IMPACT OF SUMMER PROGRAMS ON DIET AND PHYSICAL ACTIVITY IN ELEMENTARY CHILDREN

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Abstract: The USDA Food Assistance and Nutrition Research Program indicated the Summer Food Service Program (SFSP) as a priority area for research funding on diet quality and physical activity. This study aimed to compare the diet quality and physical activity of children, ages 5 to 11 years of age, participating in summer programs sponsored by the SFSP/SSO (Seamless Summer Option) and children who participated in summer programs that did not participate in these programs. All programs were within a 70-mile radius of Stillwater, Oklahoma. Anthropometric measurements, two 24-hour recalls, and the Physical Activity Questionnaire for Elementary Children (PAQ-C) were used to assess body composition, physical activity levels, as well as energy, fiber, calcium, and iron intake. Results showed a significantly greater calcium intake in children who participated in SFSP/SSO summer programs (985 ± 365 mg/day) than those who did not (661 ± 456 mg/day). Iron intake and waist circumference percentiles tended to be higher in children who attended SFSP/SSO programs than children who did not attend these programs. No participants met fiber Adequate Intake recommendations. Results indicate improvements are needed in calcium, energy, and fiber intake amongst elementary children participating in summer programs. Summer programs, especially non-SFSP/SSO programs, need to become more aware of the effect their programs have on their participants, specifically due to the lack of meal and/or snack and physical activity regulations as a result of exemption from state policies on summer programs.

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CHAPTER I

INTRODUCTION

In recent years, an increased emphasis on nutrition and overall health of Americans has been made by insurance companies, researchers, media, and even the current United States' President and First Lady, Barack Obama and Michele Obama [1]. This is due to the increasing rate of overweight and obesity amongst Americans of any age group, which leads to a greater risk of the development of illnesses, such as heart disease, diabetes, and even certain cancers [2]. Not only adults are being affected by the increasing obesity rates, but children today are much more likely to be overweight or obese than ever before. This is due to an inadequate balance of calories consumed and calories expended, in other words, children are eating more calories than their bodies require [3]. Children are also spending less time engaging in physical activities and more time indulging in the use of electronic media, such as watching television and playing video and computer games [4].

Increased portion sizes by restaurants, grocery stores, and even at home have led to this energy imbalance [5]. Even though many children are overconsuming foods, many of their choices are not nutrient-dense but rather energy-dense [3]. Studies have

shown that many children are not receiving adequate amounts of calcium, iron, and fiber in their diets [6-12] . This may be due to the increased consumption of soft drinks and fruit drinks by children rather than consuming milk, which is rich in calcium. Fiber is found in whole-grain products as well as in fruits and vegetables. More children today consume fruit juices and drinks in place of fresh, frozen, and canned fruits, thus they do not receive the fiber that is naturally found in the fruit [9]. Iron is found in many food products, particularly meats and fortified products. Studies have shown that not all children, particularly children of low-income families, are receiving adequate amounts of iron, which can lead to anemia [13].

Children spend approximately 180 days per year and at least 6 hours per day at school, thus diet quality at schools plays a significant role in children's nutritional status [3]. Many children of low-income families participate in the National School Lunch Program (NSLP) and School Breakfast Program (SBP) during the academic year for free or reduced-price lunches. However when school is out for summer vacation, many of these families need other resources to provide meals for their school-aged children. As a result, the Summer Food Service Program (SFSP) was developed in 1968. Similar to the NSLP and SBP, the SFSP provides nutritionally balanced meals for school-aged children, up to the age of 18 for families who are at or below the poverty line [14]. In more recent years, the Seamless Summer Option (SSO) was created in order to provide an easier transition between the NSLP and SBP for school-based summer programs [15].

Research has shown that children who are food insecure are more likely to become overweight and/or obese [5]. Food insecure children may have an increased intake of inexpensive energy-dense foods and the lack of physical activity when at home,

due to the possibility of unsafe playgrounds and neighborhoods [5]. For low-income households with children, food insecurity increases in the summer [16].

Summer programs in the state of Oklahoma participate in both the Summer Food Service Program and Seamless Summer Option, but other summer programs are not affiliated with either program but are licensed by the state. Oklahoma state requirements differ from the national requirements by allowing the option for children to bring their own meals from home, as well as only having recommendations rather than requirements for the foods that should be served [17]. Other states have different requirements for summer camps; for example, Texas summer day camp health and safety regulations address sanitation of food service facilities but do not include regulations for meals [18].

The purposes of this study were to compare the diet quality, physical activity, Body Mass Index (BMI), and waist circumference of children enrolled in SFSP/SSO and non-SFSP/SSO summer programs within a 70 mile radius of Stillwater, Oklahoma. Diet quality was assessed by the use of two 24-hour recalls with an interest in amounts of calories, calcium, fiber, and iron consumed. Physical activity was assessed by the use of a 7-day physical activity questionnaire called the Physical Activity Questionnaire for Older Children (PAQ-C). The children's BMI and waist circumference were measured to evaluate body weight. In addition, a phone survey was conducted in order to determine how many non-SFSP/SSO summer programs provide food for children versus sack lunches from home.

Objectives

The objectives of the study were to describe the availability of meals and snacks by non-SFSP/SSO programs and compare SFSP and SSO programs versus non-SFSP/SSO programs to examine differences in:

1. Rates of overweight and obesity by type of program.
2. Waist circumferences of participants to determine the possible risk of overweight by the type of program.
3. Calcium intake based on two 24-hour recalls by type of program.
4. Fiber intake based on two 24-hour recalls by type of program.
5. Iron intake based on two 24-hour recalls by type of program.
6. Physical activity reported by children by type of program.

Limitations

Only summer programs located within a 70 mile radius of Stillwater, Oklahoma were eligible to participate.

There may be a possible discrepancy between 24-hour recalls given by respondents and actual intake due to self-report of data.

The accuracy of dietary assessment methods depends on the respondent's perception of portion sizes.

The accuracy of physical activity assessment methods depends on the respondent's perception of what is considered physical activity and its duration.

Participants or programs may modify food intake and physical activity in response to observation.

Because subjects are volunteers, it is a non-randomized sample and would not be representative of the population.

Abbreviations

AI – Adequate Intake

BMI – Body Mass Index

CDC – Centers for Disease Control and Prevention

EAR – Estimated Average Requirements

NHANES – National Health Assessment Examination Survey

NSLP – National School Lunch Program

PAQ-C – Physical Activity Questionnaire for Elementary Children

PE – Physical Education

RDA – Recommended Dietary Allowance

SBP – School Breakfast Program

SFSP – Summer Food Service Program

SSO – Seamless Summer Option

CHAPTER II

REVIEW OF LITERATURE

Childhood Obesity and its Impact

The Centers for Disease Control and Prevention (CDC) defines overweight as 85th to 95th percentile for BMI and obese as greater than the 95th percentile [19]. Obesity rates for children, ages 2 to 19, increased dramatically in the 1980s and 1990s, but in more recent years there has been no change in obesity prevalence between 2007 to 2008 (16.8 percent) and 2009 to 2010 (16.9 percent) [20]. Significant increases have only been noticed with children as young as six years of age who have a BMI percentile between the 95 and 97 [20].

Studies have shown that children who were overweight or obese are more likely to be obese in adulthood compared to people who were not overweight in childhood [21]. Along with obesity, the risks of cardiovascular disease and Type 2 Diabetes increase significantly, particularly in adulthood [21].

More recent studies have shown that BMI alone does not accurately assess health status in children and adolescents, because it only takes height and weight into account.

More recent studies have shown that waist circumference may also be an important indicator [22-24]. However, due to its recent inclusion in health status assessment in children, there is some controversy as to what percentile ranges are categorized to be underweight, healthy, overweight, and obese. Bosy-Westphal and colleagues[22] tested three measurement sites to determine which site would provide the most accurate results in the correlation with visceral and abdominal subcutaneous fat; it was determined that waist circumference from any of the three measurement sites had a stronger correlation with subcutaneous fat than visceral abdominal fat. In a study intended to determine the interrelationships of overweight, hypertension, and central adiposity in school-age children, it was determined that overweight status (> 85^{th} percentile) and a waist circumference > 90^{th} percentile was more directly related to hypertension than waist to height ratios [23]. However, health professionals have not agreed upon a standard measurement site for waist circumference nor its correlation to obesity and its comorbidities [24].

Higher Risk Populations

Research has shown that certain ethnic and racial groups are at greater risks for overweight and obesity. According to Story and colleagues [25], "The prevalence of childhood overweight and obesity is highest among certain ethnic and racial groups such as African Americans, Latinos, and American Indians and Alaska Natives, and among low-income youth" (p.S8). According to NHANES, in 2009 to 2010, 21.2 percent of Hispanic children (ages 2 to 19) were obese, compared to 14 percent of non-Hispanic white children and 24.3 percent of non-Hispanic black children [20]. An odds ratio was used to calculate the likelihood of obesity in children based on ethnicity from the data

collected by NHANES for 1999 to 2010; it was determined that Mexican American males (1.81) and females (1.47), and non-Hispanic black males (1.27) and females (1.99) were more likely to be obese than non-Hispanic white children [20].

Ethnic and racial groups in the United States are at higher risk for overweight and obesity due to many reasons including cultural food preferences, cultural customs, and socioeconomic status [26]. A study comparing attitudes and practices related to child feeding and weight status among socioeconomically diverse mothers of Hispanic, African-American, or white origin, concluded that Hispanic and African-American mothers found child weight status to be less important than white mothers [26]. The researchers also found that low-income Hispanic and African-American mothers were more likely to consider an overweight child as "normal" or "healthy" than a middle-income white mother [26]. The effect of acculturation level and dietary habits have provided varied results; some research has concluded that the more acculturated a Hispanic family is, the more likely that family has poorer eating habits than less acculturated Hispanics, while other research has concluded the opposite [27, 28]. A needs assessment conducted on minorities found that Hispanic women consider food prices and money allowance for food the most significant factors affecting food choices for their families, while the next most common response was the lack of nutritional guidance [29]. An analysis of the NHANES III 1988 to 1994 data comparing level of education and overweight prevalence by race and ethnicity, found that families that included a reference person with at least 13 years of education no matter the age group or ethnicity, had the lowest overweight prevalence [30].

