Build a Bone Bank with 3-A-Day After-School Education Program for Elementary Students

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Human Nutrition, Foods and Exercise

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ABSTRACT

Objective: To determine whether a social cognitive theory guided nutrition educational intervention in an after-school program is associated with improved nutrition and physical activity knowledge, attitudes, beliefs and behaviors for fourth and fifth grade participants.

Design: A prospective comparative study with a quasi-experimental design over a six month period. Questionnaires were collected at baseline and at the end of the program for students at the intervention and comparison schools. Follow-up questionnaires were collected at the intervention school three months post program.

Subjects/Setting: Fourth and fifth grade students enrolled in an after-school program targeted to reach students performing below grade level and/or living below the poverty level at an elementary school in southwest Virginia. Fourth and fifth grade students at another county elementary school with similar demographics served as comparison participants.

Main Outcome Measures: Daily food intake, dairy intake, physical activity, sedentary behaviors, environment, self-efficacy for consuming dairy products, and food and activity beliefs.

Statistical Analysis: Measures of central tendency (mean, median, and variance) were performed to describe participants. Independent t-tests (p<0.05) were used to compare changes from pre to post-questionnaire by treatment group. Paired t-tests (p<0.05) were used to test for differences from pre to post-questionnaire within group. Chi square analysis (p<0.05) was conducted to further investigate changes between groups.

Results: Intervention participants significantly increased previous day’s milk consumption (p=.006) and plans to drink low-fat milk instead of regular milk (p=.047) from pre to post-program. Significant change was also observed in previous day’s milk consumption change from pre to post between groups (p=.004).

Conclusion: Participation in an after-school program with nutrition education could change daily milk consumption and plans to drink low-fat over regular milk.

Applications: After-school nutrition interventions can be effective in changing milk intake and plans to consume low-fat milk.
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Chapter 1:

INTRODUCTION

As prevalence of childhood and adolescent overweight continue to increase, so do other medical conditions and health related expenses for children.\textsuperscript{1-4} Overweight children and adolescents are more likely to become obese adults and suffer from a higher rate of metabolic complications such as insulin resistance, elevated systolic blood pressure, high total cholesterol levels, and high triglyceride levels.\textsuperscript{5,6} These co-morbidities and other complications of overweight can lead to depressed quality of life during childhood and throughout life.\textsuperscript{7,8} Due to the vast potential impact childhood overweight can have on community, state and national issues, scientists are searching for ways to help combat and improve childhood weight status.

Multiple risk factors for childhood overweight exist. Parents and home environment play an undeniable role in child weight status.\textsuperscript{9,10} Additionally, school settings and the built environment can either be a benefit or deterrent to positive weight maintenance.\textsuperscript{11,12} Physical activity levels have also been studied to determine impact on weight status. Findings have been somewhat inconclusive, but results regarding the impact of sedentary behaviors on childhood overweight have been more promising as potential habits to improve.\textsuperscript{13-15}

Food security and socioeconomic status (SES) are other possible contributing factors to childhood overweight.\textsuperscript{16,17} In these areas too, study results have shown conflicting data.\textsuperscript{18,19} However, childhood overweight does co-exist with food insecurity and lower SES, and these population subsets have more barriers to healthy weight maintenance in the form of decreased availability of nutritious, affordable food and built environments that support positive physical activity.\textsuperscript{10,18,20}

Dietary choices are another considerable risk factor for childhood overweight. Understanding why children and adolescents make the food choices they do is imperative to creating programs that can influence their dietary decisions. Much research has focused on determining perceived benefits and barriers to healthful eating, as well as frequent and favorite foods consumed by children.\textsuperscript{21-23} Findings from these studies should provide guidance and
direction for the development of future dietary educational programs and will hopefully improve the success of those programs.

An extensive amount of dietary research has focused on the consumption of dairy products and calcium intake. These foods and nutrients have been investigated as possible influences on childhood weight status. Although studies have had mixed results regarding the impact of calcium and dairy foods on body mass index, findings do stress the importance of these choices for attaining peak bone mass in adolescence. Research also consistently demonstrates that adolescents often do not meet their daily calcium needs of 1300mg. Reasons discovered for this intake deficit have included taste preference, milk intolerance, dairy food availability, and parental and peer influence. Addressing these issues should be an essential part of any intervention to influence intake of dairy foods and calcium with children.

Determining where to conduct educational programs with children and how to best allocate limited resources can be a challenge. Schools are a familiar and safe setting for children and have established facilities, rules, educators and expectations for behavior. Furthermore, school programs and after-school interventions have been shown to have positive influences on child weight status. For these reasons, designers of educational programs on nutrition and physical activity should strongly consider developing school based curricula.
References Cited


CHILDHOOD OVERWEIGHT

Childhood and adolescent overweight is a community, state and national concern. Defined as a body mass index (BMI) at or above the 95th percentile for children of the same age and sex, childhood and adolescent overweight are determined based on the 2000 Centers for Disease Control and Prevention (CDC) growth charts for corresponding BMI-for-age and gender percentile. Over 33% of children and adolescents aged 2 to 19 years are at risk for overweight or are overweight and the prevalence of overweight among children and adolescents increased significantly between 1999 and 2004. Specifically, prevalence of overweight increased from 5.0% to 13.9% for children aged 2-5 years, 6.5% to 18.8% for children aged 6-11 years and 5.0% to 17.4% for adolescents aged 12-19 years.

Increasing along with rates of overweight in children and adolescents are rates of multiple metabolic complications. Abdominal obesity, insulin resistance, and elevated systolic blood pressure have been found to be elevated in overweight children. Increased rates of total high cholesterol levels, high low-density lipoprotein levels, high triglyceride levels, high fasting glucose levels and Type 2 diabetes have also been found in overweight children and adolescents. Just as overweight status frequently translates into adulthood, so do these co-morbidities.

Other complications for children who are overweight exist. Overweight status in adolescents, aged 12 to 14 years, has been found to have a negative impact on depression, self-esteem and school and social functioning. Sleep apnea, orthopedic complications, and renal disease are also seen at higher rates among overweight children. With the breadth of potential complications from childhood overweight, it is not surprising that health care utilization and expenditures can be greater for overweight children than healthy weight children.

Because overweight children and adolescents are more likely to become adults who are obese, the future potential community, state and national implications are overwhelming.
A review of the literature showed that across all ages, the risk of adult obesity was at least two times as high for overweight versus non-overweight children.\textsuperscript{12} Additionally, the degree to which the association between childhood overweight and adult overweight can be predicted is related to both the extent of overweight status and childhood age. As BMI-for-age and childhood age increase, the ability to predict adult obesity and overfat status also increases.\textsuperscript{13}

**RISK FACTORS FOR CHILDHOOD OVERWEIGHT**

There are many factors that can contribute to a child’s risk for being overweight. Home environment, physical activity levels, television watching, food security, socioeconomic status (SES), and diet choices have all been found to impact children’s weight status.\textsuperscript{14-16}

**Environment**

As parents create the home environment and have a profound influence on their children in numerous ways, they are integral in impacting child weight status.\textsuperscript{17} Parent impact on their child’s weight is also influenced by their own weight. Although children can become obese adults without obese parents, parental obesity more than doubles the risk of overweight and normal weight children under the age of 10 becoming adults who are obese.\textsuperscript{11}

School environments can also shape the health of children. Influx of more food and beverage choices through expanded menus, a la carte options, vending machines, fast-food contracts, and fund raisers has dramatically changed the availability of higher fat foods to children.\textsuperscript{18} As higher fat diets have been associated with greater increases in BMI and skinfold thickness in girls from age 5 to 7 years, availability of higher fats foods to elementary students should be concerning.\textsuperscript{19}

The importance of the built environment on childhood overweight cannot be dismissed. According to the Institute of Medicine, a lack of sidewalks, safe bike paths, and parks in neighborhoods can discourage children from walking or biking to school as well as from participating in physical activity.\textsuperscript{17} Along with available resources for physical activity, access to affordable, healthy food choices can be lacking in poorer neighborhoods, thereby creating another obstacle to making healthy choices.\textsuperscript{20}
**Physical Activity**

Physical activity level is an important part of the childhood overweight equation. Increased levels of physical activity have been associated with lower BMI rates and weight status among high school students.\(^{21}\) However, studies have shown contradictory and inconclusive impact of the effect of physical activity on childhood overweight.\(^{22}\) Showing more promise as a contributing factor to child and adolescent overweight are sedentary behaviors, particularly television viewing (TV).\(^{16,23}\) Compared with children who watched ≥ 4 hours of daily TV, Eisenmann et al\(^{16}\) found that both boys and girls were 20% to 25% less likely to be classified as overweight if they reported only 2 to 3 hours of TV per day. Additionally, children were approximately 40% less likely to be classified as overweight if they reported < 1 hours of TV per day when compared to those who watched ≥ 4 hours of TV daily.

**Food Security and Socioeconomic Status**

The connection between food security and childhood overweight has been aggressively investigated. Food security has been defined as: “Access by all people at all times to enough food for an active, healthy life. Food security includes at minimum: the ready availability of nutritionally adequate and safe foods, and an assured ability to acquire acceptable foods in socially acceptable ways”.\(^{24,25}\) It should be noted that food security does not only mean having enough food, but having nutritionally adequate and safe food. Numerous studies have been conducted to determine if any relationships exist between food insecurity and childhood overweight.

Casey et al\(^{26}\) found that significant associations with being at risk for overweight were demonstrated more often in some subsets of children from food insecure households than in children from food secure households.\(^{26}\) This relationship was found for children aged 12 to 17 years, girls, whites, and children who live in households with incomes > 4 times the federal poverty level.

Gundersen et al\(^{27}\) reported conflicting data in a recent study. They found no significant differences in the prevalence of at risk of overweight and overweight between food secure and food insecure children. These results were similar for different genders, races and income levels.
However, they do acknowledge that food insecurity and overweight coexist among low-income children as approximately 25% of the food insecure children were overweight.

Along with food insecurity, the impact of food insufficiency on dietary intake for children has been investigated. Food insufficiency is defined as “inadequacy in the amount of food intake because of lack of money or resources to access enough food”. Casey et al examined characteristics of United States (US) children living in food-insufficient households to compare food and nutrient intakes, physical inactivity, and overweight and underweight status with children in food-sufficient households. Children among low-income groups, either food sufficient or food insufficient, had similar macronutrient and micronutrient intake, reported exercise, television watching, and percentage of overweight and underweight. However, when compared with higher-income food sufficient children, lower-income food insufficient children consumed fewer calories, total carbohydrates and fruits, and watched more TV.

Although studies have shown higher prevalence rates of obesity in low SES groups, newer data shows weakening associations between SES and overweight status. Analysis of the National Health and Nutrition Examination Surveys (NHANES) between 1971 and 2002 was conducted to study trends and possible disparity patterns. Complex patterns that varied across ethnic groups and time emerged, along with weakening associations between childhood overweight and SES. Specifically, the ratio in the prevalence of overweight between adolescent boys with a low or high SES decreased from 2.5 to 1.1 and from 3.1 to 1.6 in girls from 1988-1994 to 1999-2002.

Even if the association between SES and childhood overweight prevalence is weakening, there is still a need for nutrition education and intervention for children from lower SES groups. These groups have more barriers to healthful living due to their income level, such as disposable income to purchase food, physical environment, transportation and availability of quality food.

