

DISSERTATION

DEVELOPMENT AND EVALUATION OF A NUTRITION CURRICULUM
TO PREVENT OBESITY IN INNER-CITY TEENS

Submitted by

Rachael Tatiana Taitano

Department of Food Science and Human Nutrition

In partial fulfillment of the requirements
for the Degree of Doctorate of Philosophy

Colorado State University

Fort Collins, Colorado

Spring 1998

COLORADO STATE UNIVERSITY

March 13, 1998

WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED
UNDER OUR SUPERVISION BY RACHAEL TATIANA TAITANO
ENTITLED DEVELOPMENT AND EVALUATION OF A NUTRITION
CURRICULUM TO PREVENT OBESITY IN INNER-CITY TEENS BE
ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE
OF DOCTORATE OF PHILOSOPHY.

Committee on Graduate Work

Gary W. Auer

Lee C. Krutger

John H. H. H.

James S. Hall

Jennifer Anderson

Advisor

Pat Kendall

Department Head

ABSTRACT OF DISSERTATION

DEVELOPMENT AND EVALUATION OF A NUTRITION CURRICULUM TO PREVENT OBESITY IN INNER-CITY TEENS

Obesity is a major health concern in the United States. Obese adolescents have been found, later in life, to be at increased risk for non-insulin dependent diabetes mellitus, cardiovascular disease, hypertension and certain cancers¹. NHANES III² and HHANES³ data reveal that regardless of ethnicity, an estimated 21% of adolescents (12-17 years of age) in the United States are considered overweight or obese. Obese adolescent girls are at especially high risk for remaining obese in adulthood⁴. Adolescence represents a crucial time for reversing and preventing obesity.

The purpose of this study was two-fold: 1) to develop a nutrition education curriculum targeting sedentary, inner-city adolescents living in Denver, Colorado; and 2) to evaluate the effectiveness of this curriculum by assessing changes in knowledge, attitudes, self-efficacy, stage of change for exercise and fat intake behaviors, dietary behaviors, physical fitness indices, and certain physiological parameters. The goal of this course was to promote

¹ Must A, Jacques PF, Dallal GE, Bajema CJ, Dietz WH. Long-term morbidity and mortality of overweight adolescents. *N Eng J Med.* 1992;327:1350-1355.

² CDC. Prevalence of overweight among adolescents — United states, 1988-1991. *J Am Med Assoc.* 1994;272:108-113.

³ Pawson IG, Martorell R, Mendoza FE. Prevalence of overweight and obesity in US Hispanic populations. *Am J Clin Nutr.* 1991;53:1522s-8s.

⁴ Dietz WH. Critical periods in childhood for the development of obesity. *Am J Clin Nutr.* 1994;59:55-59.

metabolic fitness by modifying food intake and increasing exercise frequency.

In Denver Colorado, twenty-three treatment subjects were compared to fifty-three control subjects. The treatment subjects recieved two years of nutrition education, while the control subjects received none. Formative evaluations were used to establish course content, and the curriculum was developed utilizing Prochaska's Stages of Change along with Bandura's Self-Efficacy and Social Learning Theory. Promotion of behavior change and progression to the next stage of change was accomplished through instruction and activities focused on consciousness-raising, promotion of social support, environmental reevaluation, management of emotional arousal, self-monitoring and self-evaluation, goal-setting, and improving self-efficacy for selecting and eating healthier foods.

After two years of intervention, only 36% of the developed curriculum had been delivered to treatment subjects due to instructor related problems. However, despite implementation difficulties, some positive results were seen. Treatment subjects reported significant improvements in: knowledge, their intentions to change fat intake and exercise behaviors (stages of change), their fat intake as measured by two food frequency questionnaires, and their waist-to-hip ratios. The lack of more positive results are most likely due to poor curriculum implementation.

Rachael Tatiana Taitano
Department of Food Science
and Human Nutrition
Colorado State University
Fort Collins, CO 80523
Spring 1998

ACKNOWLEDGMENTS

This material is based upon work supported by the National Institute of Health grant number 3 R01 DK48159-03S1. It has been a privilege to have been a part of the larger project — entitled “Improving Metabolic Fitness in Obese Persons” — upon which this research is based.

First of all, I thank all the subjects. Without their participation, this study would not have taken place. So many other people helped me along the way, and it is difficult to list them all. I do want to thank my advisor, Dr. Jennifer Anderson, for all of her support and assistance during the past four years. Also my other committee members, including Dr. Garry Auld, Dr. Jill Kreutzer, Dr. Dale DeVoe, and especially Dr. Jim Hill, who was a great boss. Special thanks to the support staff at the Center For Human Nutrition at the University of Colorado — especially Brenda Davy, Debbie King, and Curtis Jatkauskas — their help was invaluable. My friends — the BOB’s, my family, and my husband for all of their love and emotional support. Most of all, I thank Almighty God, who has given me the strength to persevere through this endeavor.

I can do all things through Him who strengthens me (Phillipians 4:13).

TABLE OF CONTENTS

INTRODUCTION	1
Study Objectives	5
Limitations.....	5
 LITERATURE REVIEW	 7
Prevalence of obesity in American Adolescents.....	7
Health Risks Associated with Adolescent Obesity	9
Prevalence of Obesity and Type II Diabetes in Hispanic Americans	11
Obesity, Socioeconomic Status, and Acculturation.....	13
Adolescent Fitness and Physical Activity Patterns.....	16
Adolescent Eating Patterns.....	18
Elements of Successful School-Based Intervention Programs.....	24
Behavioral Focus.....	26
Educational Theory.....	27
Duration.....	28
Family and Peers	29
Behavioral Focus.....	30
Self-Assessment.....	31
School Environment.....	31
Teacher Training.....	32
Summary	33
Nutrition Education Theories	34
Prochaska's Transtheoretical Model of Behavior Change	34
Social (cognitive) Learning Theory	40
Bandura's Theory of Self-Efficacy.....	44
Dietary Intake Assessment Methods.....	47
Weighed Food Record	47
Diet Record.....	48
Diet History	49
Diet Recall.....	50
Food Frequency Questionnaires	51
Problems In Dietary Intake Assessment.....	53
 MATERIALS AND METHODS	 55
Research Hypotheses.....	55
Project Overview.....	56
Subjects.....	58
Nutrition Education Intervention.....	61

Curriculum Development.....	62
Focus Groups.....	63
Pilot Test.....	66
Advisory Committee Recommendations	68
Incorporating Theoretical Model Into Curriculum	71
Consciousness Raising.....	72
Helping Relationships.....	74
Environmental Re-evaluation.....	74
Self (Re-) Evaluation.....	75
Commitment (Goal Setting).....	75
Decisional Balance	76
Countering	77
Self Efficacy.....	77
Curriculum Content.....	77
Intervention Program.....	78
Assessments	82
Anthropometric Measurements	83
24-Hour Dietary Recall Questionnaire.....	85
Validity of 24-Hour Dietary Recall	88
Food Frequency Questionnaires	89
Physical Fitness Indices	92
Nutrition and Fitness Knowledge.....	94
Nutrition Attitudes.....	97
Stages of Change.....	99
Self Efficacy.....	101
Acculturation Scale.....	104
Socioeconomic Status.....	106
Statistical Analysis.....	108

RESULTS 111

Demographic Data of Subjects	111
Ethnicity and Acculturation	112
Socioeconomic Status and Parents' Education.....	113
Knowledge Data.....	115
Nutrition Attitudes Data.....	118
Stages of Change Data.....	119
Stage of Change for Fat Intake Behavior.....	119
Stage of Change for Exercise.....	123
Self Efficacy Data	126
Dietary Intake Data.....	128
24-Hour Recall.....	128
Fruit and Vegetable Consumption	130
Breakfast Consumption	131
Sweetened Fruit Juice and Fried Potatoes Consumption	133
Fast Food Eating	133
High-Fat Snack Foods Consumption.....	135
Soft Drink Consumption.....	136
Validity of 24-Hour Recall Data.....	137
Block Dietary Screening Questionnaire.....	140
Block Food Frequency Questionnaire For High-Fat Foods.....	142

Block Food Frequency Questionnaire For Fruits, Vegetables and High-Fiber Foods ...	145
Summary of Dietary Data.....	147
Physical Fitness Data.....	148
Anthropometric Data.....	151
Dropout Analysis: Treatment vs. Control.....	156
Curriculum Implementation.....	157
DISCUSSION	160
Curriculum Implementation.....	160
Knowledge and Attitudes.....	164
Self Efficacy.....	165
Stages of Change.....	167
Dietary Intake.....	169
Socioeconomic Status and Acculturation	176
Physical Fitness.....	177
Anthropometric Measurements	178
CONCLUSIONS AND RECOMMENDATIONS.....	180
Addressing Research Hypotheses.....	180
Recommendations.....	183
Implications and Research Directions.....	185
Summary	188
REFERENCES	189
APPENDICES	202
Appendix A: Focus Group Results	203
Appendix B: Denver Public Schools Curriculum	208
Appendix C: Table of Contents For Curriculum.....	214
Appendix D: Human Subjects Forms & Consent Forms.....	226
Appendix E: Evaluation Instruments	247

LIST OF TABLES

Table 1: Description of curricular contents and behavioral constructs used in each unit.....	79
Table 2: Gender and Ethnicity Data of Subjects at Baseline and Post-test.....	112
Table 3: Socioeconomic Data of Subjects.....	114
Table 4: Mean Knowledge Scores of Subjects.....	116
Table 5: Nutrition Attitude Scores of Subjects	119
Table 6: Distribution of Subjects by Stage of Change for Fat Intake Behavior.....	120
Table 7: Distribution Subjects by Stage of Change for Exercise.....	124
Table 8: Mean Self-efficacy Scores of Subjects.....	127
Table 9: Dietary Intake Data From 24-Hour Recalls of Subjects.....	129
Table 10: Comparison of Dietary Intake Data from Valid 24-hour Diet Recalls versus Invalid 24-hour Diet Recalls.....	138
Table 11: Mean Fat Intake From Block Dietary Screening Questionnaire of Subjects.....	141
Table 12: Mean Scores From Blood Food Frequency Questionnaire For High-Fat Foods of Subjects	143
Table 13: Mean Scores From Blood Food Frequency Questionnaire For Fruits, Vegetables, and Whole Grains of Subjects.....	146
Table 14: Physical Fitness Indices of Subjects.....	149
Table 15: Anthropometric Data of Subjects	152
Table 16: Amount of Curriculum Implemented, By Unit, During the 2-year Intervention Program.....	159

LIST OF FIGURES

Figure 1: Design of Two-Year Intervention Program.....	58
Figure 2: Stage of Change of Participants for Fat Intake Behavior at Baseline.....	120
Figure 3: Stage of Change of Participants for Fat Intake Behavior at Post-test.....	121
Figure 4: Movement through the Stages of Change for Fat Intake Behavior.....	122
Figure 5: Stage of Change of Participants for Exercise at Baseline.....	124
Figure 6: Stage of Change of Participants for Exercise at Post-test.....	125
Figure 7: Movement through the Stages of Change for Exercise.....	126

Introduction

Obesity is a major health concern, affecting an estimated 33% of adults in the United States (Kuczmarski et al, 1994). In adults, obesity and overweight is associated with several diseases — including type II diabetes, cardiovascular disease, hypertension, gallbladder disease, atherosclerosis, gout, arthritis and certain cancers (Must et al, 1992). Obese adolescents have also been found, later in life, to be at increased risk of morbidity for these conditions and have also experienced compromised functional capacity (Must et al, 1992). Since an estimated 80% of overweight youths will become overweight adults (Brownell et al, 1982), and overweight adults are at increased risk of “adverse health outcomes” (Troiano et al, 1995), overweight during childhood and adolescence has become an important health concern. This is especially true since the prevalence of childhood and adolescent obesity has been increasing since the mid 1960's (Troiano et al, 1995), and it is probably due to changes in diet and decreased physical activity (Gortmaker et al, 1990).

People from non-white ethnic groups living in the United States — such as Hispanics — are thought to be at increased risk of being obese. In fact, more than 50% of the women surveyed by the Hispanic Health and Nutrition Examination Survey (HHANES) were considered overweight by the age of 40 years, and the prevalence of overweight only increased with age (Pawson et al, 1991). Also, centralized obesity may have a higher prevalence in Hispanics than in whites, putting Hispanics at increased risk for heart disease and non-insulin dependent diabetes mellitus (Lopez & Masse, 1993). It has been suggested that Hispanics and other non-white ethnic groups in the United States who are from predominantly lower socioeconomic backgrounds, are at increased risk for being obese because of their socioeconomic status (SES) and/or their degree of acculturation.

Regardless of SES and degree of acculturation, adolescence represents a critical period for the development of obesity, especially for females (Dietz, 1994). Long-term follow-up studies of adolescents have indicated that girls may be especially at risk for adult obesity if obesity is present or develops during adolescence, unfortunately “adolescent-onset obesity in females that persists into adulthood may herald a lifelong problem” (Dietz, 1994). However, the way in which adolescent-onset obesity leads to the continuance of obesity through adulthood is not well understood. Therefore, adolescence is a crucial time for reversing obesity.

Traditional treatments for childhood and adolescent obesity, such as “dietary counseling, pharmacotherapy, exercise instruction, and therapeutic starvation”, (Brownell et al, 1982) have rarely produced successful weight loss and long-term weight maintenance. Prevention seems to be the key. However, for those individuals who are already overweight, simply reducing the degree of overweight, and not necessarily reaching an ‘ideal’ body weight, has been linked with improvements in overall health (Baranowski et al, 1992).

From a developmental perspective, adolescence is considered a crucial time for changes to occur. It is during adolescence that behavior patterns are manifested which tend to persist into later life. In fact, longitudinal studies have shown that early abstinence from drugs and alcohol was a strong predictor of healthful behavior later on in adulthood (Hamburg and Takanishi, 1989). Interventions, whether to prevent drug use or to promote exercise and healthful eating, should occur during early adolescence — a time when behavior patterns are not yet internalized.

In recent years, there have been several health education interventions for school-aged children and adolescents. Some have been successful at promoting behavior change, while others have not. Lytle (1995) reviewed 43 research studies of nutrition education interventions for school-aged children and adolescents and identified key elements required for success. These key elements included: 1) behavioral focus, 2) suitable educational theory as basis

for intervention, 3) long duration, 4) family and peer support, 5) self-assessments, and 6) environment.

Programs incorporating most, if not all, of the above elements are more likely to be effective. This is especially true when a program is behaviorally focused rather than focused only on increasing knowledge. Examples of successful nutrition and health education interventions include: the "Stanford Adolescent Heart Health" program (Killen et al, 1988 and Killen et al, 1989), the "Know Your Body" program (Resnicow et al, 1992, Resnicow et al, 1993, and Walter et al, 1988) and other programs by Lewis and colleagues (1988), Brownell and Kaye (1982), King and colleagues (1988), and Simons-Morton and colleagues (1991). Unsuccessful nutrition education programs for children and adolescents usually focused only on increasing knowledge (Byrd-Bredbenner et al, 1984, Byrd-Bredbenner et al, 1988, Tinsley et al, 1985, and Devine et al, 1992).

There is no record to date of any nutrition and fitness education interventions designed for obese, sedentary, inner-city, low SES adolescents. Interventions for this target group are directed primarily at adults and young children. This research project was unique in that it was the first of its kind. The participants in this intervention were provided with knowledge and the behavioral skills needed to achieve and sustain a healthy lifestyle and to prevent the progression of overweight.

STUDY OBJECTIVES

The objectives of the present research are:

1. To develop a 2-year nutrition and fitness curriculum that promoted metabolic fitness by improving food intake and encouraging physical fitness.
2. To measure the effectiveness of the proposed program by comparing it with standard nutrition and fitness education programs, such as health and physical education classes currently taught in a public high school setting.

LIMITATIONS

There were several limitations in this study. First was the quasi-experimental design of the study. The experimental design was considered quasi-experimental because subjects were not randomly allocated to the treatment or control group. Rather, convenience sampling was performed. If subjects happened to attend the treatment school, they were eligible to be in the treatment group, and if subjects happened to attend the control school, they were eligible to be in the control group. With a weak experimental design, there were no built-in controls for threats to internal validity and there were a number of other plausible explanations for positive outcomes besides the independent variable (which was exposure to curriculum). Also, participants involved in this study were convenient and volunteers, the

results may only be applicable to those with similar characteristics as the sample. It is unknown if similar results would be obtained from a population not located in an inner-city high school in Denver, Colorado.

Another limitation was the separation of subjects into two different schools. The treatment school and control school were located close to each other, in the same inner-city neighborhood of Denver, CO and had a similar socioeconomic and ethnic breakdown. However, they were different schools and may have differed in their rules and policies towards students, faculty and staff. These differences may have had an impact on the students' and teachers' attitude toward education and learning.

Finally, being a research project may have affected the responses of the participants — especially dietary intake reports. Since the evaluation technique was the same for both the treatment and control group, any effect most likely would be similar for both the treatment and control group.

Chapter I

Literature Review

PREVALENCE OF OBESITY IN AMERICAN ADOLESCENTS

The prevalence of obesity, which is defined as a body mass index greater than the sex-specific 85th percentile (CDC, 1997, CDC, 1994, Gortmaker et al, 1996, Troiano et al, 1995, Must et al, 1994, and Gortmaker et al, 1987), has been steadily increasing among American adolescents for many years. The second National Health and Nutrition Examination Survey (NHANES II), conducted between 1976-1980 reported that the prevalence of adolescent obesity was only 5.7%. Results from NHANES III, which was conducted between 1988-1994, indicate that 12% of adolescents are now obese (CDC, 1997). In less than two decades, the prevalence of obesity in adolescents has doubled.

Researchers at the Centers for Disease Control (CDC, 1997) reported that even within the six year period of NHANES III (1988 to 1994) the prevalence of obesity in adolescents increased from 10.8% at phase I (1991) — further indicating the increasing prevalence of obesity in the United States. This

increase in prevalence is not limited to the adolescent population. The prevalence of obesity in adults and children is also increasing steadily (CDC, 1997).

The increase in the prevalence of obesity is thought to be "a result of a positive shift in energy balance in which energy intake from food exceeds energy expenditure in physical activity" (CDC, 1997). This seems to be supported by the fact that results from Phase I of NHANES III found a high prevalence of inactivity among Americans in all age groups (CDC, 1997). Television is a major source of inactivity — "children today spend more time viewing television than they do in school" (Gortmaker et al, 1996).

The National Longitudinal Survey of Labor Market Experience, Youth Cohort (NLSY), was a study which followed 1012 children, between the ages of 6 to 11 years, from 1986 to 1990 (Gortmaker et al, 1996). Results of this survey indicated during a 4-year period, television viewing time during childhood and adolescence was positively related to the prevalence and incidence of obesity , and negatively related to the reversal of obesity . In fact, "estimates of attributable risk indicated that more than 60% of obesity incidence in this population could be linked to excess television viewing time." Other studies have also shown significant relationships between television viewing and childhood and adolescent obesity (Dietz & Gortmaker, 1985, and Gortmaker et al, 1987).

