is above the 95th percentile is affected by obesity, again looking at the same sex and age.[1] Prevalence of obesity increased nearly three times in children aged six to eleven from seven percent to 18.4 percent in the years 1980 to 2012.[12] Individuals' aged 12 to 19 also had an increase in obesity, from five percent in 1980 to 20.6 percent in 2012.[12]

In SD, 32.2% of children and adolescents aged 5-19 are affected by either overweight or obesity.[13] Over the past thirty years, these rates have doubled in children and quadrupled in adolescents.[13] This rise is linked to a lack of PA and poor nutrition.[13] In the year 2015, the SD Youth Risk Behavior Survey found that less than half of the students surveyed were physically active for at least 60 minutes on five out of seven

days.[14] The same survey showed 11.9% of these students ate vegetables and 13.1% ate fruits three or more times per day in the past week.[14,16]

Furthermore, children who are affected by overweight or obesity are more likely to continue this trend into adulthood.[4] Children with obesity are more likely to have asthma, fatty-liver disease, joint discomfort, as well as psychological and psychiatric problems (anxiety, depression, lower self-esteem etc.); these are likely to follow into adulthood.[15] Research shows that 60 percent of children, ages five to ten affected by overweight or obesity have already acquired at least one risk factor for heart disease.[3] These risk factors are likely to be more severe in adulthood if an individual is affected with obesity during childhood.[16]

AI children have the highest prevalence of childhood obesity in the U.S..[17] Additionally, AI children have had an increase is obesity prevalence reported since the year 2003, while other groups have maintained or decreased the rate of obesity.[17] This is a large concern, as obesity tends to trend into adulthood and largely increases the risk of chronic disease.[17] The current SD School Height and Weight Report reported rates of 15.2 percent with overweight and 13.7 percent with obesity in white youth for the year of 2016-2017.[2] While overweight and obesity rates for AI youth were 18.4 percent with overweight and 29.3 percent with obesity.[2] These rates combined show that AI youth in SD are almost 20 percent more affected by overweight or obesity than looking at the white youth population.[2]

Factors Related to Development of Childhood Obesity

Child overweight and obesity is a complex condition that involves several factors that all contribute to the development of this disease.[2] Individuals experiencing

overweight or obesity could have endured physical inactivity, excess energy intake, and inadequate environments to maintaining a healthy weight.[18] This could also be due to genetics, which is one obstacle that we cannot modify.[18] Although, identifying these issues that are modifiable is a step in the right direction to provide treatment as well as potential prevention.

Obesity is caused when an individual has a disproportion between energy intake and energy expenditure.[19] Positive energy balance, which is more energy being taken in (food intake) than what is being expended (PA), would indicate a likelihood of an individual with overweight or obesity.[19] Factors affecting this positive energy balance include increased portion sizes, and increased intake of high-energy dense foods.[19] These have both largely increased in the past decade and are both correlated to energy imbalance.[19]

Lack of PA also has a link to the rise in overweight and obesity in the U.S.. The PA guidelines for children and adolescents is at least 60 minutes of moderate or vigorous activity per day.[20] The number of adolescents meeting this recommendation is 27.7% in the state of SD.[21] It is thought that increased electronic use has increased the amount of sedentary time children are experiencing.[22] An average of seven hours per day is spent watching television or using electronic devices; while it is only recommended a maximum of one or two hours is spent per day using technology.[22] The amount of screen time has also been shown to influence food intake due to the exposure of advertisements or overconsumption while participating in screen time.[23]

Another factor contributing to the overweight and obesity endemic is environment. The community environment an individual lives in can greatly increase

their likelihood of being affected by overweight or obesity.[24] People may have knowledge, skills, attitudes, and motivation to be physically active, but if they do not have access to the necessary places where they can be active, they may be restricted.[24] Access to parks, sidewalks, and bike paths can impact the amount of PA and screen time a child partakes in.[24] Only 39.3% of SD youth live within half a mile of a park.[24] The state of SD unfortunately has not adopted any policy requiring access to these amenities.[24]

Places including childcare centers, schools, or communities are various environments that can also affect intake and energy expenditure.[25] Food and beverage intake as well as PA is affected by the various options offered or the amount of PA offered at that establishment.[25] Affordability, peer and family modeling, marketing, and policies of the community are other factors that can contribute to the condition of obesity.[18] It can be a challenge for parents and their children to make healthy choices and partake in PA when they are in community environments that do not support a healthy life-style.[18]

Food Security

As defined by the U.S. Department of Agriculture (USDA), food security is broken into two categories: high food security and marginal food security.[26] High food security is defined as "Having no reported indications of food-access problems or limitations".[26(p2)] Marginal food security is then defined as "Having one or two reported indications- this typically is due to anxiety over food sufficiency. Little to no indication of changes in diet or food intake".[26(p2)] Food security is based on four key factors, food availability, access physically and economically, utilization, and stability of each.[27]

For each of these factors to occur and food security to be achieved, the food system needs to be working sufficiently. The food system is broken down into sections, as shown below in Figure 2, production, distribution, access, consumption, and disposal.[27]

Figure 2. Food system showing the importance of each stage in ensuring food security.

A negative effect on just one of these sections can disrupt the food system, therefore disrupting food security.[27] This causes what is termed, food insecurity. The USDA defines food insecurity as two separate sectors, low food security and very low food security.[26] Low food security is defined as "reports of reduced quality, variety, or desirability of diet. Little or no indication of reduced food intake".[26(p2)] Very low food security is defined as "Reports of multiple indications of disrupted eating patterns and reduced food intake".[26(p3)] Food insecurity has been linked to income, education, health status, and social networks.[28] In the U.S. in 2016, 16.5% of households with children were food insecure.[28]

As briefly stated above, food insecure locations are majorly related to the incidence of food deserts. As defined by the USDA, food deserts are, "parts of the country vapid of fresh fruit, vegetables, and other healthful whole foods, usually found in impoverished areas. This is largely due to a lack of grocery stores, farmers' markets, and healthy food providers".[29(p1)] Food deserts may contribute to the condition of overweight

and obesity as many individuals that live in food deserts do not have the access to a variety of healthy options such as fruits, vegetables, grains, lean proteins. It may be more convenient to shop at a convenience store where many options include processed food items that are often more accessible and cheaper.

American Indian Food Security in South Dakota

Looking specifically at the AI population of the U.S., 35 percent of AI children live in poverty.[30] Furthermore, AI families are 400 % more likely to be food insecure; this is likely due to living in isolated locations where food, supplies, and jobs are limited.[30] As shown below in Figure 3, there are nine AI reservations in the state of SD.[31] These are as follows, Cheyenne River, Crow Creek, Flandreau Santee Sioux, Lower Brule, Pine Ridge, Rosebud, Sisseton Wahpeton, Standing Rock, and Yankton. In the year 2017, approximately 12.0 percent of U.S. households were food insecure, while the food insecurity rate in SD was 12.4 percent.[32,33] Looking at various counties within SD, shown in Figure 4 below, twelve different counties are between 15 percent and greater than 30 percent for food insecurity.[33] Additionally, Oglala Lake County in SD has a staggering child food insecurity rate of 39.6%.[33]

Figure 3. Nine American Indian Reservations in the state of South Dakota.

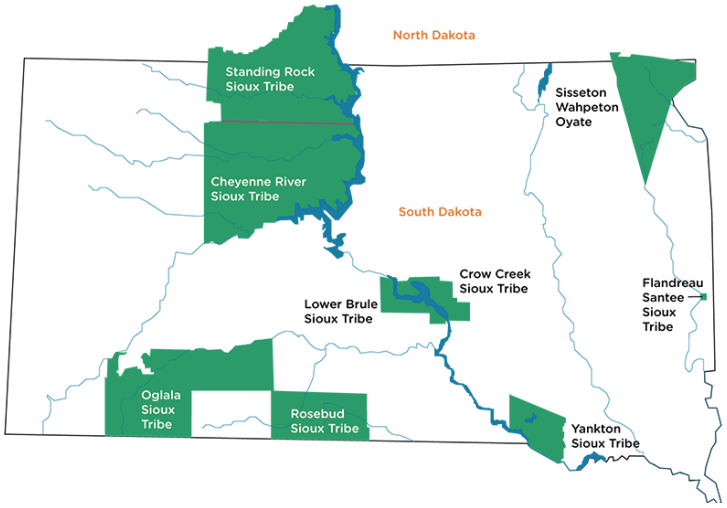
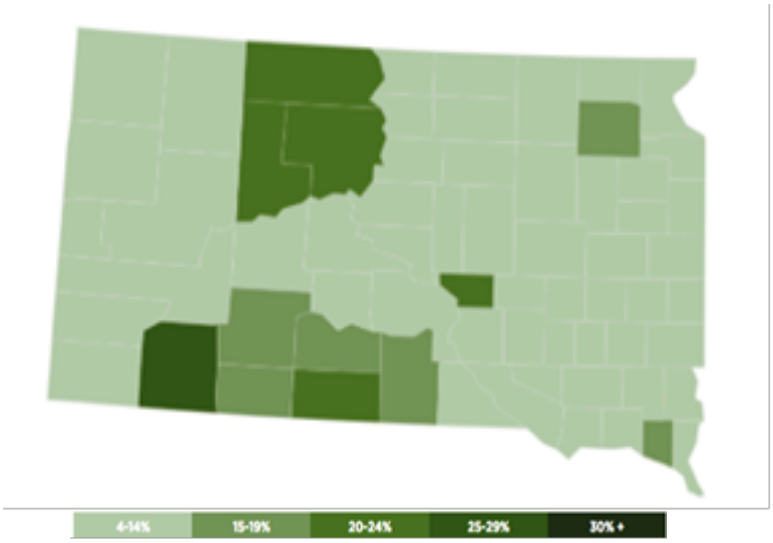


Figure 4. Food insecurity rates shown by percentage in the state of South Dakota.



