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KIDQUEST CHILDHOOD OBESITY PREVENTION PROGRAM: ANALYSIS OF
ITS INFLUENCE ON HEALTH OF RURAL SOUTH DAKOTA 5TH AND 6TH GRADE
CHILDREN

BY

NAYEF BUMARYOUM

A dissertation submitted in partial fulfillment of the requirements for the

Doctor of Philosophy

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Specialization in Nutritional Sciences

South Dakota State University

2015

KIDQUEST CHILDHOOD OBESITY PREVENTION PROGRAM: ANALYSIS OF
ITS INFLUENCE ON HEALTH OF RURAL SOUTH DAKOTA 5TH AND 6TH GRADE
CHILDREN

This dissertation is approved as a creditable and independent investigation by a candidate for the Doctor of Philosophy degree and is acceptable for meeting the dissertation requirements for this degree. Acceptance of this dissertation does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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All the greatness and dignity for ALLAH subh'anahu Wa Ta'la (God to whom be ascribed all perfection and majesty) who is the creator of the whole world.

I would like to show my thankfulness towards Prophet MOHAMMAD and his family Ahlul-Bait (prayers and peace be upon THEM).

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ABBREVIATIONS

(BMI) Body Mass Index

(CVD) Cardiovascular Disease

(DC) Dietary Choices

(FCCLA) Family, Career, and Community Leaders of America

(Hb) Hemoglobin

(LND) Low Nutrient Dense

(PA) Physical Activity

(SCT) Social Cognitive Theory

(SNAP) Supplemental Nutrition Assistant Program

(TC) Total Cholesterol

(TT) Teen Teachers

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ABSTRACT

KIDQUEST CHILDHOOD OBESITY PREVENTION PROGRAM: ANALYSIS OF
ITS INFLUENCE ON HEALTH OF RURAL SOUTH DAKOTA 5TH AND 6TH GRADE
CHILDREN

NAYEF BUMARYOUM

2015

Obesity is a growing problem throughout the developed world. This project will focus on obesity in rural children by studying those living in an area of South Dakota. Research shows high levels of overweight and obese children in this demographic. The two major objectives of this study are to evaluate the efficacy of the KidQuest (KQ) nutrition and physical activity curriculum in reducing the proportion of children and adolescents who are overweight and obese within participating South Dakota 5th and 6th grade children using baseline/post-intervention data and to determine which KQ teacher type is most effective as evaluated by anthropometric, biochemical, blood pressure, dietary choices.

The KQ program was shown to provide reinforcement for nutrition and physical education in the school setting. It was also able to help students practice healthy options and improved some of the health parameters that prevent childhood obesity. The Teen Teachers (TT) and Supplemental Nutrition Assistant Program (SNAP-ED) educators were proven to be an effective approach to improving the health outcomes of the children and adolescents; their students showed significant improvements among some health parameters and dietary choices (DC) that prevent childhood obesity.

Chapter 1

INTRODUCTION

Obesity Epidemic

Increased energy intake from fats and sugars, along with a decline in physical activity, play a large role in the worldwide obesity epidemic according to World Health Organization (1). These changes toward poor diet and sedentary lifestyle are to blame for the global obesity epidemic among children and adolescents. The adverse health effects of obesity and being overweight are significant, even for children. Higher body mass index (BMI) is associated with a greater risk of type 2 diabetes, cardiovascular disease (CVD), cancer, eating disorders and a variety of other co-morbidities before or during adulthood (1). However, because children are growing, their BMI assessments are based on specific BMI percentile ranges adapted for children and based on tables compiled by the Centers for Disease Control and Prevention (CDC), by age and by gender (2). KidQuest (KQ) was developed as a school/family-centered program to improve nutrition education and physical activity within 5th and 6th grade public school students with the goal of reducing the proportion of overweight and obese children and adolescents in this population (3).

Statement of the Problem

- In the U.S., the prevalence of childhood and adolescent obesity has more than doubled in the past 30 years (4).

- To our knowledge, no studies in South Dakota and few in the U.S. and worldwide have evaluated the association between nutrition interventions and risk factors for CVD in adolescents.
- The teacher type has been an important factor in improving eating behaviors, anthropometrics and blood parameters among children in previous studies (5, 6); this study compares two types of KQ teachers; teen teachers (TT) with the Supplemental Nutrition Assistant Program - Educators (SNAP-ED) based on student outcomes.

Overall Objectives (purpose)

1. Evaluate the efficacy of the KQ nutrition curriculum in reducing the proportion of children who are overweight and obese within participating South Dakota 5th and 6th grade children using baseline/post-intervention data.
2. Determine KQ program efficacy as evaluated by changes in the adolescents' anthropometric, blood pressure (BP), biochemical parameters and dietary choices (DC) among some participating children since not all measures were collected for all waves.
3. Determine which KQ teacher type is most effective as evaluated by anthropometric, biochemical, BP and DC.

Overall Specific Aims

Determine KQ efficacy through evaluation of baseline and post-program BP, lipid levels, hemoglobin (Hb), BMI, and DC questionnaires in reducing the proportion of children who are overweight and obese within South Dakota 5th and 6th grade children.

Hypotheses

1. The changes (from baseline to 6 months post-intervention) in BP, lipid levels, hemoglobin (Hb), BMI and DC will be different between the control and intervention groups.
2. The changes (from baseline to 6 months post-intervention) in DC, BMI, lipid levels, BP and Hb will be statistically significantly different between the two teacher type groups those taught by the TT and those taught by the SNAP-ED).

Significance

1. The study evaluates evidence on whether or not the KQ nutrition and physical activity program is effective in reducing overweight and obesity within South Dakota adolescents.
2. This study determines if the KQ program improves anthropometrics, blood parameters, BP and DC in adolescents living in rural South Dakota.
3. This study determines the most effective type of KQ teacher taught by the TT and the SNAP-ED for this age group.

Chapter 2

REVIEW OF THE LITERATURE

Children and Obesity Worldwide

Childhood obesity is a relatively new epidemic manifesting as children are becoming sedentary. Worldwide, the number of overweight or obese children under 5 years old is 42 million in 2013 (7) and it was estimated that by 2020, it was estimated that the childhood global overweight and obesity rate would be 60 million (8). From 1980-2013, overweight and obesity combined prevalence among children and adolescents rose 47.1%; consisted of 23.8% of boys and 22.6% of girls in developed countries in 2013, while developing countries were 12.9% for boys and 13.4% in girls (9). Even in an affluent country such as Kuwait, the overall prevalence of overweight/obese in intermediate school children was 30.7% and 14.6% (10).

American Children and Obesity

Data from the CDC and National Health and Nutrition Examination Surveys (NHANES) reveal that the prevalence of obesity among U.S. children and adolescents between 2-19 years of age has increased dramatically from 1971 to 2011 (11). In 2012, the prevalence of overweight/obese among youth were 31.8%, 16.9% (12). However, obesity prevalence has been plateaued among women and specifically girls between (2-19 years) nonetheless of ethnicity (12), while in boys has continued to increased (12). Prevalence of obesity by race was highest among Mexican-American boys (24%); and among girls was highest among non-Hispanic-Blacks (22%) (13).

Prevalence of Obesity Among South Dakota Children

In 2013/2014, statistics from South Dakota Department of Health (SDDOH) showed that for children ages 9-11, 17.4% were overweight and 17.9% were obese and for children ages 12-14, 17.7% were overweight and 17.4% were obese (14). These levels are above the Healthy People 2020 target of 14.5% (15).

Preliminary Studies of KidQuest

A study of the KQ curriculum with 5th and 6th graders (136 subjects) in rural South Dakota schools noted significant health improvements for intervention group (IG) students (3). The IG demonstrated greater improvement in breakfast frequency ($P < 0.05$) compared to control counterparts. Dairy intake was also statistically significantly higher in the IG ($P < 0.05$). The frequency of reading food labels and increased nutrition knowledge was statistically significant ($P < 0.05$). No significant change was found in control subjects (3).

Another study of KQ titled "Evaluating Teen-taught KidQuest: A School Based Nutrition and Physical Activity for 5th and 6th Graders in Rural South Dakota" measured outcomes for 87 subjects at baseline and endpoint. The measures included BMI, waist circumference, total cholesterol (TC), high density lipoprotein (HDL), low density lipoprotein and triglycerides. Total cholesterol significantly decreased in the IG from pre- to post-test. The percentage of IG participants with normal cholesterol levels increased from 92% to 97%. Waist circumference decreased in the IG and increased in the control group (CG). Post intervention, BMI obesity percentages increased in the CG while they remained the same in the intervention. Sixty-five percent of the CG participants had normal HDL limits by the end of the study. Overall, students in the IG showed weight

loss and healthier behaviors, while the CG exhibited little change (16). Moreover, other KQ studies found positive outcomes included significant decreased low density lipoprotein outcomes among IG (17); and parents of overweight and obese children were unaware about their children's weight status (18).

Social Cognitive Theory

The KQ program is also based on Social Cognitive Theory (SCT), which involves observing others in different situations: within social interactions, through outside media influences and in experiences showing the individual's knowledge. People's behaviors are typically based on those behaviors for which they have been rewarded or punished. People also learn new behaviors based on others' experiences, not necessarily by succeeding or failing during their own attempts, but rather by replicating the actions of others. Social Cognitive Theory also affects community, intrapersonal and institutional levels (19). This theory supports the use of nutrition and physical activity intervention programs through applying public health issues and positive reinforcement among children (20-22).

A systematic review looked for the most effective behavioral strategies and models in school-based interventions for obesity prevention among children 4-6 years of age. They focused on educational programs lasting six months and longer where SCT was used. Their review found a significant change in one or more outcomes due to these programs. This study found that the most effective strategies include dietary instruction and physical activity, school-based teaching and parental involvement and long-term follow up (23).

Eating Behaviors, Lifestyle and Dietary Intake Among American Children

Recently, 2015 Dietary Guidelines for Americans are being established to promote healthy eating, physical activity and healthy lifestyle, which is supported through the Center for Nutrition Policy – United State Department of Agriculture (USDA) for all ages 2 years old and over including individuals with increasing risk of chronic diseases; These dietary guidelines updated every 5 years (24).

In a study by researchers using a 24-hour dietary recall method which included 4,852 children and adolescents between ages 8-18, food described as low-nutrient density (LND) was found to contribute more than 30% of the research group's daily energy (25). Daily intake from protein and dietary fiber was found to relate inversely to the reported number of LND foods. The authors wrote that the prevalence of such foods in the diets of the children and adolescents studied represented an alarming trend (25). Examples of these foods are candy, carbonated or non-carbonated beverages, desserts and energy-dense foods (25).

Other studies looked at the impact of fast-food consumption by U.S. Americans to assess the dietary profile associated with fast-food consumption. Researchers studied fast-food consumption by American children and adults to assess their dietary profile by collecting data from 17,370 participants during two non-consecutive 24-hour dietary recalls (26). Though more children than adults (42% to 37%) reported eating fast-food over the prior 24-hour period, both groups were found to have had higher intakes of energy, fat, saturated fat, sodium and carbonated soft drinks, along with lower intakes of vitamins A and C, milk, fruits and vegetables compared to those who did not report eating fast food over the same period $p < 0.001$ (26).

Researchers found that per-capita daily caloric contributions of sugar-sweetened beverages (SSB) jumped from 242 kcal/day between 1988 and 1994 to 270 kcal/day from 1999-2004; children and adolescents consumed 10-15% of their daily calories from these types of drinks (27). The highest jump in consumption was recorded among children from 6 to 11 years old. Interestingly, it was not soda drinks but fruit drinks that provided more than half the SSB calories consumed. The study discovered that up to 70% of the consumption of SSB took place at home, while just 7 to 15% took place in schools (27).

Children are not the only ones consuming dietary fructose. A study of such consumption among 21,483 American children and adults found that the mean consumption among both groups averaged 10.2% of their total daily calorie intake. This ranged between 38.4-72.8 g/day. Consumption was highest among adolescents aged 12-18 years at 72.8 g/day (12.1% of total calories). The danger with such consumption is that high fructose intake has been associated with liver problems, insulin resistance, triglycerides and obesity. While fructose naturally occurs in many fruits and vegetables, it is also added to many processed foods, especially as corn syrup (28).

High Fat Foods and Sweetened Food/Beverage Consumption

Researchers evaluated the intake of sweetened beverages by 548 12-year olds in Texas (29). Results revealed that drinking sweetened beverages decreased the amount of milk children drank. The author theorized that drinking large amounts of such beverages could predispose individuals toward obesity, in that: (a) highly sweetened beverage intake triggers an elevated sugar metabolism; or (b) such energy intake is not satiating.

Results shows that children who drank more than 16 ounces of sweetened beverages significantly gained more weight over two months than those who did not (29).

A study of 236 children in the Polish region (98), evaluated the impact of family socioeconomic factors on childhood obesity, eating habits, and the impact of low-energy diets chosen and accepted by the child/parent in relation to body mass in children.

Researchers found that BMI decreased among children 7 to 15 years of age who curtailed the amount of sweets consumed daily. In other words, researchers found a positive correlation between good family eating habits and obesity in children aged 3 to 15 years. Dietary treatment significantly influenced the BMI of children and normalized the values of TC, low density lipoprotein and triglycerides (30).