Adolescence represents a critical period for the development of obesity, especially for females (Dietz, 1994). Long-term follow-up studies of adolescents have indicated that girls may be especially at risk for adult obesity if obesity is present or develops during adolescence and "that adolescent-onset obesity in females that persists into adulthood may herald a lifelong problem" (Dietz, 1994). However, the way in which adolescent-onset obesity leads to the continuance of obesity through adulthood is not well understood. Although, the two biological effects that are thought to contribute to obesity development during adolescence are changes in the amount and location of body fat (Dietz, 1997). "In girls, body fat changes from ~17% of body mass to ~24% of body mass over the period of adolescence," however, "in boys, body fat decreases over this same period." It is thought that this increase in body fat that occurs in girls may have a significant effect on the persistence of obesity. Therefore, adolescence is a crucial time for reversing obesity.

HEALTH RISKS ASSOCIATED WITH ADOLESCENT OBESITY

Obesity and overweight during childhood and adolescence is of great concern because it is likely to extend into adulthood. It has been estimated that 80% of overweight adolescents will become overweight adults, and that if adolescents do not lose the excess weight by the beginning of adulthood, the odds against them losing the excess weight during adulthood are 28 to 1 (Brownell and Kaye, 1982). If obesity extends into adulthood, it puts

individuals at risk for diseases and conditions later on in life associated with obesity, such as type II diabetes, cardiovascular disease, atherosclerosis, hypertension, gallbladder disease, gout, arthritis, and certain cancers (Must et al, 1992).

Some of the immediate health risks found in obese adolescents include increased blood pressure, increased total cholesterol and abnormal lipoprotein ratios (elevated serum LDL-cholesterol and triglycerides, and lowered HDL-cholesterol), and hyperinsulinemia (Berg, 1995) — putting the obese adolescent at risk for developing type II diabetes. This is of great concern since the incidence of type II diabetes has been increasing in young Americans. A recent study by Pinhas-Haimiel and colleagues (1996) found that the incidence of type II diabetes among the adolescents in Cincinnati has increased ten-fold since 1982. The mean BMI of these newly diagnosed type II diabetes adolescent patients was 37 — indicating a strong relationship to obesity. Haffner and colleagues (1991) also found that the incidence of type II diabetes was rising in young (25 to 34 years) Mexican Americans as well.

Obesity can have many psychological consequences as well. Adolescence is a time for developing self-image, and obesity can be detrimental to social and psychological development. Obese adolescents are often discriminated against and devalued by adults as well as their peers (Berg, 1995), and this can lead to feelings of rejection, isolation, withdrawal, depression, low self-esteem, low satisfaction with body weight, unstable self-

image and high self-consciousness about body image (Rolfes et al, 1990). These feelings are only aggravated by the usual feelings of anxiety that adolescents may have about their changing and growing bodies. Other psychological risks include "poor body image, which is 'imprinted' in adolescence, the increasing fear of being obese, and increasing preoccupation with size and shape" (Berg, 1995). Often, these feelings of rejection, fear, low-self esteem, and discrimination can lead to an increase in eating and a worsening of the obese condition (weight gain).

PREVALENCE OF OBESITY AND TYPE II DIABETES IN HISPANIC AMERICANS

According to the most recent National Health and Nutrition Examination Survey (NHANES III), 33% of American adults are overweight (CDC, 1997). People from non-white ethnic groups living in the United States — such as Hispanics — are thought to be at increased risk of being overweight/obese. In fact, more than 40% of the men and 50% of the women surveyed by the Hispanic Health and Nutrition Examination Survey (HHANES) were considered overweight or obese by the age of 40 years, and for women, with the prevalence of overweight only increasing with age (Pawson et al, 1991).

The prevalence of overweight/obesity is even greater among Mexican Americans than other Hispanic American populations (Nichaman & Garcia,

1991). According to NHANES II data, the prevalence of overweight was as high as 37% in Mexican Americans aged 35-64 years, whereas the prevalence of overweight in other Hispanic groups (Puerto Ricans and Cubans) was only approximately 25% for individuals in the same age group. In the Hispanic Health and Nutrition Examination Survey (HHANES), 33.5% of Mexican American men and 42.3% of Mexican American women were defined as overweight (BMI $\geq$ 27.8 for men or 27.3 for women), while 10% of Mexican American men and 16% of Mexican American women were defined as obese (BMI $\geq$ 31.1 for men or 32.2 for women) (Pawson et al, 1991 and Nichaman and Garcia, 1991). NHANES III found that 50% of Mexican American women were overweight (CDC, 1997). It appears that the prevalence of overweight in the Mexican American population is on the rise.

The Mexican American population is characterized by increased body fat, hyperinsulinemia, and insulin resistance (Haffner et al, 1991). Also, centralized obesity may have a higher prevalence in Mexican Americans than in whites, putting them at increased risk for heart disease and type II diabetes (Lopez & Masse, 1993). Data from NHANES II revealed that Mexican Americans are 2.1 times more likely to have type II diabetes than whites, which is a rate higher than that found in Cubans (1.5 times more likely than whites) and African Americans (1.6 times more likely than whites).

Not only do Mexican Americans have a higher prevalence of type II diabetes than non-Hispanic whites, but they also have a higher incidence.

Haffner and colleagues (1991) followed Mexican Americans and non-Hispanic whites examined in the San Antonio Heart Study for 8-years to track the incidence of type II diabetes. During the 8-year period, Mexican Americans continued to show a statistically significant increase in diabetes incidence. Obesity was found to be related to diabetes incidence, but it did not fully explain the excess incidence in Mexican Americans. Of particular concern was the fact that type II diabetes was greatly impacting Mexican Americans in the younger age groups, such as 25-34 year olds (at baseline). Twenty-three percent of Mexican American diabetic subjects were less than 45 years of age, whereas only 10% of non-Hispanic white diabetic subjects were in this age range. "Thus, not only do Mexican Americans have excess risk of diabetes and its microvascular complications, but that risk is concentrated among subjects who are in their productive years" (Haffner et al, 1991).

OBESITY, SOCIO-ECONOMIC STATUS, AND ACCULTURATION

Hispanics and other non-white ethnic groups in the United States who are from predominantly lower socioeconomic backgrounds, may be at increased risk for being obese because of their socioeconomic status (SES). Sobal and Stunkard (1989), who reviewed 144 published studies of the relationship between obesity and SES, found that regardless of ethnic background, SES was inversely related to obesity among women in developed countries. In fact, obesity was found to be six times more prevalent among

women of lower SES than among women of upper SES. The relationship between obesity and SES in children was less pronounced than that found in women, however the link of SES with obesity may increase with age. Several longitudinal studies have shown that as girls matured into women a powerful inverse relationship developed (Sobal & Stunkard, 1989). The same was not true for boys as they became men.

There are several variables that may help to explain the inverse relationship between SES and obesity. The first, and most important variable is probably dietary restraint and dieting (Sobal & Stunkard, 1989). Women from lower SES backgrounds diet less often than women from higher SES backgrounds. Some of the reasons for this are because women of higher SES: have greater access to weight control programs and 'diet' foods; have more education, giving them increased knowledge of nutrition and dieting; and may be more committed to the belief that thinness is desirable. The second variable is physical activity (Sobal & Stunkard, 1989). People of higher SES have more leisure time and more resources for recreational physical activity, and they may also be more knowledgeable about the benefits of exercise. The third variable is social mobility, which is specific for women. Upwardly mobile women (those whose SES is higher than their parents SES) were found to be significantly thinner than their counterparts whose SES declined or who had maintained the same lifetime SES. Again, as SES increased, body size decreased. The fourth variable is inheritance, which includes both

social and genetic influences on the relationship between SES and obesity (Sobal & Stunkard, 1989). It seems that genetic inheritance influences SES through intelligence and some metabolic predisposition to obesity; and social inheritance is influenced through the transmission from parent to child of values and beliefs about eating and exercise, as well as attitudes about obesity.

The San Antonio Heart Study (Hazuda et al, 1988) confirmed that as the SES of Mexican-American women increased, their risk of both obesity and type II diabetes decreased significantly. However, a stronger effect than SES was increased acculturation, which is the adoption of mainstream, non-Hispanic white behaviors, attitudes, and values. It was found in this study that as acculturation increased in Mexican-American men and women, the prevalence of diabetes and especially obesity decreased. This seems in contrast to other studies which reported that the traditional Hispanic foods are rich in complex carbohydrates, fiber and β carotene and that consumption of these traditional foods led to more nutritionally adequate diets than did consumption of 'mainstream' American foods (Romero-Gwynn et al, 1993, Kumanyika, 1990, and Guendelman & Abrams, 1995).

It appears that the relationship between obesity, socioeconomic status and acculturation in Mexican-Americans is complex. One possible explanation is Stunkard's postulate that there is a biphasic curve in the relationship between obesity and SES (Stunkard, 1975). Stunkard theorized that rising SES produces an increased prevalence of obesity up to a certain

point, after which, further increases in SES tends to decrease the prevalence of obesity. This biphasic curve also explains the relationship between acculturation and obesity (Hazuda et al, 1988). As the degree of acculturation increases, the prevalence of obesity also increases up to a certain point. Later, as acculturation increases further, the prevalence of obesity declines.

This biphasic curve has an 'ascending limb,' referred to as the 'modernization' process, and the 'descending limb' of the biphasic curve, also referred to as a 'postmodernization' or 'postwesternization' process (Stern et al, 1991). Some of the possible environmental factors of the 'modernization' process in Mexican Americans thought to 'diabetogenic' include increased intake of total calories, fat, and sucrose, decreased intake of total and complex carbohydrate, including fiber, and a decreased habitual level of physical activity. It has been theorized that during the 'postmodernization' process, as Mexican Americans become more affluent, they have become increasingly more health conscious and have taken steps to "reverse some of the perceived maladaptive features of classic modernization, thereby reversing the trend toward increasing obesity and perhaps also diabetes" (Stern et al, 1991).

ADOLESCENT FITNESS AND PHYSICAL ACTIVITY PATTERNS

Youth Risk Behavior Surveys from both 1990 and 1995 (Kann et al, 1996 and Heath et al, 1994) found that less than 40% of all adolescents do not

participate in physical activity appropriate for long-term health promotion (20 minutes activity, 3 or more times per week). This includes 29% African American, 35% Hispanic, and 39% of white students. Most adolescents spend much of their time in front of the television. Participation in vigorous exercise was higher among males than females and higher among white students than among those of other ethnic groups. Also, as students got older (high school juniors and seniors versus high school freshman and sophomores), they tended to spend even less time in regular physical activity.

Similar results were found by Zakarian and colleagues (1994), who looked at factors associated with vigorous exercise in a group of high school students from a predominantly ethnic minority and low SES population. Zakarian and colleagues discovered that males and younger students (9th & 10th graders) “participated in more vigorous exercise both during school PE and outside of school.” Year in school was also significant — as males and females got older (entered 11th & 12th grade) they were less likely to engage in vigorous exercise both during school and outside of school.

Self-efficacy is also an important factor in the continuance of vigorous physical activity outside of school requirements. Both males and females were more likely to continue engaging in vigorous exercise when they felt confident about their abilities to exercise — “suggesting the need to provide both males and females with successful exercise experiences which, in turn, may increase vigorous exercise” (Zakarian et al, 1994).

Support of the physical activity from family and friends was found to be important for adolescents (Zakarian et al, 1994). Peer support was a significant predictor of physical activity in male adolescents; while family support was significant for female adolescents.

Other factors that determine whether low SES and minority adolescents will continue to exercise vigorously outside of school include perceived barriers and benefits (Zakarian et al, 1994). Perceived barriers was highly significant for females (e.g. lack of time, lack of money, having no one to exercise with, and disapproval by family, especially father); therefore, if females were able to overcome barriers to exercise vigorously, they were more likely to continue exercise outside of school requirements. Perceived benefits were highly significant for males.

ADOLESCENT EATING PATTERNS

Eating patterns are a important part of adolescence. "They can express one's identity, signal the pubertal growth spurt, ignite power struggles, or reflect family traditions that are reassuring in a time of rapid change" (Adams, 1997). The development of eating patterns during childhood and adolescence can have an immediate impact on overall health, such as growth, intellectual development, iron deficiency anemia, and dental carries; as well as long-term consequences by increasing the risk of chronic diseases such as stroke, cancer, diabetes, and coronary heart disease. Total nutrient

needs are greater during adolescence than any other time of life (Rolfes et al, 1990). Yet, the food habits of adolescents are often irregular because of meal skipping — especially breakfast, between meal snacking and increased eating away from home at fast-food restaurants.

According to phase one of the Third National Health and Nutrition Examination Survey (NHANES III), which examined the diets of individuals between 1989 and 1991, adolescents consumed 34% of total calories from fat and only 49% of total calories from carbohydrates (Adams, 1997). These values do not meet the U.S. Dietary Guidelines of $\leq 30\%$ of calories from fat and 55% of calories from carbohydrates. According to NHANES III, the “major contributors of fat intake in teens are high-fat meats and luncheon meats, milk and ice cream, breaded and fried foods such as potato chips, and fat added to foods, such as butter or mayonnaise.”

The 1987-88 USDA Nationwide Food Consumption Survey was used to assess the nutrient intake of adolescents aged 11 to 18 years (Johnson et al, 1994). Researchers found that 68% of the adolescents surveyed consumed too much fat and 35.5% consumed too much cholesterol in their diets. It was also found that the adolescents consumed diets that were low in calcium, magnesium and phosphorus, which are associated with osteoporosis and poor bone health; low zinc intakes, which have been associated with poor growth in adolescent males; low vitamin A intakes, which may increase the

risk for developing some cancers; and poor iron intakes, which increase the risk of developing iron deficiency, particularly among females.

Another characteristic of adolescent eating is missed meals. Results from national surveys such as NHANES II and National Adolescent Student Survey (NASHS) have shown that approximately one-half of adolescents in the U.S. skip breakfast (Dausch et al, 1995) . This phenomenon is a concern since most health professionals consider breakfast as the most important meal of the day. The choice to consume or skip the breakfast meal may have consequences that surpass the basic notion of breakfast simply being a way to fuel up for the day.

A study conducted by Huang and colleagues (1997) suggested that eating breakfast could reduce fat intake and increase fiber intake. Subjects in this study (1,811 women, 817 men, mean age = 19.6 ± 3.0 years) completed 24-hour diet records during an undergraduate introductory nutrition class. The dietary intakes of the breakfast eaters (80% of men and 78% of women) were compared to the breakfast skippers. Researchers found that among young women, those who ate breakfast were significantly "more likely to get $\leq 30\%$ energy from fat than those who did not," with breakfast eaters consuming 28% of daily calories from fat versus the breakfast skippers consuming 40% of daily calories from fat. For both men and women, breakfast contained the "lowest mean percent energy from fat compared to other eating occasions." Other studies (Ruxton et al, 1993 and Gorbach et al, 1990) have shown that

children and adults who skipped breakfast consumed significantly greater amounts of high-fat snacks than those who ate breakfast.

A study by Summerbell and colleagues (1996) assessed the relationship between body mass index (BMI) and eating patterns in adults (n = 187) and adolescents (n = 33). When BMI was compared to dietary data obtained from 7-day weighed food records, the researchers found that in adolescents, a high BMI was associated with lower (or no) energy intakes at breakfast, a snacking between meals, and a 'gorging' pattern of feeding. Greater energy intakes at breakfast and eating small frequent meals — as opposed to gorging — were associated with a lower BMI in adolescents. Eating breakfast has value, not only can it lead to a lower daily fat intake, but it may also aid in the achievement and maintenance of a lower BMI.

Many adolescents typically skip breakfast, and yet, they "tend to eat more often than the traditional norm of three meals daily" (Shepherd and Dennison, 1996), implying between-meal snacking. Studies have shown that approximately three-fourths of all adolescents in the U.S. consume at least one snack per day, "with a range of one to seven snacks daily" (Dausch et al, 1995). Data from the National Health and Nutrition Examination Survey II (NHANES II) and the 1987 National Adolescent Student Health Survey (NASHS) also revealed that most adolescents (62% and 72%, respectively) consumed at least one high-fat snack daily. The 1995 Youth Risk Behavior Surveillance Survey (Kann et al, 1996) found that 39.5% of all students

surveyed consumed at least three high-fat snacks during the day preceding the survey. With 21% of total calories and 20% of total fat grams coming from between meal snacks (USDA, 1997), snack foods have become an important contributor to the adolescent diet (Dausch et al, 1995).

According to the 1989 Food and Nutrition Study, adolescents favored snacks such as potato chips, ice cream, candy, cookies, breakfast cereal, popcorn, crackers, soup, cake, and carbonated beverages (Dausch et al, 1995). Fruits and vegetables tend to be chosen least often as snack foods (Cross et al, 1994), which was also seen in the NHANES II and NASHS, where only 23% and 26% (respectively) of adolescents surveyed consumed at least one fiber-containing snack.

Adolescents tend to have diets low in fruits and vegetables. Neumark-Sztainer and colleagues (1996) found that 16.9% of adolescents reported consuming fruits and vegetables less than once a day, which was higher in Hispanic adolescents (18.8%) and those of low socioeconomic status (40%). Only 27% of adolescents participating in the 1995 Youth Risk Behavior Surveillance Survey reported consuming the recommended five servings of fruits and vegetables daily (Kaan et al, 1996). Data from the Continuing Survey of Food Intakes by Individuals (Krebs-Smith et al, 1996) revealed that adolescents (ages 12 - 18 years) consumed, on average, only 0.2 servings of green or yellow vegetables per day. It is safe to say that adolescents are consuming suboptimal levels of fruits and vegetables.

Many adolescents consume several meals per week at fast-food restaurants. Fast food meals contain few, if any, fruits and vegetables, and may contribute to the low dietary intakes of vitamins C and A (Rolfes et al, 1990). Fast food meals also tend to be high in energy , fat and sodium, and low in dietary fiber — all of which have been implicated in the progression of degenerative diseases later in life.

Nutrition education interventions targeted at adolescents often focus healthful eating. However, there is an underlying issue associated with “healthful” and “unhealthful” eating habits. A study conducted by Chapman and MacLean (1993) found that adolescents, especially females, were in conflict over whether to eat junk food or healthy food, and that this conflict symbolized the conflict that teens feel between maintaining family relationships and gaining autonomy as an adult. Junk food was found to be “associated with friends, being away from home, independence and parental disapproval,” while healthful foods were associated with family and home. Eating junk food was a way to “demonstrate an increasing independence from their family and a growing loyalty to their peer group.” However, the family was still important to the adolescent, and eating family food was one way to maintain family ties.

There is often a discrepancy between adolescents’ health knowledge and their behavior, and this seems to be true for healthful eating as well. Teens will readily acknowledge that they have poor dietary habits, eat too

many 'fast foods', do not eat the 'right foods', and choose foods of poor nutritional quality (Story & Resnick, 1986). However, teens also feel that there are too many barriers to healthful eating. Some of these barriers include access to healthful food choices, time limitations, convenience, taste, and the peer influence that represents unhealthful eating as socially acceptable (Story & Resnick, 1986, and Adams, 1997). Other important family barriers include: 1) difference between peer food choices at school and traditional foods served at home; 2) amount of parental support for reinforcing healthful eating and physical activity behaviors; and 3) family stressors that make healthy habits hard to form and maintain (Adams, 1997).

Most adolescents can identify healthful foods and eating habits, yet they "lack the ability to apply that knowledge in terms of basic food selection and preparation skills", as well as the skills necessary to overcome the barriers to healthful eating (Adams, 1997).