Obesity in Oklahoma

Oklahoma's population consists of 72.2 percent whites, 7.4 percent blacks, 8.6 percent American Indians, and 8.9 percent Hispanics [31]. Of the adult population, 37 percent are overweight and 24 percent are obese, while white non-Hispanics account for 22.5 percent of the obese population, black non-Hispanics account for 28.1 percent, Hispanics account for 25.9 percent, and multicultural non-Hispanics account for 29.1 percent [32]. According to the Oklahoma Department of Health, high levels of diabetes exist in Native Americans, Hispanics, and blacks [33]. Oklahoma has the lowest percentage of adults who eat the recommended amounts of fruits and vegetables daily in the nation and 1 out of every 4 children are overweight or at risk [32]. According to the 2011 Oklahoma Youth Risk Behavior Survey, some of the unhealthy dietary behaviors included: 9 percent of high school students who participated did not eat any fruit during the 7 days before the survey, 72 percent ate fruit less than two times per day, 6 percent did not eat any vegetable products, 86 percent ate vegetables less than three times per day, and 15 percent consumed a serving of soda three or more times per day during the 7 days before the survey [34].

Consumption of High Energy Dense Foods

A primary cause of childhood obesity is energy imbalance, consuming more calories than expended [3]. Decreased physical activity in children and excessive energy consumption from low-nutrient dense foods and drinks are just a couple of the many reasons a significant portion of American children are overweight or obese.

The mean energy intake for Americans (age 2 and up) is 150 to 300 calories more per day than what Americans were consuming 20 to 30 years ago [25]. Children are consuming more low-nutrient dense foods and beverages than high-nutrient dense options [3]. Research has shown that children are more likely to consume sweetened beverages and other similar foods due to parents' habits and its availability at home [35]. Only 34 percent of high schools surveyed in Oklahoma did not sell energy dense drinks, such as sodas or fruit drinks [34]. As a result, poor habits are being developed by not only the parents but also their children.

Since children are in school for almost half of every year (180 days for a minimum of 6 hours per day), children's food choices in school play a critical role in their current health status [3]. Children, on average, consume 35 percent of their daily food intake at school [36]. Research has shown that 95 percent of all school children eat at least one meal at school [37]. As a result, meals served at school must provide adequate nutrition and energy that is required for this age group. Apart from school meals being provided, competitive foods, such as a la carte and foods available in vending machines are widely available for children to choose. Some examples of these 'competitive foods' are desserts, sugar-sweetened beverages, salty/high-fat chips, and high-fat baked goods (such as French fries) [10]. Overall, these widely available competitive foods are less nutrient dense and more energy dense, which can be a factor as to why children are overweight [10].

Poor Physical Activity Levels in Children

What is contributing to low levels of physical activity in children? A study conducted in Alberta, Canada on elementary youth (6 to 11 years of age) concluded that

overweight children, based on BMI, had significantly lower physical activity (PAQ-C) scores than children of a normal weight [38]. In today's society, children spend much of their free time, after school has ended and homework completed, at home watching television [13]. Children of moderate to high income households watched 2 hours of television daily, while children of low income households watched significantly more (2.3 hours) television [13]. According to a study evaluating third graders' diet and physical activity patterns before and after school, it was determined that on average, 4 hours of inactive pursuits (watching television, video games, computer media, and recreational reading) by boys and girls were being done on a daily basis [39].

In previous generations children were overall more active, because they often walked or rode bicycles to and from school, were involved in physical education (P.E.) classes, and were less likely to engage in inactive pursuits [40]. According to research using the SOFIT (System for Observing Fitness Instruction Time), in 2002 elementary children averaged 2.1 P.E. lessons per week for approximately 33 minutes, while less than 6 percent of children had P.E. on a daily basis [41]. These statistics are far below the national recommendations of 60 minutes per day of physical activity [42]. In Oklahoma, 67 percent of high school surveyed did not require P.E. courses for every student [34]. Twelve percent did not participate in the recommended 60 minutes of daily physical activity for any day (7 days) of the survey and approximately one-third of Oklahoma students surveyed watched television for at least 3 hours per school day and/or were on the computer for at least 3 hours on an average school day [34]. A study using PAQ-C that evaluated elementary students' physical activity from urban, suburban, and rural

areas determined that urban children were the least active, specifically near the time period of lunch, than rural and smaller city children [43].

Research has shown that there is a behavioral risk factor, a risk factor created by a formed behavior that increases the chances of a person developing a disease, associated with poverty and physical inactivity [35]. Children of lower income households participated less in vigorous activity each week in comparison to high-income children, particularly females [13]. Children of low-income families may be less physically active because both parents work into the evening hours when children are home from school, resulting in children not being able to be outdoors without parental supervision or because children live in areas where playing outdoors is not safe.

Few studies have examined levels of physical activity of children who attend summer programs. One study measured physical activity levels of children attending summer day camps, it was determined that physical activity opportunities contributed to 38 percent of the daily schedule [44]. An average of 74 to 79 percent of children attending camp were observed being sedentary during the day, with this amount decreasing to 62 to 67 percent during physical activity opportunities [44]. Only 15 to 19 percent of children were engaged in walking or vigorous activity during scheduled opportunities for physical activity during the summer day camps [44].

Studies have shown that certain racial and ethnic groups are less likely to engage in physical activity than white children. According to the YRBSS 2011 data, 19.6 percent of black high school students did not meet the recommended 60 minutes of physical on any day during the 7 days before the survey, followed by 15.9 percent of

Hispanic students and 11 percent of non-Hispanic white students [45]. Black and Hispanic students were more likely to engage in sedentary behaviors than white students; 54.6 percent of black students and 37.8 percent of Hispanic students watched television 3 or more hours per day compared to 25.6 percent of white students [45].

Food Insecurity in the United States and Populations at Higher Risk

According to the Agriculture and Consumer Protection Department of the Food and Agriculture Organization, household food security is defined as, "the ability of the household to secure, either from its own production or through purchases, adequate food for meeting the dietary needs of all members of the household" [46]. In 2011, 14.9 percent of households were considered food insecure, meaning there was difficulty providing enough food for all family members due to limited resources at some point in the year [47]. The rates of food insecurity did not significantly change compared to 2010, however there was a significant increase in the very low food security range [47]. The prevalence of food insecurity in the summer was found to be greater in households with school-age children [16]. In 2010, the prevalence of children under the age of 17 years of age living in a food insecure household is significantly higher in Hispanic (32.5%) and black (34.8%) households than white non-Hispanic (14.9%) households [48]. According to the same data, the Southern region of the United States (which includes the state of Oklahoma) has 22.9% of children below the age of 17 in food insecure households, only the Western region has a higher percentage (23.6%) [48]. In 2010, it was reported that 1 out of every 6 Oklahomans (16.9 percent) lived in poverty, having the 14th highest rate

among the states [49]. Native Americans (24.8 percent), Hispanics (29.8 percent), and African Americans (30.1) had the highest rates of poverty within Oklahoma [49].

Previous research has shown that food insecurity may be associated with childhood obesity. This may be due to the less expensive costs for energy-dense foods and their overconsumption when available to the household [50]. Using the NHANES 1999 to 2002 data of children ages 3 to 17, it was determined that household food insecurity and child insecurity were associated with overweight in many ethnic and age groups, specifically non-Hispanic white children [51]. Thirty-two percent of children from food insecure families were more likely to be at risk of overweight versus children of food secure families [51].

Nutritional Needs of Elementary-Aged Children

Children's nutritional status is critical in order to ensure all nutrients are being received for adequate health during these years of growth. Approximately 100 percent of the 1989 Recommended Energy Allowance for food energy was reached on average by all children regardless of household income, according to a study conducted using NHANES 1988-1994 data [13]. In this same study, iron levels were overall adequate in children's diets, however adolescent females were less likely to have adequate iron intakes [13]. Fiber intake was found to need improvement; less than half of all school-age children had usual intakes of fiber consistent with the "age-plus-five rule" [13]. It has been found that Americans consume more soft drinks than milk, which can have an effect

on calcium levels [13]. This study concluded that nutritional needs of children, iron, calcium, and fiber levels were not meeting recommended levels.

Energy Intake

A study was conducted comparing children's dietary intake and the risk for increased fatness using the Avon Longitudinal Study of Parents and Children (ALSPC) [52]. It was determined that intake of an energy-dense, low-fiber, high-fat diet had a direct correlation with the increased risk of fatness in childhood [52]. Thus, this study indicates that food choices have a direct relationship with weight status.

As previously mentioned, children spend almost half of their time in school each year, thus food choices made at school play a critical role in children's overall health. A school's food policy affects children's ability to access competitive foods (foods other than the main meals provided), such as foods found in vending machines and a la carte choices [10]. Many of these choices consist of low-nutrient, energy-dense foods, such as high-fat chips, French fries, soft drinks, cookies, fruit drinks, etc. Consuming these foods in place of, or in combination with meals provided by the school, result in the consumption of excess calories with little to no nutritional value [9]. A study evaluated the progress of recent laws aimed to improve nutrient quality in schools, it was determined that minimal changes have been made to the school environment and are progressing at a slow rate [53]. The USDA passed new standards on diet quality of meals served in schools beginning in the 2012 to 2013 school year and taking effect over a three year period [54]. Some of the changes include offering fruits and vegetables every day of

the week, offering only fat-free or low-fat milk, increasing whole-grain choices, decreasing saturated fat and sodium intake, and limiting calories according to age [54].

