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**The impact of nutrition and health education intervention on kindergarten students'
nutrition and exercise knowledge**

by

Nina Louise Roofe

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Family and Consumer Sciences Education

Program of Study Committee:
Gregory Welk, Co-Major Professor
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Iowa State University

Ames, Iowa

2010

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Dedication

Without the willing assistance of several key groups, the completion of my research and this dissertation would not have been possible. I dedicate my dissertation to the 2009-2010 kindergarten students, their parents, the kindergarten faculty and administrative staff at the Florence Mattison International and Theodore Jones Elementary Schools.

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Christian, for reminding me what is really important in this life, helping me keep perspective, and giving the best hugs in the world!

Abstract

Quasi-experimental research was conducted with kindergarten students at two Southern state elementary schools to compare the changes in nutrition knowledge, food intake, physical activity behavior, and body mass index among elementary-age students and parents who participated in a nutrition education program with those who did not participate in the program. Permission and assent was obtained from 156 parents and kindergarten students (treatment $n = 79$, control $n = 77$) out of 205 total kindergarten students (76% response rate). A mixed between-within ANOVA was used to compare the children's knowledge change over time (repeated measures), the parent's Family Nutrition and Physical Activity (FNPA) score change over time, and the BMI results change over time. The nutrition and health curriculum taught by dietetics undergraduate students showed a significant increase in the children's knowledge and in the parent's FNPA scores ($p=.000$) compared to the control curriculum. However, the findings did not show a positive impact on the children's BMI results compared to the control curriculum. Qualitative research was conducted with the undergraduate nutrition majors at a local Southern state university to explore the personal impact of service learning on their personal and professional development. After participating in the program, the dietetic students were required to write a reflection paper including a personal impact section. When the personal impact sections were coded for emerging themes, the feeling of purpose and impact, general and pediatric experience gained, and the place for service learning in higher education were identified. These results demonstrated beneficial outcomes for the research participants (children and parents) as well as for the dietetic students implementing the program.

Chapter 1

Introduction

Overview

An epidemic refers to a condition that is extremely prevalent or widespread (Epidemic, 2009). Pediatric obesity has reached epidemic proportions in the United States. According to the latest National Health and Nutrition Examination Survey (NHANES) conducted by the Center for Disease Control (CDC) in 2005-2006, 15% of children aged 6-11 years and 18% of children and adolescents aged 12-19 years are overweight (National Center for Health Statistics Fact Sheet, 2006). Despite considerable efforts, few approaches have been shown to be effective in treating or preventing pediatric overweight and obesity. The increasing prevalence of overweight in youth presents a huge public health challenge since overweight youth are more likely to become overweight adults. Effective school-based programs are critical for addressing this problem (American Dietetic Association Position Statement, 2003; American Dietetic Association Position Statement, 2006). In most communities, there is no coordination or collaboration among entities such as public schools, health departments, and/or universities. Studies show varying degrees of effectiveness of school based programs in certain areas, such as increasing nutrition knowledge, reducing adiposity, and improving physical activity and healthy behaviors (Sahota, et.al. 2001; Sallis, et.al., 2003; Sallis, Alcaraz, McKenzie, & Hovell, 1999). Less is known about why certain programs are more effective than other programs in increasing nutrition knowledge, physical activity, and health status. A review of school based programs revealed some commonalities among effective programs such as: parental involvement, inclusion of nutrition education,

physical activity, behavior modification, access to health care, and affordability of health care (ADA, 2003; ADA 2006; Fulton, J. E., McGuire, M. T., Caspersen, C. J. & Dietz, W. H., 2001; Kettner, P. M., Moroney, R. M. & Martin, L. L., 1999; Montgomery & Willis, 2006).

Purpose

The purpose of this research was to compare the changes in nutrition knowledge, home obesigenic environment and body mass index among kindergarten students and their parents who participated in the Florence Mattison International Elementary school (FMI) Fit Families Curriculum with those attending one school who did not participate in this Conway, Arkansas based program. The term “obesigenic” refers to environments that may predispose individuals to become overweight (G. Welk, Personal Communication, May 12, 2010). The FMI Fit Families Curriculum is part of an existing program that includes an after-school exercise component two afternoons a week. The exercise component is a ten-week walk/jog program led by the physical education teacher which occurs during the spring and fall terms on the school track. The same classroom teachers who teach during the fall and spring terms lead the exercise component in the summer term. A registered dietitian oversees a nutrition and health curriculum provided in the classroom setting during the summer, fall and spring terms. Undergraduate dietetics students from the University of Central Arkansas (UCA) conducted the nutrition lessons in the kindergarten classrooms. The dietetics students were responsible for the development or update of lesson plans, written materials and nutrition education each term. To control for consistency the same lesson plans and materials were used in each of the five treatment classrooms, and lessons were videotaped for training purposes. The dietetic students were required to complete an orientation before teaching the curriculum and were required to view a videotape of the lessons during that orientation.

Rationale

Children who are obese or overweight have an increased risk of developing high blood pressure, diabetes, and heart disease affecting their longevity and quality of life (Arkansas Center for Health Improvement, 2006). Furthermore, unhealthy children are less ready to learn academically (Shephard, 1997; USDA, 2001). On the other hand, the psychological and social benefits of health to elementary school children include improved body image and reduced teasing. Thus, it is in a school's best interest to address the health of students in order to achieve better academic outcomes (Kun, Vigil, & Wilson-Graham, 2002; Madigan, 2004; Pica, 2006; Pyle, Sharkey, Yetter, Felix, Furlong, & Poston, 2006; Shephard, 1997). Therefore, the rationale of the research was to determine if participation in this school-based nutrition education and physical activity program produced a change in behaviors related to food intake, physical activity behavior, and/or self-efficacy related to health care access of the participants. The hope was that this research would influence kindergarten students' and families' attitudes, feelings, and behaviors about health-related choices after the program ends.

Relevance

This research is relevant due to the increase in pediatric overweight and obesity nationally and specifically in southern states (Annie E Casey, 2003). Program developers need objective data to measure effectiveness of programs. Body mass index is one objective outcome measurement used to evaluate weight management effectiveness. This measure is used by health care providers to assess health disease risk associated with overweight or obesity. Food intake quality and quantity are measures used by health care providers to assess the nutritional quality of diets. Grant providers such as the National Institutes of

Health (NIH), the United States Department of Agriculture (USDA), and General Mills require documentation of outcomes such as participation rates, pounds lost or weight change, or BMI reduction to continue funding programs to address pediatric obesity and related health issues. This study documented outcomes including changes in nutrition knowledge, changes in food and exercise behaviors, and changes in body mass index.

Definitions

Please see the table below for current CDC definitions.

Table 1

Definitions of Body Mass Index Terms

Term	Definition
Obese (formerly overweight)	BMI greater than or equal to 95 th percentile
Overweight (formerly at risk for overweight)	BMI between 85 th and 95 th percentiles
Healthy weight	BMI between 5 th and less than 85 th percentiles
Underweight	BMI less than 5 th percentile

(Centers for Disease Control and Prevention, 2009).

The definitions used by the Arkansas Center for Health Improvement (ACHI) changed to be consistent with those used by the Centers for Disease Control and Prevention (CDC) and in the scientific literature (M. Justus, Personal Communication, April 21, 2009). Body mass index (BMI) is currently defined as a function of weight in relation to height. Body mass index results are categorized according to the Centers for Disease Control and Prevention

(CDC) BMI-for-age growth charts (CDC, 2009). One BMI interval equals six to seven pounds (Byrd-Bredbenner, Moe, Beshgetoor, & Berning, 2009).

The two calculation methods used include:

- Weight in kilograms divided by height in meters squared
 - Kilograms / meters²
- Weight in pounds divided by height in inches squared and multiplied by 703
 - Pounds / inches² X 703

Problem Statement

Topic and Research Problem

Health problems appear to result from pediatric obesity (Hedley, et. al., 2004). Ethnic minority status and low socioeconomic status may contribute to pediatric obesity (National Center for Health Statistics, 2002). These variables may affect academic performance (Shephard, 1997). The incidence of pediatric obesity is increasing (NCHS, 2006, 2002; NIH, 2005; Parsad, Lewis, Westat, & National Center for Education Statistics (ED), 2006). Arkansas reflects the national trend in pediatric obesity (Healthy Arkansas, n.d.). Unless this trend is reversed, life expectancy is expected to decrease by five years, especially for younger Americans (NIH, 2005).

Justification

Previous research focused on nutrition education, physical activity, or a combination of nutrition education and physical activity as related to prevalence of pediatric obesity (ADA, 2005; Madigan, 2004). Previous research examined changes in BMI and disease risk (Arkansas Center for Health Improvement, 2006). School-based nutrition and physical activity programs implemented in some school districts are an adjunct or addition to their

state-mandated health and physical education curricula (Parsad, Lewis, Westat, & National Center for Education Statistics, 2006).

There is a body of evidence replete with programs and interventions resulting in varying degrees of success (Alliance for a Healthier Generation, 2007). Recommendations of the American Dietetic Association (ADA) include a comprehensive approach to nutrition education along with the provision of nutritious meals and snacks at school and collaboration among families, schools, physicians, communities, and other partnerships to effect change (ADA, 2003). This research focused on the impact of a school-based nutrition and health program designed to improve the nutrition and exercise knowledge, attitudes and actions of kindergarten students and their families. The Commission on Dietetic Registration's Certificate of Training in Childhood and Adolescent Weight Management is the model for the nutrition education and health program implemented in this study (Commission on Dietetic Registration, 2009).

Deficiencies in the Literature

The majority of research in pediatric obesity has focused on the curriculum used, the setting or location, and program offerings (ADA, 2003). The American Dietetic Association uses a grading scale to rate the strength of research studies based on quality, consistency across studies, quantity, likely clinical impact, and generalizability (ADA, 2006). Grade I is 'good' with consistent evidence from studies of strong design. Grade II is 'fair' with studies of strong design, but inconsistent results. Grade III is 'limited' with evidence from a limited number of studies. Grade IV is 'expert opinion' only in the case of unsubstantiated results based solely on expertise. Grade V is for studies with no intervention component or evidence of expertise.

In the category of school-based secondary prevention studies, the rank is Grade III due to the limited number of prevention school-based studies identified. Studies identified as having a multi-component overweight prevention program received a Grade II, indicating fair evidence to effect changes in weight status and adiposity in elementary and secondary school students. The inclusion of nutrition education, physical activity education, physical activity environment, and parent/family involvement each received a Grade II. In the area of grade level for program delivery, evidence is fair (Grade II) for primary school settings and is lacking (Grade V) for preschool settings. School is where children spend the majority of their days, thus a school-based intervention will reach the most children. The inclusion of dietetic undergraduate students as instructors and mentors offers an approach that may benefit the elementary students and their families as well as the dietetics students.

Audience

The goal of this research was to evaluate the potential benefits of a coordinated service learning program to promote nutrition education in youth. The primary goal was to serve kindergarten-age children and their families by providing curriculum to increase nutrition knowledge and application of that knowledge. A secondary goal was to enhance learning by the university students providing the instruction. The coordinated service learning model enhances their dietetic internship applications and their ability to perform on their future jobs. Additionally, public school administrators, teachers, and state Departments of Education may be interested in the outcome of the program for their students as well as ease of implementation in the school systems.

There are several program benefits. The use of undergraduate students to implement the program provides sustainability. It creates no extra work for the elementary classroom

teachers and supports the required elementary health curriculum. Dietetic students attend orientation sessions, which include videotaped examples of the program, to promote consistent program delivery. Dietetic Internship Directors and university administrators of undergraduate dietetics programs may be interested in the outcome of the program for their students as well. This service learning project provided dietetics students with the opportunity to hone integrative thinking and human relationship skills, which are important to future employers (Moore, 1995).

Research Questions

The purpose of this research was to compare the changes in nutrition knowledge, home obesigenic environment, and body mass index among kindergarten-age students and parents who have participated in the FMI Fit Families Curriculum with those who did not participate in the program. The current literature focuses on evidence-based practice, the need to document outcomes, and the need for community collaboration. The use of undergraduate dietetics students as instructors in a public school-based nutrition and exercise program provided a collaboration component for this research study. The following research questions helped determine if there was a significant difference between the program participants and the non-participants, who included elementary students and their family members at Florence Mattison International and Theodore Jones Elementary Schools:

- (1) Did the children's knowledge change (participants differ from non-participants)?
- (2) Did the FNPA score change (participants differ from non-participants)?
- (3) Did the children's BMI results change (participants differ from non-participants)?

The experimental group population used in the study was composed of elementary school children and their families at Florence Mattison International Elementary School in

Conway, Arkansas while the control group population included elementary school children and their families at Theodore Jones Elementary School also in Conway, Arkansas. The university students were dietetics undergraduate majors at the University of Central Arkansas. Therefore, the findings of the study may not apply to elementary schools in other areas of the United States or to universities without an undergraduate dietetics curriculum.

Theoretical Framework

Stages of Change

The theory basis of this research was the Transtheoretical Theory, or Stages of Change Model. This theory was developed by Prochaska and DiClemente (1982), and used to study health behavior change. Examples include smoking cessation, physical activity, addiction, helmet and seat belt use. This theory indicates that people will make health behavior changes when they perceive the need, are ready, are informed of how to proceed, and feel capable of making the needed changes. Capability is related to self-efficacy as described by Bandura (1997). People will progress through six distinct stages of change: Pre-Contemplation, Contemplation, Preparation, Action, Maintenance, and Relapse (Prochaska & DiClemente, 2006; Mahan & Escott-Stump, 2008).

People in the Pre-Contemplation stage of change are unaware of the need to make a behavior change. Those in Contemplation are considering making a change in the next six months, weighing the pros and cons of making a change and gathering information. In the Preparation stage, people are gathering information and comparing programs. People in the Action stage are engaged in the behavior to be changed, for example attending smoking cessation or exercise classes, wearing seat belts, or keeping food records. When a person has maintained the action for at least six months, they are considered to be in the Maintenance

stage of change. In the Transtheoretical model, Relapse is seen as a normal part of the process, which almost everyone experiences. The goal in this stage is to refocus and move back toward Action. The education program used in this study was based on this model and addressed all six stages of change. Program implementation included increasing awareness of the benefits of nutrition and exercise, providing age-appropriate nutrition education and physical activity, and creating an environment consistent with healthy behaviors within the school setting.

Program Aims

Very few programs have been shown to be effective in preventing or treating pediatric obesity. Therefore, new strategies and approaches may be needed. Research suggests that including the whole family is one “effectiveness-based” strategy (ADA, 2006). Three major components known to be effective in treating and preventing obesity include nutrition education, exercise, and behavior modification (ADA, 2006.) These three elements have been employed in a number of programs but a limitation of previous efforts is that programming may have been started too late in the education process. The goal of the present study program was to develop and evaluate programming that could be delivered to kindergarten students and their families to promote obesity prevention practices at home.

The specific purpose of this research was to evaluate the effectiveness of an education program that provided sound nutrition education along with fun exercises for kindergarten children and their families. Activities included age-appropriate nutrition education, exercise sessions, and activities conducted by a registered dietitian (RD), a physical education teacher, and undergraduate dietetics students. The partnership between a local university and a public

school system provided the benefit of college students majoring in dietetics teaching the classes to foster familiarity and belonging among the elementary school students.

The long-term goal was to improve the health status of the children attending Florence Mattison International (FMI) Elementary School. At the time of this research, FMI had one of the highest percentages of students in the Conway elementary schools with a body mass index in the overweight or obese category. This program remains in place at FMI, and is revised each term based on feedback and study outcomes. The long-term goal is to implement the program in all nine elementary schools in the Conway School District. An Advisory Committee of school and university personnel, parents and children provided guidance in structuring the program as well as formative and summative feedback. The overarching hypothesis was that participation in the nutrition and health intervention program improved participant's nutrient intake and physical activity behaviors, which lead to a decrease in overweight and obesity.

Projected outcomes included an increase in nutrition knowledge, an increase in FNPA family score, and healthy BMI percentiles. Outcomes were evaluated in three ways: (1) pre- and post-test on nutrition, (2) pre- and post- Family Nutrition and Physical Activity screening tool, and (3) pre- and post-BMI results. Creation of a "So-That Chain" and logic model guided program development (see Appendix A). The parent survey tool was for formative program evaluation at the experimental school. It was expected that as many as 100 students and their families would be served initially. Primary beneficiaries of the program were the participating students and their families. Secondary beneficiaries included the UCA Dietetics Students since they will be gaining valuable classroom and individual teaching experiences. The expected positive impact of this project was health status improvement for children who

participate as well as greater academic success due to their enhanced physical ability to attend school free of health-related absences.

Sustainability is expected due to the commitment of the Conway Public School system, specifically the Florence Mattison Elementary School personnel and the University of Central Arkansas' Family and Consumer Sciences Department. It is anticipated that the program will gain community support when the program is recognized as successful by the general public.

Program Evaluation Design

The data collection combined qualitative and quantitative methods including student pre-tests/post-tests, parent surveys, parent pre/post FNPA screening tools, and school BMI reports. Review of the Mental Measurements Yearbook (2001) did not reveal instruments usable with this age group to assess nutrition and exercise knowledge of the topics taught in the FMI Fit Families Curriculum. Attention was given to item writing and format development in preparation of the instruments (Cox, 1996). Appendix B contains the instruments used in the study including pre-and post-tests, and parent surveys.

The student pre-test/post-test was on the 0.5 reading level according to the Flesch-Kincaid scale. Ten questions were included on this instrument to assess a representative sample of the content taught in the program (Linn, Miller, and Gronlund, 2005). Descriptive and inferential statistics were used to indicate the level of change in students' nutrition and exercise knowledge and behavior due to program participation as well as measure student's attitudes towards physicians.

The parent surveys showed no identification and were hand-tallied by the researcher. The percentages of the total were calculated for each of four possible responses: "definitely

yes”, “generally yes”, “generally no”, and “definitely no” for each of the questions asked on the survey. The Family Nutrition and Physical Activity screening tool was a 21-question instrument designed to assess the effect of various constructs on a child’s weight status (Ihmels, Welk, Eisenmann, & Nusser, 2009).

Information sources included the student participants, the parents of the student participants, the undergraduate dietetics students, the school nurses, and the elementary classroom and physical education teachers. The students and parents were selected based on their enrollment at FMI in kindergarten and their willingness to participate by completing the consent form, screening tools, surveys, pre-tests and post-tests. The management plan outlined the procedure for administering these instruments. All data obtained was coded with no names on the forms and stored in a locked file cabinet in the researcher’s office.

Content validity of the instruments was checked by having subject-matter experts review the instruments and UCA Writing Center employees and nutrition graduate students proofread the instruments. Recommended appropriate changes were made after each term of program delivery. Reliability of the evaluation results will increase each time the evaluation is administered and revised (Patten, 2007). The following table outlines the design of the evaluation.