When making a comparison between figures three and four, one can determine that the areas in which are food insecure in SD are extremely similar to the areas where AI reservations are located. Food insecurity can be related to the condition of overweight and obesity. Individuals experiencing food insecurity are likely to purchase food items that are processed and lack quality, therefore increasing their intakes of unhealthful food items while also decreasing their intake of nutrient dense foods. [34]

AI have also had higher rates of negative outcomes when looking at various diseases.[35] Diabetes is more prevalent in the AI population than any other U.S. racial group; diabetes is also the leading cause of kidney disease.[35] Approximately two out of three patients with diabetes led to kidney failure and the AI population were about five times more likely to have kidney disease (caused by diabetes) than compared to white/Caucasians.[35] Other diseases with high prevalence rates in the AI population are heart disease, stroke, cancer, hepatitis, liver disease, and high rates of suicide.[36] Many of these high disease rates in the population occur from frequent barriers that prevent them from receiving quality medical care, including low income, geographic location, and cultural barriers.[36]

This next paragraph will be focusing on the differences between AI children and Non-Hispanic children residing in SD, as well as comparing that to the national average.[37] Looking at Table 1. below, AI children had higher rates for negative outcomes, not only at the SD level, but the national level.[37] AI children were twice as likely to lack health insurance and reside in neighborhoods with limited resources.[37]

Table 1. Key indicators of child well-being, comparing American Indian, Non-Hispanic White, and the National Average.[37]

	American Indian	Non-Hispanic White	National Average
Economic Well-Being			
Children in Poverty	34%	12%	21%
Children Whose Parents Lack Secure Employment	47%	23%	29%
Education			
Young Children Not in School	56%	51%	53%
Fourth Graders Not Proficient in Reading	78%	54%	65%
Health			
Children Without Health Insurance	13%	4%	5%
Family and Community			
Children in Families Where the Household Head Lacks a High School Diploma	19%	6%	14%
Children Living in High-Poverty Areas	31%	5%	14%

Looking at the educational piece, young AI children who are not in school is 56%, compared to 51% of white children.[37] Also, the percentage of AI fourth graders who are not proficient in reading is at a rate of 78%, compared to Non-Hispanic white at 54%.[37] With such a gap in these numbers, it leads an individual to question the underlying factors as to why this gap exists in this population.[37] Looking specifically at the AI population, a lack in culturally tailored education could be a factor in this large gap between these statistics.

Nutrition Education

The Academy of Nutrition and Dietetics (AND) position on nutrition programs in schools is that comprehensive, integrated nutrition programs in all grades are necessary to improve the health, nutritional status, and academic performance of children throughout the nation.[38] To boost impact, AND recommends specific strategies in nutrition education and promotion as a specific area.[38] Additionally, access to healthy food is an important factor to solving the childhood overweight and obesity endemic. When access is combined with nutrition education, this has been shown to be the most effective method in diminishing this issue.[39] Nutrition education is stated as "any combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food and nutrition-related behaviors conducive to health and well-being; nutrition education is delivered through multiple venues and involves activities at the individual, community, and policy levels".[40(p1)]

Nutrition education is great way to help improve health outcomes as well as form healthy eating habits that will last long-term.[39] Additionally, nutrition education is evidence-based and cost effective.[39] Education that is focused on nutrition addresses the need for a multifaceted response on the complexity of this issue. The school environment has been shown as a key opportunity for policy intervention.[39] Programs that are implemented in the school system are able to show policy makers their success within their community and this can lead to a more widespread change in school policies.[41] Local level programs that have success can be brought up to a national level quickly, which has been done with various programs that involve marketing and school meals.[41]

Children react positively towards nutrition education, as learning about healthy

food choices intrigues them.[42] This aids in the children's knowledge and skills in making healthful food choices, and creates an environment where choosing the healthy choice is the natural choice.[42] Research that was done in 2009 conducted a nutrition education program to look at how it affected nutrition knowledge and dietary behavior of elementary aged children.[43] It was found that children in the treatment group had significant improvement in dietary behaviors overall as well as a large improvement in nutrition knowledge.[43] Nutrition education that is school-based has also been linked to decreasing BMI, students experiencing overweight and obesity, as well as increased vegetable and fruit consumption.[39] Other studies have also depicted a positive impact on academia.[39]

Physical Education

Physical education as defined by the CDC as "an academic subject characterized by a planned, sequential K–12 curriculum (course of study) that is based on the national standards for physical education. Physical education provides cognitive content and instruction designed to develop motor skills, knowledge, and behaviors for PA and physical fitness".[39(p1)] Physical education is the basis of children increasing their PA levels as well as decreasing their amount of sedentary time.[6] This increase in physical education positively impacting PA leads to improving bone health, improving cardiorespiratory and fitness, as well as decreasing body fat percentages.[7] Benefits that are provided by physical education also include improvements in academia, decreasing screen-time, and staying on task in the classroom.[6(p2)7(p1)]

Physical education must not only have children participating in PA, but also include teaching activities and lessons that increase skills and knowledge about PA.[44]

Research that was conducted in 2007 found that students that had partaken in physical education classes were more physically active on that specific day.[44] Children that are exposed to physical education will be more likely to use the knowledge and skills they have learned to partake in other opportunities such as recess, sports, transportation to and from school, non-school related activities etc.; physical education programs are the foundation for PA opportunities.[45] Collectively, physical education adds to a child's daily PA levels; this is of importance to children, especially those who do not have access to PA opportunities, or those affected by overweight or obesity.[45]

Culturally Tailored Education

One sizeable factor playing into high rates of obesity and diabetes in the AI population is the lack of culturally tailored education.[46] AI children are challenged by several obstacles to attain academic achievement.[46] Educational failure in AI students is rising due to a shift in education (more modern approach).[46] Elders state that their younger generation do not "see themselves in the curriculum".[46(p2)] Little is known about specific methods to develop a culturally tailored curriculum that will improve learning. Culturally tailored educational plans that can be expended in the school setting are needed for educating today's AI children, especially those focusing on nutrition and PA.

Some projects have already been conducted, outside of health-related education, and have shown positive correlation between improving the knowledge of AI children and utilizing a culturally appropriate curriculum. The MCC project conducted in the years 2001-2002, showed improvements in math skills when local tribal knowledge was intertwined into a curriculum for student in the sixth grade level.[8] MCC is a mathematics

curriculum that is culturally based for students of both urban and rural communities.[8] This research included both quantitative and qualitative data, although the quantitative data does not show contribution to improved knowledge or performance.[8] Qualitative data showed how local culture, and curriculum improved student learning.[8]

Another culturally tailored education curriculum is known as the Eagle Books, and were developed by the CDC Division of Diabetes Translation (DDT).[47]. The Eagle Books series was created by the federal Native Diabetes Program and promotes type 2 diabetes prevention as well as traditionally encouraging PA and healthy eating.[47] The Eagle Books have not been evaluated for feasibility of efficacy, although they aim to increase PA, consumption of health food items, and education from elders about traditional ways of living a healthy lifestyle.[47]

Culturally tailored education was also used in the K-12 Diabetes Education in Tribal Schools (DETS) curriculum. This curriculum was created in 2007-2008 by three federal agencies and eight different tribal colleges, and was implemented in 14 different states including SD.[48] The DETS curriculum wanted to achieve the objective of understanding health, diabetes, and lifestyle.[48] Results were shown to have an increase in knowledge of all the above areas although attitudes stayed the same throughout the implementation period.[48]As shown in the curricula above, there is evidence in culturally tailored education. The next step is combining nutrition and physical education and knowledge with culturally tailored education.