American children are not only consuming these excess calories from foods, but also beverages. According to the national dietary survey data, the average intake of sodas for those under 18 years of age had increased from 1989 to 1995 by 38 percent [55]. According to a 2002 study in Houston, Texas, it was determined that of the 504 fourth and sixth grade students, the average daily intake of sweetened beverages consisted of half of the total daily beverage intake [56]. A correlation has been made between the increased soda consumption in children today and obesity risk [57]. In a study evaluating the effects of soft drink consumption on nutrition and health, it was concluded that Americans were not compensating for the added calories consumed from soft drinks by reducing their total energy intakes [58]. In some studies, it has been shown that soft drink consumption is associated with weight gain [58]. According to a study using data from NHANES (1999-2004), children who reported consuming a sugar-sweetened beverage once during the recalled day consumed an average of 273 calories from the beverage, which is an increase of approximately 23 calories from similar reported data from NHANES (1988-1994) [9]. An increased consumption of soft drinks was noticed in children of low-income families, rural white, Hispanics, blacks, and Native Americans [9]. In Oklahoma 15 percent of high school students surveyed drank at least three servings of soda 3 or more times per day in the week prior to survey completion [34].

Iron

Iron is an essential nutrient that is involved in a plethora of bodily functions, including the transport of oxygen throughout the body [59]. The Recommended Dietary Allowance (RDA) for iron in boys and girls ages 4 to 8 is 10 mg/day and for children ages 9 to 13 is 8 mg/day [60]. The Estimated Average Requirements (EAR) for iron in boys and girls ages 4 to 8 is 4.1 mg/day and for girls ages 9 to 13 is 5.7 and 5.9 mg/day for boys of the same age group [61]. NHANES III 1988 to 1994 statistics were used to compare nutrient intake in low-income school-age children from a 24-hour recall [13]. Based on the estimated average intake, low iron intake was more common in school-age children belonging to low-income families than high-income (6 percent to 4 percent), this was mainly attributable to teenage females with 10 percent of females in low-income families versus 5 percent of females in high-income families consuming less than the EAR (Estimated Average Requirement) for iron [13]. Inadequate intake in teenage females is most likely due to the iron deficiency risk associated with heavy menstruation [59]. According to data collected from NHANES in 1999 to 2000, overall children met iron intake recommendations for the age groups 6 and below and children ages 6 to 11 [62]. Wang and colleagues [63] compared dietary intakes of low-income black urban adolescents, ages 10 to 14, in four Chicago public schools by use of a food frequency questionnaire. It was concluded that iron intakes were well above the EAR amongst the non-Hispanic black adolescents [63].

In West Virginia, a study comparing the Summer Food Service Program (SFSP) lunches versus home lunches of 9 to 12 year old children was conducted by using 24-hour diet recalls [64]. This study evaluated iron amounts, as well as many other nutrients,

using the RDAs and Dietary Guidelines for Americans [64]. It was determined that iron amounts consumed by children were almost double (at almost 40 percent of the RDA) in lunches provided by the SFSP than lunches from home [64].

Calcium

Adequate calcium intake in childhood is necessary to achieve peak bone mass in order to decrease risk of osteoporosis development later in adulthood [65]. Using the NHANES 2003 to 2006 data, an estimation of total usual calcium and vitamin D intake was created for all age groups in the United States [66]. It was concluded that only 15 percent of girls ages 9 to 13 met the AI (Adequate Intake) for calcium from diet alone [66]. A decline in calcium intake was noticed in girls ages 4 to 8 between the NHANES 1999 to 2002 [66]. The RDA for children ages 9 to 13 is 1,300 mg/day of calcium and 1,000 mg/day for children ages 4 to 8 [67]. The EAR for children ages 4 to 8 is 800 mg/day and 1,100 mg/day for children ages 9 to 13 [61].

Research has shown that children are consuming more and more calories from beverages than in previous decades [68]. Increased soft drink consumption may be affecting the intake of other nutritious beverages, such as dairy products [69]. Some cross-sectional studies have shown that calcium intake was negatively associated with soft drink consumption [58]. According to NHANES III 1988 to 1994 data, the 24-hour recall conducted on low-income children showed that soft drinks were consumed more that fluid milk in all gender and age groups [13]. LaRowe and colleagues examined characteristics of children (ethnicity, household income, overweight status, birth weight, physical activity, and media screen time) ages 6 to 11 and compared it to their drinking

patterns [68]. This study found that African-American children were more likely to drink a combination of high-fat milk, water, sweetened beverages, and soda, but specifically sweetened beverages [68]. It was also found that children who spent more media viewing time drank more sweetened beverages than others, and children with BMIs at or above the 85th percentile drank more sweetened beverages and soda [68].

Dairy products are popular choices to meet calcium recommendations. According to an article evaluating beverage consumption in the United States, black children were less likely to drink milk than white and Hispanic children [70]. This may be due to the increased lactose intolerance risk in African-Americans, although the exact percentage is debatable [11].

Stuhldreher and Bowen [64] found that calcium intakes were higher in children who consumed lunches provided by the SFSP versus lunches from home, but each were below the recommended 400 mg. According to the third School Nutrition Dietary Assessment Study (SNDA-III) that was conducted in 2004 to 2005 to evaluate the food and nutrient content of meals offered by school meal programs, it was determined that mean calcium intakes of middle and high school students were less than the AI.

Fiber

Dietary fiber is a critical component of a healthy diet. The benefits of consuming adequate amounts of fiber include prevention of gastrointestinal disorders, prevention and treatment of childhood obesity, and promotion of normal laxation [71]. Less than half of low-income school-age children had an average intake of dietary fiber associated by the "age-plus-five rule" [13]. An AI has been established for children recommending

consumption of 14 grams of fiber per 1,000 calories [72]. Fruits and vegetables provide a variety of nutrients essential for good health, one in particular being fiber. Among African Americans and Hispanics, fruit and vegetable intake, a good source of fiber, is lower than average [73]. Only 7 percent of Hispanic children consumed on average 5 or more servings of fruits and vegetables per day [6]. A study using 24-hour recalls collected from NHANES from 1999 to 2002, determined that black children were most likely to not meet recommended vegetable intake on any given day (86.1 percent) compared to non-Hispanic white (85.2 percent) and Mexican American (82.9 percent) children [74]. As mentioned earlier, residents of Oklahoma have the lowest rates of vegetable and fruit consumption in the United States, thus meaning that Hispanic children residing in Oklahoma may have even lower rates.

Children who consumed lunches provided by the SFSP consumed almost double the fiber than those that consumed home lunches, and the SFSP lunches met the recommended levels [64]. In 2004 to 2005, the third SNDA-III evaluated food and nutrient content of meals offered by schools, it was determined that the fiber content met only half of the recommended AI [75].

Summer Food Service Program

The Summer Food Service Program (SFSP) was established in 1968 to provide nutritionally balanced meals to low-income and/or mentally or physically handicapped children up to 18 years of age during the summer months when options such as the National School Lunch Program (NSLP) and School Breakfast Program (SBP) are not in

session [14]. The SFSP can be sponsored by a variety of organizations, such as community organizations, private nonprofit residential camps, churches, school districts, and state or local government agencies [15].

Feedings sites are determined by location and amount of low-income households with children, such as open sites, enrolled sites, or camps [14]. Open sites require its location to be within close proximity to areas where at least 50 percent of the children are from households at or below the 185 percent of poverty (which is the same requirement for eligibility for free/reduced price meals in the SBP and NSLP) and is open to provide food to all children in the neighborhood [14]. Enrolled sites and camps are eligible if at least half the children enrolled in the program or camp qualify for free or reduced priced meals. These programs provide food only to those who are enrolled in the program or site [14]. Programs are given reimbursements for meals if nutrition guidelines are met; the number of meals provided per child is dependent on site location with a maximum of two meals per child [76]. The meal pattern requirements for SFSP consist of 8 ounces of fluid milk, ¾ cup of fruit or vegetables or juice, 1 ounce of grains/breads, and 2 ounces of meat or meat alternatives [15].

Seamless Summer Option

The Seamless Summer Option (SSO) was developed in 2002 in order to eliminate the burden to school districts of using two different programs during the year (SBP/SNLP and SFSP), thus reducing paperwork and administrative requirements [14]. As a result, this option is available to school districts that participate in either the SBP and/or NSLP

during the school year. This option provides the same meal pattern requirements as the NSLP. In summer 2012 the meal requirements were: 2 ounces of meat or meat alternative, ¾ cup of fruits and vegetables, 8 to 10 ounces of breads/grains per week, and 8 ounces of dairy product per day. Programs must serve meals with this pattern in order to receive reimbursements from the government for the meals provided [77]. A maximum of two meal periods are permitted if site meets location requirements (similar to SFSP regulations) [77].

Oklahoma Licensure

The state of Oklahoma has its own licensing requirements concerning summer day camps, however the majority of summer camps are exempt from state licensure because they meet one or more of the fifteen exemptions on the Licensing Requirements for School-age Programs and Summer Day Camps Handbook [17]. Many of the summer day camps meet either Exemption 6 ("Summer youth camps for children who are least five (5) years of age, that are accredited by a national standard-setting agency or church camp accreditation program") or Exemption 8 ("A program of specialized activity or instruction for children that is not designed or intended for child care purposes including, but not limited to, scouts, 4-H clubs and summer resident youth camps, and single-activity programs such as academics, athletics, gymnastics, hobbies, art, music, dance and craft instruction") [17].

Meals at state licensed summer programs may be provided by the program or parents. Requirements relating to food and nutrition include providing a meal that meets

one third of the child's daily nutritional requirements or a snack for children who did not bring their own food [17]. For children ages 6 to 12, if the program provides lunch it must include 1 cup of milk, 2 ounces of meat or meat alternative, 2 kinds of fruits and vegetables (3/4 cup), and 1 slice of bread or bread alternatives or ½ cup of pasta or cereal grains [17]. As for midmorning or afternoon snacks and breakfast, only recommendations are offered not requirements, which differ greatly from the SFSP and SSO.