To address income and food choices by predicting what food decisions a rational individual would make to reduce his or her food budget, Darmon et al used linear programming. As the cost constraint increased, the proportion of calories contributed by fruits, vegetables, meat, and dairy products decreased. At the same time, the proportion of calories from cereals, sweets, and added fats increased. The overall impact on the diet was a decrease in nutritional quality. This example shows the potential consequences on diet quality as food
dollars diminish. If energy-dense foods containing refined grains, added sugars or fats are chosen because of their low consumer cost, they could contribute to inequities in diet quality of children from different socio-economic groups.\textsuperscript{34}

**Dietary Choices**

Dietary choices also impact body weight status. Roseman et al\textsuperscript{14} summarizes dietary factors related to children being overweight as: “(a) consumption of high-energy-dense foods, (b) high dietary fat content and increased fast-food consumption, (c) high consumption of sugar-sweetened beverages and high sugar-foods, (d) low fruit and vegetable consumption, (e) large portion sizes, and (f) low breakfast consumption”.

In addition to affecting body weight, poor dietary choices may also impact school performance. The Nutrition and Health survey in Taiwan Elementary School Children for 2001-2002 found associations between unfavorable school performance and unhealthful eating habits.\textsuperscript{35} Fu et al\textsuperscript{35} analyzed overall performance in school, demographic and socio-economic characteristics, frequency of food intake and food preferences for over 2,200 children from grades 1 through 6. Unfavorable school performance was positively associated with unhealthful eating patterns, and the greater the number of unhealthful eating patterns, the higher the relative risk for unfavorable overall school performance. High intake of low-quality foods and low intake of dairy products and highly nutrient-dense foods were considered unhealthful eating patterns. It should also be noted that children’s food preferences for each of the high-quality and low-quality food groups was a predictor of level of food intake.

Children and adolescents frequently define healthy foods as fruits, vegetables, juice, pasta, rice, milk, and cheese.\textsuperscript{36} O’Dea et al\textsuperscript{36} attempted to determine why children and adolescents do eat healthful foods. During focus groups, students in grades 3 through 11 did not list appearance, weight control, immunity, longevity and future health as the most important reasons for choosing healthful foods. Instead, the most important benefits these students described were enhancement of cognitive function, physical performance, psychological factors, physical sensation, and production of energy. Surprisingly, these themes were consistent across all grades, genders, and ethnic groups.
Perceived barriers to healthful eating were also identified by children in this study. Listed in descending order as the major barriers to healthful eating were: convenience of less healthful alternatives, internal/physiological preference, social reinforcement, and reward driven/mood enhancement. Parental control over what is available and allowed at home was a consistent barrier discussed for the vast majority of participants. As these results align with findings from other studies, program coordinators of future interventions on improving healthful food intake of this target population should use these identified perceived benefits and barriers as guidelines when developing curricula.

Designers of future interventions should also understand the impact specific foods can have on children’s diets. Van Horn et al discovered that over 30% of daily calories for 8 to 10 year-olds came from snack foods, desserts and pizza. Additionally, as children get older these food groups represent more daily calories. Results from 663 children showed an increase from baseline in the percent of calories from these food groups over a three year period of time to between about 32% and 34.5% per day. If these few food categories account for almost one-third of children’s daily calories, nutrition professionals would be well served to educate on ways to improve the nutrient density, quality and healthfulness of these foods.

Beverage consumption is another important component to maintaining a healthy diet. Ludwig et al investigated the relationship between consumption of sugar-sweetened drinks and childhood overweight among 548 sixth and seventh grade students. Sugar-sweetened drinks were categorized as: soda, Hawaiian punch, lemonade, Koolaid, or other sweetened fruit drink, and iced tea, not artificially sweetened. Results indicated that both BMI and the odds of becoming overweight increased significantly for each additional can or glass of sugar-sweetened drink consumed daily.

Understanding why children consume sugar-sweetened drinks can help guide the development of childhood overweight prevention programs. Surveys completed by 560 elementary and middle school children included questions about soft drink consumption habits, parental and peer influence on soft drink consumption, availability of soft drinks at home and school, taste preferences and hours of TV watched. The strongest predictor of soft drink consumption was a strong preference for the taste of soft drinks. Students who reported that they “strongly like” the taste of soft drinks were 4.5 times more likely to drink them five or more times per week than those students who claimed they “like”, “dislike” or “strongly dislike” the
taste of soft drinks. Also strongly associated with children’s soft drink consumption was parental intake and home availability of soft drinks. Compared to children whose parents were not regular soft drink consumers, children whose parents regularly drank soft drinks were almost three times more likely to drink soft drinks themselves five or more times per week. Parental influence on beverage intake has also been found in previous studies.

**Dairy and Calcium**

Calcium and dairy intake have also been investigated as possible influences on body weight status. Among 54 white, normal growing, healthy, eight year old children, Skinner et al found that dietary calcium and polyunsaturated fat intake were negatively related to body fat percentage. Other study findings included a positive association between dietary variety and calcium intake and a negative relationship between children’s carbonated beverage consumption and calcium intake.

Roseman et al studied the dietary behaviors of middle school students to examine associations with weight status. Findings showed significantly negative associations between weight status and consumption of milk, breakfast, “other vegetables” (defined as all vegetables except green salad and carrots), and fruits. Of the 4,049 survey participants, only 32% of students consumed two or more glasses of milk each day in the past week. Students who were at risk of being overweight or who were overweight consumed less milk than healthy-weight students.

However, other studies show no positive association between dairy consumption and body weight status. Phillips et al followed 178 girls from ages 8-12 years at enrollment up to four years postmenarche. After collecting at least three years of annual data on percent body fat, BMI, z-score, and dietary intake, no relationship was found between BMI, z-score or percent body fat with dairy food or calcium consumption.

In addition to exploring the relationship between dairy consumption and overweight status, the impact of dairy foods on other risk factors for the metabolic syndrome have been examined. Over 3,100 black and white adults aged 18 to 30 years were followed from 1985-1986 to 1995-1996. Diet history was measured by quantitative 28 day food frequency queries. Inverse associations between frequency of dairy intake and the development of obesity, elevated
blood pressure, abnormal glucose homeostasis, and dyslipidemia were observed in young overweight black and white men and women. Additionally, results showed that overweight individuals who consumed 5 or more dairy foods a day had a 10-year incidence of insulin resistance syndrome that was more than two-thirds lower than those who consumed less than 1.5 dairy foods per day.45

Weight status and metabolic syndrome aside, adequate calcium intake is necessary during childhood and adolescence to attain peak bone mass.46 Bailey et al47 found that mean peak age of calcium accretion was 14.0 years for white boys and 12.5 years for white girls. Based on their study results, they estimated that during the two adolescent years of peak skeletal growth, 26% of adult calcium is laid down.47

The Food and Nutrition Board of the Institute of Medicine, National Academy of Sciences, developed the most recent Dietary Reference Intakes (DRIs) for calcium in 1997.48 Adequate Intake (AI) levels are provided for calcium because sufficient scientific evidence is not available to calculate the Estimated Average Requirement (EAR). Observed values or experimentally determined estimates of nutrient intake by a group, or groups, of healthy people are used to set the AI recommendations. The goal for the nutrient’s AI level is for it to ensure that the needs of at least 98% of healthy people are addressed. Daily AI levels for calcium are as follows: children age 1-3 years 500mg, children age 4-8 years 800mg, adolescents age 9-13 years 1300mg, and adolescents age 14-18 years 1300mg.48

Studies show that milk and dairy products contribute the greatest amount of calcium to the US food supply.46 In fact, dairy products provide 65% of the dietary calcium consumed by US children and nearly 50% of children’s total calcium intake comes from milk.49 To adequately meet or exceed daily calcium AI goals in adolescents 9 years and older, consumption of 3-4 servings of dairy products are needed.50

Kranz et al51 investigated current dairy and calcium rates of 4-18 year-olds by analyzing NHANES dietary data. There were not significant differences of dairy consumption from all food sources among different age groups. However, because calcium daily recommend levels increase by 500mg from age 8 to 9, dietary calcium consumption would need to increase to meet this elevated AI level. As this was not found, 9 to 18 years-olds consumed significantly less than the recommended amount of daily calcium.51
Similar results were found by Fiorito et al\textsuperscript{52} when examining 24-hour diet recalls of 151 girls at age 5, 7, 9, and 11 years. Total dairy intake remained stable from age 5 to 11 years, but girls age 9 and 11 years did not meet daily calcium recommendations. Although dairy intake remained stable over this four-year period, total milk consumption decreased due to declines in drinking milk as a beverage. At the same time, intakes of cheese and dairy desserts increased which stabilized overall dairy intake.\textsuperscript{52} As it is unlikely that adolescents can meet adequate intake for calcium without dairy foods, educational emphasis for this target population should be placed on increasing dairy intake during meals and snacks.\textsuperscript{53}

For children who avoid drinking cow’s milk and have low dietary calcium intakes, poor bone health can occur.\textsuperscript{54} Black et al\textsuperscript{54} measured body composition, bone mineral density, and dietary calcium intakes for 50 milk avoiders age 3-10 years. These results were compared with 200 milk-drinking control children. Milk avoiders were found to have lower total-body bone mineral content, be shorter, and have smaller skeletons than did the control children of the same age, sex and locality.

In addition to preference for and intolerance of milk, environmental and social support factors can influence calcium intake.\textsuperscript{54, 55} After examining correlates of calcium, dairy and milk intakes among 4,079 middle and high school students, Larson et al\textsuperscript{55} found that calcium intake for both male and female adolescents were significantly and positively related to availability of milk at meals, taste preference for milk, and eating breakfast. Other significant positive associations for males included social support for healthful eating and higher SES. Positive associations for females were also found for higher SES, personal health/nutrition attitudes, and self-efficacy to make healthful food choices. For both males and females, calcium intakes were inversely related to fast-food consumption.

Findings that relate SES to dairy consumption have been observed in other studies.\textsuperscript{56, 57} In particular, low SES girls are at higher risk than low SES boys for inadequate calcium consumption.\textsuperscript{58} Lee et al\textsuperscript{56} found a negative association between number of children in the household and calcium intake for adolescent girls, leading to hypotheses that due to expense, dairy rich foods are not as readily available or are used for other household members.\textsuperscript{56} Positive associations for milk consumption were found with these same girls from encouragement to drink milk by fathers, mothers and friends. Based on these results, addressing the availability
and taste preferences of calcium rich foods, along with influence of friends and family, will be important components of any dietary intervention on calcium consumption.

**APPROPRIATENESS OF AFTER-SCHOOL INTERVENTIONS**

As almost 98% of eligible school-aged children in the US attend public or private school, school-based interventions can be an excellent option to provide diet and physical activity education.\(^{59}\) In addition to having established facilities, transportation and educators, schools are stable and safe settings.\(^9\)

Veugelers et al\(^{60}\) investigated the effects of school programs on preventing excess body weight by surveying 5200 students in 5\(^\text{th}\) grade. Height and weight measures, dietary intake data, and information on physical and sedentary activity levels were collected. Comparisons were made for excess body weight, diet, and physical activity across schools with and without nutrition programs. Schools with nutrition programs were divided into two categories; 1) schools that reported they had policies or practices in place to offer healthy menu alternatives and 2) schools that were part of a coordinated program. The coordinated program included aspects of each of the CDC recommendations for school-based healthy eating programs.\(^{60}\)

Results showed positive impact of the coordinated program on students’ health. Students from schools with coordinated programs had significantly lower rates of overweight and obesity than students from schools without a nutrition program.\(^{60}\) Although not significant, results showed a positive trend towards healthier diets and greater physical activity among the students from the coordinated program. These results support the influence that educational institutions can have and that schools can be an appropriate setting for nutrition and physical activity educational programs.