Thailand has become industrialized since the late 20th century; this has resulted in increased availability of sugar-sweetened foods available to Thai children. Researchers studied the effect of this “junk food” on Thai children who snacked during the day (31). Within the study, snacks constituted about 20% of the country’s food market and 86% of primary school children chose snacks of candy at least twice a day from village shops. When evaluating normal weight and undernourished pre-school children, the undernourished children who attended pre-school less often than the others ate fewer snacks; however, by the time subjects reached school age, their energy intake from snacks was nearly identical. Among both groups, milk and dairy products were left out of the diet when more snacks, mostly high sodium, were consumed. Results show that in both groups, children preferred crispy snacks between breakfast and lunch and that the nutrient consumption including protein, carbohydrates and fats were delivered from snacks and were significantly lower in undernourished children (31).

Researchers concluded that consuming SSB between meals is a significant risk factor in the toward childhood obesity (32). The study evaluated 2,103 pre-school children in Quebec. Overall, 17.2% of the participating children ages 2.5 to 4.5, 6.9% who consumed SSB between meals became overweight by age 4.5 years (32). A systemic review also searched through 40 years of publications, from 1966 through 2005, to determine whether a relationship existed between SSBs and the risk of weight gain (33). It was determined that increased consumption of SSBs is associated with weight gain and obesity among adolescents (33).

High-fat foods have been described as a non-nutrient dense (NND) snack (34). These NND foods typically include potato chips, candy and cookies. A study of 201 children in 3rd to 6th grade categorized them according to four snacking conditions: vegetable only, cheese only, potato chips only, cheese and vegetables. The study found that eating potato chips was significantly higher among those who did not consume cheese and vegetable snacks, while those eating healthy snacks reduced their consumption of extra calories. The children who ate a combined vegetable and cheese snack consumed 72% fewer calories than those in the other groups (34).

Another study determined an association between consumption of SSB and weight status among 4,283 children aged 2-16 (35). Using cross-sectional data, the study found that higher obesity risk was associated with higher levels of SSB consumption. Sixty-two percent of participants reported consumption of SSB, and those who consumed > 250 g (more than 1 serving) were 26% more likely to be obese or overweight (35).

The top dietary energy sources of children ages 2-18 include added sugar and solid fats, as noted by a study using data from NHANES (36). The results of a related

cross-sectional study showed that SSBs from combined soda and fruit drinks totaled 173 kcal/day, and 40% of total energy consumed came from empty calories, the sum of energy from solid fats and added sugars (36).

Parent Involvement Needed in Interventions

Family-based intervention is an effective means of changing children's food habits and the best avenue to use in nutritional and health interventions (37). Children are too young and powerless to produce changes on their own, and while school lunch programs may be a good place to start, the family is the center of the child's world where values are learned and handed down. The significant role of parents has been demonstrated in various studies. Fat intake levels between children and parents in the Netherlands are similar; their results showed a significant association in the intake of energy, fat and cholesterol between parents and children from 1 to 30 years of age (37).

A study which traced the similarities of family members' eating habits to the person who prepares a majority of the family meals and the number of meals the family shares (38). This study of 282 people who described themselves as family food preparers (FFP) revealed that the preparer's fruit-and-vegetable intake was mimicked by the spouse and offspring ($p < 0.01$). If that person ate high-fat foods, so did other family members ($p < 0.01$). The more meals the family shared, the more eating habits the family members shared. Women tend to have the greatest impact on the family eating habits, as they are more likely to follow dietary guidelines than men (38). This article included data showing that child and parental intakes of most nutrients were significantly correlated, especially shared meals of fruits and vegetables ($p < 0.05$) (38). Dietary interventions may need to

target wives/mothers and not necessarily the entire family in order to be successful; however, the family and the all children would be a secondary target.

With the aforementioned studies showing that ingesting certain foods and beverages during childhood may play a major role in children's tendency to become obese, a logical next step is to educate parents on good nutrition. With the increasing prevalence of obesity in children and parental obesity a risk factor for childhood obesity (39), Researchers evaluated a parent-focused behavioral intervention on parent/child eating changes and corresponded the percentage of overweight changes in families with at least one obese parent and a non-obese child (39).

The families were encouraged, over a period of one year, to increase fruit and vegetable intake and decrease intake of high fat/high sugar foods. Measurements were taken at four bi-weekly and two monthly meetings. Parents were given workbooks on diet and activities, as well as a Traffic Light diet with foods given red, green or yellow lights to designate how often they should be incorporated into the daily diet (39). Although small, one notable change was that over the year children ate more fruits and vegetables and fewer foods high in fat and sugar (39). The overweight status change was greater among children whose parents targeted increases in fruit and vegetables consumption compared to parents who reduced high fat/high sugar intake (39).

Cross-Age Teaching

The Cross-age teaching model is designed to build program capacity and help expand sustainability, as well as teach teens how to teach nutrition to the "tweens" (5th and 6th grade students). As noted by researchers, cross-age teaching provides a sense of

belonging to the group and encourages the involvement of students who often feel left behind in a larger group (40). A cross-age teacher may either teach lessons to a group or be a one-to-one tutor, giving them hands-on learning while gaining experience, subject knowledge, practice, talent, self-confidence and improved academic performance (40).

A study used trained high school students leaders to teach 6th and 7th graders about healthy snacks through skits, goal-setting activities and videos. The study found that the connection with the school setting and the role of peer leaders had a significant effect on the health behaviors and healthy lifestyle changes of all participants, including the high school students, the 6th graders and the school overall (41).

Another study examined cross-age tutoring using a one-to-one setup twice a week, matching 45 student athletes with at-risk children. The study found that 18 out of 20 first grade students moved to higher reading levels, because the children's confidence levels were boosted (42).

During the early adolescence years (ages 10-14), teenagers go through cognitive changes, along with emotional and physical development. Such changes may be addressed by cross-age teaching, since it provides practice in critical thinking, transition to adulthood and achievement (43). This activity leads teens to learn the content of the curriculum in depth, including strategies, planning, age group needs, evaluation and information delivery (43).

A study tested a curriculum on the subject of dietary intake and physical activity using a pre- and post-test designed group comparison of 72 children living in rural areas (5). Researchers noted improvement in the consumption of healthy foods, attitudes, knowledge, efficacy and body mass index. This study indicated that teen mentors could

significantly lower children's BMI and improve eating behaviors (5). Another study confirmed the use of a cross-age prevention program to successfully change behaviors, knowledge and the attitudes of students (44).

Cross-age teaching methods provide the most impact when implemented within schools' health education curricula. They may assist in modifying diets, eating behaviors, self-efficacy and goal-setting (6). Teen teachers can effectively impact children's knowledge and improve health education through cross-age teaching (45).

Peer Teaching

A study examined whether a school-based pilot program, *Improving Meals and Physical Activity in Children and Teens* (IMPACT), would improve physical activity and nutrition in rural North Carolina elementary and high school students, using a Train the Trainer model and a school-based curriculum (46). High school students taught the IMPACT program to 4 classrooms of 4th graders (2 classrooms with 38 students and 2 classrooms with 37 students). The students received the standard curriculum along with baseline and post-intervention surveys. Within the IG, the elementary children's eating behaviors and nutrition knowledge improved. The increased intake of fruits and vegetables was statistically significant amount (+0.85 servings/day) compared with controls. And they also increased their intake of calcium rich-foods and grains, though the results were not statistically significant (46).

Different Types of Instructors

SNAP-ED teachers

In South Dakota, extension SNAP-ED teachers taught the students at some KidQuest schools. SNAP-ED received previous nutrition training as part of their job; they were required to attend bi-annual professional development training. Also, they receive at a minimum two times per year around 10 hours or a total of approximately 20 hours professional development related training related to nutrition, physical activity and wellness per year. They also paid to do the teaching as part of their employment. This is accomplished through the MyPlate program and the Dietary Guideline for Americans (47-50).

SNAP-ED educators have played a significant role in learning about the dietary habits and intervention outcomes for SNAP-ED participants. A study used an evaluation within 124,105 school-age children to develop a Taste-Testing tool (51). SNAP-ED teachers presented the 6-item evaluation tool in order to develop validity, reliability and useful information when capturing important nutritional outcomes where students showed a significant willingness to try the food again for fruits than vegetables (51).

SNAP-ED educators also participated in a study incorporating four vegetable-focused lessons among 4th graders in 72 interventions and 68 controls schools (52). Fifty-one classrooms were in a CG with no sessions and 57 intervention classrooms went through a 3-5 week timeline of sessions, using pre- and post-testing. The sessions included vegetable preferences and self-efficacy. The lessons were effective in increasing vegetable intake among 4th graders (52).

SNAP-ED educators have been effective by finding and using new communication channels to reach clients. They educate on diabetes prevention, provide encouragement to clients, develop nutrition education materials, improve healthy eating in communities and schools and develop instructional guides for low-literate Spanish speakers participating in nutritional intervention programs (53-55).

Teen Teachers

The participation of teen teachers has also been shown to be effective as a transdisciplinary approach to teaching younger children. A study tested mentors attitudes about children interacting with their mentees (56). The study included 221 high school participants, 182 youth in a CG and 205 mentees. An in-service training was suggested to teach the mentors to meet their expectations, which led to statistically significant relationships and effective delivery of nutrition education (56).

Another study tested a mentoring model of trained teens in a school setting among 72 children, using a pre- and post-test design (5); the teens delivered lessons on healthy lifestyle patterns, including nutrition and physical activity. The results noted an improvement in health knowledge, self-efficacy and BMI. Teen teaching was found to be effective in delivering nutrition education to children, resulting in positive health outcomes and knowledge (5).

School-Based Nutrition/Physical Activity Programs Benefits

Over the last several decades, physical activity (PA) has dropped among children, leading to more sedentary lifestyles. Instead of activity, they are spending more time at the computer browsing the internet, playing games, watching TV, etc. This is especially

true for youth between 4-21 years of age. This behavior has been shown to lead to heart-related risk factors such as increased systolic blood pressure (SBP), unwanted lipid profile and type 2 diabetes mellitus (57). Numerous studies have found that lack of physical activity for youth and their preference for sedentary activities, while consuming high calorie foods, is a chief contributing factor to rising obesity prevalence (58-60).

Another intervention, implemented from 2004-2006, aimed to increase physical activity among 350 9-11-year old children through eight lessons of 45-minute physical activities each week, which is double the intensity of the control group; The study found boys' overall BMI was significant improved, compared to the girls respectively with non-significant reduction (61).

A 6-month school-based physical activity intervention program evaluated 457 children ages 6-10 years and found that adding 2 physical activity sessions a week to the standard classes was beneficial to reducing childhood obesity (62). A study found body composition improved through a six-month PA intervention program (63); The PA intervention program had a significant effect on boys' BMI and fat-free-mass and girls' anthropometric variables including BMI and WC (63).

The "Nutrition on the Go" intervention study completed in 2012 was successful in maintaining normal BMI among 5th grade children. This study aimed to reduce children's intake of sugars in cereals and the fat content in milk, while increasing PA and awareness of the value of fruits and vegetables. Results showed a slight decrease in obesity occurred between baseline and post 6-month, ($p= 0.065$) (64). A controlled trial done aimed to reduce video games and television viewing (65). One hundred ninety eight 3rd and 4th

grade students who completed a 6-month in-classroom 18-lesson curricula. The study found that there was a significant improve in BMI ($P < 0.05$) (65).

One of the largest childhood obesity programs, the “Let’s Move” campaign initiated by First Lady Michelle Obama, began in February, 2010. This campaign aims to reduce the childhood obesity rate 5% by the year 2030. It consists of information on healthy lifestyles targeted for children, families, educators and community leaders (66). The campaign accomplishments up to date including meet nutritional guidelines that limit federal standards in all owned Disney theme parks and channels, more than 1.7 million kids provided beginner athletic programming for free or low cost during 2012 Olympic Games, updated nutritional standards at the Department of Defense to include more healthy foods, new collaborations from different organizations to support Let’s Move in Cities, Towns and Counties, distribution of 50 million coupons to promote vegetables, safe streets were blocked to provide more space for kids to play, walk and bike in safe areas (67).

A 2010 U.S. study used an obesity prevention curriculum with one to one coaching by nursing students for 99 children 4th and 5th grade students (68). Students demonstrated a significant improvement in health, including decreased BMI percentile, increased consumption of healthy foods such as fruits and vegetables, and decreased intake of sweetened beverages such as sodas and punch (68).

Cardiovascular Disease Risk Factors Among U.S. Children

A study found that among 3383 U.S. adolescents aged 12-19 years, 22% had borderline-high/high low density lipoprotein and 6% had low HDL (69). Within the same group, prevalence of diabetes and pre-diabetes increased by 14%. There were also increases in hypertension and prehypertension (69).

In a study titled “The Relation of Overweight to Cardiovascular Risk Factors Among Children and Adolescents: The Bogalusa Heart Study,” 9,167 children aged 5-17 years old participated until the mean age of 27 years. Results found that 11% of the children were overweight, and of the 475 children 58% were found to have at least one risk factor (70).