Summary

Childhood overweight/obesity rates have not increased significantly in recent years, but rates are higher for children from low-income families. Studies have shown that many children are consuming increasing amounts of energy but inadequate amounts of key nutrients, particularly, calcium, iron, and fiber. Children from certain ethnic groups have been shown to be more at risk of consuming inadequate amounts of these nutrients and more likely to be of low-income households, further increasing their risk of having an inadequate diet and weight status. Many children participate in summer programs during their summer vacations from school because parents and guardians do not have work schedules that complement their children's schedule. Unfortunately, there is a lack of information on diet, physical activity, and body weight in children who attend different types of summer programs. Determining which areas of nutrient and physical activity levels need improvements in summer programs is necessary in order to develop strategies and improvements to enhance the overall health of youth.

CHAPTER III

RESEARCH METHODOLOGY

The USDA Food Assistance and Nutrition Research Program indicated the Summer Food Service Program (SFSP) as a priority area for research funding on diet quality and physical activity [78]. The main purposes of this study were to assess the diet quality and physical activity of elementary-aged children who took part in summer programs that participated in the SFSP or Seamless Summer Option (SSO) against elementary-aged children who participated in summer programs that did not. The study's main hypothesis was that elementary children's physical activity and nutritional needs would be better met by summer programs that participated in the SFSP/SSO than those that did not. A phone survey was also conducted in order to determine how many non-SFSP/SSO summer programs provided meals for participants. The study was approved by the Oklahoma State University Institutional Review Board (Appendix A).

This section will discuss the research methodology used in conducting this study. First, the procedures used to collect data for the phone survey, followed by the procedures used collect data from child study participants will be outlined, and closing

with the measures used to conduct the data analysis.

Data Collection Methods for Phone Survey

The Oklahoma Department of Human Services provided a list of licensed state summer programs, while summer programs that met exemptions were located by local searches in advertisements online and in local magazines. All non-SFSP/SSO summer programs identified within a 70-mile radius of Stillwater, Oklahoma were contacted for a short phone survey. Program directors were asked if the program provided meals and/or snacks for participants or if parents/guardians sent food from home (Appendix B). The following questions were asked: 1) Does this facility provide meals to participants? 2) Are snacks provided to participants by the facility? 3) If meals and/or snacks are provided, what is the source of funding? 4) How many children, on an average day, participate in the program? 5) How many participants accept meals and/or snacks provided by the facility? Each program was called two times if no response was received on the first call; a voicemail with contact information was provided for directors who were interested in participating in the phone survey.

Data Collection Methods for Children in Summer Programs

The goal was to collect data from thirty 9 to 11 year old children who attended 5 summer programs that participated in the SFSP/SSO and 30 children of the same age group who attended 5 summer programs that did not participate in the SFSP/SSO. However a total of five programs volunteered to participate in the study; three

participated in the SFSP/SSO and two did not. Children between the ages of 9 to 11 were the target group for participation in the study. However, parents of a few younger children returned signed consent forms so data were collected from these children. All summer programs were licensed by the state of Oklahoma and were listed on the Oklahoma State Department of Education website or were located in local magazines.

The Oklahoma State Department of Education provided a list of all SFSP/SSO programs for the state. The Oklahoma Department of Human Services provided a list of licensed summer programs, while summer programs that met exemptions were located by local searches in advertisements online and in local magazines. All programs within the 70-mile radius of Stillwater were contacted for the study (approximately 270 programs met requirements). A letter of invitation to participate in the study was sent to all eligible licensed programs within approximately 70 miles of Stillwater, Oklahoma (Appendix C). Programs that served fewer than 5 school-aged children or served only children with special needs were excluded. Once a signed letter of consent for involvement in the study was received from the program directors, they were asked how many children participated in the summer program and the parental consent forms were delivered to the program directors for distribution (Appendix D). Once parents gave consent to allow their child to participate in the study by submitting a signed parental consent form, child assent was obtained by telling the children that their parents signed a consent form agreeing for them to participate in the study and verbally asking if they wanted to participate.

After all consent forms were received and child assent obtained, anthropometric measurements (body weight, height, BMI, and waist circumference) and information on

age and race/ethnicity were collected from all participants by two student researchers. All participants were measured for height and weight in an area away from the other children with dividers to ensure their privacy. A Tanita scale was used to collect the weight measurements of the children. The children were only weighed once because the scale provided one weight measurement that was locked for accuracy after the scale was calibrated. A standing height-measuring tool, a Shorr Board**,** was used to collect height measurements of each child. Children were asked to stand erect and place their heels at the base of the height measure for an accurate measurement, each child was measured twice and an average was calculated. The average recorded height and weight were used to calculate BMI. Once all measurements and calculations were made, the participants' BMI was then compared to charts relating to each child's age and sex to determine the child's percentile of BMI. The charts used for BMI comparison were gathered from the CDC [79]. To be considered a healthy weight, the participant's BMI was greater than the 5^{th} percentile but less than the 85^{th} percentile [19]. Any BMI percentile below this range was underweight and a BMI percentile greater than the range was considered overweight or obese. To accurately calculate the BMI percentile, the child's birthdate was necessary. However only the child's age in years was collected, thus a standard of six months was used for all the child participants.

A flexible tape measure was used to collect waist measurements; waist was defined as the circumference at the navel [23]. Children were asked to point to where their navel was located then raise their arms to shoulder height parallel to the ground to collect a more accurate measurement. The participants' waists were measured three times and the average taken to the nearest hundredth of an inch. Waist circumference

percentiles were calculated from tables created by Fernandez and colleagues [80] using nationally representative samples of American children regardless of ethnic/racial group.

24 – Hour Recall

Two 24-hour recalls were collected from each participant to evaluate diet quality. The validity of the use of a 24-hour recall for children was confirmed in a study comparing observed and recalled food intakes with the result that "the use of the 24-hour recall assisted by food records is a valid method for assessing dietary intake of children as young as 8 years old for the purpose of group comparison" (p. 1431) [81]. The 24-hour recalls were conducted individually in a short interview in which the child was asked what foods had been consumed in the last 24 hours (Appendix E). Several studies used 24-hour recalls in the methods of data collection, it is used by NHANES and has been shown to be more valid than other forms of dietary assessments [82].

The USDA 5-Step Multiple-Pass Method, a standardized dietary assessment tool, was used to gather data in order to gain information about food and beverage intake, specifically the times consumed, additions to foods, where food was obtained, and a description of the foods. This method used five descriptive tools: a) a quick list which provides uninterrupted listing by the participant of foods and beverages consumed, b) the forgotten foods list which allows the researcher to question the subject on categories of foods that are documented as frequently forgotten, c) a time and occasion that each food was consumed, d) the detail cycle which asks for descriptions of foods and amounts eaten with the use of the "Portion Photos of Popular Foods"[83] book, food models, and measuring guides, and e) a final probe interview. The book "Portion Photos of Popular

Foods" and food models were also used to provide children with a more visual representation of the portions of foods consumed to ensure accuracy of the information gathered during the 24-hour food recall.

The researchers reviewed the 24 hour recalls and excluded data if the recall seemed incomplete or unreliable, particularly in the recalls collected from the younger children. As a result, data from 6 participants were removed from the nutrient analysis and 5 children also had only one recall assessed if the one of the two recalls seemed unreliable.

The diet recalls were analyzed using Food Processor software. Nutrients that were considered low in the diets of elementary-aged children based on previous studies (iron, calcium, total calories, and fiber) were evaluated by comparing the two-day average received in their diet to the RDA and EAR for the appropriate age group (or AI if RDAs were not available). Children were considered below recommendations in iron if their intake was below the RDA for children ages 4 to 8 (10 mg per day) and 9 to 13 (8 mg per day) [59]. Inadequate iron intake was determined if two-day intake was below the EAR for children ages 4 to 8 (4.1 (mg/day) and 9 to 13 (male: 5.9 and female: 5.7 mg/day) [61]. Children were considered below recommendations in calcium if their intake was below the RDA of 1,300 mg/day for the ages 9 to 13 and 1,000 mg for children between the ages 4 to 8 [67]. Inadequate calcium intake was determined if two-day intake was below the EAR for children ages 4 to 8 (800 mg/day) and 9 to 13 (1,100 mg/day) [61]. Low fiber intake was determined by consuming less than the AI of 14 grams of fiber per 1,000 calories consumed [72]. The Age + 5 Method was used to determine fiber intake by adding five grams of fiber to one's age [7].

Physical activity questionnaire (PAQ-C)

The Physical Activity Questionnaire for Older Children (PAQ-C) is a self-administered 7-day physical activity recall tool (Appendix F) [84]. This instrument is intended to assess general physical activity throughout the school year for children approximately 8 to 14 years of age [84]. The questionnaire was read to the younger participants (age 8 and below); older children also had the option of having the questionnaire read to them. The recall provided a physical activity score based on the average of a total of nine questions, with each scored on a 5-point scale [84]. A score of 1 indicates low physical activity and a score of 5 indicates high physical activity. The questions involved in the recall assess physical activity in different times of the day including weekends. When compared against objective measures of physical activity, PAQ-C has been shown to have an adequate test-retest reliability (range: r = 0.75-0.82) and validity (range: r = 0.45-0.53) [43, 85]. Two participants were not present at the program during the administration of the PAQ-C, resulting in a total of 45 recalls collected.

Hypotheses and Data Analysis

Hypotheses:

1. Children who attend SFSP/SSO programs will have greater intakes of calories, iron, calcium, and fiber, than children who attend non-SFSP/SSO programs.

   Statistical Procedure: Independent t-test

2. Children who attend SFSP/SSO programs will be more physically active during a typical summer program day than those involved in a non-SFSP/SSO program.

   Statistical Procedure: Independent t-test

3. Children involved in SFSP/SSO programs will have higher BMIs than those who attend a non-SFSP/SSO program.

   Statistical Procedure: Independent t-test

4. Children involved in SFSP/SSO programs will have higher waist circumferences than those of non-SFSP/SSO programs.

   Statistical procedure: Independent t-test

5. Hispanic, African-American, and Native American children will be more likely to be overweight/obese than white children.