Table 2

Program Evaluation Design

Evaluation Question	Information Required	Information source	Method for Collecting Data	Analysis Procedures	Interpretation Procedures & Criteria
1. Did the children's knowledge change?	Pre/Post test scores from Kindergarten participants	Students pre/post tests	Pre/Post Tests	Descriptive and inferential statistics	Determine if student's nutrition knowledge changed to a practical or statistical degree after participation in the FMI Fit Families Curriculum.
2. Did the parent's FNPA score change?	Pre/Post FNPA scores from parents	Parents FNPA screening tool	FNPA screening tool	Descriptive and inferential statistics	Determine if parent's family score changed to a practical or statistical degree after participation in the FMI Fit Families Curriculum.
3. Did the children's BMI results change?	BMI results from school nurses	BMI result reports	Nurse's screening	Descriptive and inferential statistics	Determine if students' BMI results changed to a practical or statistical degree after participation in the FMI Fit Families Curriculum.

Reporting Plan

Four groups of audience members received the evaluation results—FMI students and parents, FCS teachers and staff, FMI teachers and staff, and UCA teachers and students.

Each audience group was interested in all aspects of the evaluation (Fitzpatrick, Sanders, & Worthen, 2004).

Table 3

Reporting Plan

Evaluation Question	Audience	Content	Format	Schedule	Context
1. Did the children's knowledge change?	FMI students and families; FCS teachers and staff; FMI teachers and staff; UCA teachers and students	Student pre-and post-test scores and data analysis	Colorful one-page handout	At end of each session	Presented at fall and spring staff meeting and fall and spring PTO meetings; article in local and UCA newspapers
2. Did the parent's FNPA score change?	FMI students and families; FCS teachers and staff; FMI teachers and staff; UCA teachers and students	FNPA screening tool and data analysis	Colorful one-page handout	At end of each session	Presented at fall and spring staff meeting and fall and spring PTO meetings; article in local and UCA newspapers
3. Did the children's BMI results change?	FMI students and families; FCS teachers and staff; FMI teachers and staff; UCA teachers and students	BMI results and data analysis	Colorful one-page handout	At end of each session	Presented at fall and spring staff meeting and fall and spring PTO meetings; article in local and UCA newspapers

Chapter 2

Literature Review

Need is defined by the federal government as “any identifiable condition which limits a person or individual, or a family member in meeting his or her full potential” (Kettner, et al., 1999, p.36). The need for healthy children to become productive members of society reflects both a normative and a relative need. It is a normative need in that the portion of elementary school children in Arkansas fall far above Healthy People 2010’s target of five percent of children and adolescents being overweight or obese (*Healthy People 2010*). The National Initiative for Children’s Healthcare Quality (2007) reports that 37.5% of Arkansas children age 10-17 are overweight or obese compared with 31.6% nationally. It is a relative need in that there are inequities among subsets of the population specifically Mexican-American and African-American boys and girls under eighteen years of age (Politzer, Yoon, Shi, Hughes, Regan, & Gaston, 2001). Arkansas elementary school children and their families need nutrition education and physical activity to meet health and fitness criteria as defined by Presidential Fitness Challenge parameters (President’s Council on Physical Fitness and Sports, 2007), Healthy People 2010 thresholds, and the American Academy of Pediatrics recommendations (Krebs, 2005).

In 2003, the Arkansas legislature passed Act 1220 (State of Arkansas, 2003), which required the public schools to assess student’s body mass index and confidentially report it to their parents (ACHI, 2006). The Arkansas Center for Health Improvement (ACHI) coordinated and organized the training of school personnel to accomplish this task. No funding was provided by the legislature and no direct health care intervention was required in Arkansas Act 1220. Each school had to create a Nutrition and Physical Activity Advisory

Committee to develop local policies, report vending expenditures and revenues, and prohibit access to vending machines in all elementary schools.

Since Arkansas Act 1220 was enacted in 2003, all public schools in Arkansas are in compliance with the formation of Nutrition and Physical Activity Advisory Committees and reporting of BMI to parents. In 2007, the law was amended by Arkansas Act 201 to allow BMI assessment and reporting in Kindergarten, even numbered grades (2nd, 4th, etc.) with twelfth grade excluded from BMI assessment. Based on four years of data collected by the ACHI, the trend of increasing pediatric obesity in the state of Arkansas has halted (ACHI, 2007).

Prevalence

The prevalence of adult overweight and obesity in the United States has resulted in an increase in weight-related diseases such as cardiovascular disease, hypertension, dyslipidemia, type 2 diabetes, osteoporosis, and certain cancers (Hedley, et.al., 2004). Data from a 1999-2004 survey showed that 65% of United States adults were overweight and 32% were obese; only 3% of adults were of healthy weight. This same survey revealed that 17% of persons aged 6-19 years were overweight (Ogden, et. al., 2006).

The prevalence of pediatric obesity in the southern states is extremely high and correlates with health problems, ethnic minority status, low socioeconomic status, and poor academic performance (NCHS, 2006, 2002; NIH, 2005; Parsad, et. al., 2006). In Arkansas, 38% of children and adolescents are overweight or at risk for overweight (ACHI, 2006). The Annie E. Casey Kids Count data set from 2003 echoes the similar numbers for Arkansas: 37% of males and 29% of females aged 10-17 are overweight or obese. In related data, 49% of Arkansas children age 10-17 exercise regularly and 7% have asthma (Annie E Casey,

2003). Arkansas reflects the national trend showing a 77% increase in obesity for all age groups from 1991-2000 (Healthy Arkansas, n.d.).

The focus of this program was Florence Mattison International Elementary School in Conway, Arkansas. Currently 35.09% of all Conway Public School children are at risk for overweight or overweight (ACHI, 2007). This percentage is down from 43% in 2006 (ACHI, 2006). Of the nine elementary schools in the Conway school district, Florence Mattison International Elementary school had one of the highest percentages of students in the overweight or obese categories (formerly termed at risk for overweight or overweight). Appendix C contains body mass index data for Conway Public Elementary Schools for the 2006-2007, 2007-2008, and 2008-2009 school years (ACHI, 2009, 2008, 2007).

To end these weight problems prevention and intervention efforts should begin in the pre-kindergarten and kindergarten classrooms and continue through each school grade. Children who are at risk or overweight have an increased risk of developing high blood pressure, diabetes, and heart disease (ACHI, 2006). The Healthy People 2010 goal for children and adolescents who are overweight or obese is five percent of the pediatric population. Appendix D compares the demographics of each elementary school in Conway, Arkansas. Appendix E outlines the Healthy People 2010 goals set by the United States Department of Health and Human Services. Appendix F contains a summary of child related objectives from Healthy People 2010.

Current Efforts

According to the National Center for Education Statistics, in 2005 two-thirds (66 percent) of public elementary schools were not assessing students' body mass indexes. Of those schools that did assess body mass index, 49 percent provided that information for

parents (Parsad, et. al., 2006). The Arkansas Center for Health Improvement (ACHI) began statewide assessment and reporting of body mass index of all public school children in the state in 2003. A confidential letter is sent to the parent / guardian of each public school child measured each year. This letter notes that child's BMI number along with an interpretation of this number as either underweight, healthy weight, overweight, or obese. The letter directs parents or guardians to contact their child's health care provider with questions or concerns related to the BMI result. This effort was mandated by the legislature under Arkansas Act 1220. This act improved access to healthier foods in schools, eliminated vending machines in all elementary schools, made pouring/vending contracts public, created Health and Wellness Committees at each local school to address nutrition and physical activity, and mandated confidential reporting of student's body mass index to parents (Ryan, Card-Higginson, McCarthy, Justus, & Thompson, 2006).

During the 2007 Arkansas legislative session, the law was amended to require BMI assessment and reporting in kindergarten and even grades (2nd, 4th, etc.) with high school seniors being exempt. The result of applying the principles of Arkansas Acts 1220 and 201 was that increases in the rate of childhood obesity have halted in the State of Arkansas. A recent survey noted that parents and adolescents are "generally comfortable" with the BMI assessments and reporting conducted in the schools. To date, six years of BMI data have been compiled by ACHI (2009).

Schools are in the business of education. However, students who are physically unfit do not learn well. Several studies have looked at the correlation between health or fitness and academic performance. Increased physical activity and proper nutrition improves academic performance (Active Living Research, 2007, Shephard, 1997; USDA, 2007).

Movement enhances literacy and language arts skills of listening, speaking, reading, and writing in pre-school and elementary-age children (Pica, 2007). One study in California found a positive relationship between mathematics achievement scores and physical fitness levels of fifth, seventh, and ninth graders (Kun, Vigil & Wilson-Graham, 2002).

Cardiovascular activity is also linked to improved achievement test scores (Sallis et al, 1999). Research conducted by Madigan (2004) links exercise and recess to increased attention span, regulation of sleep, improved cognition and brain development, improved reading and behavior, and stress reduction for elementary-age children. A different approach involved combining nutrition education and geography through interactive games to enhance learning of these content areas in elementary schools (Eck, Straempler & Raby, 2005). Higher income, Caucasian children at higher socio-economic status schools scored higher on the Family Nutrition and Physical Activity screening tool. On this screening tool, a high total score reflects healthy behaviors regarding constructs such as breakfast and family meals, beverage choices, television in bedrooms, parent and child physical activity levels, and sleep schedules (Ihmels, Welk, Eisenmann, & Nusser, 2009).

Implications for Children

Pediatric obesity is a problem not just for the school systems, but also for the community at large. Social values threatened by pediatric obesity include quality and longevity of life, academic performance, graduation rates, employment rates, and health care costs. To address the issue of pediatric obesity, strategies must start at the grassroots level and utilize all available resources to affect attitudinal and behavioral change in individuals and families. According to the National Institutes of Health, life expectancy is predicted to decrease by five years if current rates of pediatric obesity continue unchecked (NIH, 2005).

The American Dietetic Association in a position statement (ADA, 2005) addressed providing nutrition education to promote growth and development in children. According to this statement, nutrition education should be provided to children and their parents or caregivers with a focus on the link between nutrition and health.

The general community may or may not be shocked to know that children today have a lower life expectancy than that of their parents. The pediatric obesity epidemic and its consequences are well known to practitioners such as physicians, nurses, and dietitians, but are not consistently known to children, parents, and the community. Public education is improving the awareness of most Americans, but not all. The effect pediatric obesity has on the health and quality of life of America's children requires increased education among stakeholder groups. Arkansas has a low rate of insured adults and children (health care), lack of access to quality health care, and racial health disparities which compounds the issue of pediatric obesity (ACHI, 2006).

Implications for Dietetics Students

Undergraduate dietetics education must prepare future dietitians with a background in nutritional science, foodservice and food-systems management, counseling, and research. The quality of future practice by registered dietitians is a direct reflection of the quality of education received as undergraduates. The standards for each required course are essential to student performance in an internship or supervised practice program (Puckett, 1997). After completion of a Bachelor of Science degree from an accredited university, the student applies for acceptance into a dietetic internship or supervised practice program accredited by the American Dietetic Association. Important admission predictor variables to a supervised

practice program included work experience, quality of application, and the program to which a student applied (English, 1995).

Upon completion of the supervised practice program, students are eligible to take the national registration examination (RD exam) to become a registered dietitian. Employers value integrative thinking, problem-solving, interpersonal skills, and creativity, so education programs need to incorporate opportunities for students to hone these skills (Karp & Lawrence, 1999; Moore, 1995).

Providing undergraduate students with a practicum setting to apply what they have learned fosters integrative thinking, problem-solving, interpersonal skills, and creativity in a way that is difficult to achieve in the classroom. One study conducted at the Florida Gulf Coast University examined the effect of service learning on development of core competencies for undergraduate and graduate business students. This study found that service learning not only reinforced core educational concepts for the students, but also addressed community needs and instilled a sense of civic responsibility in the students (Andrews, 2007). In another study, a fifth grade teacher at Grover Washington Jr. Middle School partnered with a La Salle University Professor in Philadelphia to conduct a study examining the effect of service learning on academic achievement. The class who participated in service learning in addition to traditional classroom instruction demonstrated a statistically significant retention of knowledge, more enthusiasm for learning, and greater academic achievement scores over students who did not participate in service learning (Soslau & Yost, 2007).

Current Issues

Specific issues, including public policy, vending and pouring contracts, parental involvement, the role of schools in obesity prevention, and sustainability, need to be addressed from a public education or awareness standpoint. Some of these key issues may be appropriately addressed by state legislative bodies. Clinicians can and should be leading the way in advocating policy change to improve the health of every child in Arkansas (Homer & Simpson, 2007). Keeping physical education (PE) in the public schools and allowing time for recess are major components in addressing pediatric obesity (Madigan, 2004).

School's vending and pouring contracts can be written to ensure healthy choices in vending machines. Limiting access to vending machines before lunch and/or in elementary schools and ensuring nutritious school lunch menus are vital in addressing pediatric obesity. This improves access to nutritious foods for children at school and provides a basis for nutrition education (Alliance for a Healthier Generation, 2007).

Other social issues that need to be addressed at the individual level include parental or caregiver involvement and sedentary time (Fulton, McGuire, Caspersen, & Dietz, 2001). Positive parental modeling of physical activity and nutrition are crucial to teaching their value to children. Limiting television or other screen time to two hours a day is the current recommendation from the American Academy of Pediatrics (Krebs, 2005). Schools can promote "walk to school" days when appropriate and safe or "no TV days" to support these recommendations. In a study on television advertising and childhood obesity involving children aged three to eighteen, when time spent watching television was excluded, advertising was correlated with the children's' probability of being overweight (Gorman, 2006).

Looking at the public schools as a logical site to address obesity has supporters and detractors. According to Pyle and colleagues, schools contain a “captive audience” since this is where most American children spend the majority of their days. School-based programs should be designed to promote a healthy weight through nutritious food choices, physical activity, and behavior management that starts at pre-school and involves families (Pyle, et. al., 2006). Schools are in the business of education, so leading by example in providing healthy snacks, nutritious school food, avoidance of fundraisers related to sales of non-nutritious items, and physical activity are upheld in the literature (ADA Position Statements, 2005, 2003). If teachers and administrators view pediatric obesity as an important issue, support a healthy school environment, and model healthy behaviors noticeable positive change can occur (Lafee, 2005).

How can schools contribute to improvement of academic performance by attending to nutritional and activity needs of youth? In an effort to comply with the No Child Left Behind (NCLB) Act of 2001, many schools have decreased or eliminated physical education from the curriculum (Parsad, et.al. 2006). As the goal of NCLB is “developmentally appropriate practice” (Aldridge & Goldman, 2007), then children should be required to move to enhance cognitive learning (Shephard, 1997). Pediatric obesity data suggest practitioners need to encourage all involved to adopt a new paradigm. Incorporating physical activity into school curricula meets children’s need for physical movement and enhances academic education efforts. Family and Consumer Sciences teachers have the knowledge to address health course requirements in the secondary education setting (Browne, Gentzler & Myers, 2007.) For maximum benefit, prevention and treatment must start early in children’s lives.

Sustainability is a key issue in program development. Using dietetics majors from a local university provides no cost nutrition education to area youth through a service learning model. This approach builds capacity in the community and commits resources to an ongoing partnership which enhances sustainability (Pluye, Potvin, Denis, & Pelletier, 2004; Shediac-Rizkallah & Bone, 1998). Service learning provides the university students the opportunity to apply knowledge and gain real-world experience (Goodrow & Meyers, 2000; Peacock, Flythe, & Jones, 2006). Grant funders look for evidence of sustainability including reasonable cost, ease of program replication and ability to continue the program independent of future grant funding (Akerlund, 2000; LaPelle, Zepka, & Ockene, 2006).

Evidence-Based Programs

School-based nutrition and physical activity programs have shown various levels of effectiveness. In the United Kingdom, one study involving 636 children with a mean age of 8.4 years showed an increase in vegetable consumption in the intervention group, but overall no difference in adiposity was found between the intervention and the control groups (Sahota, et. al., 2001). Another study in California of 1,434 middle-school students in grades six through eight demonstrated that a school-based program was effective at increasing physical activity and decreasing BMI among boys but not girls (Sallis, et. al., 2003). These finding may be reflective of the differing rates of maturation in boys and girls.

According to position statements by the American Dietetic Association, schools are in a unique position to play a key role in reversing pediatric obesity through nutrition education, healthy school environment policies, and community involvement. The position of the American Dietetic Association is “that comprehensive nutrition services must be provided to all of the nation’s preschool through grade twelve students. These nutrition services shall be

integrated with a coordinated, comprehensive school health program and implemented through a school nutrition policy. The policy should link comprehensive, sequential nutrition education; access to and promotion of child nutrition programs providing nutritious meals and snacks in the school environment; and family, community, and health services' partnerships supporting positive health outcomes for all children" (ADA, 2003, page 505). Positive components of successful interventions include parental involvement, nutrition education, physical activity, reduced TV time, behavioral counseling, decreasing media influences, and an appropriate after-school food environment (ADA, 2006). Davis and Carpenter (2009) report that students with fast-food restaurants within one half mile of their school consumed fewer fruits and vegetables, more soda, and were more likely to be overweight. A National Bureau of Economic Research study suggests policies limiting access to fast food restaurants near schools could decrease obesity rates among schoolchildren (Currie, Vigna, Moretti, & Pathania, 2009).

A review of school-based programs in the United States showed that several schools are achieving success in the area of physical and nutrition education. Appendix G illustrates a sample of the programs reviewed. One community program, which provides education in the school setting, stands out for documenting effective nutrition education. The United States Department of Agriculture (USDA, 2007) oversees the Cooperative State Research, Education, and Extension Service's (CSREES') Expanded Food and Nutrition Education Program (EFNEP). These programs are in all 50 states and six United States territories led by Cooperative Extension Family and Consumer Scientists or Nutrition Educators focusing on initial, intermediate, and long-term outcomes of nutrition education for individuals and families. The initial outcomes focus on knowledge, skills, and attitudes. The intermediate

outcomes focus on behavior change. The long-term outcomes reflect personal development, self-worth, improvement of the total family diet, reduction in food insecurity, and nutritional well-being (Broberg, D. M., Broberg, K. A., & McGuire, J. K., 2009).

Outcome data show improved nutrition practices, increased physical activity, more skillful resource management, and a more balanced dietary intake as a direct result of the EFNEP lessons. Cost-benefit analysis shows that for every \$1.00 spent, from \$3.63 to 10.64 was saved in health care costs alone (Montgomery & Willis, 2006). Using programs like EFNEP as a model or utilizing EFNEP in the local community will provide the opportunity to improve outcomes for school-based nutrition and exercise programs.

The Alliance for a Healthier Generation and the Robert Wood Johnson Foundation announced in 2007 a \$20 million expansion of the Healthy Schools Program. The Healthy Schools Program was created with assistance from the American Heart Association and the William J. Clinton Foundation. This program uses evidence-based criteria consistent with the USDA guidelines and the CDC School Health Index to promote healthy eating and physical activity for students and staff (Alliance for a Healthier Generation, 2007).