Culturally Tailored Nutrition and PA Education Components

Culturally tailored education curriculums have been shown effective in increasing knowledge for students in a certain area.[9] Nutrition and physical education have also been

proven to be a successful strategy in various ways, including lifestyle changes and knowledge relating to these areas of study.[9] Embracing a nutritious diet and active lifestyle can reduce the odds for children at-risk of overweight and obesity.[9]

The *Eat Smart, Play Hard: The Oyate Way* nutrition and PA curriculum utilized a six-part series of colorful posters with coordinating lessons in tribal schools.[9] The purpose of the posters was to create discussion and serve as an educational reminder in relation to nutrition education.[9] The accompanying lessons included Visual Thinking Strategy,[10] culture, and Lakota and Dakotah language-infused activities as well as common core content standards, including key understandings about the history of the Oceti Sakowin--Great Sioux Nation.[9] The tribal schools that implemented the *Eat Smart, Play Hard: The Oyate Way* curriculum showed that 94% of children improved their skill to select foods or gained comprehension in at least one area of nutrition education.[9] Also, 58% of the same population of students improved in PA scores.[9] Teachers found this curriculum easy to implement in their classrooms and simple to use.[9] Minor revisions were completed based on feedback given by implementers.[9]

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Chapter 3

EAT SMART, PLAY HARD THE OYATE WAY: IMPACT OF A CULTURALLY TAILORED NUTRITION AND PHYSICAL ACTIVITY CURRICULUM ON ELEMENTARY YOUTH

Submitting to: *Journal of Nutrition, Education, and Behavior*

ABSTRACT

Objective: To assess changes in nutrition and physical activity (PA) knowledge and behavior in elementary-age participants from school districts with high American Indian enrollment after completion of a culturally tailored education curriculum.

Design: Pre-post intervention study assessing knowledge and behavior using quantitative methods.

Participants: A total of 248 participants (Kindergarten through 5th grade, n=248) throughout 13 elementary classrooms in tribal communities participated in *Eat Smart. Play Hard.: The Oyate Way*.

Intervention(s): Baseline and post intervention data from a culturally tailored nutrition and PA knowledge and behavior curriculum.

Main Outcome Measure(s): Dependent variables were nutrition and PA knowledge, and nutrition and PA behavior. Independent variable was the intervention (pre-post).

Analysis: Paired t-tests were conducted to determine if there was an overall change, as well as changes by grade by comparing pre and post-tests looking specifically at nutrition and PA knowledge and behavior. Proportion tests were used to examine the proportion of yes responses to determine if they differ pre/post for PA.

Results: A significant increase was found in PA ($p = 0.01$) and cultural ($p = 0.03$) knowledge categories in first, fourth and fifth graders. No significant nutrition knowledge differences were found. All macronutrient intakes ($p < 0.05$) decreased significantly in

the fourth and fifth grade levels. Individual food groups were also found to have significance in various grade levels. Meat, poultry and fish intake ($p = 0.02$) had a significant decrease in the fourth and fifth grade category. Fruit/fruit juice ($p = 0.03$), total fiber ($p = 0.04$), total sugars naturally occurring in foods ($p = 0.03$), as well as added sugar/syrup ($p = 0.01$) intake significantly decreased in the third-grade category. Significant decreases in physical activity behavior ($p < 0.01$) were found in the following categories for all grades: part-time work, activities like dance/drill team, biking/hiking, and physical education. Individual aspects were seen within specific grade levels for specified outcomes that were examined.

Conclusions and Implications: The present study incorporated culturally tailored education as it related to nutrition and PA knowledge and behavior. This study was the first to analyze culturally tailored education and its impact on nutrition and PA knowledge as well as behaviors. It identifies the need for interventions in this specific population. Further research should be done to incorporate this the culturally tailored education with multiple levels of the SEM specifically focusing on nutrition and PA to increase success for a long-lasting change in behavior. This behavior change could decrease the risk of comorbid diseases and increase a healthier lifestyle. The focus on this population is due to AI having higher risks for comorbid diseases such as obesity and diabetes. This study helps address the need for interventions, especially in this specific age group as these diseases are likely to carry on into adulthood.

Keywords: Obesity, Child Obesity, Culturally Tailored Education, Nutrition Education, Physical Activity, American Indian

INTRODUCTION

Childhood obesity is an ongoing health issue that has shown a large prevalence in the United States (U.S.), as it affects one in six children.[1] Furthermore, American Indian (AI) children have the highest prevalence of childhood obesity in the U.S.[2] The 2016-2017 South Dakota (SD) School Height and Weight Report looking at children aged 5-19, showed 13.7 percent of white youth affected by overweight, while 29.3 percent of AI youth affected by obesity.[2] The causes for obesity in this population are complex and will unlikely be solved by ignoring the need for culturally tailored health interventions.

The Social Ecological Model (SEM) for food and physical activity (PA) decisions is effective in improving eating and PA behaviors when multiple changes are implemented at various levels of the model.[49] These levels include Social and Cultural Norms and Values, Sectors, Settings, and Individual Factors.[49] Sectors affect the access of healthy foods or the opportunity to participate in PA.[49] Settings provide choices. Depending on the setting, such as school, can influence individual choices and have the potential for broader population-level impact if they are integrated with strategies by multiple sectors.[49] In combination, sectors and settings can influence social norms and values.

Social and cultural norms can affect beliefs and behavior.[49] In relation to nutrition and PA, it can include preferences for certain types of foods or the perceived importance of PA and health.[49] Changing norms and values can be difficult due to them being prevalent within a community or setting.[49] Although, positive changes that are made to sectors and settings can have an effect on social and cultural norms and values over time.[49]

Individual factors include age, socioeconomic status, race/ethnicity etc.; It also impacts physical health, knowledge/skills, and personal preferences.[49] To improve individual nutrition and PA choices, education can be delivered while also integrating cultural, ethnic, traditional, and personal preferences, as well as economic status, and accessibility.[49] It can be a challenge for parents and their children to make healthy choices and partake in PA when they are in community environments that do not support a healthy life-style.[19] Eating patterns or PA that is accommodating to the individual are more likely to be motivating and maintained over time; This could lead to changes in dietary intake and increased PA.[49]

One sizeable factor playing into high rates of obesity in the AI population is the lack of culturally tailored education.[45] While AI children are challenged by several obstacles to attain academic achievement, one specific obstacle is a shift in education to a more modern approach.[45] Elders state that their younger generation do not "see themselves in curriculum".[46(p2)] Culturally tailored education curriculums that can be expended in the school setting are needed for educating today's AI children, especially those focusing on nutrition and PA to help with obesity prevention. These tailored materials have potential to positively change nutrition and PA knowledge, as well as behavior. AI communities have long requested the development of culturally tailored Indigenous Health programs where culture is the main component in the design, development, and implementation of intervention.[5]

The *Eat Smart, Play Hard: The Oyate Way* nutrition and PA program utilized a six-part series of colorful posters with coordinating educational lessons in tribal schools.[9] The purpose of the posters was to create discussion and serve as an educational reminder

in relation to nutrition education.[9] The accompanying lessons included Visual Thinking Strategy,[10] culture, and Lakota and Dakotah language-infused activities as well as common core content standards, including key understandings about the history of the Oceti Sakowin--Great Sioux Nation.[9] This study aimed to quantitatively examine changes in basic nutrition and PA knowledge and behavior in elementary-aged students from SD school districts with high AI enrollment after completion of the *Eat Smart, Play Hard: The Oyate Way* curriculum. This study tested the hypothesis that AI elementary age youth exposed to *Eat Smart, Play Hard: The Oyate Way* will demonstrate an increase in nutrition and physical activity knowledge and behavior.

METHODS AND ANALYSIS

The South Dakota State University (SDSU) Institutional Review Board, Sisseton/Wahpeton Tribal Review Board, and the Great Plains Area Indian Health Services Institutional Review Board approved this study.

Study Design and Participants

The study follows a pre-post intervention design looking at quantitative data obtained from a culturally tailored nutrition and PA curriculum to assess knowledge and behavior. A convenience sample of thirteen (n=13) elementary schools, with participants in Kindergarten through 5th grade (n=248), were recruited based on their proximity to an SDSU Extension educator, proximity to an AI reservation, and having a majority (at least 60%) of the student body that was AI.

Recruitment

Schools that fit the criteria were contacted to participate via a letter sent to administrators. Within the schools recruited, teacher and legal guardian consent and child assent were obtained prior to participation. Participants that did not provide assent and/or did not have parental/guardian consent to participate in the study were still included within the classroom educational sessions; however, they were not included in the data collection process.