   Statistical Procedure: Chi-square

6. Hispanic, African-American, and Native American children will be more likely to have intakes that do not meet the recommended levels of the following nutrients: fiber, iron, and calcium than white children.

   Statistical Procedure: Chi-square

The Statistical Package for Social Sciences (SPSS 19, version for Windows, 2010) was used to analyze participants' anthropometric measurements, physical activity levels, intake of energy, fiber, calcium, and iron compared to recommended values. Independent t-tests were used to compare energy, fiber, calcium, and iron intake of children who attended SFSP/SSO programs versus non-SFSP/SSO program participants. Independent t-tests were also used to compare physical activity levels, BMI, and waist

circumference of SFSP/SSO participants to non-SFSP/SSO participants. A chi-square was used to compare weight status and likelihood of inadequate intake in nutrients being assessed based on racial ethnic group. The level of significance was set at 0.05.

CHAPTER IV

RESULTS

A total of 57 non-SFSP/SSO programs within a 70-mile radius of Stillwater, Oklahoma were contacted to participate in the telephone study. Of the 57 programs, 23 programs within the designated area participated in the phone survey portion of the research study and 22 out of the 23 completed the survey. One program director stopped participation in the survey. Table 1 illustrates the responses to the questions in the survey. The majority (68.2 percent) of the programs offered meals to its attendees. Almost all (95.5 percent) programs offered snacks to the children. The majority of the programs' source of funding originated from the Child and Adult Care Food Program or tuition and fees.

A total of 47 children from 5 programs (3 SFSP/SSO and 2 non-SFSP/SSO) participated in the diet and physical activity evaluation portion of the study. A total of 32 children between the ages of 5 to 11 from SFSP/SSO programs participated in the study. A total of 15 children participated from the non-SFSP/SSO programs. Characteristics and demographics of the participants overall and based on program assignment (SFSP/SSO and non-SFSP/SSO) are shown on Table 2. Participants were between the ages of 5 and 11 years old. The median age of the elementary children was 8 years old.

The majority of participants were black and male. Although not a significant difference, SFSP/SSO program participants tended ($p = 0.07$) to be more likely to be white and less likely to be other racial/ethnic groups than non-SFSP/SSO participants.

The mean BMI for all participants was about 19 with a BMI percentile of 62 ± 32. The obesity rate according to BMI was 38.3 percent. There was no significant difference between SFSP/SSO and non-SFSP/SSO in BMI, BMI percentile, waist circumference, and PAQ (Table 3). Children in the non-SFSP/SSO programs had a mean waist circumference percentile of 48 ± 39 that tended ($p = 0.081$) to be lower than the children in the SFSP/SSO programs who had a mean of 68 ± 26.

Calcium intake was significantly different ($p = 0.017$) between the two groups (Table 3). Children participating in SFSP/SSO programs reported significantly higher (985± 365 mg) average calcium intake versus non-SFSP/SSO children (661± 456 mg). No other significant differences were determined for nutrient intake for either group. Iron intake tended ($p = 0.082$) to be higher in the SFSP/SSO group (15.3 ± 5.9) than the non-SFSP/SSO group (12.4 ± 3.3). All but 8 percent of children participating in SFSP/SSO programs met the EAR for iron, while 100 percent of non-SFSP/SSO met the recommendation. The majority of children (62 percent) participating in SFSP/SSO programs met the EAR for calcium, which was significantly higher ($p = .003$) than children of non-SFSP/SSO programs, with only 13 percent meeting the EAR. There was a tendency ($p = 0.087$) for children attending SFSP/SSO programs (39 percent) to be more likely to meet the RDA for calcium compared to non-SFSP/SSO (13 percent) children.

A chi-square was used to analyze participants' average nutrient intake from two 24-hour recalls in order to determine if children's consumption of the recommended amounts of iron, calcium, fiber differed by race/ethnicity (Table 4). Children had a low iron intake if their intake was below the RDA [61]. Children had a low intake of calcium if their intake was below the RDA and inadequate intake if it was below the EAR [61, 67]. A low fiber intake was determined by consuming less than the AI of 14 grams of fiber per 1,000 calories consumed [72], and the Age +5 recommendation [7]. There were no significant differences in the percent of children who met the RDA for iron, calcium, or fiber based on racial/ethnic group. Most children in all groups met the RDA and EAR for iron while no child of any ethnic group met fiber recommendations based on the AI. Most black children (65 percent) and children of other racial/ethnic groups (71.4 percent) were below the EAR, signifying an inadequate calcium intake. These results were significantly different by racial/ethnic group ($p = 0.02$) because, only 1 out of 8 white children did not meet the EAR for calcium.

A chi-square was also used to determine which racial/ethnic group had the highest rates of overweight (BMI percentile > 85^{th} percentile) and obesity (BMI percentile > 95^{th} percentile). Due to the limited number of participants, only two categories were used (normal weight and overweight/obesity). Table 5 illustrates the results of this chi-square. There were no significant differences in weight classification by racial/ethnic group ($p = 0.375$).

Table 1. Non-SFSP/SSO phone survey responses (n = 22) regarding foods offered to children and source of funding.

Phone Survey Question	*Yes*		*No*	
	n	%	n	%
Meals offered by program	15	68.2	7	31.8
Snacks offered by program	21	95.5	1	4.5
Source of funding[a]				
Tuition and fees	9	40.9	13	59.1
Donations	4	18.2	18	81.8
Child and Adult Care Food Program	10	45.5	12	54.5

[a]Programs could report more than one source of funding.

Table 2. Characteristics of participants (n = 47) attending one of two types of summer programs (SPSP/SSO or non-SFSP/SSO).

Characteristic	*Overall*	*SFSP/SSO*	*Non-SFSP/SSO*	*p-value*
		n (%)		
Gender				0.148
Female	21 (44.7)	12 (57.1)	9 (42.9)	
Male	26 (55.3)	20 (76.9)	6 (23.1)	
Age, years				
5	4 (8.5)	3 (9.4)	1 (6.7)	
6	10 (21.3)	9 (28.1)	1 (6.7)	
7	7 (14.9)	4 (12.5)	3 (20.0)	
8	8 (17.0)	5 (15.6)	3 (20.0)	
9	7 (14.9)	4 (12.5)	3 (20.0)	
10	6 (12.8)	6 (18.8)	0	
11	5 (10.6)	1 (3.1)	4 (26.7)	
Race/Ethnicity				0.070
White	12 (25.5)	11 (34.4)	1 (6.7)	
Black	28 (59.6)	18 (56.3)	10 (66.7)	
Other[a]	6 (12.8)	3 (9.4)	4 (26.7)	

[a] Other is defined as any racial or ethnic group that is not only white or black (Asian, Hispanic, Muslim, or a combination)

Table 3. Anthropometric measurements, physical activity, and nutrient intakes of participants (n = 47) attending one of two types of summer programs (SFSP/SSO or non-SFSP/SSO).

Characteristic	*Overall*	*SFSP/SSO*	*Non-SFSP/SSO*	*p-value*
	Mean ± standard deviation			
BMI[a]	18.6±4.8	18.4±4.6	18.9±5.2	0.747
BMI percentile	63±32	63±31	60±36	0.712
Waist Circumference (in)	25.4±4.9	25.8±5.0	24.7±4.7	0.458
Waist Circumference percentile	62±32	68±26	48±39	0.081
Physical Activity Questionnaire[b] (n = 45)	2.84±0.70	2.97±0.70	2.66±0.64	0.165
Nutrient Intake (n = 41)				
Energy, kcal	2140±506	2164±507	2098±535	0.696
Fiber, gm	13.0±5.5	13.5±3.8	12.2±7.8	0.475
Calcium, mg	866±420	985±365	661±456	0.017
Iron,mg	14.3±5.2	15.3±5.9	12.4±3.3	0.082

[a] BMI = body mass index (calculated kg/m^2)
[b]PAQ-C scoring: 1 = minimum (low physical activity), 5 = maximum (high physical activity)

Table 4. Percent of children whose average intake of iron, calcium, and fiber met recommendations (EAR or RDA) by ethnic group.

Nutrient	*Ethnicity*						
	Black		*Other*		*White*		*p* value
	n	%	n	%	n	%	
Iron RDA[a]	23	88.5	5	71.4	8	100	0.24
Iron EAR[b]	24	92.3	7	100	8	100	0.55
Calcium RDA[c]	6	23.1	2	28.6	4	50	0.34
Calcium EAR[d]	9	34.6	2	28.6	7	87.5	0.02
Fiber Adequate Intake[e]	0	0	0	0	0	0	-
Fiber (Age +5)[f]	9	34.6	3	42.9	5	62.5	0.37

[a] Children had low intake of iron if it was below the RDA for children ages 4 to 8 (10 mg/day) or 9 to 13 (8 mg/day).
[b] Children were considered to have inadequate iron intake if it was below the EAR for children ages 4 to 8 (4.1 mg/day) or 9 to 13 (male: 5.9 mg/day or female: 5.7 mg/day).
[c] Children had low intake of calcium if their intake was below the RDA for children ages 4 to 8 (1,000 mg/day) or 9 to 13 (1,300 mg/day).
[d] Children were considered to have inadequate calcium intake if calcium intake was below the EAR for children ages 4 to 8 (800 mg/day) or 9 to 13 (1,100 mg/day).
[e] Low fiber intake was determined if children consumed less than the AI of 14 grams of fiber per 1,000 calories consumed.
[f] Low fiber intake was determined if children consumed less than the age of the child plus an additional 5 grams of fiber per day.

Table 5. Percent of participants who were normal weight (BMI percentile < 85) or overweight/obese (BMI percentile > 85) by ethnicity.