Strengths

Willingness of school administrators and teachers to participate and provide a service-learning for the university students is the major strength of this study. This collaboration included and benefitted both the university undergraduate dietetics students and the elementary school student participants and their families. Another strength of this study is the sustainability provided by the collaboration of two stable education providers in the community.

Assumptions

Since the investigator could not be present in all classrooms to observe the university students teaching the nutrition and health behaviors curriculum, feedback from the classroom teacher who observed the teaching was solicited using a rating form. Therefore, it was necessary to assume that the dietetics students implemented the curriculum appropriately and consistently. As part of their college courses, the dietetics students took and earned at least a “C” grade in Methods of Teaching, Advanced (lifecycle) Nutrition, and Medical Nutrition Therapy I courses prior to their participation in this program.

Limitations

The experimental group population was composed of elementary school children and their families at Florence Mattison International Elementary School in Conway, Arkansas. The university students are dietetics undergraduate majors at the University of Central Arkansas. Therefore, a limitation of this study was that the findings of the study may not apply to elementary schools in other areas of the United States or to universities without an undergraduate dietetics curriculum or a service-learning component.

Other limitations included time, location, sample, selected aspects of the problem, and selected criteria of the study. The time of the study was the 2009-2010 school year. The initial BMI measurements, student’s pre-test, nutrition education, and parent’s pre-FNPA were completed in August / September of 2009. Kindergarten students completed the post-test at the completion of the nutrition education component. Parents were provided educational materials throughout the fall semester and completed the post-FNPA in March of 2010. The second BMI measurements were taken in March of 2010. Florence Mattison International (FMI) Elementary school was the location of the experimental group for the

study. Only those students who attend FMI and their families were included in this study. Attendance rates at FMI were 94.7 (2005-2006), 94.9% (2006-2007), 95.5% (2007-2008), and 95.5% (2008-2009) school years (The National Office for Research on Measurement and Evaluation Systems, 2009). Participation in this program was voluntary. The school principal and classroom teachers determined the specific classrooms designated for the experimental group. The control group consisted of the elementary students at Theodore Jones Elementary (TJ). This school was chosen due to similar prevalence of overweight and obese students and student demographics as the experimental school (see Appendices C and D). Attendance rates at TJ were 94.8% (2005-2006), 95.4% (2006-2007), 95.8% (2007-2008), and 95.8% (2008-2009) school years (The National Office for Research on Measurement and Evaluation Systems, 2009).

The selected aspects of the problem studied included nutrition knowledge, home obesigenic environment and body mass index. The overall study outcome is applicable to elementary schools and universities of similar size and demographics. Voluntary departure rates were not reported for either school, but both schools report zero students obtained through school choice (The National Office for Research on Measurement and Evaluation Systems, 2009).

Summary of Major Themes

An effective approach to reverse the incidence and prevent the future occurrence of pediatric obesity and weight-related health issues in the public school system is inclusion of many of the aspects discussed previously. Primarily, evidence-based practice should guide the program development (W. K. Kellogg Foundation, 1998; Lohrmann, 2006). Programs should be family-based and age-appropriate (ADA, 2006). A thorough needs assessment

makes definition and comprehension of the problem more accurate. Second, the program content should have documented effectiveness results (Kettner, Moroney, & Martin, 1999). Resources including time, money, and staff should be spent on nutrition education and exercise activities with a proven record of accomplishment. To be effective the curriculum has to be applicable to age, diversity, and skill-level of the target audience. The program should also encompass public policy advocacy beginning at the local level. Program participants should be provided an avenue for expressing their opinions to lawmakers and decision-makers overseeing or running the program. Legislative mandates will affect service availability, access to programs, and cost of programs. Legislators are public servants and need feedback from their constituents to influence their opinions when making decisions regarding program availability, access, and cost.

Finally, collaboration should be evident in each local community. Forming liaisons and natural collaborations within each community will strengthen the local support for a program and therefore, enhance success (Hardy, 2007; Michael, Dittus, & Epstein, 2007). Alliances with programs such as the Healthy Schools Builder will provide resources, training, and support for school personnel to implement physical activity and nutrition programs. Evaluation of the program should encompass changes in attitudes, beliefs, knowledge, skills, behaviors, and health indices such as body mass index. In this research, specific areas for evaluation include changes in food intake and in physical activity, and ability to access health care to address overweight or obesity.

Chapter 3

Methodology

Introduction

The purpose of this research was to compare the changes in nutrition knowledge, home obesigenic environment and body mass index among kindergarten students and their parents who participated in the intervention program with those who did not participate in the program. The study used undergraduate nutrition majors from a local university to implement the nutrition education program as part of a service learning project in a senior-level nutrition course. Three outcomes were measured including child nutrition knowledge on pretest and posttest scores, family home environment on the parent pre and post FNPA screening tool, and child BMI measured at a six month interval. The experiences and perceptions of the undergraduate nutrition majors on service learning were evaluated based on a reflection paper and coded for emerging themes.

Intervention Development

The intervention developed for this project incorporated four key aspects including needs assessment, evidence-based practice, age-appropriateness, and community collaboration. A thorough needs assessment was conducted in 2007 along with the development of a logic model (see Appendix A) which formed the backbone for outcome measurements. Evidence-based practice guided the program development (Lohrmann, 2006; W. K. Kellogg Foundation Report, 1998) in that this project used the FNPA screening tool which is part of the American Dietetic Association's Evidence Analysis Library (Ihmels, Welk, Eisenmann, & Nusser, 2009). The curriculum used appropriate age- and skill-level applicable to the kindergarten and family target audience. The nutrition education

curriculum used in this study was developed by the faculty researcher, reviewed by nutrition and education faculty, and determined to be an age- and skill-level appropriate for kindergarten students. Local support for the program was strengthened by formation of collaboration between the local public elementary school and the local university (ADA, 2006).

Population, sample and site.

The population included kindergarten-age public school children and their families. The sample consisted of kindergarten-age public school children in the State of Arkansas in the Conway Public School District attending Florence Mattison International Elementary School (experimental group) and Theodore Jones Elementary School (control group). To have adequate power (.80 power criterion with an effect size of .50) to find a difference, a minimum of 65 students were needed in both the control group and in the experimental group, for a total of at least 130 students (Creswell, 2008). Permission to participate was obtained from 79 families at FMI (experimental group) and from 77 families at TJ (control group) for a total of 156 students out of a possible 205 students (response rate 76%). Five families at FMI and 5 families at TJ spoke Spanish in the home and received all materials written in Spanish. All five Spanish-speaking families from FMI and three of the five Spanish-speaking families at TJ participated in the study.

Forty-nine families chose not to participate in the study (21 from FMI and 28 from TJ). The researcher was unable to determine the reason some parents chose not to participate or assess the benefit of the intervention to the non-participant families. Parental involvement, socioeconomic status, and non-participant's degree of perceived benefit are

three factors the researcher will attempt to determine from non-participants in future research studies.

Procedures.

During the fall of 2009, twenty UCA dietetics students completed the following steps for implementation of the study:

1. Dietetics students took Methods of Teaching and Advanced (lifecycle) Nutrition courses and earned a grade of C or better in each class;
2. Dietetics students took Medical Nutrition Therapy I and earned a grade of C or better; as part of this course they completed a field experience assignment and weighed and measured pre-school age children at the UCA Child Study Center Preschool;
3. To promote uniformity of program delivery each UCA student involved in the study completed this orientation:
 - a. Met as a group with instructor regarding the program
 - b. Viewed one video of previous lesson delivery
 - c. Reviewed lesson plans (located in Appendix H)
 - d. Practiced lesson delivery twice with classmates and were evaluated by classmates and instructor using a rubric (see Appendix I);
4. Dietetics students took Medical Nutrition Therapy II and created age-appropriate teaching materials on topics to be covered in program and created information packets to send home to the children's families (located in Appendix J):
 - a. Beverages

- b. Body Mass Index
 - c. Eating Routines
 - d. Food Budget
 - e. Meal Patterns
 - f. Physical Activity
 - g. Sleep;
5. The principal and classroom teachers identified classrooms for the experimental group. Groups of three or four UCA students were assigned to each kindergarten classroom for the duration of program delivery to provide consistency and familiarity with the kindergarten students;
 6. Schedule of lesson delivery was established with the classroom teacher and dietetics students;
 7. Obtained needed permission forms from parents at both schools;
 8. For children at both schools whose parents granted permission, child assent was also obtained;
 9. Researcher and UCA students assisted school nurses in weighing and measuring students for initial BMI calculation;
 10. Kindergarten students (experimental and control group) took pre-test (dietetics students read pre-test with Kindergarten students); parents completed pre-FNPA screening;
 11. Lessons were delivered (experimental group only);
 12. Kindergarten students (experimental and control group) took post-test (dietetics students read post-test with kindergarten students); parents

completed post-FNPA screening; parents completed parent survey (experimental school only);

13. Weighed and measured students for final BMI calculation. UCA students assisted school nurse with this measurement as it is required by the state of Arkansas;

14. Data analysis was completed; and

15. Interpretation, discussion, and reporting were completed.

Access and permissions.

Access and permission to conduct this research study was obtained from the Conway Public Schools central office and the principals at Florence Mattison International and Theodore Jones Elementary Schools in the spring of 2009. In August of 2009, the parent permission and consent forms were provided to parents of kindergarten students at both schools. Parents who gave written permission and consent for both them and their child to participate in the study received the pre-Family Nutrition and Physical Activity Screening tool. The children of the parents who gave written permission and consent for their child to participate in study were asked to give verbal assent. When verbal assent was obtained, the children received the pre-tests and provided initial heights and weights. All initial measurements, pre-screening, and pre-tests were completed by September of 2009.

Intervention.

The intervention performed at Florence Mattison International Elementary school consisted of nutrition and health lessons delivered by senior dietetics majors from the University of Central Arkansas. Appendix H contains the lesson plans delivered to the kindergarten students in the Fall Semester of 2009. Each lesson consisted of a story to

introduce content, a game to reinforce content, and a coloring sheet to take home to show parents what the child was taught that day. Packets of written materials to reinforce the concepts presented to the children and consistent with the FNPA content were provided to participating parents. These materials are located in Appendix J.

Evaluation Design

This project used five intact classrooms in the elementary school and the RE-AIM Framework as a guide for validity and reliability. The use of intact classrooms was chosen to not disrupt established classrooms and learning routines. Content validity refers to the representativeness of the questions on the student's pre- and post-tests and the parent's pre- and post-FNPA screening tool (Creswell, 2008). Content validity was addressed by review of experts including the researcher's Program of Study Committee and nutrition and education colleagues. Criterion or predictive validity refers to how well scores on an instrument related to and outcome or predict a future outcome (Creswell, 2008). The RE-AIM Framework addresses external validity and generalizability of results.

Quasi-Experimental research.

This study is an example of quasi-experimental research as the investigator used intact classrooms as the experimental group for the study. Inherent in the quasi-experimental design are threats of maturation, selection and mortality. The efforts of the school officials to have similar classrooms for each teacher in terms of gender, previous academic content exposure and student ability addressed these threats. The pre-test and post-test instrument used was pilot-tested in 2008 and slight format changes were made to improve readability, response rate, validity and reliability (Creswell, 2008). The intervention for this study

involved kindergarten students and undergraduate dietetics students at a university in the same community.

RE-AIM framework.

For the results of this study to be generalizable to other populations, the study must use a representative sample of the population. The RE-AIM Framework provided a means to enhance external validity or representativeness and therefore, generalizability of results. The goal of the RE-AIM process is to “increase the potential to translate controlled research to ‘real-world’ practice conditions” (Dzewaltowski, Estabrooks, Klesges, Bull, & Glasgow, 2004; Estabrooks, Dzewaltowski, Glasgow, & Klesges, 2003). This process emphasizes the need for researchers to think about their sample and target populations, how effectiveness of the intervention is measured, use of program by others, ease of delivery, and sustainability during the program planning stage. This process aligns closely with the accuracy standards developed by the Joint Committee on Standards for Educational Evaluation (The Joint Committee on Standards for Educational Evaluation, 1994). Table 4 outlines the definitions of each part of the RE-AIM Framework.

Table 4

RE-AIM Framework Definitions

Term	Definition
Reach	Refers to inclusion and representativeness of the target population in the study sample.
Efficacy	Refers to key components of the intervention, strengths, and outcome measurement standards.
Adoption	Addresses who is involved with delivery of the program and what other organizations will offer the program.
Implementation	Refers to ease of program delivery at other sites.
Maintenance	Addresses individual and community-level sustainability of the program.

Reach refers to how inclusive and representative of the target population is the study sample. Researchers and program planners can identify the demographics of a target population to ensure each are represented in the study or program. Identification of barriers and solutions for reaching the target audience improved the reach of the program. Efficacy or effectiveness refers to the key components of the intervention, its strengths, and its outcome measurement standards. A researcher sets the alpha level before analyzing data and the program planner sets measurable goals and objectives before implementing the program. Deciding ahead of time what is significant or successful addresses the behavioral outcome measure. This is the “what works” of the research, for example does reduction of sedentary

time improve BMI measures in children, and if so, how much reduction in sedentary time is recommended to achieve a certain result? Adoption deals with the delivery of the program including who is involved in delivery and what other organizations will offer the program.

The goal was to get the program to the people who needed it the most. This is why FMI was the experimental group with a 35-40% rate of overweight or obese students for the last three school years. The control school, TJ, was chosen because it has similar demographics (% of students eligible for free and reduced meals, ethnicity, and total enrollment) to the experimental (FMI) school and had a 23-30% rate of overweight or obese for the last three years. Identification of barriers and solutions for possible delivery sites improves the adoption of the program. Implementation involves the ease with which other sites or organizations can deliver the program. There must be some degree of flexibility so the program is pertinent to each group of participants, but still maintains the original intent of the program. Progress reports provide documentation of program outcomes useful to researchers and program evaluators. Maintenance for the individual addresses relapse prevention and the ability of the program to provide lasting benefits for participants. This is similar to the Maintenance Stage of Change in the Transtheoretical Model of Change (Mahan & Escott-Stump, 2008). Maintenance for the community addresses sustainability of the program by a supporting organization. This includes additional funding sources as well as stakeholder commitment.

Instruments

The children's pretest / posttest instrument was developed by the researcher. It was proofread and evaluated by colleagues, nutrition professors, kindergarten teachers, and elementary reading specialists. The instrument was then pilot-tested and revised.

Readability level was determined by Microsoft Office Flesch-Kincaid Grade Level report to be at 0.5 grade level. Slight format changes were incorporated to improve response rate, validity and reliability (Creswell, 2008). The parent's instrument is a screening tool developed by researchers at Iowa State University. The Family Nutrition and Physical Activity screening tool was validated in a study conducted in the Des Moines, IA school district (Ihmels, Welk, Eisenmann, & Nusser, 2009). The following tables specify how each variable was measured.

Tables of Specifications

Table 5

Student Pre-Test and Post-Test

	Research Question 1	Research Question 2	Research Question 3		
Content	Nutrition Knowledge	Home Environment	Body Mass Index	# of Items	% of Items
Calcium	2			2	22%
Vegetables	1			1	11%
Fruits	1			1	11%
Fried foods	1			1	11%
Beverage choices	2			2	22%
Television		1		1	11%
Exercise (tricycle)		1		1	11%
Doctor comfort*					
Total # of items	7	2		9	
% of items	78%	22%			100%

*Included at request of kindergarten teachers

Table 6

Parent Survey

	Research Question 1	Research Question 2	Research Question 3	Other		
Content	Nutrition Knowledge	Home Environment	Body Mass Index	Overall Program	# of Items	% of Items
Curriculum	1	1		2	4	58%
Child talks about nutrition	1				1	14%
Child talks about exercise		1			1	14%
Yearly visit to pediatrician			1		1	14%
Total # of items	2	2	1	2	7	
% of items	28.5%	28.5%	14.5%	28.5%		100%

Table 7

Family Nutrition and Physical Activity Screening Tool

	Research Question 1	Research Question 2	Research Question 3		
Content	Nutrition Knowledge	Home Environment	Body Mass Index	# of Items	% of Items
Eat dinner while watching TV	1			1	4.78
Use food as reward	1			1	4.78
Restrict foods	1			1	4.78
Bedtime routine		1		1	4.78
Hours of sleep per night		1		1	4.78
Hours of TV per week		1		1	4.78
Hours of computer or video games per week		1		1	4.78
TV in bedroom		1		1	4.78
Monitor TV time		1		1	4.78
Eat breakfast	1			1	4.78
Eat family meals together	1			1	4.78
Fast food	1			1	4.78
Fruits and/or vegetables with main meal	1			1	4.78
Prepackaged foods	1			1	4.78
Prepare fresh food for main meal	1			1	4.78
Soda pop or Kool-Aid	1			1	4.78
100% fruit juice or low fat milk	1			1	4.78
30 minutes physical activity per day		1		1	4.78
Family physical activity outside		1		1	4.78
Child's free time physical activity		1		1	4.78
Child in organized sports or group activities		1		1	4.78
Total # of items	11	10	0	21	
% of items	52%	48%	0%		100%

Data Processing

The independent variable was the nutrition and health curriculum taught by undergraduate dietetics students. The dependent variables were the differences between groups in nutrition knowledge, home obesigenic environment, and body mass index as evidenced by responses to the pre- and post-tests; the differences between groups in parent response to the pre and post FNPA screening tool, and the differences in BMI percentile categories between groups. Appendix B contains the pre-test/post-test instrument with the desirable responses highlighted as well as the FNPA screening tool and the parent survey. The parent survey was used for program evaluation.

The student pretest and posttest forms were evaluated for number of desirable responses out of ten possible responses. For example, a child may have made 4 desirable choices on the pretest and 7 desirable responses on the posttest. The scores of 4 and 7 would be entered for that child's identification code for pretest and posttest, respectively. A score of ten indicated that the child chose the desirable response on all ten questions. The pretest scores for males and females for the treatment and control groups were compared at baseline to determine similarity of groups. The pretest and posttest scores for the treatment and control groups were compared at the end of the nutrition education intervention to determine if the intervention made a difference in the children's nutrition knowledge scores.

The parent pre and post FNPA forms were scored using the self-scoring guide. The number of items in column one multiplied by one; the number of items in columns two and three multiplied separately by two; the number of items in column four multiplied by three; then the four numbers were added together for the total FNPA score. A total score of 10-20 indicated a home environment more likely to develop pediatric overweight. A total score of

20-30 indicated an average home environment, and a total score of 30-40 indicated a home environment less likely to develop pediatric overweight. The parent's pre FNPA scores for male and female students for the treatment and control groups were compared at baseline to determine similarity of groups. The parent's pre and post FNPA scores for the treatment and control groups were compared six months apart to determine if the parent education materials made a difference in the home environment scores.

