THE EFFECT OF A NUTRITION AND FITNESS PROGRAM ON THE
DIETARY HABITS, FITNESS LEVEL, AND HEALTH STATUS
OF UTE INDIAN YOUTH

ALISON K. LEMON

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OF UTE INDIAN YOUTH

by

Alison K. Lemon

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ABSTRACT

The Effect of a Nutrition and Fitness Program on the Dietary Habits, Fitness Level, and Health Status of Ute Indian Youth

by

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Utah State University, 1996

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Lifestyle changes from traditional diet and activities to modern diets high in fat and sugar, and sedentary habits have increased inherited health risk for diabetes and obesity among Native American youth. Nutrition education and physical activity programs have been recommended to help reduce health-risk factors. This study evaluated a summer nutrition education and fitness program for effectiveness in improving the dietary habits, nutrition knowledge, fitness level, and health status of American Indian children ages 9-14 living on or near the Uintah-Ouray Reservation in Uintah and Duchesne Counties of Eastern Utah.

A 6-week nutrition and fitness program was conducted through the Native American Diabetes Center in Ft. Duchesne, Utah for two consecutive years. The Cooperative Extension Service and Ute tribe also participated in program planning,
organization, and support. Lessons were based on the USDA Food Guide Pyramid and emphasized making healthy food choices. The program included lessons on energy balance and the relationship of nutrition and diabetes and heart disease. Food preparation activities reinforced the message for healthy food choices. Fitness activities encouraged healthy lifestyles.

Quantitative and qualitative evaluation of this nutrition education and fitness program demonstrated that such a program can improve nutrition knowledge and influence lifestyle habits. Analysis of diet histories indicated that vitamin and mineral intake was not the main concern for the study population, but rather excess calories and fat. Overall fitness did not improve during the program but there were individual improvements. No statistically significant impact on current health status was seen because of the relatively short duration of the program, but there is potential for long-term effects in both health and fitness. Evaluations reveal that both parents and children perceived improved nutrition knowledge and dietary habits. This program was successful in increasing awareness of healthy lifestyle choices. Some of these choices were implemented. Others were not adopted but may be at a later time. Nutrition education and fitness programs can influence knowledge and choices.
ACKNOWLEDGMENTS

Thanks to all of those who have been involved in the Food, Fun, and Fitness Program from proposal to planning to presentation and participation, including personnel from the Native American Diabetes Center in Ft. Duchesne; Cooperative Extension Service in Duchesne and Uintah Counties and at Utah State University; the Ute tribe; and especially the children who were the subjects of this research. I give special thanks to those who have encouraged and supported me through this time. I appreciate your confidence and patience.

Alison K. Lemon
V. CONCLUSIONS AND RECOMMENDATIONS .................................. 34

Conclusions .................................................................................. 33
Limitations ................................................................................... 33
Recommendations ........................................................................ 34

REFERENCES ................................................................................................................ 36

APPENDICES ................................................................................................................. 38

APPENDIX A. PROGRAM SCHEDULE ................................................................. 39
APPENDIX B. NUTRITION KNOWLEDGE ASSESSMENT ............................. 41
APPENDIX C. FITNESS ASSESSMENT STANDARDS ................................. 45
APPENDIX D. ANTHROPOMETRIC STANDARDS .................................. 49
APPENDIX E. FINAL EVALUATION FORMS AND RESPONSES .......... 51
<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal Hematocrit Values for Children</td>
</tr>
<tr>
<td>2</td>
<td>Analysis of Diet Histories According to the USDA Food Guide Pyramid</td>
</tr>
<tr>
<td>3</td>
<td>Calorie Totals and Distribution Among Macronutrients</td>
</tr>
<tr>
<td>4</td>
<td>Summary of INQ Values for Preprogram and Postprogram Diet Histories</td>
</tr>
<tr>
<td>5</td>
<td>Fitness Assessment Results for Program Participants</td>
</tr>
<tr>
<td>6</td>
<td>Anthropometric Data of Program Participants</td>
</tr>
<tr>
<td>7</td>
<td>Summary of Student Evaluations for Lessons and Activities</td>
</tr>
<tr>
<td>8</td>
<td>Fitness Standards for 9-Minute Run--Boys</td>
</tr>
<tr>
<td>9</td>
<td>Fitness Standards for 9-Minute Run--Girls</td>
</tr>
<tr>
<td>10</td>
<td>Fitness Standards for Sit-Ups--Boys</td>
</tr>
<tr>
<td>11</td>
<td>Fitness Standards for Sit-Ups--Girls</td>
</tr>
<tr>
<td>12</td>
<td>Fitness Standards for Sit and Reach--Boys</td>
</tr>
<tr>
<td>13</td>
<td>Fitness Standards for Sit and Reach--Girls</td>
</tr>
<tr>
<td>14</td>
<td>Mean Weight, Height, and Body Mass Index (BMI) for American Indian, NHANES II, and HHANES-MA Standards</td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

Many health problems common among Native Americans are related to nutrition and obesity. Risk factors vary among the different tribes, but all have been adversely affected by the high incidence of obesity (Welty, 1991). Three of the 10 leading causes of death among American Indians are related to nutrition. These are heart disease, cancer, and diabetes mellitus. Poor nutrition also contributes to the prevalence of obesity, hypertension, and dental caries (Jackson, 1986).

Behaviors that compromise health status or are health-risk factors among American Indian adults begin or are observed in adolescents (Blum, Harmon, Harris, Bergesen, & Resnick, 1992). A survey sample of American Indians was three times more likely to report health and social-risk factors compared to youth of other races. In this population, poor self-assessed health status was significantly correlated with nutritional inadequacy and social-risk factors of abuse, suicide attempts, substance abuse, and poor school performance (Blum et al., 1992).

Lifestyle choices contribute to health risk. Modern sedentary habits have replaced physical activity. Dietary habits have also changed. Historically, Ute Indian diets consisted of small and large animals, berries, and roots. Traditional diets have been replaced by diets higher in fat and sugar and low in fiber. These lifestyle changes have led to obesity and its associated health risks (Tom-Orme, 1988).
Although lifestyle choices greatly influence health risk, genetic predisposition to obesity and diabetes mellitus is an uncontrollable risk factor. It has been hypothesized that American Indians have a genetically "thrifty" metabolism that is more efficient in the utilization of nutrients. This results in obesity and non-insulin-dependent diabetes mellitus. Though beneficial during prolonged hunger, a "thrifty" metabolism is detrimental with an adequate food supply (Neel, 1962).

One of the health risks associated with obesity and overweight is non-insulin dependent diabetes mellitus (NIDDM). This disease is reaching epidemic proportions among many segments of the Native American population. The high prevalence of NIDDM is a concern. Complications such as end-stage renal disease, limb amputations, blindness, and others can result if this disease is not carefully controlled. Even though control is possible, prevention is preferred. Historical, ecological, and incidence data collected among the American Indians suggest that diabetes mellitus can be controlled by controlling obesity (Welty, 1991).

In 1986, the Indian Health Services identified reducing the prevalence of overweight as a priority objective. Another objective listed was increasing the proportion of American Indians able to identify dietary factors related to disease (Jackson, 1986). Those who have studied health care services available to Native Americans agree on the need for more nutrition education and physical activity programs. Such programs are particularly beneficial for the youth since prevention and early intervention may have a greater impact
on health than later weight reduction attempts (Broussard et al., 1991; Rhoades, Hammond, Welty, Handler, & Amler, 1987).

Problem

Can a summer nutrition education and fitness program be effective in improving the (a) nutrition knowledge, (b) dietary habits and nutrient intake, (c) fitness level, and (d) health status of Native American children ages 9-14 living on or near the Uintah-Ouray Reservation in Duchesne and Uintah counties of Eastern Utah?