Weight Classification	*Ethnicity*					
	Black		*Other*		*White*	
	n	%	n	%	n	%
Normal Weight	17	60.7	3	42.9	9	75
Overweight/Obesity	11	39.3	4	57.4	3	25

CHAPTER V

DISCUSSION

Phone Survey Responses

Of the 22 non-SFSP/SSO programs that completed the short phone survey, the majority offered meals and snacks to child program participants. Results indicate the significance that foods provided by these programs have on children's dietary intake, because almost all programs surveyed offered food choices to participants. Program directors reported that the majority of the children involved in their programs accepted the meals and snacks offered to them. About half (45.5 percent) of these programs received funding from CACFP so the meals and snacks served in these locations met USDA standards. The remaining programs met the less stringent Oklahoma standards.

SFSP/SSO and non-SFSP/SSO Participant Results

This study identified several important patterns in the dietary intake and physical activity behavior in elementary school-aged children who resided within a 70-miles radius of Stillwater, Oklahoma and attended a summer program. The analyses of the

anthropometric data, 24-hour food recalls, and Physical Activity Questionnaire for Elementary Children disclosed differences in children participating in SFSP/SSO programs versus non-SFSP/SSO programs. In this section, the results of the study will be discussed, as well as the description of the trends found in the nutrition and physical activity behavior of children participating in each type of program.

Energy and Nutrient Intake of SFSP/SSO and non-SFSP/SSO Participants

The nutritional analysis of the two 24-hour recalls revealed an overall mean of approximately 2140 ± 506 kcal per day for all children. According to data from NHANES 2009 to 2010, the average energy intake of one 24-hour recall for male children ages 6 to 11 years of age was 1922 kcal and 1812 kcal for females of the same age group [86]. Energy intake in this study is therefore higher than the average energy intake according to NHANES 2009 to 2010. In a study comparing data collected from NHANES 1977 to 2006, it was determined that American children in 2003 to 2006 were consuming a significantly larger portion of their daily energy intake from popular energy-dense foods, such as pizza, french fries, sugar-sweetened beverages, and burgers [87].

There was no significant difference in energy intake by type of program. In a study comparing lunches brought from home versus lunches provided by SFSP locations amongst low-income residents of West Virginia , it was determined that there was no significant difference ($p = 0.20$) in energy intake by type of lunch [64]. However energy intakes provided by the West Virginia SFSP locations fell short of the guidelines (833 calories for lunch) [64].

The overall mean iron intake of participants was 14.3 ± 5.2 mg, with no significant differences between program types, however, iron intakes tended to be higher in children attending the SFSP/SSO programs than other programs. The average intakes in both groups met the iron RDA of 10 grams for children ages 4 to 8 years old or 8 grams for children ages 9 to 11 [72]. Stuhldreher and Bowen [64] found no significant difference in reported intake of iron at lunch between SFSP lunches and home lunches.

The overall mean intake of calcium was 866 ± 420 mg, however there was a significant difference ($p = 0.017$) between the intake of children attending SFSP/SSO programs (985 ± 365) compared to non-SFSP/SSO programs (661± 456). Similar results were shown in the comparison of calcium intake between SFSP lunches and home lunches by Stuhldreher and Bowen [64] with calcium intake being significantly higher in SFSP lunches. Mean calcium intake for both groups in this study was below the EAR recommended levels for the older children (1,100 mg calcium for children between the ages of 9 and 11) [67]. Most children in the SFSP/SSO programs met the EAR but few children in the non-SFSP/SSO programs met the EAR.

On average, children in this study reported less calcium intake than other studies. Data from NHANES 2003 to 2006 revealed that male children between the ages of 4 and 8 consumed approximately 1058 ± 29 mg of calcium from diet alone, while female children of the same age group consumed approximately 951 ± 27 mg of calcium [66]. Only male children of this age group met recommendations [66]. However children between the ages 9 and 13 consumed less than recommended levels; male children consumed 1074 ± 31 mg per day and female children consumed 968 ± 44 mg per day [66].

The overall mean intake of fiber for both programs was 13.0 ± 5.5. There was no significant difference in fiber intakes by program type. However, in a similar study, fiber intake was significantly higher in SFSP lunches (5.0 ± 3.8) than home lunches (2.5 ± 2.1), with only the SFSP lunches meeting the recommended level of 5 to 6 grams [64]. Based on the AI for fiber intake, reported intake for neither SFSP/SSO (13.5 ± 3.8) nor non-SFSP/SSO (12.2 ± 7.8) children met recommendations of 14 grams per 1,000 calories. When fiber intake was evaluated based on the Age + 5 method, the majority of participants (59 percent) did not meet recommendations.

Physical Activity Levels of SFSP/SSO and non-SFSP/SSO Participants

Based on the scoring of the PAQ-C (1 is minimum, 5 is maximum), the overall mean was 2.84 ± 0.70. There was no significant difference in physical activity by program type (SFSP/SSO: 2.97 ± 0.70; non-SFSP/SSO: 2.66 ± 0.64). A score of 3 indicates a level of moderate physical activity, indicating participants in both summer program types engaged in moderate physical activity. Since scores indicated overall physical activity level over the past 7 days and not physical activity opportunities offered by program type, determining quality and quantity of physical activity opportunities by programs was not an option. According to Beets and colleagues [44], the majority of children observed at summer day camps were shown to be engaged in sedentary behaviors during opportunities of physical activity. It was determined that increases in sedentary behaviors were due to children waiting to take turns for certain activities, staff instructing, and organized physical activity [44].

Joens-Matre and colleagues [43] conducted a study comparing physical activity levels of urban, small city, and rural elementary children using PAQ-C. They found that urban children were the least active of the three groups, and small city children reported a slightly higher PAQ-C score than rural children. Male children, regardless of location, had higher PAQ-C scores than females [43]. The summer programs that participated in this study were located in urban areas of Oklahoma (Tulsa and Oklahoma City). Urban boys (3.0 ± 0.7) and girls (2.8 ± 0.7) in Iowa had scores that were similar to the current study (2.84 ± 0.7).

BMIs of SFSP/SSO and non-SFSP/SSO Participants

The overall mean BMI of participants was 18.6 ± 4.8 and the BMI percentile was 63 ± 32. There were no significant differences in BMI or BMI percentiles between the two program types. Based on overall BMI percentile means, the average child in both programs was greater than the 50^{th} percentile. According to BMI-for-age standards, in 2003, 28.2 percent of Oklahoma children were overweight or obese [88]. Amongst Oklahoma children in poverty, the prevalence of overweight and obesity is more than 1 in 3 children [88]. According to this study, results indicated an overweight/obesity rate of 38.3 percent, slightly higher than the state average.

Waist Circumferences of SFSP/SSO and non-SFSP/SSO Participants

The overall mean waist circumference of both program types was 25.4 ± 4.9 inches with a mean waist circumference percentile of 62 ± 32. There were no significant differences between waist circumference or waist circumference percentile between SFSP/SSO and non-SFSP/SSO programs; however, the mean waist circumference percentile of non-SFSP/SSO programs tended to be lower. According to a study comparing BMI of children attending public and private schools, a statistically significant higher BMI value was associated with children attending public schools that are part of the NSLP/SBP [89]. Similar results were found in this study in regards to waist circumference according to program type.

Weight Status Based on Ethnicity/Race

There were no significant differences in rates of overweight or obesity by ethnicity/race in this study. However, according to data collected from NHANES 2009 to 2010, 21.2 percent of Hispanic children and 24.3 percent of black children were obese compared to only 14 percent of non-Hispanic white children [20]. In a related study by Fernandez and colleagues [80], African-American males demonstrated a consistently lower rate of increase in waist circumference due to age than any other ethnic group and Mexican-American children experienced the highest overall waist circumferences and the fastest overall rate of waist circumference increase with age.

Nutrient Intake Based on Ethnicity/Race

In this study there were significant differences by racial/ethnic group in the number of children who met the EAR but not the RDA for calcium intake. The majority of black children and children of other ethnic/racial groups were below RDA and EAR recommended levels. The majority of white children (87.5 percent) met the EAR and one-half met the RDA for calcium. Wang and colleagues [63] found that low-income urban African-American adolescents in Chicago met the recommended 1,300 mg/day of calcium. However, a study by Storey and colleagues [70] using data from NHANES 1999 to 2002, indicated African-American children between the ages of 6 and 11 years of age had significantly lower intakes of dairy products compared to white and Mexican-American children. This is similar to findings in this study, with black children having the lowest rates of meeting calcium recommendations, possibly due to lower intakes of dairy products, which are rich in calcium. According to a study using information gathered from NHANES 2001 to 2002, African-American consumed a large portion of their beverage intake from sodas compared to dairy beverages and more nutritious beverages (55 percent) [68].

The majority of summer program participants consumed the recommended amount of iron based on age group. All white children, 88.5 percent of black children, and 71.4 percent of children from other ethnicities met iron intake recommendations. Low-income black adolescents in Chicago had an overall iron intake that exceeded recommendations [63].

Based on the AI for fiber, no child of any ethnic racial classification met recommendations. Low-income urban African-American adolescents of Chicago had inadequate intakes of fiber [63]. Fruit and vegetable intake, an important contributor to fiber intake, was below recommended levels with only 49 percent meeting needs [63]. Intakes of fruit and vegetables have been shown to be lower in Hispanic and African-American children [73, 74].

Limitations

There were several limitations to this study as originally designed, but due to unforeseeable events, additional limitations developed. Only summer programs located within a 70-mile radius of Stillwater, Oklahoma were eligible to participate in this study due to time and financial constraints. Because many summer camps are exempt from Oklahoma Department of Human Services licensing requirements, it was difficult to locate and recruit non-SFSP/SSO programs. In addition, programs meeting exclusion criteria were not required to have meal or snack requirements; both non-SFSP/SSO programs in this study met exclusion criteria. Thus, this study is not an accurate representation of summer program licensed by the state of Oklahoma. Only five summer programs agreed to participate in the study. In addition, the ethnic/racial background of children did not reflect the composition of the state. The majority of participants were African American with no Native Americans and very few Hispanic children (n = 2) represented in this study. The majority of children participated in programs sponsored by the SFSP/SSO and all programs were located in urban areas, resulting in no data

available for children's diet and physical activity in smaller cities and rural regions of Oklahoma. Moreover, because programs and subjects volunteered to participate in the study, it is a non-randomized sample. As a result, the study does not provide a representation of Oklahoma summer programs as a whole.