Lipid Parameters

The serum lipid profile measurement is one of the cardiovascular risk predictors, usually obtained in a fasting state of 12-14 hours. The measurement consists of total cholesterol, low density lipoprotein cholesterol, HDL cholesterol and triglycerides (71). New guidelines for these measurements were recently endorsed by the National Institute of Health (NIH), American Academy of Pediatrics (AAP), and National Heart, Lung, and Blood Institute (NHLBI), recommending that all children between ages 9-11 to be screened for cholesterol, regardless of family history (72).

Heart-related disease is still responsible for 450,000 deaths per year in the U.S. Atherosclerosis may begin in youngsters (73) and evidence shows that lowering of some lipid parameters is associated with lower heart disease (74).

Blood Pressure (BP)

Blood pressure has been proven to be associated with obesity and CVD risk factors among children (75-82). A cohort found that SBP was associated with CVD risk factors and obesity in children ages 9-16 (75). Results show statistical improved associations of BMI with triglyceride concentrations (66). A meta-analysis of 63 studies involving 49,220 children ages 5-15 years old concluded that BP was found to worsen due to obesity. The tracking of elevated BP occurrence into adulthood demonstrated that more girls than boys showed an increase in diastolic blood Pressure (DBP) (83).

Hemoglobin

Low Hb levels may lead to insufficient oxygen in red blood cells, which carry oxygen from the lungs to the rest of the body. Low Hb is an indicator of iron deficiency anemia (84). A cohort study included 2,492 school children aged 9-13 years old aimed to study the association between iron deficiency and being overweight (85). The results show that iron deficiency anemia was higher among all ages compared to their normal counterparts ($p < 0.05$) and that obese children were at great risk of iron deficiency anemia (85). Another study evaluated the association between obesity and iron deficiency anemia found that iron deficiency were significantly associated with high percentage of body fat for boys and girls ages 9-13 (86).

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Chapter 3

**THE KIDQUEST CHILDHOOD OBESITY PREVENTION PROGRAM:
EFFICACY ON DIETARY CHOICES, ACTIVITY AND HEALTH OUTCOMES
AMONG SOUTH DAKOTA 5TH AND 6TH GRADERS**

NAYEF BUMARYOUM

ABSTRACT

Background: Obesity among U.S. children and adolescents has increased dramatically from 1971 to 2011. School-based interventions have played a major role in improving children's health. The aim of this study was to determine the efficacy of the KidQuest (KQ) nutrition and physical activity program in health measures and dietary choices (DC) among South Dakota 5th and 6th grade school children.

Methods: KidQuest is a South Dakota signature program, designed by South Dakota Extension Educators, focused on teaching 5th and 6th graders in their classrooms about healthy nutrition and physical activity. Of the 292 students invited to participate, 254 5th and 6th graders (166 intervention and 88 control) from 13 elementary schools in rural South Dakota agreed to participate. The program was taught using six different 50-minute hands-on nutrition education activities provided in the classroom 1-2 times per month over the course of 4-6 months.

Results: There were two measures for which there were statistically significant differences in the changes between the control and intervention groups (IG). For responses to the question "Yesterday, how many times did you eat any type of candy?" the odds of improvement were higher for the IG (odds ratio= 0.562; 95% CI= 0.361, 0.874, $p= 0.011$); and for whole grain consumption, the IG showed more change in a healthier direction (odds ratio= 1.816; 95% CI= 1.038, 3.178, $p= 0.037$).

Conclusions: KidQuest provides reinforcement for nutrition and physical education in the school setting, is able to support students in practicing healthy options, and improved a number of health parameters associated with childhood obesity.

Keywords: KidQuest; school children; school-based intervention; teen teachers; body mass index; obesity; blood pressure; dietary choices

INTRODUCTION

In the U.S., obesity prevalence of youth were considered overweight/obese is (31.8%, 16.9%) in 2012 (1). In the U.S., prevalence of body mass index (BMI) greater than 99th percentile has increased more than 300% among 2-19 year old children and adolescents since 1976 (2). Statistics for South Dakota students using data from 2013/2014 showed that within children ages 9-11, 17.4% were overweight and 17.9% were obese and within children ages 12-14, 17.7 were overweight and 17.4% were obese (3).

In order to change this dire situation, the KidQuest (KQ) nutrition and physical activity intervention was created for South Dakota children and adolescents, which includes six 50-minute in-class activities based on Social Cognitive Theory (SCT). An extensive review determined that the most effective behavioral strategies and models in school-based interventions for childhood obesity prevention include dietary instruction and physical activity, school-based teaching and parental involvement (based on involvement of school and parents), and long-term follow-up (4).

A school-based intervention incorporating a nutrition curriculum has been shown to play a major role in improving children's health (5). The program evaluated within 12 intervention and 13 control schools, implemented a card game and "Healthy Eating" curriculum among 2,519 5th and 6th grade children. This 9-week intervention aimed to improve nutrition knowledge and change in eating attitudes. The nutrition intervention curriculum resulted in a modest increase in nutrition knowledge scores and more children at the intervention schools ate a healthier diet or would try to eat a healthier diet than those in the control schools (5).

Teen teaching methods have been found to provide the most impact when implemented within the schools' health education curricula; they may assist in modifying diets, eating behaviors, self-efficacy and goal-setting (6).

Obesity and being overweight have been shown to cause major health problems for children as well as adults. Cardiovascular disease (CVD) risk factors in childhood continue to exist in adult years (7). Therefore, the prevention of CVD risk factors among children would slow the progress of the disease in later life (8). One of the major risk factors is the significant decrease in physical activity (PA) among children of all ages, leading to more sedentary lifestyles; this behavior alone has been shown to lead to heart-related risk factors such as increased systolic blood pressure (SBP) (9-16), poor lipid profile (8), type 2 diabetes mellitus (17-21) and iron deficiency anemia (22).

Poor diet, another alarming global trend, also contributes to overweight/obesity. There is an association between consumption of sugar-sweetened beverages (SSB) and weight status among children aged 2-16; children who consumed SSB more than 1 serving were obese or overweight (23). High-fat foods have been described as a non-nutrient dense (NND) snack (24). These NND foods typically include potato chips, candy and cookies. A study of 201 children in 3rd to 6th grade categorized them according to four snacking conditions: vegetable only, cheese only, potato chips only, cheese and vegetables. The study found that eating potato chips was significantly higher among those who did not consume cheese and vegetable snacks, while those eating healthy snacks reduced their consumption of extra calories. The children who ate a combined vegetable and cheese snack consumed 72% fewer calories than those in the other groups (24). The top dietary energy sources of children ages 2-18 include added sugar and solid

fats were also noted by a study using data from NHANES (25). The results of a related cross-sectional study showed that SSBs from combined soda and fruit drinks totaled 173 kcal/day, and 40% of total energy consumed came from empty calories, the sum of energy from solid fats and added sugars (25).

The KQ program has previously revealed consequential improvements in dairy and breakfast consumption, frequency of reading food labels, food label knowledge and lipid outcomes among intervention group (IG) participants (26-28). To our knowledge, no studies in South Dakota and few in the U.S. have evaluated the association between nutrition intervention and risk factors for CVD in children and adolescents. The purpose of this study was to determine the efficacy of the KQ nutrition and physical activity program in improving blood pressure (BP), lipid levels, hemoglobin (Hb), BMI and dietary choices (DC) in reducing the proportion of children who are overweight and obese within South Dakota 5th and 6th grade children using baseline/post-intervention data.

METHODOLOGY

Selection of Schools

School administrators were contacted to confirm their interest in participating in the study; letters were mailed reaffirming this, and verbal and signed approvals were obtained. Six schools were randomly assigned to the control and intervention groups; the remaining 7 schools were assigned based on their willingness to participate resulting in 6 control and 7 intervention schools.

Participants

Two hundred fifty four 5th and 6th grader students were invited to participate from 13 elementary schools in rural South Dakota via parents' conference day and/or distribution of the KQ program invitation brochure being mailed to parents/guardians through school administrations. Seven elementary schools implemented the KQ program. The program was implemented in collaboration with the Family, Career, and Community Leaders of America (FCCLA) program (29). In this study, Institutional Review Board (IRB) approval was obtained through the South Dakota State University Human Subjects Committee.

Program Teachers

Two teacher types were trained to present KQ to the intervention students, teen teachers (TT) and SNAP-ED staff. The TT were recruited through the FCCLA teachers in each district. In these high schools, the TT had the option to participate in KQ as one of their subjects or as a FCCLA project. Teen teachers were trained by the researchers and a registered dietitian for a total of 3-4 hours on KQ topics, teaching techniques, program instructions, guidelines, procedures and schedules; they worked directly with the children

and teachers to implement and monitor the program; FCCLA teachers were also encouraged to attend each session.

The second teacher type presenting KQ to students was SNAP-ED staff who were selected from South Dakota State University Extension. In South Dakota, extension SNAP-ED teachers taught the students at some KQ schools. SNAP-ED received previous nutrition training as part of their job; they were required to attend bi-annual professional development training. Also, they receive at a minimum two times per year around 10 hours or a total of approximately 20 hours professional development related training related to nutrition, physical activity and wellness per year. They also paid to do the teaching as part of their employment.

Two of the intervention schools had SNAP-ED staff teaching the KQ lessons; in the other five intervention schools, TT taught the lessons. The required KQ instructional supplies were provided to each school.

Instruments

Youth Survey Form

Students completed the KQ Youth Nutrition and Physical Activity Surveys (KYNPAS) before the intervention and approximately 6 months post program initiation ended. Class time was used to administer the surveys and complete the lessons, while measurements were obtained at the beginning of a school day. The KYNPAS questions were adapted from the School, Physical Activity and Nutrition Survey tool (30), and from Girls Health Enrichment Multisite Studies of Food Availability Questionnaires.

Detailed survey instructions were read in class to all participants by trained interviewer. The KYNPAS asked for the following demographic information: age, grade,

gender, and ethnicity. Some items asked for the number of times youth ate specific foods the day before, providing some highlights on their food patterns. Participants were also asked about healthy food consumption, including serving and portion sizes, use of food labels, and breakfast habits. Questions also covered specific nutrition facts on food labels, such as amounts of fat and sugar, whether meal times existed in their family during a week, nutrition behaviors such as cooking or snack suggestions, and whether any physical activities were done with any family members during the past week. Finally, the survey asked about food availability and if youth had certain food items during the past week in their home, such as fruits, dairy products, cereals, processed foods, and sweet or fatty foods. Only questions that match all schools were analyzed in this study.

All participants had the right to skip any question they did not want to answer, and were told that the survey would not affect their grades in school or their ability to take part in any of the KQ activities. They were assured that the information obtained would be kept confidential and coded.

The reliability of the youth survey was evaluated using 52 5th and 6th grade students. They were given a second survey seven days after the post survey was completed. Cronbach alpha indicators for internal consistency showed 85% of the variables had a reliability of 0.70 and higher, 11% between 0.58-0.69, and 4% (only one variable) less than 0.50 (28).

Anthropometrics and Biochemical Assessments

Students' parents were contacted by research assistants the day before measurements were obtained, providing detailed instructions on required protocol procedures. Children were provided breakfast after the data was obtained.

Typical cutoff and reference points were used in all measures. Desired BMI cut-off values were calculated and categorized using Centers for Disease Control and Prevention (CDC) charts (31-35). In 2007, desired cut-off values of BMI were categorized using categories for children according to the CDC charts (36) for children aged 2-20, with normal cut off values: BMI < 5th percentile is considered underweight, \geq 5th to < 85th percentile is a healthy weight, \geq 85th to < 95th percentile is overweight, and \geq 95th percentile is considered obese (37). Growth charts are based on BMI for age and sex specific percentiles, because children are still growing and body fat changes as they grow, and the difference of body fat percentiles between boys and girls (37-38).

Weight was measured in kg to the nearest 0.1 kilogram (Seca, Vogel & Halke, Germany). Weight was taken twice and averaged. Height was measured using the Adult/Child Shorrboard (Shorrboard Productions, Olney, MD); height was taken twice and averaged to the nearest 0.1 centimeters. The OMRON Intelli Sense® Digital Blood Pressure Monitor was used to obtain the diastolic blood pressure (DBP) and SBP. Two measurements were obtained and averaged, with normal values based on standardized age specific measurements (38). Biochemical assessments were obtained by finger prick to obtain small blood samples (4-5 drops, 1 drop= 35 μ l). Lipid levels were analyzed using National Heart, Lung, and Blood Institute and National Cholesterol Education Program standards (31, 32). Anemia was diagnosed using age-specific cutoff values Hb

from the Centers for Disease Control and Prevention (33). Cholestech® LDX Analyzer P.A. (Polymer Technology Systems, Inc, Inverness Medical, Hayward, CA.) was used to obtain total cholesterol (TC), high density lipoprotein (HDL) and Hb levels (Table 1). Following data collection and analysis, outcomes for each child were provided to parents; no personal or demographic information was incorporated. .