After-school settings have also been used for implementation of health related programs. Speroni et al\(^{61}\) conducted a 12-week after school intervention, titled the Kids Living Fit™ Program, with 80 children in grades 2 through 5. The program was designed by community hospital nurses and implemented in elementary schools. Best lifestyle choices for foods consumed and activities chosen were focused on with the children. BMI and waist circumference, along with food and activity diaries were collected from students. A similar group of 105 students was used as a contrast school. Compared to the contrast school, the
intervention students showed a mean significant decrease in BMI percentile from baseline to follow-up. These results show that an after-school intervention focused on dietary behaviors and physical activity, can positively impact BMI percentile.61

The Medical College of Georgia FitKid Project was a three-year, two hour after-school intervention focused on physical activity for the reduction of adiposity in children.62 Eighteen elementary schools were randomly assigned to either the intervention or control condition and all second grade students were invited to participate in the study. Data collection included body composition by dual energy X-ray absorptiometry (DXA), weight, height, and waist circumference.62

Project results were analyzed with 447 participants after the first year. Demographics of the participating students were: 182 intervention (must have attended at least 40% of the after-school sessions), 265 control, 68% eligible for free or reduced lunch, 61% African-American, 31% white, and 8% other racial background. Significant changes were observed between intervention and control students from baseline to the end of the first year. Significant decreases in body fat percentage, along with significant increases in bone mineral density, were observed between the two groups. The potential positive impact of after-school programs was also shown in this study.62

AIMS OF THE PRESENT STUDY

Identifying where to apply limited resources is one challenge health educators face. Lee et al63 found that independent of school-level median household income and student-level demographics, percentage of students enrolled in free or reduced-price meal programs was associated with overweight status. Therefore, when no data on childhood overweight prevalence is available, percentage enrollment in free and reduced-price meal programs could be a practical method to distinguish community areas with greater need for intervention programming.

As the county elementary school with the greatest percentage of qualifying free and reduced meals, Pulaski Elementary School was the school chosen for this intervention. Additionally, county students in the fourth and fifth grade had no planned nutrition curriculum provided prior to the initiation of this study.
The purpose of this study was to determine whether an educational program focused on dairy foods, overall good nutrition and physical activity in an after-school program was associated with improved nutrition and physical activity knowledge, attitudes, beliefs and behaviors for fourth and fifth grade participants in the program and their parents when compared to a comparison school receiving no intervention. Several hypotheses were tested. Compared to students at the comparison school, students at the intervention school would demonstrate an: 1) increase in daily dairy consumption over baseline levels, 2) increase in knowledge of the health benefits of dairy over baseline levels, 3) increase in self-efficacy for choosing low-fat dairy foods over baseline levels, 4) increase in daily physical activity over baseline levels, and 5) increase in importance placed on the health benefits of physical activity over baseline levels.
References Cited


63. Lee NE, De AK, Simon PA. School-Based Physical Fitness Testing Identifies Large Disparities in Childhood Overweight in Los Angeles. *J Am Diet Assoc.* 2006;106:118-121.
Chapter 3:

BUILD A BONE BANK WITH 3-A-DAY AFTER-SCHOOL INTERVENTION FOR ELEMENTARY STUDENTS

By: Cox H, Hosig K, Anderson E, Burkett S, Nickols-Richardson SM, Serrano E

To be submitted to the Journal of Nutrition Education and Behavior
Build a Bone Bank with 3-A-Day After-School Intervention for Elementary Students

Heather K. Cox

ABSTRACT

As prevalence of childhood and adolescent overweight continue to increase, so do other medical conditions and health related expenses for children. Co-morbidities and other complications of overweight can lead to depressed quality of life during childhood and throughout life. Risk factors for childhood overweight include environment, dietary choices, dairy and calcium intake, and physical activity levels. Determining how to develop and where to conduct nutrition educational programs with children can be a challenge. Because schools are a familiar and safe setting for children and school programs have been shown to have positive influences on child weight status, after-school settings can be a good choice for interventions. In particular, after-school educational programs on dairy foods, overall good nutrition and physical activity may prove to improve nutrition and physical activity knowledge, attitudes, beliefs and behaviors for participants.

Objective: To determine whether a social cognitive theory guided educational intervention focused on dairy foods, overall good nutrition and physical activity in an after-school program is associated with improved nutrition and physical activity knowledge, attitudes, beliefs and behaviors for fourth and fifth grade participants.

Design: A prospective comparative study with a quasi-experimental design over a six month period. Questionnaires were collected at baseline and at the end of the educational program for students at the intervention and comparison schools. Follow-up questionnaires were collected at the intervention school three months post program.

Subjects/Setting: Fourth and fifth grade students, along with their parents, enrolled in an after-school program targeted to reach students performing below grade level and/or living below the poverty level at an elementary school in southwest Virginia. Fourth and fifth grade students enrolled at another county elementary school with similar demographics served as comparison participants.

Main Outcome Measures: Average daily food intake, dairy intake, and physical activity, sedentary behaviors, environment, self-efficacy for consuming dairy products, and food and activity beliefs.

Statistical Analysis: Measures of central tendency (mean, median, and variance) were performed to describe participants. Independent t-tests (p<0.05) were used to compare changes from pre to post-questionnaire by treatment group. Paired t-tests (p<0.05) were used to test for differences from pre to post-questionnaire within group. Chi square analysis (p<0.05) was conducted to further investigate changes between groups.

Results: Intervention participants significantly increased previous day’s milk consumption (p=.006) and plans to drink low-fat milk instead of regular milk (p =.047) from pre to post-program. Significant change was also observed in previous day’s milk consumption change from pre to post between groups (p=.004).

Conclusion: Participation in the Build A Bone Bank with 3-A-Day after-school program could change daily milk consumption and plans to drink low-fat over regular milk.

Applications: After-school nutrition interventions can be effective in changing milk intake and plans to consume low-fat milk.
INTRODUCTION

As prevalence of childhood and adolescent overweight continue to increase, so do other medical conditions and health related expenses for children. Overweight children and adolescents are more likely to become obese adults and suffer from a higher rate of metabolic complications such as insulin resistance, elevated systolic blood pressure, high total cholesterol levels, and high triglyceride levels. These co-morbidities and other complications of overweight can lead to depressed quality of life during childhood and throughout life. Due to the vast potential impact childhood overweight can have on community, state and national issues, scientists are searching for ways to help combat and improve childhood weight status.

Multiple risk factors for childhood overweight exist. Parents and home environment play an undeniable role in child weight status. Additionally, school settings and the built environment can either be a benefit or deterrent to positive weight maintenance. Physical activity levels have also been studied to determine impact on weight status. Findings have been somewhat inconclusive, but results regarding the impact of sedentary behaviors on childhood overweight have been more promising as potential habits to improve.

Food security and socioeconomic status (SES) are other possible contributing factors to childhood overweight. In these areas too, study results have shown conflicting data. However, childhood overweight does co-exist with food insecurity and lower SES, and these population subsets have more barriers to healthy weight maintenance in the form of decreased availability of nutritious, affordable food and built environments that support positive physical activity.

Dietary choices are another considerable risk factor for childhood overweight. Understanding why children and adolescents make the food choices they do is imperative to creating programs that can influence their dietary decisions. Much research has focused on determining perceived benefits and barriers to healthful eating, as well as frequent and favorite foods consumed by children. Findings from these studies should provide guidance and direction for the development of future dietary educational programs and will hopefully improve the success of those programs.
An extensive amount of dietary research has focused on the consumption of dairy products and calcium intake. These foods and nutrients have been investigated as possible influences on childhood weight status. Although studies have had mixed results regarding the impact of calcium and dairy foods on body mass index, findings do stress the importance of these choices for attaining peak bone mass in adolescence.\textsuperscript{9, 24-26} Research also consistently demonstrates that adolescents often do not meet their daily calcium needs of 1300mg.\textsuperscript{27-29} Reasons discovered for this intake deficit have included taste preference, milk intolerance, dairy food availability, and parental and peer influence.\textsuperscript{30} Addressing these issues should be an essential part of any intervention to influence intake of dairy foods and calcium with children.

Determining where to conduct educational programs with children and how to best allocate limited resources can be a challenge. Schools are a familiar and safe setting for children and have established facilities, rules, educators and expectations for behavior.\textsuperscript{31} Furthermore, school programs and after-school interventions have been shown to have positive influences on child weight status.\textsuperscript{12, 32} The Build a Bone Bank program was an after-school intervention designed to increase dairy food consumption, increase knowledge on the health benefits of dairy foods and physical activity, and build self-efficacy and intention for making healthy food choices and participating in physical activity in fourth and fifth grade participants.
METHODS

STUDY DESIGN

A prospective comparative study was conducted in an intervention school and a comparison school. Since randomization was neither practical nor possible, a quasi-experimental design was employed. Two elementary schools from rural southwest Virginia were selected for participation. These two schools serve the greatest number of free and reduced price meals of all the county’s elementary schools. The educational intervention school was chosen based on the school’s ability to accommodate the intervention as part of their current after-school program. The study was approved by the Virginia Tech Institutional Review Board for Research Involving Human Subjects.

SUBJECTS

Intervention School

The intervention elementary school has an after-school program three days per week. This program is targeted to reach students performing below grade level, as determined by test and standards of learning scores, and/or students living below the poverty level, as determined by the number of eligible free and reduced meals. Children must fit the targeted population to participate in the after-school program.

This school has a free and reduced meal student qualification rate of 57.1%. Based on 2005-2006 school year student data for 621 students: 32% were fourth and fifth grade students, 47% were male, 9% were black, 2.6% were Hispanic, 1.6% were Asian and 84% were white. All fourth and fifth grade students enrolled in this after-school program participated in the Build a Bone Bank with 3-A-Day (BBB3AD) intervention as their assigned daily after-school activities one day a week.

Comparison School

Fourth and fifth grade students enrolled at another county elementary school with similar demographics served as the comparison participants. This school has a free and reduced meal student qualification rate of 54.1%. Based on 2005-2006 school year student data for 442 students: 33% were fourth and fifth grade students, 51.5% were male, 8% were black, 0.9% were
Hispanic, 0.7% were Asian and 90% were white. This school does not host an after-school program.

**EDUCATION PROGRAM**

For eight weeks, all present fourth and fifth grade students enrolled in the after-school program participated in the intervention. Children could voluntarily opt out of the program, but none chose to do so. The BBB3AD program sessions were held immediately following the school day at the elementary school and lasted approximately eighty minutes. The sessions were held on the same day of each week. Sessions were not held consecutively due to the school district’s calendar. The program lasted from the beginning of October through mid-December.

**Theoretical Framework**

The BBB3AD program is based on Social Cognitive Theory (SCT). According to Baronowski et al, “Social Cognitive Theory addresses both the psychological dynamics influencing health behavior and methods for promoting behavioral change”. Behavioral modeling of milk consumption and perceptions of others’ opinions were shown to be significant predictors of total calcium and milk intake. Additionally, as students are surrounded by their peers at school and consume about 35% to 40% of their daily energy intake there, the environmental construct of SCT can be addressed in a school environment. With the influence of environment, peers, and parents on consumption of dairy products and physical activity levels, a SCT model is a natural fit for this intervention.