A possible discrepancy between 24-hour recalls given by respondents and actual intake due to self-report of data and participants' perception of portion sizes may have occurred, particularly in younger participants. This discrepancy could have increased, because recruiting methods included only children between 9 to 11 years of age. However, children as young as 5 years of age returned parental consent forms and wanted to participate in the study. As a result, younger participants may not have been at the cognitive level necessary to adequately self-report two 24-hour recalls or 7 days of physical activity. It was also a possibility that participants and/or programs modified food intake and physical activity in response to the observation. Finally, birthdates were not collected so it was not possible to accurately calculate BMI percentiles. All children were assumed to be in the middle of their birth year.

Conclusions

The results of this study provided insight into the overall health of elementary youth who participate in summer programs in Oklahoma. based on dietary intake, physical activity, and weight status. There were no significant differences in physical activity between program types, both groups reported moderate activity. Children attending SFSP/SSO programs had greater calcium intakes and tended to consume more

iron than children attending non-SFSP programs. The study indicated improvements are needed in fiber and calcium intake of Oklahoma's youth, specifically minority children in relation to calcium intake. Obesity is affecting a large portion of America's youth, results indicate more than 38 percent of Oklahoma children in this study were overweight or obese. Children attending SFSP/SSO programs tended to have higher waist circumference percentiles, but there no significant differences in BMI percentile by program type. Improved dietary and physical activity efforts from summer programs are needed to combat this issue by providing foods more nutrient-rich, specifically fiber, and provide more food options rich in calcium in the non-SFSP/SSO programs.

Previous studies, including this study, have shown that children in the United States are consuming calorie-dense diets and many are not receiving adequate amounts of essential nutrients needed for healthy physical and cognitive growth. Summer programs may provide up to two meals and snacks for children, as a result, these programs have a significant influence on children's diets. Stricter regulations of meal and snack requirements are needed for participants especially in non-SFSP/SSO programs in order to increase fiber and calcium intake to meet recommended levels. An increase in physical activity options for summer program participants is needed with fewer options of engaging in sedentary behaviors. The researcher made observations during "free time", and many children chose to engage in leisurely behaviors, such as sitting down and talking with friends or reading rather than participating in more active behaviors with their peers, such as basketball, tag, and other cardiovascular undertakings. Non-SFSP/SSO programs need to become more aware of the effect their programs have on

their participants, specifically due to the lack of meal and/or snack and physical activity regulations as a result of exemption from state policies on summer programs.

Future Research

Due to the limitations of this study, further studies are needed to evaluate the physical activity and dietary intake of America's youth that participate in summer programs. Although results of this study highlighted significant trends of elementary youth that participate in summer programs, a representative sample is needed to further scrutinize trends in physical activity and diet. A larger sample size should also meet demographics based on ethnicity and race for an accurate representation of the population. Future studies should focus on an older age group for more reliable dietary and physical activity recalls. Since this study took place prior to the implementation of more stringent meal pattern regulations by the USDA [90], it would be beneficial to investigate the impact of these new policies if they are applied to summer programs. Furthermore, future studies should focus on observations of summer programs in relation to the amounts and types of physical activity and foods offered to participants. Plate waste studies could be conducted to determine how much of these healthier food choices are being consumed and reviewing summer programs' cycle menus could be useful. Observations of children's free time would be beneficial in determining whether children are choosing to engage in sedentary behaviors, as mentioned earlier, or if the opportunities are not being provided by the program.

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APPENDICES

APPENDIX A

Oklahoma State University Institutional Review Board

Date:	Wednesday, May 23, 2012
IRB Application No	HE1230
Proposal Title:	Evaluation of Physical Activity and Nutrition in Summer Programs
Reviewed and Processed as:	Expedited

Status Recommended by Reviewer(s): Approved **Protocol Expires: 5/22/2013**

Principal Investigator(s):

Cecilia Rodriguez
106 B Kamm Hall
Stillwater, OK 74077

Lauren Amaya
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Edmond, OK 73003

Gail Gates
301 HES
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

[X] The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Shelia H. Kennison

Shelia Kennison, Chair
Institutional Review Board

APPENDIX B

Phone Survey Script

Hello, this is [interviewer], I am a graduate student at Oklahoma State University. I am currently completing phone surveys on state licensed summer programs in Oklahoma to determine food choices that are available to children.
This information will allow the Oklahoma Department of Health Services to know what areas are needing improvements. This program was found on the list of state licensed summer programs.
If you choose to participate, your responses will be kept completely confidential by our research center and never connected to the name of the program you are a part of.
My questions will take about less than five minutes. You may stop participating at any time and may decline to answer any question you do not feel comfortable answering. You will not be penalized in any way if you choose not to participate in this study.
At the completion of the interview I will give you telephone numbers in case you have questions concerning the study or questions concerning your rights as a participant in the study.
Is this a good time for phone survey? _____ Ok great, let's get started.

Question 1: Does this facility provide meals to school-aged children enrolled in your summer program?

Question 2: Are snacks provided by your program?

Question 3: If meals and/or snacks are provided, what is the source of funding?

Question 4: How many children, on an average day, participate in the program?

Question 5: On an average day, how many children accept meals and/or snacks provided by your program?
This concludes the phone survey. Thank you so much for taking the time to participate. Do you have any questions for me? I also sent out a letter in an attempt to recruit programs to participate in my research study. Did you happen to receive it? If so, would you be interested in having your program participate? The first 10 programs that agree to participate and have at least 5 children participate receive a fee of $65. Thank you for your time.
If you have any further questions concerning the study, please feel free to contact me at 817-714-7670, or if you have any questions about your rights as a participant, please call the Institutional Review Board Chair, Dr. Shelia Kennison at 405-744-3377.

APPENDIX C

Summer Program Invitation

Nutrition and Physical Activity in Summer Programs

Hello,

My name is Cecilia Rodriguez, and I am a graduate student in the Nutritional Sciences Department at Oklahoma State University. I am conducting a research study as part of the requirements of my master's program, and I would like to invite your summer program the opportunity to participate in my study.

I am studying differences in nutrition and physical activity in licensed summer programs serving 9 to 11 year old children that participate in the Summer Food Service Program/Seamless Summer Option and programs that do not participate in the Summer Food Service Program/Seamless Summer Option. The Oklahoma State Department of Education's Division of Child Nutrition Programs administers the Summer Food Service Program/Seamless Summer Option for the U.S. Department of Agriculture (USDA).

If you allow your facility to participate, we will provide letters of consent for the parents/guardians of your students, and we will ask you to send the consent forms home with the children and collect the forms when parents/guardians return them. Researchers will be available to hand out consent letters and/or answer questions by parents at your request. If parents/guardians return signed consent forms, we will ask children for their permission before data collection begins. If you agree to let your facility participate in this study, we will need at least 5 children from your center to agree to participate in the study. The first 10 programs that agree to participate will be offered a small facilitation fee ($65).

If you choose to participate, at least three visits will be scheduled with your program between June 2012 and August 2012. All children participating will be asked to be measured for height and weight to calculate Body Mass Index as well as be measured for waist circumference. All participating children will be asked to be interviewed for two 24-Hour Food Recalls and one physical activity recall on an individual basis in the form of a short interview, and the interview will take no longer than approximately 10 minutes per child. If your center has a menu for meals and snacks, we will ask to see it. Nutrient content and portion sizes of snacks will be recorded and analyzed using nutrient analysis software. In addition, the physical activity at your center will be observed using SOFIT (System for Observing Fitness Instruction Time), which allows researchers to draw conclusions about student physical activity levels.

There are no known risks associated with this project which are greater than those ordinarily encountered in daily life. Parents/guardians will have the opportunity to receive a copy of their child's diet analysis at the conclusion of data collection which could help them identify potential areas of excess or deficiencies in their child's diet. Also, the results of

the proposed study will help the USDA and Oklahoma Department of Education to better understand the effectiveness of the Summer Food Service Program/Seamless Summer Option.

Participation is confidential. Study information will be kept in a secure location at Oklahoma State University.

Your agreement of participation is completely voluntary. If you agree to participate, you may remove your facility from the study at any time. We will be happy to answer any questions you have about the study. You may contact me at 817.714.7670 or Cecilia.Rodriguez@okstate.edu, or my faculty advisor, Dr. Gail Gates, at 405.744.3845 or gail.gates@okstate.edu. If you have any questions about you or your students' rights, you may contact the IRB staff at Oklahoma State University at 405.744.3377 or irb@okstate.edu.

Thank you for your consideration. If you would like your center to participate please sign the attached form and contact me at the number listed below to discuss participating, or I will call you within the next week to see whether you are interested in participating.

Sincerely,

Cecilia V. Rodriguez
817.714.7670
Cecilia.Rodriguez@okstate.edu

Program Director Consent Form

By signing below, I agree to allow my program to participate in the research study. Your agreement is completely voluntary, and if you decide, you may remove your facility from the study at any time.

Name of Program: _____

Director's Name Printed: _____

Signature: _____

Date: _____

APPENDIX D

Parent/Guardian Permission

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Purpose: Your child is invited to take part in a study comparing food intake and exercise of children enrolled in summer programs. The purpose of this study is to find differences in food intake and exercise of children who are enrolled in the summer programs sponsored by the Summer Food Service Program/Seamless Summer Option and children who take part in summer programs that are not sponsored through the Summer Food Service Program/Seamless Summer Option.