Procedure

KidQuest is a South Dakota Signature program, designed by South Dakota Extension Educators, focused on teaching 5th and 6th graders in their classrooms about healthy nutrition and physical activity. The KQ sessions are designed to enhance classroom curriculums and to provide content standards that link with the South Dakota Department of Education curriculum standards for health education, reading and math. The KQ curriculum was taught by both SNAP-ED and TT using six different 50-minute hands-on nutrition education activities provided in the classroom on a 1 or 2 times per month basis over the course of 4-6 months (Table 2). General Educator Instructions were also provided to the teachers in order to run the KQ curriculum. These instructions included a letter to educators/teachers, an educator feedback card and planning/scheduling guidelines. Incentives were provided to students and the school for participation in the KQ program.

Statistical Analysis

A linear mixed model was used to evaluate the statistical significance of differences in mean values at baseline between participants from the two groups. Regression analyses using linear mixed models were used on the outcome variables, which would adjust for both the clustering effects of schools and for covariates considered to be potential

confounders. These models would measure and evaluate the statistical significance of the differences between the two groups in changes from baseline to post-intervention values. Data analyses were conducted using SPSS[®] statistical software (IBM[®], Version 20.0, 2012) and Stata/IC Version 12.1 for Windows[®]. A p-value < 0.05 significance level was used.

To evaluate the statistical significance of possible differences in mean values at baseline between students from the two groups, a random effects regression model was fit for each variable. The student's value at baseline was an independent variable; the group membership (control/intervention) was a predictor, along with gender as a covariate. Group membership was coded as 0=control group, 1=intervention group. School was entered as a random effect, to adjust for clustering effects, which were to be expected (i.e., students in the same school should behave more similarly than students in different schools). The null hypothesis was that the coefficient for the group variable was equal to zero (i.e., no mean difference in change between students for the two groups); the alternate hypothesis was that the coefficient was not equal to zero (i.e., that there were differences in the mean change). Since the regression model adjusts for school-to-school differences, the regression estimate will not necessarily agree with the raw difference between mean scores. For dichotomized variables (categories), a logistic mixed model was used, set up in the same manner. The null hypothesis was that the odds ratio for differences between students from the two groups was equal to 1.

RESULTS

Of the 254 5th and 6th grade students invited to participate from 13 elementary schools, 66% agreed to participate (47% male). Within the control group (CG) 45% were male and from the IG 53% were male. Participant characteristics are presented in Table 3, while a flow chart of the study participants shown in Figure 1.

Health characteristics were compared between the two groups. There were two statistically significant differences in mean values at baseline between the groups: 1) systolic blood pressure and 2) diastolic blood pressure. The mean difference for SBP (CG mean minus IG mean) was 5.5 (95% CI: 2.39, 8.70). The mean difference for DBP (CG mean minus IG mean) was 4.6 (95% CI: 1.79, 7.38) (Table 4).

Mean Value Changes from Baseline to Post-Intervention

Characteristics were reassessed 6 months post-intervention. The change from baseline was calculated and compared between participants from the two groups. There were no statistically significant differences in mean change between the two groups for these variables (Table 5).

Dietary intake differences in change between groups from baseline to approximately 6 months post-intervention

The statistical significance of differences in changes (from baseline to 6 months post-intervention) was assessed by a generalized linear mixed model (a logistic regression). The dependent variable was the dichotomized response to each question, where the response was classified as ‘no consumption’ vs. ‘some consumption’ or ‘no/not

sure' vs. 'yes'. The data was coded with 'no consumption'/'no' coded as 0, 'some consumption'/'yes' as 1. The models included school as a random effect (which would adjust for both the possible clustering effects of within schools), two covariates considered to be potential confounders – gender and the baseline response, and the group status (CG vs. IG). The coefficient for this variable was used to assess the difference in change between the control and intervention groups. For the consumption models, the odds ratio had to be interpreted by item, because for some items 'no consumption' was healthier; for others it was unhealthier.

There were two measures for which there were statistically significant differences in the changes between the control and intervention groups. For the question "Yesterday, how many times did you eat any type of candy?" (listed in table 7 as 'Candy'). The IG showed more change in a healthier direction (decreased consumption): (odds ratio= 0.562; 95% CI= 0.361, 0.874, p=0.011) (Table 7). For the question (listed in table 7 as 'Whole grain cereal, whole grain bread or whole grain crackers'). The IG showed more change in a healthier direction (increased consumption): (odds ratio= 1.816; 95% CI= 1.038, 3.178, p=0.037) (Table 6).

DISCUSSION

Increased nutrition knowledge among children and adolescence through school-based nutrition and physical activity programs has been associated with improvements in lifestyle, eating habits, physical activity and health measures (34-35, 39- 41). This study compares improvements (declines) between a control and intervention groups. It was also hypothesized that there would be statistically significantly different changes (from baseline to approximately 6 months post-intervention) between the control and intervention groups for BP, lipid levels, Hb, BMI and DC. With the exception of two measures SBP and DBP (Table 4), the means for all baseline characteristics were not statistically significantly different between the two groups prior to the nutrition and activity intervention. If the groups were significantly different in many measures, this would threaten the validity of comparing the changes between them to judge the effects of the intervention.

Researchers found that their IG significantly decreased intake of total sweets, while intake increased in the CG (42); which is in agreement with this study findings of IG towards healthier direction of decreased consumption of candy (Table 6). These findings were also consistent with the study found that a nutrition education curriculum delivered a modest increase in nutrition knowledge scores, and more children at intervention schools ate a healthier diet (39.6%) or would try to eat a healthy diet (35.7%) than those in control schools (34.4% and 31.7%) respectively; $p < 0.001(5)$; and agree with other studies where children statistically reduce their sweet intake (43) (44).

This study found that IG showed more change in a healthier direction with increased consumption for 'Whole grain cereal, whole grain bread or whole grain crackers': (odds

ratio= 1.816; 95% CI= 1.038, 3.178, $p=0.037$) (Table 6). Likewise, dietary intake of fiber among IG in school-based intervention was significant over time (43); and concurs with another study found a higher consumption of fiber after 6-months of intervention such as brown bread (2.5g; 95% CI 0.7, 4.2g; $p=0.005$) (44); and among 23 rural intervention schools in increased knowledge of fiber food frequency score ($p<0.003$) (45). This study also contradicted findings of a study where grains intake insignificant among 13 school-based interventions (46).

The strengths of this intervention study were that it was implemented during the school day and in the classrooms by more than one peer teacher through the FCCLA, rather than by individuals. Also, the intervention schools provided full curriculum materials to be used in different health-related classrooms. The control and intervention groups were in different schools, although some were located in the same county; this reduced the possibility of cross-contamination via communication between the groups. A nutrition curriculum is a major part of education at these schools. This education provides a healthy nutritional intervention program, which should lead to healthy eating behaviors and a healthier population in the future.

Limitations

This study has some limitations, including no one-year follow-up data analyzed; the researcher believes that adding 12-month post-intervention data would contribute to the promising outcomes. The use of self-administered questionnaires may also be a weakness, since participants need to recall their food consumption or availability at home the week before; this may provide a biased report of the results. Also, this study is at risk of a type I error, which may increase with further analyses. The randomization of 6 out of

13 schools was not as desirable as full randomization, although randomized studies are not always unbiased or fully reliable. Also, regarding N/A values indicated in Table 6 for “Elevated TC”; For TC, the researcher re-ran the model; only five subjects changed status, all in the control group. The confidence interval is extremely wide, reflecting the problem with fitting this model to the data (the predictors were the baseline status, gender, school and control/intervention group status). The p-value was 0.407; the difference in changes between the two groups was not statistically significant. Given that there was a change for only three individuals, a model taking into account school, gender and previous status cannot be computed (there are more parameters than data points). The model would not converge. And under “Obese (≥ 95 th percentile for Body Mass Index) vs. Normal” variable in the same table, the N/A occurred because only one person shifted categories (the 13 \Rightarrow 14 in the control group); again there were not enough changes to fit the desired model.

Conclusion

The KQ program appears to be successful in improving the potential health of children and adolescents in rural South Dakota schools. The improvements of some DC in IG are encouraging findings. Also, KQ provides reinforcement for nutrition and physical education in the school setting, is able to significantly put healthy outcomes into practice, and improve some of the health parameters that prevent childhood obesity. Further observational research should focus on how these children response and interact during intervention and ensure sustainability of the program.

Implications for School Health

School administrators should be asked to help sustain the KQ program in South Dakota. This study's findings support the need for health programs in the schools in order to fight obesity. The Federal law to apply such school-based programs should also be addressed in the school settings and to prevent any conflict with their education. Since this research shows a promising health potential for children and adolescents, more programs could be developed, while providing a useful addition to the literature and body of practice. Long-term school and family-based programs, along with further qualitative research, would be created to insure more interaction between schools, families and children. Adding a one- or two-year follow-up protocol while closely monitoring the children would ensure a lasting positive health intervention.

TABLES

Table 1 Outcome variables and cut off values

Variable	Cut off values
Body Mass Index	<ul style="list-style-type: none"> • BMI < 5th percentile is considered underweight • \geq 5th to < 85th percentile is a healthy weight • \geq 85th to < 95th percentile is overweight • \geq 95th percentile is considered obese
Anemia	<ul style="list-style-type: none"> • < 11.5 g/dl
Elevated Total Cholesterol	<ul style="list-style-type: none"> • \geq 200 mg/dl
Low High Density Lipoprotein	<ul style="list-style-type: none"> • < 35 mg/dl
Blood Pressure	<ul style="list-style-type: none"> • Normal values based on BP tables for children percentile equal or more than 90th to less than 95th

Table 2 KidQuest Curriculum Components

Nutrition Lessons: Six different 50 minute hand on nutrition education activities are provided in the classroom on a 1 or 2 times per month basis over the course of 4-6 months.

1. Introduction, Label Lingo and Think Your Drink

* Recognition of actual sugar content In beverages with healthier drink options presented.

2. Eating Out, Portion Sizes, and Snacks

* Visit Mock restaurants and determine amount of fat and calories in various menu items.

* Instruction on nutrition facts label and portion sizes as tools for choosing snacks.

3. Fruits and Veggies

* Play fruit and veggie bingo and sample fruits and veggies ideal for healthy snack choices.

4. Grains and Breakfast

* Recognition of the benefits of breakfast with an exercise on coming up with solutions to common excuses for skipping breakfast.

* Team challenge activity related to healthy whole grain and breakfast choices.

5. Dairy Intake

* Participants learn about the importance of not robbing their bones as they play "Bone Banking" game similar in fashion to the popular Monopoly board game.

6. Consumer Connections, Media Messages, and Wrap-up

* Food advertising is presented with the tools needed to determine fact from fiction.

Physical Activity Lesson:

* Physical activity lessons benefits with tips on how to incorporate the activities outside of the classroom follow each nutrition lesson. 10-15 minute physical activities are conducted.

Quest Challenges: Participants can pick 1 challenge to take home between nutrition lessons.

* The challenge choices are: increasing calcium, decreasing junk food, eating breakfast, increasing fruits and veggies, think your drink, whole grains, decrease screen time and physical activity. Tips for meeting the challenge along with goal setting are provided.

* KidQuest Bucks are awarded for attempting a challenge and turing in a challenge calendar with extra bucks awarded for discussing the challenge with the participant's parent.

* Health and physical activity related rewards can be purchased with KidQuest Bucks program.

Parent Newsletter:

* Provided four times during the program covering topics presented In the nutrition lessons.