ELEMENTS OF SUCCESSFUL SCHOOL-BASED INTERVENTION PROGRAMS

Adolescents spend a significant amount of their day in school. School intervention remains an effective way to promote good health through peer influences, curriculum additions, environmental changes and family involvement (Perry et al, 1990). Public schools offer facilities for experiential learning (Kolbe, 1982) to practice healthful eating through cafeteria menu

modifications and to learn duration and intensity of exercise needed for optimal physical fitness. The schools are also ideal vehicles for disseminating information to students and their families and provide the basis for continuing interaction on a day-to-day basis.

Most of the nutrition and fitness educational intervention programs for children and adolescents to date have been conducted in a school setting. School settings are often used because they provide a means for continuous access to children and adolescents, and represent a useful mechanism for the dissemination of health information.

Little is known about the success of nutrition and fitness intervention programs for children and adolescents outside of the school setting. Of the 43 nutrition education research studies conducted in children or adolescent populations since 1980, only five studies were conducted outside of the school setting (Lytle, 1995), and only two of these studies met with some success.

As stated earlier, dozens of nutrition and health education interventions for school-aged children and adolescents have been conducted in recent years — some have been successful at promoting the desired behavior change, while others have not. Lytle (1995) reviewed 43 research studies of interventions done in children and adolescents and found that the six main elements required for interventions to be successful are: behavioral focus, use of appropriate educational theory, duration, family support, peer

support, self-assessment, and school environment. Another important element is teacher training.

Behavioral Focus

The focus of the intervention should be on specific behavior or behaviors related to specific health problem — like cardiovascular disease prevention or weight-loss. When the intervention is focused on a specific behavior it is more likely to be effective than general, broad educational programs. Specific behaviors may include increased consumption of fruits and vegetables, decreasing fat intake or use of salt.

An example of a successful program focused on specific behaviors was Killen and colleagues (1989 and 1988), who administered the 'Stanford Adolescent Heart Health' program to adolescents. This behaviorally focused education intervention emphasized cardiovascular disease prevention. Students exposed to this program significantly increased the frequency of regular exercise bouts, significantly decreased resting heart rate, body mass index, triceps and subscapular skinfolds, and a significant number of students also quit smoking. This program was successful because the program focus was specific — cardiovascular disease prevention, the curriculum was based on an appropriate educational theory (social-cognitive learning theory), and teachers were trained to disseminate the curriculum properly.

An example of an unsuccessful program was the 'Nutrition For Life' program (Devine et al, 1992). This nutrition education program was designed to supplement health courses taught by the school and focused on increasing general knowledge of nutrition and fitness — there was no behavioral focus. The program was administered to 1,865 junior high school students and caused a significant increase in knowledge and attitudes, but exposure to the program did not lead to significant behavior changes. This program was probably not successful because it was focused on increasing knowledge instead of changing a particular behavior.

Educational Theory

Interventions are more likely to be effective when they use suitable educational theories and research to drive curriculum development as well as development of learning activities and instructional methods used to promote specific behavior change (Lytle, 1995). Many of the general nutrition education interventions focus on increasing knowledge and changing attitudes about nutrition by using didactic teaching methods. The hope is that a change in behavior will occur as a result of increased knowledge and a change in attitude—most of these interventions are unsuccessful. Successful programs need instructional methods derived from appropriate theories and research such as the Social Learning Theory, that are experiential, active, and hands on (Lytle, 1995).

The 'Know Your Body' program is an example of a successful, nutrition education program (Resnicow et al, 1993, Resnicow et al, 1992, Resnicow et al, 1991, Resnicow et al, 1989, Walter, 1989, and Walter, 1988). The success of this program was due to several factors including: use of appropriate educational theories to guide the intervention (social learning theory and cognitive learning theory), use of learning activities which were based on a theoretical framework, use of learning activities which were developmentally and cognitively appropriate for students, extensive length of time — three to five years, teacher training, and involvement of school staff and student family members. Other examples of successful nutrition education programs for adolescents which were based on a theoretical framework include interventions by Killen and colleagues (1989 and 1988), Simons-Morton and colleagues (1991), King and colleagues (1988), and Brownell and Kaye (1982).

Duration

Interventions should be long enough in duration. Interventions are more likely to be effective if they devote adequate time and intensity to the program (Lytle, 1995). Many studies have shown that when programs are longer in duration, have more contact hours and have more components, they are more successful than the shorter, less intense programs (Lytle, 1995 and Contento et al, 1992). Walter (1989) administered and evaluated the 5-year nutrition education program, "Know Your Body". This program was

behaviorally focused and based on an appropriate theory — Social Learning Theory and Cognitive Learning Theory. Walter found significant decreases in blood total cholesterol, total fat intake and significant increases in carbohydrate intake. Many other studies looking at the affects of nutrition education on the knowledge, attitudes and behavior of children and adolescents have not seen significant behavior changes since they lacked the time and intensity required to make a significant impact and usually involved “only 10-15 hours of instruction over a 3-15 week period” (Contento et al, 1992).

Family and Peers

Interventions with children should involve the family. However, it has been suggested that family involvement does not seem to be as useful for programs aimed at adolescents as it is for programs aimed at children (Lytle, 1995). This may indeed be true, especially since adolescents spend more time with their peers and less time with their families. However, families are still important — adolescence is a time of attachment and interdependence with parents, even though there may be occasional periods of conflict.

Family involvement and support has been found to be an important and key element for successful weight control among children, adolescents and adults (Kingsley & Shapiro, 1977; Epstein et al, 1985 and 1990; Brownell et al, 1983; Mellin, 1987; Wadden, 1990; and Hart et al, 1990). Food and physical

activity habits are learned and reinforced within the context of the family unit (Frankle, 1985). To change food and physical activity habits, the individuals who manage the selection, preparation and distribution of food — usually the mother — and who monitor activity need to be involved in order for positive food and physical activity habits to develop. However, family involvement in the weight control of the child or adolescent can have a positive or negative influence, depending on the level of family functionality (Hertzler, 1981). A functional family has a strong positive influence on adolescent health and, likewise, a dysfunctional family can have a strong negative influence on an adolescent's past, present and future health (Serrano, 1993).

When a family malfunctions because of illness or parental separation, the chance of adolescents adopting risky health behaviors — from eating patterns to drug abuse — increases greatly (Urzúa, 1993). Health care professionals can help these adolescents from dysfunctional homes by (1) getting teens involved in juvenile organizations and (2) getting teens and their families involved in family support programs through school- or community- based programs.

Peer groups are a very important component of adolescent development and peer acceptance is the second most important contributor (after looks) to the self-esteem of an adolescent (Feldman & Elliot, 1990). Peer groups help adolescents search for their identity as a person, they help

individuals deal with new social structures like school and dating, and they may ultimately reflect adolescent life-style choices.

Peer support is so important that it may act as a buffer against psychophysiological problems. Studies of adolescents with Type I Diabetes have shown that when both males and females had low peer support, they were more likely to report negative (disease) symptoms. However, those with high peer support appeared unaffected — no negative symptoms (Ray, 1992). Since lack of peer support is considered a significant stressor, and stress can affect individuals physically, it is not surprising that peer support and acceptance is important in the social and physical development of adolescents.

Self-Assessment

Interventions with adolescents should incorporate a self-assessment component. Programs that incorporate self-assessment and feedback increases the effectiveness of the intervention for older children and adolescents (Lytle, 1995).

School Environment

The sixth element involves the school environment. Interventions are more likely to be effective if they include intervention in the school environment (Lytle, 1995). The Center for Disease Control (CDC, 1997) has

developed a list of ways in which the school environment can be changed in order to support nutrition education that occurs in the classroom:

1. schools can provide appealing, low-fat, low-sodium foods in vending machines and at school meetings and events,
2. school counselors and nurses can provide guidance on health and, if necessary, referrals for nutritional problems,
3. physical education teachers can help students understand the relationship between nutrition and physical activity,
4. school food service personnel can serve healthy, well-balanced meals in the cafeteria, and
5. school personnel can act as role models for healthy eating.

Teacher Training

One essential element that is often overlooked in school-based programs designed to improve nutrition and physical activity behaviors in children and students is teacher training. Teachers should be trained in nutrition and fitness education because behaviorally oriented programs require substantially more teacher preparation than other knowledge oriented programs (CDC, 1997 and Lytle, 1995). Also, the way in which a teacher implements the program itself is important because studies have shown that program effectiveness was significantly related to quality of teacher implementation (Resnicow et al, 1992, Resnicow et al, 1991, Killen et

al, 1989, Lewis et al, 1988). Since degree of teacher implementation in programs such as this has been shown to be significantly related to program, teachers should to be trained on how to disseminate the program properly. This can be accomplished by offering teachers workshops covering topics like: orientation, introduction, and purpose of the new school-based program, basic nutrition and fitness concepts, teaching methods based on the theoretical framework of program, familiarization with the various physical activities to be used in the program, and training in other behavior change techniques. Also, regularly scheduled sessions can be offered to teachers which will help the teacher prepare for upcoming topics and events — a sort of 'refresher' course.

Summary

Programs that incorporate most, if not all of the above elements are more likely to be effective. This is especially true when a program is behaviorally focused rather than focused on increasing knowledge. Examples of these successful nutrition and health education interventions include: the 'Know Your Body' program (Resnicow et al, 1993, Resnicow et al, 1992, Resnicow et al, 1991, Resnicow et al, 1989, Walter et al, 1988 and Walter, 1989), the 'Stanford Adolescent Heart Health' program (Killen et al, 1989 and Killen et al, 1988) and other programs by Simons-Morton and colleagues (1991), King and colleagues (1988), and Brownell and Kaye (1982). Unsuccessful nutrition

education programs for children and/or adolescents that focused only on increasing knowledge include programs implemented by Devine and colleagues (1992), Byrd-Bredbenner and colleagues (1984), Byrd-Bredbenner and colleagues (1988), and Tinsley and colleagues (1985).

In summary, the school-based educational interventions that were most successful at changing behavior in children and adolescents were those that: 1) focused on changing a specific behavior or behaviors related to a specific health problem; 2) used an appropriate theory to guide the development and implementation of the program as well as the learning tools/activities; 3) were conducted over an adequate amount of time — at least 3 months; and 4) trained teacher(s) how to disseminate the curriculum and the materials properly.

NUTRITION EDUCATION THEORIES

The theoretical model behind the intervention program presented was Prochaska's Transtheoretical Model of Behavior Change. Other theories that were incorporated into this model included Social Learning Theory and Bandura's Self-Efficacy model, which is a part of the Social Learning Theory.

Prochaska's Transtheoretical Model of Behavior Change

The basis of the development, intervention and evaluation of behavior change was Prochaska's Transtheoretical Model of Behavior Change

(Prochaska et al, 1994, Ruggiero & Prochaska, 1993, and Mhurchu et al, 1997, Greene et al, 1994, and Prochaska et al, 1988), also known as Prochaska's Stages of Change Model. The theoretical processes in this model were selected from a variety of commonly used behavior change techniques, thus the term *transtheoretical*. The Stages of Change model is comprised of several stages of change — each stage reflecting the individual's readiness to change a particular behavior (Ruggiero & Prochaska, 1993).

Understanding which stage an individual is at becomes important when considering progression towards the next stage. Listed below are the stages of change defined by Prochaska. It should be noted that movement through the stages is not necessarily linear, it follows more of a spiraling pattern.

- The precontemplation stage describes when individuals are unaware that they have a problem and are resistant to modify their behavior.
- The contemplation stage describes when individuals are aware that they have a problem and are seriously thinking about resolving it within the next six months.
- The preparation stage describes when individuals have made a commitment to take action within the next 30 days.

- The action stage describes when individuals have made notable overt efforts to change.
- The maintenance stage describes when individuals have stabilized behavior change, and have sustained the change for at least six months.
- Relapse can occur at any stage, which brings the individual back to a previous stage (Ruggiero & Prochaska, 1993). Relapse tends to be the rule rather than the exception. This "spiral" pattern of change allows individuals to recycle through the stages, and potentially learn from mistakes, which will eventually lead to the last stage.
- The termination stage describes when an individual has stopped relapsing, and has stabilized and sustained the behavior change for at least one year.

This model, as well as providing a theoretical framework addressing ways to accelerate the rate of behavior change, also has the ability to categorize behavior change into stages along a continuum. Since cognitive learning, social learning and performance accomplishments are emphasized, this model is supported particularly well by the Social Learning Theory and Bandura's Self-Efficacy model. Many constructs of the Social Learning Theory which promote behavior change are similar, if not identical, to the processes of change in the Stage of Change model.

In addition to the stages of change, the model also incorporates ten processes of change (Prochaska et al, 1994). The processes of change describes how to change. At each stage individuals use different psychological processes and require different approaches to move them to the next stage (Prochaska et al, 1994). The ten processes of change described by Prochaska are:

- **Consciousness raising** — Increasing information about oneself and the problem behavior by way of observations, confrontations and interpretations.
- **Helping relationships** — Being open and trusting about problems with someone who cares, forging therapeutic alliances, obtaining social support, and joining self-helping groups.
- **Dramatic relief** — Experiencing and expressing feelings about one's problems and solutions by such activities as psychodrama and role playing (i.e. being able to share with others what it feels like to be overweight OR how to deal with others when they make fun of me).
- **Environmental reevaluation** — Assessing how one's problem affects others (i.e. family and friends) around them.
- **Self-reevaluation** — Assessing how one feels and thinks about oneself with respect to the problem behavior.

- Self-liberation or Commitment — choosing and committing to act on a belief in one's ability to change, make decisions, and adopt new resolutions.
- Countering — Substituting alternative constructive behaviors for the problem behavior.
- Environmental control — avoiding or countering stimuli that elicit the problem behavior. Changing one's environment so that problem stimulus is reduced.
- Reward — Rewarding oneself or being rewarded by others for making changes, by using contingency contracts and self-rewards.
- Social liberation — Developing appropriate alternatives for non-problem behaviors available in society, advocating for the rights of the oppressed, and encouraging policy interventions.

The following lists the different processes used to encourage movement from one stage to the next progressive stage:

- Precontemplation to Contemplation — consciousness-raising, helping relationships, dramatic relief, and environmental reevaluation
- Contemplation to Preparation — consciousness-raising, self-reevaluation, and helping relationships

- Preparation to Action — self-reevaluation, helping relationships, and commitment
- Action to Maintenance — countering, helping relationships, environmental control, reward, and social liberation

Prochaska and DiClemente developed this model by (Prochaska, 1995) studying smokers who had successfully stopped smoking on their own and smokers who had undergone treatment programs. Since its' development 14 years ago, this theory has been applied to other behaviors such as mammography screening, adolescent delinquent behaviors, quitting cocaine, exercise acquisition, and dietary change (Mhurchu et al, 1997). However, the "complexity of dietary change has made it more difficult to apply the model in this area". It is more difficult and complex to categorize dietary change than it is to assesses stage of change in behaviors where assessment revolves around the cessation or acquisition of the behavior (i.e. smoking or starting an exercise regimen). Assessment of stage of dietary change is also difficult since it depends on an individual's level of dietary knowledge and an individual's perceived dietary habits, which are often inaccurate.

To date, there has not been any published studies that have looked at the use of the stages-of-change model for dietary change in adolescents. Given the complexities involved in truly assessing stage of dietary change (Steptoe et al, 1996, Lamb & Sissons, 1996, Laforge et al, 1994, Greene et al, 1994, Bowen et al, 1994, and Curry et al, 1992) — such as knowing whether

reported dietary intake is valid, and given the possibility that adolescents, as well as many adults, do not have sufficient knowledge to truly evaluate the healthfulness of their diets (Mhurchu et al, 1997) it is indeed possible that this model is inappropriate for use in adolescents. To make this model more appropriate for use in the present research, several precautions have been taken. First, elements and constructs from the Social (cognitive) Learning theory and Bandura's Theory of Self-Efficacy have been incorporated into the theoretical framework. Second, the different processes of change to encourage movement from one stage to the next have been used throughout the curriculum so that students learning about the same subject would be encouraged to move along the continuum, even though they might be in different stages of change.

Social (cognitive) Learning Theory

Social Learning Theory (SLT) addresses the important psychosocial issues underlying health behavior and the methods for promoting behavior change (Bandura, 1977a). It emphasizes the three-way interaction between what people think (their conceptions) or personal factors, environmental influences, and their behavior. The crucial factors of this theory are: 1) people's capability to symbolize the meanings of behavior, 2) to foresee the outcomes of given behavior patterns, 3) to learn by observing others, 4) to self-determine or self-regulate behavior, and 5) to reflect and analyze the

experience (Contento et al, 1995). This theory is attractive to health educators "because it approaches the explanation of human behavior in terms of a continuous interaction among cognitive, behavioral, and environmental determinants" (Parcel & Baranowski, 1981).

Both Bandura (1977a) and Mischel (1973) have formulated a number of constructs important in understanding the intervention on health behavior. These constructs include: reciprocal determinism, environments and situations, behavioral capacity, expectations, expectancies, self-control and performance, observational learning, reinforcement, self-efficacy and managing emotional arousal (Glanz, 1990).

Reciprocal determinism describes how the environment may be as influenced by the human learner as the learner is by the environment; there is a dynamic interaction between the person, that persons' behavior, and the environment in which that person is in (Glanz, 1990, Parcel & Baranowski, 1981). All three components are constantly interacting. If one component is changed, it has implications for the others.

The *environment* represents all factors that are external to the person (Glanz, 1990). The environment can provide both the stimuli and the reinforcements for behavior (Parcel & Baranowski, 1981). *Situation* is the persons' perception (cognitive representation) of the environment.

Behavioral capacity is the knowledge and skill necessary to perform a certain behavior (Glanz, 1990). This construct "maintains that if a person is to

perform a particular type of behavior, he or she must know what the behavior is and how to perform the behavior.”

Expectations are the expected outcomes of behavior (Glanz, 1990). A person expects or anticipates that certain events or outcomes are likely to occur in a particular situation.

Expectancies are the values placed by a person on what is expected to occur (Parcel & Baranowski, 1981). Expectancies influence behavior in that, “if all other things are equal, a person will choose to perform an activity that maximizes a positive outcome or minimizes a negative outcome” (Glanz, 1990).

Self-control states that a person may gain control of his or her own behavior through directing that behavior and controlling the reinforcers (Parcel & Baranowski, 1981). A specific goal might help promote self control (i.e. eat only three cookies today instead of eating 6) (Glanz, 1990).

Performance is the type of behavior that focuses on achieving a goal (Glanz, 1990).

Observational learning (vicarious experience) “occurs when an observer watches the action of another person and observes the reinforcements that the other person receives” (Glanz, 1990).

Reinforcement represent the responses to a persons’ behavior that increases or decreases the likelihood of behavior reoccurrence (Glanz, 1990). Reinforcements can either be positive (i.e. a reward) or it can be negative (i.e.

punishment). Positive reinforcement “increases the likelihood that the behavior will be repeated”. However, negative reinforcement “does not always decrease the likelihood that a certain type of behavior may be performed”.

Self efficacy is the confidence in one’s ability to perform a certain behavior and it is strongly related to one’s ability to perform that behavior (Bandura, 1977).