Hypothesis

Involvement in a nutrition education and physical activity program will result in improved nutrition knowledge, dietary habits, fitness, and health status of Native American children.

Null Hypothesis

Involvement in a nutrition education and physical activity program will have no effect on the nutrition knowledge, dietary habits, fitness, and health status of Native American children.

Research Questions

This study questioned the effectiveness of a youth summer nutrition and fitness
program in:

1. improved nutrition knowledge

2. improved dietary habits

3. improved fitness level

4. improvement in the following indicators of health status:
   
   anthropometric measurements (body mass index)
   
   blood glucose reading
   
   iron status (hematocrit).
CHAPTER II
LITERATURE REVIEW

Health Problems

Obesity

Historical studies show that several generations ago obesity and non-insulin dependent diabetes mellitus (NIDDM) were rarely found among Native Americans (Rhoades et al., 1987; Welty, 1991). Historically, the leading causes of death were infectious diseases. Today, injuries, violence, alcoholism, and chronic diseases including NIDDM and cardiovascular disease are the major health concerns for Native Americans (Rhoades et al., 1987). Chronic diseases appeared with a reduction in infectious diseases and changes away from the traditional lifestyle. One major change is the now abundant supply of high-fat low-fiber foods. Formerly undernutrition was a main nutritional concern.

In the late 1960s hunger and malnutrition in America received much public attention. To combat the problem of hunger in America, the United States government implemented widespread public feeding programs. These programs included distribution of commodity foods from agricultural surplus to Native Americans. Many of these foods were high in fat and calories and low in fiber. The term "Comod Bod" was coined, linking the use of commodity foods with overweight (Welty, 1991). The problem of undernutrition has been largely replaced by obesity, a different form of malnutrition. The recent increase of obesity among American Indians has made them disproportionally susceptible to NIDDM,
hypertension, and cardiovascular disease (Rhoades et al., 1987). These diseases as well as some forms of cancer are associated with obesity in adults (Johnston, 1985; National Institutes of Health, 1985). Physical activity is generally decreased. The traditional lifestyle has been replaced by a sedentary lifestyle (Rhoades et al., 1987; Welty, 1991). These changes are not unique to Native Americans. It is a concern for all segments of the population.

Obesity is not completely environmentally caused. Heredity also plays a part. It has been hypothesized that Native Americans have a "thrifty" metabolism that allows for exceptionally efficient utilization of food. This is an advantage during times of famine but predisposes this population to obesity and diabetes when food is plentiful (Neel, 1962). Even though there is an inherited tendency toward obesity and diabetes, weight reduction can reverse some of the abnormal biochemical characteristics of this disease (National Institutes of Health, 1985).

There is a high prevalence of obesity among Native American youth. Among American Indian adolescents, 24.5% of males and 25% of females are overweight. Overweight is defined here as >85th percentile of the age and sex specific National Health and Nutrition Examination Study II (NHANES II) reference data. As implied by this definition this is a higher incidence than the NHANES II reference data. Obesity, defined as >95th percentile of the age- and sex-specific NHANES II reference data, was found in 11.1% of male and 7.3% of female adolescents. Obesity and overweight were also excessively high among school-age children when compared to NHANES II reference data.
(Broussard et al., 1991). The appropriateness of using the NHANES II reference data for the Native American population has been questioned because minority populations were undersampled in the survey. When Native American data were compared to the Hispanic population surveyed in the Hispanic Health and Nutrition Examination Survey (HHANES-MA), the overall prevalence of overweight decreased. Overweight was still significantly high (Jackson, 1993).

The main medical concern with childhood obesity is the probability that it will carry into adulthood. By age one year, a pattern is often established. Juvenile onset obesity is resistant to treatment, but many obese or overweight children have normal weight and body fat during adolescence and adulthood (Johnston, 1985). Under-age-50 mortality rates increase as weight increases. Mortality also increases with increased duration of obesity (National Institutes of Health, 1985). When considering childhood obesity and diabetes, hyperinsulinemia has been observed in obese children (Johnston, 1985). Low amounts of high-level physical activity have been correlated with childhood obesity (Walberg & Ward, 1983-85). With childhood obesity there is also a psychological risk. The stereotype of the obese as being weak or overindulgent can negatively affect a child (Johnston, 1985).

Differences between the prevalence of obesity in the minority and dominant populations are often caused by differences in socioeconomic status. Low socioeconomic status is associated with increased incidence of obesity regardless of race. Low socioeconomic status is also associated with less knowledge about health and less exposure to health education (Jeffery, 1991).
Diabetes

Non-insulin dependent diabetes mellitus (NIDDM) is reaching epidemic proportions among Native Americans. This high incidence of diabetes and the attending complications not only jeopardize quality and quantity of life, but it also represents a significant financial health-care burden as well. Fifteen percent of those accessing Indian Health Services (IHS) over age 45 are diabetic. In some southwest tribes, 50% of those age 45-64 are diabetic (Rhoades et al., 1987). Among the Ute Indians, 7.7% of all tribal members have been diagnosed with diabetes. This is four times the incidence of the white population living in the same area (Tom-Orme, 1988).

In 1983, diabetes mellitus was the second leading clinical impression for IHS outpatient visits of patients over age 15 (Gohdes, 1986; Rhoades et al., 1987). The Uintah-Ouray Reservation is included in the Phoenix area of IHS. In this area, 88% of lower extremity amputations and 54% of discharges for chronic renal failure are related to diabetes mellitus. Diabetes is also noted in 47% of hospitalizations for ischemic heart disease. These values are much higher than other areas of IHS (Gohdes).

Between 1955 and 1982, the mortality rate from diabetes among American Indians increased from 17.0 to 19.9 per 100,000 population. This is especially distressing considering the mortality rate from diabetes among all races in the US decreased from 13.0 to 9.6 per 100,000 population during the same time period (Jackson, 1986). From 1980 to 1982, the death rate from diabetes mellitus for all areas of IHS was 19.3 per 100,000. In the
Phoenix area, the death rate reached 31.6 per 100,000 (Gohdes, 1986). The age of onset has also been decreasing. This is especially true in women with gestational diabetes (Welty, 1991). Obesity is a significant risk factor for the onset of NIDDM. As the incidence of overweight and obesity increase in this population, the occurrence of diabetes also increases (Welty).

Risk Reduction Intervention

Research data indicate that diabetes among Native Americans can be controlled by reducing obesity (Welty, 1991). Prevention of obesity may have a greater impact than later weight reduction (Broussard et al., 1991). Prevention is preferred, but when this is not possible, obesity can be controlled through diet and exercise (Rhoades et al., 1987). Appropriate intervention programs encouraging healthy eating habits and increasing physical activity have been recommended to decrease health-risk factors. Services such as dietary treatment and education, weight control, and exercise, which address common American Indian health problems such as obesity and diabetes, are particularly important. Other topics of concern include alcohol abuse, safety, and smoking cessation (Rhoades et al., 1987). Health-care providers from the Uintah-Ouray Reservation have indicated a need to reach school-age populations to teach more healthy lifestyle behaviors (Tom-Orme, 1988). In the past, attempts have been made to incorporate nutrition education and exercise programs among the Ute Indians through existing schools, training programs, and the Head Start program. Unfortunately, these programs were never fully implemented (Tom-Orme).
Nutrition education and physical activity programs have been effective in reducing health-risk factors and increasing nutrition knowledge in certain population groups. Obese children enrolled in a 5-week multi-component weight control program showed reduced systolic blood pressure and plasma glucose levels after completion of the program.

Participation in exercise programs has been found to decrease plasma glucose and improve insulin sensitivity in obese children (Ward, Dover, Porter, & Schumaker, 1988). This is desirable in a population at risk for diabetes. Weight loss was stimulated by exercise along with caloric restriction in obese children when comparing programs with and without exercise (Welty, 1991).