Instructional Delivery

Both SDSU Extension educators and school classroom teachers were trained on curriculum implementation and collaborated to deliver the curriculum over the duration of six weeks. The *Eat Smart, Play Hard: The Oyate Way* curriculum included six posters, each accompanied by five lessons that centered on nutrition, PA, social studies,

family/culture and reaching out. Each session consisted of a 30-minute nutrition and a 30-minute PA lesson. As part of this study, the nutrition and PA lessons were assessed for efficacy in increasing nutrition and PA knowledge, and in changing nutrition and PA behaviors. Lessons were implemented at various time points throughout the school year, for example during the school spring semester from February to April, and also during a summer school session in June.

Nutrition and PA Knowledge Survey

Nutrition and PA knowledge were assessed using a survey that was developed based on feedback collected from community stakeholders in AI communities utilizing talking circles.[46] SDSU Extension staff that worked with limited resource audiences in these communities were also included in the development of the final survey. The survey included 18 questions (Appendix A) related to traditional AI practices that related to nutrition and PA, as well as three perception questions that related to AI culture and lifestyle. Feasibility was piloted between 2014-2015 in elementary schools on two tribal reservations in SD.[46] Data from the feasibility study showed the curriculum is practical, culturally tailored as well as received positively by both teachers and elementary students.[46]

Block Screeners

Nutrition behavior was assessed using the Block Food Screener for Ages 2-17 2007.[50] The screener consists of 40 items on this screener that assess what the child ate during the previous day, and provides information about intake of fruit and fruit juices, vegetables, potatoes, whole grains, meat/poultry/fish, dairy legumes, saturated fat, “added sugars” to determine if there was a change in nutrition behavior of the participants.

PA behavior was assessed using the Block Kids Physical Activity Screener for Ages 8-17.[51] This 10-item survey asked about the frequency and duration of the child's activities as well as technology use in the past seven days to determine if there was a change in PA behavior of the participants.

Administration of Questionnaires

All knowledge and behavior questionnaires were administered to participants one week prior to curriculum one-week post intervention implementation. The questionnaires were then coded with the student's identification (ID) number, assigned to ensure anonymity and to maintain location distinctions.

Analysis

All analyses were done using Stata Release 14 (College Station, TX). Paired t-tests were conducted to determine if there was an overall change, as well as differences by grade by comparing pre and post-tests looking specifically at nutrition and PA knowledge and behavior. Chi-square tests were done to determine if the responses were the same between pre/post tests for PA. Proportion tests were used to examine the proportion of yes responses to determine if they differ pre/post for PA. Both chi-square and proportion tests were done using pre and post, as well as comparing by student response using their coded ID number.

RESULTS

A total of 13 schools participated in the study. Participants that did not have parental consent were not included in the data analysis. The characteristics of eligible participants are shown in Table 1. Of the total sample, 248 participants completed a pre-survey and 152 participants completed a post-survey. The majority of participants were in third grade (n=100) as well as fourth and fifth grade (n=68). The AI population for participants was just above 50%. Table 2 shows changes in knowledge scores if there were significant pre/post-test differences. Table 2 was categorized by like questions (nutrition, PA, cultural knowledge) and divided by grade categories. No significant nutrition knowledge differences were found. A significant increase was found in PA knowledge ($p = 0.01$) and cultural knowledge ($p = 0.03$) categories in first, fourth and fifth grade levels.

Table 3 shows differences in macronutrient intakes from pre to post-test by grade categories. All macronutrient intakes ($p < 0.05$) decreased significantly in the fourth and fifth grade category. Nutrient changes and food group intake changes from pre to post-test are listed in Table 4 also by grade categories. Meat, poultry and fish ($p = 0.02$) had a significant decrease between pre and post-test for fourth and fifth grade category. Fruit/fruit juice ($p = 0.03$), total fiber ($p = 0.04$), total sugars naturally occurring in foods ($p = 0.03$), as well as added sugar/syrup ($p = 0.01$) intake significantly decreased in the third-grade category. PA changes are recorded in Table 5 looking at differences between pre and post surveys. Significant decreases ($p < 0.01$) were found in the following categories for all grades grouped together: part-time work, activities like dance/drill team, biking/hiking, and physical education.

DISCUSSION

Other studies have looked at the impact of culturally tailored education; however, *Eat Smart, Play Hard: The Oyate Way* is the only study relating culturally tailored education with nutrition and PA outcomes. The objective of the current study was to assess changes in nutrition and PA knowledge and behavior in elementary-age participants from school districts with high AI enrollment after completion of the *Eat Smart, Play Hard: The Oyate Way* curriculum.

There were no significant findings at any grade-level when looking at nutrition knowledge. Physical activity knowledge significantly increased from pre- to post among first-graders and those participants in the fourth and fifth grade category. This was consistent with other findings. A recent study conducted in a school setting showed that lectures and relevant games improved PA knowledge. [52] Younger students showed significant differences for knowledge in comparison to older students.[52] This suggests that, the earlier the intervention takes place, the better the outcomes are for increases in PA knowledge. [52] At the first-grade level students are developing the knowledge and understanding for physical education, where the focus is to teach the foundation and skill of physical education by incorporating a knowledge piece to each activity.[53] Since the ESPH curriculum also focused on knowledge and skill with younger students, this could be a contributing factor as to why first graders saw a significant increase in PA knowledge. Further research should be done with first graders to determine whether culturally tailored education at this grade level continues to affect PA knowledge.

Cultural knowledge also significantly increased from pre- to post test in first-graders and those participants in the fourth and fifth grade category. One study

specifically looking at AI population did not directly study cultural knowledge, although, the students in three of the most heavily culturally tailored programs performed better academically.[54] Another resource stated culturally tailored education and teaching draws upon cultural knowledge and skills that they bring from their home environment.[55] Having culturally tailored education in schools allows the child to connect with education on a greater level, therefore increasing more positive outcomes in academics and behavior.

In the current study, there was a significant decrease in caloric intake, protein, fat and saturated fat consumed by participants in the fourth and fifth grade category. Similar results were found in one study after implementing a middle school nutrition curriculum, which presented increases in fruit and vegetable consumption and decreased consumption of fats and sugar.[56] Additionally, a separate study presented an increase in label reading and correct interpretation of nutrition labels in grades fifth and sixth, which could impact nutrient intake.[57]

It is important to consider that fourth and fifth graders fall into the preadolescent age group. This age group is becoming more independent from their family and is taking on more responsibility.[58] They also have a higher level of education than younger grade levels. It could be perceived more challenging to change individual nutrition behavior in younger children, as they are less likely to prepare meals at home, and the majority of their meals are provided at school, without making a change to their environment. This reasoning could be a contributing factor as to why a significant change occurred in the older grade levels. Further research is needed to determine if nutrition behavior can be positively affected at an older grade level. In the current study, decreases in meat

consumption, added sugars, and natural sugars were also found in the upper grade levels. It could be assessed that this is due to the same rationale as stated above.

Results from the physical activity block screener showed significant decreases were found in participation of physical activity for all grade levels, which included: part-time work, biking, hiking, jumping rope, dancing/drill, playing with friends, and participation in physical education class. This decrease in could be attributed to environmental factors. This study was conducted within rural schools in South Dakota, which experiences long winters including low temperatures, snow, and blizzards. When the first implementation period took place, which accounts for a large portion of results, weather conditions were less than optimal, likely causing a decrease in participation of physical activity; this was reflective in the results. In addition, other research has found that students that had partaken in physical education classes were more physically active on that specific day.[43] Other steps need to be done in addition to education to promote a lasting behavior change in PA participation.

Although this curriculum incorporated culturally tailored materials with nutrition and physical education, this may not be enough to produce a long-term behavior change. For example, food security and food access need to be addressed in addition to nutrition education in order to promote positive behavior change. A recent study that was conducted in an after-school program utilizing culturally tailored education as well as age-sensitivity, with a high population of African American and Hispanic students found significant increases in mean nutrition knowledge scores in serving sizes and food labels after the intervention. This study also incorporated cooking classes to facilitate behavior change and self-efficacy. An improvement was found in eating low-fat dairy foods and

finding serving sizes from a food label. Handouts and recipes were also given to parents/guardians to influence a positive home environment.[59] Education combined with direct methods, such as incorporating multiple levels of the SEM, is more likely to promote positive behavior change.[60]

The findings above along with the results of the current research indicate that a variety of factors need to be considered in designing culturally tailored interventions, such as the home environment, access to healthy foods, and grade level. Incorporating multiple levels of the SEM for food and PA decisions is effective in improving eating and PA behaviors when multiple changes are implemented at various levels of the model.[48] Eating patterns or PA that is accommodating to the individual are more likely to be motivating and maintained over time, which could lead to positive behavior changes in dietary intake and PA.[49] Recommendations can still be made using current research, but in order to gain a better understanding, further research and modifications to a culturally tailored education and incorporations of the SEM need to be considered.