Excessive *emotional arousal* can inhibit learning and performance (Glanz, 1990). Emotional coping responses are the strategies that a person uses to deal with the anxiety and other emotional stimuli — enabling the person to perform the desired behaviors (Parcel & Baranowski, 1981).

Parcel and Baranowski (1981) suggested that health education interventions should incorporate these constructs by:

1. providing opportunities for the learner to observe and practice performing certain tasks (environment, observational learning, and behavioral capacity),
2. identify learner misconceptions and promote healthful norms (situation),
3. promote self-efficacy at changing behavior in the learner by promoting behavior modification in small, achievable steps,
4. clarify for the learner suitable expectations and expectancies so he/she will not be distracted from achieving a change, and finally,

5. enable the learner to cope with emotional responses that are the result of learning about a health problem.

These suggestions enable teachers to bridge the gap between constructs of the theoretical model and how to incorporate them into the classroom.

The Social Learning Theory is the most widely used theory in documented nutrition education programs targeted at children and adolescents (Lytle, 1995). Nutrition education interventions for children and adolescents using the SLT typically address the constructs of behavioral capacity (providing both knowledge and skills to do the desired behavior), self-efficacy, incentives and reinforcement, opportunities and barriers, intentions to act, expectations, and peer and adult role models (CDC, 1997 and Lytle, 1995). It has been suggested that the SLT compliments the stages of change framework (Contento et al, 1995). Indeed, this project used some of the constructs of this model for curriculum development and implementation.

Bandura's Theory of Self-Efficacy

This theory postulates that confidence in one's ability to perform a certain behavior is strongly related to one's ability to perform that behavior (Bandura, 1977). When applied to behavior modification, a strong sense of self-efficacy indicates that people believe they will succeed at a task, while a weak sense of self-efficacy is associated with an inclination towards failure.

There are two distinct expectations that must be considered when trying to make a behavior change — the outcome expectation and the efficacy expectation. The outcome expectation is a person's belief that a certain behavior will lead to certain outcomes. If the outcome expectation is valued highly, the behavior change will more likely occur. An example of an outcome expectation would be a person's belief that if people exercise, they can become physically fit. The efficacy expectation is the conviction that one can successfully execute the behavior to produce the outcome. An example of an efficacy expectation would be the following statement, "I know I *can* exercise three times per week." Efficacy expectations determine how much effort one will expend and how long they will persist in the face of obstacles and aversive experiences in order to change behavior (Bandura, 1977).

Efficacy expectations vary in magnitude, generality and strength — all of which affect performance (Bandura, 1977). Magnitude refers to the level of difficulty. Generality is when some experiences create efficacy expectations only for a specific behavior, while other experiences create efficacy expectations that extend to a variety of situations. Strength refers to the resoluteness of one's conviction that one can perform the behavior change. Strong expectations will persevere while weak expectations are easily extinguished.

The sources of efficacy expectations include performance accomplishments, vicarious experience, verbal persuasion and emotional

arousal (Bandura, 1977). Performance accomplishments are the most influential source of efficacy expectations because it is based on experiences of personal mastery. Strong efficacy expectations are developed through repeated successes. Experiences based on performance accomplishments produce higher, more generalized and stronger efficacy expectations than other sources of efficacy expectations.

Vicarious experience involves observing others successfully perform a behavior change, and then the observer believes that he/she can accomplish the behavior change too. Verbal persuasion is the act of convincing someone to believe that they are capable of performing a behavior change. Emotional arousal can be motivational (e.g. listening to an inspiring testimonial of how an individual overcame personal problems, started an exercise program and eventually lost weight), but it can also be debilitating if arousal is too high. Arousal can be motivational if one perceives themselves of handling the behavior change.

Beliefs of self-efficacy are tied closely to the performance of many behaviors, including exercise and weight-loss (Marcus et al, 1992) and self-efficacy measures have been found to be related to Prochaska's Stages of Change for both exercise (Marcus et al, 1992) and smoking (DiClemente et al, 1985). Marcus and colleagues (1992) looked at the relationship between self-efficacy and the stages of change for exercise behavior and found that individuals in the precontemplation and contemplation stages for exercise

had significantly lower exercise self-efficacy scores than individuals in the maintenance stage, who had the highest exercise self-efficacy scores.

Because this theory has elements that are incorporated into both Prochaska's Stages of Change model the Social Learning Theory, it was used as part of the theoretical model for curriculum development in the present research study.

DIETARY INTAKE ASSESSMENT METHODS

Many types of dietary assessment tools have been developed for measuring dietary intake in humans. Methods of assessment range from quantitative methods, such as the weighed food record, to qualitative methods, such as the food frequency questionnaire. However, there does not seem to be one method that is ideal for all study situations. The selection of a dietary method should depend on the goal of the study, the accuracy of the dietary data required, and the funds and personnel available (Angus et al, 1989). The weighed food record, diet history, diet recall, diet record, and food frequency will each be reviewed below.

Weighed Food Record

A weighed food record is an inventory of all foods eaten by an individual in a specified period of time, the amounts being determined by direct weighing (Sanjur, 1982). Food is weighed immediately before eating,

with leftovers also weighed to get an exact weight of consumed food; the food and its weight are then recorded (Bingham et al, 1988). This is one of the most accurate methods of calculating food intake; however, it is expensive, time-consuming and not necessarily indicative of daily intake due to the weighing process itself. Because the weighed food record requires a high degree of willingness to participate, it is usually only appropriate for small groups of volunteers in a research setting (Sanjur, 1982). Thus, routine assessment of food intake for a large study group requires a quicker and simpler method than the weighed food record (Angus et al, 1989).

Diet Record

The diet record method requires that the subject write down everything eaten during varying lengths of time; usually three to seven days. Measurements of food are based on weights, household measures, or estimated quantities over a stated period of time (Sanjur, 1982). This method may not be as accurate as weighed food records, but it is a quicker and simpler way to assess diets of large numbers of subjects; and cooperation rates are likely to be higher (Nelson, 1988).

Several factors affect the validity of the diet record method. The faithfulness of the subject in filling out the record and the ability of the subject to estimate quantities of foods both affect validity (Sanjur, 1982). The number of days that the food record is kept may also affect validity; an

insufficient number of diet-record days may decrease its true validity (Potosky et al, 1990).

Diet History

The diet history method was developed by Burke and Stuart (Block, 1982) to assess an individual's total food intake and usual meal pattern over long periods of time. This method "includes any method which consists of an extensive interview designed to elicit the usual or customary diet" (Haraldsdottir, 1988).

A diet history is best obtained by a nutritionist or someone with appropriate training (Haraldsdottir & VanStaveren, 1988). A true diet history consists of four parts: 1) the subject is asked to provide information about eating patterns over an extended period of time; 2) the subject is asked to recall the actual food eaten during the preceding 24 hours; 3) the interviewer assists the subject in compiling a list of foods usually consumed by the subject; and finally, 4) as a cross-check, the subject is asked to complete a 3-day diet record (Klaver et al, 1988).

The diet history method has several advantages. It provides information on the subject's diet over a long period of time requiring limited effort so that high cooperation rates can be achieved in surveys (Haraldsdottir, 1988). Diet histories are useful in studies of food habits, in epidemiological

studies in which past food habits and preferences are important (Sanjur, 1982).

The diet history method has disadvantages, as well. It is based entirely on an individual's memory and report, so it can be highly subjective. It asks about regular eating patterns, so irregularities in the diet are easily underestimated (Haraldsdottir, 1988). This method is also time-consuming. There are many other errors that can be made when using the diet history method including: 1) omitting foods eaten or adding foods not eaten; 2) estimating portion sizes incorrectly; 3) incorrectly estimating frequency of food intake; 4) incorrectly coding the food consumed; and 5) present diet may bias the recall of the past diet. The reliability of this method, based on repeated trials of a diet history, has been found to be very good (Block, 1982); however, the validity of the method is not known.

Diet Recall

The diet recall method determines the actual food intake of an individual, usually during the previous 24-48 hours, by using an interview, a questionnaire, or a computer program (Loken, 1988). The dietary recall has been found valid in some studies, while results from others suggest that the recall method underestimates the actual intake (Block, 1982). Validity depends on how the study was designed, how the quantities have been estimated, and how the results have been expressed (Loken, 1988). Also, this

method has been shown to be valid for diets of groups but not for diets of individuals (Gibson, 1990 and Block, 1982) because a single (24-hour) diet recall will not necessarily reflect usual intake. The accuracy of the dietary recall method seems to be improved by repeated recalls and by increasing the sample size (Loken, 1988).

The diet recall method has several advantages. It is quick and simple to perform; it places minimal burden on the participant; it is applicable to most target groups; it is inexpensive; and the response rates are high compared to other dietary methods (Loken, 1988). The diet recall method has disadvantages as well. Some participants experience difficulties with memory and food descriptions, and there can be large intra-individual or day-to-day variation found in many groups, especially in industrialized countries (Loken, 1988).

Food Frequency Questionnaires

The food frequency method uses questionnaires to identify how often an individual consumes certain foods during a specified time period, usually a day, week, or month. These questionnaires are usually developed for specific purposes and specific population groups (Haraldsdottir & Van Staveren, 1988). To estimate nutrient intake for the food frequency, the scores for individual food items are multiplied by the nutrient content of the local standard portion or estimated portion size. There are several ways a food

frequency questionnaire can be given, by mail, by phone, or by conducting a short interview (Haraldsdottir & Van Staveren, 1988).

The food frequency method has many advantages. Food frequency questionnaires are easy to administer. They require minimal coding; they require little training on the part of the interviewer and subject; they are easier for the subject to fill out than diet recalls or records — especially if portion size estimates are given; they are inexpensive; they are quick; and they can cover a longer time period than a 24-hour diet record or recall (Block, 1982, Haraldsdottir & Van Staveren, 1988, and Margetts et al, 1989). These advantages allow more subjects to be included in a study using the food frequency method than with more time-consuming methods, such as a diet history or a diet record. This, in turn, increases the representativeness of the study sample and statistical power of the analysis (Margetts et al, 1989). The disadvantages are that food frequency questionnaires can be difficult to develop, and they provide only descriptive information, so nutrient calculations are limited (Sanjur, 1982, and Haraldsdottir & Van Staveren, 1988). Furthermore, they are dependent on the subjects' memory, and the nutrient values tend to be lower than those obtained by diary methods (Stoff et al, 1983).

Several factors affect the accuracy of the food frequency method. One study reported that "simple estimates of portion size (small, medium, or large) produce somewhat more accurate results than classification of all

portions as medium" (Cummings et al, 1987). This same study found that exact estimates, in terms of cups and ounces, may produce less accurate estimates of calcium intake than simple estimates of portion size such as small, medium and large. A food frequency questionnaire is more likely to be accurate when it is used to estimate a limited number of dietary components — such as dietary fat and cholesterol — rather than the total diet (Haraldsdottir & Van Staveren, 1988).

Problems In Dietary Intake Assessment

Studies which assess the dietary intake of children and adolescents typically rely on diet recalls during a one-on-one interviews by a trained interviewer and reflect short time periods such as one or two days (Frank et al, 1992). Food frequency questionnaires are also used quite often with adolescents (Rockett & Colditz, 1997) and are indeed appropriate when describing eating patterns rather than nutrient intakes (Nicklas et al, 1989).

Two other difficulties that are often encountered with dietary assessments — whether in children, adolescents, or adults — are the issues of response set bias and the underreporting of energy intake. Response set bias is where "participants report eating diets that match the goals of the intervention program rather than what they actually ate" (Kristal et al, 1998). This can lead to a bias towards overestimating intervention effectiveness. Response set bias is often due to a desire on the part of participants to report

what they consider to be socially desirable dietary intake (Kristal et al, 1998).

The desire for social approval on the part of participants can also contribute to underreporting of energy intake. It was found in the NHANES III survey that 18% of men and 28% of women underreport energy intake (Briefel et al, 1997). Also, underreporting rates were higher among overweight people, especially overweight females.

Much consideration should be made when choosing a dietary assessment instrument for use in any population. The instrument should be age appropriate — shouldn't ask young children to read and fill out a food frequency questionnaire — and culturally relevant, by including frequently eaten foods, if applicable.

Chapter II

Materials and Methods

RESEARCH HYPOTHESES

The goal of the present research was to develop a 2-year nutrition curriculum targeting sedentary, inner-city adolescents living in Denver, Colorado. A secondary goal was to evaluate whether exposure to the developed curriculum improved knowledge, attitudes, behaviors, and certain physiological parameters. It was projected that exposure to such a curriculum would lead to improved metabolic fitness and reduced risk of diseases associated with obesity and a sedentary lifestyle.

The following are specific hypotheses regarding the present research:

1. Exposure to the curriculum would significantly increase knowledge of nutrition and fitness.
2. Exposure to the curriculum would significantly improve attitudes towards nutrition.

3. Exposure to the curriculum would lead subjects to progress from one stage (Prochaska's Stages of Change) to the next concerning fat intake behavior.
4. Exposure to the curriculum would lead subjects to progress from one stage (Prochaska's Stages of Change) to the next, concerning exercise frequency.
5. Exposure to the curriculum would significantly improve self-efficacy towards choosing to eat low-fat foods.
6. Exposure to the curriculum would significantly improve self-efficacy towards exercise.
7. Exposure to the curriculum would significantly improve behaviors. This would be determined by measuring the quality of dietary intake and decreasing fat intake. It would also be accomplished by the significant improvement in physical fitness parameters.
8. lead to a significant change in body composition, with a lower body mass index, lower percent body fat, and lower waist-to-hip ratio.

PROJECT OVERVIEW

This was a 3-year study, with the first year devoted to curriculum development, which included a semester-long pilot test, and the final 2 years devoted to the actual administration of the intervention program in a high school setting. The design of this study was considered a quasi-experimental design since subjects were not randomly allocated to either the treatment or control group. Subjects in this study were considered as belonging to 'pre-

existing' groups since they already attended either the treatment school or the control school. In particular, this research study was a 'static group pretest-posttest design' (Fraenkel and Wallen, 1993).

The goal of the 2-year curriculum was to prevent and/or reverse obesity by promoting metabolic fitness in sedentary, inner-city teens by modifying food intake and increasing physical activity. Figure 1 shows a diagram showing how exposure to the curriculum would eventually affect metabolic fitness. Originally, the nutrition curriculum was to be one part of a two-pronged curriculum integrating both nutrition and physical fitness, with another team developing the physical fitness part of the curriculum. Although sections of this curriculum were developed, it was never implemented or tested. As will be explained later, exercise and physical activity was a part of the 2-year intervention program, however, they were not a part of the nutrition curriculum presented here. Figure 1 illustrates how the nutrition curriculum (lower half of figure) was designed to affect nutrition knowledge and attitudes, then food intake, and finally metabolic fitness.

The philosophy behind modifying food intake for this intervention program was not necessarily to promote a strict, low-fat diet. Students were taught that there were no 'bad' foods and that any food can be a component of a healthy diet — moderation and variety was the key. Students were also taught how to make healthful food choices, such as foods low in fat, in a

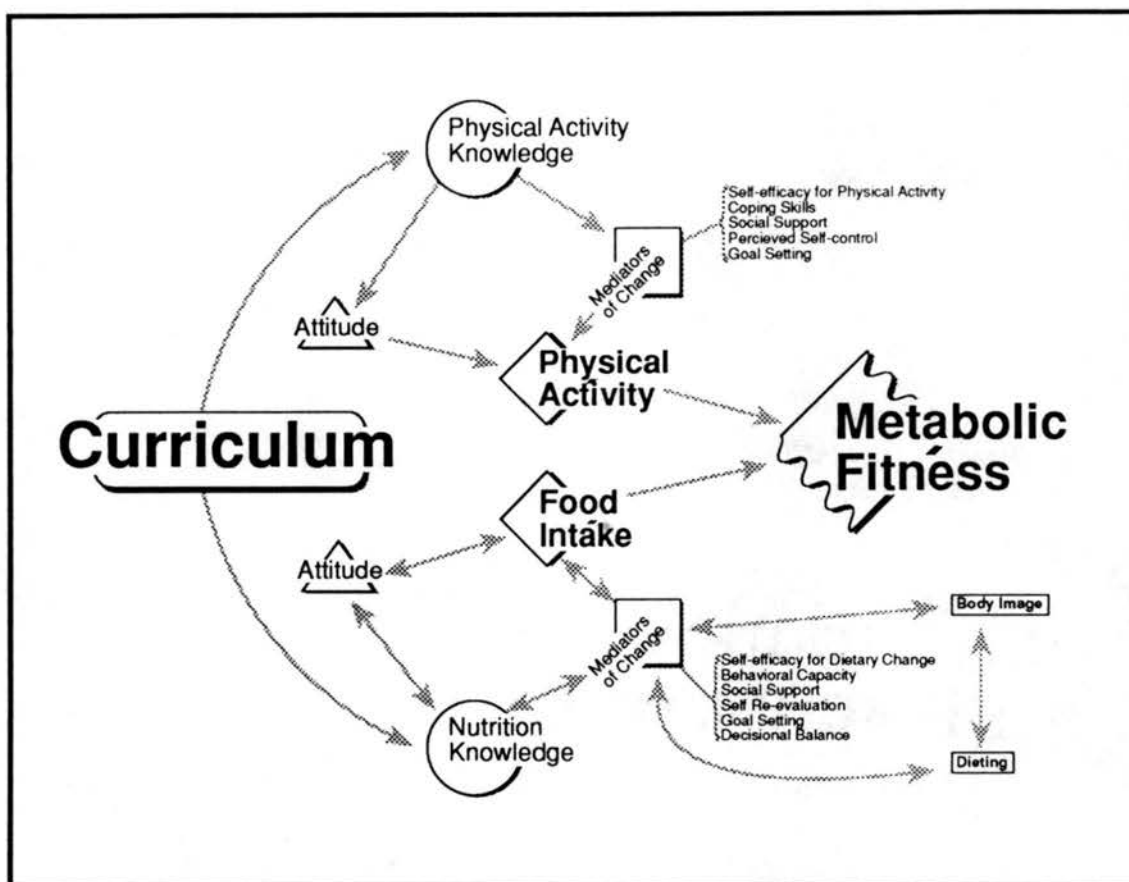


FIGURE 1 Design of Two-Year Intervention Program

variety of different situations and settings. This intervention program was not marketed as a 'weight-loss' class. The consistent message that was conveyed to participants throughout was that one could be healthy and fit — at any size — by eating a healthful diet and getting regular physical activity.

Subjects

There were a total of 148 subjects who voluntarily enrolled in this 2-year intervention program, forty-two in the treatment group and 106 in the

control group. Both treatment and control subjects consisted primarily of sedentary high school students, both males and females, enrolled in one of two inner-city high schools in Denver, Colorado.

Subjects were not randomly allocated to either the treatment group or the control group. Subjects in this study were allocated to their groups via 'convenience sampling.' If subjects happened to attend the treatment school (Abraham Lincoln High School, Denver), they were eligible to be in the treatment group. If subjects happened to attend the control school (North High School, Denver), they were eligible to be in the control group.

Abraham Lincoln High School (ALHS) was chosen to be the treatment school for several reasons. First and foremost, faculty at ALHS initiated the whole program by asking researchers at the University of Colorado Center for Human Nutrition to initiate some sort of intervention program that would address the increasing incidence of overweight students at ALHS. Secondly, the administration at ALHS, as well as the Denver Public School system, was enthusiastic and receptive to such a program at the school. Third, ALHS was one of the few high schools in the Denver area that had a well-established school-based health clinic.