Dietary changes are the ultimate objective of nutrition education and counseling. Characteristics of effective intervention programs have been proposed. Social support is critical to success. When working with children, this support system should include parents or guardians (Ward et al., 1988). People may not know how to apply nutrition information so programs should provide skills training as well as information. Information and skills components should be based on current research and recommendations. Reinforcement appears to work better if it is tied to behavior rather than to things such as weight loss (Glanz, 1985).

For the program itself to be successful, there must be support from the community and all levels of the sponsoring agency. Interagency cooperation is encouraged. Tribal participation is essential. This provides for more widespread ownership and support
(Rhoades et al., 1987). Many different agencies work with the Native American population. A variety of resources can be tapped.

Ute Culture

Effective communication is a vital part of the educational process. Awareness and sensitivity to cultural values and beliefs are a critical part of effective communication. There are many basic differences between the traditional Ute Indian culture and the dominant Anglo culture (Cuch, 1987). The educator must be aware of this and work within the value system of the students in order to reduce barriers and maximize effective communication.

Some of the traditional Ute values are potentially barriers to effective nutrition education. These and other beliefs must be considered and used to maximize the impact of health education. One potential barrier is the traditional belief that one should not attempt to control or change "what is" to "what should be." This includes the idea that men neither control nor are controlled by natural processes (Cuch, 1987). Nutrition education for health risk reduction is based on the premise that it is possible to manipulate, control, or intervene in natural disease processes for better health.

Traditionally, Utes have not readily accepted externally imposed ideals. In the Ute culture it is seen as improper to assert oneself into another person's affairs before it is wanted or needed (Cuch, 1987). This can make preventive health care and education difficult, especially if a need is not recognized.
Ute Indians have a tradition of individuality. Guidelines may be defined but the person then chooses whether or not to conform. The culture is, however, becoming more group oriented. This belief in individuality extends to children. Children are given the right to make their own decisions and act on them. While one may choose his own actions, taking responsibility for those actions is also important (Cuch, 1987). When applying this to nutrition education, children may be more free to make their own food choices. They may also be less receptive to accepting guidelines for healthy food choices unless they value them and understand the possible disease consequences. The key is to help children value lifestyle choices for better personal health, including healthy food choices and physical activity. It is critical that the students come to value the information being presented or changes will not be made.

Summary

Native Americans are at risk for many health problems. Obesity and diabetes are common and increasing in this population. The high incidence is due to inherited and lifestyle risk factors including dietary habits and activity level. Nutrition education and physical activity programs have been shown to help in the treatment of obesity. Culture is an important aspect of any education program. Differences must be recognized and considered in program development.
CHAPTER III

METHODS

Program Planning

This project was a result of cooperation between a variety of public and tribal agencies. In Ft. Duchesne, the director of the Indian Health Service Native American Diabetes Center was instrumental in initiating and supporting the project. The director of the Diabetes Center coordinated the project with tribal department heads and obtained the support of tribal officials. During the first year of the program, an IHS Public Health intern and the author conducted the program. Two graduate students from USU, including the author, taught the program during the second year.

The USU Cooperative Extension service was involved on the state and county levels. Through the State Extension Office, a graduate student was recruited to design appropriate lesson materials and to function as an instructor. Because the Uintah-Ouray Reservation lies in two counties, Extension Home Economists from Uintah and Duchesne counties were involved. They assisted with planning field trips and activities. The Uintah County Home Economist was also involved with recruitment.

The project was initially proposed by the State Cooperative Extension to the Federal Extension Service. When funding was not granted, a revised proposal was submitted to the Phoenix Area IHS by the director of the Native American Diabetes Center in Fort Duchesne under the Year 2000 Objectives. The specific objectives were
reduce diabetes related deaths, reduce the most severe complications of diabetes, and reduce diabetes incidence. Funding was not available, but the value of the project was recognized. Since the Diabetes Center was a control and prevention program, funding was provided through the IHS Diabetes Center.

Curriculum and Program Implementation

A nutrition and fitness curriculum was developed by the author under the direction of Extension nutrition specialists and a State Home Economics curriculum writer. This program was planned to last 6 weeks. Since many children had parents or guardians who worked for the Ute tribe that used a 4-day work week, lessons and activities were planned for 4 days each week. Each session lasted for 2 to 3 hours. Younger children attended the morning sessions. Older students attended the afternoon sessions.

The four components of this program were (a) nutrition education, (b) cooking activities, (c) physical activity, and (d) recreation activities. Nutrition education was the main focus. The nutrition education portion of the program incorporated several different topics. Students learned about the six basic nutrients and food groups using the USDA Food Guide Pyramid. Low-fat and low-sugar options in each food group were emphasized. Because of the high incidence of diabetes and heart disease among Native Americans, information on nutrition-related prevention and care for these diseases was also included. Lessons on reading nutrition labels emphasized low-fat food choices and
provided valuable consumer information. Making choices for less fat and less sugar while eating out and for fast-food choices were also discussed. See Appendix A for a schedule of program lessons and activities.

Cooking experiences and taste tests provided opportunities to prepare and taste low-fat and low-sugar foods. Recipes for the cooking experiences were selected so that the children would be able to prepare the foods again at home.

Fitness activities and exercise were included. This component of the program focused on enjoyable fitness activities rather than strenuous physical training to encourage lifetime physical activity. Activities included basketball, kickball, volleyball, canoeing, and a variety of tag games.

A day-camp provided an opportunity for outdoor cooking and games. In the first year, a 3-day camp included nutrition-centered activities, water sports, and traditional crafts. For the second year, the overnight camp was replaced with a day at the park and water slide. Students applied their knowledge of healthy food choices in planning the snacks and meals for these activities.

One of the successes of the program was the cooperation between various tribal departments and government agencies. Personnel from the Diabetes Center were the most involved during the program. The center provided recruitment, arranged transportation, and helped with fitness activities and camp experiences. Facilities for cooking and conducting class were also arranged and provided through the Diabetes Center. Classes were conducted mainly at the Ute Tribe Recreation Center. The
Recreation Department also facilitated transportation of students to and from camp activities. Cooking was done at the Diabetes Center. The Adult Education Center provided facilities for nutrition education computer activities. The Ute language department provided traditional language and craft activities.

Subjects

Program participants were a volunteer sample of Native American children and adolescents living on or near the Uintah-Ouray Reservation in Uintah and Duchesne Counties in Eastern Utah. Ages of participants ranged from 9 to 14 years. Of the 13 participants who completed the program during the first year, 12 were female. During the second year, 17 students completed the program. Seven were male. Ten were female. Other students were involved in the program, but complete data sets were not available because these students were not involved in the program during both the initial and final assessments.

Research Design

To evaluate the effectiveness of the program, assessments were conducted during the first and last weeks of the program. A variety of methods was used. A written test examined nutrition knowledge. Diet histories indicated dietary habits and nutrient intake. Muscle strength, flexibility, and endurance assessed physical fitness. Anthropometric measurements, blood glucose level, and hematocrit were used as measures of health
status. A final evaluation was completed at the end of the course by students and their parents.

Pretest and posttest results were compared. Paired t tests were used to determine statistical significance (p = 0.05). Students served as their own control. Assessment of a separate control group was attempted, but these attempts were unsuccessful. The lack of an outside control group is a threat to internal validity because there was no control for test wiseness that may occur with the repeat testing.

Assessment of Objectives

**Nutrition Knowledge**

Nutrition knowledge was measured using a knowledge test developed for this project. This test was reviewed by nutrition education experts for appropriateness and content validity prior to administration. This test is included in Appendix B.