Procedures: If approval is granted by you, the parent or guardian, your child will be made aware of the actions. He/she will then be asked if he/she would like to participate in the study. If your child gives permission, then he or she will be asked for basic demographic data. This includes age, gender, and ethnicity. If your child agrees, height and weight measurements and waist circumference will be collected to calculate Body Mass Index. The measurements will be collected in a private area to protect your child's privacy. After measurements have been collected, he/she will be asked to explain what they have eaten during two days and to tell how much exercise they have done in the last 7 days. This will take no longer than about fifteen minutes each. The foods served by your child's summer program will also be observed. Your child's summer program will be observed 3 times during this summer (June 2012 – August 2012). Each visit to the center will last about two to three hours, which will provide enough time for researchers to collect food recalls and observe food served, and exercise at the center.

Risks and Benefits: There are no known risks associated with this project that are greater than those usually come across in daily life. Potential benefits of your child joining include researchers finding possible nutrition problems in children enrolled in summer programs. This could allow for professionals to focus on education or other policies to increase health benefits. The results will also be shared with the Oklahoma State Department of Education's Division of Child Nutrition Programs. This division administers the Summer Food Service Program for the U.S Department of Agriculture (USDA). The results of this study will help the USDA and Department of Education better understand the usefulness of this program. If you would like to receive a copy of an analysis of your child's food intake and/or body measurements, please fill out the form provided. We can then send you the results directly.

Confidentiality: The records of this study will be kept private. Any written results of this project will discuss group findings. It will not include information that will identify your child. Research records will be stored securely and only researchers and individuals

responsible for research oversight will have access. It is possible that the consent process and data collection will be observed by research oversight staff responsible for protecting the rights and wellbeing of people who participate in research. Physical copies of data will be stored securely for about one year, and then will be shredded. Data will be entered into Microsoft Excel, but no identifying information of the parent or child will be included. Microsoft Excel is an electronic spreadsheet program that allows for storing and organizing data. The Excel spreadsheet will be deleted after one year.

Participation is voluntary: Giving your child consent to partake in this study is completely voluntary. If you grant your child permission and your child then verbally agrees to participate in this study, you or your child can decide to pull out at any time. There will be no penalties for removing from the study. Your child can choose to not participate in any part of the study for any reason.

Contacts: If you have any question about the research or your child's rights, please contact Cecilia V. Rodriguez at Cecilia.Rodriguez@okstate.edu or 817.714.7670, or Dr. Gail Gates at Gail.gates@okstate.edu or 405.744.3845. If you have any questions about your child's rights as a research volunteer, you may contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405.744.3377 or irb@okstate.edu.

Consent:
Parental Signature for Minor
I have read and fully understand the consent form. As parent or guardian I authorize _____ (print name) to participate in the described research.

_____ _____
Parent/guardian Name (printed) Date

_____ _____
Signature of Parent/Guardian Date

Nutrient and Body Measurement Analyses

If you agree to let your child participate in the research study described in the consent form, your child will be asked for two 24-hour food recalls, a physical activity recall, and measured for body composition. If you would like to receive a copy of your child's results, please provide your contact information below. Your child's results will be mailed to you at the end of data collection at the address you provide below. **If you do not wish to receive a copy of your child's analysis, you may discard this page.**

Check below which results you are interested in receiving (select the reports you would like to receive)

- ☐ Diet analysis
- ☐ Body measurement analysis
- ☐ Physical activity recall

Name:
_____

Street Address:
_____
(Including apt number if applicable)

City and State:
_____

Zip-Code: _____

APPENDIX E

24-Hour Food Recall Script

Hi _____,

Do you mind if I ask you some questions about the foods and drinks you have had today and yesterday? There are no right or wrong answers for these questions. I also have a food model booklet that can help us figure out about how much of each food that you had.

If the child agrees, the researcher will begin the 24-hour food recall. Although each recall will vary based on answers the child gives, the outline of questions is as follow.

1. Quick list: The child will be asked to provide a listing of foods and beverages consumed during the previous 24 hours.
2. Forgotten foods list: The researcher will question the child on categories of foods that have been documented in studies as frequently forgotten.
3. Time and occasion: At this portion of the recall, the researcher will ask the child at what time was each food consumed.
4. Detail cycle: This portion of the recall asks the child about descriptive characteristics of the foods eaten, such as where the food was obtained and where it was consumed. Also, the researcher and the child will look through the USDA Food Model Booklet to help determine portion sizes of items consumed. Food models will also be used to help the child determine portions consumed.
5. Final probe review: The researcher will go over all information collected from the child to help him/her determine any other foods or drinks consumed over the 24-hour period.

Once the recall is complete, the researcher will ask the child if he/she takes any kind of multi-vitamin or any dietary supplements on a usual basis.

At the conclusion of the recall, the researcher will thank the participant for his/her time and ask if he/she has any questions about what was discussed or about any of the foods that he/she had eaten.

APPENDIX F

Physical Activity Questionnaire (Elementary School)

Name:_____ Age:_____

Sex: M_____ F_____ Grade:_____

Teacher:_____

We are trying to find out about your level of physical activity from ***the last 7 days*** (in the last week). This includes sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing, and others.

Remember:

1. There are no right and wrong answers — this is not a test.
2. Please answer all the questions as honestly and accurately as you can — this is very important.

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1. Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (Mark only one circle per row.)

	No	1-2	3-4	5-6	7 times or more
Skipping	❍	❍	❍	❍	❍
Rowing/canoeing	❍	❍	❍	❍	❍
In-line skating	❍	❍	❍	❍	❍
Tag	❍	❍	❍	❍	❍
Walking for exercise	❍	❍	❍	❍	❍
Bicycling	❍	❍	❍	❍	❍
Jogging or running	❍	❍	❍	❍	❍
Aerobics	❍	❍	❍	❍	❍
Swimming	❍	❍	❍	❍	❍
Baseball, softball	❍	❍	❍	❍	❍
Dance	❍	❍	❍	❍	❍
Football	❍	❍	❍	❍	❍
Badminton	❍	❍	❍	❍	❍
Skateboarding	❍	❍	❍	❍	❍
Soccer	❍	❍	❍	❍	❍
Street hockey	❍	❍	❍	❍	❍
Volleyball	❍	❍	❍	❍	❍
Floor hockey	❍	❍	❍	❍	❍
Basketball	❍	❍	❍	❍	❍
Ice skating	❍	❍	❍	❍	❍
Cross-country skiing	❍	❍	❍	❍	❍
Ice hockey/ringette	❍	❍	❍	❍	❍
Other:					
_____	❍	❍	❍	❍	❍
_____	❍	❍	❍	❍	❍

2. In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)? (Check one only.)

- I don't do PE ❍
- Hardly ever ❍
- Sometimes ❍
- Quite often ❍
- Always ❍

3. In the last 7 days, what did you do most of the time *at recess*? (Check one only.)

- Sat down (talking, reading, doing schoolwork) ❍
- Stood around or walked around ❍
- Ran or played a little bit ❍
- Ran around and played quite a bit ❍
- Ran and played hard most of the time ❍

4. In the last 7 days, what did you normally do *at lunch* (besides eating lunch)? (Check one only.)

- Sat down (talking, reading, doing schoolwork) ❍
- Stood around or walked around ❍
- Ran or played a little bit ❍
- Ran around and played quite a bit ❍
- Ran and played hard most of the time ❍

5. In the last 7 days, on how many days *right after school*, did you do sports, dance, or play games in which you were very active? (Check one only.)

- None ❍
- 1 time last week ❍
- 2 or 3 times last week ❍
- 4 times last week ❍
- 5 times last week ❍

6. In the last 7 days, on how many *evenings* did you do sports, dance, or play games in which you were very active? (Check one only.)

- None ❍
- 1 time last week ❍
- 2 or 3 times last week ❍
- 4 or 5 last week ❍
- 6 or 7 times last week ❍

7. *On the last weekend*, how many times did you do sports, dance, or play games in which you were very active? (Check one only.)

None ..... ❍
1 time ..... ❍
2 — 3 times ..... ❍
4 — 5 times ..... ❍
6 or more times ..... ❍

8. Which *one* of the following describes you best for the last 7 days? Read *all five* statements before deciding on the *one* answer that describes you.

A. All or most of my free time was spent doing things that involve little physical effort ..... ❍

B. I sometimes (1 — 2 times last week) did physical things in my free time (e.g. played sports, went running, swimming, bike riding, did aerobics) ..... ❍

C. I often (3 — 4 times last week) did physical things in my free time ..... ❍

D. I quite often (5 — 6 times last week) did physical things in my free time ..... ❍

E. I very often (7 or more times last week) did physical things in my free time ..... ❍

9. Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week.

	None	Little bit	Medium	Often	Very often
Monday	❍	❍	❍	❍	❍
Tuesday	❍	❍	❍	❍	❍
Wednesday	❍	❍	❍	❍	❍
Thursday	❍	❍	❍	❍	❍
Friday	❍	❍	❍	❍	❍
Saturday	❍	❍	❍	❍	❍
Sunday	❍	❍	❍	❍	❍

10. Were you sick last week, or did anything prevent you from doing your normal physical activities? (Check one.)

Yes ..... ❍
No ..... ❍

If Yes, what prevented you? _____

VITA

Cecilia Victoria Rodriguez

Candidate for the Degree of

Master of Science

Thesis: IMPACT OF SUMMER PROGRAMS ON DIET AND PHYSICAL ACTIVITY IN ELEMENTARY CHILDREN

Major Field: Nutritional Sciences

Biographical:

Education:

Completed the requirements for the Master of Science in Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma in December, 2012

Completed the requirements for the Bachelor of Science in Nutritional Sciences and Dietetics at Texas Tech University, Lubbock, Texas/USA in 2011.

Experience: Employed by Texas Tech University, Department of Nutritional Sciences, undergraduate teaching assistant and student assistant, 2010 – 2011. Employed by Wellspring Camps, San Marcos, Texas, Nutrition and Culinary Counselor, Summer 2011. Employed by Oklahoma State University, Department of Nutritional Sciences as a graduate teaching and research assistant, 2011 – present

Professional Memberships: Academy of Nutrition and Dietetics; Latinos and Hispanics in Nutrition and Dietetics; Oklahoma Academy of Nutrition and Dietetics; North Central District Dietetic Association