The children's height in inches and weight in pounds were entered into the BMI Tool for Schools Calculator on the CDC Web site (Centers for Disease Control and Prevention, 2010) to calculate BMI and BMI percentile. The BMI and BMI percentiles were entered into the data processing software for analysis. The children's BMI percentiles for males and females for the treatment and control groups were compared at baseline to determine similarity of groups. The children's pre and post BMI percentiles and pre and post BMI percentile categories were compared approximately six months apart to determine if the intervention affected body mass index.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) software was used to perform the data analysis. The children's knowledge pretest and posttest scores were measured approximately two weeks apart, before and after delivery of the nutrition education program. This time frame was chosen to be consistent with classroom assessment time frames. The children's BMI and the parent's FNPA scores were measured approximately six months apart. This time frame was chosen to be able to see expected increase in height velocity in this age group and to allow time for initial changes in home environment to be recognized (Kirk, Scott, & Daniels, 2005; Mahan & Escott-Stump, 2008; Savoye, Shaw, Dziura,

Tamborlane, Rose, Guandalini, et.al., 2007). For a six month time frame, the expected rate of growth is 2.5 kg weight gain and ~1.5 inches in height (Mahan & Escott-Stump, 2008).

Descriptive statistics were computed for all independent and dependent variables to examine central tendency and variability. Data from BMI were further processed to examine the percentage of children classified as underweight, normal weight, overweight, or obese. A mixed between-within subjects analysis of variance was used to test for significant differences between groups. The group means were compared to determine if the intervention program affected the kindergarten student's knowledge, the parents FNPA score and the kindergarten student's BMI results of the treatment group compared to the control group. The critical value or alpha of .05 was used to determine significance of results. If the significance level for any measure were less than .05, it could be said that the effect of the program on that variable was statistically significant (Stockburger, 2008).

The students in the treatment and control schools were similar with regard to gender distribution, ethnicity, and socio-economic status. Teachers from the schools also indicated that the intact classrooms used in this research were similar with regard to academic ability and academic content exposure. It was hypothesized that the nutrition and health curriculum taught by dietetics undergraduate students would increase children's knowledge, improve parents FNPA scores, and positively impact children's BMI results compared to the control curriculum.

Chapter 4

Results

Descriptive Statistics

Complete data on student test scores (pre and post) and BMI were obtained from 156 children (79 from the experimental school and 77 from the control school). Data on the FNPA tool were obtained from 149 parents (75 parents from the experimental school and 74 parents from the control school). An independent-samples t-test was conducted to compare the baseline knowledge pretest scores, body mass indexes, and pre-FNPA scores for the experimental and the control groups. No significant difference was found for knowledge pretest, $t=1.734$, $p = .085$ (two-tailed); for BMI, $t = 1.500$, $p = .136$ (two-tailed); and for FNPA, $t = -1.808$, $p = .282$ (two-tailed). A two-way ANOVA was conducted for gender by condition to compare baseline child data for height, weight, BMI, BMI percentile, and knowledge and for parent's baseline FNPA score (see Figures 1-3). There was no significant interaction between groups by gender for any of the baseline data ($p = .098$ for height; $p = .560$ for weight; $p = .730$ for BMI; $p = .669$ for BMI percentile; $p = .736$ for knowledge pretest; and $p = .075$ for pre FNPA). Table 8 provides a baseline comparison of the primary outcome variables for the two schools.

The treatment group and the control group were similar in terms of parent participation (75% treatment group, 70% control group), percentage of minority students (43% treatment group, 52% control group school), and percentage of students receiving free and reduced lunch assistance (69% treatment group, 67% control group school). At the time of this study, the treatment school had 50 males and 50 females in kindergarten while the control school has 62 males and 43 females in kindergarten. Appendix D gives demographic

data for all nine Conway public elementary schools. Table 9 summarizes descriptive statistics for the primary outcome variables.

Table 8

Baseline Comparison of Experimental and Control Schools for Primary Outcome Variables

	Treatment			Control		
	Male	Female	Combined	Male	Female	Combined
Child height (inches)	45.1 +/- 2.53	44.0 +/-2.54	44.5+/- 2.58	44.8/-2.15	45.0+/-2.51	44.9 +/-2.26
Child weight (pounds)	48.6 +/-10.37	47.0 +/-10.28	47.7 +/-10.28	46.6 +/-9.26	47.0 +/-8.94	46.7 +/-9.04
BMI	16.7 +/-2.36	16.9 +/-2.54	16.8+/-2.45	16.3 +/-2.38	16.2 +/-2.21	16.2 +/-2.31
BMI Percentile	69.6 +/-29.40	69.9 +/-23.19	69.8 +/-26.08	60.9 +/-28.93	57.2 +/-32.7	59.7+/-30.09
Child Nutrition Knowledge	6.6+/-1.56	6.8+/-1.60	6.7+/-1.58	6.3 +/-1.20	6.6+/-1.75	6.4 +/-1.41
Parent FNPA	23.3+/-2.67	23.7 +/-2.30	23.5 +/-2.47	23.3 +/-2.66	25.2 +/-2.27	24.0 +/-2.67

Figure 1. Baseline Knowledge

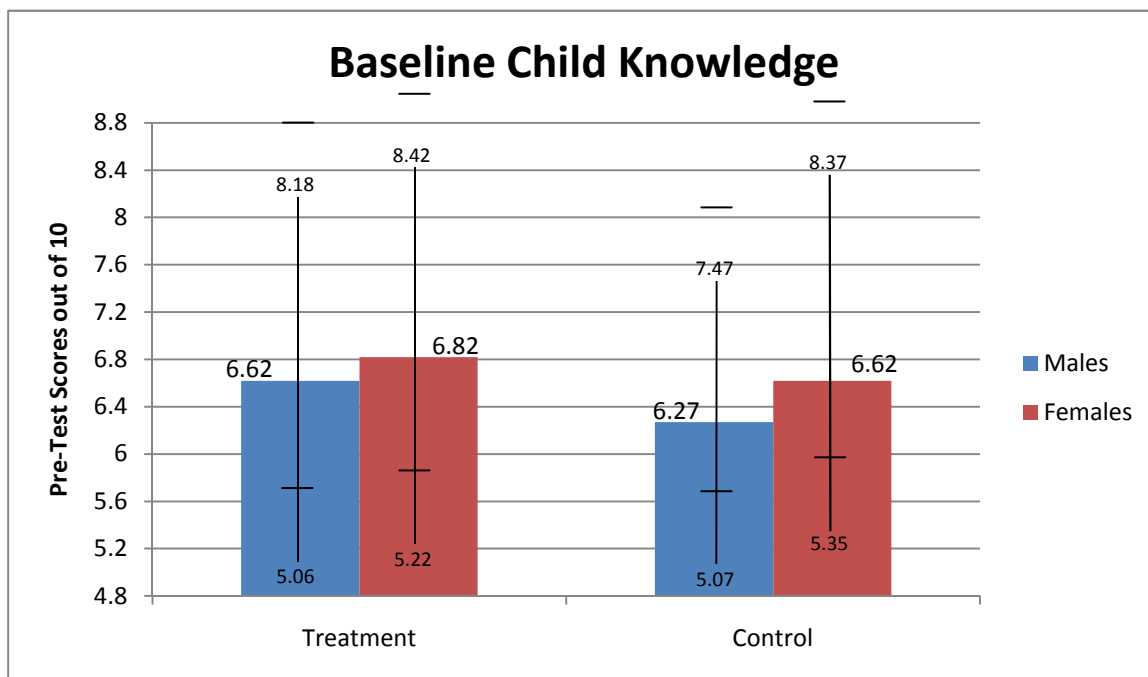


Figure 2. Baseline FNPA

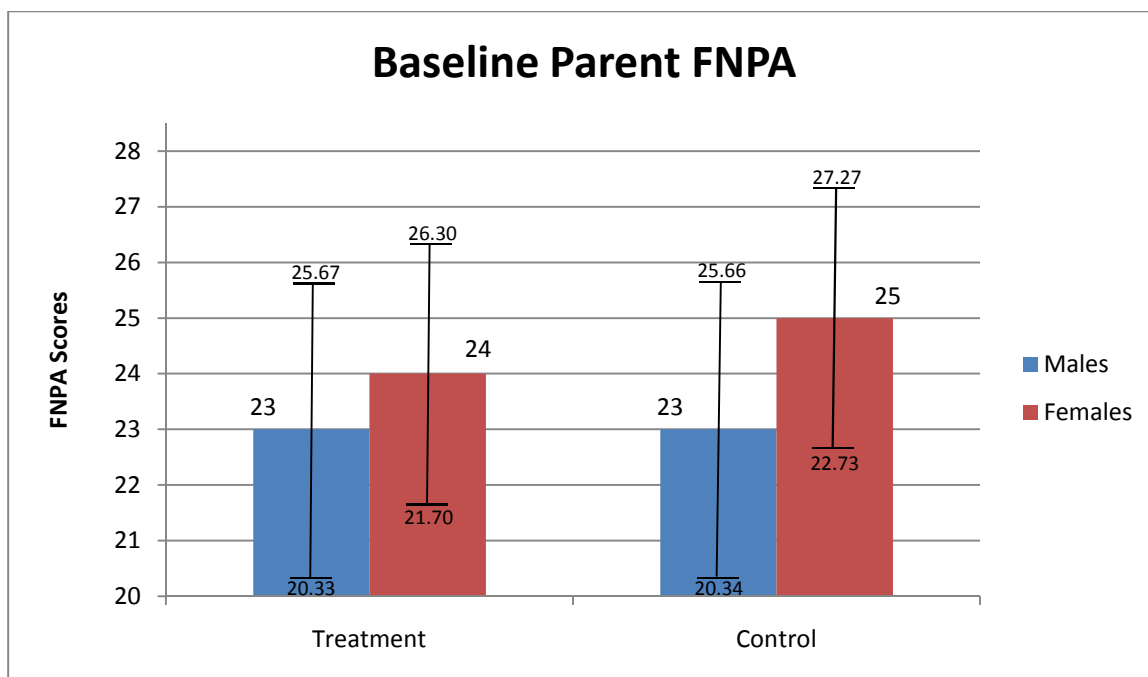


Figure 3. Baseline BMI Percentiles

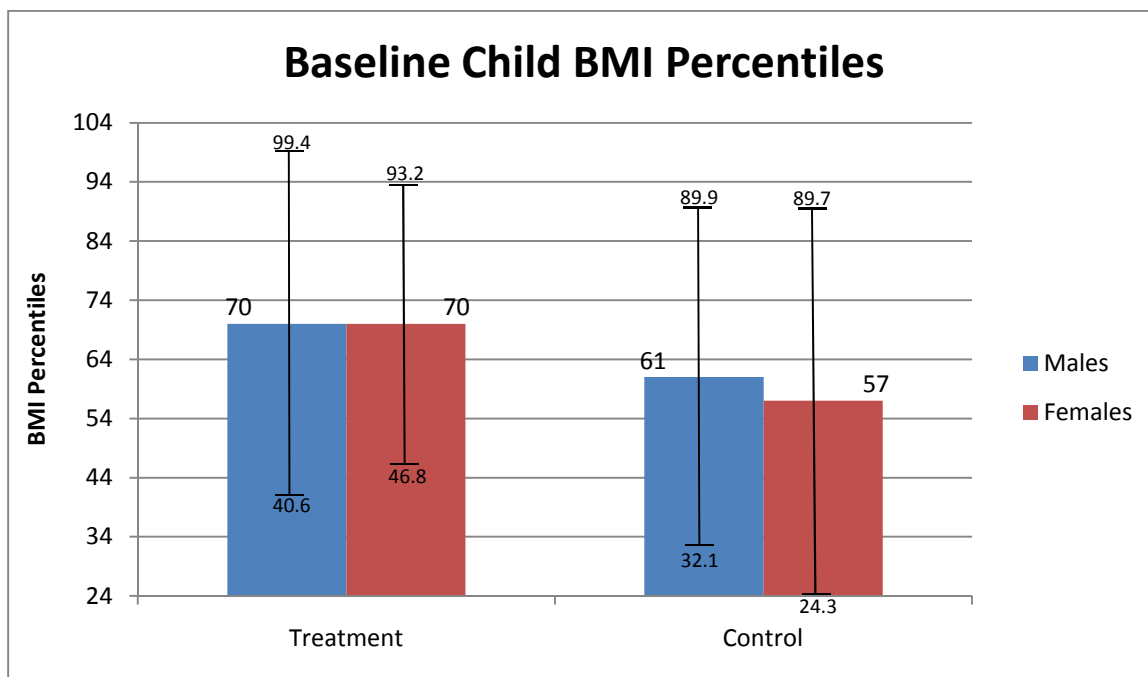


Table 9

Summary of Descriptive Statistics for the Primary Outcome Variables

	Treatment					Control				
		Pre	Pre	Post	Post		Pre	Pre	Post	Post
	n	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD
Knowledge	79	6.78	1.552	8.01*	1.532	77	6.36	1.441	6.56	1.446
FNPA	75	23.49	2.440	24.31*	2.736	74	23.95	2.674	23.95	2.564
BMI	79	16.80	2.38	17.08*	2.38	77	16.24	2.27	16.08	2.10
BMI Percentiles	79	70	26.08	72*	24.88	77	59.7	30.09	58	30.80

Intervention Effects—Knowledge

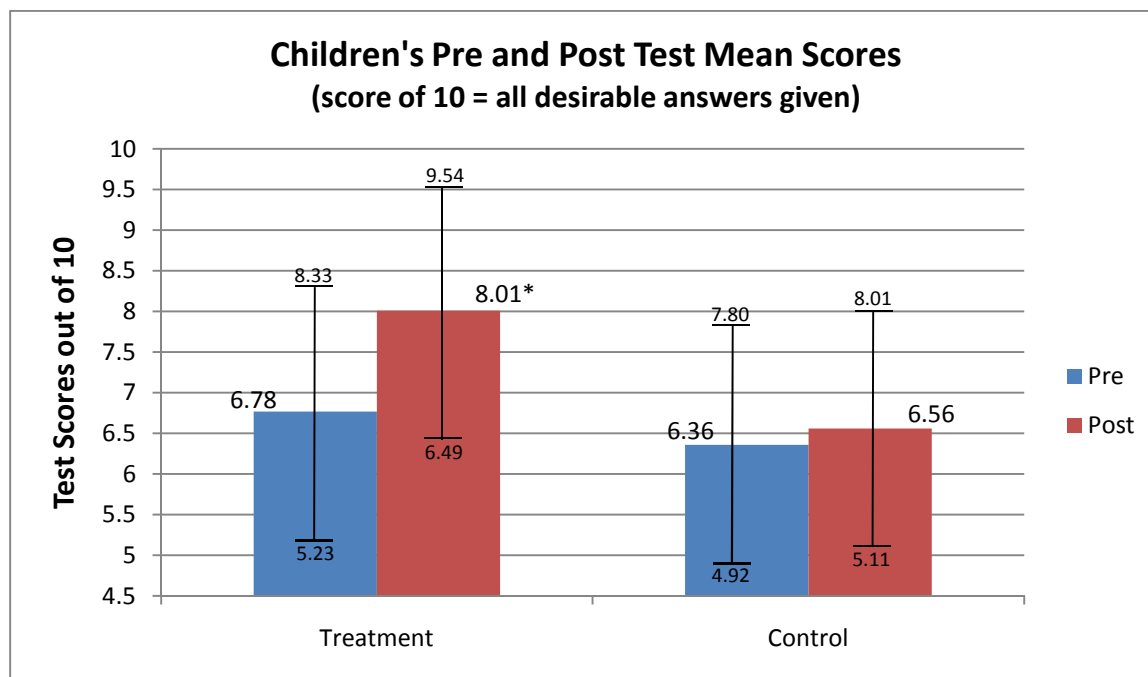
Students were provided the pre-test in August/September and the post-test in late September. A mixed between-within subjects analysis of variance was conducted to assess the impact of the nutrition education intervention on children's knowledge scores across two time periods (pre-intervention and post-intervention). There was a significant interaction between groups per time, Wilks' Lambda = .76, $df = (1, 153)$, $F = 49.74$; $p = <.001$; partial eta squared = .245. The results showed a significant condition by time interaction for knowledge (see Figure 4). When classroom was considered as a covariate, knowledge outcome approached significance indicating that class may have influenced learning to some degree ($p = .078$). Table 10 summarizes knowledge score means for each treatment and control classroom. Treatment classrooms three and five had the largest increase in mean knowledge scores.

Table 10

Summary of Knowledge Score Means

		Treatment			
		Pretest	Pretest	Posttest	Posttest
n		Mean	SD	Mean	SD
Class 1	17	7.24	1.64	8.53	1.38
Class 2	17	7.00	1.28	7.94	1.09
Class 3	16	5.81	1.38	7.19	2.11
Class 4	14	7.29	1.27	8.29	1.64
Class 5	15	6.36	1.74	8.07	1.07
		Control			
		Pretest	Pretest	Posttest	Posttest
n		Mean	SD	Mean	SD
Class 1	18	6.67	1.28	6.72	1.23
Class 2	16	6.31	1.35	6.69	1.30
Class 3	16	6.81	1.28	6.94	1.29
Class 4	13	5.92	1.89	6.23	2.05
Class 5	14	5.93	1.39	6.07	1.39

Figure 4. Children's Knowledge Pre and Post Test Scores



Intervention Effects—Family Nutrition and Physical Activity

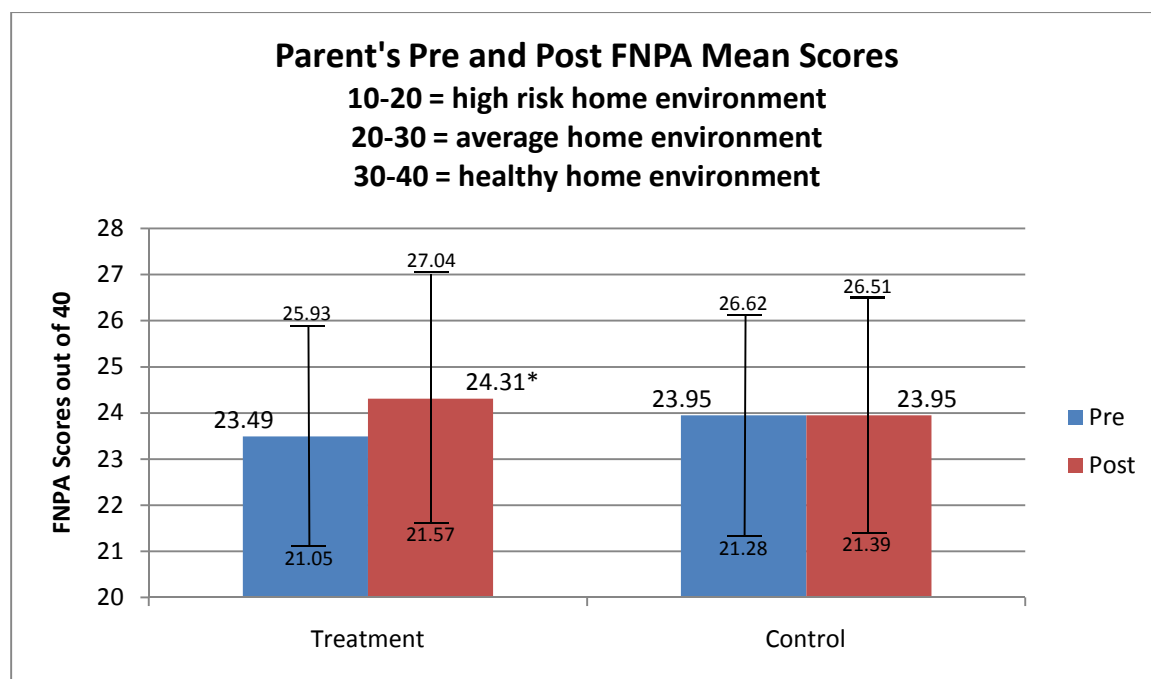
Parents were provided the FNPA screening tool in August/September of 2009 and again in February/March of 2010. A mixed between-within subjects analysis of variance was conducted to assess the impact of the nutrition education intervention on parent's scores on the FNPA screening tool across two time periods (pre-intervention and post-intervention). There was a significant interaction between groups by time, Wilks' Lambda = .86, $df = (1, 147)$, $F = 23.93$; $p < .001$; partial eta squared = .14 (see Figure 5). When classroom was considered as a covariate, FNPA outcome was not dependent on class ($p = .999$). Table 11 summarizes FNPA score means for each treatment and control classroom. Treatment classrooms three and five had the largest increase in mean FNPA scores.