North High School was chosen as the control school because it most closely matched the treatment school demographically, and because the administration of the school was willing to participate in the study. North High School had an established school-based clinic, it had a similar social and

ethnic mix to the treatment school, and it was located close to the treatment school. Both the treatment and control schools were located in an inner-city neighborhood of Denver, Colorado; and both schools were located within 5 miles of each other, on the same street.

Recruitment for the treatment subjects was through three mechanisms. First, recruitment occurred directly via advertisements and announcements at the school. Second, referrals were made from the school-based clinic at Abraham Lincoln High School. The school nurse and social worker referred students who were overweight and who they thought might be interested in a program to improve health. Finally, oral presentations were made to the entire freshman class. During these presentations, students were offered information regarding the program, and students were asked to indicate if they had an interest in participating in the program. The program was not advertised as a weight-loss program, but rather a program to promote nutrition, fitness, and a healthy lifestyle. Most of the participants were recruited via the presentations.

Recruitment for the control subjects was through two mechanisms. At first, direct recruitment was conducted through announcements in home-rooms and advertisements posted at the school. These methods attracted only a few interested participants. Finally, the physical education department at North High School allowed the research team to come into their classes during class time to recruit, and then test all interested students currently

enrolled in a physical education class.

In order to participate in the study, all subjects and their parents were required to read and sign an informed consent form approved by the Colorado Multiple Institutional Review Board Review Board for Human Subjects and the Colorado State University Human Research Committee (Appendix C). The only other criteria to participate in this study, whether in treatment or control group, was that students had to be in their freshman or sophomore year of high school. Otherwise, all students were allowed to participate, regardless of ethnic background, gender, or whether they were overweight, underweight, active, or sedentary. So, approximately one-half of treatment subjects and one-fourth of control subjects recruited into this study were considered overweight.

Both the treatment and control subjects received incentives to participate in this study. For subjects in both groups, a sum of \$25.00 was paid to each subject who completed all questionnaires and physical measurements for each time period (i.e. baseline measures in Fall '95 or post-test measures in Spring '97). In addition, subjects in the treatment group received school credit towards high school graduation.

Nutrition Education Intervention

The intervention subjects received two years of nutrition education, beginning in the Fall 1995 semester, and ending in the Spring 1997 semester.

The control group received no nutrition education, except that which would normally be taught in required science, health, or physical education classes.

During year 1 of the intervention, high schools in the Denver Public School (DPS) system were on a 'block' schedule. Therefore, the intervention subjects met only 3 days per week, 75 minutes per day, for a total of 225 minutes (3.75 hours) per week. Subjects were divided into four groups of 12 to 13 individuals. During year 2 of the intervention, DPS switched to a daily schedule, so the intervention subjects met 5 days per week, 45 minutes per day, for a total of 225 minutes (3.75 hours) per week. Due to a loss of subjects and scheduling needs of participants, subjects were divided into three groups of 8 to 10 individuals. Subjects who were grouped together during year 1, were not necessarily grouped with the same subjects during year 2. During both year 1 and year 2 of the intervention, half of the class time (over the course of a week) was spent doing various sports, while the other half was spent learning about nutrition, fitness and health.

CURRICULUM DEVELOPMENT

Curriculum development started during the school year (1994-1995) prior to the beginning of the 2-year intervention program. As a first step in developing the curriculum, multiple formative evaluation methods were used to assess the present physical activity patterns, eating habits, nutrition knowledge, views on appearance, interests, incentives and barriers to class

involvement and general needs of an inner-city adolescent population living in Denver, Colorado. These methods included (1) review of published dietary surveys of adolescent eating patterns (as discussed in literature review), (2) review of other published nutrition education interventions for adolescents (as discussed in literature review), (3) focus groups with students and parents, (4) a 1-semester pilot test of the preliminary curriculum, and (5) consultation with a program advisory committee. This formative evaluation provided information on designing the overall structure of the intervention, amount and type of information to present in the developed curriculum, and barriers and motivators to change in this particular population.

Focus Groups

Focus groups were an integral part of the formative evaluation. Seven focus groups were initially conducted: three with adolescent females, one with adolescent males, and three with parents who had children attending the treatment school (Lincoln High School). An eighth focus group was conducted after the pilot testing with the students in that pilot group. All focus groups were conducted at the treatment school at a time convenient for the participants. Written informed consent was obtained from each subject and his/her parent prior to participation in focus groups.

The focus groups were conducted using standard protocols (Krueger, 1988). After the participants signed informed consent forms, a trained

moderator conducted the focus groups, beginning the discussion with a brief introduction. An assistant moderator took notes and controlled the recording equipment. Issues addressed in the questions included the teenagers' views on: physical activity, eating habits, appearance, and incentives and barriers to healthful eating and exercise. Other questions addressed their preferred class content and format, psychosocial issues faced at home and school, self-esteem, and peer pressures. The questions for parents addressed issues such as their teen's eating and physical activity habits, concerns with appearance, and how the parents could support healthy habits, and get involved with the class.

Each focus group was audiotaped and transcribed verbatim. The transcript was then reviewed and edited by the assistant moderator using the audiotape and assistant moderator's notes in order to achieve a high degree of accuracy in the transcript (Krueger, 1988). The focus group data was then independently analyzed in a detailed manner to identify major points, themes, and noteworthy quotes. The analysis from each individual focus group was then compiled into a main summary for both the girls and parents.

Results from focus groups (Appendix A) revealed the eating patterns of the majority of these teens were consistent with other adolescents (Dausch et al, 1995, Cross et al, 1994, Krebs-Smith et al, 1996, and Neumark-Sztainer et al, 1996). These teens frequently skipped meals, especially breakfast, and they consumed high-fat snacks and fast food almost daily. Although there were some misconceptions about healthful eating among these teens, most knew

that they should be eating better and recognized some advantages to eating better. However, most lacked the knowledge and skills needed to choose healthful foods. The teens also discussed their concepts and barriers to regular physical activity. Most students wanted to exercise regularly and become physically fit, but again, they lacked the knowledge, skills, and motivation needed to make that change.

The teens in these focus groups were concerned about their health. They were particularly interested in how nutrition and physical activity could influence their appearance. Other topics, identified by the focus groups, which students wanted to learn more about included: weight-loss, diabetes, more on health and their bodies, the food guide pyramid, how to read food labels, shopping for food, recipe modification and food preparation, and gaining the skills to make healthful food choices — snacking, beverages, eating out at fast food restaurants, while at school and when at home.

When the teens and parents were asked what sort of class they felt would be most conducive to learning about nutrition and fitness, suggestions included: that the class should emphasize social interaction, group-oriented, and hands-on experiential activities, specifically classes should address: learning how to shop, prepare, and eat healthful — quickly, easily, and on a limited budget, as well as learn how to read and interpret food labels; address the issue of self-esteem throughout the class — give attention, recognition, incentives to improve behavior as well as self esteem. In addition, involve

parents in the class — keep them informed of what is going on in the class as well as invite them in to participate in the class. Issues, concerns, and topics raised by students and parents during the focus groups were addressed in the preliminary nutrition and fitness curriculum and again in the final 2-year nutrition curriculum.

Pilot Test

The information gathered from the focus groups, as well as guidelines from the Denver Public School system, were used to help design a preliminary nutrition and fitness curriculum. A course syllabus (preliminary curriculum) was submitted to and approved by the Denver Public School system (Appendix B). The curriculum was approved for 50% science credit and 50% physical education credit. The curriculum used in the pilot class was loosely based on the “Smart-Start for a Healthy Heart Program” (Anderson, 1992), and was implemented during the 1995 Spring semester at Lincoln High School.

There were 13 students (ten females and three males) in the pilot class, eight of whom were freshman and the rest, sophomores. Ten of the students were Hispanic, while the other three were Caucasian.

The course content was divided into three main sections which addressed health risks, physical activity, and nutrition, though time was not equally devoted to each due to unexpected start-up constraints. Topics

covered included: dietary guidelines, food guide pyramid, physical fitness training methods, diabetes, and heart disease. The students went on several field trips (i.e. tour of 'Hall of Life' at Denver Museum of Natural History) and participated in weekly activities such as biking, rollerblading, tennis, and walking. Several guest speakers attended class to discuss topics such as diabetes, or demonstrate activities such as dissections of the heart. Additionally, the students planned and prepared a meal for their parents, the majority of whom attended the 'parents' night dinner.'

At the end of this pilot test, a final focus group was conducted with the 13 students in the class. A variety of topics were explored including the time spent on each of the class topics, types of learning activities, types of physical activities, speakers, and general likes and dislikes of the class.

The final focus group revealed that most of the students had negative feelings toward the teacher, which impacted their feelings toward the program. Student comments were contradictory. On the one hand, students complained that the teacher was too 'controlling' in general, she ignored their ideas and input for activities, meal planning, and field trips, she treated them like children, and class time was often wasted because of her lack or preparedness for the class activity of the day. On the other hand, students wanted to be told exactly what to do when it came to projects, and they did admit that they basically did not want to do much class work (i.e. in-class assignments and homework). Despite complaints about the teacher, students

did like and respect their teacher's good intentions. However, the problems and complaints that arose regarding the teacher had implications for the type of teacher required for this class. It was clear that these students needed to be encouraged and motivated, yet given some freedom in choices and decision making. It was also clear that the student-teacher interaction was an important factor to program success. If the teacher-student interaction was less than satisfactory, it could have a negative impact on program success.

Overall, the majority of the students indicated they liked the pilot class and thought it was fun, despite negative feelings toward the teacher. They especially liked learning about the food guide pyramid, cooking modified family recipes, and having tests "run on them" (self-evaluations, blood pressure and fitness tests). Results from pilot test were used primarily to discover better ways to present the ideas and information in the curriculum.

Advisory Committee Recommendations

The curriculum advisory committee was made-up of the following individuals: the principal investigator (PI) of the study, two co-PI's of the study, the study coordinator, and the author of this study.

Once the focus groups and pilot test were completed a list of the topic areas identified by participants was compiled. The following eight content areas were identified: 1) health and my body; 2) weight-loss; 3) diabetes; 4) food guide pyramid; 5) healthy food choices; 6) reading food labels; 7) grocery

shopping; and 8) recipe modification.

Upon reviewing this list, the advisory committee for the project recommended the following:

1. Regarding 'health and my body,' the committee decided that the appropriate introductory unit should include an short overview of general health, including a review of the Dietary Guidelines for Americans and the American College of Sports Medicine's exercise guidelines. The topics of 'stress' and 'stress management' were also recommended to be included in this introductory unit because of its' potential impact on overall mental and physical health. Other units dealing with cardiovascular disease and diabetes were proposed to be presented later to further address the interest in the effects of 'health and my body.'
2. A unit regarding the 'food guide pyramid' was recommended next, after the introduction, to introduce the concepts of healthful, balanced eating. It was decided that this unit would also be an appropriate place to introduce the concept of macronutrients (carbohydrate, fat, and protein) within the context of foods.
3. Regarding 'weight-loss,' the advisory committee determined that students should be first introduced to the concept of energy balance, even though previous formative evaluations had not identified this topic. The intent of teaching students about energy balance was to

familiarize them with the fact that in order to lose weight, energy going into the body must be less than energy being expended by the body.

The committee also felt that this unit would be an appropriate place to review the concept of calories coming from the macronutrients in food. Therefore, a unit addressing the concept of energy balance preceded the unit on weight-loss.

4. Regarding 'reading food labels,' 'grocery shopping,' and 'recipe modification,' the advisory committee decided to include these topics under the 'healthful food choices' topic, since all are methods that can be used to change food intake towards more healthful choices.
5. Regarding 'healthful food choices,' the advisory committee felt that this general category really encompassed a major portion of the whole curriculum — equipping students with the tools necessary to make healthful food choices. The committee recommended the following topics and learning activities in order to equip students with the tools necessary to make healthful food choices: the concepts of nutrient dense foods versus energy dense foods, reading and interpreting food labels, shopping for healthful foods on a budget, choosing healthful foods when dining out, choose healthful snacks and beverages, modifying recipes, and food preparation.
6. The committee also recommended that an additional unit regarding fat and cholesterol, should be added in order to give students additional

information which would be helpful in understanding diabetes and cardiovascular disease.

Incorporating Theoretical Model Into Curriculum

Successful nutrition education interventions have consistently been found to use appropriate educational theories; especially those advocating experiential, active and hands-on learning methods (Lytle, 1995). Therefore, the methods used to deliver the curriculum content of this intervention and promote behavior change was based on the theoretical framework.

Prochaska's Stages of Change Model (Prochaska et al, 1994, Ruggiero and Prochaska, 1993, and Mhurchu et al, 1997) was used as core of the theoretical framework, and other theories incorporated into this curriculum included Social Learning Theory (Bandura, 1977a) and Bandura's Self-Efficacy (Bandura, 1977) model. Learning and promotion of behavior change was accomplished through instruction and activities focused on: consciousness-raising; promotion of social support; environmental re-evaluation; modeling; self monitoring; self-evaluation; behavioral rehearsal; goal setting; and self efficacy. Instruction progressed from acquiring knowledge to skill development. As students became more knowledgeable, there was less emphasis on conveying factual information (lecturing, individual assignments, tests) and more emphasis on hands-on activities, active participation, group interaction, group projects, and actually learning the

skills necessary to change behavior.

The curriculum was based on the premise that the method of presentation was just as important as the content of the curriculum in motivating the students to participate. We wanted an intervention program where the teacher not only presented information to the students, but consistently engaged students in activities which required them to act on the information presented, which has been shown to improve the success of nutrition education interventions (Contento et al, 1992).

Since the Stage of Change Model was the core of the theoretical framework, a multi-stage of change approach was used in the developed curriculum since all individuals would not be in the same stage of change at the beginning of the intervention program and since all individuals would not progress to a higher stage of change at the same rate. The following describes how behavioral constructs from the Stage of Change Model, the Social Learning Theory, and the Self-Efficacy Model were used in the teaching and learning activities to address individuals in different stages of change, to help individuals progress to the next stage of change, and ultimately, to promote behavior change.

Consciousness Raising

One of the main processes thought to be emphasized in moving from the precontemplation to the contemplation stage is consciousness-raising.

However, this process is important for individuals moving from the contemplation to the preparation stage. The underlying philosophy of consciousness raising is that knowledge provides the power to perceive the 'problem' clearly. There were many teaching and learning activities which used consciousness-raising. All of these different activities could be put into three categories:

Discussion Questions. Discussion questions were a way to relate information in an informal way. The discussion that resulted from the questions asked helped raise the awareness of the behavior and its consequences, and helped validate the concerns and struggles associated with making a change.

Learning the Facts. Acquiring the knowledge of the 'problem' behavior by learning the facts was accomplished through many ways, including general assignments, videos, quizzes and self-tests, fact-finding hunts, and teacher presentations. Learning the facts about the behavior helped individuals realize that the undesirable behaviors were undesirable. It also helped individuals see where they fit in —if they were actually practicing the undesirable behavior or not.

Seeing Examples. Being able to acquire knowledge first-hand was a powerful tool in the consciousness raising process. This was accomplished by actually seeing the information being presented through taste-testing, learning about habits and opinions through

surveying class-mates and family, making food displays (i.e. to learn about fat intake in various kinds of food items), supermarket tours, and field-trips (e.g. 'Hall of Life').

Helping Relationships (Promotion of Social Support)

Developing and maintaining helping relationships is one of the processes that is used throughout the stage of change model and is used to encourage movement from the precontemplation stage all the way to the maintenance stage. This process was encouraged during discussion questions, when subjects shared their ideas and feelings about the particular topic being discussed, and allowed them to begin building open and trusting relationships with each other. Some assignments required students to interview their parents, which helped students to learn more about their families and also encouraged family interaction. Group projects encouraged team-work and social interaction with each other.

Environmental Re-evaluation

Environmental re-evaluation, which describes the act of assessing how one's problem affects others around them, is one of the processes used to encourage individuals to move from the precontemplation stage to the contemplation stage. This process was not used very much in this curriculum. However, a few activities used the process of environmental re-

evaluation, including discussion questions and other assignments used to determine how students' attitudes towards themselves and overweight individuals affect others around them.

Self (Re-) Evaluation

Self evaluation (a.k.a. 'self re-evaluation') is one of the main processes used to encourage movement from contemplation to preparation, as well as preparation to action. This process was used extensively throughout each unit of the curriculum. Although too numerous to mention here, most of the teaching and learning activities incorporating the process of self evaluation were discussion questions and self assessments (including intake of various foods, dietary variety, opinions of dieting and weight-loss, and risk of diabetes), where the student was required to assess his/her status in regards to the problem behavior, and how he/she felt about it.

Commitment (Goal-Setting)

Commitment is one of the main processes used to encourage movement from preparation to action. As individuals become more confident in their ability to change and more willing to make a change, subjects were more likely to make a commitment by setting goals for themselves. Goal-setting was used throughout the curriculum. In addition to being encouraged to commit to regular physical activity, individuals were

encouraged to set goals such as: increase fruit and vegetable intake, conform diets to food guide pyramid guidelines, balance (food) intake with (physical) output, eat breakfast regularly, drink less soda, eat smaller portions at fast food restaurants, and choose more nutrient-dense foods rather than energy-dense foods.

Decisional Balance

Although not considered an official 'process' of the stage of change model, the decisional balance is considered an important activity throughout the stage of change process — especially in the contemplation and preparation stages. The decisional balance is a list of pros and cons of both the old and new behavior. Individuals at lower stages usually list greater numbers of cons for the new behavior and pros for the old behavior. However, as individuals progress to higher stages of change, they will be able to list a greater number of pros of the new behavior and cons of the old behavior. In many of the curriculum units, students were asked to weigh the pros and cons of making a behavior change. The 'behavior changes' to consider included: regular physical activity, decreasing fat intake, decreasing refined sugar intake, increasing fruit and vegetable intake, modifying fast-food choices, and modifying snack choices.

Countering

Countering, the process of change in which healthy responses are substituted for unhealthy responses, is one of the processes used to encourage individuals to move from action to maintenance. Countering was used in several of the curriculum units: to encourage positive self-esteem, attitudes toward self and positive thinking rather than negativity; to learn how to substitute more healthful (nutrient-dense) foods for less healthful (energy dense) foods; and to learn more constructive ways of dealing with stress.

Self Efficacy

Self efficacy is the confidence in ones' ability to perform a certain behavior. This behavioral construct, although not part of the stage of change model, was a cornerstone in the theoretical framework for the developed curriculum. Self efficacy was encouraged throughout the whole curriculum. This was accomplished by empowering the students with specific knowledge on how to make healthful food choices and then by giving students opportunities to practice what they had learned. These opportunities included: cooking low-fat foods, taste-testing, and a grocery store tour.

Curriculum Content

Using the results from the formative evaluations, and recommendations from the advisory committee a final draft of the nutrition

curriculum was developed. The final 2-year curriculum consisted of 13 units, each containing eight to twelve 40-minute lessons. Unit topics and application of the theoretical model are presented in Table 1. A more complete description of the curriculum content, including activities, is presented in Appendix C.