**Nutrient Intake and Dietary Habits**

Nutrient intake data can be collected in a variety of ways. Diet histories were determined to be the most appropriate for this situation. Nutrient intake was determined by computer analysis of diet histories. Diet histories were used rather than food frequency questionnaires because histories more accurately reflect actual intake in children (Domel et al., 1994). Accuracy and validity of diet histories depend on the ability and willingness of the individual to recall and report foods and portion sizes with accuracy.
Analysis of diet histories included the index of nutritional quality (INQ). The INQ was used to determine the nutrient density of the reported diets. INQ is a ratio between the percentage of the Recommended Dietary Allowance (RDA) for a nutrient and the percentage of the RDA for calories. Information from diet histories was also compared to the USDA Food Guide Pyramid since this was the basis of the educational program.

**Fitness Level**

Fitness level was determined by comparing performance to national standards (Ross, Dotson, Gilbert, & Katz, 1985). A 9-minute run assessed cardiovascular fitness. The sit-and-reach test measured hamstring muscle flexibility. A 1-minute sit-up test assessed abdominal muscle strength. Standards are listed in Appendix C.

**Health Status**

**Anthropometric measurements.** Height and weight were measured using standard procedures. Community health representatives from the tribe assisted in collecting anthropometric data. Body Mass Index (kg/m²) was calculated and compared to national standards (Himes and Dietz, 1994; Jackson, 1993). Anthropometric standards for comparison are listed in Appendix D.

**Blood glucose.** Blood glucose readings were taken from a finger-stick blood sample. This was done according to county health department procedures (e.g., clean equipment between each subject, new lancets, gloved technicians, and alcohol swabs for
each new subject). An Accucheck III glucometer was used to measure blood glucose level.

Normal fasting blood glucose is 60-100 mg/dl in whole blood. During a 3-hour glucose tolerance test, values below 200 mg/dl at 90 minutes are considered normal (Tilkian, Conover, & Tilkian, 1987). Since subjects were not fasting during sample collection, values below 200 mg/dl were considered acceptable.

Iron status. Iron status was determined by hematocrit measurement. Blood was taken from a finger-stick sample. This was done according to county health department procedures. Two capillary tubes were filled, centrifuged, and measured. The HemataSTAT model C-70 centrifuge (Separation Technology, Inc., Salt Lake City, UT) was used according to manufacturer recommendations. The two measurements were recorded and averaged. This average was compared to standards. Queen and Lang (1993) have defined hematocrit standards as listed in Table 1. Primary Children's Medical Center in Salt Lake City, Utah uses a range of normal values also listed in Table 1.

Attitude

The students' attitudes toward nutrition, physical fitness, and the impact of food choices on health were surveyed. Comments by students were observed and noted by the teacher.
Table 1

**Normal Hematocrit Values for Children**

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Deficient</th>
<th>Marginal</th>
<th>Acceptable</th>
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<tr>
<td>6-12</td>
<td>up to 30</td>
<td>30-35</td>
<td>36+</td>
</tr>
<tr>
<td>13-16 male</td>
<td>up to 37</td>
<td>37-39</td>
<td>40+</td>
</tr>
<tr>
<td>13-16 female</td>
<td>up to 31</td>
<td>31-35</td>
<td>36+</td>
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*Note.* Adapted from Queen and Lang, *Handbook of Pediatric Nutrition*, 1993.

<table>
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<tr>
<th>Age (years)</th>
<th>Hematocrit (%)</th>
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<tr>
<td>8</td>
<td>36-44</td>
</tr>
<tr>
<td>12</td>
<td>39-47</td>
</tr>
<tr>
<td>4-12</td>
<td>35-47</td>
</tr>
</tbody>
</table>

*Note.* Reference values used at Primary Children's Medical Center.

**Final Evaluation**

At the end of the program, students and parents evaluated the program according to what they believed the students had learned, and how this had influenced them. Parents were asked if they had noticed any changes in their children's attitudes or dietary habits. Final evaluation forms are in Appendix E.
CHAPTER IV
RESULTS AND DISCUSSION

Evaluation of this education program showed statistically significant improvements and changes. Observations and evaluation by instructors, participants, and their parents or guardian indicated other trends for positive change. When evaluating education programs, it can be difficult to determine what has been learned and how this information has been translated into behavior changes. These behavior changes are indicators of success. Strictly quantitative analysis can miss important individual changes that are the object of health education.

Nutrition Knowledge Test

Scores from the 25-question nutrition knowledge test range from a pretest average of 13.18 (SD = 3.28) to a posttest average of 16.47 (SD = 4.41). The first 15 questions were multiple choice and the remaining 10 were true or false. A one-tailed t test indicated significant increase (p = .002). Increased nutrition knowledge is an important first step toward behavior change.

Dietary Habits and Nutrient Intake

Diet histories were compared to the USDA Food Guide Pyramid, which was the basis for the nutrition education program. The average number of servings consumed from each food group was lower than the recommended number except for the fats,
sweets, and oils group. Though a specific number of servings is not designated for fats, 
sweets, and oils, it is recommended that they be used sparingly. Serving sizes used for 
this group were comparable to the Exchange Lists for Meal Planning from the American 
Diabetes Association.

Compared to the Food Guide Pyramid, students had an inadequate intake of food 
from all nutrient dense food groups. Improvements were also recognized. None of these 
differences reached statistical significance after a two-tailed t test ($p = 0.05$). Comparison 
of histories showed increased consumption of grains and fruit and decreased intake of 
fats, oils, and sweets. There was also a slight decrease in vegetables and a larger decrease 
in milk and other dairy products. Table 2 presents analysis results from diet histories.

Recommended energy intake for the children in this population is 2,000-2,500 
calories per day. Children over age 2 should follow the American Heart Association 
guideline of less than 30% of calories from fat. Results show that students consumed an 
average of 110% ($SD = 80.1$, range = 984 to 3432 calories) of their recommended energy 
intake at the preprogram assessment and 96% ($SD = 72.3$, range = 684 to 3431 calories)

Table 2

Analysis of Diet Histories According to the USDA Food Guide Pyramid

<table>
<thead>
<tr>
<th>Average # of servings</th>
<th></th>
<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Bread, Cereal, Rice, &amp; Pasta</td>
<td>Fruit</td>
<td>Vegetable</td>
<td>Milk, Yogurt, &amp; Cheese</td>
<td>Meat, Poultry, Fish, Dry Beans, Eggs, &amp; Nuts</td>
<td>Fats, Sweets, &amp; Oils</td>
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<tr>
<td>Recommended</td>
<td>6-11</td>
<td>2-4</td>
<td>3-5</td>
<td>2-3</td>
<td>2-3</td>
<td>use sparingly</td>
</tr>
<tr>
<td>Preprogram</td>
<td>$4.1 \pm 2.5$</td>
<td>$0.6 \pm 0.9$</td>
<td>$1.6 \pm 2.1$</td>
<td>$2.1 \pm 1.8$</td>
<td>$2.5 \pm 1.2$</td>
<td>$3.2 \pm 3.0$</td>
</tr>
<tr>
<td>Postprogram</td>
<td>$4.7 \pm 2.0$</td>
<td>$1.4 \pm 1.4$</td>
<td>$1.4 \pm 1.4$</td>
<td>$1.1 \pm 1.3$</td>
<td>$2.6 \pm 1.5$</td>
<td>$2.3 \pm 1.8$</td>
</tr>
<tr>
<td>Difference from Recommended</td>
<td>$+0.6$</td>
<td>$+0.8$</td>
<td>$-0.2$</td>
<td>$-1.0$</td>
<td>$+0.1$</td>
<td>$-0.9$</td>
</tr>
<tr>
<td>p-value</td>
<td>.412</td>
<td>.072</td>
<td>.603</td>
<td>.068</td>
<td>.901</td>
<td>.281</td>
</tr>
</tbody>
</table>
at the postprogram assessment. There was not a significant difference between pre- and postprogram intake ($p = .382$). The high mean percentages implied that many of the children exceeded their estimated calorie needs. The extremely low values most likely are a result of underreporting intake.