Limitations of this study included reporting bias. This is always a concern when utilizing self-report tools such as the ones used in this study. When looking at a specific culture, it is also important to utilize a tool that relates to that population. Food-based food frequency questionnaires (FFQ) may increase response error, when individuals (such as children) do not typically cook their food or are unfamiliar with the ingredients.[61] This is because various seasonings, oils, and ingredients are not reported, which can contribute to additional nutrients that may be missed.[61] As the current study was focused on the AI population, this could have been a limitation as they have specific dishes they consume relating to their culture; therefore, this may not be reflective in a

food-based FFQ. This is one area that could be further researched in utilizing dish-based FFQ that are culturally tailored for the AI population. Additionally, our age group included K-5th grade classrooms. The PA questionnaire was designed for children aged eight years old and above. This tool may have been more difficult to navigate for the children in grades K-2nd, therefore a potential for inaccuracy in responses. Loss to follow-up was also an issue as consent was needed from parents; several participants were not involved in analysis due to this factor.

Even with the above limitations, the study had several strengths. This study was the first to analyze culturally tailored education and its impact on nutrition and PA knowledge as well as behaviors. Additionally, validated tools were utilized to assess nutrition and PA behaviors. This study identifies the need for interventions in this specific population. The AI population has higher risks for comorbid diseases such as obesity and diabetes and this study helps address the need for interventions, especially in this specific age group as these diseases are likely to carry on into adulthood.

Overall, the present study incorporated culturally tailored education as it related to nutrition and PA knowledge and behavior. The next step is to incorporate this culturally tailored education with multiple levels of the SEM, specifically focusing on nutrition and PA to increase success for a long-lasting change in behavior. This behavior change could decrease the risk of comorbid diseases and increase a healthier lifestyle especially when focusing on the AI population due to their higher rate of adverse health outcomes.

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Table 1. Demographics of eligible youth participants with knowledge pre-survey

Variable	**All Participants with Pre-Survey (n = 248)**
Grade, n (%)	
Kindergarten	26 (10.5)
First	33 (13.3)
Second	21 (8.5)
Third	100 (40.3)
Fourth & Fifth	68 (27.4)
Gender, n (%)	
Female	145 (58.9)
Male	101 (41.1)
Race, n (%)	
American Indian	134 (54.0)
Other	114 (46)

Table 2. Knowledge survey* by question categories looking at paired pre/post data

Variable	Grade	Pre-Survey	Post-Survey	P-Value
Nutrition				
	All Participants (n=135)	73.9 (17.0)	74.9 (14.7)	0.46
	Kindergarten (n=22)	66.6 (14.0)	66.6 (12.5)	1.00
	First (n=17)	64.3 (28.7)	78.2 (10.2)	0.69
	Second (n=13)	72.5 (15.9)	70.9 (15.8)	0.64
	Third (n=32)	78.1 (13.3)	79.5 (13.7)	0.60
	Fourth & Fifth (n=51)	77.9 (13.3)	75.6 (15.9)	0.22
Physical Activity				
	All Participants (n=135)	87.3 (22.6)	88.9 (20.4)	0.41
	Kindergarten (n=22)	84.5 (16.3)	90.0 (14.8)	0.23
	First (n=17)	68.2 (37.5)	91.8 (15.9)	**0.01**
	Second (n=13)	83.1 (22.9)	90.8 (13.2)	0.14
	Third (n=32)	91.3 (19.0)	90.6 (19.7)	0.85
	Fourth & Fifth (n=51)	93.3 (16.8)	85.9 (25.4)	**0.01**
Knowledge				
	All Participants (n=135)	77.4 (17.0)	78.6 (14.1)	0.39
	Kindergarten (n=22)	71.3 (12.6)	72.7 (10.0)	0.52
	First (n=17)	65.3 (29.3)	81.7 (8.8)	**0.03**
	Second (n=13)	75.3 (17.1)	76.1 (13.4)	0.79
	Third (n=32)	81.6 (13.0)	82.4 (13.7)	0.74
	Fourth & Fifth (n=51)	81.9 (12.6)	78.3 (16. 6)	**0.05**

* Questions on the Knowledge Survey were scored as 1 if scores correct and 0 if incorrect. Section scores within categories were summed and divided by the total number of questions in the category to allow for comparison across groups.

Table 3. Nutrition Block Screener: Macronutrients, looking at paired pre/post data.

Variable	Grade	Pre-Survey	Post-Survey	P-Value
Average Daily Kcalories	All Participants (n=94)	1582.9 (1608.1)	1508.7 (1636.0)	0.64
	Kindergarten	No observation	No observation	-
	First (n=15)	491.1 (289.3)	931.9 (1492.9)	0.26
	Second (n=11)	1358.0 (1117.9)	1722.1 (2116.2)	0.66
	Third (n=17)	1427.3 (805.9)	1339.7 (970.7)	0.67
	Fourth & Fifth (n=51)	2020.8 (1962.7)	1639.8 (1706.9)	**0.05**
Total Protein (grams)	All Participants (n=94)	64.3 (75.1)	63.4 (69.9)	0.89
	Kindergarten	No observation	No observation	-
	First (n=15)	15.9 (8.9)	35.5 (58.9)	0.22
	Second (n=11)	51.6 (42.4)	74.3 (85.4)	0.47
	Third (n=17)	51.4 (30.5)	61.1 (47.6)	0.38
	Fourth & Fifth (n=51)	86.1 (93.5)	68.2 (74.2)	**0.05**
Total Fat (grams)	All Participants (n=94)	61.4 (74.8)	57.7 (69.0)	0.60
	Kindergarten	No observation	No observation	-
	First (n=15)	12.9 (8.0)	31.0 (55.8)	0.23
	Second (n=11)	53.3 (46.3)	65.6 (79.2)	0.69
	Third (n=17)	49.4 (28.4)	55.4 (46.8)	0.60
	Fourth & Fifth (n=51)	82.1 (93.3)	62.5 (74.5)	**0.04**
Saturated Fat (grams)	All Participants (n=94)	22.2 (26.2)	20.9 (23.8)	0.59
	Kindergarten	No observation	No observation	-
	First (n=15)	5.6 (3.1)	11.7 (19.1)	0.24
	Second (n=11)	18.9 (15.8)	23.3 (26.6)	0.68
	Third (n=17)	18.2 (10.3)	20.0 (15.5)	0.62
	Fourth & Fifth (n=51)	29.3 (32.7)	22.6 (26.2)	**0.04**

Average daily intake for macronutrients. Block Food Screener may underestimate actual intake. Bold indicates statistical significance ($P \leq 0.05$).

Table 4. Nutrition Block Screener: Other, looking at paired pre/post data.

Variable	Grade	Pre-Survey (n = 96)	Post-Survey (n = 96)	P-Value
Meat, Poultry, Fish (ounce equiv.)	All Participants (n=94)	3.1 (5.2)	2.9 (4.2)	0.67
	Kindergarten	No observation	No observation	-
	First (n=15)	0.2 (0.3)	1.2 (3.6)	0.30
	Second (n=11)	2.1 (2.2)	3.9 (4.7)	0.23
	Third (n=17)	2.0 (1.9)	3.1 (3.5)	0.29
	Fourth & Fifth (n=51)	4.6 (6.6)	3.1 (4.5)	**0.02**
Fruit/Fruit Juice (cup equiv.)	All Participants (n=94)	1.7 (1.4)	1.5 (1.6)	0.36
	Kindergarten	No observation	No observation	-
	First (n=15)	0.7 (1.0)	0.8 (1.8)	0.92
	Second (n=11)	1.4 (0.9)	1.5 (2.1)	0.92
	Third (n=17)	2.2 (1.9)	1.2 (1.1)	**0.03**
	Fourth & Fifth (n=51)	1.9 (1.2)	1.9 (1.4)	0.96
Total Fiber (grams)	All Participants (n=94)	14.2 (12.3)	13.5 (15.1)	0.61
	Kindergarten	No observation	No observation	-
	First (n=15)	4.1 (3.2)	8.8 (17.5)	0.31
	Second (n=11)	12.4 (9.6)	16.3 (20.2)	0.60
	Third (n=17)	14.0 (10.1)	10.5 (8.3)	**0.04**
	Fourth & Fifth (n=51)	17.7 (13.8)	14.7 (14.6)	0.06
Total Sugars Naturally Occurring in Foods (grams)	All Participants (n=94)	104.9 (88.2)	98.9 (99.5)	0.54
	Kindergarten	No observation	No observation	-
	First (n=15)	49.6 (42.5)	70.4 (112.7)	0.48
	Second (n=11)	85.4 (74.0)	101.9 (136.9)	0.76
	Third (n=17)	117.7 (82.4)	76.3 (49.6)	**0.03**
	Fourth & Fifth (n=51)	122.6 (97.9)	112.2 (97.9)	0.29
Sugar/Syrup Added during Processing or Preparation (tsp)	All Participants (n=94)	11.0 (13.4)	9.9 (13.7)	0.40
	Kindergarten	No observation	No observation	-
	First (n=15)	5.1 (3.8)	8.2 (14.4)	0.42
	Second (n=11)	9.9 (10.8)	11.8 (16.7)	0.79
	Third (n=17)	10.9 (9.6)	6.0 (5.6)	**0.01**
	Fourth & Fifth (n=51)	13.2 (16.4)	10.9 (14.3)	0.13

Average daily intake for nutrient and food group estimates. Bold indicates statistical significance ($P \leq 0.05$).