Bandura’s SCT constructs were used in the design of the BBB3AD program. The following table maps how the constructs of SCT are supported by the intervention strategies used in BBB3AD. Environmental/Social support, Knowledge and Outcome expectations were specifically targeted throughout the curriculum.
Table 1. BBB3AD with SCT Constructs

<table>
<thead>
<tr>
<th>BBB3AD Intervention Components and Mastery Experiences</th>
<th>Social Cognitive Theory Constructs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutrition and Physical Activity lessons:</strong></td>
<td>Environmental/ Social supports</td>
</tr>
<tr>
<td>participants were educated on positive outcomes of healthy diet choices, eating 3 or more servings of dairy foods daily and weight bearing activities</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Food activities:</strong></td>
<td></td>
</tr>
<tr>
<td>participants experienced how to easily prepare healthy food options and experimented with trying new foods</td>
<td></td>
</tr>
<tr>
<td><strong>Physical activities:</strong></td>
<td></td>
</tr>
<tr>
<td>participants were offered instruction and participation in weight bearing activities</td>
<td></td>
</tr>
<tr>
<td><strong>School lunch sampling events:</strong></td>
<td></td>
</tr>
<tr>
<td>the entire school was presented samples and information on healthy foods readily available in the cafeteria</td>
<td></td>
</tr>
<tr>
<td><strong>Parent dinner and presentation:</strong></td>
<td></td>
</tr>
<tr>
<td>parents were educated on how to include dairy foods in family meals</td>
<td></td>
</tr>
<tr>
<td><strong>Poster contest and incentive opportunities:</strong></td>
<td></td>
</tr>
<tr>
<td>incentives and rewards for purchasing and consuming dairy foods and participating in physical activity daily were offered to participants and parents</td>
<td></td>
</tr>
<tr>
<td><strong>Guest speakers:</strong></td>
<td></td>
</tr>
<tr>
<td>participants were exposed to a variety of credible role models including experts, mentors, teachers and peers</td>
<td></td>
</tr>
<tr>
<td><strong>Dairy diary and physical activity log:</strong></td>
<td></td>
</tr>
<tr>
<td>self-monitoring, goal-setting, and decision making were encouraged by participants through use of these logs</td>
<td></td>
</tr>
</tbody>
</table>
Schedule

Children spent the first week of the BBB3AD program learning about the intervention, completing a pre-questionnaire, receiving educational handouts, and participating in a milk flavoring and tasting activity. Due to the nature of the program and questionnaires, informed consent was not required. Participants had the right to decline participation in the program and choose another after-school session to attend. No students requested exemption.

During the remaining seven weeks of the BBB3AD program, 40 minutes were spent in the nutrition component and 40 minutes in the physical activity component. For classroom and resource management, children were split into two groups: one group started in the nutrition component and one group began in the physical activity component. Groups switched components after 40 minutes to participate in the opposite activity.

Parents of participating students were asked to participate in the study by completing parent questionnaires. Prior to initiation of the BBB3AD program, a family night dinner was held at the intervention elementary school to discuss the program, answer questions, and encourage parent participation.

Nutrition Component

Each week the children spent approximately forty minutes on nutrition education and food activities. The lessons were taught by a senior extension agent in nutrition and wellness and a registered dietitian. Objectives of the lessons included: learning the importance of dairy foods, encouraging environmental dietary changes, building self-efficacy for selecting healthier foods and beverages for meals and snacks, and reinforcing increased dairy intake. The BBB3AD curriculum outline is included in Appendix A. Each week is briefly described below.

- Week 1 addressed MyPyramid as a guide to healthy eating, a “Calcium Counts” handout, review of food labels and a food activity with flavored milk.
- Week 2 reviewed “Calcium Counts” and food labels, had a specific focus on bone health and the food activity consisted of preparing vegetable omelets.
- Week 3 addressed the bone benefits of physical activity, lunch ideas to increase calcium intake and the food activity was preparing tomato soup and grilled cheese sandwiches.
• Week 4 addressed food and beverage processing through a visit by a dairy farmer and cow and the food activity was conducted with string cheese.
• Week 5 addressed “Calcium Robbers”, dinner ideas to increase calcium intake, and the food activity consisted of preparing vegetable English Muffin pizzas.
• Week 6 addressed “Beverage Boosts and Busts” and there was a food activity of preparing fruit and yogurt smoothies.
• Week 7 addressed dairy intake modeling by a middle school student and science experiments which included a food activity of making ice cream.
• Week 8 included a video on dairy farms and where milk comes from in addition to a food activity of making flavored pudding cups.

Physical Activity Component

Each week the children spent approximately 40 minutes in physical activity. A physical education teacher led the physical activity lessons. Objectives of the lessons included: building behavioral capability to perform weight-bearing exercise, learning about the bone benefits of weight-bearing activities, promoting positive associations with physical activity and developing self-efficacy towards participating in exercise. The BBB3AD curriculum outline is included in Appendix A.

MEASUREMENTS

Intervention School

Children

During the first week of the BBB3AD program, participants completed the child pre-questionnaire (Appendix B). This self-administered measure was designed specifically for the BBB3AD curriculum. It was developed using questions from the CATCH Kids Club After-School Student Questionnaire (ASSQ) and the “What Do I Think?” (WDIT) questionnaire from Healthy Weight for Healthy Kids. Questions used in the development of the ASSQ were modified from measurement tools that had been found to have acceptable internal consistency. Some questions from the WDIT measurement tool were extracted from the Centers for Disease
Control Youth Risk Behavioral Surveillance System. Remaining questions were created, then tested for reliability, using test-re-test, and content validity via an expert review panel. Questions examined previous-day dietary intake for selected foods, previous and weekend-day physical and sedentary behaviors, nutrition and food knowledge and attitudes, home food environment for dairy foods, and self-efficacy and intentions for consuming dairy and low fat dairy foods. Demographic information such as date of birth, grade level, gender, race and ethnicity was also collected.

Questionnaires contained 57 multiple choice questions and took participants between 20 to 30 minutes to complete. Questions were read out loud to students who needed assistance. In addition to the initial questionnaire, participants completed the same two more times over a six month period; the post-questionnaire was given at the end of the intervention and the follow-up questionnaire was given three months after the end of the intervention.

According to standard methodology, focus groups were held to learn about what the participants liked and did not like about the intervention. Students also had the opportunity to share details on any dietary and physical activity changes they may have made based on the intervention. Four focus groups of five to seven participants were conducted 11 weeks after the end of the intervention. Two moderators were present at each of the 15 to 20 minute focus groups. Audio recordings and written notes were taken during the focus groups for generation of common themes.

Parents

One parent questionnaire (Appendix C) was sent home with each child on the first day of the BBB3AD program. This self-administered measure was designed specifically for this curriculum. Questions used came from measurement tools developed by Anderson et al that previously showed satisfactory reliability and from the ASSQ and WDIT instruments. One parent per participating child was asked to complete the form, preferably the primary parent in charge of purchasing and/or cooking food. Questions examined the parent’s and participating child’s previous-day dietary intake for selected foods, previous and weekend-day physical and sedentary behaviors, nutrition and food knowledge and attitudes, home food environment for dairy foods, and food intentions. Demographic information collected from the parent included their gender, race ethnicity, number of children, ages and gender of their children, and number of children living in their home. Questionnaires contained 50 multiple choice questions and took
participants between 20 to 30 minutes to complete. Parents were asked to return the questionnaire to school via their child.

Each child’s parent also received information sheets about the intervention, a cookbook, guides to the incentives and educational handouts. Contact information for the investigators was also provided and parents were encouraged to make contact with program leaders if they had questions or concerns.

Comparison School

Child pre-questionnaires were completed by the comparison students during the same month as the intervention students for baseline, and post-questionnaires were completed three months later. Questionnaires were the same as used with the intervention school participants but were administered during class time as there was not an after-school program available. Three classes were randomly chosen from all the fourth and fifth grade classes to complete the questionnaires at the comparison school. Parent questionnaires were not used for the comparison school.

Incentives

All participants from both elementary schools received the same educational handouts, t-shirt, educational toys, and a $15 gift card to a local grocery store when they completed the post-questionnaire. Parents who completed the parent questionnaire received a $20 gift card to a local grocery store at the end of the BBB3AD program.

DATA ANALYSIS

Descriptive Analysis

Characteristics used to describe the study population include: grade, gender, race and ethnicity. Participants’ responses to pre and post-questionnaires were also used to depict the participants.
**Statistical Analysis**

All analyses for this study were performed using SPSS (version 15.0, 2007, SPSS Inc, Chicago, IL) statistical software. Statistical significance was set at p< 0.05. Descriptive statistics on demographics, food consumption, physical activity, sedentary behaviors, self-efficacy for dairy consumption, knowledge concerning health benefits of dairy foods, environment and plans to consume dairy products were examined. Measures of central tendency (mean, median, and variance) were performed to describe the child participants and the comparison school children. Paired t-tests were used to analyze changes from pre to post-questionnaires within group. Independent t-tests were used to analyze changes from pre to post-questionnaires between groups. Chi-square analysis was used to evaluate degree of change from pre and post-questionnaires between groups.
RESULTS

Study Sample

There were 65 fourth and fifth grade participants in the intervention group of the BBB3AD program. Of those 65, 46 completed all the questionnaires included in the study and were used in statistical analyses. There were 47 fourth and fifth grade participants in the comparison group for the BBB3AD program. Of those, 44 completed all the questionnaires included in the study and were used in statistical analyses. Characteristics of the sample are summarized in Table 2.

Table 2. Characteristic Measures

<table>
<thead>
<tr>
<th></th>
<th>Intervention Participants</th>
<th>Comparison Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n, (%)</td>
<td>n, (%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>30 (65.2%)</td>
<td>22 (50.0%)</td>
</tr>
<tr>
<td>Female</td>
<td>16 (34.8%)</td>
<td>22 (50.0%)</td>
</tr>
<tr>
<td><strong>Grade</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fourth</td>
<td>29 (63.0%)</td>
<td>18 (40.9%)</td>
</tr>
<tr>
<td>Fifth</td>
<td>17 (37.0%)</td>
<td>26 (59.1%)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>39 (84.8%)</td>
<td>39 (88.6%)</td>
</tr>
<tr>
<td>Black or African American</td>
<td>3 (6.5%)</td>
<td>5 (11.4%)</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>1 (2.2%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (4.3%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>7 (15.2%)</td>
<td>1 (2.3%)</td>
</tr>
<tr>
<td>Other</td>
<td>39 (84.8%)</td>
<td>42 (95.5%)</td>
</tr>
</tbody>
</table>

Environment

There was only one significant change in environmental measures within the intervention group. When asked if their closest friends ate or drank at least 3 servings of dairy foods every day, the intervention group had a significant positive increase in the post-questionnaire. However, this was not significant when evaluated against the comparison participants. Additionally, chi-square analysis on the change in this variable between groups was not
significant and showed no positive trends for the intervention group. All other environmental measures remained constant within and between groups. Table 3 provides specific values for questions related to environment.

Table 3. Environment Measures

<table>
<thead>
<tr>
<th>Question</th>
<th>Intervention Participants</th>
<th>Comparison Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Mean ± SD</td>
<td>Post Mean ± SD</td>
</tr>
<tr>
<td>Do you ever drink milk for dinner?</td>
<td>2.13 ± .75</td>
<td>2.17 ± .64</td>
</tr>
<tr>
<td>Do you ever cook dinner for family?</td>
<td>2.42 ± .66</td>
<td>2.24 ± .65</td>
</tr>
<tr>
<td>Does your family let you choose what you want to eat for meals?</td>
<td>1.84 ± .52</td>
<td>1.91 ± .63</td>
</tr>
</tbody>
</table>

Rating on a scale from 1 to 3, 1 being “Almost always or always” and 3 being “Almost never or never”

<table>
<thead>
<tr>
<th>Question</th>
<th>Intervention Participants</th>
<th>Comparison Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Mean ± SD</td>
<td>Post Mean ± SD</td>
</tr>
<tr>
<td>My closest friends eat or drink at least 3 servings of dairy foods every day.</td>
<td>3.24 ± 1.21</td>
<td>3.71 ± 1.04* (p=.046)</td>
</tr>
<tr>
<td>My family wants me to eat or drink at least 3 servings of dairy foods every day.</td>
<td>3.70 ± 1.26</td>
<td>3.47 ± 1.32</td>
</tr>
<tr>
<td>My family wants me to eat or drink low-fat over regular dairy foods.</td>
<td>3.41 ± 1.20</td>
<td>3.41 ± 1.28</td>
</tr>
</tbody>
</table>

Rating on a scale from 1 to 5, 1 being “Really Disagree” and 5 being “Really Agree”

<table>
<thead>
<tr>
<th>Question</th>
<th>Intervention Participants</th>
<th>Comparison Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Mean ± SD</td>
<td>Post Mean ± SD</td>
</tr>
<tr>
<td>There is usually milk in my refrigerator at home.</td>
<td>2.45 ± .66</td>
<td>2.61 ± .62</td>
</tr>
<tr>
<td>There is usually low-fat milk in my refrigerator at home.</td>
<td>1.82 ± .72</td>
<td>1.73 ± .79</td>
</tr>
</tbody>
</table>

Rating on a scale from 1 to 3, 1 being “Not likely” and 3 being “Very likely”

Paired t-tests (p<0.05)
Dietary Intake

Previous day’s milk intake increased significantly in the intervention group from pre to post-questionnaire (p=.006). Although the intervention group consumed less milk on the previous day for both the pre and post-questionnaires compared to the comparison participants, they significantly increased milk consumption for the previous day by the end of the intervention and were able to reach the baseline milk consumption of the comparison participants. However, when previous day’s milk consumption change was analyzed with independent t-tests between groups, the intervention group’s increase was not significant (p=.088). No other previous day’s dietary intake patterns changed. Table 4 summarizes specific values for some of the dietary intake measures.