There was a significant difference in the distribution of calories among the macronutrients. Before education, an average of 36.3% of reported calories came from fat and 48.7% came from carbohydrate. After the program, reported fat calories were near the recommended level at 30.3% and reported carbohydrate calories were up to 55.4%. Percentage of calories reported from protein remained fairly constant at 15.0% preprogram and 14.3% postprogram. Refer to Table 3.

Underreporting of calorie dense foods would explain high INQ values when observations of actual intake suggest low nutrient density. An INQ above 1.0 identifies a nutrient dense food or diet for an individual nutrient. All average INQ values from preprogram and postprogram histories were above 1.0 except calcium, zinc, and vitamin

Table 3

<table>
<thead>
<tr>
<th>Table 3: Calorie Totals and Distribution Among Macronutrients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Intake</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Total calories</td>
</tr>
<tr>
<td>% of RDA for calories</td>
</tr>
<tr>
<td>% of calories from protein</td>
</tr>
<tr>
<td>% of calories from fat</td>
</tr>
<tr>
<td>% of calories from carbohydrate</td>
</tr>
</tbody>
</table>

Note. Values are mean ± standard deviation; p-values are the result of two-tailed paired t tests.
B6. Even these are above 0.7. Table 4 provides a summary of the average INQ values and results of \( t \) tests. There were no significant differences in vitamin and mineral intake as a percent of the RDA \((0.141 \leq p \leq 0.986)\) or in the INQ \((0.147 \leq p \leq 0.936)\).

Results from diet histories imply that vitamins and minerals are not the main nutrient concerns for this group, but rather excess energy intake and inappropriate distribution of calories among the macronutrients. This is supported by anthropometric and hematocrit data.

Fitness Assessment

The three parts of the fitness assessment were designed to assess muscle strength,

Table 4

Summary of INQ Values for Preprogram and Postprogram Diet Histories

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Preprogram</th>
<th>Postprogram</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>iron</td>
<td>1.129 ± 0.472</td>
<td>1.018 ± 0.578</td>
<td>0.645</td>
</tr>
<tr>
<td>sodium</td>
<td>1.100 ± 0.625</td>
<td>1.190 ± 0.416</td>
<td>0.642</td>
</tr>
<tr>
<td>calcium</td>
<td>0.905 ± 0.541</td>
<td>0.702 ± 0.563</td>
<td>0.193</td>
</tr>
<tr>
<td>phosphorus</td>
<td>1.234 ± 0.350</td>
<td>1.091 ± 0.468</td>
<td>0.147</td>
</tr>
<tr>
<td>vitamin A</td>
<td>1.879 ± 2.830</td>
<td>1.296 ± 1.499</td>
<td>0.209</td>
</tr>
<tr>
<td>thiamin</td>
<td>1.278 ± 0.349</td>
<td>1.205 ± 0.519</td>
<td>0.727</td>
</tr>
<tr>
<td>riboflavin</td>
<td>1.576 ± 0.742</td>
<td>1.266 ± 0.573</td>
<td>0.116</td>
</tr>
<tr>
<td>vitamin C</td>
<td>2.030 ± 1.733</td>
<td>2.982 ± 2.995</td>
<td>0.309</td>
</tr>
<tr>
<td>potassium</td>
<td>1.312 ± 0.337</td>
<td>1.268 ± 0.545</td>
<td>0.608</td>
</tr>
<tr>
<td>zinc</td>
<td>0.871 ± 0.308</td>
<td>0.960 ± 0.470</td>
<td>0.481</td>
</tr>
<tr>
<td>niacin</td>
<td>1.331 ± 0.492</td>
<td>1.190 ± 0.509</td>
<td>0.593</td>
</tr>
<tr>
<td>vitamin B6</td>
<td>1.009 ± 0.344</td>
<td>0.945 ± 0.344</td>
<td>0.685</td>
</tr>
<tr>
<td>vitamin B12</td>
<td>2.445 ± 1.278</td>
<td>2.476 ± 2.198</td>
<td>0.936</td>
</tr>
<tr>
<td>folic acid</td>
<td>1.625 ± 1.169</td>
<td>1.988 ± 1.163</td>
<td>0.378</td>
</tr>
</tbody>
</table>

**Note.** Values are reported as mean ± standard deviation; \( p \)-values are the results of two-tailed paired \( t \) tests \((n = 15)\).
endurance, and flexibility. There were several instances of marked individual improvement. However, when compared with national standards, the study population ranked poorly for endurance and strength. Comparison of flexibility scores to national standards was better.

No statistically significant changes were identified in fitness (strength $p = 1.000$, endurance $p = .206$, flexibility $p = .930$). For muscle strength assessment, the mean remained the same but the standard deviation increased, indicating some individual improvement and some decline. One participant improved from below the 5th percentile to the 15th percentile. This represents an improvement from 10 to 26 sit-ups per minute. Three participants were unable to complete a sit-up at either assessment. When each student's best performance for sit-ups was compared to national standards, all were below the 20th percentile. Nine of 17 were at or below the 5th percentile.

Flexibility compared more favorably to national standards. Of each student's best measurement, 14 of 17 were above the 50th percentile. Six were above the 75th percentile.

Four of the 17 participants showed improvement in endurance. One run was near the 50th percentile compared to national standards. All others were less than the 25th percentile. Four of 17 were less than the 5th percentile for endurance.

Results of fitness testing are recorded in Table 5. Tables of values used to determine percentile scores are in Appendix D (Ross et al., 1985). These results indicate that the study participants were much less fit than the national average for their age and
Table 5

Fitness Assessment Results for Program Participants

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age</th>
<th>Pretest results</th>
<th>Posttest results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>9-minute run (yards, %ile)</td>
<td>Sit &amp; reach (cm, %ile)</td>
</tr>
<tr>
<td>f</td>
<td>10</td>
<td>927 &lt; 5</td>
<td>32 &lt; 75</td>
</tr>
<tr>
<td>m</td>
<td>9</td>
<td>834 &lt; 5</td>
<td>27 &lt; 60</td>
</tr>
<tr>
<td>m</td>
<td>10</td>
<td>1274 &lt; 15</td>
<td>26 &lt; 55</td>
</tr>
<tr>
<td>m</td>
<td>11</td>
<td>74 &lt; 5</td>
<td>28 &lt; 75</td>
</tr>
<tr>
<td>f</td>
<td>10</td>
<td>1182 &lt; 20</td>
<td>64 &lt; 95</td>
</tr>
<tr>
<td>f</td>
<td>10</td>
<td>1089 &lt; 20</td>
<td>28 &lt; 60</td>
</tr>
<tr>
<td>f</td>
<td>10</td>
<td>1112 &lt; 15</td>
<td>27 &lt; 50</td>
</tr>
<tr>
<td>m</td>
<td>10</td>
<td>1205 &lt; 10</td>
<td>29 &lt; 80</td>
</tr>
<tr>
<td>f</td>
<td>11</td>
<td>1089 &lt; 10</td>
<td>29 &lt; 55</td>
</tr>
<tr>
<td>m</td>
<td>11</td>
<td>1297 &lt; 15</td>
<td>27 &lt; 65</td>
</tr>
<tr>
<td>m</td>
<td>12</td>
<td>649 &lt; 5</td>
<td>24 &lt; 45</td>
</tr>
<tr>
<td>m</td>
<td>11</td>
<td>-</td>
<td>27 &lt; 65</td>
</tr>
<tr>
<td>f</td>
<td>11</td>
<td>996 &lt; 10</td>
<td>28 &lt; 50</td>
</tr>
<tr>
<td>f</td>
<td>10</td>
<td>927 &lt; 5</td>
<td>29 &lt; 70</td>
</tr>
<tr>
<td>f</td>
<td>14</td>
<td>973 &lt; 5</td>
<td>19 &lt; 10</td>
</tr>
<tr>
<td>f</td>
<td>11</td>
<td>973 &lt; 10</td>
<td>33 &lt; 80</td>
</tr>
<tr>
<td>f</td>
<td>11</td>
<td>1181 &lt; 15</td>
<td>16 &lt; 5</td>
</tr>
</tbody>
</table>

Note. Percentile values are comparisons to national standards (Ross et al., 1985).

gender. Some individual improvements were made, but much improvement in all areas of fitness is needed.