Table 5. Block Kids Physical Activity Screener Ages 8-17 by question looking at paired pre/post data

Variable	Pre-Survey	Post-Survey	P-Value
Watched < one hour per day of television (n=147)	0.54 (0.05)	0.60 (0.05)	0.37
Walking to school, walking the dog, walking around the mall (n=164)	0.39 (0.05)	0.29 (0.04)	0.13
Doing inside chores (n=168)	0.59 (0.05)	0.50 (0.05)	0.17
Doing outside chores (n=163)	0.35 (0.05)	0.32 (0.04)	0.57
Part-time work outside of the house (n=159)	0.21 (0.04)	0.08 (0.03)	**0.01**
Activities like dancing, playing with friends etc. (n=159)	0.62 (0.05)	0.42 (0.05)	**0.005**
Biking, hiking, jump rope, staking etc. (n=161)	0.63 (0.05)	0.41 (0.05)	**0.002**
Participating in sports (n=163)	0.44 (0.05)	0.34 (0.05)	0.14
Exercise including running, swimming, heavy farm work etc. (n=163)	0.47 (0.05)	0.41 (0.34)	0.34
Amount of days participating in physical education class at school (n=165)	0.53 (0.05)	0.11 (0.03)	**0.000**

Questions on the Block Kids Activity Screener were examined by the proportion of yes responses to determine if they differ from paired pre/post surveys. All groups were responses 1,2,3 (never, 1 day, 2 days) vs 4,5,6 (3-4 days, 5-6 days, every day). Analysis grouped frequency for all questions by 3+ days or less, except watching television; this was grouped by 1 hour or less per day. Bold indicates statistical significance ($P \leq 0.05$).

APPENDECIES

Appendix A. Knowledge Survey

Test Administrator Mark one: _____Pre Survey _____Post Survey

Child ID or 3 Initials _____

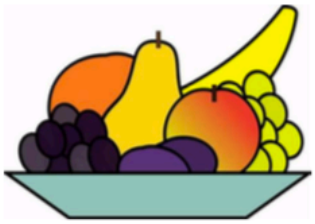
Eat Smart, Play Hard Survey

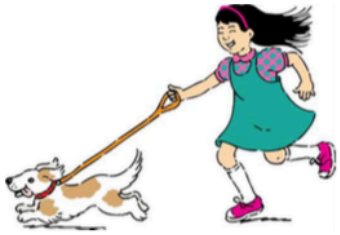
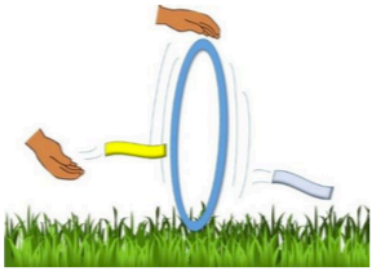
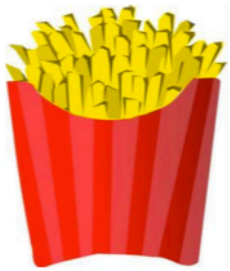
1. What grade are you in?
- ❑ Kindergarten
- ❑ 1st Grade
- ❑ 2nd Grade
- ❑ 3rd Grade
- ❑ Other

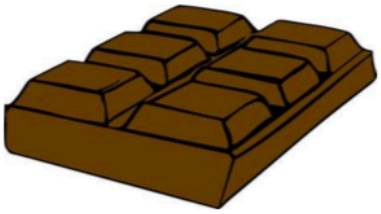
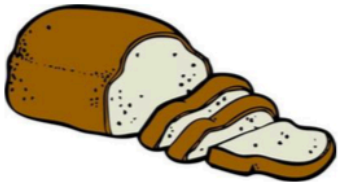
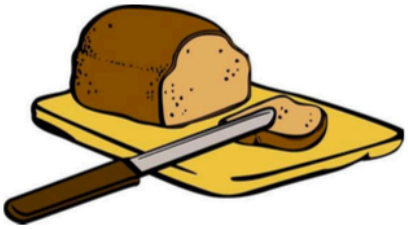
2. I am a
- ❑ Boy
- ❑ Girl

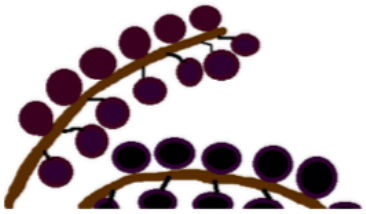
3. How do you describe yourself? You may choose more than one.
- ❑ Latino, Hispanic
- ❑ Black, African American
- ❑ White
- ❑ American Indian, Alaskan Native
- ❑ Asian, Pacific Islander
- ❑ Other (_____)

Circle the one correct answer in the following questions.

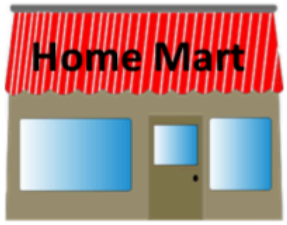
4. The vegetables that you could grow in a garden:	
	
5. The exercise which is active and healthy:	
	
Gardening	Playing Video Games
6. The activity that uses the most energy:	
	
Playing Basketball	Sliding

7. The picture that shows a traditional Native American way of serving fruit is:	
	
Wojapi	**Fruit Smoothie**
8. The picture that shows energy going into your body:	
	
Walking the dog	**Eating breakfast**
9. The activity that is good to do every day:	
	
Hoop Game	**Eating French Fries**

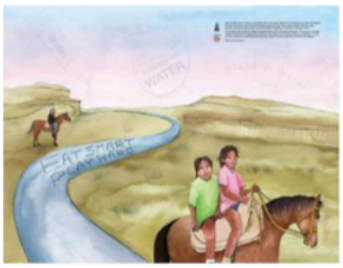
10. A healthy snack for the school store or snack stand is:	
	
Light popcorn	Chocolate bar
11. The bread that is a whole grain:	
	
White Wheat Bread	Whole Wheat Bread
12. The beverage that helps build strong bones and teeth:	
	
Milk	Juice

13. A traditional wild food is:	
	
Chokecherry	Wheat
14. A good way to get vegetables and fruits in your meals is:	
	
Buy potato chips from the convenience store	Make a bean and squash soup
15. Which of these items contains the most sugar:	
	
Soda pop	Apple

16. Hopping, stomping, dipping, twirling, reaching arms up, reaching arms down, bobbing head, side twisting are active movements that you make when:	
	
Traditional Powwow Dancing	Riding Bike
17. The traditional shape that matches the MyPlate symbol is:	
	
Square	Medicine Wheel
18. The Lakota/Dakota drum sounds like a strong:	
	