Table 3 Characteristics of participants by group

	Total	CG* (N=88)	IG** (N=166)
Urban (vs. Rural)	54.6%	51.2%	56.4%
Tobacco use	0.8%	0.0%	1.2%
Grade (5 th vs. 6 th)	70.1%	68.2%	71.1%
Computer at home	93.2%	95.3%	92.1%
Ethnicity			
Caucasian	82.9%	92.2%	77.0%
American Indian	6.7%	4.7%	8.0%
Asian	0.6%	0.0%	1.0%
African American	2.4%	0.0%	4.0%
Mexican American	4.3%	1.6%	6.0%
Other	3.0%	1.6%	4.0%

*CG: Control group

**IG: Intervention group

Table 4 Characteristics of Participants at Baseline - Measurements for Control and Intervention Groups

Variable/Scale	CG**		IG***		P-Value for Difference at Baseline
	Mean±SD	N	Mean±SD	N	
Age	10.9±0.7	88	10.8±0.8	166	0.243
Body Mass Index	20.6±5.1	85	20.3±4.4	165	0.676
BMI Percentile	64.3±30.7	86	65.6±28.7	164	0.758
Systolic Blood Pressure	114.7±13.3	86	109.1±11.4	164	0.001*
Diastolic Blood Pressure	70.3±11.7	86	65.6±10.1	164	0.001*
Total Cholesterol	155.6±27.0	84	156.8±30.2	152	0.592
High Density Lipoproteins	47.4±14.3	84	46.3±15.3	152	0.949
Hemoglobin	13.7±1.1	85	13.9±1.2	155	0.823

*Indicates a statistically significant difference ($p \leq 0.05$)

**CG: Control group

***IG: Intervention group

Table 5 Mean Value Changes from Baseline to Post-Intervention for Students in the Control, Intervention Groups

Variable	CG**		IG***		P-Value for Difference in Change
	Mean Change \pm SD	N	Mean Change \pm SD	N	
Height	2.4 \pm 1.4	85	2.8 \pm 1.4	163	0.281
Weight	2.0 \pm 2.1	84	2.7 \pm 2.2	163	0.109
Body Mass Index	0.2 \pm 0.9	84	0.4 \pm .9	163	0.229
Body Mass Index Percentile	0.5 \pm 6.3	84	1.1 \pm 7.3	163	0.529
Systolic Blood Pressure	-3.4 \pm 12.6	85	0.8 \pm 11.8	161	0.597
Diastolic Blood Pressure	-2.8 \pm 12.3	85	2.6 \pm 12.3	161	0.226
Total Cholesterol	-8.2 \pm 20.3	83	-12.5 \pm 25.9	147	0.317
HDL Cholesterol	-2.2 \pm 9.9	83	-2.5 \pm 10.2	147	0.911
Hemoglobin	-0.1 \pm 1.1	84	0.1 \pm 1.4	146	0.624

*Indicates a statistically significant difference ($p \leq 0.05$)

**CG: Control group

***IG: Intervention group

Table 6 Comparison of The Dietary Intake Differences in Changes From Baseline to Post-Intervention For Intervention and Control Groups

Dietary Intake/Activity Variable	**CG				***IG				P-Value
	Baseline		Post-Intervention (6-Months)		Baseline		Post-Intervention (6-Months)		
	N	%	N	%	N	%	N	%	
Whole grain cereal, whole grain bread or whole grain crackers									
Some consumption	30	68%	28	64%	80	65%	94	75%	.037*
Fresh, frozen, dried or canned fruit (Do not count juice)									
Some consumption	60	71%	50	60%	87	54%	109	68%	.143
100% fruit juice									
Some consumption	39	46%	53	63%	67	42%	84	52%	.204
Fresh, frozen or canned vegetables									
Some consumption	37	84%	35	80%	106	82%	105	84%	.099
Regular pop (not diet), punch, Kool-Aid®, sports drinks, or other fruit-flavored drinks (Do not count 100% fruit juice or flavored water)									
Some consumption	54	64%	47	56%	98	60%	94	58%	.699
French fries or chips									
Some consumption	29	35%	38	45%	83	52%	72	44%	.214
Ice-cream, sweet rolls, doughnuts, cookies, brownies, pies or cakes									
Some consumption	30	36%	38	45%	79	50%	85	52%	.607
Candy									
Some consumption	39	47%	39	47%	86	53%	71	44%	.011*
Used Food Labels									
Yes	9	35%	8	29%	6	40%	10	53%	.523

*Indicates a statistically significant difference ($p \leq 0.05$)

**CG: Control Group

***IG: Intervention Group

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Chapter 4

**EFFECTIVENESS OF KIDQUEST: TEEN TEACHERS VS SUPPLEMENTAL
NUTRITION ASSISTANCE PROGRAM EDUCATION TEACHERS ON
DIETARY AND HEALTH OUTCOMES FOR SOUTH DAKOTA SCHOOL
CHILDREN**

NAYEF BUMARYOUM

Abstract: Nutrition and health outcomes in rural South Dakota 5th and 6th grade students were evaluated to determine which group of teachers resulted in better student outcomes. The two teacher groups were teen teachers (TT) and Supplemental Nutrition Assistance Program Education - Educators (SNAP-ED). Outcomes evaluated were dietary choices (DC), body mass index (BMI), lipid levels, blood pressure (BP) and hemoglobin (Hb). The KidQuest (KQ) nutrition and physical activity curriculum was implemented in seven schools (5 TT and 2 SNAP-ED taught). Outcomes were obtained at baseline and post-program in 166 participants (130 TT and 36 SNAP-ED taught). The mean Hb level increased significantly in students trained by the TT group as compared to the SNAP-ED group; The difference (mean for TT students minus mean for SNAP-ED students) was 0.6 (95% CI: 0.11, 1.75). Percentage in overweight, the odds of improvement were significantly higher for the SNAP-ED group (odds ratio= 0.01; 95% CI= 0.00, 0.73, p=0.037). Percentage in overweight and obese combined, the odds of improvement were significantly higher for the SNAP-ED group (odds ratio= 0.01; 95% CI= 0.00, 0.98, p=0.049). No statistically significant differences were found in dietary intake changes between the two teacher types. Overall, efficacy varied based on teacher type. Program success was demonstrated and should be implemented and evaluated on a larger scale.

Keywords: teen teachers, SNAP-ED Educators, KidQuest, Body Mass Index, obesity, blood pressure, anemia

INTRODUCTION

In 2011, (31.8%, 16.9%) of youth in the U.S. were considered overweight/obese (1). Statistics from the South Dakota Department of Health (SDDOH) in 2013/2014 revealed that within children ages 9-11, 17.4% were overweight and 17.9% were obese. For children ages 12-14, 17.7% were overweight and 17.4% were obese (2).

The obesity epidemic is on the rise among children and adolescents due to increased sedentary lifestyle, larger portion sizes served at restaurants, increased frequency of dining out and increased consumption of high sugar drinks (3). Experts agree that lifestyle changes such as eating behaviors, dietary intake and physical activity are contributing factors of obesity (4). Obesity prevention goals should focus on both primordial prevention (preventing the development of risk factors) and primary prevention (managing children at increased risk because of identified risk factors) (4).

Previous data indicate that informal nutrition education effectively promotes positive lifestyle changes in youth with results demonstrated in body mass index (BMI) and lowered fat intake (5).

Teen teaching provides the highest impact when implemented within the schools' health education program and has positively affected diet modification, BMI, eating behaviors, self-efficacy and goal-setting (6). Teen teaching has been used successfully to change behaviors, knowledge and attitudes of students (7).

The Supplemental Nutrition Assistant Program-Education (SNAP-ED) program, with training focusing on using MyPlate and Dietary Guidelines for Americans, is designed to improve healthy choices and promote active lifestyles within eligible participants (8). The program has resulted in significantly improved daily fruit and vegetable consumption,

willingness to try new fruits and vegetables, availability of fruits and vegetables at home, and increased fat free milk consumption (8, 9, 10). The SNAP-ED minimum qualification required for educators is a high school education at this point.

The KidQuest (KQ) program has previously demonstrated a significant increase in breakfast consumption, dairy consumption, food label knowledge and frequency of reading food labels (11). Also, KQ positive outcomes included significant decreased low density lipoprotein outcomes among intervention group (12).

Using the KidQuest nutrition and physical activity curriculum, the purpose of this study was to determine whether the Teen Teachers (TT) or the Supplemental Nutrition Assistance Program Education - Educators (SNAP-ED) were more effective in improving dietary choices (DC), body mass index, lipid levels, blood pressure (BP) and hemoglobin (Hb) within rural South Dakota 5th and 6th graders using baseline/post-intervention data.

METHODOLOGY

Study Design

The study used a clustered baseline design and compared pre- and post- KQ program data obtained from rural South Dakota 5th and 6th graders. Results were used to determine if the TT or the SNAP-ED were more effective in obtaining program objectives. The study was approved by South Dakota State University (SDSU) Human Subjects Review Board.

School and Participant Selection

One hundred sixty six 5th and 6th grade students were invited from seven elementary schools to participate via parents' conference day and/or distribution of the KQ program invitation brochure being mailed to parents/guardians through school administrations. The five schools that utilized TT were randomly selected. The two additional schools that utilized SNAP-ED were selected based on their willingness to participate. The seven participating elementary schools were located in rural eastern South Dakota and were within 125 miles of SDSU, Brookings, South Dakota.

Program Teachers

Teen teachers taught nutrition and physical activity lessons within five schools. The teens were recruited through Family, Career, and Community Leaders of America (FCCLA) teachers (Family, Career and Community Leaders of America). Teen teachers were provided three hours of training on teaching techniques, KQ program instructions, nutrition and physical activities lessons, and scheduling.

Extension SNAP-ED taught the nutrition lessons in two schools. In South Dakota, extension SNAP-ED teachers taught the students at some KidQuest schools. SNAP-ED

teachers received previous nutrition training as part of their job; they were required to attend bi-annual professional development training. Also, they receive at a minimum 20 hours per year of professional development related training related to nutrition, physical activity. They are also paid to do the teaching as part of their employment. The same curriculum was taught by both SNAP-ED and TT using hands on nutrition education and physical activities provided in the classroom, 1-2 times/month over the course of 4-6 months. The following topics were covered in the six lessons: (1) Introduction, Label Lingo and Think Your Drink, (2) Eating Out, Portion Sizes and Snacks, (3) Fruits and Veggies, (4) Grains and Breakfast, (5) Dairy Intake, (6) Consumer Connections, Media Messages and Wrap-up. A physical activity lesson was incorporated into all six sessions.

Instruments

Youth Survey Form

Students completed the KQ Youth Nutrition and Physical Activity Surveys (KYNPAS) prior to implementation of the KQ program and post program. The KYNPAS questions were adapted from the School, Physical Activity and Nutrition Survey (SPAN) tool (13) and from Girls Health Enrichment Multisite Studies (GEMS). Detailed survey instructions were read in class to all participants by trained interviewer. The KYNPAS asked for the following demographic information: age, grade, gender, and ethnicity. Some items asked for the number of times youth ate specific foods the day before, providing some highlights on their food patterns. Participants were also asked about healthy food consumption, including serving and portion sizes, use of food labels, and breakfast habits. Questions also covered specific nutrition facts on food labels, such as amounts of fat and sugar, whether meal times existed in their family during a week,

nutrition behaviors such as cooking or snack suggestions, and whether any physical activities were done with any family members during the past week. Finally, the survey asked about food availability and if youth had certain food items during the past week in their home, such as fruits, dairy products, cereals, processed foods, and sweet or fatty foods. It was explained to all participants that the survey would not affect their grades or ability to participate in the KQ activities. They were assured that all data obtained would be kept confidential.

The reliability of the youth survey was evaluated using 52 5th and 6th grade students. They were given a second survey seven days after the post survey was completed. Cronbach alpha indicators for internal consistency showed 85 of the variables had a reliability of 0.70 and higher, 11% between 0.58-0.69, and 4% (only one variable) less than 0.50 (11).

Anthropometrics and Biochemical Assessments

Standardized cutoff and reference points were used for all measurements. Height was obtained to the nearest 0.1 centimeters using the Adult/Child Shorrboard. Weight was obtained to the nearest 0.1 Kilogram using the Seca Scale 890. Anthropometrics obtained are listed in Table 1. Desired BMI cut-off values were calculated and categorized using the Centers for Disease Control and Prevention (CDC) charts (13, 14, 15, 16). Blood pressure was obtained using the OMRON Intelli Sense® Digital BP Monitor. Blood pressure categories (Table 1) were based on standardized age specific measurements (17). Biochemical assessments were determined using finger prick blood samples. Lipid levels cut off values (Table 1) were based on the age specific standards set by the National Heart, Lung, and Blood Institute and National Cholesterol Education

Program (18, 19). Hemoglobin values were obtained using the HemoCue Photometer Hb201+ (Angelholm, Sweden). Anemia was diagnosed using age-specific hemoglobin cutoff values (Table 1) (20). Students' parents were contacted the day before measurements were obtained and were reminded of the detailed protocol instructions.

Statistical Analysis

To evaluate the statistical significance of possible differences in mean values at baseline between students from the two teacher types, a random effects regression model was fit for each variable. The student's value at baseline was an independent variable; the teacher type (SNAP-ED vs TT) was a predictor. School was entered as a random effect, to adjust for clustering effects which were to be expected (i.e., students in the same school should behave more similarly than students in different schools). The null hypothesis was that the coefficient for the teacher type variable was equal to zero (i.e., no mean difference in change between students for the two teacher groups); the alternate hypothesis was that the coefficient was not equal to zero (i.e., that there were differences in the mean change). Since the regression model adjusts for school-to-school differences, the regression estimate will not necessarily agree with the raw difference between mean scores. For dichotomized variables (categories), a logistic mixed model was used, set up in the same manner. The null hypothesis was that the odds ratio for differences between students from the two teacher types was equal to 1.

Data analyses were conducted using SPSS[®] statistical software (IBM[®], Version 20.0, 2012) and Stata/IC Version 12.1 for Windows[®]. The criterion for assessing statistical

significance was a p-value < 0.05 ; all tests were two-tailed (looking for either increases or decreases).

RESULTS

Of the 166 5th and 6th grade students invited to participate from 7 elementary schools, 66% agreed to participate (47% male). Within the TT group 45% were male and from the SNAP-ED group 53% were male. Additional characteristics of participants are listed in Table 2, which is organized by teacher type group, created by the way that the waves of the study were done. A flow chart of the study participants also shown in Figure 2.

Health characteristics were compared between the two groups at baseline (Table 3). There were no statistically significant differences in mean values at baseline between the groups.

Mean Value Changes from Baseline to Post-Intervention

Characteristics were reassessed at approximately 6 months post-intervention. The change from baseline was calculated and compared between participants from the two teacher types (Table 4). When assessing mean value changes, hemoglobin was the only outcome to have a statistically significantly different change from baseline to post-intervention in students from the two teacher type groups (Table 4). Mean hemoglobin increased significantly in students trained by the TT group as compared to the SNAP-ED group. The difference (mean for TT students minus mean for SNAP-ED students) was 0.6 (95% CI: 0.11, 1.75).