Table 4. Dietary Intake Measures

<table>
<thead>
<tr>
<th>Question</th>
<th>Intervention Participants</th>
<th></th>
<th>Comparison Participants</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Mean ± SD</td>
<td>Post Mean ± SD</td>
<td>Pre Mean ± SD</td>
<td>Post Mean ± SD</td>
</tr>
<tr>
<td>Yesterday, did you drink any kind of milk?</td>
<td>2.48 ± .98</td>
<td>2.98 ± .98* (p=.006)</td>
<td>2.98 ± .98</td>
<td>3.07 ± 1.09</td>
</tr>
<tr>
<td>Yesterday, did you eat any yogurt?</td>
<td>1.41 ± .69</td>
<td>1.39 ± .75</td>
<td>1.51 ± .88</td>
<td>1.53 ± .88</td>
</tr>
<tr>
<td>Yesterday, did you eat any cheese?</td>
<td>2.16 ± 1.17</td>
<td>2.13 ± .97</td>
<td>2.02 ± 1.12</td>
<td>1.95 ± 1.00</td>
</tr>
<tr>
<td>Yesterday, did you eat any ice cream.</td>
<td>1.49 ± .94</td>
<td>1.42 ± .69</td>
<td>1.39 ± .72</td>
<td>1.41 ± .79</td>
</tr>
</tbody>
</table>

Rating on a scale from 1 to 4, 1 being “No, I didn’t” and 4 being “Yes, I had it 3 or more times”
Paired t-tests (p<0.05)

Chi-square analysis was used to further investigate the change from pre to post-program in previous day’s milk consumption between groups. At post-questionnaire, 58.7% of the intervention group increased previous day’s milk consumption compared to 25% of the comparison group increasing consumption (p=.004). In addition, only 21.7% of the intervention group did not change while 52.3% of the comparison group did not change. Table 5 and Chart 1 provide further data on this analysis.
### Table 5. Milk Consumption Change

<table>
<thead>
<tr>
<th>Previous Day’s Milk Consumption Change (#times/day)</th>
<th>Total (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3.00</td>
<td>46</td>
</tr>
<tr>
<td>-2.00</td>
<td></td>
</tr>
<tr>
<td>-1.00</td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>3.00</td>
<td></td>
</tr>
</tbody>
</table>

**Intervention Group**

<table>
<thead>
<tr>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.2%</td>
</tr>
<tr>
<td>1</td>
<td>2.2%</td>
</tr>
<tr>
<td>7</td>
<td>15.2%</td>
</tr>
<tr>
<td>10</td>
<td>21.7%</td>
</tr>
<tr>
<td>21</td>
<td>45.7%</td>
</tr>
<tr>
<td>4</td>
<td>8.7%</td>
</tr>
<tr>
<td>2</td>
<td>4.3%</td>
</tr>
</tbody>
</table>

**Comparison Group**

<table>
<thead>
<tr>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>3</td>
<td>6.8%</td>
</tr>
<tr>
<td>7</td>
<td>15.9%</td>
</tr>
<tr>
<td>23</td>
<td>52.3%</td>
</tr>
<tr>
<td>5</td>
<td>11.4%</td>
</tr>
<tr>
<td>6</td>
<td>13.6%</td>
</tr>
<tr>
<td>0</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Pearson Chi-square 19.33, p=.004

### Chart 1: Change in Milk Consumption

![Chart showing the change in milk consumption](chart.png)
Activity and Sedentary Behaviors

Both activity and sedentary behaviors were evaluated. None of the active or sedentary behaviors changed significantly from pre to post-questionnaire in either group. In fact, the minutes spent exercising yesterday in the intervention group’s post-questionnaire showed a downward trend.

Table 6. Activity Measures

<table>
<thead>
<tr>
<th>Question</th>
<th>Intervention Participants</th>
<th></th>
<th>Comparison Participants</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Mean ± SD</td>
<td>Post Mean ± SD</td>
<td>Pre Mean ± SD</td>
<td>Post Mean ± SD</td>
</tr>
<tr>
<td>Yesterday, how many hours did you spend watching TV (shows/movies/video games)?</td>
<td>2.76 ± 1.43</td>
<td>2.91 ± 1.33</td>
<td>3.02 ± 1.47</td>
<td>3.09 ± 1.43</td>
</tr>
<tr>
<td>Yesterday, how many hours did you spend on the computer?</td>
<td>1.67 ± .99</td>
<td>1.80 ± 1.07</td>
<td>1.64 ± 1.08</td>
<td>2.05 ± 1.28</td>
</tr>
<tr>
<td>Last Saturday, how many hours did you spend watching TV (shows/movies/video games)?</td>
<td>2.96 ± 1.40</td>
<td>2.96 ± 1.40</td>
<td>2.93 ± 1.37</td>
<td>3.00 ± 1.54</td>
</tr>
<tr>
<td>Last Saturday, how many hours did you spend on the computer?</td>
<td>1.72 ± 1.22</td>
<td>1.59 ± .98</td>
<td>1.68 ± 1.07</td>
<td>1.86 ± 1.21</td>
</tr>
</tbody>
</table>

Rating on a scale from 1 to 5, 1 being “I didn’t” and 5 being “Yes, I did for 3 or more hours”

| yesterday, how many minutes did you spend exercising?                   | 3.17 ± 1.53               | 2.87 ± 1.44          | 3.35 ± 1.48             | 3.26 ± 1.58          |
| Last Saturday, how many minutes did you spend exercising?              | 3.00 ± 1.51               | 2.89 ± 1.45          | 2.93 ± 1.52             | 3.07 ± 1.42          |

Rating on a scale from 1 to 5, 1 being “I didn’t” and 5 being “Yes, I exercised for 60 minutes or more”

Paired t-tests (p<0.05)
Knowledge

Questions evaluating knowledge of benefits and recommended servings for dairy foods showed no improvement in either group. Additionally, on the post-questionnaire both the intervention and control groups demonstrated downward trends in knowledge of benefits of low-fat dairy foods on bones. Intervention participants answered the questions “how many servings of dairy products should you consume daily” and “which beverage would be a sometimes choice at a vending machine” equally wrong at both pre and post-questionnaire. Further data on these results can be seen in Table 7.

Table 7. Knowledge Measures

<table>
<thead>
<tr>
<th>Question</th>
<th>Intervention Participants</th>
<th>Comparison Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Mean ± SD</td>
<td>Post Mean ± SD</td>
</tr>
<tr>
<td>How many servings of dairy products should you eat each day?</td>
<td>0.239 ± 0.43</td>
<td>0.239 ± 0.43</td>
</tr>
<tr>
<td>Which would be a “sometimes” choice at a vending machine?</td>
<td>0.435 ± 0.50</td>
<td>0.435 ± 0.50</td>
</tr>
</tbody>
</table>

Rating on a 0,1 scale, 1 being the correct answer and 0 being all other answers

| Eating healthy low-fat dairy foods can help my bones grow stronger. | 4.33 ± 1.11 | 3.91 ± 1.36 (p=.055) | 4.41 ± .79 | 3.93 ± 1.35* (p=.026) |
| Being physically active can help my bones grow stronger. | 4.14 ± 1.25 | 4.27 ± 1.02 | 4.48 ± 0.51 | 4.16 ± 1.26 |

Rating on a scale from 1 to 5, 1 being “Really Disagree” and 5 being “Really Agree”
Paired t-tests (p<0.05)

Self-efficacy and Intentions

Self-efficacy to eat or drink at least 3 servings of dairy foods a day was close to “Agree” for both groups before the intervention and this did not change post-intervention. A significant decrease in plans to drink milk over soda in the intervention group was observed in the post-questionnaire. This decrease was not expected or desired. Once again, this change did not remain significant when analyzed between groups.
The intervention group showed a significant positive increase in plans to drink low-fat milk instead of regular milk (p = .047). However, this did not remain significant when change was analyzed between groups. Chi-square analysis of plans to drink low-fat milk instead of regular milk did not show any significant differences between groups and response changes from both groups ranged from -4.00 to +4.00. Detailed data on these variables are reported in Table 8.

Table 8. Self-efficacy and Intention Measures

<table>
<thead>
<tr>
<th>Question</th>
<th>Intervention Participants</th>
<th>Comparison Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Mean ± SD</td>
<td>Post Mean ± SD</td>
</tr>
<tr>
<td>I can eat/drink or eat 3 servings of dairy a day.</td>
<td>3.77 ± 1.27</td>
<td>3.80 ± 1.23</td>
</tr>
<tr>
<td>I can choose low-fat milk instead of regular milk.</td>
<td>3.25 ± 1.43</td>
<td>3.45 ± 1.39</td>
</tr>
<tr>
<td>I plan to drink low-fat/skim milk instead of regular milk.</td>
<td>2.93 ± 1.47</td>
<td>3.43 ± 1.39*</td>
</tr>
<tr>
<td>I plan to drink milk instead of soda.</td>
<td>3.81 ± 1.16</td>
<td>3.23 ± 1.41*</td>
</tr>
<tr>
<td>I plan to eat/drink 3 or more servings of dairy foods a day.</td>
<td>3.75 ± 1.16</td>
<td>3.84 ± 1.22</td>
</tr>
<tr>
<td>I plan to be physically active for 60+ minutes at least 3 days a week.</td>
<td>3.70 ± 1.19</td>
<td>4.07 ± .99</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rating on a scale from 1 to 5, 1 being “Really Disagree” and 5 being “Really Agree”
Paired t-tests (p<0.05)

Additional Analysis

Due to lack of change between pre and post-questionnaires, analysis of the follow-up questionnaire for the intervention participants have not been reported. Due to poor response rate on parent questionnaires of intervention participants’ parents (n=8, 12%), those results have not been reported.
Focus Group Findings

Responses from participants were varied. However, some common themes were apparent and are listed below.

- Participants stated that they were preparing calcium rich foods at home, a change from before the intervention, that were the same or similar to the foods prepared by the students during the course of the program.
- Participants stated that they were requesting their parents purchase more dairy foods.
- Participants mentioned that they did not have dairy foods available even if they asked for them because their parent(s) could or would not purchase them due to cost.
- Participants talked about how they asked for some foods but those foods were not purchased due to other family members not liking those foods.
DISCUSSION

The main finding from this study was that previous day’s milk consumption increased significantly for the intervention group from pre questionnaire to post-questionnaire (p = .006). Chi-square analysis also showed a significant change in previous day’s milk consumption between groups (p=.004). Previous day’s intake did not change significantly for any other food or beverage, including other dairy foods.

A within group analysis revealed two additional significant changes in the intervention participants. Participant’s response to whether their closest friends try to consume at least 3 servings of dairy foods every day increased (p=.046) and plans to drink low-fat milk instead of regular milk (p =.047) increased from pre to post-questionnaire. Both of these changes were positive and desirable. Investigators believe the change in friends is due to the fact that many of the participants friend’s were also in the BBB3AD program.