Beating heart	Hands clapping

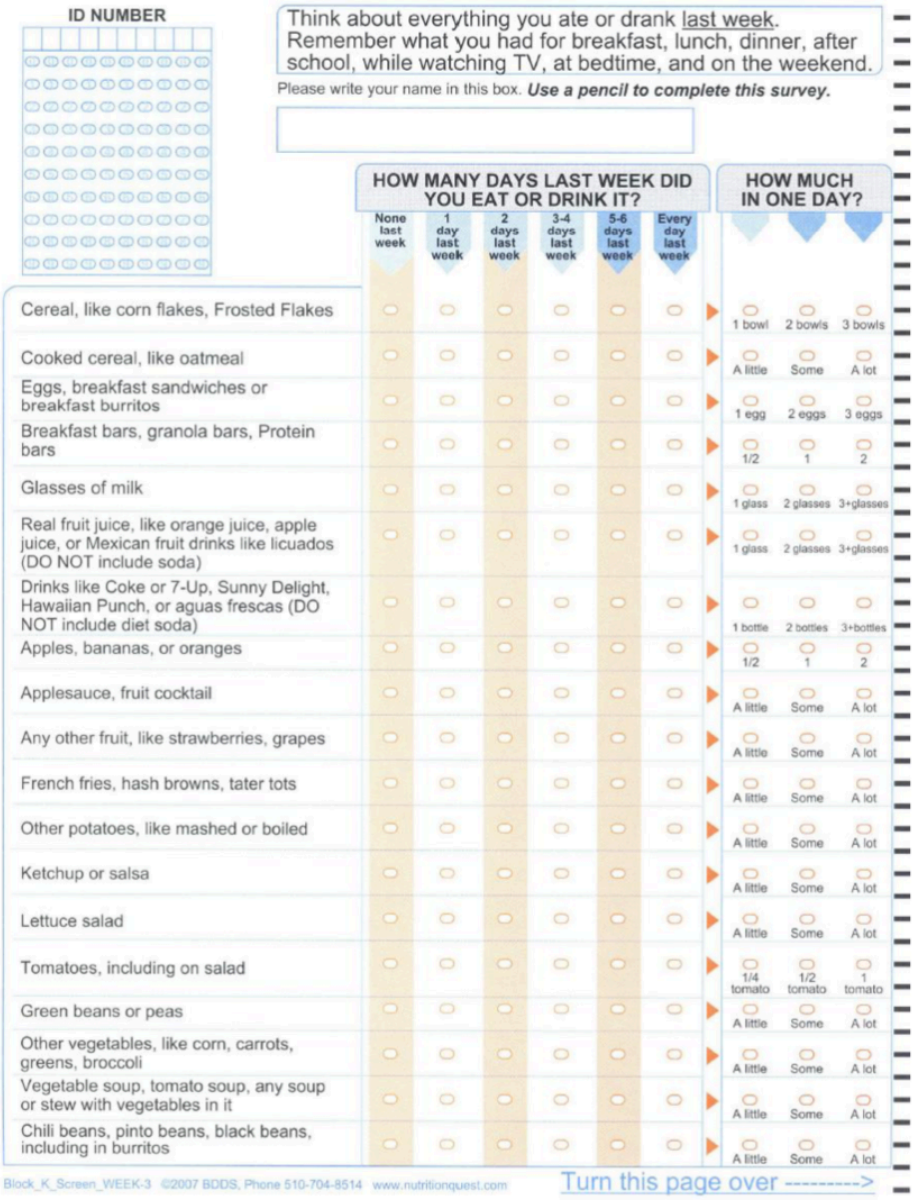
19. A food that is mostly water is:	
	
Milk	Cheeseburger
20. The place that provides a good choice of vegetables is:	
	
Corner Convenience Store	School Lunch
21. Fiber from grains in your body works like a:	
	
Broom or Sponge	Mixer

Circle one answer about the way you feel for the next 3 questions.

22. I am interested in Native American traditional activities like powwows and naming ceremonies.		
		
A lot like me	**A little like me**	**Not like me**
23. I want to eat foods that are harvested or hunted or fished from the land.		
		
A lot like me	**A little like me**	**Not like me**
24. I think about my neighborhood and the community where I live.		
		
A lot like me	**A little like me**	**Not like me**

Appendix B. Block Food Screener for Ages 2-17 2007

Appendix C
Block Kids Food Screener



ID NUMBER

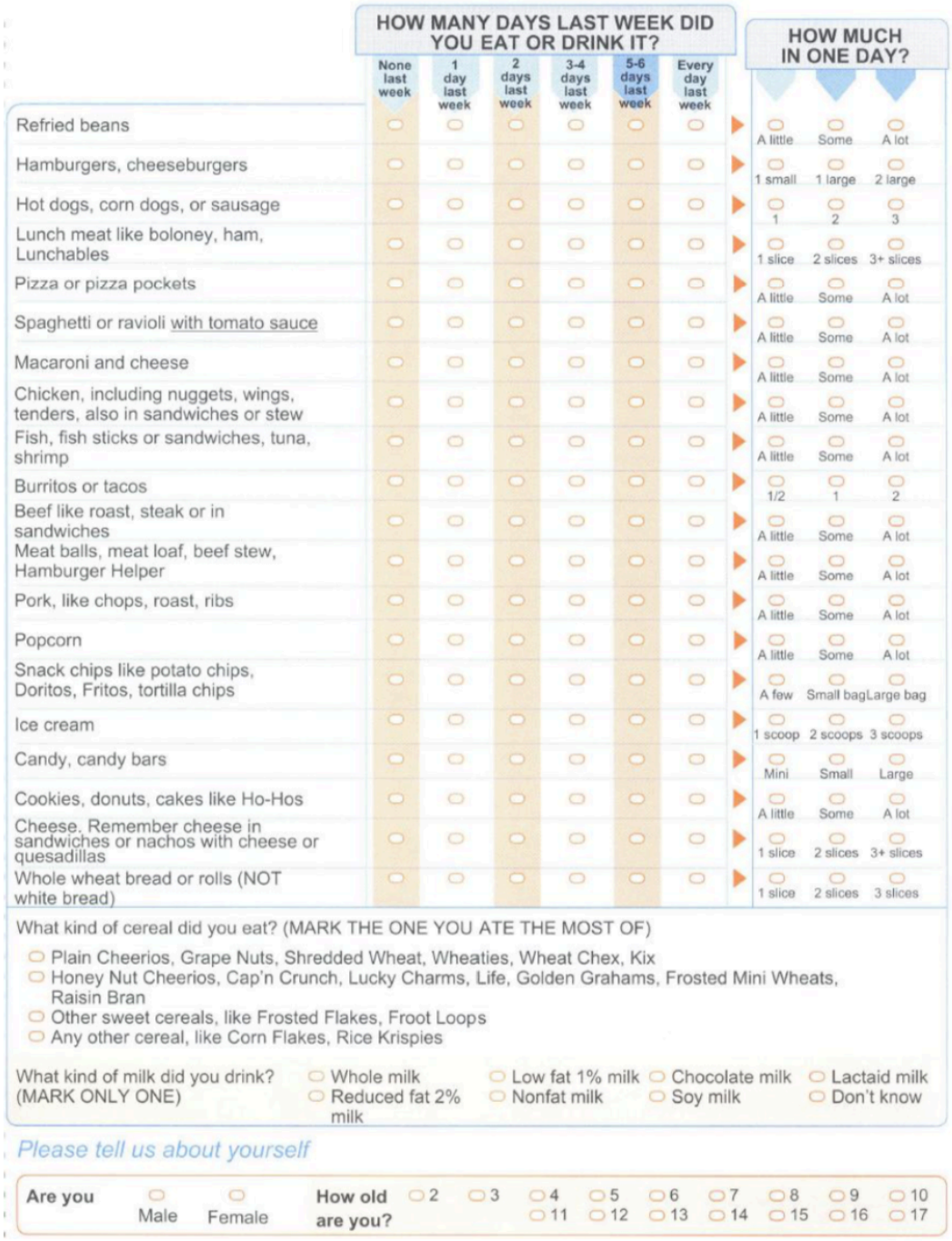
Think about everything you ate or drank last week. Remember what you had for breakfast, lunch, dinner, after school, while watching TV, at bedtime, and on the weekend.

Please write your name in this box. ***Use a pencil to complete this survey.***

	HOW MANY DAYS LAST WEEK DID YOU EAT OR DRINK IT?						HOW MUCH IN ONE DAY?		
	None last week	1 day last week	2 days last week	3-4 days last week	5-6 days last week	Every day last week			
Cereal, like corn flakes, Frosted Flakes	○	○	○	○	○	○	1 bowl	2 bowls	3 bowls
Cooked cereal, like oatmeal	○	○	○	○	○	○	A little	Some	A lot
Eggs, breakfast sandwiches or breakfast burritos	○	○	○	○	○	○	1 egg	2 eggs	3 eggs
Breakfast bars, granola bars, Protein bars	○	○	○	○	○	○	1/2	1	2
Glasses of milk	○	○	○	○	○	○	1 glass	2 glasses	3+glasses
Real fruit juice, like orange juice, apple juice, or Mexican fruit drinks like licuados (DO NOT include soda)	○	○	○	○	○	○	1 glass	2 glasses	3+glasses
Drinks like Coke or 7-Up, Sunny Delight, Hawaiian Punch, or aguas frescas (DO NOT include diet soda)	○	○	○	○	○	○	1 bottle	2 bottles	3+bottles
Apples, bananas, or oranges	○	○	○	○	○	○	1/2	1	2
Applesauce, fruit cocktail	○	○	○	○	○	○	A little	Some	A lot
Any other fruit, like strawberries, grapes	○	○	○	○	○	○	A little	Some	A lot
French fries, hash browns, tater tots	○	○	○	○	○	○	A little	Some	A lot
Other potatoes, like mashed or boiled	○	○	○	○	○	○	A little	Some	A lot
Ketchup or salsa	○	○	○	○	○	○	A little	Some	A lot
Lettuce salad	○	○	○	○	○	○	A little	Some	A lot
Tomatoes, including on salad	○	○	○	○	○	○	1/4 tomato	1/2 tomato	1 tomato
Green beans or peas	○	○	○	○	○	○	A little	Some	A lot
Other vegetables, like corn, carrots, greens, broccoli	○	○	○	○	○	○	A little	Some	A lot
Vegetable soup, tomato soup, any soup or stew with vegetables in it	○	○	○	○	○	○	A little	Some	A lot
Chili beans, pinto beans, black beans, including in burritos	○	○	○	○	○	○	A little	Some	A lot