Change in Categorical Medical Variables from Baseline to 6 Months Post-Intervention

The statistical significance of differences in changes (from baseline to 6 months post-intervention) was assessed by logistic regression. The dependent variable (outcome) was the status at the 6-month follow-up time. The baseline status and teacher type were used as covariates; the school was used as a random effect, to control for school differences and possible clustering effects.

The measures were dichotomized, classified as normal/abnormal (0/1, respectively). The model was set up so that the odds ratio compared changes in the SNAP-ED students to the changes in TT students (the SNAP-ED group was coded as 1; the TT group was coded as 0). An odds ratio of less than one indicates that there was a greater improvement for the SNAP-ED students than for the TT students.

There were two post program statistically significant changes between the SNAP-ED and TT groups and both reflected a positive change within the SNAP-ED group. Percentage in overweight, the odds of improvement were significantly higher for the SNAP-ED group (odds ratio= 0.01; 95% CI= 0.00, 0.73, p=0.037). Percentage in overweight and obese combined, the odds of improvement were significantly higher for the SNAP-ED group (odds ratio= 0.01; 95% CI= 0.00, 0.98, p=0.049). (Table 5).

Dietary intake change between teacher groups from baseline to 6 months post-intervention

Survey responses were dichotomized, and classified as ‘no consumption’ vs. ‘some consumption’ for data analysis. Results of change in dietary intake between teacher groups from baseline to post-intervention revealed no statistically significant differences between the two teacher types (Table 6).

DISCUSSION

In classrooms, teachers have a great impact on children's education. Previous studies indicate that using an informal nutrition technique most effectively promotes lifestyle changes for youth and encourages teachers to provide more in-class discussion regarding the importance of nutrition (5). In this research, we hypothesized that the baseline BMI, BP, Hb, lipid levels and DC would not be statistically significantly different between the two groups: the students taught by the teen teacher and those taught by SNAP-ED teachers. The two groups were very similar at baseline, which would support valid results at 6 months (Table 3).

The current study found a significant increase in the Hb level within the teen teachers' groups (Table 4). This finding is in agreement with the literature, which has reported that iron deficiency anemia was significantly reduced among nutrition education program students after intervention taught by teachers, even though the study does not explain the differences between the groups due to type of teaching (21). A literature search found no previous intervention studies which compared Hb outcomes among adolescents taught by a these two groups of teachers (TT and SNAP-ED), so this will be the first such study.

By looking at change in prevalence of abnormal values of medical variables from baseline to 6 months post-intervention, this study shows two statistically significant changes (from baseline to 6-months post program) between the SNAP-ED and TT groups. Both reflected a positive change within the SNAP-ED group relative to the TT group. Percentage in overweight, the odds of improvement were significantly higher for the SNAP-ED group (odds ratio= 0.01; 95% CI= 0.00, 0.73, p=0.037). Percentage in overweight and obese combined, the odds of improvement were significantly higher for

the SNAP-ED group (odds ratio= 0.01; 95% CI= 0.00, 0.98, p=0.049), respectively (Table 5). This finding is in agreement with the literature, which has reported where students in a school-based program taught by trained nutritionists have shown significant improvements towards a healthy weight category after intervention (22); and another obesity prevention program which showed significant results in normal BMI values post intervention taught by registered dietitians (23) and significant reduction in BMI in post intervention program taught by registered dietitians (24).

Researchers found significant improvements in attitude, self-efficacy, preference and knowledge scores about improving vegetable intake in a school-based intervention curriculum taught in SNAP-ED settings. The mean scores for the intervention group improved in vegetable preference, increasing by 1.56 (\pm 5.80) points, whereas the mean scores for control group increased only 0.08 (\pm 4.82) points (25). Another study noted an improvement in health knowledge and self-efficacy. Teen teaching was found to be effective in delivering nutrition education to children taught by teen mentors, resulting in positive health outcomes and knowledge (6); although both studies (6, 25) have not studied and compared teaching delivery methods; and in contrast to the current study finding of non-significant improvement in dietary intake in the students taught by both SNAP-ED and TT; even some non-significance outcomes of dietary intake exist (Table 6).

The current study is the first to observe and compare differences in delivery teaching methods is as effective using Social Cognitive Theory. A study limitation was the unequal sample size of the groups taught by TT vs. SNAP-ED teachers, including the

number of schools (5 vs. 2) and of participants (130 vs. 36). Additionally, only 5 out of 7 schools were randomly selected, which may produce a later bias.

Conclusions and Suggestions

The KQ program provided by TT and SNAP-ED is shown to be an effective and innovative approach to improving the health outcomes of the children and adolescents in these rural South Dakota schools in responding to obesity epidemic. This study suggests that the teen teachers and SNAP-ED educators facilitated significant improvements among the 5th and 6th graders' health parameters Hb and BMI.

Future Directions

Building healthier schools in the future is needed, and can be done by encouraging obesity prevention school policies and programs through federal regulations. Matching the right mentor to groups of children is very important. Also, adding qualitative research elements and more characteristic measurements to the research can increase the outcome measures to reflect positive health and nutritional behavior. Future research is needed to compare the teaching efficacy of teen teachers and other paraprofessional teachers in order to validate the most effective methods.

TABLES

Table 1 Outcome variables and cut off values

Variable	Cut off values
Body Mass Index	<ul style="list-style-type: none"> • BMI < 5th percentile is considered underweight • \geq 5th to < 85th percentile is a healthy weight • \geq 85th to < 95th percentile is overweight • \geq 95th percentile is considered obese
Anemia	<ul style="list-style-type: none"> • < 11.5 g/dl
Elevated Total Cholesterol	<ul style="list-style-type: none"> • \geq 200 mg/dl
Low High Density Lipoprotein	<ul style="list-style-type: none"> • < 35 mg/dl
Blood Pressure	<ul style="list-style-type: none"> • Normal values based on BP tables for children percentile equal or more than 90th to less than 95th

Table 2 Characteristics of participants by teacher type

Student Characteristics	Total	TT* (N=130)	SNAP-ED** (N=36)
Urban (vs. Rural)	56%	79.6%	20.4%
Use Tobacco	2%	0.0%	5.6%
Grade (5 th vs. 6 th)	71%	72.3%	66.7%
Computer at home	92%	90.7%	92.2%
Ethnicity			
Caucasian	77%	71.9%	86.1%
American Indian	8%	9.4%	5.6%
Asian	1%	0.0%	2.8%
African American	4%	4.7%	2.8%
Mexican American	6%	7.8%	2.8%
Other	4%	6.3%	0.0%

*TT: Teen Teachers

**SNAP-ED: Supplemental Nutrition Assistant Program-Education Educators

Table 3 Baseline Characteristics for Students Taught by TT and SNAP-ED Teachers

Variable	TT**		SNAP-ED***		P-Value for Difference at Baseline
	Mean±SD	N	Mean±SD	N	
Age (years)	10.8±0.8	130	10.8±0.9	36	0.540
Body Mass Index (BMI)	20.3±4.4	129	20.3±4.2	36	0.895
BMI Percentile	65.8±28.5	129	65.5±29.9	36	0.984
Systolic Blood Pressure	109.1±11.6	128	109.4±10.6	36	0.877
Diastolic Blood Pressure	66.2±10.6	128	63.9±8.0	36	0.238
Total Cholesterol	158.6±30.1	120	150.1±30.0	32	0.185
High Density Lipoproteins	44.8±14.8	120	51.9±16.2	32	0.230
Hemoglobin	13.9±1.1	123	13.6±1.3	32	0.602

*Indicates a statistically significant difference ($p \leq 0.05$).

**TT: Teen Teachers

***SNAP-ED: Supplemental Nutrition Assistant Program-Education Educators

Table 4 Mean Value Changes from Baseline to Post-Intervention for Students Taught by TT as compared to those Taught by SNAP-ED

Variable	TT Group**		SNAP-ED Group***		P-Value for Difference in Change
	Mean Change \pm SD	N	Mean Change \pm SD	N	
Body Mass Index (BMI)	0.5 \pm 0.9	127	0.2 \pm 0.7	36	0.093
BMI Percentile	1.2 \pm 7.5	127	0.7 \pm 6.4	36	0.762
Systolic Blood Pressure	1.0 \pm 12.1	125	0.1 \pm 11.1	36	0.683
Diastolic Blood Pressure	2.4 \pm 13.4	125	3.1 \pm 7.8	36	0.651
Total Cholesterol	-15.2 \pm 26.2	116	-2.6 \pm 22.2	31	0.064
High Density Lipoproteins	-2.0 \pm 10.2	116	-4.7 \pm 10.4	31	0.618
Hemoglobin	0.2 \pm 1.4	115	-0.4 \pm 1.4	31	0.034*

*Indicates a statistically significant difference ($p \leq 0.05$).

**TT: Teen Teachers

***SNAP-ED: Supplemental Nutrition Assistant Program-Education Educators

Table 5 Change in Categorical Medical Variables from Baseline to 6 Months Post-Intervention

Variable	TT**				SNAP-ED***				OR (95%CI)	P-value
	Baseline		Post-Intervention (6-Months)		Baseline		Post-Intervention (6-Months)			
	N	% of Group	N	% of Group	N	% of Group	N	% of Group		
Elevated Systolic Blood Pressure	36	28.1%	26	20.6%	12	33.3%	7	19.4%	0.72 (0.25,2.10)	0.540
Elevated Diastolic Blood Pressure	23	18.0%	27	21.4%	2	5.6%	6	16.7%	0.87 (0.32,2.37)	0.783
Low Hemoglobin	1	0.8%	2	1.7%	1	3.1%	3	9.7%	6.06 (0.97,38.22)	0.070
Percentage in Overweight ($\geq 85^{\text{th}}$ - $< 95^{\text{th}}$ percentile for Body Mass Index)	19	18.6%	21	20.6%	5	17.9%	3	10.7%	0.01* (0.00,0.73)	0.037
Percentage in Obese ($\geq 95^{\text{th}}$ percentile for Body Mass Index)	21	21.0%	21	21.0%	7	23.3%	7	23.3%	N/A (no change in either group)	
Percentage in Overweight or Obese combined ($\geq 85^{\text{th}}$ - $\geq 95^{\text{th}}$ percentile for Body Mass Index)	45	34.9%	46	36.2%	13	36.1%	11	30.6%	0.01* (0.00,0.98)	0.049

*Indicates a statistically significant difference ($p \leq 0.05$).

**TT: Teen Teachers

***SNAP-ED: Supplemental Nutrition Assistant Program-Education Educators

Table 6 Change in Dietary Intake Between Teacher Groups from Baseline to Post-Intervention

Dietary Intake Variable	TT Group**				SNAP-ED Group***				P-Value
	Baseline		Post-Intervention (6-Months)		Baseline		Post-Intervention (6-Months)		
	N	%	N	%	N	%	N	%	
Whole grain cereal, whole grain bread or whole grain crackers									
Some Consumption	85	68.0%	93	74.4%	24	66.7%	30	83.3%	0.107
Fresh, frozen, dried or canned fruit (Do not count juice)									
Some Consumption	64	51.6%	81	65.3%	23	63.9%	28	77.8%	0.194
100% fruit juice									
Some Consumption	50	40.0%	62	49.6%	17	47.2%	22	61.1%	0.643
Fresh, frozen or canned vegetables									
Some Consumption	72	57.6%	69	55.2%	22	61.1%	24	66.7%	0.215
Regular pop (not diet), punch, Kool-Aid®, sports drinks, or other fruit-flavored drinks (Do not count 100% fruit juice or flavored water)									
Some Consumption	77	61.1%	71	56.3%	21	58.3%	23	63.9%	0.633
French fries or chips									
Some Consumption	65	51.6%	55	43.7%	18	54.5%	15	45.5%	0.897
Ice-cream, sweet rolls, doughnuts, cookies, brownies, pies or cakes									
Some Consumption	58	46.4%	68	54.4%	21	63.6%	14	42.4%	0.119
Candy									
Some Consumption	65	52.0%	52	41.6%	21	58.3%	19	52.8%	0.727

*Indicates a statistically significant difference ($p < 0.05$).