As knowledge of benefits of dairy foods and self-efficacy towards consuming dairy did not appear to increase while previous day’s milk consumption did change, it is not clear which intervention components affected behavior. Based on the focus group discussions, investigators believe that some of the influence on changing the previous day’s milk consumption is due to the experience of cooking and sampling different dairy rich foods during each lesson. Additionally, emphasis placed on choosing milk with meals and while in school, where it is readily available, is believed to have had a positive impact on previous day’s milk intake post-program. These mastery experiences are supported in SCT models and proved to have a positive impact on the BBB3AD participants. Based on the success of these approaches, more mastery experiences should have been included in the curriculum.

Insight on the impact of the intervention on some participants was gleaned by investigators through the use of focus groups. As reported, common themes did develop out of the four focus groups such as increased food preparation of dairy rich foods and increased requests for parents to purchase dairy rich foods. Participants frequently mentioned foods that had been prepared during the BBB3AD program that they were now making and consuming at home.

Based on the focus group responses, it was recognized that the questionnaires lacked the ability to capture changes in food preparation patterns and reasons for food availability. Measurement tools for future studies should include methods for measuring these variables.
Other variables to include would be school specific environment and food behaviors and self-efficacy for making healthy choices based on environmental conditions.

**Limitations**

Due to the fact that the intervention and comparison groups were not homogenous for baseline characteristics, limitations existed in the ability to detect significant changes from pre to post-program in the intervention participants. The intervention participants were not randomly assigned and were part of the after-school program due to eligibility in free or reduced-price meals and/or academic performance below grade level. Although the comparison school had similar demographics and the comparison students were randomly chosen by classroom, there may have been a greater variance in the comparison students in SES status and academic performance than in the intervention group. Furthermore, the comparison students were not in an after-school program and completed their questionnaires during the regular school day.

As the total number of students participating in the BBB3AD program was more than initially planned and resources were limited, some management issues arose. Staffing, classrooms, and lessons were developed to fit a smaller group than participated. Additionally, because of specific needs of many of the participating students due to reading comprehension levels and behavior, there was an even greater demand on investigators. Behavior management and lack of individual attention may have influenced both intervention affects and student performance on measurement tools. Modifications in curriculum, scheduling and resources were made when feasible and reasonable throughout the program. In particular, investigators decreased the reading level of program materials, used the timing of physical activity for behavior management and modified the lessons to include more hands on learning than had initially been planned. Investigators believe these changes were appropriate based on the needs of the participants and improved the BBB3AD program.

Length and dosage of the BBB3AD program was influenced by the after-school program and was not under the investigators’ control. It was not possible to offer a consecutive calendar due to the elementary school schedule and administrative decisions. Due to time limits, introduction of the program to participants was conducted less thoroughly than originally designed. This schedule change decreased available time for several remaining lessons.

As the BBB3AD program provided snacks and food sampling opportunities, that alone could have impacted participant’s perception of their friends’ consumption of dairy foods and
their food environment. However, the intervention was not held on the day before any of the
questionnaires were completed so the BBB3AD program did not provide food or beverages that
would have changed dietary intake on those days. The impact of repeated questionnaires on the
participants may also have unduly influenced results based on what responses the children
thought investigators wanted and did not want. Although a comparison group was used to
control for testing effect, the intervention participants seemed particularly resistant to completing
the repeated questionnaires.

Lastly, the measurement tool did not evaluate the research hypotheses to the desired
extent. Investigators agree the questionnaires were too long and complicated for the intervention
population. Decreasing the total number of questions and decreasing the reading level while
focusing remaining questions on the research hypotheses is suggested for future studies.

Conclusion

Working and researching in community nutrition education presents many opportunities
and challenges. When those issues are combined with adolescent participants and public school
administration, additional matters must be considered. To be successful, investigators need to
spend adequate time in development that accounts for the many complexities of each community
and audience. Implications for future practice drawn from this study include: having adequately
trained staff to provide the education, designing lesson plans with facility access and availability
in mind, using data collection tools that fit the needs and capabilities of the targeted population
and fully addresses research design and hypotheses, and allotting time to accurately design,
conduct and analyze focus groups.
References Cited


Chapter 4

SUMMARY & IMPLICATIONS FOR RESEARCH AND PRACTICE

Summary

Previous day's milk consumption and plans to drink low-fat milk instead of regular milk increased for participants in the after-school Build A Bone Bank with 3-A-Day (BBB3AD) program. These changes presented in the post-questionnaire taken at the end of the intervention. In addition to no other dietary habits changing, environment, activity and sedentary behaviors, knowledge about the benefits of healthy eating, and self-efficacy for consuming dairy foods remained the same. Observable trends for change also did not exist in this data set. Overall, these results were disappointing but not unexpected. Due to the measurement tools used and the investigators' observations of the participants completing the questionnaires, some thought has been given to the accuracy of the responses.

It was hypothesized that BBB3AD participants would increase their physical activity levels based on the lessons from the program. There was no significant change in either physical or sedentary activity levels, however, the investigators discussed the potential impact of seasonality on those behaviors. The pre-questionnaires were given during when the weather was still warm enough for children to be outside. The post-questionnaires were given months later when the weather was much colder. As many of the participants were from families of lower SES, access to indoor physical activity may have been limited during the winter months.

Setting clearer and more specific expectations with school administrators may have enhanced the BBB3AD program. Resource, staff and scheduling management was a constant struggle over the course of the intervention. Although the school and county administration supported the BBB3AD program, the education of after-school staff and teachers was not optimal. Lack of communication with the after-school program director made some activities difficult to accomplish as designed. However, investigators do not feel these issues detracted from the central messages and objectives of lessons.
Implications for Research and Practice

Based on the results and resources required to conduct the BBB3AD program, it would be difficult to justify implementing this program into after-school curricula. However, some components of the program could be employed. Rather than distributing snacks to children in after-school programs, finding ways for student involvement in the preparation and sampling of those snacks could be a positive addition. Focus group responses and general comments throughout the program from the BBB3AD participants consistently repeated that students enjoyed and learned from cooking and sampling different foods.

Measuring knowledge, attitude and self-efficacy changes in any population, particularly adolescent populations, is a challenge. Reading comprehension, confusing questions, and disinterest in completing measurement tools can impact ability to answer surveys and questionnaires. Development of reliable instruments that capture responses by adolescents in their own words could help improve the quality of data collected. These tools would take longer to evaluate and score but would appear to offer more insight into the impact of interventions.

Understanding the roles of school administrators and investigators is a crucial component to developing after-school nutrition education programs. An administrator who supports the program, has decision making authority and believes in the goals of the education would be an optimal choice. Additionally, communication modes and frequency should be delineated before the beginning of an after-school program.

Conducting formative focus groups would provide insight for development of appropriate curriculum, measurement tools and roles for administrators. By learning the needs and goals of each group, investigators could create more powerful programs. This early outlay of resources may result in greater returns on investments of time, money and other resources long term.

Final Thoughts

These investigators firmly believe that the BBB3AD program made an impact on the student participants. One investigator occasionally encounters participants in the community. Even five months after the program the students will often talk excitedly about the activities they participated in and the things they learned. They often talk about new foods they eat and try that are based on what they experienced in the BBB3AD program. Due to these meetings and observations made while students were completing the questionnaires, these investigators believe that the measurement tools were not designed and used appropriately.
Appendices
Appendix A: Build a Bone Bank with 3-A-Day Curriculum Outline

Lesson 1: 3-A-Day: The Power of 3  
(October 3, 2008)
A. Nutrition Component
   a. Complete pre-questionnaire
   b. MyPyramid- a guide to healthy eating
   c. Calcium Counts! (use food models; plan daily food intake and calculate total calcium)
   d. Examine food labels to determine calcium content
   e. “Bone Up On Dairy” (National Dairy Council parent handout)
   f. Assignment: Dairy Diary for one week
   g. Food Activity: Taste 3 different kinds of milk (compare fat, calories and sugar) and experiment with coloring and flavoring milk with extracts (vanilla, almond, coconut)
B. Physical Activity Component
   a. Challenge Courses and Basketball

Lesson 2: Bone Health: Being Dense Is Smart  
(October 10, 2008)
A. Nutrition Component
   a. Calcium Counts! continued
   b. Examine food labels to determine calcium content continued
   c. Review Dairy Diaries
   d. Show bone samples to illustrate healthy and unhealthy bones
   e. “Have You Fed Your Bones Lately?” Activity
   f. Breakfast ideas to increase calcium
   g. Food Activity: Prepare cheese omelets with veggie toppings
B. Physical Activity Component
   a. Activity Stations and Sideline Soccer

Additional: Dairy Display and Food Sampling  
(October 11, 2008)
A. Distribute string cheese to 400 students in cafeteria from 10:50 am to 12:40 pm

Lesson 3: Physical Activity: Moooove It  
(October 17, 2008)
A. Nutrition Component
   a. Benefits of Physical Activity for Bone Health-education on weight-bearing activities
   b. Lunch ideas to increase calcium
   c. Food Activity: Prepare tomato soup with milk and grilled cheese sandwiches
B. Physical Activity Component
   a. Stations for Weight Bearing Activities

Lesson 4: Visit From a Dairy Farmer and His Cow  
(October 24, 2008)
A. Nutrition Component
   a. Students will learn about dairy products and how they are processed
   b. Increase knowledge about where food comes from and the importance of dairy in their diets
   c. Introduce 3-A-Day Poster contest guidelines
   d. Food Activity: String cheese fun
B. Physical Activity Component
   a. Jump Rope and Elimination
Lesson 5: Calcium Robbers  (November 7, 2008)
A. Nutrition Component
   a. Bone Up On Calcium (Quiz)
   b. The Robbers: excess phosphorus, inactivity, smoking, alcohol
   c. Distribute Calcium Robbers handout
   d. Dinner ideas to increase calcium
   e. Food Activity: Prepare English muffin pizzas with cheese and veggie toppings
B. Physical Activity Component
   a. Relay races and Hockey

Lesson 6: Beverage Boosts and Busts  (November 14, 2008)
A. Nutrition Component
   a. Think Your Drink- learning about healthy beverage choices
   b. My Milk Mustache – take photos of children with milk mustaches
   c. Food Activity: Make smoothies and distribute “Berry Delicious Smoothies” handouts
B. Physical Activity Component
   a. Milk jug relays and Sideline Soccer

Additional: Dairy Display and Food Sampling  (November 14, 2008)
A. Distribute yogurt samples to 400 students in cafeteria from 10:45 am to 1:00 pm

Lesson 7: Mad Scientist and Friends  (November 28, 2008)
A. Nutrition Component
   a. Guest Dr. Frances Webster, chemist, and Dr. Janet Webster, food scientist, describe functions of calcium
   b. Middle school student describes why and ways to incorporate more calcium in your diet
   c. Science Experiment: Egg soaked in vinegar and application to bone strength
   d. Dairy quiz and calcium resources distributed
   e. Science Experiment: “Mad Scientist makes ice cream”
   f. Food Activity: Sample Ice Cream from science experiment
B. Physical Activity Component
   a. Challenge Courses and Scooters

Lesson 8: Make Mine Milk  (December 5, 2008)
A. Nutrition Component
   a. Watch video: “Make Mine Milk” on dairy farms and where dairy products come from
   b. Complete post-questionnaires
   c. Food Activity: Prepare and sample pudding cups
B. Physical Activity Component
   a. Jump Rope and Basketball

Lessons 9: Final Celebration  (February 19, 2008)
A. Celebration, review and incentives distributed
B. Complete focus groups with randomly selected participants
C. Nutrition Component
   a. Food Activity: Fudgesicles
D. Physical Activity Component
   a. Activity Stations and Hockey
Appendix B
Child Questionnaire

Build a Bone Bank with 3-A-Day

What is your first name? ________________________________
What is your middle name? ________________________________
What is your last name? ________________________________
Build a Bone Bank with 3-A-Day

What is the date? ________________________________

What is your birth-date? ________________________________

What grade are you in? ________________________________

Are you a boy or girl?  
☐ Boy  ☐ Girl

How do you describe yourself?