The curriculum was designed for teachers to use as a lecture and activity guide. The information presented was kept at a practical level so that the curriculum could be administered by instructors with little nutrition background. There was no student workbook, but there were lessons, worksheets, assignments and activities that would enable students to build a notebook. The format of the 13 units was consistent and broken down into major headings: 1) key concepts; 2) student objectives; 3) preparation and needed materials; 4) unit glossary; 5) background information for teacher; 6) teaching activities/aids; and 7) application of theoretical model. Information and recommendations made in this curriculum was consistent with the United States Department of Agriculture's Food Guide Pyramid (USDA, 1992), and Dietary Guidelines for Americans (USDA and USDHHS, 1995).

INTERVENTION PROGRAM

In September 1994, the semester before the pilot test, a teacher was hired through the Denver Public School system to teach during the pilot semester and during the 2-year intervention program. In July 1995, six weeks

Table 1. Description of curricular contents and behavioral constructs used in each unit.

#	Title of Unit	Topics Covered	Behavioral Constructs
1	Introduction to Health & Health Habits	• Lifestyle Habits associated with good health • Exercise guidelines • Dietary guidelines • Health issues during adolescence • Stress • Ways to handle stress • Coping styles	• consciousness-raising • self-evaluation • promotion of social support • modeling
2	The Food Guide Pyramid	• Foods in the different food categories • Variety, moderation, proportionality • Appropriate serving sizes • Daily food choices • Meal planning • Evaluating meals	• consciousness-raising • self-evaluation • promotion of social support • goal-setting
3	Energy Balance	• What is balance? • What is energy imbalance? • What is a calorie • Calories in vs. calories out • Calorie input — fat, carbohydrate, and protein • Components of energy output • Energy storage • How to calculate calorie needs	• consciousness-raising • self-evaluation
4	Obesity & Weight Loss	• Characteristics of fad diets • How to evaluate fad diets and other weight-loss programs • Body image • Weightism • Obesity and overweight • Proper weight loss methods • Eating styles • Hunger vs. appetite	• consciousness-raising • self-evaluation • promotion of social support • countering • modeling • environmental re-evaluation • emotional arousal • commitment • goal-setting
5	Changing Food Intake: Nutrient Density and Food Choices	• Nutrient density • Energy density • Role of fat in diet • Fat content of common foods • Making a fat 'display' • Role of refined (simple) sugars in diet • Sugar content of common foods • Moderation when making food choices • Benefits of fruits, vegetables, dietary fiber	• consciousness-raising • self-evaluation • countering • decisional balance • emotional arousal • self-efficacy • goal-setting

#	Title of Unit	Topics Covered	Behavioral Constructs
6	Changing Food Intake: How to Read Food Labels	• Information available on food labels — what does it mean? • How to read food labels • How to determine nutrient and caloric density of foods • How to choose foods that meet dietary guidelines	• consciousness-raising • self-evaluation • behavioral rehearsal • promotion of social support • self-efficacy
7	Changing Food Intake: Shopping For Food	• Types of food shops • Tips on selecting healthy foods from sections at the supermarket • Buying quality food at low cost • Advertising pitfalls • Supermarket tour • Comparison shopping • Taste-testing	• consciousness-raising • emotional arousal • environmental re-evaluation • promotion of social support • behavioral rehearsal • self-efficacy
8	Changing Food Intake: Dining Out	• Problems and solutions to eating out • Overcoming the pitfalls of the salad bar • Overcoming the pitfalls of Mexican food • Overcoming the pitfalls of Italian food • Overcoming the pitfalls of Chinese food • Sources of high fat foods at favorite fast food restaurant • Healthy options at fast-food restaurant • How to design a low-fat meal at fast-food restaurant • Taste-tests at fast-food restaurants	• consciousness-raising • self-evaluation • countering • decisional balance • emotional arousal • behavioral rehearsal • goal-setting • self-efficacy
9	Changing Food Intake: Snacks and Beverages	• Benefits and potential problems with snacking • Suggestions for healthy, nutrient-dense snacks • Preparation and taste-tests of various snack foods • Water/fluid needs • Caffeine • Healthy beverages	• consciousness-raising • self-evaluation • countering • goal-setting • self-efficacy
10	Changing Food Intake: Food Preparation and Recipe Modification	• When and how to modify recipes • Tips to decrease fat, cholesterol, & calories • Tips to decrease sugar • Tips to increase fiber • Food preparation • Taste-test challenges	• consciousness-raising • behavioral rehearsal • self-efficacy

#	Title of Unit	Topics Covered	Behavioral Constructs
11	Understanding Fat and Cholesterol	• Differentiate different types of fats • Sources of common fats • Relationship of dietary fat to cardiovascular disease risk • How much fat is in my diet? • Healthy choices — how to decrease dietary fat	• consciousness-raising • emotional arousal • self-evaluation • countering
12	Diabetes Mellitus	• What is NIDDM • Risk factors of NIDDM • Treatment and prevention of NIDDM • My risk of diabetes	• consciousness-raising • emotional arousal • self-evaluation • promotion of social support
13	Cardiovascular Disease	• What is CVD • Risk factors of CVD • Prevention of CVD • Heart dissection • Blood pressure • Hypertension	• consciousness-raising • emotional arousal • self-evaluation • promotion of social support

before the beginning of the intervention program, this teacher quit due to personal reasons and to take another job. At this point, a second teacher was hired, again through the Denver Public School system.

In August 1995, the 2-year intervention program began, and was implemented during the 1995-96 and 1996-97 school years. At the end of the first year of the intervention, in June 1996, the second teacher quit due to personal conflicts with the study coordinator and also due to a desire to return to graduate school. The study coordinator then volunteered to teach the intervention program, in addition to coordinating the study. This coordinator became the third teacher and taught during the second and final

year of the intervention program until April 1997. At this point, 7 weeks before the end of the school year, the third teacher quit to pursue a career in white-water rafting. During the final 7 weeks of the intervention program, a new study coordinator and the curriculum author taught the class.

Assessments

Subjects were assessed pre- (Fall 1995) and post- (Spring 1997) treatment on all variables except for socioeconomic status and degree of acculturation, which were only measured once. Additionally, the treatment group was assessed on all variables except for those previously mentioned at the end of year 1 (May 1996), and the beginning of year 2 (September 1996). Treatment subjects were assessed four times, while the control subjects were assessed only two times.

During each assessment period, diet interviews and questionnaires were administered in the classroom. For treatment subjects, physical fitness data and anthropometric data were collected at the University of Colorado Center for Human Nutrition lab because subjects were having other tests performed (hydrostatic weighing, maximal exercise testing, and measurement of metabolic rate) which were not included in this report. It was easier to collect the data in one visit at the lab. Only some of the control subjects could come to the University of Colorado Center for Human Nutrition lab for the additional testing. Therefore, all physical fitness data and anthropometric

data for the control subjects were collected at North High School.

Acculturation and ethnicity were assessed at baseline, therefore, this information was available for all subjects involved in this study, including drop-outs. However, due to the sensitivity of questions pertaining to subjects' family information and economic status, the project coordinator felt it inappropriate to gather this information at baseline. Therefore, information regarding socioeconomic status and family structure was not collected until post-test.

Anthropometric Measurements

Height and weight were measured (Detecto scale) in street clothing without shoes. Body mass index was calculated from each subject's height and weight.

Body fat percent was calculated by two methods, the skinfold method and bioelectric impedance analysis (BIA). Bioelectric impedance analysis is a noninvasive, and safe method of estimating fat-free mass (FFM) and fat mass (FM). Fat mass and fat-free mass were measured by one of two trained personnel using the BIA method, described by Kushner (1992). Using the FM and FFM measurements, body density was determined, and in turn % body fat was calculated as follows: % body fat, as determined by BIA = $[(2.057 + D_b) - (0.786 \times \text{wt}(\text{kg})) - 1.286] \times 100$, where D_b equaled body density (g/cm^3). The

preceding formula has been validated for use in children and adolescents (Houtkooper et al, 1992).

Skinfolds were measured using Lange calipers by a single trained person. Skinfolds measured included the chest, axillary, subscapular, suprailiac, abdominal, triceps, calf, and thigh sites. Skinfolds were measured according to procedures explained by Heyward (1991). Percent body fat using the skinfold measurements was calculated three different ways. First, Pollock and colleagues' (1984) formula, which estimates % body fat for adults, was used to estimate body composition by using the seven skinfold measurements to calculate body density for each subject. Body density was determined from the following generalized regression equations for adults (Pollock et al, 1984):

For females, $Db = 1.097 - 0.00046971 (X_1) + 0.00000056 (X_1)^2 - 0.00012828 (X_2)$

For males, $Db = 1.112 - 0.00043499 (X_1) + 0.00000055 (X_1)^2 - 0.00028826 (X_2)$

Where, Db = body density

X_1 = sum of seven skinfolds in millimeters

X_2 = age in years

Percent body fat (for adults) was then determined by using the Brozek equation (Pollock et al, 1984), where % body fat = $[(4.570/Db) - 4.142] 100$.

The second and third methods used to calculate % body fat via skinfold measurements came from Slaughter and colleagues (1988). Both methods from Slaughter and colleagues have been validated for use in children and adolescents between the ages of 8 - 18 years and they are as follows:

For Triceps and Calf,

$$\% \text{ body fat in males} = 0.735 (\text{triceps skinfold (mm)} + \text{calf skinfold (mm)}) + 1.0$$

$$\% \text{ body fat in females} = 0.61 (\text{triceps skinfold (mm)} + \text{calf skinfold (mm)}) + 5.1$$

For Triceps and Subscapular,

$$\% \text{ body fat in males} = 1.21(\text{triceps} + \text{subscapular}) - 0.008(\text{triceps} + \text{subscapular})^2 - 5.5$$

$$\% \text{ body fat in females} = 1.33(\text{triceps} + \text{subscapular}) - 0.013(\text{triceps} + \text{subscapular})^2 - 2.5$$

Waist and hip circumferences were measured as previously described by Callaway and colleagues (1988). Waist-to-hip ratio was determined by dividing the hip measurement into the waist measurement.

Resting blood pressure was measured by one of three trained laboratory technicians using the appropriate sized cuff for subjects. Two measurements of both systolic and diastolic blood pressure were taken in a seated position with a random zero sphygmomanometer. Each measurement was separated by a 2 minute period.

24-Hour Dietary Recall Questionnaire

Due to limited resources and the large sample size, dietary intake was assessed by a self-reported 24-hour diet recall instead of 3-day diet records (Appendix E). Dietary information was obtained during a face-to-face interview with one of two trained personnel. Respondents were asked to recall everything that they had consumed, including beverages since the

previous morning. Plastic food models (Nasco) were used to assist in the estimation of portion sizes. All recalls obtained included weekdays only. Total calorie and macronutrient intake were determined using Nutritionist IV computer software (version 3.2.5, 1995, First DataBank). Each subjects' diet analysis was checked for accuracy by a trained reviewer. Individual analyses were then reviewed for additional intake variables as defined below.

Breakfast consumption was defined as any foods or beverages consumed prior to 9:30 a.m. that totaled more than 200 kilocalories (kcal). This calorie level was chosen so that it would be high enough to exclude the consumption of coffee with cream and sugar, but low enough to include a slice of toast or small portion of cereal. Also, consumption of soda before 9:30 a.m. was not considered breakfast, even if the calories were greater than 200 kilocalories. Other investigators (Devaney et al, 1995) rely on the respondent to designate what constitutes breakfast consumption, which could provide inconsistent results across individuals.

Fast-food eating occasion was defined as the number of times eating occurred at "fast-food" eating establishment within the 24-hour period. The caloric value of all food items consumed at fast-food restaurants were summed and expressed as a percentage of total caloric intake. Soft drinks and carry out items from fast-food restaurants, such as pizza, were included in this category.

Items typically considered to be high-calorie, high-fat, low nutrient-

dense foods such as potato chips, cookies, candybars, cake, pastries, and ice cream were included in the “% of kcals from high-snack foods” category. This variable was also expressed as a percentage of total caloric intake (sum of the caloric value of the high-fat snacks divided by total caloric intake).

The total volume of both diet and non-diet soft drinks consumed was calculated in both fluid ounces and as a percentage of total caloric intake.

Sweetened fruit juice drinks, defined as juice that was not 100% fruit juice, were recorded in fluid ounces and categorized separately from the fruit category. These drinks, such as sweetened cranberry juice and orange juice drinks, do not typically have the nutrient density of other foods in this category.

Fried potatoes such as hash browns and french fries are, unlike others in the vegetable category, generally high in fat and low in fiber and were therefore categorized separately from the vegetable group.

Serving sizes for the fruit and vegetable servings are defined as follows:

One Vegetable Serving:	One Fruit Serving:
1 cup raw leafy vegetables	1 medium apple, banana, orange
1/2 cup vegetable, cooked or raw	1/2 cup chopped, cooked, or canned fruit
3/4 cup vegetable juice	3/4 cup of unsweetened fruit juice
1 small baked potato	1/4 cup of dried fruit

In general, these definitions are consistent with the USDA’s Food Guide Pyramid (USDA, 1992), the Five-A-Day Program (USDHHS, 1991), and the Center for Disease Control’s NCHS Consensus Workshop (NCHS and

USDHHS, 1993). Legumes were not counted as vegetables. Lettuce and tomato, consumed as part of a sandwich or burger, were included as vegetable servings as these items could potentially be a significant contributor to vegetable intake in this population.

Validity of 24-Hour Dietary Recall

The validity of reported 24-hour recall energy intakes was assessed by calculating the mean energy intake/expenditure ratio (EIER = reported energy intake/estimated basal metabolic rate) for each subject — a method used by Goldberg and colleagues (1991) and Summerbell and colleagues (1996). Basal metabolic rate was calculated from Harris Benndict equations (Hunt and Groff, 1990) where:

$$\text{BMR for females} = 655 + (9.6 \times \text{wt(kg)}) + (1.7 \times \text{ht(cm)}) - (4.7 \times \text{age})$$

$$\text{BMR for males} = 66 + (13.7 \times \text{wt(kg)}) + (5 \times \text{ht(cm)}) - (6.8 \times \text{age})$$

For this study, as was for Summerbell and colleagues (1996) and Goldberg and colleagues (1991), if the EIER value was ≥ 1.10 , then the 24-hour recall was considered “valid” and if the EIER value was less than 1.10, then the 24-hour recall was considered “invalid”. It should be noted that EIER values ≥ 1.10 may still not be valid, however, Goldberg and colleagues (1991) found that values of 1.10 or greater identified reported energy intakes which were representative of habitual intake.

Food Frequency Questionnaires

Dietary intake was also assessed by a Block Food Frequency Questionnaire (Appendix E) and a Block Dietary Screening Questionnaire (Appendix E). Both questionnaires were administered by the same personnel who administered the 24-hour diet recall, and both were administered after the 24-hour diet recall was administered.

Both questionnaires were tested for validity and reliability in adult populations (Cann et al, 1995, Block et al, 1989, and Thompson and Byers, 1994), but not adolescent populations. Neither questionnaire has been validated for use in Hispanic adolescents. However, the two research dietitians consulting for this project felt that these questionnaires could be applicable if slightly modified to include foods preferred by adolescents and to include some Hispanic foods.

The Block Food Frequency Questionnaire was divided into two sections. First, it assessed a score for high-fat foods, then it assessed a score for fruit, vegetables, and high-fiber foods. The high-fat foods section was made up of 15 food categories. Foods in a particular food category were similar in kilocalorie and fat content. For each food category, respondents were asked to choose how often in the past 12 months had they consumed foods in that category. Each response was given a corresponding score:

If response was:	Then the corresponding score was:
eat foods less than once per month	0
eat foods 2-3 times per month	1
eat foods 1-2 times per week	2
eat foods 3-4 times per week	3
eat foods 5 + times per week	4

Once each category was scored, the sum of the category scores yielded a total score. The total score was then used to categorized usual fat intake over the past 12 months:

Total Score:	Fat Intake Category:
> 27	diet is very high in fat
25-27	diet is quite high in fat
22-24	typical American diet; diet could be lower in fat
18-21	making better choices; diet lower in fat
≤ 17	making best choices; diet low in fat; desirable score

The fruit/vegetable/high-fiber foods section of the Block Food Frequency Questionnaire was made up of 9 food categories. For each food category, respondents were asked to choose how often in the past 12 months had they consumed foods in that category. Each response was given a corresponding score:

If response was:	Then the corresponding score was:
eat foods less than once per week	0
eat foods about 1 time per week	1
eat foods 2-3 times per week	2
eat foods 4-6 times per week	3
eat foods every day	4

Once each category was scored, the sum of the category scores yielded a total score. The total score was then used to categorized usual fat intake over the past 12 months:

Total Score:	Fruit/Vegetable/High-fiber Foods Intake Category:
< 20	diet is very low in fruits, vegetables, and whole grains
20-29	diet still low, but making better choices
≥30	making best choices; desirable score

The Block Food Frequency Questionnaire was designed for screening purposes by Block and colleagues from analyses of NHANES II food intake data (Thompson and Byers, 1994). When compared to 3-day diet records, the high-fat foods score was correlated to fat grams per day ($r = 0.65$), and the fruit/vegetable/high-fiber score was correlated to percentage of energy from complex carbohydrates ($r = 0.45$). Developers of this questionnaire did not intend for this instrument to be used as the sole source of dietary information, but rather, to be used along with other dietary evaluation methods, such as a diet record or recall.

The Dietary Screening Questionnaire is a 13-item questionnaire developed as a rapid screening tool to identify groups of individuals with a high or low level of fat intake (Block et al, 1989). This questionnaire was initially tested in a group of white, college-educated women. It has been recommended that this questionnaire and any modifications should be used in conjunction with other dietary evaluation methods since it exhibited insufficient sensitivity and specificity to be used as a single assessment method (Caan et al, 1995). However, the designers of this screening questionnaire expressed that the questionnaire does nearly as well as a four-day diet record in correctly identifying individuals with high-fat versus low-

fat intakes.

For this study, the dietary screening questionnaire was modified slightly to include foods preferred by adolescents and to include some Hispanic foods. A total of seven foods were added to the 13 food categories. Foods added to the categories were of similar fat content per serving. Foods in the questionnaire were listed in the order in which they might have been used in an actual questionnaire with a respondent, not in the order of their importance as nutrient sources (Block et al, 1989).

For each food category, respondents were asked to recall how often in the past 12 months had they consumed foods in that category. Responses could potentially range from one to several times per day, week, month, year, or a response of rarely/never could be chosen. Respondents were then asked to estimate the approximate portion size. Plastic food models (Nasco) were used to estimate portion sizes. The fat scores were calculated by using the following algorithm:

$$\text{Fat grams/day} = (\# \text{ times column}) \times (\text{time unit}) \times (\text{portion size}) \times (\text{fat per 100 grams})$$

The values for each of the above factors for each food category in the questionnaire are shown in appendix E.

Physical Fitness Indices

Assessments of physical fitness involved using the tests suggested by the 'Physical Best' program (1988). These included: flexibility, abdominal

muscular strength/endurance, upper body muscular strength/endurance, and aerobic endurance.

Flexibility was assessed by the sit-and-reach test, which measures hip and trunk flexibility (Heyward, 1991). Subjects were asked to sit on the floor with their legs fully extended and the bottom of their feet against a sit-and-reach box at the 38 centimeter mark. With one hand on top of the other and fingertips together, the subject gradually reached forward along the box, holding final position for 2 seconds. The number reached was recorded to the nearest half centimeter. Subjects performed three trials to assure accuracy.