Health Status

Several measurements were used as indicators of health status. These included anthropometric measurements, blood glucose level, and hematocrit as a measure of iron status.

Anthropometric Measurement

Body Mass Index (BMI) was used to compare anthropometric data for
participants of different heights and ages. There was no statistically significant difference in BMI between preassessment and postassessment. This was most likely due to the relatively short duration of the program.

BMI measurements for participants were much higher than national standards (NHANES) and also higher than race specific standards. High BMI indicates overweight for height. This may have important implications for chronic disease risk. BMI ranged from 16.2 to 31.6. Average values and standard deviations are reported in Table 6. In adults, a BMI greater than 25 is associated with increased risk for chronic diseases such as diabetes, hypertension, and hypercholesterolemia. Intervention for reducing risk is appropriate for this population. Anthropometric standards are included in Appendix D.

**Blood Glucose**

Since part of the purpose for this program was diabetes prevention, blood glucose levels were tested. All readings were within normal limits for nonfasting state (<200 mg/dl). There was a statistically significant difference in pretest and posttest averages

<table>
<thead>
<tr>
<th>Anthropometric standard</th>
<th>Preprogram</th>
<th>Postprogram</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass Index (BMI)</td>
<td>25.0 ± 4.5</td>
<td>24.5 ± 4.3</td>
<td>.542</td>
</tr>
<tr>
<td>% of Native American Std for BMI⁹</td>
<td>119.4 ± 22.6</td>
<td>116.6 ± 21.0</td>
<td>.518</td>
</tr>
<tr>
<td>% of NHANES Std for BMI⁹</td>
<td>136.3 ± 25.8</td>
<td>133.0 ± 24.1</td>
<td>.524</td>
</tr>
</tbody>
</table>

*Note. Values are reported as average ± standard deviation.*

⁹ (Jackson, 1993)
for blood glucose ($p = .008$). This has no practical significance because both values are within normal limits. Pretest average was $67.3 \pm 6.3$ mg/dl. Posttest average was $83.2 \pm 18.3$ mg/dl.

**Hematocrit**

Hematocrit was used as an indicator of iron status. None of the children were found to be deficient. All children had hematocrits in the acceptable range (> 36 %) except two. In both cases the values were only slightly outside of the acceptable range. One child had marginal iron status when pretested (34.8 %) but was in the acceptable range at posttest (36.8 %). In the second case, both pretest and posttest were marginal, 34.8 % and 34.6 %, respectively.

The fact that none of the subjects had iron-deficient hematocrit levels points out that adequate iron intake was not a problem for study participants. Hematocrit data and anthropometric data imply that the more significant nutritional concern is overnutrition through excess energy intake and inappropriate calorie distribution.

**Student Attitudes and Habits**

As part of the assessment before and after the program, students responded to questions about their attitudes and habits regarding food and health. The questions were: Can food choices affect your health? Do you look at food labels? Will you try low fat foods? Will you try low sugar foods? In all but one or two cases, answers indicated that the children believed that food choices could affect health status. They reported looking
at food labels and a willingness to try low-fat and low-sugar foods. However, observations of and comments from the participants during class did not always support these answers.

Through the food preparation portion of the program, participants were able to try a variety of low-fat and low-sugar foods. At other times blind taste tests were used to have the children taste foods such as sugar-free soda and skim milk. Children were able to recognize the difference between the two choices and correctly identify them. When asked which one they preferred, answers varied. Some expressed a willingness to use a lower fat or lower sugar product, while others were adamantly opposed to the suggestion. As the education progressed, students were able to identify high-fat and high-sugar foods and make appropriate substitutions. When asked if they would be willing to make similar changes in their own eating habits, a few agreed, but others refused.

Actions speak louder than words. The children were in the habit of stopping by the gas station on the corner for candy, chips, and sodas before coming to class. For some of them this was their breakfast or lunch. The message of healthy food choices was reaching its mark and slowly being translated into behavior change. Occasionally, orange juice was chosen and brought to class instead of soda, and pretzels or popcorn were chosen over chips and cookies. This may appear small, but it shows that when given a choice, children can and will make healthier food choices.

Long-time community members commented that health promotion and disease prevention were not a priority for many native people. Ute traditions frowned on
controlling nature. Seeming to contradict tradition makes health promotion programs a challenge. Working with people while they are young can help them accept the idea that morbidity and mortality can be prevented through healthy lifestyle choices while maintaining native culture.

Parent and Student Evaluation

**Parent Evaluations**

Parent evaluations were very helpful in determining how information presented during the program was translated into behavioral changes at home. The evaluation form is included in Appendix E. Written comments and results of closed ended questions are also included in Appendix E.

The parents and guardians who responded indicated positive changes for the majority of those participating. Changes in eating habits were observed. Approximately half of those who indicated a change reported that their child ate more fruit and vegetables and less candy, soda pop, and chips. Reading food labels also increased. Parents reported more awareness of healthy food choices in their children. Part of this was reflected in comments made by the children. Most of the comments involved the fat or sugar content of specific foods or the function of nutrients in foods. More interest in healthy food choices and increased activity were mentioned in several different evaluations. These changes were the goal of the program.
Parents commented that the program material was reinforcing concepts they were teaching at home. Some parents had received previous nutrition education through the IHS Native American Diabetes Center, the WIC program, or nutrition demonstrations. Reinforcement of information and habits at home provided support for the program.

**Student Evaluations**

At the end of the program, students were asked how much they believed they had learned from each lesson and how likely they were to use the information. A 5-point Likert Scale was used with 1 = little to 5 = a lot. Response to recipes used during cooking activities and fitness activities was measured with the same scale. Results are listed in Table 7.

Average rating for each lesson ranged from 3.18 to 4.18 with an overall average of 3.76. Average ratings for cooking and fitness activities ranged from 3.76 to 4.47 with an overall average of 4.19. Ratings for the usefulness of the information ranged from 3.29 to 3.94 with an overall average of 3.63.

Lessons on the Food Guide Pyramid, nutrition facts labels, and food safety earned the highest ratings for the amount learned. Other lessons with ratings above average discussed diabetes, heart disease, and restaurants and food service. In many cases these were also the lessons which the students perceived as most useful. Lessons receiving high ratings for both amount learned and usefulness discussed the Food Guide Pyramid, diabetes, nutrition labeling, and heart disease. Other lessons with above average ratings for usefulness discussed individual nutrients and eating less fat.
These ratings indicate that the students perceived that they had learned information they found useful. Results also indicate they enjoyed the food preparation and fitness activities. The high rating for fitness activities did not reflect individual unwillingness to participate in activities and assessments, such as the timed run, during the program.