☐ White
☐ Black or African American
☐ Asian of Pacific Islander
☐ American Indian or Alaskan Native
☐ Other ________________________________

Are you Hispanic or Latino?  
☐ Yes  ☐ No
Instructions: Discover what YOU think. Circle ONE answer for each question that tells us what YOU think.

1. Yesterday, did you drink any kind of milk? Count chocolate milk or flavored milk, milk on cereal, or drinks made with milk.
   a. No, I didn’t drink any milk yesterday.
   b. Yes, I drank milk 1 time yesterday.
   c. Yes, I drank milk 2 times yesterday.
   d. Yes, I drank milk 3 or more times yesterday.

2. Yesterday, did you drink any sodas or soft drinks?
   a. No, I didn’t drink any soda or soft drinks yesterday.
   b. Yes, I drank soda or soft drinks 1 time yesterday.
   c. Yes, I drank soda or soft drinks 2 times yesterday.
   d. Yes, I drank soda or soft drinks 3 or more times yesterday.

3. Yesterday, did you drink any 100% fruit or vegetable juice?
   a. No, I didn’t drink any 100% fruit or vegetable juice yesterday.
   b. Yes, I drank 100% fruit or vegetable juice 1 time yesterday.
   c. Yes, I drank 100% fruit or vegetable juice 2 times yesterday.
   d. Yes, I drank 100% fruit or vegetable juice 3 or more times yesterday.

4. Yesterday, did you drink any fruit drinks? Count punch, kool-aid, sports drinks, lemonade and other fruit flavored drinks like these.
   a. No, I didn’t drink any fruit drinks yesterday.
   b. Yes, I drank fruit drinks 1 time yesterday.
   c. Yes, I drank fruit drinks 2 times yesterday.
   d. Yes, I drank fruit drinks 3 or more times yesterday.

5. Yesterday, did you eat any vegetables? Count salads, baked and mashed potatoes, and all cooked and uncooked vegetables. Do not count French fries.
   a. No, I didn’t eat any vegetables yesterday.
   b. Yes, I ate vegetables 1 time yesterday.
   c. Yes, I ate vegetables 2 times yesterday.
   d. Yes, I ate vegetables 3 or more times yesterday.
6. Yesterday, did you eat any beans such as pinto beans, baked beans, kidney beans, refried beans or pork and beans?
   a. No, I didn’t eat any beans yesterday.
   b. Yes, I ate beans \textbf{1 time} yesterday.
   c. Yes, I ate beans \textbf{2 times} yesterday.
   d. Yes, I ate beans \textbf{3 or more times} yesterday.

7. Yesterday, did you eat any fruits? Do not count fruit juice.
   a. No, I didn’t eat any fruits yesterday.
   b. Yes, I ate fruits \textbf{1 time} yesterday.
   c. Yes, I ate fruits \textbf{2 times} yesterday.
   d. Yes, I ate fruits \textbf{3 or more times} yesterday.

8. Yesterday, did you eat any yogurt?
   a. No, I didn’t eat yogurt.
   b. Yes, I ate yogurt \textbf{1 time} yesterday.
   c. Yes, I ate yogurt \textbf{2 times} yesterday.
   d. Yes, I ate yogurt \textbf{3 or more times} yesterday.

   a. No, I didn’t eat any of the foods listed above yesterday.
   b. Yes, I ate one of these foods \textbf{1 time} yesterday.
   c. Yes, I ate one of these foods \textbf{2 times} yesterday.
   d. Yes, I ate one of these foods \textbf{3 or more times} yesterday.

10. Yesterday, did you eat any cheese? Count cheese sticks, cheese slices, cheese in your foods, and any other cheeses.
    a. No, I didn’t eat cheese yesterday.
    b. Yes, I ate cheese \textbf{1 time} yesterday.
    c. Yes, I ate cheese \textbf{2 times} yesterday.
    d. Yes, I ate cheese \textbf{3 or more times} yesterday.
11. Yesterday, did you have a snack? A snack is a food or drink that you have before, after or between meals.
   a. No, I didn’t have any snacks yesterday.
   b. Yes, I had a snack 1 time yesterday.
   c. Yes, I had a snack 2 times yesterday.
   d. Yes, I had a snack 3 or more times yesterday.

12. Yesterday, did you eat ice cream?
   a. No, I didn’t eat ice cream yesterday.
   b. Yes, I ate ice cream 1 time yesterday.
   c. Yes, I ate ice cream 2 times yesterday.
   d. Yes, I ate ice cream 3 or more times yesterday.

13. Yesterday, did you eat breakfast?
   a. Yes
   b. No

14. Yesterday, how many hours did you spend watching TV shows, movies or video games?
   a. I didn’t watch TV shows, movies or video games
   b. I watched less than 1 hour of TV show, movie or video games
   c. I watched 1-2 hours of TV shows, movies or video games
   d. I watched 2-3 hours of TV shows, movies or video games
   e. I watched 3 or more hours of TV shows, movies or video games

15. Yesterday, how many hours did you spend playing on the computer (surf the Internet, play games) or working on the computer?
   a. I didn’t play or work on the computer
   b. I used the computer less than 1 hour
   c. I used the computer 1-2 hours
   d. I used the computer 2-3 hours
   e. I used the computer 3 or more hours
16. **Last Saturday**, how many **hours** did you spend watching TV shows, movies or video games?

   a. I didn’t watch TV shows, movies or video games
   b. I watched less than 1 hour of TV show, movie or video games
   c. I watched 1-2 hours of TV shows, movies or video games
   d. I watched 2-3 hours of TV shows, movies or video games
   e. I watched 3 or more hours of TV shows, movies or video games

17. **Last Saturday**, how many **hours** did you spend playing on the computer (surf the Internet, play games) or working on the computer?

   a. I didn’t play or work on the computer
   b. I used the computer less than 1 hour
   c. I used the computer 1-2 hours
   d. I used the computer 2-3 hours
   e. I used the computer 3 or more hours

18. **Yesterday**, how many **minutes** did you spend exercising or participating in sport activities that made your heart beat fast and made you breathe hard. (For example: basketball, jogging, skating, fast dancing, swimming laps, tennis, fast bicycling, or similar aerobic activities.)

   a. I didn’t exercise or participate in sports
   b. I exercised or participated in sports less than 20 minutes
   c. I exercised or participated in sports 20-40 minutes
   d. I exercised or participated in sports 40-60 minutes
   e. I exercised or participated in sports 60 or more minutes

19. **Last Saturday**, how many **minutes** did you spend exercising or participating in sport activities that made your heart beat fast and made you breathe hard.

   a. I don’t exercise or participate in sports
   b. I exercise or participate in sports less than 20 minutes daily
   c. I exercise or participate in sports 20-40 minutes daily
   d. I exercise or participate in sports 40-60 minutes daily
   e. I exercise or participate in sports 60 or more minutes daily
20. Do you ever read the nutrition labels on food packages?
   a. Almost always or always
   b. Sometimes
   c. Almost never or never

21. Do you ever drink low-fat or skim milk?
   a. Almost always or always
   b. Sometimes
   c. Almost never or never

22. Do you ever eat low-fat instead of regular cheese?
   a. Almost always or always
   b. Sometimes
   c. Almost never or never

23. Do you ever drink milk for dinner?
   a. Almost always or always
   b. Sometimes
   c. Almost never or never

24. Do you ever eat yogurt?
   a. Almost every day
   b. Sometimes
   c. Almost never or never

25. Do you think exercise (physical activity) is fun?
   a. Yes
   b. No

26. The foods that I eat and drink now are healthy.
   a. Yes, all the time
   b. Yes, sometimes
   c. No
27. How many total servings of fruits and vegetables should you eat each day?
   a. At least 2
   b. At least 5
   c. At least 9
   d. At least 10
   e. I don’t know

28. How many total servings of dairy products should you eat each day?
   a. At least 1
   b. At least 2
   c. At least 3
   d. I don’t know

29. Exercise (physical activity) is important.
   a. Yes
   b. No

30. Imagine you are standing in front of a vending machine. Which of these drinks is the LEAST healthy to drink, and belongs in the “sometimes” – NOT “everyday” category?
   a. Low-fat milk
   b. 100% juice
   c. Water
   d. Fruit drink

How much do you or don’t you agree with the following questions:

31. Eating healthy low-fat dairy foods can help my bones grow stronger.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree
32. Being physically active can help my bones grow stronger.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

33. Eating healthy foods helps me think and concentrate better in school.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

34. I can choose snacks that have the nutrients my body needs.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

35. Exercise (physical activity) can be easy to include every day.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

36. My closest friends drink a lot of regular sodas (not diet) or sugared drinks.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree
37. My **closest friends** try to eat low-fat dairy foods.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

38. My **closest friends** eat or drink at least 3 servings of dairy foods every day.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

39. My **family** has told me that they want to cut down on sodas or sugared drinks.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

40. My **family** wants me to eat or drink at least 3 servings of dairy foods every day.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

41. My **family** wants me to eat or drink low-fat over regular dairy foods.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree
Answer the below with how sure you are that you....

42. I know the difference between low-fat milk and regular white milk.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

43. I know the difference between plain yogurt and sweetened yogurt.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

44. I can drink or eat at least 3 servings of dairy foods each day.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

45. I can choose low-fat milk instead of regular white milk.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

46. I plan to drink low-fat milk or skim milk instead of regular white milk.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree
47. I plan to drink milk instead of soda.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

48. I plan to eat low-fat cheese instead of regular cheese.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

49. I plan to eat or drink three or more servings of dairy foods a day.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

50. I plan to be physically active for at least 60 minutes 3 or more days a week.
   a. Really Disagree
   b. Disagree
   c. Don’t Agree or Disagree
   d. Agree
   e. Really Agree

**Answer the following for what it is usually like in your house:**

51. There is usually milk in my refrigerator at home.
   a. Not likely
   b. Likely
   c. Very Likely
52. There is usually **low-fat milk** in my refrigerator at home.
   
   a. Not likely  
   b. Likely  
   c. Very Likely  

53. There is usually **yogurt** in my refrigerator at home.
   
   a. Not likely  
   b. Likely  
   c. Very Likely  

54. There is usually **cheese** in my refrigerator at home.
   
   a. Not likely  
   b. Likely  
   c. Very Likely  

55. There is usually **low-fat cheese** in my refrigerator at home.
   
   a. Not likely  
   b. Likely  
   c. Very Likely  

**Thank you for taking this survey about your health!!**

If there is anything else you would like to add, please write in the space below.

I think...

THANK YOU!
Appendix C
Parent Questionnaire

Build a Bone Bank with 3-A-Day

What is your first name? ________________________________
What is your middle name? ________________________________
What is your last name? ________________________________

What is your child’s first name? ________________________________
What is your child’s middle name? ________________________________
What is your child’s last name? ________________________________
Build a Bone Bank with 3-A-Day

What is the date? ____________________________________________

What is your birth-date? ______________________________________

How many children do you have? ________________________________

What are their ages and genders? ________________________________

How many of your children live with you? _________________________

What are their ages and genders? ________________________________

Are you a man or woman?  □  Man  □  Woman

How do you describe yourself?

□  White

□  Black or African American

□  Asian of Pacific Islander

□  American Indian or Alaskan Native

□  Other ____________________________________________________

Are you Hispanic or Latino?  □  Yes  □  No
The following questions are about your family's habits and opinions. Please choose the answer that describes what you do and think most of the time. When asked about your child, please answer correctly for only your child involved in this program.