Abdominal muscular strength and endurance was assessed by sit-ups. Subjects were required to perform as many sit-ups as possible in a period of 60 seconds. Subjects were required to keep their arms folded across their chest, knees bent, and feet flat on the ground. Subjects were timed with a stop watch during the test.

Upper body (especially lower arm) muscular strength and endurance was assessed by a grip-strength test. A 'Grip-A' dynamometer was held by the subject in his/her dominant hand. Dominant hand was noted to ensure consistency of measurement. Subjects held instrument, stood upright, relaxed, and with arms extended downward. Subject then exerted full force and squeezed instrument as hard as possible without letting his/her arms touch his/her body or waving instrument about. Once grip was released, the strength measurement, in kilograms, was recorded. Three trials were

administered for each subject with a 1-minute rest between trials.

Aerobic endurance was assessed by a 1 mile walk/run test. Subjects were asked to run or walk one mile as quickly as possible. The running/walking course was a 1/4-mile track at either the treatment or control school. The time was recorded in minutes to the nearest tenth of a second.

Nutrition and Fitness Knowledge

Nutrition knowledge was assessed by a 61-item questionnaire, which was based, in part, on a 75-item questionnaire developed and validated for low socioeconomic women (Parks, unpublished 1994) (Appendix E). The questionnaire developed by Parks (1994) was intended to reflect basic information required by an individual to comprehend the 'Dietary Guidelines for Americans' and the public awareness nutrition objectives from the '1990 Objects for the Nation.' Although this questionnaire had not been validated for Hispanic adolescents, this questionnaire was deemed adequate as a foundation for use in this study for several reasons. First, the content covered by the questionnaire was applicable to a low SES population since it had been initially developed for a low SES population. Second, questionnaire content was similar to content of the curriculum in this study. Third, reliability and content validity of this questionnaire had already been established for a low-socioeconomic audience.

For the purpose of this study, twenty questions identifying which foods belonged in which food groups were deleted from the original 75-item questionnaire after results from a pilot test revealed that these questions were too easy. Also, four other questions were deleted because they were deemed irrelevant to the curriculum content for this study. Thirty-two additional questions, which asked more specifically about curriculum content, were then added to the questionnaire. The project advisory committee then reviewed the newly revised nutrition knowledge questionnaire to check for content validity and to assure continued appropriateness of questions.

To score this questionnaire, each correct answer was given a score of "1", while a wrong answer was given a score of "0". Total scores could range from 0 to 83 points. Questions were also categorized by the following topic areas: general nutrition information (17 questions), diabetes (25 questions), relationship between cholesterol and heart disease (5 questions), energy balance and weight loss (10 questions), high calorie foods (6 questions), high fat foods (5 questions), high cholesterol foods (5 questions), high salt foods (5 questions), and high sugar foods (5 questions). All nutrition knowledge questionnaires were scored by one trained individual.

Reliability of the revised nutrition knowledge questionnaire was established by the test-retest method. Thirty students from a sophomore biology class at the treatment school (Abraham Lincoln High School) volunteered to participate. These students were not involved in the study.

Permission was obtained from the teacher and the school vice-principal. Participants were administered this questionnaire on two separate occasions, 9 days apart. For each student, the answers from the first test and the second test were compared using Pearson's correlation. A value of $r = 0.70$ or higher was considered to be reliable. Out of 83 points possible, the mean score was 32.0 for the test 1 and 31.1 for test 2. Paired t-test showed no significant ($p = 0.45$) difference between scores from test 1 and test 2. The correlation coefficient was 0.83 ($p > 0.01$), which was considered reliable.

The fitness knowledge questionnaire (Appendix E) was developed by one of the researchers on this project who helped develop the physical education portion of the overall study, which was not an element of the nutrition education component presented here. Questions asked primarily about the effects of physical training on metabolism, but also included a few questions regarding weight loss. The project advisory committee felt that this questionnaire was too advanced for the study population. However, since there were some relevant questions pertaining to the nutrition education curriculum, results from this questionnaire were included in this study.

The fitness knowledge questionnaire consisted of 28 questions, and the total possible points ranged from 0 to 41. Questions 1 to 15 were true/false questions worth 1 point for a correct answer, and questions 16 to 29 were multiple questions worth 2 points for a correct answer. All fitness knowledge questionnaires were scored by one trained individual.

Reliability of the fitness knowledge questionnaire was established by the test-retest method, performed during the same time and following the same procedures as the nutrition knowledge test. Out of 41 points possible, the mean score was 8.27 for the test 1 and 8.34 for test 2. Paired t-test showed no significant ($p = 0.96$) difference between scores from test 1 and test 2. The correlation coefficient was 0.88 ($p > 0.01$), which was considered reliable.

Nutrition Attitudes

Attitudes towards nutrition were evaluated by a 22-item nutrition attitudes scale (Appendix E) developed by Byrd-Bredbenner and colleagues (1984). This attitude scale has been used previously to assess nutrition attitudes of adolescents. This attitude scale was chosen for this study because of its applicability for adolescents and because attitudes being measured reflected those needing to be assessed in this study.

The attitude scale was divided into four segments reflecting four different constructs. The section assessing interest in nutrition, abbreviated "caring about nutrition," consisted of seven statements, all 7 of which were worded negatively. The section assessing liking to eat new foods, abbreviated "eating new foods," consisted of six statements that were worded positively. The section assessing belief that nutrition affects health, abbreviated "nutrition affects health," consisted of three statements that were worded positively. Finally, the section assessing desire to learn about nutrition,

abbreviated "learning about nutrition," consisted of six statements that were also worded positively. Statements from each construct were mixed throughout the instrument, especially the negatively worded statements, to avoid a response set. Inter-item correlations (Cronbach alpha reliability coefficient) were found to be adequate (Byrd-Bredbenner et al, 1984), with:

'caring about nutrition' = 0.67

'eating new foods' = 0.81

'nutrition affects health' = 0.53

'learning about nutrition' = 0.84

Students were asked to indicate their agreement with each of the twenty-two statements on a 5-point Likert scale by indicating if they strongly agree (score = 5), agree (score = 4), are neutral (score = 3), disagree (score = 2), or strongly disagree (score = 1). For negatively worded attitude statements, the above scores were opposite; for example, a 'strongly disagree' response scored a '5' instead of a '1'. All attitude statements were scored by one trained individual. A mean score for each of the four sections was calculated by summing the scores of the statements in a section and dividing by the number of statements in the section.

Reliability of the attitude scale was established for this study by the test-retest method, performed during the same time and following the same procedures as the knowledge questionnaires. The results were as follows:

	Test (mean)	Re-test (mean)	r (p-value)	t (p-value)
caring about nutrition	2.84	2.98	0.72 (< 0.05)	1.53 (0.135)
eating new foods	3.21	3.20	0.73 (< 0.05)	1.43 (0.163)
nutrition affects health	3.79	3.94	0.59 (< 0.05)	1.42 (0.167)
learning about nutrition	2.95	2.85	0.79 (< 0.05)	1.16 (0.253)

Although r-value of the “nutrition affects health” section of the attitude scale was less than satisfactory, this instrument was still used since three of the four sections were found to be reliable, with a correlation coefficients greater than 0.70, and since paired t-tests revealed no significant difference for each attitude section between the two tests (test and re-test).

Stages of Change

Two questionnaires were developed to categorize subjects according to the ‘stage of change’ (precontemplation, contemplation, preparation, action or maintenance) they fell into with regard to exercising regularly and dietary fat reduction.

The ‘physical activity stages’ questionnaire (Appendix E) was based on an instrument developed by Marcus and colleagues (1992). The same constructs were used in this questionnaire to categorize individuals into one of the five stages. Subjects were given an explicit definition, with examples, of what ‘exercise’ meant before they answered all other questions. This questionnaire was administered by face-to-face interview. Once completed, the questionnaire was scored by one trained personnel.

The reliability of 'physical activity stages' questionnaire was established for this study by the test-retest method, performed during the same time and following the same procedures as the knowledge questionnaires. For each student, the answer from the first test and the second test were compared in two ways. First, by scoring agreement which was equal to $\frac{\text{agreements}}{\text{agreements} + \text{disagreements}}$, and second by paired sign test. The paired sign test revealed no significant differences ($p = 0.125$) in stages of change between the two tests. Scoring agreement for this questionnaire was 0.774, slightly lower than desirable since a scoring agreement of 0.80 was considered reliable (Fraenkel and Wallen, 1993).

The 'fat behavior stages' questionnaire (Appendix E) was based on questions that Rossi and colleagues (1993) developed and tested to categorize individuals into one of the five stages of change for dietary fat reduction. In order to make this instrument more understandable, examples of high fat foods were listed to ensure that subjects actually knew the difference between low-fat and high-fat foods. This questionnaire was administered by face-to-face interview. Once completed, the questionnaire was scored by one trained personnel.

The reliability of 'fat behavior stages' questionnaire was established for this study by the test-retest method, performed during the same time and following the same procedures as the knowledge questionnaires. For each

student, the answer from the first test and the second test were compared in two ways. First, by scoring agreement which was equal to = agreements ÷ (agreements + disagreements), and second by paired sign test. The paired sign test revealed no significant differences ($p = 0.45$) in stages of change between the two tests. Scoring agreement for this questionnaire was 0.766, slightly lower than desirable since a scoring agreement of 0.80 was considered reliable (Fraenkel and Wallen, 1993).

Self-Efficacy

Self efficacy scores were assessed for 'exercise' and 'choosing low-fat foods' (Appendix E) on two separate questionnaires. The questionnaire for assessing self-efficacy towards exercise was based, in part, on a self-efficacy questionnaire used by Marcus and colleagues (1992). Subjects were asked to indicate their level of confidence in participating in regular exercise during five different situation. For this study, four additional situations were added to make the instrument more relevant for an adolescent population.

Subjects were asked how confident they felt at participating in regular exercise in a series of nine situations. Responses could range from being 'not at all confident' (score = 1) to 'extremely confident' (score = 7).

Reliability of the exercise self-efficacy questionnaire was established for this study by the test-retest method, performed during the same time and

following the same procedures as the knowledge questionnaires. The results indicated that overall, the instrument would be considered reliable since the overall correlation of the instrument was high ($r = 0.763$) and a paired t-test indicated no significant differences between the overall test and re-test scores ($t = 1.4, p = 0.17$). However, there were four 'situation' questions that were not reliable because either the correlation values were too low ($r < 0.50$) or because the paired t-tests were significantly different ($p < 0.05$). When these four 'situation' questions were taken out, the overall correlation of the instrument increased slightly ($r = 0.773$). For the purpose of this study, only the following 'situations' were included in the exercise self-efficacy questionnaire:

"I am confident I can participate in regular exercise"	<i>r</i>	<i>t</i> (<i>p</i> -value)
when I am in a bad mood	0.702	1.65 (0.10)
when I don't have the time	0.636	0.84 (0.40)
when I am having a good day	0.749	0.62 (0.53)
when I am on vacation	0.792	0.01 (0.99)
when I am feeling good	0.660	0.37 (0.71)

The questionnaire developed for assessing self-efficacy towards choosing low-fat foods was based, in concept only, on a self-efficacy questionnaire used by Marcus and colleagues (1992). Subjects were asked to indicate their level of confidence in choosing low-fat foods during various situations. Based on comments from the formative evaluations about barriers to choosing healthy foods and recommendations from the project advisory committee, twenty 'situation' questions were developed for this instrument.

Subjects were asked how confident they felt at choosing low-fat foods in a series of twenty situations. Responses could range from being 'not at all confident' (score = 1) to 'extremely confident' (score = 7).

Reliability of the low-fat foods self-efficacy questionnaire was established for this study by the test-retest method, performed during the same time and following the same procedures as the knowledge questionnaires. The results indicated that overall, the instrument would be considered reliable since the overall correlation of the instrument was high ($r = 0.841$) and a paired t-test indicated no significant differences between the overall test and re-test scores ($t = 0.07, p = 0.93$). However, there were ten 'situation' questions that were not reliable because either the correlation values were too low ($r < 0.50$) or because the paired t-tests were significantly different ($p < 0.05$). When these ten 'situation' questions were taken out, the overall correlation of the instrument increased slightly ($r = 0.877$). For the purpose of this study, only the following 'situations' were included in the low-fat foods self-efficacy questionnaire:

"I am confident I can choose low-fat foods"	<i>r</i>	<i>t</i> (<i>p</i> -value)
when I am at home	0.826	1.76 (0.08)
when I am at a restaurant	0.531	0.56 (0.57)
when I am in a hurry	0.700	0.94 (0.35)
when I am having a good day	0.714	0.35 (0.72)
when I am tired	0.626	0.59 (0.55)
when I am not rushed	0.836	0.29 (0.76)
on the weekend	0.758	0.10 (0.91)
when I am watching TV	0.549	1.02 (0.31)
when I go to the movies	0.737	1.35 (0.18)
when I am bored	0.691	1.18 (0.24)

Total self-efficacy scores were calculated by summing the the scores from the exercise self-efficacy questionnaire and the low-fat foods self-efficacy questionnaire.

Acculturation Scale

Degree of acculturation was assessed by a questionnaire (Appendix E) used in the Hispanic Health and Nutrition Examination Survey (NCHS, 1985). This eight-variable acculturation scale was developed and validated for use in a Mexican-origin population (Cuellar et al, 1980), which was appropriate since all 'Hispanic' subjects in this study were found to be of Mexican descent. In this study, degree of acculturation was not assessed for the non-Hispanic white subjects, acculturation was assessed only for Hispanic subjects.

This instrument assessed language ability, self-identification, parents' ethnic identification and generation in the United States. Subjects were asked the following eight variables: 1) what language do you speak? 2) what language do you prefer? 3) can you read Spanish? English? 4) can you write Spanish? English? 5) how do you identify yourself? 6) what ethnic identity does your mother use? 7) what ethnic identity does your father use? 8) where were you born? your mother? your father? Variables 1 through 7 were scaled from 1 to 5, where 1 represented the least acculturated category and 5 represented the most acculturated category. Variable 8 was only scaled from 1

to 4, since subjects were not asked about birthplace of grandparents.

For variable one, subjects were asked if they spoke Spanish and to what degree. The following are scores for possible answers:

- 1 = can speak Spanish and speaks it most of the time
- 2 = can speak Spanish and speaks about same amount of Spanish and English
- 4 = can speak Spanish, but speaks English most of the time
- 5 = cannot speak Spanish

For variable two, subjects were asked which language they preferred:

- 1 = Spanish only
- 2 = mostly Spanish
- 3 = both equally
- 4 = mostly English
- 5 = English only

For variables three and four, subjects were asked if they could read and write Spanish. The following are scores for possible answers:

- 1 = can read/write Spanish and prefers Spanish
- 2 = can read/write Spanish; prefers to read/write in both Spanish and English
- 4 = can read/write Spanish, but prefers English
- 5 = cannot read/write Spanish

For variable five, six, and seven, subjects were asked to describe the ethnic identity for themselves and their parents. The scores were as follows:

- 1 = 'Mexican' or 'Chicano'
- 2 = 'Hispano' or 'Latin American'
- 3 = 'other Hispanic'
- 4 = 'Mexican-American'
- 5 = 'American' or 'Anglo-American'

For variable eight, generational status was determined by asking subjects the birth place of themselves and their parents. If the subject and his/her parents were all born outside of the United States (i.e. Mexico), then the subject was classified as 1st generation (score = 1). If the subject was born here in the

United States, but at least one of his/her parents were born outside of the United States, then the subject was classified as 2nd generation (score = 2 for both parents born in Mexico and score = 3 if only one parent born in Mexico). If the subject and his/her parents were all born in the United States, then the subject was classified as 3rd generation (score = 4). This method of generation classification has been used previously (Delgado et al, 1990, and Guendelman and Abrams, 1995).

Once scores were assessed for all eight variables, the total acculturation score was calculated by summing the scores for the eight variables. The higher the acculturation score, the more acculturated the individual. Total acculturation scores could range from 8 to 40 points.

Socioeconomic Status

Socioeconomic status (SES) of the subjects' family was determined by a questionnaire (Appendix E) that used the Hollingshead Two-Factor Index of Social Position (Hollingshead, 1965). Information about the subjects' family was obtained through a face-to-face interview by one trained interviewer. This data was not collected until the end of the intervention program, Spring 1997, by which time subjects felt more at ease in giving more personal information.

Subjects were first asked how many adults lived in their home and who they were to determine if the subject came from a 1-parent or 2-parent

home. If subjects came from a 1-parent home, they were asked if missing parent provided child support to the family. The subjects were then asked about the educational and occupational status of their parents or guardians. With this information, occupation and education position scores were allocated for each parent.

<i>For Education:</i>		<i>For Occupation:</i>	
graduate professional training	= 1	executives, major professionals	= 1
standard college graduation	= 2	managers, minor professionals	= 2
partial college training	= 3	semiprofessionals, small business owner	= 3
high school graduation	= 4	clerical, sales, technicians	= 4
completion of 10th or 11th grade	= 5	skilled workers	= 5
completion of 7th, 8th, or 9th grade	= 6	semiskilled workers	= 6
less than seven years of school	= 7	unskilled workers	= 7

To calculate the index of social position score for an individual, the scale value for occupation was multiplied by the factor weight (which is 7) for occupation, and the scale value for education is multiplied by the factor weight (which is 4) for education. For example, if an individual is a supermarket manager and had one year of college training, his/her index of social position score would be computed as follows:

<i>Factor</i>	<i>Scale Score</i>	<i>Factor Weight</i>	<i>Score X Weight</i>
Occupation	3	7	21
Education	3	4	<u>13</u>
Index of Social Position Score:			33

After the index of social position score was calculated, individual parents were ranked by social class:

Range of Computed Scores	Social Class
11 - 17	I
18 - 27	II
28 - 43	III
44 - 60	IV
61 - 77	V

As the SES of the individual or family decreased, the 'social class' ranking and 'index of social position score' increased. A social class ranking greater than III and a social position score greater than 43 were both considered within the lower end of the socioeconomic strata (Hollingshead, 1965).

To determine the overall SES of the subjects' family, scores/ranks of both parents were compared. In families where both parents worked, the overall family SES was equal to the score/rank of the parent with the best rank or score (lowest rank and score), which was usually the father. In families where only one parent worked, or where there was only 1 parent, the overall family SES was equal to the score/rank of the working parent.

Statistical Analysis

The dependent variables in this project were: knowledge, attitudes, self efficacy, stage of change, dietary intake, physical fitness indices, physical activity patterns, percent body fat, height, weight, body mass index (BMI), waist-to-hip ratio, and blood pressure. The independent variable in this project was exposure to the nutrition education intervention. Other descriptive data included: ethnicity, gender, socioeconomic status, parents' education level, and degree of acculturation.

Data entry was done by both the author and a lab technician, and cross-checked by the author. Data was entered onto Microsoft Excel (Microsoft Excel Version 5.0 for Power Macintosh, 1994) spreadsheets. These spreadsheets were then merged together and converted to the statistical package format. Statistical analyses were performed using Statview (Abacus Concepts, Inc. 1995, version 4.5) statistical package and SuperANOVA — Accessible General Linear Modeling (Abacus Concepts, Inc. 1995) statistical package on a PowerCenter Pro 180 (PowerComputing Corporation, Round Rock, Texas) computer. A value of $p < 0.05$ was considered statistically significant.