**TT: Teen Teachers

***SNAP-ED: Supplemental Nutrition Assistant Program-Education Educators

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Appendix A



KidQuest Youth Nutrition and Physical Activity Survey

Name of School: Pre-survey
 ID Code: Post-survey
 Today's date:

1. What month were you born? (circle one) Jan Feb March April May June July Aug Sept Oct Nov Dec
 Date you were born? (circle one) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
 18 19 20 21 22 23 24 25 26 27 28 29 30 31
 What year were you born? (please write in the year) _____

2. What grade are you in? (circle one) 4th 5th 6th 7th 8th 9th 10th 11th 12th
 3. Are you a boy or a girl? Boy Girl
 4. How do you describe yourself? (fill in only one)
 White, non-Hispanic, non-Latino American Indian Asian
 Black or African American Alaska Native Other
 Native Hawaiian or Pacific Islander Mexican American, Latino or Hispanic

These questions are about YESTERDAY .	None ▼	1 TIME ▼	2 TIMES ▼	3 or MORE TIMES ▼
5. Yesterday, how many times did you eat or drink: cheese, cottage cheese, yogurt or milk?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Yesterday, how many times did you eat <i>whole grain</i> cereal, <i>whole grain</i> bread, or <i>whole grain</i> crackers?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Yesterday, how many times did you eat fresh, frozen, dried or canned fruit? (Do not count juice.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Yesterday, how many times did you drink 100% fruit juice?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Yesterday, how many times did you eat fresh, frozen, or canned vegetables?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Yesterday, how many times did you drink any regular pop (not diet), punch, Kool-Aid®, sports drinks, or other fruit-flavored drinks? (Do not count 100% fruit juice or flavored water.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Yesterday, how many times did you eat French fries or chips? (Include potato chips, tortilla chips, or other snack chips)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Yesterday, how many times did you eat ice-cream, sweet rolls, doughnuts, cookies, brownies, pies or cakes?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. Yesterday, how many times did you eat any type of candy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please continue on the next page. →

14. How many days per week do you usually eat breakfast?
- | | | | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| days | day | days | days | days | days | days | days |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

15. From which food group should you eat the *fewest* servings each day?

- Breads, cereals, rice, pasta
 Vegetables
 Fruits
 Dairy Products (milk, cheese)
- Meats, fish, poultry, beans, eggs, nuts
 Fats, oils, sweets
 I don't know

16. How many total servings of fruits and vegetables should you eat each day?

- At least 2
 At least 3
 At least 4
 At least 5
 I don't know

17. In the past week, have you used the Nutrition Facts food label to help you decide if the food you eat is a healthy choice or a food you should eat less of?

- Yes
 No
 Not Sure

18. Look at the amount of fat on each label. Select the food label that would provide the least amount of fat if you ate the whole package. (select only one)

This one

Nutrition Facts	
Serving size: 5 pieces	
Servings per package: 2	
Amount per serving	
Calories	100
Calories from Fat	45
% Daily Value	
Total Fat 5 g	8%
Cholesterol 0 mg	0%

This one

Nutrition Facts	
Serving size: 5 pieces	
Servings per package: 3	
Amount per serving	
Calories	200
Calories from Fat	90
% Daily Value	
Total Fat 10 g	15%
Cholesterol 0 mg	0%

This one

Nutrition Facts	
Serving size: 5 pieces	
Servings per package: 1	
Amount per serving	
Calories	100
Calories from Fat	45
% Daily Value	
Total Fat 5 g	8%
Cholesterol 0 mg	0%

19. Look at the amount of sugar on each label. Select the food label that would provide the least amount of sugar if you ate the whole package. (select only one)

This one

Nutrition Facts	
Serving size: 12 oz	
Servings per package: 1.0	
Amount per serving	
Calories	152
Calories from Fat	0
% Daily Value	
Total carbohydrate 38 g	13%
Dietary fiber 0 g	0%
Sugars 38 g	

This one

Nutrition Facts	
Serving size: 12 oz	
Servings per package: 2.5	
Amount per serving	
Calories	152
Calories from Fat	0
% Daily Value	
Total carbohydrate 38 g	13%
Dietary fiber 0 g	0%
Sugars 38 g	

This one

Nutrition Facts	
Serving size: 12 oz	
Servings per package: 2.0	
Amount per serving	
Calories	152
Calories from Fat	0
% Daily Value	
Total carbohydrate 38 g	13%
Dietary fiber 0 g	0%
Sugars 38 g	

20. I usually do a total amount of physical activity each day for:

- 1 hour or more 30 to 45 minutes Less than 30 minutes I hardly ever exercise

21. How many hours per day do you usually spend on the computer away from school? (Include time spent surfing the internet and instant messaging or texting on a cell phone.)

- 6 hours or more 5 hours 4 hours 3 hours
 2 hours 1 hour Less than 1 hour

22. How many hours per day do you usually spend watching TV or video movies away from school?

- 6 hours or more 5 hours 4 hours 3 hours
 2 hours 1 hour Less than 1 hour

23. How many hours per day do you usually spend playing video games like Nintendo®, Sega®, Play Station®, Xbox®, GameBoy® or arcade games away from school? (Don't include time you spend playing a physically active game like Dance Dance Revolution®, Wii® sports games or Wii Fit®.)

- 6 hours or more 5 hours 4 hours 3 hours
 2 hours 1 hour Less than 1 hour

24. Think about the past week and please select one of the boxes for each meal that fits the number of times you eat each of the following meals at home with at least one other member of your family:

	0 times this week	1 time this week	2 times this week	3 times this week	4 times this week	5 times this week	6 times this week	7 times this week
Breakfast	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lunch	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dinner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Yes	No	Not Sure
25. In the past week, have you talked with any member of your family about eating healthier foods?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. In the past week, have you given any member of your family an idea for a new snack?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27. In the past week, have you helped plan or cook any meals for your family?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28. In the past week, have you done any physical activities with at least one other member of your family?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In the past week did you have.....	Yes ▽	No ▽	Not Sure ▽
29. Fresh, frozen, canned, or dried fruit available for you to eat in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30. Fresh frozen, or canned vegetables available for you to eat in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
31. Cut up fresh vegetables on a shelf in the refrigerator?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
32. Yogurt in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
33. Milk in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
34. Cheese in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
35. Cookies, pies, cakes, or snack cakes in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
36. Chips in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
37. Ice cream or frozen yogurt in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
38. Granola or breakfast bars in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
39. TV dinners, frozen dinners, chicken nuggets, or fish sticks in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
40. Hot dogs or bologna in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
41. Oatmeal in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
42. Whole grain cold cereal in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
43. Cold cereal that isn't whole grain in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
44. Whole grain bread in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
45. Donuts, sweet rolls, or muffins in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Note: Questions 5-13, 15-18 and 20-23 are adapted from the School, Physical Activity and Nutrition Survey (SPAN) tool. Questions 25-45 are adapted from the GEMS Food Availability Questionnaires, Bar-



**End of Survey
Thank You**



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South Dakota State University, South Dakota counties, and USDA cooperating. South Dakota State University adheres to AA/EEO guidelines in offering educational programs and services.

Appendix B



KidQuest Youth Nutrition and Physical Activity Survey

Name of School: Pre-survey
 ID Code: Post-survey
 Name: _____ Today's date: 1 year survey

1. What month were you born? (circle one) Jan Feb March April May June July Aug Sept Oct Nov Dec
 Date you were born? (circle one) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
 18 19 20 21 22 23 24 25 26 27 28 29 30 31
 What year were you born? (please write in the year) _____

2. What grade are you in? (circle one) 4th 5th 6th 7th 8th 9th 10th 11th 12th
 3. Are you a boy or a girl? Boy Girl
 4. How do you describe yourself? (fill in only one)
 White, non-Hispanic, non-Latino American Indian Asian
 Black or African American Alaska Native Other
 Native Hawaiian or Pacific Islander Mexican American, Latino or Hispanic

These questions are about YESTERDAY.	None ▼	1 TIME ▼	2 TIMES ▼	3 or MORE TIMES ▼
5. Yesterday, how many times did you eat or drink: cheese, cottage cheese, yogurt or milk?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Yesterday, how many times did you eat <i>whole grain</i> cereal, <i>whole grain</i> bread, or <i>whole grain</i> crackers?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Yesterday, how many times did you eat fresh, frozen, dried or canned fruit? (Do not count juice.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Yesterday, how many times did you drink 100% fruit juice?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Yesterday, how many times did you eat fresh, frozen, or canned vegetables?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Yesterday, how many times did you drink any regular pop (not diet), punch, Kool-Aid®, sports drinks, or other fruit-flavored drinks? (Do not count 100% fruit juice or flavored water.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Yesterday, how many times did you eat French fries or chips? (Include potato chips, tortilla chips, or other snack chips)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Yesterday, how many times did you eat ice-cream, sweet rolls, doughnuts, cookies, brownies, pies or cakes?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. Yesterday, how many times did you eat any type of candy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please continue on the next page.

14. How many days per week do you usually eat breakfast? 0 1 2 3 4 5 6 7
 days day days days days days days days

15. From which food group should you eat the *fewest* servings each day?

- Breads, cereals, rice, pasta Vegetables Fruits Dairy Products (milk, cheese)
- Meats, fish, poultry, beans, eggs, nuts Fats, oils, sweets I don't know


16. How many total servings of fruits and vegetables should you eat each day?

- At least 2 At least 3 At least 4 At least 5 I don't know


17. In the past week, have you used the Nutrition Facts food label to help you decide if the food you eat is a healthy choice or a food you should eat less of?

- Yes No Not Sure


18. Look at the amount of fat on each label. Select the food label that would provide the least amount of fat if you ate the whole package. (select only one)

This one 

Nutrition Facts	
Serving size: 5 pieces	
Servings per package: 2	
Amount per serving	
Calories	100
Calories from Fat	45
% Daily Value	
Total Fat 5 g	8%
Cholesterol 0 mg	0%


This one 

Nutrition Facts	
Serving size: 5 pieces	
Servings per package: 3	
Amount per serving	
Calories	200
Calories from Fat	90
% Daily Value	
Total Fat 10 g	15%
Cholesterol 0 mg	0%


This one 

Nutrition Facts	
Serving size: 5 pieces	
Servings per package: 1	
Amount per serving	
Calories	100
Calories from Fat	45
% Daily Value	
Total Fat 5 g	8%
Cholesterol 0 mg	0%


19. Look at the amount of sugar on each label. Select the food label that would provide the least amount of sugar if you ate the whole package. (select only one)

This one 

Nutrition Facts	
Serving size: 12 oz	
Servings per package: 1.0	
Amount per serving	
Calories	152
Calories from Fat	0
% Daily Value	
Total carbohydrate 38 g	13%
Dietary fiber 0 g	0%
Sugars 38 g	

This one 

Nutrition Facts	
Serving size: 12 oz	
Servings per package: 2.5	
Amount per serving	
Calories	152
Calories from Fat	0
% Daily Value	
Total carbohydrate 38 g	13%
Dietary fiber 0 g	0%
Sugars 38 g	

This one 

Nutrition Facts	
Serving size: 12 oz	
Servings per package: 2.0	
Amount per serving	
Calories	152
Calories from Fat	0
% Daily Value	
Total carbohydrate 38 g	13%
Dietary fiber 0 g	0%
Sugars 38 g	

20. Think about the past week and please select one of the boxes for each meal that fits the number of times you eat each of the following meals at home with at least one other member of your family:

	0 times this week	1 time this week	2 times this week	3 times this week	4 times this week	5 times this week	6 times this week	7 times this week
Breakfast	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lunch (noon meal)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dinner (supper)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In the past week..... **Yes** **No** **Not Sure**

	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21. Have you talked with any member of your family about eating healthier foods?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22. Have you given any member of your family an idea for a new snack?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. Have you helped plan or cook any meals for your family?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. Have you done any physical activities with at least one other member of your family?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Almost done, just one more page.



In the past week did you have.....	Yes ▽	No ▽	Not Sure ▽
25. Fresh, frozen, canned, or dried fruit available for you to eat in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. Fresh frozen, or canned vegetables available for you to eat in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27. Cut up fresh vegetables on a shelf in the refrigerator?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28. Yogurt in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29. Milk in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30. Cheese in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
31. Cookies, pies, cakes, or snack cakes in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
32. Chips in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
33. Ice cream or frozen yogurt in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
34. Granola or breakfast bars in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
35. TV dinners, frozen dinners, chicken nuggets, or fish sticks in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
36. Hot dogs or bologna in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
37. Oatmeal in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
38. Whole grain cold cereal in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
39. Cold cereal that isn't whole grain in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
40. Whole grain bread in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
41. Donuts, sweet rolls, or muffins in your home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Note: Questions 5-13, 15-18 and 20-23 are adapted from the School, Physical Activity and Nutrition Survey (SPAN) tool. Questions 25-45 are adapted from the GEMS Food Availability Questionnaires.



**End of Survey
Thank You**



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Appendix C



KidQuest Youth Survey

Name of School: _____

ID Code: _____

Name: _____

Today's Date: _____

- Pre-Survey
 Post-Survey
 12 month Survey

Questions about yourself.

1. Are you a boy or a girl? Boy or Girl
2. Month you were born?(circle one) Jan Feb March April May June July Aug Sept Oct Nov Dec
- Date you were born? (circle one) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
23 24 25 26 27 28 29 30 31

Write in the year you were born: _____

3. How do you describe yourself? (select all that apply)
- White, not-Hispanic, not-Latino American Indian Asian
 Black or African American Alaska Native Hawaiian or Pacific Islander
 Mexican American, Latino or Hispanic Other Two or more races

Questions about the types of food eaten yesterday.