Table 7

Summary of Student Evaluations for Lessons and Activities

<table>
<thead>
<tr>
<th>Lesson topic</th>
<th>Rating for amount learned</th>
<th>Rating for usefulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Balance</td>
<td>3.53 ± 1.19</td>
<td>3.29 ± 1.27</td>
</tr>
<tr>
<td>Food Safety</td>
<td>4.00 ± 1.08</td>
<td>3.94 ± 1.21</td>
</tr>
<tr>
<td>Nutrients</td>
<td>3.18 ± 1.38</td>
<td>3.47 ± 1.33</td>
</tr>
<tr>
<td>Food Guide Pyramid</td>
<td>4.18 ± 1.15</td>
<td>3.76 ± 1.26</td>
</tr>
<tr>
<td>Food Groups</td>
<td>3.65 ± 1.32</td>
<td>3.68 ± 1.40</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3.76 ± 1.21</td>
<td>3.76 ± 1.26</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>3.82 ± 1.46</td>
<td>3.65 ± 1.41</td>
</tr>
<tr>
<td>Eat Less Fat</td>
<td>3.58 ± 1.46</td>
<td>3.65 ± 1.37</td>
</tr>
<tr>
<td>Eat Less Sugar</td>
<td>3.76 ± 1.26</td>
<td>3.47 ± 1.29</td>
</tr>
<tr>
<td>Nutrition Labeling</td>
<td>4.00 ± 0.97</td>
<td>3.71 ± 1.40</td>
</tr>
<tr>
<td>Restaurant/Food Service</td>
<td>3.94 ± 1.35</td>
<td>3.53 ± 1.42</td>
</tr>
<tr>
<td>All Lessons Combined</td>
<td>3.78 ± 1.28</td>
<td>3.63 ± 1.34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Rating for Enjoyment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recipe 1</td>
<td>4.47 ± 1.03</td>
</tr>
<tr>
<td>Recipe 2</td>
<td>4.00 ± 1.37</td>
</tr>
<tr>
<td>Recipe 3</td>
<td>4.47 ± 1.04</td>
</tr>
<tr>
<td>Recipe 4</td>
<td>3.76 ± 3.76</td>
</tr>
<tr>
<td>Fitness Activities</td>
<td>4.24 ± 0.81</td>
</tr>
<tr>
<td>All Activities Combined</td>
<td>4.19 ± 1.20</td>
</tr>
</tbody>
</table>

Note. Ratings are listed as mean ± standard deviation.
CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Quantitative and qualitative evaluation of this nutrition education and fitness program has demonstrated that such a program can improve nutrition knowledge and influence lifestyle habits. Overall fitness did not improve during the program, but there were individual improvements. No statistically significant impact on current health status was seen because of the relatively short duration of the program, but there is potential for long-term effects in both health and fitness.

Limitations

Several different factors limited the results of the study. The small size of the class and wide variability in test performance within the group limited statistical significance. The short duration of the program also influenced the amount of change between pretest and posttest and thus the statistical significance noted. Long-term effects of dietary changes on chronic disease cannot be determined during a short-term program evaluation. We can only assess current risk factors.

The accuracy of diet analysis is limited by poor record keeping and inaccurate reporting of food intake. Diet histories depend on factual reporting of the type and amount
of food eaten. There was often a discrepancy between the eating habits students reported and habits observed during the program.

Control group assessment was planned, but could not be completed. Testing a control group on the same schedule as the study group would improve internal validity by controlling for improvement due to repeat testing.

Students were a unique volunteer sample. Random sampling was not feasible. Only children willing to participate with supportive parents could be included in the study group. Because of this, results should not be extrapolated to the entire population.

Recommendations

At the time of this evaluation this program was only in its second year. There is much room for progress and growth. The following recommendations for the future should help with continued success and improvement. The most important recommendation is to continue the program and maintain support of the sponsoring agencies, Indian Health Services, Cooperative Extension Service, the Ute Tribe, and the community. Ongoing support is vital for the continuation and success of projects such as this where many different organizations contribute.

Involvement and support from the parents or guardians of the children involved are needed for implementation of healthy lifestyle choices. Because parents or guardians usually control what food is brought into the home and where the family eats, children have limited control over their food choices. If healthier food options are not available, they
cannot be selected. The level of control increases as the child becomes more independent, but parental support is still needed. Education of the care givers along with the children would allow for increased support of healthy food choices at home. Parents were included in activities through the parents' picnic. More parent involvement in the program could come through parent visits to the class and a weekly newsletter explaining the concepts being discussed with ideas for reinforcement and implementation at home.

Another recommendation is to employ a teacher or recruit a volunteer teacher from the community who is already familiar with the culture, area, and people. This will help provide more continuity and community involvement and ensure that the information is presented in a culturally appropriate manner. This will also help reduce costs.

The curriculum and program plan need to be continually updated and adapted to meet the changing needs of each group and situation. New activities can be added while those that are less effective for a particular group can be omitted. As children repeat the program, additional activities need to be added or adapted to build on the initial concepts and maintain the interest of the participants.
REFERENCES


APPENDIX A. PROGRAM SCHEDULE
### Food, Fun, and Fitness
#### June & July, 1994

**Location:**
- Monday, Tuesday, and Thursday = Recreation Center classroom/poolroom
- Wednesday = Diabetes Center

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>14 Balance</td>
<td>15 Sanitation &amp; Food Safety</td>
<td>16</td>
</tr>
<tr>
<td>Health &amp; Fitness Assessment</td>
<td>Activity &amp; Cals using exercise equipment Assessment</td>
<td>Fitness Cooking - Fruit Salad</td>
<td>Food Guide Pyramid Fitness Review Games</td>
</tr>
<tr>
<td>20</td>
<td>21 Vegetables - raw veg &amp; dip</td>
<td>22 Grains</td>
<td>23</td>
</tr>
<tr>
<td>Nutrients</td>
<td>Fitness Plan Friday menu</td>
<td>Fitness Cooking - Pretzels</td>
<td>Day in the Mountains Parent Picnic</td>
</tr>
<tr>
<td>Fitness</td>
<td></td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Fitness</td>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Food Prep</td>
<td></td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>Fruit</td>
<td></td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>Fruit &amp; Milk</td>
<td></td>
<td></td>
<td>28</td>
</tr>
<tr>
<td>Fitness Review Games</td>
<td></td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>5 Fats, Sweets, &amp; Oils</td>
<td>6 Heart Disease Computer Activities Review Games</td>
<td>7</td>
</tr>
<tr>
<td>Holiday Pow Wow</td>
<td>Fitness</td>
<td>14* Computer Activities Breakfast</td>
<td>Canoeing and swimming</td>
</tr>
<tr>
<td>11</td>
<td>12 Nutrition Labels</td>
<td>13 Fast Food</td>
<td>14</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Fitness Food Service</td>
<td>Fitness Food Service</td>
<td>15</td>
</tr>
<tr>
<td>- chocolate banana pops</td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Fitness</td>
<td></td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>18</td>
<td>19 Final Assessment</td>
<td>20 Day at the Water Park Graduation</td>
<td>21</td>
</tr>
</tbody>
</table>

* Adult Education Computer Center
** Ute Language Department
APPENDIX B. NUTRITION KNOWLEDGE ASSESSMENT
Nutrition Knowledge Test

Name______________________________

____1. Where is iron found?
   a. milk
   b. rice
   c. beef
   d. apples

____2. Vitamin A is found in which food?
   a. pineapple
   b. carrot
   c. whole wheat bread
   d. chicken

____3. Protein is important to eat because it:
   a. prevents heart attacks
   b. builds and repairs cells
   c. speeds up how fast you use food
   d. helps you see at night

____4. A good source of vitamin C is:
   a. lemon
   b. fish
   c. bread
   d. sunshine

____5. A food which has starch and fiber is:
   a. milk
   b. orange juice
   c. eggs
   d. bran cereal

____6. The most healthy food is one that:
   a. has no carbohydrates
   b. has a lot of calories
   c. has a lot of vitamins and minerals
   d. has little protein
7. Beef has which nutrient?
   a. calcium
   b. vitamin C
   c. iron
   d. carbohydrate

8. Which food has the most fat?
   a. orange juice
   b. bread
   c. whole milk
   d. broccoli

9. Which food has the most protein?
   a. chicken
   b. apple
   c. rice
   d. butter

10. Jane wants to keep her bones strong since her grandmother just broke her hip. She should eat more from which food group?
    a. vegetable
    b. milk, yogurt, and cheese
    c. fruit
    d. meat, poultry, fish, dry beans, and nuts

11. Jerry has trouble seeing at night because his eyes do not adjust to dark. He should eat more of which nutrient?
    a. vitamin A
    b. calcium
    c. vitamin C
    d. vitamin D

12. Hot foods should be kept hot and cold foods should be kept cold to:
    a. preserve nutrients
    b. avoid food poisoning
    c. to keep a person busy

13. Which food has the most sugar?
    a. tomato
    b. cookie
    c. hamburger
    d. corn flakes
14. A food which contains some natural sugar is:
   a. orange juice
   b. chicken
   c. flour
   d. mayonnaise

15. To lose weight a person must:
   a. eat less calories than are used
   b. eat more calories than usual
   c. take diet pills
   d. stop exercising

Circle the T if the statement is true. Circle the F if the statement is false.