Turn this page over -------->

28



	HOW MANY DAYS LAST WEEK DID YOU EAT OR DRINK IT?						HOW MUCH IN ONE DAY?		
	None last week	1 day last week	2 days last week	3-4 days last week	5-6 days last week	Every day last week			
Refried beans	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Hamburgers, cheeseburgers	○	○	○	○	○	○	○ 1 small	○ 1 large	○ 2 large
Hot dogs, corn dogs, or sausage	○	○	○	○	○	○	○ 1	○ 2	○ 3
Lunch meat like boloney, ham, Lunchables	○	○	○	○	○	○	○ 1 slice	○ 2 slices	○ 3+ slices
Pizza or pizza pockets	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Spaghetti or ravioli with tomato sauce	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Macaroni and cheese	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Chicken, including nuggets, wings, tenders, also in sandwiches or stew	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Fish, fish sticks or sandwiches, tuna, shrimp	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Burritos or tacos	○	○	○	○	○	○	○ 1/2	○ 1	○ 2
Beef like roast, steak or in sandwiches	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Meat balls, meat loaf, beef stew, Hamburger Helper	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Pork, like chops, roast, ribs	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Popcorn	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Snack chips like potato chips, Doritos, Fritos, tortilla chips	○	○	○	○	○	○	○ A few	○ Small bag	○ Large bag
Ice cream	○	○	○	○	○	○	○ 1 scoop	○ 2 scoops	○ 3 scoops
Candy, candy bars	○	○	○	○	○	○	○ Mini	○ Small	○ Large
Cookies, donuts, cakes like Ho-Hos	○	○	○	○	○	○	○ A little	○ Some	○ A lot
Cheese. Remember cheese in sandwiches or nachos with cheese or quesadillas	○	○	○	○	○	○	○ 1 slice	○ 2 slices	○ 3+ slices
Whole wheat bread or rolls (NOT white bread)	○	○	○	○	○	○	○ 1 slice	○ 2 slices	○ 3 slices

What kind of cereal did you eat? (MARK THE ONE YOU ATE THE MOST OF)

- ○ Plain Cheerios, Grape Nuts, Shredded Wheat, Wheaties, Wheat Chex, Kix
- ○ Honey Nut Cheerios, Cap'n Crunch, Lucky Charms, Life, Golden Grahams, Frosted Mini Wheats, Raisin Bran
- ○ Other sweet cereals, like Frosted Flakes, Froot Loops
- ○ Any other cereal, like Corn Flakes, Rice Krispies

What kind of milk did you drink? (MARK ONLY ONE)

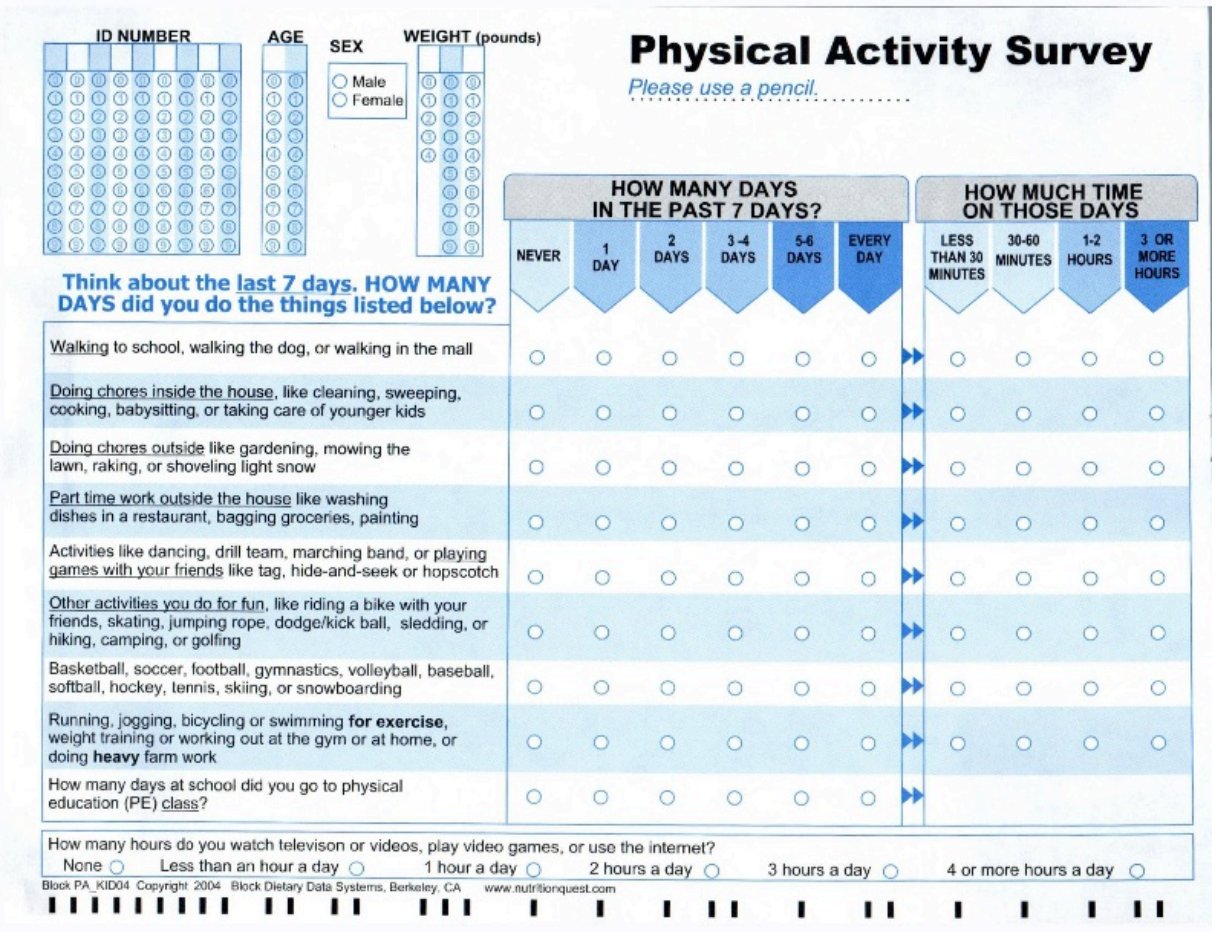
○ Whole milk ○ Reduced fat 2% milk ○ Low fat 1% milk ○ Nonfat milk ○ Chocolate milk ○ Soy milk ○ Lactaid milk ○ Don't know

Please tell us about yourself

Are you ○ Male ○ Female

How old are you? ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 12 ○ 13 ○ 14 ○ 15 ○ 16 ○ 17

Appendix C. Block Kids Physical Activity Screener for Ages 8-17



ID NUMBER AGE SEX WEIGHT (pounds)

○ Male ○ Female

Physical Activity Survey

Please use a pencil.

Think about the last 7 days. HOW MANY DAYS did you do the things listed below?

	HOW MANY DAYS IN THE PAST 7 DAYS?						HOW MUCH TIME ON THOSE DAYS			
	NEVER	1 DAY	2 DAYS	3 -4 DAYS	5-6 DAYS	EVERY DAY	LESS THAN 30 MINUTES	30-60 MINUTES	1-2 HOURS	3 OR MORE HOURS
Walking to school, walking the dog, or walking in the mall	○	○	○	○	○	○	○	○	○	○
Doing chores inside the house, like cleaning, sweeping, cooking, babysitting, or taking care of younger kids	○	○	○	○	○	○	○	○	○	○
Doing chores outside like gardening, mowing the lawn, raking, or shoveling light snow	○	○	○	○	○	○	○	○	○	○
Part time work outside the house like washing dishes in a restaurant, bagging groceries, painting	○	○	○	○	○	○	○	○	○	○
Activities like dancing, drill team, marching band, or playing games with your friends like tag, hide-and-seek or hopscotch	○	○	○	○	○	○	○	○	○	○
Other activities you do for fun, like riding a bike with your friends, skating, jumping rope, dodge/kick ball, sledding, or hiking, camping, or golfing	○	○	○	○	○	○	○	○	○	○
Basketball, soccer, football, gymnastics, volleyball, baseball, softball, hockey, tennis, skiing, or snowboarding	○	○	○	○	○	○	○	○	○	○
Running, jogging, bicycling or swimming **for exercise**, weight training or working out at the gym or at home, or doing **heavy** farm work	○	○	○	○	○	○	○	○	○	○
How many days at school did you go to physical education (PE) class?	○	○	○	○	○	○				

How many hours do you watch televison or videos, play video games, or use the internet?

None ○ Less than an hour a day ○ 1 hour a day ○ 2 hours a day ○ 3 hours a day ○ 4 or more hours a day ○