Table 11

Summary of FNPA Score Means

	Treatment					Control				
		Pretest	Pretest	Posttest	Posttest		Pretest	Pretest	Posttest	Posttest
	n	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD
Class 1	16	23.88	1.89	24.38	2.31	17	24.59	3.14	24.41	2.94
Class 2	16	22.94	3.30	23.88	3.70	14	24.14	2.60	24.00	2.42
Class 3	16	22.88	2.45	23.88	2.90	16	23.00	1.67	23.38	1.71
Class 4	13	24.62	2.43	25.08	2.47	13	23.85	2.48	23.92	2.50
Class 5	14	23.46	1.61	24.69	2.02	14	24.14	3.26	24.00	3.26

Figure 5. Parents Pre and Post FNPA Scores



Intervention Effects—Body Mass Index Percentiles

Body mass index data was calculated using the Children's BMI Tool for Schools on the Centers for Disease Control and Prevention website (CDC, 2010). Kindergarten students were weighed and measured in August of 2009 at an average age of five years and again in March of 2010 at an average age of five and a half years to assess BMI changes over a six month time period. A mixed between-within subjects analysis of variance was conducted to assess the impact of the nutrition education intervention on children's BMI percentile measurements across two time periods (pre-intervention and post-intervention).

There was a significant interaction within groups, Wilks' Lambda = .97, $df = (1, 153)$, $F = 5.107$, $p = .025$, $\eta^2 = .032$. The between-subjects effects were $F = 4.78$, $p = .03$, and partial eta squared = .030. When classroom was considered as a covariate, BMI outcome was not dependent on class ($p = .993$). Table 12 summarizes BMI means for each treatment and control classroom.

However, students in the experimental school demonstrated an increase in average BMI from 16.80 to 17.08 over the six month time period while students in the control school demonstrated a decrease in average BMI measurement from 16.24 to 16.08 over the six month time period. The percentage of students in the experimental school who were in the normal weight category decreased by one percent over the six month time frame. The percentage of children in the experimental school in the underweight category decreased while the percentage of children in the overweight and obese categories increased. For students in the control school, the percentage of underweight children stayed the same, the percentage of overweight, and obese children decreased, and the number of normal weight children increased (see Figures 6 and 7). Appendix K contains additional data tables.

Table 12

Summary of BMI Means

	Treatment					Control				
		Pretest	Pretest	Posttest	Posttest		Pretest	Pretest	Posttest	Posttest
	n	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD
Class 1	17	17.14	2.02	18.01	2.40	18	15.59	1.77	15.77	1.70
Class 2	17	16.74	3.18	17.34	3.13	16	16.32	2.19	15.91	1.55
Class 3	16	16.58	1.50	16.62	1.31	16	15.85	2.43	15.71	1.93
Class 4	14	16.99	3.18	17.28	2.70	13	16.90	2.97	16.61	3.09
Class 5	15	16.32	1.70	15.92	1.52	14	16.82	2.02	16.61	2.27

Figure 6. Children's Mean Pre and Post BMI Percentiles

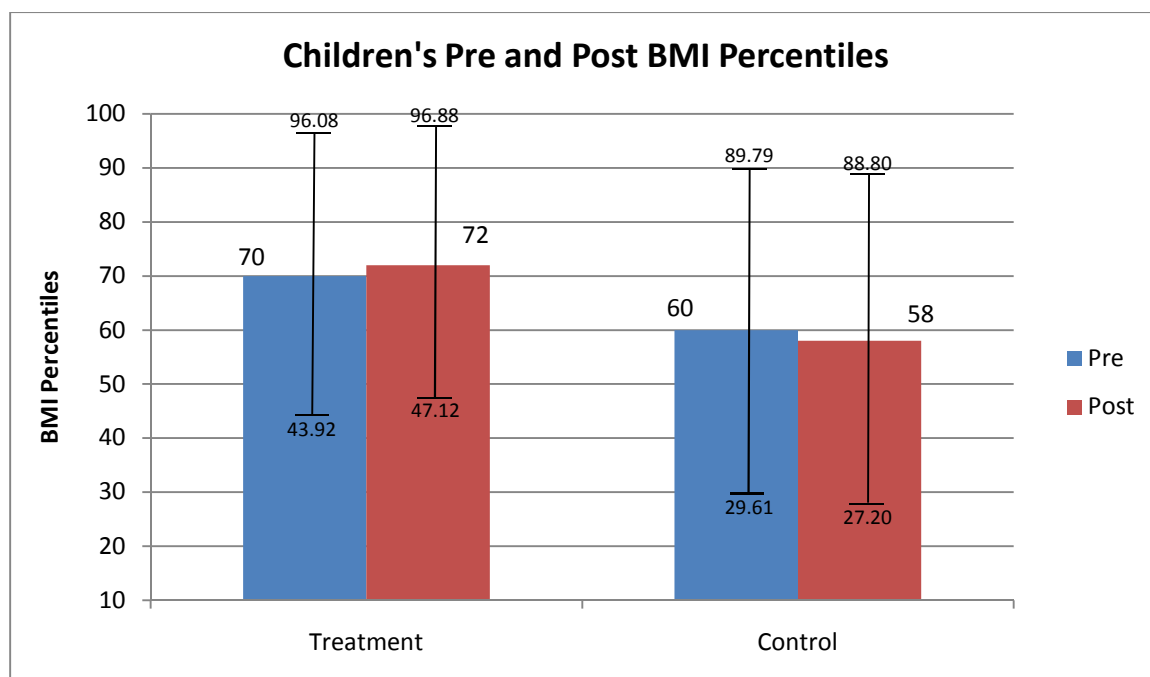
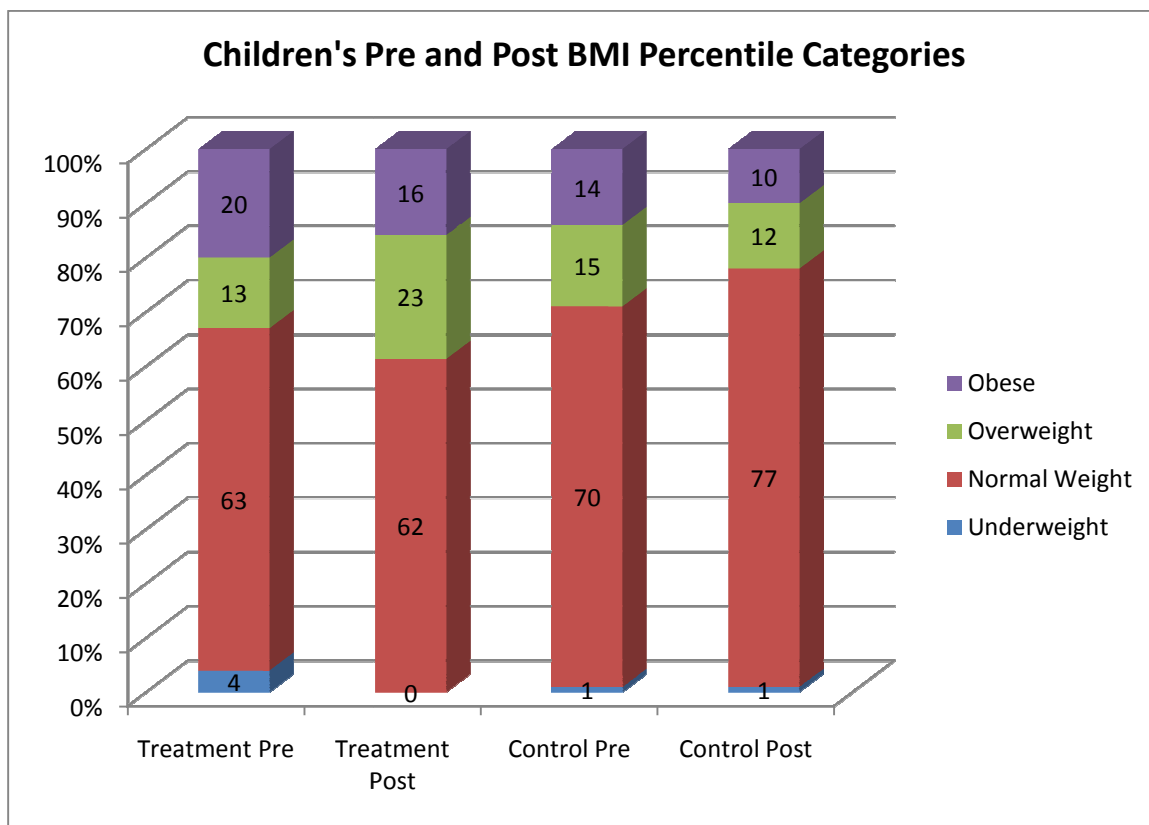


Figure 7. Children's Pre and Post BMI Percentile Categories



Service Learning Outcomes

This study also examined learning outcomes associated with the coordinated service learning component. The rationale for this part of the study was to determine if the program provides mutual benefits to elementary school students and to the university students.

Twenty senior nutrition majors enrolled in Medical Nutrition Therapy II participated in this study in the 2009 fall semester at the University of Central Arkansas. These students taught kindergarten students in a local elementary school the relationship among food choices, nutrition and health. A range of two to ten hours each were volunteered by the university students for this project.

After participating in the program, the dietetic students were required to write a reflection paper for course credit. The personal impact section of the reflection papers were coded for emerging themes. The following four themes emerged: (1) feeling of purpose/impact, (2) general experience gained, (3) pediatric experience gained, and (4) place for service learning in higher education. Table 13 summarizes the student's written comments. Dietetics students came to believe that they could influence the childhood obesity trend through nutrition education. They saw the value in volunteering and gained self-efficacy and self-esteem in the process. The students reflected the feeling that service learning should be included in higher education courses as a benefit to them and to the community. Students identified the need to schedule service learning activities during class or laboratory time to avoid scheduling conflicts with work and student organization responsibilities. Finally, the students reported the feeling that those who volunteer during college are more likely to volunteer after they graduate and that integrating service learning

opportunities into dietetics curriculum enhances dietetics education and strengthens dietetic internship applications.

This collaborative aspect benefited both the elementary school and the university. The elementary school benefited by having a developed curriculum provided for the students at no additional cost to the school system. By videotaping the lessons and sharing the lesson plans, this program can be a model for teachers statewide. Other benefits for the elementary school included access to student instructors trained in methods of teaching and an up-to-date curriculum. The university benefited by developing a relationship in the community that provides practical experiences for undergraduate students. Other elementary school and universities will benefit from this research by having an example of community collaboration, a developed curriculum to adapt and use in their school, and a research protocol to replicate.

Table 13

Personal Reflection Themes

Theme	Examples
<i>Feeling of purpose or impact</i>	<p>“felt like I made a little bit of a difference in their lives just by being there”</p> <p>“I loved it”</p> <p>“shape the lives of people in their communities”</p> <p>“make a larger impact than students enrolled in traditional lecture courses”</p> <p>“feel like I have given back”</p> <p>“it has changed the way I value my life”</p>
<i>Experience gained (general)</i>	<p>“we go into these schools intending to pour out the knowledge that we already have to others, but one thing we usually do not expect is to learn more from the experience than the students we are actually teaching”</p> <p>“skills and satisfaction”</p> <p>“fun”</p> <p>“exposure to communication and problem-solving skills”</p> <p>“the student is put into real-life situations in which they learn things that they never could from a textbook”</p> <p>“it is one thing to do something for class performance, it is another thing to do something that is going to impact somebody’s life, and this is what made the difference in this project”</p>
<i>Experience gained (pediatrics)</i>	<p>“how to interact with children in this age group”</p> <p>“they hang on your every word”</p> <p>“they pick up on everything you say and do”</p> <p>“have to set the standard by the example that we set”</p> <p>“these kids look up to us like we know everything”</p> <p>“they are like little sponges waiting for us to leak out our liquids of knowledge”</p>
<i>Place for service learning in higher education</i>	<p>“becoming educated on a topic is only the beginning.... It becomes our responsibility to share the information we know with others”</p> <p>“exposure to communication and problem- solving skills”</p> <p>“made a larger impact than students enrolled in traditional lecture courses”</p>

Chapter 5

Discussion

General Discussion

This chapter summarizes the study and conclusions drawn from the data analysis in Chapter IV. It also provides a discussion of the implications for action and recommendations for further research. The focus of this research project was to examine the relationship among kindergartener's knowledge of nutrition and health, parent's knowledge and home environment choices related to nutrition and health, and children's body mass index as it relates to health.

This research compared the changes in nutrition knowledge, home obesigenic environment and BMI among kindergarten-age students and parents who participated in an intervention program with those who did not participate in the program. The following research questions were used to determine if there was a significant difference between the program participants and the non-participants:

- (1) Did the children's knowledge change (participants differ from non-participants)?
- (2) Did the FNPA score change (participants differ from non-participants)?
- (3) Did the children's BMI results change (participants differ from non-participants)?

The study used a quasi-experimental design by assigning intact classrooms to the experimental or control conditions. Seventy-nine students and their parents participated in the experimental group while seventy-seven students and their families participated in the control group. Permissions were obtained from school district administrators, parents and kindergarten students. University of Central Arkansas senior dietetics majors were oriented and trained to deliver the nutrition education portion of the intervention.

Specific Research Outcomes

Intervention effects—knowledge.

The results of the study showed significant increases in nutrition knowledge for children in the experimental group. The average score for children in the experimental group increased slightly over one point after receiving the nutrition education, while the average score for the children in the control group did not change over the same time frame. No significant difference was found for knowledge scores by classroom ($p=.078$) indicating that some classroom teachers may or may not have created a better learning environment or that some nutrition majors may or may not have been better at program delivery. Documenting a knowledge change is important to illustrate the children's knowledge acquisition and that this curriculum was effective for teaching nutrition content to this experimental group. The data suggest that the group's post-test scores increased as a result of the nutrition education intervention. A higher score on the knowledge test indicated the child could identify desirable behaviors, for example, choosing water instead of soda as a beverage. Most change was evident in question two, "Yogurt is good for me," and question six, "Water is the best choice when I am thirsty." On the pretest, 28 kindergarten students did not select "yes" to indicate that "yogurt is good for me" while on the posttest only five kindergarten students did not select "yes" for that question. On the pretest, 11 kindergarten students selected "no" to indicate that water was not the best choice when thirsty while on the posttest only two kindergarten students indicated that choice. The choices of fried foods (chosen 61 times) and television as "good for me" (chosen 54 times) were picked most often on the pretest. Improvement was seen in both these areas on the posttest (see Appendix K).

The results of this study support school-based intervention including nutrition education as a part of a comprehensive school health program and provide needed research in the area of school-based programs to improve the current Grade III designation by the American Dietetic Association's Evidence Analysis Library (ADA 2003; ADA, 2005; Pyle, et .al., 2006). This study supported collaboration and community partnerships as a resource to improve health outcomes for children through a service learning program that worked with local kindergarten students (ADA, 2003; Hardy, 2007; Michael, Dittus, & Epstein, 2007). These findings support the hypothesis that the nutrition and health curriculum taught by dietetics undergraduate students increased children's knowledge scores compared to the control curriculum ($p=.000$).

Intervention effects—family nutrition and physical activity.

Small but significant improvements in FNPA scores for parents in the experimental group were evident in the study. Parents in the experimental group showed a significant change ($p=.000$) from the pre-FNPA score to post-FNPA score by an average increase of almost one point, while parents in the control group showed no change in FNPA score over time. No significant difference was found for FNPA scores by classroom ($p=.993$) indicating that some parents made changes based on the parent materials provided on an individual basis, not on a classroom basis. Scores on the FNPA between 10 and 20 indicate a home environment conducive to children becoming overweight; a score of 20-30 indicates an average household environment; a score of 30-40 indicates a home with a reduced risk of children becoming overweight. Both the initial and the second FNPA score for parents at both schools indicate an average home environment. A change in FNPA score is an important indicator of change in the home environment, which is important for

kindergarten-age children since they are not the ones making food purchasing and preparation decisions. Most change was evident in decreased use of prepackaged foods and increased use of freshly prepared meals. Parents indicated improvements in the consumption of fruits and vegetables with meals and family activity time together. Table K6 in Appendix K shows the selections parents made to improve their FNPA score over time.

Parental involvement, identified as a positive component of successful interventions (ADA, 2006; Fulton, McGuire, Caspersen, & Dietz, 2001), was evidenced by the change in FNPA score for parents in the experimental group. The FNPA screening tool is a relatively new instrument used by practitioners and researchers to assess home environment risk of obesity. An increase in FNPA score indicates healthier choices made in the home environment to reduce the risk of obesity in that home. Many parenting decisions affect the obesity risk in the home. Risk examples include allowing a television in the child's bedroom, choosing packaged versus fresh items at the grocery store, and not enforcing an appropriate bedtime. Parents may not view all these decisions as directly affecting their child's weight. Using the FNPA screening tool with parents of young children can increase awareness of how these issues affect weight, and provide feedback to enable parents to make better choices. These findings appear to support the hypothesis that the parent education materials provided by dietetics undergraduate students improved parents FNPA scores compared to the control curriculum ($p=.000$).

Intervention effects—body mass index percentiles.

The results of the children's BMI did not significantly change over the six month time period. No significant difference was found by BMI percentile scores by classroom

($p=.999$). Body mass index typically increases with age as a part of normal growth and development (CDC, 2009; Malina, 1999). It can be difficult to show BMI change in a growing child in a six month period of time. One study evaluated different methods to measure adiposity change in children and found that BMI z is reliable for evaluating a single measure, but BMI itself or BMI % is better to measure change in adiposity (Cole, Faith, Pietrobelli, & Heo, 2005). Another study (Mast, et. al., 2003) showed that BMI is a more sensitive indicator for obese than for overweight five to seven year olds. A one point change in BMI is equivalent to a six pound weight change.