1. Do you eat more than 1 kind of fruit each day?
   a. Always
   b. Often
   c. Sometimes
   d. Never

2. Do you eat more than 1 kind of vegetable each day?
   a. Always
   b. Often
   c. Sometimes
   d. Never

3. How many servings of vegetables do you eat each day? _________ servings

4. How many servings of fruit do you eat each day? _________ servings

5. Circle each dairy product below that you eat on a weekly basis.
   - Regular white milk
   - Low-fat milk
   - Yogurt
   - Low-fat yogurt
   - Cheese
   - Low-fat cheese
   - Cottage cheese
   - Ice cream

6. Do you drink milk daily?
   a. Always
   b. Often
   c. Sometimes
   d. Never

7. Do you eat fruit or vegetables as snacks?
   a. Always
   b. Often
   c. Sometimes
   d. Never

8. Do you eat milk or dairy products as snacks?
   a. Always
   b. Often
   c. Sometimes
   d. Never
9. Do you drink soft drinks (sodas) daily?
   a. Always
   b. Often
   c. Sometimes
   d. Never

10. Do you drink regular soft drinks (sodas)?
    a. Always
    b. Often
    c. Sometimes
    d. Never

11. Does your child drink regular soft drinks (sodas)?
    a. Always
    b. Often
    c. Sometimes
    d. Never

12. When shopping, do you use the Nutrition Facts on the food label of foods?
    a. Always
    b. Often
    c. Sometimes
    d. Never

13. Does your child drink milk daily?
    a. Always
    b. Often
    c. Sometimes
    d. Never

14. Do you run out of food before the end of the month?
    a. Always
    b. Often
    c. Sometimes
    d. Never

15. How often are fruits available in your house?
    a. Always
    b. Often
    c. Sometimes
    d. Never
16. How often are low-fat dairy foods available in your house?
   a. Always
   b. Often
   c. Sometimes
   d. Never

17. How often are vegetables available in your house?
   a. Always
   b. Often
   c. Sometimes
   d. Never

18. How often are soft drinks (sodas) available in your house?
   a. Always
   b. Often
   c. Sometimes
   d. Never

19. How often is yogurt available in your house?
   a. Always
   b. Often
   c. Sometimes
   d. Never

20. How often are fruits and vegetables served as snacks in your house?
   a. Always
   b. Often
   c. Sometimes
   d. Never

21. How often are low-fat dairy foods served as snacks in your house?
   a. Always
   b. Often
   c. Sometimes
   d. Never

22. How often is milk served at meals in your house?
   a. Always
   b. Often
   c. Sometimes
   d. Never
23. How often does your child decide which meals will be served in your house?
   a. Always
   b. Often
   c. Sometimes
   d. Never

24. How often are fruit drinks (kool-aid, sports drinks, lemonade, etc.) served at meals in your house?
   a. Always
   b. Often
   c. Sometimes
   d. Never

25. I try to eat or drink at least 3 servings of dairy foods every day.
   a. Always
   b. Often
   c. Sometimes
   d. Never

26. I encourage my child to drink at least 3 servings of dairy foods every day.
   a. Always
   b. Often
   c. Sometimes
   d. Never

27. I believe that the foods I eat impact my health.
   a. Yes
   b. No

28. I believe that the foods my child eats impacts his/her health.
   a. Yes
   b. No

29. How would you describe your diet?
   a. Excellent
   b. Very Good
   c. Good
   d. Fair
   e. Poor

30. How would you describe your child’s diet?
   a. Excellent
   b. Very Good
   c. Good
   d. Fair
   e. Poor
31. How would you describe your health?
   a. Excellent
   b. Very Good
   c. Good
   d. Fair
   e. Poor

32. How would you describe your child’s health?
   a. Excellent
   b. Very Good
   c. Good
   d. Fair
   e. Poor

33. Does your family participate in physical activity together?
   a. Almost every day
   b. Often
   c. Sometimes
   d. Never

34. During the week, how many hours per day do you usually spend watching TV shows, movies or video games?
   a. I don’t watch TV shows, movies or video games
   b. I watch less than 1 hour of TV show, movie or video game daily
   c. I watch 1-2 hours of TV shows, movies or video games daily
   d. I watch 2-3 hours of TV shows, movies or video games daily
   e. I watch 3 or more hours of TV shows, movies or video games daily

35. During the week, how many hours per day does your child usually spend watching TV shows, movies or video games?
   a. He/she doesn’t watch TV shows, movies or video games
   b. He/she watches less than 1 hour of TV shows, movies or video games daily
   c. He/she watches 1-2 hours of TV shows, movies or video games daily
   d. He/she watches 2-3 hours of TV shows, movies or video games daily
   e. He/she watches 3 or more hours of TV shows, movies or video games daily

36. During the weekend, how many hours per day do you usually spend watching TV shows, movies or video games?
   a. I don’t watch TV shows, movies or video games
   b. I watch less than 1 hour of TV show, movie or video game daily
   c. I watch 1-2 hours of TV shows, movies or video games daily
   d. I watch 2-3 hours of TV shows, movies or video games daily
   e. I watch 3 or more hours of TV shows, movies or video games daily
37. During the **weekend**, how many **hours per day** does **your child** **usually** spend watching TV shows, movies or video games?

   a. He/she doesn’t watch TV shows, movies or video games
   b. He/she watches less than 1 hour of TV shows, movies or video games daily
   c. He/she watches 1-2 hours of TV shows, movies or video games daily
   d. He/she watches 2-3 hours of TV shows, movies or video games daily
   e. He/she watches 3 or more hours of TV shows, movies or video games daily

38. During the **week**, how many **hours per day** do **you** **usually** spend playing on the computer (surf the Internet, play games) or working on the computer?

   a. I don’t play or work on the computer
   b. I use the computer less than 1 hour daily
   c. I use the computer 1-2 hours daily
   d. I use the computer 2-3 hours daily
   e. I use the computer 3 or more hours daily

39. During the **week**, how many **hours per day** does **your child** **usually** spend playing on the computer (surf the Internet, play games) or working on the computer?

   a. He/she doesn’t play or work on the computer
   b. He/she uses the computer less than 1 hour daily
   c. He/she uses the computer 1-2 hours daily
   d. He/she uses the computer 2-3 hours daily
   e. He/she uses the computer 3 or more hours daily

40. During the **weekend**, how many **hours per day** do **you** **usually** spend playing on the computer (surf the Internet, play games) or working on the computer?

   a. I don’t play or work on the computer
   b. I use the computer less than 1 hour daily
   c. I use the computer 1-2 hours daily
   d. I use the computer 2-3 hours daily
   e. I use the computer 3 or more hours daily

41. During the **weekend**, how many **hours per day** does **your child** **usually** spend playing on the computer (surf the Internet, play games) or working on the computer?

   a. He/she doesn’t play or work on the computer
   b. He/she uses the computer less than 1 hour daily
   c. He/she uses the computer 1-2 hours daily
   d. He/she uses the computer 2-3 hours daily
   e. He/she uses the computer 3 or more hours daily
42. Yesterday, did you exercise or participate in sport activities that made your heart beat fast and made you breathe hard for at least 20 minutes. (For example: basketball, jogging, skating, fast dancing, swimming laps, tennis, fast bicycling, or similar aerobic activities.)
   a. Yes
   b. No

43. Yesterday, did your child exercise or participate in sport activities that made his/her heart beat fast and made him/her breathe hard for at least 20 minutes. (For example: basketball, jogging, skating, fast dancing, swimming laps, tennis, fast bicycling, or similar aerobic activities.)
   a. Yes
   b. No

44. During the week, how many minutes per day do you usually spend exercising or participating in sport activities that makes your heart beat fast and makes you breathe hard.
   a. I don’t exercise or participate in sports
   b. I exercise or participate in sports less than 20 minutes daily
   c. I exercise or participate in sports 20-40 minutes daily
   d. I exercise or participate in sports 40-60 minutes daily
   e. I exercise or participate in sports 60 or more minutes daily

45. During the week, how many minutes per day does your child usually spend exercising or participating in sport activities that makes your heart beat fast and makes you breathe hard.
   a. He/she doesn’t exercise or participate in sports
   b. He/she exercises or participates in sports less than 20 minutes daily
   c. He/she exercises or participates in sports 20-40 minutes daily
   d. He/she exercises or participates in sports 40-60 minutes daily
   e. He/she exercises or participates in sports 60 or more minutes daily

46. During the weekend, how many minutes per day do you usually spend exercising or participating in sport activities that makes your heart beat fast and makes you breathe hard.
   a. I don’t exercise or participate in sports
   b. I exercise or participate in sports less than 20 minutes daily
   c. I exercise or participate in sports 20-40 minutes daily
   d. I exercise or participate in sports 40-60 minutes daily
   e. I exercise or participate in sports 60 or more minutes daily
47. During the **weekend**, how many minutes per day does your child **usually** spend exercising or participating in sport activities that makes your heart beat fast and makes you breathe hard.

   a. He/she doesn’t exercise or participate in sports
   b. He/she exercises or participates in sports less than 20 minutes daily
   c. He/she exercises or participates in sports 20-40 minutes daily
   d. He/she exercises or participates in sports 40-60 minutes daily
   e. He/she exercises or participates in sports 60 or more minutes daily

48. I believe that the foods my child eats impacts his/her bone health.
   a. Yes
   b. No

49. I believe that the foods I eat impact my bone health.
   a. Yes
   b. No

50. I believe that the foods and beverages I eat and drink influence my child’s food and beverage choices.
   a. Yes
   b. No

If there is anything else you would like to add, use the space below.

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**Thank you for taking this survey about the health of your family!**
Appendix D

IRB Approval Forms
DATE: September 17, 2007

MEMORANDUM

TO: Kathy Hosig
    Sarah D. Burkett
    Heather Cox

FROM: David M. Moore


This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of 12 months, effective September 17, 2007.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in previously approved human subject research activities to the IRB, including changes to your study forms, procedures and investigators, regardless of how minor. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.

2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

3. Report promptly to the IRB of the study’s closing (i.e., data collecting and data analysis complete at Virginia Tech). If the study is to continue past the expiration date (listed above), investigators must submit a request for continuing review prior to the continuing review due date (listed above). It is the researcher’s responsibility to obtained re-approval from the IRB before the study’s expiration date.

4. If re-approval is not obtained (unless the study has been reported to the IRB as closed) prior to the expiration date, all activities involving human subjects and data analysis must cease immediately, except where necessary to eliminate apparent immediate hazards to the subjects.

Important:
If you are conducting federally funded non-exempt research, this approval letter must state that the IRB has compared the OSP grant application and IRB application and found the documents to be consistent. Otherwise, this approval letter is invalid for OSP to release funds. Visit our website at http://www.irb.vt.edu/pages/newstudy.htm#OSP for further information.

cc: File
OSP
DATE: February 19, 2008

MEMORANDUM

TO: Kathy Hosig
Sarah D. Burkett
Heather Cox

FROM: David M. Moore


This memo is regarding the above referenced protocol which was previously granted approval by the IRB on September 17, 2007. You subsequently requested permission to amend your IRB application. Since the requested amendment is nonsubstantive in nature, I, as Chair of the Virginia Tech Institutional Review Board, have granted approval for requested protocol amendment, effective as of February 19, 2008. The anniversary date will remain the same as the original approval date.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in previously approved human subject research activities to the IRB, including changes to your study forms, procedures and investigators, regardless of how minor. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.

2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

3. Report promptly to the IRB of the study’s closing (i.e., data collecting and data analysis complete at Virginia Tech). If the study is to continue past the expiration date (listed above), investigators must submit a request for continuing review prior to the continuing review due date (listed above). It is the researcher’s responsibility to obtained re-approval from the IRB before the study’s expiration date.

4. If re-approval is not obtained (unless the study has been reported to the IRB as closed) prior to the expiration date, all activities involving human subjects and data analysis must cease immediately, except where necessary to eliminate apparent immediate hazards to the subjects.

cc: File