16. T F Starch is always fattening.
17. T F Water is one of the best drinks to have when you are exercising.
19. T F Vitamins and minerals contain calories.
20. T F On the food label the first ingredient weighs the least.
21. T F A high fat diet can raise your risk for heart disease.
22. T F Snacks can add needed nutrients to the diet.
23. T F Moderation means not too much and not too little of something.
24. T F Fruits, vegetables, and grains contain carbohydrates.
25. T F Pizza, ice cream, tacos, and muffins can never be part of a healthy diet.
APPENDIX C. FITNESS ASSESSMENT STANDARDS
**Fitness Standards for 9-Minute Run--Boys**

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*Note: measurements in yards*

**Fitness Standards for 9-Minute Run--Girls**

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*Note: measurements in yards*
### Table 10

Physical Standards for Sit-Ups--Boys

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Table 12

Fitness Standards for Sit and Reach--Boys

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Note: Measurements in centimeters

Table 13

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Note: Measurements in centimeters

APPENDIX D. ANTHROPOMETRIC STANDARDS
**Table 14**

**Mean Weight, Height, and Body Mass Index (BMI) for American Indian, NHANES II, and HHANES-MA Standards**

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*American Indian

b NHANES II = second National Health and Nutrition Examination Survey

c HHANES-MA = Hispanic Health and Nutrition Examination Survey, Mexican-American population

APPENDIX E. FINAL EVALUATION

FORMS AND RESPONSES
## Student Evaluations

1. Did you enjoy being in this program?  
   - no  
   - yes

2. How much did you learn from each of the lessons?  
   - little  
   - a lot
   - Energy balance: 1 2 3 4 5  
   - Food Safety: 1 2 3 4 5  
   - Nutrients: 1 2 3 4 5  
   - Food Guide Pyramid: 1 2 3 4 5  
   - Food Groups: 1 2 3 4 5  
   - Diabetes: 1 2 3 4 5  
   - Heart Disease: 1 2 3 4 5  
   - Eat less fat: 1 2 3 4 5  
   - Eat less sugar: 1 2 3 4 5  
   - Food labels: 1 2 3 4 5  
   - Restaurant: 1 2 3 4 5

3. What is the chance that you will use the information from each lesson?  
   - Energy balance: 1 2 3 4 5  
   - Food Safety: 1 2 3 4 5  
   - Nutrients: 1 2 3 4 5  
   - Food Guide Pyramid: 1 2 3 4 5  
   - Food Groups: 1 2 3 4 5  
   - Diabetes: 1 2 3 4 5  
   - Heart Disease: 1 2 3 4 5  
   - Eat less fat: 1 2 3 4 5  
   - Eat less sugar: 1 2 3 4 5  
   - Food labels: 1 2 3 4 5  
   - Restaurant: 1 2 3 4 5

4. How much did you like the recipes that we used?  
   - Fruit salad: 1 2 3 4 5  
   - Pretzels: 1 2 3 4 5  
   - Tortillas: 1 2 3 4 5  
   - Bread Sticks: 1 2 3 4 5
5. Have you changed your eating habits since you began this program? yes no
   If yes, what changes have you made?

6. Are you more aware of what you eat? yes no

7. Are you more willing to try low fat or low sugar foods? yes no

8. How did you like the fitness activities? little a lot
   1 2 3 4 5
Parent or Guardian Evaluation for Food, Fun, and Fitness

Please answer the following questions and return this paper to the Diabetes Program with your child. We would like to know what you thought about this program and how the children responded so that we can make it better next year.

1. Have you noticed changes in the eating habits of your child?
   yes no

   If yes, what are those changes?
   ___ more fruit or vegetables
   ___ less candy, soda pop, chips
   ___ other - please explain:

2. Has your child made comments about healthy food choices?
   yes no

   If yes, what were some of the comments made?

3. Does your child read food labels? yes no sometimes

   Does your child read food labels more often than before this program?
   yes no

4. Do you feel that your child is more aware of healthy food choices?
   yes no

5. Do you feel that your child benefited from participating in this program?
   yes no

   If yes, how?

6. In what way did this program meet or fail to meet your expectations?

7. Other comments:
Responses to Parent Evaluations

1. Have you noticed changes in the eating habits of your child?
   - yes: 12
   - no: 1
   - more fruit and vegetables: 7
   - less candy, soda pop, chips: 6

2. Has your child made comments about healthy food choices?
   - yes: 12
   - no: 1
   - “Eating too much fat clogs your arteries causing heart problems”
   - “How much sugar does this have?”
   - “good for developing strong bones”
   - “during meal talks about what groups we are eating and talks about if its balance meal or not”
   - “not to eat too much fat”
   - “cholesterol levels. Told us about the fat in foods.”
   - “They are nutritious and good for the body”
   - “asking more questions about healthy foods vs. high sugar and fat”
   - “now also reading labels, especially while grocery shopping”

3. Does your child read food labels?
   - yes: 7
   - no: 1
   - sometimes: 5

   Does your child read food labels more often than before this program?
   - yes: 8
   - no: 5

4. Do you feel that your child is more aware of healthy food choices?
   - yes: 13
   - no: 0

5. Do you feel that your child benefited from participating in this program:
   - yes: 12
   - no: 1

Comments:

“More aware of what you should eat - pertaining to the four basic food groups”
“weight gain - more energetic” (these girls were underweight)
“eat healthier and to eat more low fat foods”
“She had a better understanding of it this time. She takes better care of herself.”
“Learned about the food pyramid. They learned how to get along with other children.”
“He is more conscious about his food intake, but I always try to cook good balanced meals and less snacks.”
“Beginning to show more interest in healthy food choices - where before I would mention what were healthy foods to eat she wasn't interested in them, but since being with this group now more interested.”
“Tries the food that was showed to her out for brothers”
“She more aware of what benefits come from healthy eating and food choices - juices vs. pop - orange juice good for skin”

6. In what way did this program meet or fail to meet your expectations?

“would like to have more on salt and sodium”
:She doesn’t eat quite as much and she exercises more”
“I wanted my children to learn about good foods and healthy food choices and I think that is the main thing they learned”
“He has had a lot of exercise and has been very active, instead of sitting around watching TV and snacking.”
“A variety of activities instead of the gym you could go to Diabetes Center or Adult Ed. so that she wasn’t expecting to do the same activities day after day.”

7. Other Comments:

“It was great, it gave my daughter something to do during summer instead of just laying around at home.”
“I wish I had been to one of his sessions and seen how it was constructed - but is seemed he had a swell time at your program this year. I hope you have the program again next year. He also enjoyed going to Logan to the Youth Conference. He gained self confidence and made new friends. The crafts he made there were very nice. There could have been more craft sessions. But all together - thank you for having him in your program.”
“Need for them to quiz at home of what they learned and more cooking, and to measure”
“Transportation was great, however, pick-up times could have been more consistent. Pick-up ranged from quarter to twelve to quarter after one.”