For children who are still growing is it important to look at changes in BMI percentile categories as defined by the Centers for Disease Control and Prevention. Children with a BMI above the 85th percentile may be at risk for weight-related medical conditions such as diabetes and heart disease. Using BMI in children as a screening tool is appropriate to determine if additional medical intervention is needed (CDC, 2009). In this study, 39% of kindergarten students in the experimental school and 22% of kindergarten students in the control school are in the overweight or obese category according to the CDC definitions based on their BMI percentiles. The important issue for the children in this study is that for both schools, the percentage of children in the overweight or obese categories is well above the Healthy People 2010 recommendation of five percent of children who are either overweight or obese. These findings did not support the hypothesis that the nutrition and health curriculum taught by dietetics undergraduate students positively affected the children's BMI results compared to the control curriculum.

Service Learning Outcomes

The second goal of the study was to examine service learning outcomes for the undergraduate nutrition majors implementing the nutrition education curriculum. These senior students reported an overall positive experience with service learning. The personal impact section of their reflection papers indicated a belief that they could make a positive difference in the lives of kindergarten students by providing nutrition education in the classroom. They indicated a sense of value in participating in this service learning project and a gain of experience in teaching and child development. Inclusion of service learning in higher education was identified as a responsibility to the community and as an opportunity to further develop problem-solving and communication skills. Additionally, a sense of civic responsibility (Andrews, 2007) was identified by the senior nutrition majors in their reflection papers.

School faculty and health professionals could benefit from the study based on the finding that the children's test scores increased after the nutrition education intervention. The lesson plans and training video are available for sharing with other school personnel in Conway and are available to all districts in Arkansas through the Arkansas Dietetics Association. These materials provide teachers with lesson plans, teaching materials, and ideas for implementation they may use in their own classrooms.

RE-AIM Framework

The target population for the experimental group at Florence Mattison International (FMI) Elementary school was the 100 kindergarten students. The control group target population was the 105 kindergarten students at Theodore Jones (TJ) Elementary school. Appendix B provides pertinent demographic information. This study reached most of the

target population by permission and assent, and included 79 of FMI and 77 of the TJ kindergarten students. Student assignments to the five intact kindergarten classrooms were purposefully diverse in terms of demographic criteria of race/ethnicity, gender, and academic readiness. Both the treatment and the control group samples contained females and males, English and Spanish speaking children, as well as race/ethnicity diversity and academic readiness levels. Descriptive statistics were reported as part of the study.

Effectiveness or efficacy addresses the intended impact of the intervention as well as any unintended consequences for participants. The curriculum used was created by undergraduate dietetics students and university dietetics instructors. This curriculum was chosen because it was age-appropriate for the kindergarten students and provided the undergraduate dietetics students an opportunity to practice skills learned in their Methods of Teaching course. Participation criteria for the dietetics students included receipt of at least a “C” in the Methods course to promote consistency of delivery skills.

The goals of the intervention were to enhance the knowledge, skills, and healthy behaviors of the kindergarten students and to provide the undergraduate dietetics students with practical work experience in their field of study. Kindergarten students completed the knowledge post-test within two weeks of lesson delivery. This is the time frame used by the kindergarten teachers to assess learning at the end of each unit of study (A. Criswell, Personal Communication, August 16, 2009). Parent’s FNPA scores and BMI were measured six months apart to allow parents time to incorporate changes in the home and to assess growth in children (Mahan & Escott-Stump, 2008).

The desired outcomes for the kindergarten students included an increase in knowledge, skills, and healthy behaviors, which lead to improved health and reduced

overweight and obesity rates. The desired outcomes for the undergraduate dietetic students included documentation of field-related work experience; exposure to a community-based nutrition education program, which enhanced the student's dietetic internship application; and comfort with future work in nutrition education. Placement of dietetic graduates into dietetic internships and an undergraduate program survey is conducted by the Didactic Program Director each year and reported to the university and to the American Dietetic Association. A possible unintended consequence of this program is the desire for the program to be provided to other grades at FMI and other elementary schools in Conway before additional dietetic students can be trained to deliver the program.

The adoption process includes utilizing those involved with program delivery and other organizations that may offer the program. The approximately 20 students in each of two senior-level Medical Nutrition Therapy (MNT) courses at UCA were involved with program delivery. Participation in service learning was a requirement of the MNT course, but students could choose a different setting if so desired. Other options for meeting the service learning course requirement included working at a local shelter or soup kitchen. All students chose to volunteer their time to the nutrition education project to meet the service learning component of the MNT course. Delivery of this program was a service-learning project for one section of MNT with plans to incorporate service-learning into the Community Nutrition course each fall and spring semester. This collaboration between UCA and FMI will hopefully continue indefinitely and expand to other elementary schools in the future. Adoption encompasses potential settings and representativeness of these settings to the total population. Enrollment of UCA dietetics majors is one limitation in the ability to deliver this program to other elementary schools.

The quality and ease of program delivery is referred to as implementation. Efforts to ensure the program was delivered as planned included the requirement of dietetics students earning at least a “C” grade in the Methods of Teaching and Advanced (lifecycle) Nutrition courses prior to taking the MNT course. Other efforts aimed at quality and consistency of program delivery included instructor oversight, elementary classroom teacher evaluations of the dietetic students, and the assignment rubric developed by the MNT professor. After each term the program is delivered, a debriefing meeting is held including the dietetics students, a percentage of the elementary students and their parents, the elementary classroom teachers, and the elementary school principal and counselor. Identified changes, for example teaching and classroom management techniques, were made before the next term’s program delivery. One change was recommended after the fall 2009 program delivery to change the fruit and veggie color bingo game to a matching game.

Maintenance at the individual level refers to the elementary students being able to maintain the knowledge, skills, and behaviors gained from the program. At the community level, maintenance refers to the continuance of the program after the study is completed. This program was targeted for delivery to kindergarten students. Elementary schools were required to provide age-appropriate nutrition education to all grades as part of Arkansas Act 1220 (State of Arkansas, 2003). The nutrition education provided in subsequent grades should reinforce what is learned in the kindergarten curriculum. Both UCA and FMI are stable schools in the Conway community, so this relationship has the potential to grow and deepen over time. This program is part of the existing dietetics curriculum at UCA, and no additional funding or supplies above those currently in place were needed. The major future need will be availability of dietetics students for placement in the elementary school

classrooms desiring the program. Key stakeholders for program delivery included the dietetics students, the FACS Department chair and faculty, and the elementary school faculty and staff. All key stakeholders were committed to the success of the program as it benefits both the university and the elementary school.

According to the RE-AIM Framework, small changes that reach a large population are valuable (Dzewaltowski, Estabrooks, Klesges, Bull, & Glasgow, 2004; Estabrooks, Dzewaltowski, Glasgow, & Klesges, 2003). To facilitate reaching a larger population, the lesson plans and training video are available to elementary classroom teachers and dietetics faculty on request. There are four other undergraduate dietetics programs in Arkansas that can utilize this program to incorporate service learning in their curricula. Additionally, kindergarten classroom teachers can use the lesson plans as part of their existing nutrition and health curriculum.

Summary of Project

Implications for action.

This research focused on the impact of a school-based nutrition and health program designed to improve the nutrition and exercise knowledge, attitudes and actions of kindergarten students and their families through collaboration with a local university. Other children and families could benefit from the study based on the findings that the children's test scores and the parents FNPA scores increased after the nutrition education intervention. The scores suggested possible positive behavior changes. Including nutrition education as part of a comprehensive approach to school health, children and families could benefit by the knowledge received and the reinforcement of that knowledge through a healthy school environment. Improved participation may be enhanced by using parent communication

methods already in place at each school. Examples of existing parent communication methods include a parent link program for families with home computer access, automated phone messaging, and the local *Log Cabin Democrat* and *Thrifty Nickel* newspapers. A parent survey to determine the best time for parent night events and providing babysitting for these events may also improve participation.

Implementation of the FNPA screening tool in other school districts in Arkansas has been assessed by individuals at the Arkansas Center for Health Improvement, the Arkansas Department of Health, and the Arkansas Dietetic Association. It has been recommended that this screening tool be used in conjunction with the BMI testing in Arkansas to increase awareness and provide information to parents regarding healthy choices made in the home which impact children's weight. The notification letter to parents reporting the child's BMI could contain the FNPA link as well as a link to the Arkansas Dietetics Association Web site to connect parents with a Registered Dietitian in their area. Arkansas has thirty-three coordinated school health districts, eight of which have Wellness Centers in the schools. The FNPA tool could be piloted in those eight schools. All schools in Arkansas have Parent Centers which provide resources for parents and children. The FNPA tool is a resource option for these Centers. Educating physicians who treat pediatric clients on the use of the FNPA tool may help physicians feel more comfortable starting a conversation with parents regarding their child's weight and provide a resource for these physicians in addressing weight issues with parents.

Making service learning a permanent part of the nutrition curriculum at UCA is recommended. Ongoing communication with the Didactic Program in Dietetics Director at UCA resulted in the inclusion of service learning as part of the Community Nutrition

course. This recommendation was based on the analysis of the nutrition major's reflection papers. The Didactic Program in Dietetics Director determined that the Community Nutrition course was the best fit for this project based on course content and objectives, the benefit to the students in that course, and the consistency gained by the same instructor teaching the class each semester.

Strengths and limitations.

A major strength of this study is that it provided a benefit to both the elementary school and to the university. The elementary schools are required to provide age-appropriate nutrition education, so this program provides that for the schools at no cost. The kindergarten students benefited by receiving the nutrition education and by their interaction with the university students. The university students benefited from the opportunity to work with a pediatric population, practice oral presentation and organization skills, and gain valuable volunteer hours. The faculty researcher observed an increase in the university students' self-confidence and in their comfort level when interacting with children. The university, especially the Family and Consumer Sciences Department, benefitted from strengthened ties in the community.

The service learning model contributed to the sustainability of the program and will enable the relationship between the university and the local elementary schools to flourish over time. This study used intact classrooms that provided applied experience for the university students. This allowed the university students to observe the elementary school physical plant including the cafeteria menus, physical education room, and playground equipment. This model can be accessed and used by other undergraduate dietetic programs wishing to incorporate service learning into their curricula.

One limitation of the study is the use of intact classrooms. If this study were repeated, students could be randomly assigned to the treatment and control groups to reduce the potential threats to internal validity. Conducting this study in all nine elementary schools would provide a larger sample to strengthen reliability of the findings. Another limitation is that of generalizability. This study was conducted in an elementary school in a Southern state with a local university which contained an undergraduate dietetics program. This program could be implemented by students in health-related fields including nursing, health, and wellness. Elementary schools in other areas of the country or in towns with no local university containing undergraduate healthy-related programs may not find the results applicable.

Recommendations for further research.

Further research in Arkansas should study the effect of implementing the FNPA screening tool state-wide along with analyzing the BMI results. A comparison of home-school children with public school children in Arkansas may uncover additional strategies for improving nutrition knowledge in children, choices made in the home regarding nutrition and activity, and BMI results in children. Another valuable study would be to determine if participation in service learning projects enhances nutrition majors' placement in dietetic internships.

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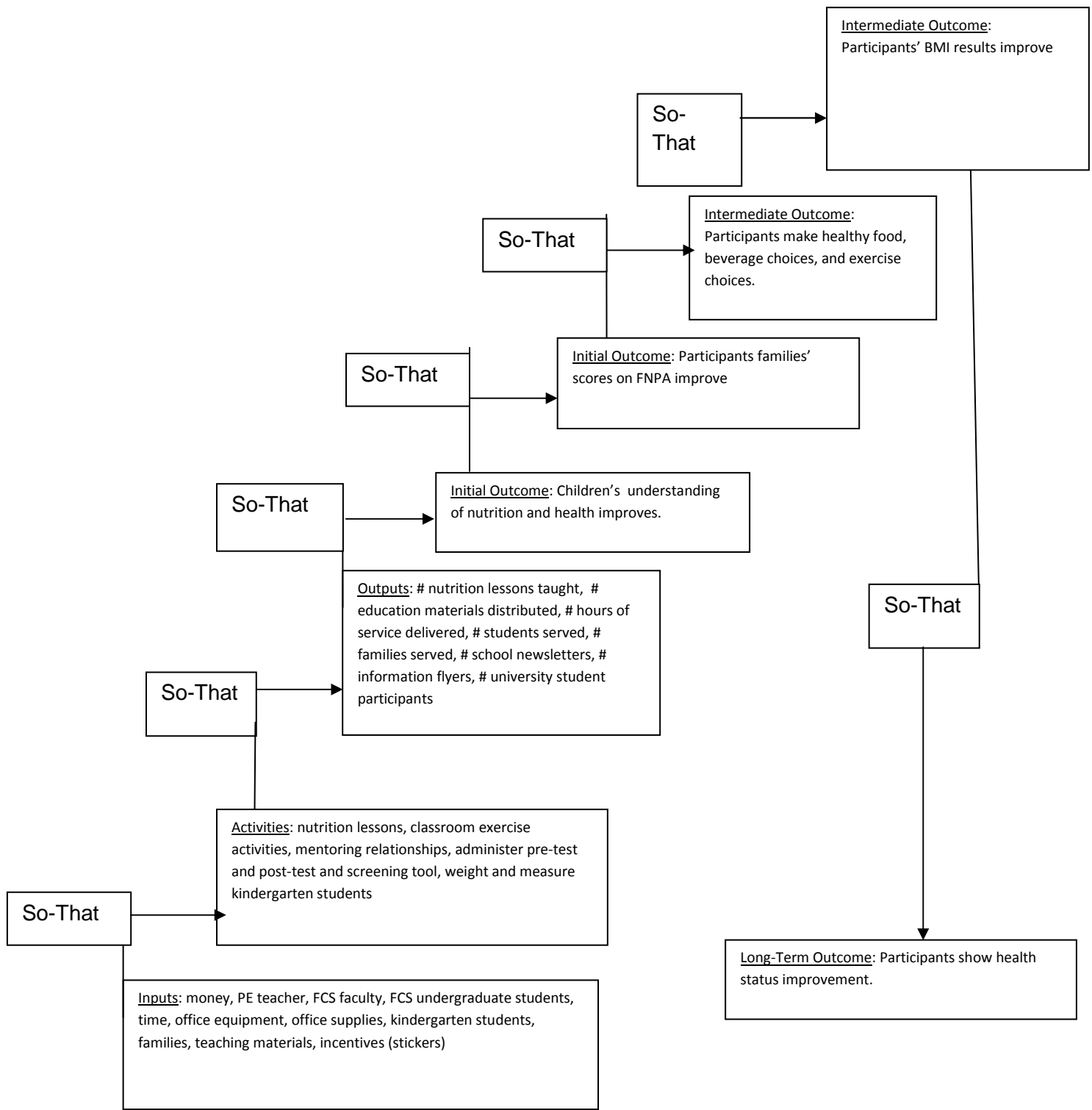
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Appendix A: So-That Chain and Logic Model (United Way of America, 1996).





Inputs	Activities	Outputs	Outcomes		
			Initial	Intermediate	Longer-term
<ul style="list-style-type: none"> • Money • PE teacher • FCS faculty • FCS undergraduate students • Office equipment (paper, copier, etc) • Office supplies • Kindergarten students • Families (of kindergarten students) • Teaching materials • Incentives 	<ul style="list-style-type: none"> • Nutrition lessons • Exercise activities • Create mentoring relationship • Pre-test • Post-test • Weigh and measure kindergarten students 	<ul style="list-style-type: none"> • # nutrition / health lessons taught • # education materials distributed • # hours of service delivered • # students served • # families served • # school newsletters distributed • # information flyers distributed • # university student participants 	<ul style="list-style-type: none"> • Children's understanding of nutrition improves • Parent's understanding of healthy home environment improves 	<ul style="list-style-type: none"> • Participants make healthy food, beverage, and exercise choices. • Participants' BMI results improve 	<ul style="list-style-type: none"> • Participants show health status improvement.

Logic Model

Appendix B: Instruments

Children's Pre-Test / Post-Test

Circle your answer.

1.  makes  strong.

a. Yes

b. No

2.  is good for me.

a. Yes

b. No

3. I should eat a green  vegetable every day.

a. Yes

b. No

4. I should eat  every day.

a. Yes


b. No

5. Fried foods  are good for me.

a. Yes

b. No




6.  is the best choice when I am thirsty.

a. Yes

b. No




7.  is a good choice when I am thirsty.

a. Yes

b. No




8.  is good for me.

a. Yes

b. No



9.  is good for me.

a. Yes

b. No

10. I like my doctor.



a. Yes

b. No

FNPA Screening Tool

In a typical week...	Yes	No
1. Does your family eat dinner while watching television?	<input type="radio"/>	<input type="radio"/>
2. Do you use food as a reward for good behavior?	<input type="radio"/>	<input type="radio"/>
3. Do you restrict how much your child eats potato chips, cookies, and candy?	<input type="radio"/>	<input type="radio"/>
4. Do you have a routine or schedule for bedtime for your child?	<input type="radio"/>	<input type="radio"/>

In a typical week...	<8	8-9	9-10	>10
5. How many hours of sleep does your child usually get each night?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In a typical week...	<7	7-14	14+
6. How many hours of television does your child watch?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. How many hours does your child spend on the computer or video games?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In a typical week...	Yes	No
8. Does your child have a television in his or her bedroom?	<input type="radio"/>	<input type="radio"/>
9. Do you monitor the amount of television your child watches?	<input type="radio"/>	<input type="radio"/>

In a typical week...	Almost Never	Sometimes	Often	Almost Always
10. How often does your child eat breakfast?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. How often does your family eat at least one meal together each day?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. How often does your family eat fast food during the week?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. How often does your family eat fruits and/or vegetables with your main meal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. How often do you use prepackaged foods (like frozen pizza) for your main meal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. How often does your family freshly prepare food (like chicken, pasta) for your main meal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. How often does your family drink soda pop or Kool-Aid at snacks and meals?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. How often does your family drink 100% fruit juice or low fat milk at snacks and meals?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. How often do you participate in at least 30 minutes of physical activity per day?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. How often does your family play games outside, ride bikes, or walk together?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. How often does your child participate in physical activity during their free time?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In the past year...	Number of Organized Activities			
	0-1	1-2	3-4	5+
21. Has your child participated in organized sports with a coach or leader (e.g. soccer) or in organized group activities involving physical activity (e.g. swim lessons)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Parent Survey

Parents: It is very important to the teachers and staff of FMI that parents have a chance to tell how they feel about what we teach at school. Below are some statements to help us obtain information concerning the nutrition and health curriculum taught in Kindergarten. Please answer exactly the way you feel. Do not put your name on this paper or on the return envelope. Thank-you for completing the survey. Please return the survey by Friday in the envelope provided.

Read each statement listed below and check the box that comes closest to your feelings.