	NONE	1 TIME	2 TIMES	3 or MORE TIMES
4. Yesterday, how many times did you drink milk?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Yesterday, how many times did you eat cheese?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Yesterday, how many times did you eat or drink yogurt?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Yesterday, how many times did you eat fresh, frozen, dried or canned fruit (do not count fruit juice)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Yesterday how many times did you drink 100% juice?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Yesterday, how many times did you eat fresh, frozen, or canned vegetables?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Yesterday, how many times did you eat whole grain cereal, whole grain bread, or whole grain crackers (where whole grain is the 1st or 2nd ingredient listed)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Yesterday, how many times did you drink any regular pop (not diet), punch, kool-aid, sports drinks, or other fruit-flavored drinks? (do not count 100% fruit juice or low calorie flavored water)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Yesterday, how many times did you eat french fries or chips? (include potato chips, tortilla chips, or other snack chips)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Yesterday, how many times did you eat ice-cream, sweet rolls, doughnuts, cookies, brownies, pies or cakes?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Yesterday, how many times did you eat any type of candy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Questions about breakfast.

13. How many days per week do you usually eat breakfast?
- 0 days 1 day 2 days 3 days 4 days 5 days 6 days 7 days
14. If you skip breakfast, what is the reason you skip breakfast? (fill in one or more choices that best fit your reasons)
- does not apply to me because I don't skip breakfast no time trying to lose weight
 I'm not hungry at breakfast time nothing to eat I don't know

PAGE ONE

Please continue on the next page.

15. Look at the amount of fat on each label. Select the food label that would provide the LEAST amount of FAT if you ate the WHOLE PACKAGE. (select only one)

Nutrition Facts

Serving size: 5 pieces		
Servings per package: 2		
Amount per serving		
Calories		100
Calories from Fat		45
% Daily Value		
Total Fat	5 g	8%
Cholesterol	0 mg	0%

Nutrition Facts

Serving size: 5 pieces		
Servings per package: 3		
Amount per serving		
Calories		200
Calories from Fat		90
% Daily Value		
Total Fat	10 g	15%
Cholesterol	0 mg	0%

Nutrition Facts

Serving size: 5 pieces		
Servings per package: 1		
Amount per serving		
Calories		100
Calories from Fat		45
% Daily Value		
Total Fat	5 g	8%
Cholesterol	0 mg	0%

Nutrition Facts

Serving size: 5 pieces		
Servings per package: 4		
Amount per serving		
Calories		300
Calories from Fat		60
% Daily Value		
Total Fat	15 g	23%
Cholesterol	0 mg	0%

16. Look at the amount of sugar on each label. Select the food label that would provide the LEAST amount of SUGAR if you ate the WHOLE PACKAGE. (select only one)

Nutrition Facts

Serving size: 12 oz		
Servings per package: 1		
Amount per serving		
Calories		152
Calories from Fat		0
% Daily Value		
Total Carbohydrate	38 g	13%
Dietary Fiber	0 g	0%
Sugars	38 g	

Nutrition Facts

Serving size: 12 oz		
Servings per package: 2.5		
Amount per serving		
Calories		152
Calories from Fat		0
% Daily Value		
Total Carbohydrate	38 g	13%
Dietary Fiber	0 g	0%
Sugars	38 g	

Nutrition Facts

Serving size: 12 oz		
Servings per package: 2		
Amount per serving		
Calories		152
Calories from Fat		0
% Daily Value		
Total Carbohydrate	38 g	13%
Dietary Fiber	0 g	0%
Sugars	38 g	

Nutrition Facts

Serving size: 12 oz		
Servings per package: 4		
Amount per serving		
Calories		152
Calories from Fat		0
% Daily Value		
Total Carbohydrate	38 g	13%
Dietary Fiber	0 g	0%
Sugars	38 g	

Questions about dietary guidelines and use of the food label.

17. How many total cups of fruits and vegetables combined should you eat each day?
 less than 2 cups at least 2 cups at least 3 cups at least 4 cups I don't know
18. From which food group should you eat the FEWEST servings each day?
 breads, cereals, rice, pasta vegetables fruits
 milk, yogurt, cheese fats, oils, sweets I don't know
19. In the past week, have you used the Nutrition Facts food label to help you decide if the food you eat is a healthy choice or a food you should eat less of?
 Yes No Not Sure

Questions about physical activity and screen time.

20. In the past week, how many total minutes of physical activity have you usually done each day? (include any type of physical activity like walking, playing sports, riding bike, throwing frisbee, etc.)
 Less than 30 minutes 30 to 45 minutes 1 hour or more
21. In the past week, how many hours per day have you usually spent on the computer away from school? (include time spent surfing the internet and instant messaging or texting on a cell phone)
 6 hours or more 5 hours 4 hours 3 hours 2 hours 1 hour Less than 1 hour
22. Do you have a TV in your bedroom?
 Yes No
23. In the past week, how many hours per day have you usually spent watching TV or video movies away from school?
 6 hours or more 5 hours 4 hours 3 hours 2 hours 1 hour Less than 1 hour
24. In the past week, how many hours per day have you usually spent playing video games away from school? (don't include time you spend playing a physically active game like Dance Revolution®, Wii® sports games or Wii Fit®)
 6 hours or more 5 hours 4 hours 3 hours 2 hours 1 hour Less than 1 hour
25. In the past week, how often have you done any physical activity with at least one other adult member of your household?
 5 times or more 3 to 4 times 1 to 2 times None

Questions about meal patterns.

26. How many meals have you eaten with at least one other member of your household in the past week? (include all mealtimes; breakfast, lunch and dinner)
 none 1 to 2 3 to 4 5 to 6 7 or more
27. How often in the past week has your family ordered a meal at a gas station store, mini-mart, fast food restaurant, sit down restaurant or take out/home delivery? (don't include school breakfast or school lunch)
 none 1 to 2 times 3 to 4 times 5 to 6 times 7 or more times
28. During your most recent full week of school, how often did you eat the breakfast prepared by the school?
 5 times 3 to 4 times 1 to 2 times None
29. During your most recent full week of school, how often did you eat the lunch prepared by the school?
 5 times 3 to 4 times 1 to 2 times None
30. During your most recent full week of school, how often did you bring your lunch from home?
 5 times 3 to 4 times 1 to 2 times None
31. In the past week, how often have you talked with any member of your family about eating healthier foods?
 5 times or more 3 to 4 times 1 to 2 times None
32. In the past week, how often have you given any member of your family an idea for a healthier snack to have available?
 5 times or more 3 to 4 times 1 to 2 times None
33. In the past week, how often have you helped plan or cook any meals for you and/or your family?
 5 times or more 3 to 4 times 1 to 2 times None

Questions about weight perception

34. How do you feel about your own weight?

- I am worried that I am underweight
 I am worried that I am overweight
 I am not worried about my weight

35. Which statement best describes your own weight?

- Very underweight About right Overweight Obese (very overweight)

Questions about sleeping patterns

36. What is your usual bedtime on **weeknights**? (write in the time)

37. What is your usual bedtime on **weekends**? (write in the time)

38. What time do you usually wake up on **weekdays**? (write in the time)

39. What time do you usually wake up on **weekends**? (write in the time)

40. How often do you usually feel very tired **during the school day**?

- Always Often Sometimes Hardly Ever Never

41. How often do you usually feel very tired **during the weekend**?

- Always Often Sometimes Hardly Ever Never

End of Survey - Thank You

Note: Questions 5-12 adapted from the School, Physical Activity and Nutrition Survey (SPAN) tool.

KidQuest (Fitness, Food and Fun). South Dakota State university Cooperative Extension Service. These materials may be copied for educational purposes only. Revised October 2011.



South Dakota State University, South Dakota counties, and USDA cooperating. South Dakota State University adheres to AA/EEO guidelines in offering educational programs and services.

KidQuest: Study 1 Participants Flow

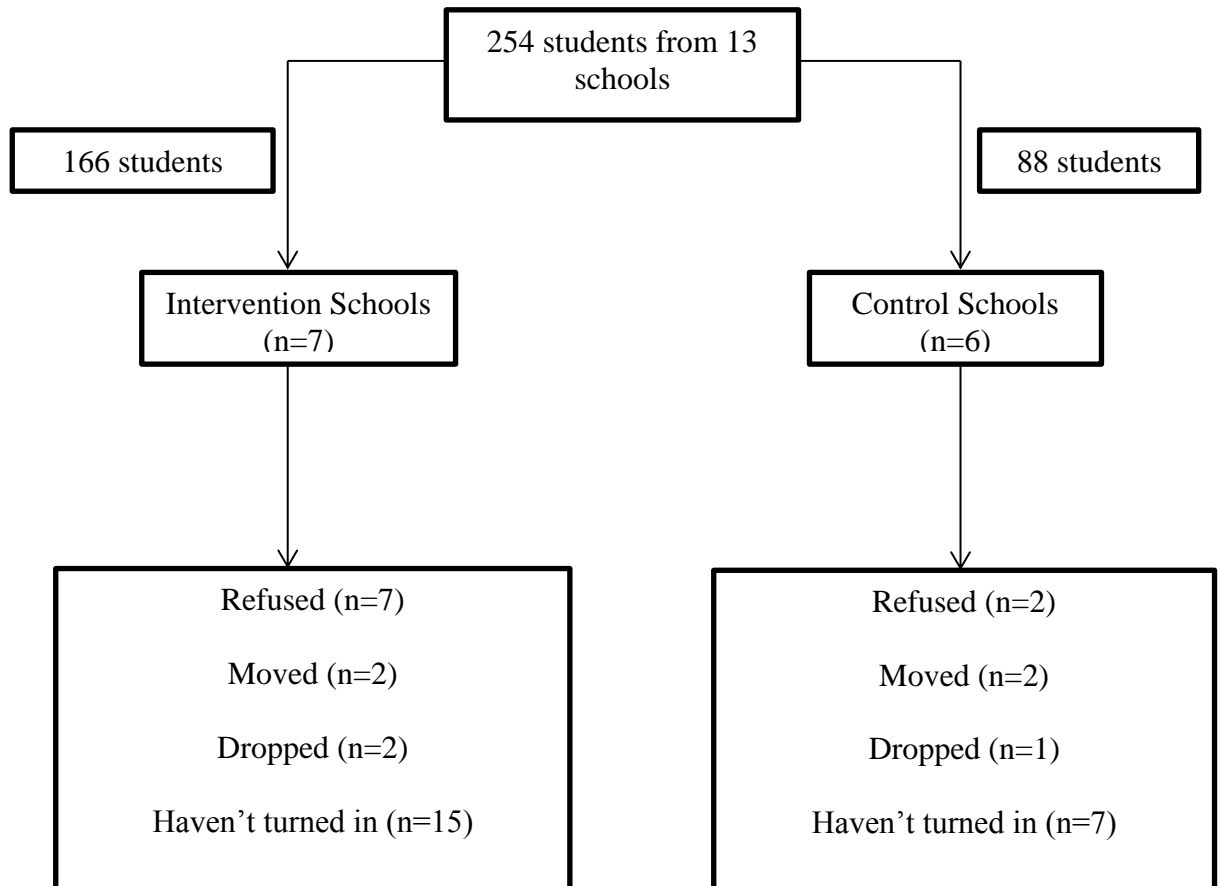


Figure 1 Flow chart of the study 1 participants.

KidQuest: Study 2 Participants Flow

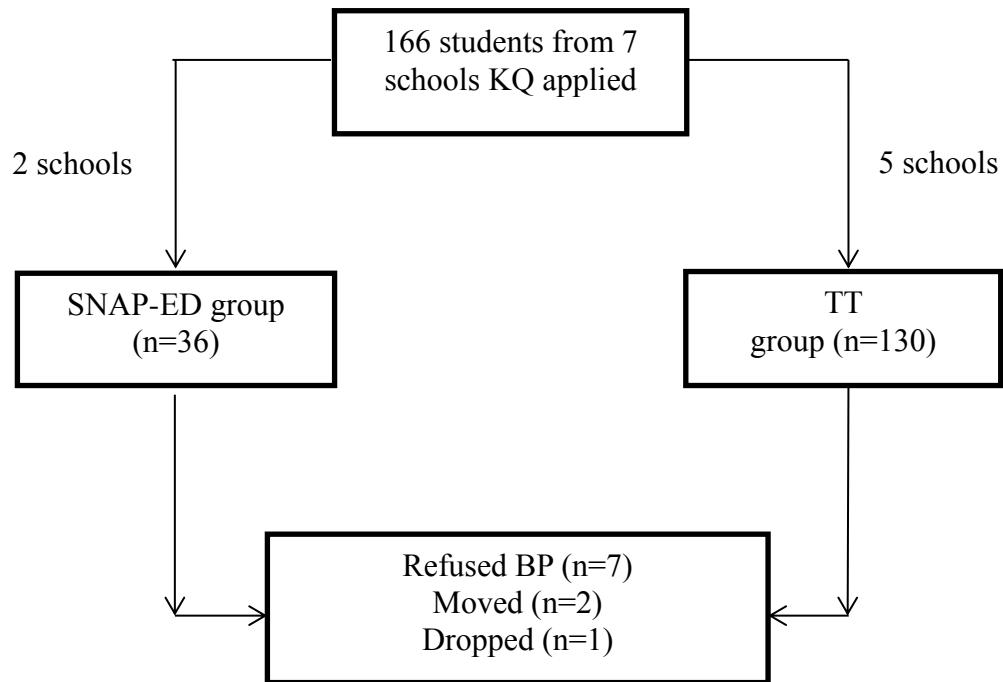


Figure 2 Flow chart of the study 2 participants.