	Definitely Yes	Generally Yes	Generally No	Definitely No
1. I have read and used the Fit Families Curriculum my child brought home.				
2. My child talks about healthy foods at home.				
3. My child talks about exercise at home.				
4. The nutrition materials sent home support what I teach my child at home.				
5. The exercise materials sent home support what I teach my child at home				
6. My child sees a pediatrician at least once a year.				
7. My overall feeling of the FMI Fit Families Curriculum is positive.				

The following materials were most helpful to my family:

Please write any additional comments you would like the teachers and staff to know:

Appendix C: Body Mass Index Data for Conway Public Elementary Schools, 2006-2007

Elementary School	% Overweight or Obese (2006-2007)	% Overweight or Obese (2007-2008)	% Overweight or Obese (2008-2009)
Ellen Smith	31.44%	32.76%	33.34%
Florence Mattison International	40.06%	35.37%	36.32%
Ida Burns	30.56%	29.32%	36.41%
Julia Lee Moore	31.71%	33.05%	29.21%
Jim Stone	29.16%	24.56%	27.39%
Marguerite Vann	30.84%	37.90%	33.47%
Sallie Cone	30.03%	39.58%	46.89%
Theodore Jones	30.16%	29.77%	22.93%
Woodrow Cummins	NA	NA	22.28%

(ACHI, 2009, 2008, 2007)

School	% Students eligible for free and reduced meals	Languages Spoken at Home	Total Enrollment	# Kinder-gardeners	Asian / Pacific Islander	Black	Hispanic	Indian (Native American)	White	Males	Females
Ellen Smith	23%	English—411 Spanish—42 Punjabi—2 Vietnamese—2 Bengali—1 Gujarati—1 Japanese—1 Marathi—1	461	90	13	50	55	1	342	221	240
Ida Burns	62%	English—359 Spanish—19 Cantonese—1 Chinese—1	380	80	5	122	35	0	218	203	177
Julia Lee Moore	25%	English—232 Spanish—5 French—1	329	66	1	49	12	0	267	181	148
Sallie Cone	79%	English—315 Spanish—27	342	63	2	165	34	2	139	157	185
Florence Mattison	69%	English—414 Spanish—21	435	100	3	153	31	2	246	231	204
Marguerite Vann	49%	English—425 Spanish—14 Chinese—2 Japanese—1	442	94	7	118	18	1	298	233	209

School	% Students eligible for free and reduced meals	Languages Spoken at Home	Total Enrollment	# Kinder-gardeners	Asian / Pacific Islander	Black	Hispanic	Indian (Native American)	White	Males	Females
Jim Stone	22%	English—413 Spanish—8 Burmese—2 Chinese—2 Gujarati—1 Japanese—1	427	76	18	60	14	3	332	214	213
Theodore Jones	67%	English—434 Spanish—28 Taiwanese—1	463	105	4	179	39	2	239	244	219
Woodrow Cummins	33%	English—382 Spanish—21 Mandarin—1 Russian—1 Vietnamese—1	406	100	9	57	31	2	307	222	184

(Conway School District, Statistical Data for 2009-2010 School Year, October 1, 2009)

Appendix E: Healthy People 2010 Target Goals

1. A reduction to 5% of children and adolescents who are overweight or obese,
 2. An increase to 35% of adolescents who engage in moderate physical activity for at least 30 minutes on 5 or more of the previous 7 days,
 3. An increase to 25% of middle and junior high schools that require daily physical activity for all students,
 4. An increase to 50% increase in trips made by walking and
 5. An increase to 5% increase in trips made by bicycling (or other “child-powered” wheeled vehicle) by children and adolescents aged 5 to 15 years
- (Healthy People 2010 Online Documents).

Appendix F: Summary of Healthy People 2010 Child Related Objectives

Objective	1988-94 Baseline Percentages	2010 Target Percentages
Children and adolescents aged 6 to 19 who are overweight or obese	11	5
Adolescents who engage in moderate physical activity for at least 30 minutes on 5 or more of the previous 7 days	27	35
Middle and junior high schools that require daily physical activity for all students	17	25
Increase in trips to school of one mile or less made by walking by children and adolescents aged 5 to 15 years*	31	50
Increase in trips to school of two miles or less made by bicycling by children and adolescents aged 5 to 15 years*	2.4	5

(Healthy People 2010 Online Documents).

*Note: crosswalks with flashing lights during school hours and bicycle racks are available at all Conway elementary schools for safety

Appendix G: Examples of Activity and Nutrition Education Programs

State	Name of program	Location	Documented Outcomes	Website or Author(s)
Arkansas	Kids for Health	Northwest Arkansas	Yes	www.kidsforhealth.com/cover.htm
Georgia	YMCA of Metropolitan Atlanta	Atlanta, GA	NA	www.ymcaatlanta.org
Hawaii	Fun 5 to the Rescue	Statewide	Yes	www.hmsa.com/community/programs/fun5/
Kansas	Power Panther	Statewide	Yes	www.powerpanther.org/
Kentucky	Fitness Rocks	Covington, KY	NA	www.covingtonky.com/
Massachusetts	Jump Up & Go!	Statewide	Yes	www.alpha.confex.com/alpha/133am/techprogram/paper_112471.htm
Nebraska	ARF (All Recreation on Fridays)	Statewide	NA	www.esu3.org/ectc/whatsup/05-06/wufall05/health_art.htm
New Mexico	Just Be It! Healthy and Fit	Rio Arriba and Los Alamos counties, 5 th grades	Yes	www.nmcyfar.org/over.html
North Dakota	Healthy Living is CATCHy	8 elementary schools	Yes	www.ndmedicine.org/summer2006/CATCH.cfm
Tennessee	Fit Kids	Johnson City elementary schools	Yes	www.etsu.edu/coe/klss/fitkids.jsp
Texas	Jump Into Action	Webb County, TX (TX-Mexico border)	Yes	ERIC Document Service No. EJ574524 Holcomb, Lira, Kingery, Smith, Lane, & Goodway

Appendix H: Lesson Plans

Teaching Plan: Seeing the Doctor to Be Healthy**Audience:** TBA**Course and Unit:** TBA**Class and Time:** TBA**Day and Date:** TBA**A. Major concept(s) from unit plan:**

- Doctors are not scary
- Doctors help us stay healthy
- Exercise helps us stay healthy

B. Terminal objectives: Following the lesson the student will be able to

- State their level of comfort with seeing the doctor
- Identify the role of doctors in health
- Identify the role of exercise in health

C. Establishing set:

- Use “Human Body Practice Pad” to name the body parts

D. Lesson Body

Enabling Objectives	Content Notes	Learning Experiences
1. Students identify basic body parts (cognitive)	“My Doctor, My Friend”	Anatomy Apron and Effect of Exercise on your Heart Rate
2. Students identify nutrition and exercise as important to health (cognitive)	“My Doctor, My Friend”	Anatomy Apron and Effect of Exercise on your Heart Rate
3. Students indicate a positive feeling about going to the doctor, eating healthy, and exercise (affective)	“My Doctor, My Friend”	Anatomy Apron and Effect of Exercise on your Heart Rate
4. Students demonstrate where each body part is located (psychomotor)	“My Doctor, My Friend”	Anatomy Apron and Effect of Exercise on your Heart Rate

E. Summary / Closure:

Review material by asking children to identify body parts and tell how good nutrition and exercise keeps their bodies healthy. Ask if they now can be a good example to others at home and at school.

F. Generalization:

Practicing good nutrition, exercise, and seeing the doctor regularly helps keep us healthy.

G. Teaching Materials:

- *My Doctor, My Friend* by P. K. Hallinan
- Human Body Parts practice pad
- Anatomy Apron
- Exercise spinner
- Take-homes handouts: Local Resources for Primary Care, FNPA fact sheet
- Reward stickers

H. Evaluation:

- Student Pre-Test and Post-Test Questions 8-10
- Parent Pre-FNPA and Post-FNPA Screening Tool

Teaching Plan: My Pyramid

Audience: TBA

Course and Unit: TBA

Class and Time: TBA

Day and Date: TBA

D. Major concept(s) from unit plan:

- My Pyramid food groups

E. Terminal objective: Following the lesson the student will be able to

- Identify the need to eat a variety of foods each day.

F. Establishing set:

- Show pictures of various foods and have children identify the correct food group

D. Lesson Body

Enabling Objectives	Content Notes	Learning Experiences
5. Students identify healthy foods in each pyramid food group (cognitive)	"Showdown at the Food Pyramid"	Healthy Foods Game
6. Students verbalize the need to eat a variety of foods each day in order to get a variety of nutrients (cognitive)	"Showdown at the Food Pyramid"	Healthy Foods Game
7. Students indicate a positive feeling about all food groups (affective)	"Showdown at the Food Pyramid"	Healthy Foods Game
8. Students demonstrate a meal with nutrient variety (psychomotor)	"Showdown at the Food Pyramid"	Healthy Foods Game

E. Summary / Closure:

Review material by asking children to identify foods in each pyramid food group and nutrients in those groups. Ask if they now wish to eat a variety of foods each day.

F. Generalization:

Eating a variety of foods helps people be healthy.

G. Teaching Materials:

- *Showdown at the Food Pyramid* by Rex Barron
- Healthy Foods magnetic game
- Reward stickers
- Take home: Little Portions for Little People; Iron, Calcium, and Zinc Needs in Children; Eat This, Not That for Kids

H. Evaluation:

- Student Pre-Test and Post-Test questions 1-5
- Parent Pre-FNPA and Post-FNPA Screening Tool 12-17

Teaching Plan: Calcium

Audience: TBA

Course and Unit: TBA

Class and Time: TBA

Day and Date: TBA

G. Major concept(s) from unit plan:

- Calcium food sources
- Food sources of calcium

H. Terminal objectives: Following the lesson the student will be able to

- State the role of calcium in our bodies
- Identify food sources of calcium.

I. Establishing set:

- Show pictures of calcium containing foods and let children vote on their favorites

D. Lesson Body

Enabling Objectives	Content Notes	Learning Experiences
9. Students name 3 food sources of calcium (cognitive)	Carlos and Clarice Mooove to Lowfat Milk!	Experiment: Extracting calcium out of bones and Milk Jug Game
10. Students identify 2 roles of calcium in the body (cognitive)	Carlos and Clarice Mooove to Lowfat Milk!	Experiment: Extracting calcium out of bones and Milk Jug Game
11. Students indicate a positive feeling about eating calcium-rich foods (affective)	Carlos and Clarice Mooove to Lowfat Milk!	Experiment: Extracting calcium out of bones and Milk Jug Game
12. Students demonstrate the importance of calcium in bones thru experiment and game (psychomotor)	Carlos and Clarice Mooove to Lowfat Milk!	Experiment: Extracting calcium out of bones and Milk Jug Game

- a. Show children the chicken bones and talk about the importance of calcium in developing strong bones. Emphasize that a low calcium intake will lead to weakened bones.

- b. Show the cover of the book, "What do you think this book is about?"
- c. "This is a story about milk. Who knows where milk comes from? Yes, a cow. Today we are going to read a story about milk and which type of milk to buy at the store."
- d. Read the book, *Carlos and Clarice Mooove to Lowfat Milk!* Encourage the children to participate in the activities in the book, as appropriate.
- e. Finish the story and go back to the first page. Encourage the children to find the hidden milk jugs.
- f. "What type of milk did Carlos say to drink? That's right, 1% milk. 1% milk keeps our heart healthy and is good for our bones and teeth." Show the children a picture of a 1% milk jug and a whole milk jug.
- g. "Which jug is the 1% milk? Which jug is the whole milk? Which milk is best for us to drink?"
- h. Play Hide the 1% Milk Jug Game. Show the children the pictures of the 1% lowfat milk jug and the whole milk jug. Ask the children which picture has the "1" on it. Ask them which milk their mom's should buy at the store. Then tell the children that you are going to hide the milk cartons under the pictures of Carlos (use the floor or table). Ask them to shut their eyes. Let the children take turns lifting up Carlos and looking for the milk with the "1" on it. Reinforce to them that they want to buy the milk with a "1" on it at the store.
- i. Revisit the bones and remind them to drink lowfat milk (or other calcium source) everyday so they will have strong bones.

E. Summary / Closure:

Review material by asking children to identify that calcium builds strong bones and is found in lowfat milk, yogurt, and cheese. Have the children practice asking their parents / caregivers to make lowfat milk their mealtime beverage.

F. Generalization:

Eating calcium-rich foods help people be healthy.

G. Teaching Materials:

- *Carlos and Clarice Mooove to Lowfat Milk!*
- Magic School Bus calcium experiment
- Calcium food pictures
- Milk Jug Game
- Take-home handout: Calcium for Your Kids
- Reward stickers

H. Evaluation:

- Student Pre-test and Post-test questions 1 and 2
- Parent Pre-FNPA and Post-FNPA Screening Tool

Teaching Plan: Fruits and Vegetables

Audience: TBA

Course and Unit: TBA

Class and Time: TBA

Day and Date: TBA

J. Major concept(s) from unit plan:

- Fruit and Vegetable food groups
- Nutrients in fruits and vegetables

K. Terminal objectives: Following the lesson the student will be able to

- State the influence of healthy fruits and vegetables on their personal health
- Exercise their influence on purchasing and consumption behaviors in their homes by asking for and eating healthy fruits and vegetables

L. Establishing set:

- Show pictures of various fruits and vegetables for children to name and vote on their favorite

D. Lesson Body

Enabling Objectives	Content Notes	Learning Experiences
13. Students name 3 fruits and vegetables (cognitive)	"The Fish Who Wished He Could Eat Fruit"	Fruits and Vegetables Color Bingo
14. Students identify 2 nutrients found in fruits and vegetables (cognitive)	"The Fish Who Wished He Could Eat Fruit"	Fruits and Vegetables Color Bingo
15. Students identify fresh fruits and vegetables as a fiber source (cognitive)	"The Fish Who Wished He Could Eat Fruit"	Fruits and Vegetables Color Bingo
16. Students indicate a positive feeling about eating fruits and vegetables (affective)	"The Fish Who Wished He Could Eat Fruit"	Fruits and Vegetables Color Bingo
17. Students demonstrate recognition of fruits and vegetables (psychomotor)	"The Fish Who Wished He Could Eat Fruit"	Fruits and Vegetables Color Bingo

E. Summary / Closure:

Review material by asking children to identify fruits and vegetables and which are the children's favorites. Ask if they now wish to try new fruits and vegetables to be healthy. Have the children practice asking their parents / caregivers for fruits and vegetables.

F. Generalization:

Eating healthy fruits and vegetables help people be healthy.

G. Teaching Materials:

- *The Fish Who Wished He Could Eat Fruit* by Kathleen Stefancin, MS, RD
- Fruit and Veggie Color Bingo Game
- Fruit and Vegetable Pictures
- Take-home handout: Feeding Your Family on a Budget
- Reward stickers

H. Evaluation:

- Student Pre-test and Post-test questions 3 and 4
- Parent Pre-FNPA and Post-FNPA screening tool items 13 and 17

NUTR 4374: Nutrition Education Lesson Delivery Rubric

Name: _____ Total score: _____ out of 70 = _____ %.

Rating Standards:

Excellent—Could not be improved upon. (5)

Commendable—Only slight room for improvement. (4)

Good—Average. (3)

Fair—OK, but considerable room for improvement. (2)

Poor—Only marginally acceptable. (1)

NA—Unacceptable. (0)

Checklist:	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)	Unacceptable (0)	Comments
Story Delivery (30)							
Gets on student's level on carpet							
Makes eye contact							
Shows pictures after reading each page							
Does not rush through story							
Allows some comments and questions							
Keeps on task							

Checklist:	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)	Unacceptable (0)	Comments
Activity (25)							
Explains game or activity on student's level							
Demonstrates how to do the game or activity							
Allows for questions before starting							
Divides students into even groups							
Provides materials and assists students							
Recap (15)							
Reviews learning objectives							
Provides coloring sheet for student to share with parents							
Gathers materials and leaves classroom neat							

Appendix J: Parent Materials

Drink Up: Healthy Choices for Healthy Kids

By age one, consumption of milk decreases. Unfortunately, beverage choices change to an increased consumption of soda, Kool-Aid and sweetened fruit juices. This contributes to cavities, vitamin and mineral deficiencies and loss of nutrient dense foods.

Excessive intake of soda, Kool-Aid and sweetened fruit juices causes:

- Loss of vitamin and mineral intake especially calcium and vitamin D
- Lowered nutrient intake
- Decreased appetite and carbohydrate malabsorption
- Diarrhea, cavities, overweight and obesity

How can families improve these trends?

- Avoid soda, Kool-Aid and sweetened juices at snacks and meals
- Choose only 100% fruit juices and limit to 6 oz. or less per day. It may also be beneficial to dilute juice by adding water to small amount of juice instead of full strength juices.
- Choose 1% or 2% milk at every meal



Beber: Opciones sanas para niños sanos

Para la edad de un año, el consumo de leche disminuye. Lamentablemente, las opciones de bebidas cambian a un aumento del consumo de soda, Kool-Aid y jugo de frutas endulzadas. Esto contribuye a cavidades, deficiencias de vitaminas y minerales y la pérdida de alimentos con gran densidad de nutrientes.

Consumo excesivo de bebidas gaseosas, Kool-Aid y jugos frutas endulzadas causan:

- Pérdida de consumo de vitaminas y minerales especialmente calcio y vitamina D
- Bajado consumo de nutrientes
- Disminución del apetito y mal absorción de carbohidratos
- Diarrea, cavidades, sobrepeso y obesidad

¿Cómo pueden familias mejorar estas tendencias?

- Evitar las Sodas, Kool-Aid y jugos de frutas endulzadas en meriendas y comidas
- Elija sólo 100 % de los jugos de frutas y un límite de 6 onzas o menos al día. También puede ser beneficioso diluir el jugo mediante la adición de agua a pequeña cantidad de jugo en lugar de jugo entero.
- Elija leche en cada comida de 1% o 2 % de grasa.





Healthy Weight for Healthy Kids

Children typically grow three inches and gain five and a half pounds each year between the ages of two and ten. Regular monitoring of growth helps parents and physicians identify health problems early and provide education or intervention as needed.

The following measurements should be taken at least once a year:

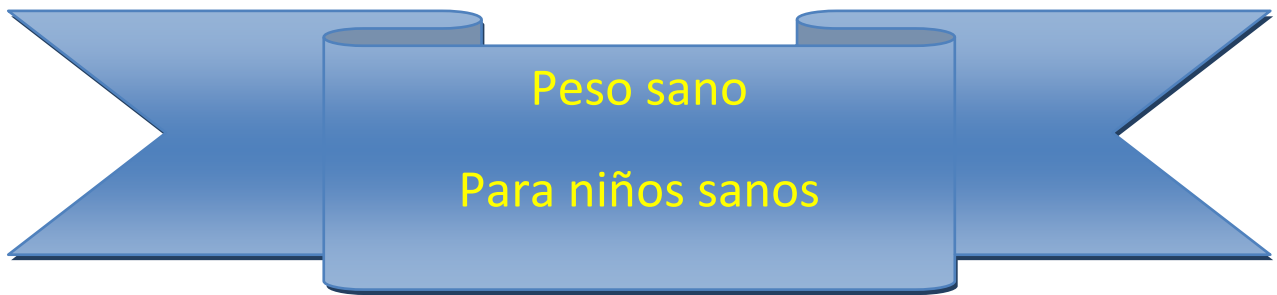
- Height
- Weight
- Body Mass Index (BMI)

What does Body Mass Index mean?

- Body mass index is a formula that correlates with body fat. It is used to identify children and adults who may develop health problems from being too heavy for their height
- It is calculated with this formula: weight in pounds divided by height in inches squared multiplied by 703 (pounds / inches / inches X 703)
- A body mass index of 18.5-24.9 has the lowest correlation with weight related health problems

Things to keep in mind when using body mass index:

- Persons who are very muscular will have a higher body mass index because muscle weighs more than fat
- Body mass index is just one screening tool and should not be used to diagnose a medical condition
- Having a high or low body mass index means you should ask a physician or dietitian for more information



Normalmente niños crecen tres pulgadas y ganan cinco y media libras cada año entre las edades de dos y diez años. Supervisión periódica del crecimiento, ayuda a los padres y los médicos a identificar problemas de salud temprano y proporcionan educación o intervención según sea necesario.

Las próximas mediciones se deberán tomar al menos una vez al año:

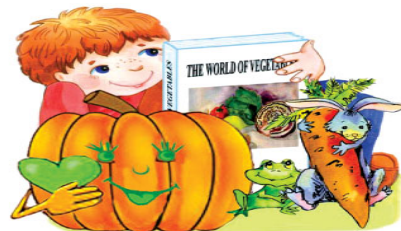
- Altura
- Peso
- Índice de masa corporal (IMC)

Lo que significa el índice de masa corporal?

- Índice de masa corporal es una fórmula que está relacionada con la grasa del cuerpo. Se utiliza para identificar niños y adultos que pueden desarrollar problemas de salud por ser demasiado pesados para su altura
- Se calcula con la siguiente fórmula: peso en libras dividido por la estatura en pulgadas al cuadrado multiplicado por 703 (libras / cm / cm X 703)
- Un índice de masa corporal de 18.5-24.9 tiene la más baja correlación con el peso relacionados con problemas de salud

Cosas a tener en cuenta al utilizar el índice de masa corporal:

- Personas que son muy musculosas tendrá un mayor índice de masa corporal porque los músculos pesan más que la grasa
- El índice de masa del cuerpo es sólo una herramienta de análisis y no debe utilizarse para diagnosticar un condición médica
- Tener un índice de masa corporal alto o bajo significa que debe preguntar a un médico o dietista para obtener más información



Eating Routines

Research has shown that families who make healthy choices in the following five eating routines have a better nutrient intake and healthier weight status compared to families who make unhealthy choices in these eating routines.

Do not use food as a reward:

- It contributes to poor health and poor eating habits.
- Instead—play a favorite game or puzzle, fun physical activity, dance to favorite music

Healthy foods available at home:

- Having family meals encourages kids to eat more fruits, vegetables, and grains
- Get kids involved in meal preparation
- Serve a variety of healthy foods and snacks, which includes lean meats, beans, whole – grains, low fat or nonfat dairy products, fruits and vegetables
- Limit access to sugary drinks and “junk” foods in the home

Benefits of daily breakfast:

- Good performance in school
- Proper growth and development
- Improved nutritional status

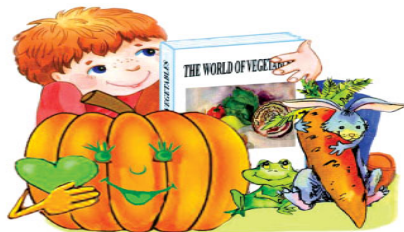
Need for fruits and vegetables with main meal:

- Most children in the United States do not consume adequate amounts of fruits and vegetables.
- Including these foods at the main family meal improves the nutrient status of the whole family.

Fresh foods in main meal:

- Families who prepare fresh food for the main meal enjoy a higher nutrient intake
- These families also report less health problems than families who use prepackaged meals

Rutinas de comidas



Investigaciones han demostrado que las familias que toman decisiones saludables en las cinco siguientes rutinas de comer tienen un mejor consumo de nutrientes y más saludable estado de peso en comparación con las familias que hacen opciones no sanas en estas rutinas de comer.

No utilice alimentos como una recompensa:

- Contribuye a la mala salud y hábitos alimenticios.
- En lugar: juegue un juego favorito o un rompecabezas, diviértase con actividad física, baile su música favorita

Alimentos saludables disponibles en casa:

- Tener las comidas en familia incentiva a los niños a comer más frutas, vegetales y granos
- Involucre a los niños en la preparación de la comida
- Sirva una variedad de alimentos saludables y meriendas, que incluya carnes magras, frijoles, granos enteros, productos lácteos bajos en grasas o sin grasa, frutas y verduras
- Limitar el acceso a bebidas azucaradas y alimentos "basura" en el hogar

Beneficios de desayuno diario:

- Buen rendimiento en la escuela
- Adecuado crecimiento y desarrollo
- Mejorar el estado nutricional

Necesidad de frutas y verduras con la comida principal:

- La gran mayoría de los niños en los Estados Unidos no consumen cantidades adecuadas de frutas y verduras.
- Incluyendo estos alimentos en las comidas principales familiar se mejora el estado nutricional de toda la familia.

Productos frescos en la comida principal:

- Familias que preparan alimentos frescos para la comida principal disfrutan de un mayor consumo de nutrientes
- Estas familias también informaron menos problemas de salud que las familias que utilizan las comidas pre hechas.

Feeding Your Family on a Budget

Want to save money on groceries and feed your family well?

Try the following tips:

- Eat legumes (like kidney beans, pinto beans, navy beans, lima beans) instead of meat or chicken. If you eat whole grains like whole wheat bread or oatmeal in your diet along with beans, you get the same amino acids that are found in meat or chicken.
- Eat peanut butter instead of lunch meat. Peanuts are legumes like beans, so they are high in protein. Combine peanut butter with whole grains and you get the same amino acids found in meat or chicken.
- Eat canned tuna in water. It's a good source of protein.



- Eat pretzels instead of chips. They usually cost less and have less fat.

- Pop your own popcorn on the stove. A bag of popping corn costs less than microwave popcorn.



- Visit the Farmer's Market. The prices may be lower than the grocery store and the fruits and vegetables will be fresher.
- Check the price on powdered milk. It may be less than a gallon of milk. Mix up 1 glass at a time. The powder doesn't need to be refrigerated.
- Buy the store-brand instead of the name-brand. For example, the Kroger brand cereal usually costs less than the Kellogg's cereal.

Happy Shopping!





Alimentar a su familia con un presupuesto

¿Desea ahorrar dinero en comestibles y alimentar a su familia con un presupuesto?

Pruebe las siguientes sugerencias:

- Coma legumbres (como frijoles, frijoles pintos, frijoles negros, habas) en lugar de carne o pollo. Si usted come granos enteros como pan de trigo integral o avena en su dieta junto con frijoles, obtendrá los mismos aminoácidos que se encuentran en la carne o pollo.
- Comer mantequilla de maní en lugar de comer carne. Maní son legumbres como los frijoles, por lo que son ricos en proteínas. Combinar la mantequilla de maní con granos integrales y obtendrá los mismos aminoácidos que se encuentra en la carne o pollo.
- Coma atún enlatados en agua. Es una buena fuente de proteínas.
- Coma pretzels en lugar de chips. Que generalmente cuestan menos y tienen menos grasa.
- Pop su propio palomitas de maíz en la estufa. Una bolsa de palomitas de maíz de estallar cuesta menos que palomitas de maíz de microondas.
- Visita el mercado de los agricultores. Los precios pueden ser inferiores a la tienda de comestibles y la frutas y verduras serán más frescos.
- Verifique el precio de la leche en polvo. Puede ser menos que un galón de leche. Mezclar 1 vaso en el momento. El polvo no se necesita refrigerar.
- Comprar la marca de la tienda en lugar de la marca de nombre. Por ejemplo, los cereales marca Kroger generalmente cuestan menos que cereales de Kellogg.

TABLE TIME: HEALTHY TABLES, HEALTHY FAMILIES



Trends show that families eating together are becoming less common. Busy schedules lead to eating away from home and consumption of unhealthy foods. On average children watch 23 hours of T.V. per week. Unfortunately in recent years, consumption of dairy, fruits and vegetables have decreased, while soda and sweets intake has increased in children. Small steps can be taken to improve eating and meal patterns to make a big difference for the well being of children as well as adults. What to do?

Eating at least one meal together each day results in:

- Increased intake of fruits and vegetables
- Decreased intake of soda and fried foods

Eating dinner without watching T.V. will:

- Provide quality family time
- Avoid candy, sweets, and soft drink advertisements aimed at children
- Decrease over-consumption of foods

Food preparation: home versus fast food:

- Home cooked and prepared meals are more likely to increase fruit, vegetable and vitamin consumption. Cooking methods can be changed and monitored. Sweets and empty calories can be avoided, and cost per serving is less.
- Fast food options are loaded with saturated fat, sodium, and empty calories. Most contain few vitamins. Although eating occasionally is inexpensive, even moderate consumption can become costly.

TIEMPO PARA COMER: MESA SANA, FAMILIA SANA

Tendencias muestran que familias que comen juntos se están convirtiendo en menos común. Horario de trabajos ocupados conducen a comer lejos del hogar y al consumo de alimentos poco saludables. En promedio niños ven 23 horas de T.V. por semana. Por desgracia en los últimos años, consumo de productos lácteos, de frutas y vegetales disminuyeron, mientras que ha aumentado el consumo de bebidas gaseosas y dulces en los niños. Pequeños pasos pueden tomarse para mejorar los patrones de comer y patrones de comida para hacer una gran diferencia para el bienestar de los niños, así como adultos. ¿Que podemos hacer?

Comer al menos una comida juntos cada día resulta en:

- Aumento de consumo de frutas y verduras
- Disminución de consumo de bebidas gaseosas y alimentos fritos

Comer cena sin ver la T.V. puede:

- Proporcionar calidad de tiempo de familia
- Evitar anuncios de dulces, golosinas y bebidas destinadas a los niños
- Disminución de consumo excesivo de alimentos

La preparación de alimentos: preparados en casa frente a la comida rápida:

- Comidas preparadas y cocidas en casa tienen más probabilidades de aumentar las frutas, vegetales y consumo de vitamina. Métodos de cocinar pueden ser cambiados y monitoreados. Dulces y calorías vacías pueden evitarse y el costo por porción es menor.
- Opciones de alimentos rápidos se cargan con grasa saturada, sodio y calorías vacías. La mayoría tienen pocas vitaminas. Aunque ocasionalmente comer es barato, incluso el consumo moderado puede ser costoso.

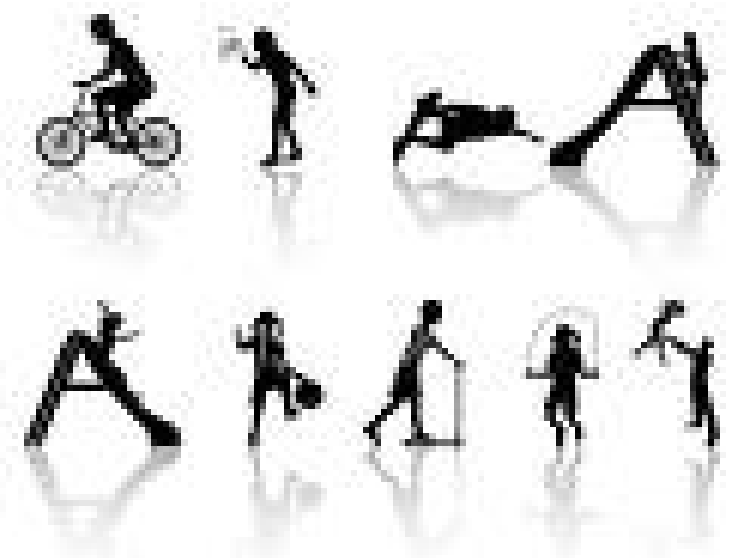
American Academy of Pediatrics (AAP) Recommendations

AAP Recommends less than 2 hours of TV per day for children

*Need for Electronic
FREE bedrooms
(NO TV, radio,
computer,
playstations, etc.)*

*Encourage child to
play actively during
his or her free time.*

*Encourage child to
participate in
organized sports or
FMI Running Club
on Mondays and
Thursdays*



- Monitor the amount of screen time children are allowed.
- Adopt “No TV Tuesday” as a family.
- Parents should participate in at least 30 minutes of physical activity per day as an example for their children.
- Family play time (games outside, ride bikes, walk together, etc.) each day, weather permitting.

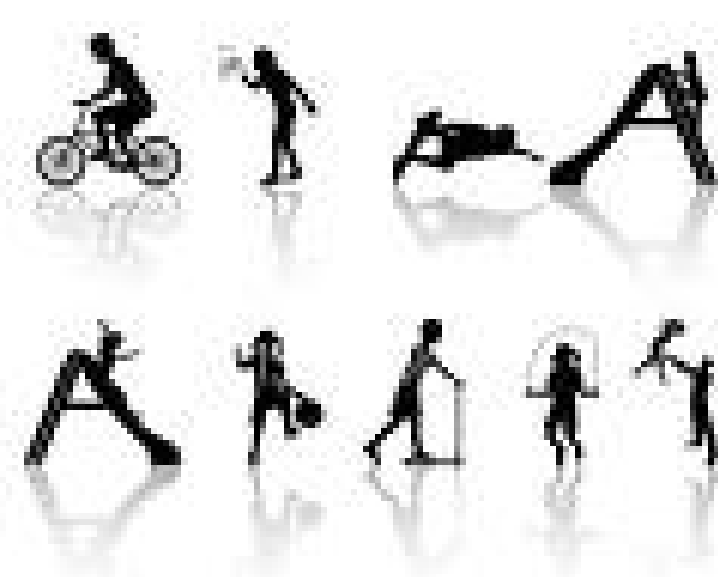
Recomendaciones de la Academia de Pediatría Americana (AAP)

AAP recomienda menos de 2 horas de TV por día para los niños

Necesidad de dormitorios sin electrónico (NO TV, radio, equipo, playstations, etc.)

Fomentar los niños jugar activamente durante su tiempo libre.

Fomentar los niños a participar en deportes organizados o Club de corredores FMI los lunes y Jueves



- Monitorear la cantidad de tiempo los niños están permitidos frente a las de pantallas.
- Adoptar "No TV los martes" toda la familia.
- Los padres deben participar al menos de 30 minutos de actividad física por día como un ejemplo para sus hijos.
- Juegos en familia (juegos fuera, montar bicicletas, caminar juntos, etc.). cada día, si el clima lo permite.

Sleepy Heads?

Children today are finding less time to sleep due to busy schedules with school, activities and sports. Television, computer time, and caffeine also contribute to decreased sleep in school age children. Inadequate sleep in children leads to mood or behavior changes, poor concentration, memory, and retention. Lack of sleep decreases motivation and performance. To prevent these complications, children need at least 10 hours of sleep per night.



To improve sleep quality in your child try the following remedies:

- Establish a daily bedtime routine in child's life
- No T.V. or computers in bedroom
- Prepare sleep inducing room: dark, quiet, and cool
- Avoid caffeinated beverages



Sleepy Head?

Dormilon

Los niños de hoy están encontrando menos tiempo para dormir debido a su horario en la escuela, actividades y deportes. Televisión, tiempo de computadora y la cafeína también contribuyen a la disminución de sueño en la edad escolar de los niños. Sueño insuficiente en los niños conduce a cambios en el estado de ánimo o comportamiento, pobre concentración, memoria y retención. Falta de sueño disminuye la motivación y el rendimiento. Para evitar estas complicaciones, los niños necesitan al menos 10 horas de sueño por noche.



Para mejorar la calidad de sueño en su hijo intente lo siguiente recursos:

- Establecer una rutina diaria a la hora de acostarse en la vida del niño
- No T.V. o computadora en el dormitorio
- Preparar la habitación para la inducción del sueño: oscura, tranquila y fría
- Evitar bebidas con cafeína



Appendix K: Tables

Table K1

Children's Pre and Post Test Scores Across Two Time Periods

Time period	Pre-Test Scores (treatment)			Post-Test Scores (control)		
	n	M	SD	n	M	SD
Pre-intervention	79	6.78	1.552	77	6.36	1.441
Post-intervention	79	8.01	1.532	77	6.56	1.446

Table K2

Parent's Family Nutrition and Physical Activity Screening Tool Scores Across Two Time Periods

Time period	FNPA Scores (treatment)			FNPA Scores (control)		
	n	M	SD	n	M	SD
Pre-intervention	75	23.49	2.440	74	23.95	2.674
Post-intervention	75	24.31	2.736	74	23.95	2.564

Table K3

Children's BMI Measurements Across Two Time Periods

Time period	BMI Results (treatment)			BMI Results (control)		
	n	M	SD	n	M	SD
Pre-intervention	79	16.80	2.38	77	16.24	2.27
Post-intervention	79	17.08	2.38	77	16.08	2.10

Time period	BMI Percentiles (treatment)					BMI Percentiles (control)			
	n	Underweight	Normal weight	Overweight	Obese	Underweight	Normal weight	Overweight	Obese
Pre-intervention	79	4%	63%	13%	20%	1%	70%	15%	14%
Post-intervention	79	0%	62%	23%	16%	1%	77%	12%	10%

Question	Undesirable Pretest Choices	Desirable Posttest Choices
1: Milk makes bones strong.	5	3 of 5 (60%)
2: Yogurt is good for me.	28	23 of 28 (82%)
3: I should eat a green vegetable every day.	17	8 of 17 (47%)
4: I should eat fruit every day.	8	6 of 8 (75%)
5: Fried foods are good for me.	61	27 of 61 (44%)
6: Water is the best choice when I am thirsty.	11	9 of 11 (82%)
7: Soda is a good choice when I am thirsty.	40	14 of 40 (35%)
8: TV is good for me.	54	14 of 54 (26%)
9: Riding a tricycle is good for me.	10	7 of 10 (70%)
10: My doctor is my friend.	12	6 of 12 (50)

Itemization of Knowledge Test Results

Table K5

FNPA Item	Number parents indicating behavior change
3. Decreased use of prepackaged foods and increased use of freshly prepared meals	10
3. Consumption of fruits and vegetables with meals	3
8. Family activity time together	3
6. Decrease in TV and video time	2
7. Removed TV from bedroom	1
1. Child eats breakfast on most days	1
1. Eating meals together as a family	1
7. Monitoring of TV and video time	1
2. Use of fast food	1
5. Snacks and candy not used as a reward for good behavior	

Table K6
Itemization of FNPA Choices