Data in this repeated measures study design was analyzed by several different methods. Differences between the treatment and control group at baseline were calculated by unpaired t-tests for continuous variables, and chi-square analysis for nominal variables. Once pre-existing differences were detected, an analysis of covariance (ANCOVA) would be performed for each variable to determine if these pre-existing differences were significant covariates. If these covariates were significant, repeated measures ANCOVA would be performed to determine if there were significant differences in improvement of the dependent variable between the treatment and control group. If these covariates were not significant, a repeated measures analysis of variance (ANOVA) would then be performed to determine significant differences between the treatment and control group. Data were reported in

tables as adjusted means $\pm$ standard error of the mean (s.e.m.) if the covariate was significant. Otherwise, the unadjusted mean $\pm$ s.e.m. was reported.

Other analyses performed included correlation and multiple regression analysis. Multiple regression analysis was performed by assigning the 'pre' measurement score as the independent variable (X) and the 'post' measurement score as the dependent variable (Y). Other independent variables (regressors) applied to the regression model included family socioeconomic status score, acculturation score, BMI at baseline, and weight (kg) at baseline.

Chapter III

Results

One hundred and twenty-eight subjects enrolled in this program, 41 in the treatment group and 87 in the control group. Seventy-four subjects, 23 in the treatment group and 51 in the control group, remained in the program until the end of the study (Spring '97). Not every subject completed all assessments, forms, or all questions on a form.

DEMOGRAPHIC DATA OF SUBJECTS

At baseline and post-test, the treatment and control groups were compared on a variety of treatment and demographic variables. Table 2 shows the distribution of treatment and control subjects for gender and ethnicity at baseline and at post-test. There was a significant difference at baseline with respect to the proportion of males and females participating in

TABLE 2 Gender and Ethnicity Data^a of Subjects at Baseline and Post-test

	Treatment		Control	
	Baseline	Post	Baseline	Post
Gender				
Males	20% (8) ^b	13% (3) ^b	37% (39)	41% (21)
Females	80% (33) ^b	87% (20) ^b	63 % (48)	59% (30)
Ethnicity				
Caucasian	34% (14) ^b	26% (6)	9% (8)	10% (5)
Mexican American	66% (27) ^b	74% (17)	91% (79)	90% (46)

^aPercent (n)^b Distribution significantly ($p < 0.05$) different from control group

each group ($\chi^2 = 7.68$; $p < 0.01$), and this difference was also present at the end of this 2-year program ($\chi^2 = 5.28$; $p < 0.05$).

Ethnicity and Acculturation

The ethnic distribution of subjects in the treatment and control groups, shown in Table 2, were significantly different at baseline ($\chi^2 = 5.07$; $p < 0.05$). However, this difference was not present at the end of this 2-year program ($\chi^2 = 2.17$; $p = 0.14$). All Hispanics in the treatment and control groups were found to be of Mexican descent, therefore referred to as 'Mexican-Americans'.

For the Mexican-American subjects, acculturation scores were not significantly different ($p = 0.22$) between the treatment subjects (mean $\pm$ s.e.m.

= 27.8 ± 1.8) and control subjects (mean $\pm$ s.e.m. = 25.2 ± 1.3). Scores ranged from 15.0 to 37.0 in the treatment group and 11.0 to 38.0 in the control group. Acculturation scores were related to several demographic variables, including mothers' education, occupation class, and socioeconomic status, fathers' education and socioeconomic status, and the subjects' family socioeconomic status. As acculturation scores increased (as subjects became more acculturated): 1) mothers of subjects had higher education levels ($r = 0.505$; $p < 0.001$), had better jobs ($r = 0.379$; $p < 0.05$), and had a higher socioeconomic status ($r = 0.447$; $p < 0.01$); 2) fathers of subjects had higher education levels ($r = 0.531$; $p < 0.001$) and had a higher socioeconomic status ($r = 0.397$; $p < 0.05$); and 3) the subjects' family had a higher socioeconomic status ($r = 0.348$; $p < 0.05$).

Socioeconomic Status and Parents' Education

Table 3 shows the distribution of treatment and control subjects' parental education, socioeconomic status, and family structure — variables measured only at post-test. There was no significant difference ($p = 0.22$) in socioeconomic status between subjects in the treatment and control groups. It was also determined that there was no significant difference in socioeconomic status between males and females ($p = 0.177$), or between Caucasians and Mexican-Americans ($p = 0.662$).

TABLE 3. Socioeconomic Data^a of Subjects

Characteristic	Treatment Group (n = 23)	Control Group (n = 51)
Mother's Education Level		
Grade 8 or less	4 % (1)	23 % (12)
Grade 8-12	18 % (4)	15 % (8)
H.S. diploma/GED	50 % (11)	40 % (21)
Attended college	14 % (3)	11 % (6)
College graduate	14 % (3)	11 % (6)
Advanced degree	0 %	0 %
Father's Education Level^b		
Grade 8 or less	10.5 % (2)	26 % (12)
Grade 8-12	10.5 % (2)	13 % (6)
H.S. diploma/GED	37 % (7)	39 % (18)
Attended college	21 % (4)	17 % (8)
College graduate	21 % (4)	4 % (2)
Advanced degree	0 %	0 %
Family's SES rank		
Very High SES	0 %	0 %
Mid/high SES	4.5 % (1)	5.5 % (3)
Middle SES	22 % (5)	26.5 % (14)
Mid/low SES	59 % (13)	38 % (20)
Very Low SES	13.5 % (3)	30 % (16)
Family Structure		
2-parent home	77 % (17)	79 % (42)
1-parent home	23 % (6)	21 % (16)

^aPercent (n)

^b Distribution significantly ($p < 0.05$) different from control group

There was no significant difference in the level of education in the parents of Caucasians subjects versus Mexican-American subjects. However, there was a significant difference in the level of education in the parents of subjects in the treatment group versus the control group, especially in the fathers. Chi-square analysis revealed that fathers of the treatment subjects were significantly ($p < 0.05$) more educated than fathers of the control subjects. Table 2 shows that 21% of the fathers of the treatment subjects had not completed high school versus 39% of fathers of the control subjects. Also, 42% of the fathers of the treatment subjects had at least some college education versus only 21% of the fathers of the control subjects. Mothers of the treatment subjects also tended to be more educated than mothers of the control subjects, although not significantly ($p = 0.12$). The difference in fathers' education between groups was not found to be a significant covariate for any variable in this study and was, therefore, not used as a covariate for any analyses of covariance.

KNOWLEDGE DATA

Table 4 shows the mean knowledge scores ($\pm$ s.e.m.) at baseline and again at the end of the intervention program (post-test). Repeated measures ANOVA revealed that knowledge gains were significantly greater for subjects in the treatment group on overall nutrition knowledge ($p < 0.05$), general nutrition knowledge ($p < 0.01$) and total knowledge scores ($p < 0.05$).

TABLE 4. Mean^a Knowledge Scores of Subjects

Characteristic	Treatment (n = 22)		Control (n = 49)	
	Baseline	Post	Baseline	Post
Nutrition Knowledge Score (b = 83) ^b	29.17 ± 2.21	47.81 ± 1.95 ^d	27.46 ± 1.32	38.56 ± 1.73
High Fat Foods (b = 5)	3.13 ± 0.31	4.40 ± 0.18	2.71 ± 0.26	3.98 ± 0.18
High Sugar Foods (b = 5)	2.72 ± 0.25	3.90 ± 0.21	2.47 ± 0.22	3.32 ± 0.17
High Sodium Foods (b = 5)	2.45 ± 0.28	4.34 ± 0.19	2.30 ± 0.24	3.57 ± 0.20
High Cholesterol Foods (b = 5)	2.40 ± 0.31	4.00 ± 0.24	2.17 ± 0.23	3.24 ± 0.20
High Calorie Foods (b = 6)	2.86 ± 0.40	5.18 ± 0.26	2.56 ± 0.29	4.24 ± 0.27
General Nutrition Knowledge (b = 17)	3.90 ± 0.41	7.22 ± 0.60 ^e	3.39 ± 0.33	4.87 ± 28
Diabetes (b = 25)	7.08 ± 1.06	11.31 ± 0.73	7.08 ± 0.55	9.12 ± 0.73
Weight Loss/Dieting (b = 10)	2.81 ± 0.40	4.81 ± 0.48	2.84 ± 0.24	4.24 ± 0.27
CVD (b = 5)	1.86 ± 0.24	2.59 ± 0.21	1.95 ± 0.18	2.28 ± 0.17
Fitness Knowledge Score (b = 41)	11.13 ± 0.77	15.45 ± 1.23	9.19 ± 0.66	12.58 ± 0.85
TOTAL KNOWLEDGE SCORE (b = 124)	40.13 ± 2.58	63.31 ± 2.39 ^e	37.41 ± 2.45	51.22 ± 2.35

^a Mean score ± s.e.m.^b "b" = best score possible for that section^c Significantly (p < 0.05) different from control group according to Student's unpaired t test^d Improvement in treatment group significantly (p < 0.01) greater than improvement in control group according to repeated measures ANOVA^e Improvement in treatment group significantly (p < 0.05) greater than improvement in control group according to repeated measures ANOVA

Treatment subjects also achieved greater improvement than control subjects in fitness knowledge scores, although not significantly ($p = 0.062$). Knowledge scores in the control group also improved, but not significantly when compared to the improvements in the treatment group.

An analysis of covariance was performed to determine if there were any pre-existing difference, such as body composition, which were significant covariates for changes in knowledge. No significant covariates were found, except for gender. At baseline, females scored significantly higher scores ($p < 0.05$) than males for total knowledge (score of 39.28 versus score of 33.61). In the control group, females scored significantly higher scores ($p < 0.05$) than males for weight-loss/dieting knowledge (score of 2.95 versus score of 2.0) and cardiovascular disease knowledge (score of 2.09 versus score of 1.25) — these differences were not observed in the treatment group. Over time, gender had no significant effect on the change in knowledge scores for either the treatment and control group.

Multiple regression analysis revealed that in the treatment subjects, post-test knowledge scores could be predicted by pre-test knowledge scores and acculturation scores — in particular, total nutrition knowledge (adjusted $r^2 = 0.523$) and total knowledge (adjusted $r^2 = 0.478$). Acculturation scores and pre-test total knowledge scores, taken together, accounted for 52.3% of the variability in post-test total knowledge scores of treatment subjects. Likewise,

acculturation scores and pre-test nutrition knowledge scores accounted for 47.8% of the variability in post-test nutrition knowledge scores of treatment subjects.

NUTRITION ATTITUDES DATA

Table 5 shows the mean attitude scores ($\pm$ s.e.m.) at baseline and again at the end of the intervention program (post-test). No significant gender differences were observed, however, there was a significant difference ($p < 0.05$) at baseline in the "caring about nutrition" attitude score between the treatment and control group (unadjusted mean $\pm$ s.e.m. = 3.40 ± 0.10 versus 3.07 ± 0.06). An analysis of covariance revealed that the baseline "caring about nutrition" attitude score was a significant covariate ($F\ 1, 60 = 8.28, p < 0.01$) for only one variable in this study — the change in the "caring about nutrition" attitude score over time. During the two year intervention program, the treatment subjects improved their "caring about nutrition" attitude score significantly ($F\ 1,60 = 7.95, p < 0.01$) from 3.14 at baseline to 3.30 at post-test (adjusted means), while the control subjects only increased their scores from 3.14 at baseline to 3.24 at post-test (adjusted means).

Analysis of covariance found that initial waist-to-hip ratio was a significant covariate for the "eating new foods" attitude score ($F\ 1,61 = 4.97, p < 0.05$). However, even when accounting for this pre-existing difference, repeated measures ANCOVA revealed no significant difference in the

TABLE 5. Nutrition Attitude Scores^{a,b} of Subjects

Attitude Category	Treatment (n = 21)		Control (n = 48)	
	Baseline	Post	Baseline	Post
Caring About Nutrition	3.14 ± 0.13	3.30 ± 0.11 ^c	3.14 ± 0.85	3.24 ± 0.10
Eating New Foods	3.06 ± 0.15	3.27 ± 0.16	3.14 ± 0.10	3.28 ± 0.06
Nutrition Affects Health	3.57 ± 0.15	3.68 ± 0.15	3.69 ± 0.10	3.73 ± 0.08
Learning About Nutrition	3.29 ± 0.17	3.21 ± 0.11	2.97 ± 0.10	3.14 ± 0.09
OVERALL MEAN SCORE	3.33 ± 0.10	3.35 ± 0.10	3.21 ± 0.06	3.33 ± 0.05

^a Mean score ± s.e.m. are adjusted if covariate is significant

^b Scores range from 1 ("strongly negative attitude") to 5 ("strongly positive attitude"), where a score equal to 3 is considered "neutral"

^c Improvement in treatment group significantly ($p < 0.05$) greater than improvement in control group according to repeated measures ANCOVA

"learning about nutrition" attitude score or the "nutrition affects health" attitude score between the treatment and control subjects upon completion of the intervention program. After two years in a nutrition education program, the treatment subjects still did not see the connection between nutrition and health. However, after two years in a nutrition education program, the treatment subjects did care more about nutrition.

STAGES OF CHANGE DATA

Stage of Change for Fat Intake Behavior

Table 6 and figures 2 and 3 show the distribution of subjects according to their stage of change for fat intake behavior at baseline and again at the end

TABLE 6. Distribution of Subjects by Stage of Change for Fat Intake Behavior

Stage of Change ^a	Treatment (n = 23)		Control (n = 51)	
	Baseline	Post	Baseline	Post
Precontemplation	22 % (5)	9 % (2) ^b	12 % (6)	16 % (8)
Contemplation	13 % (3)	4 % (1) ^b	27 % (14)	35 % (18)
Preparation	22 % (5)	26 % (6)	23 % (12)	19.5 % (10)
Action	26 % (6)	18 % (4)	10 % (5)	19.5 % (10)
Maintenance	17 % (4)	43 % (10) ^b	27 % (14)	10 % (5)

^aPercent (Frequency)

^b Distribution of treatment subjects into stages significantly ($p < 0.0005$) different from control group according to χ^2 analysis

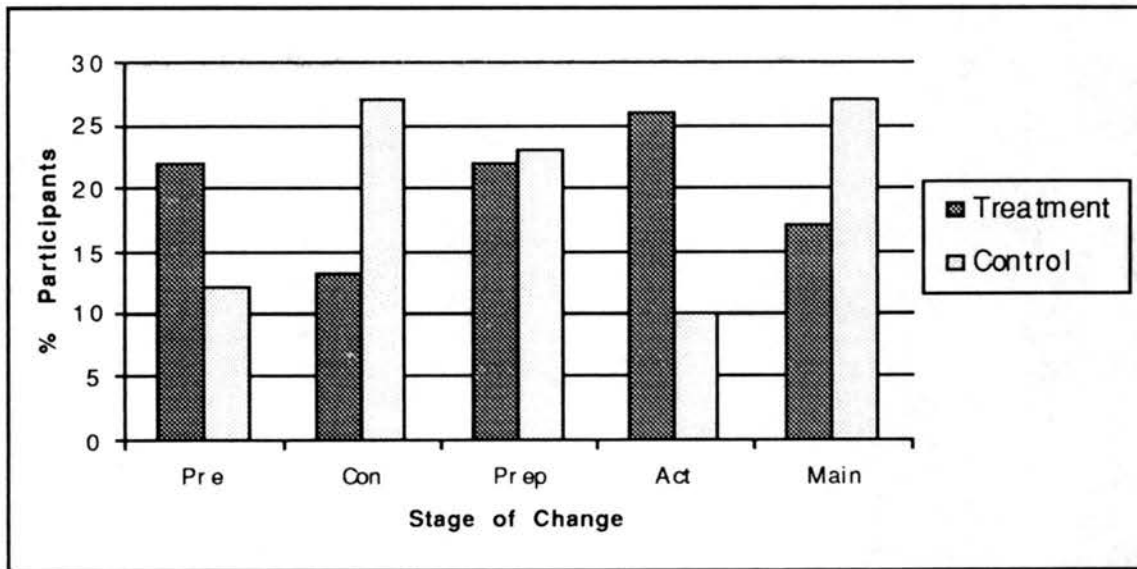


FIGURE 2. Stage of Change of Participants for Fat Intake Behavior at Baseline

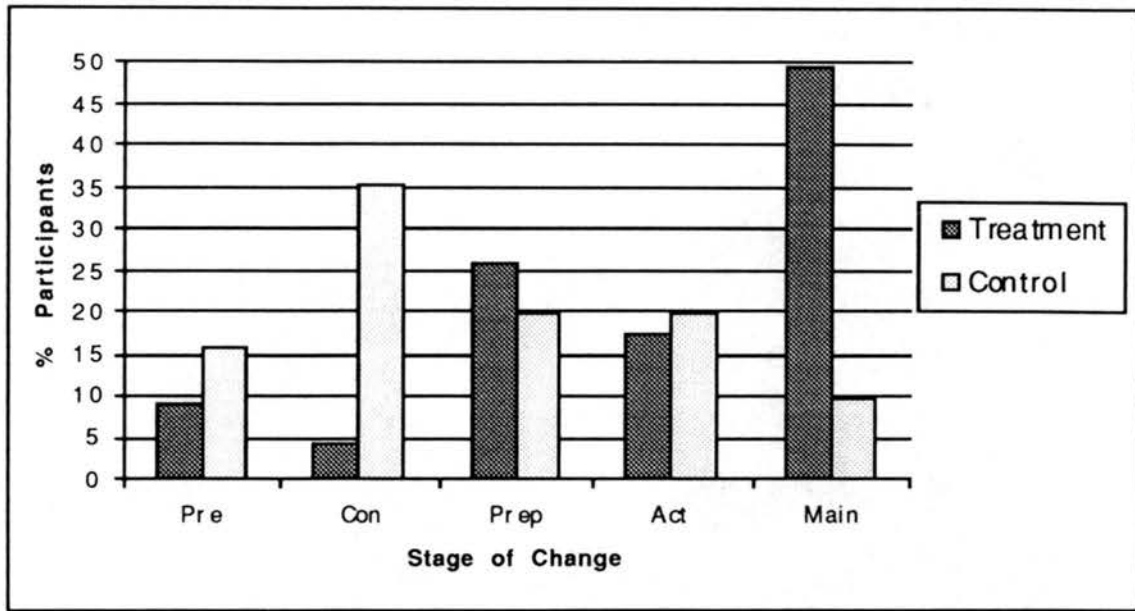


FIGURE 3. Stage of Change of Participants for Fat Intake Behavior at Post-test

treatment and control subjects ($\chi^2 = 3.03, p = 0.55$), or between males and females ($\chi^2 = 2.14, p = 0.70$). However, by the end of the 2-year intervention program (post-test), there was a significant difference between the treatment and control subjects in their distribution among the stages of change for fat intake behavior ($\chi^2 = 15.70, p = 0.005$). Significantly more of the treatment subjects (61%) were at the higher stages of change — action and maintenance stages — than control subjects (29.5%).

Subjects were assessed by their “movement” along the stage of change continuum for fat intake behavior (Figure 4) over the 2-year intervention period by analysis of covariance to account for pre-existing differences in body

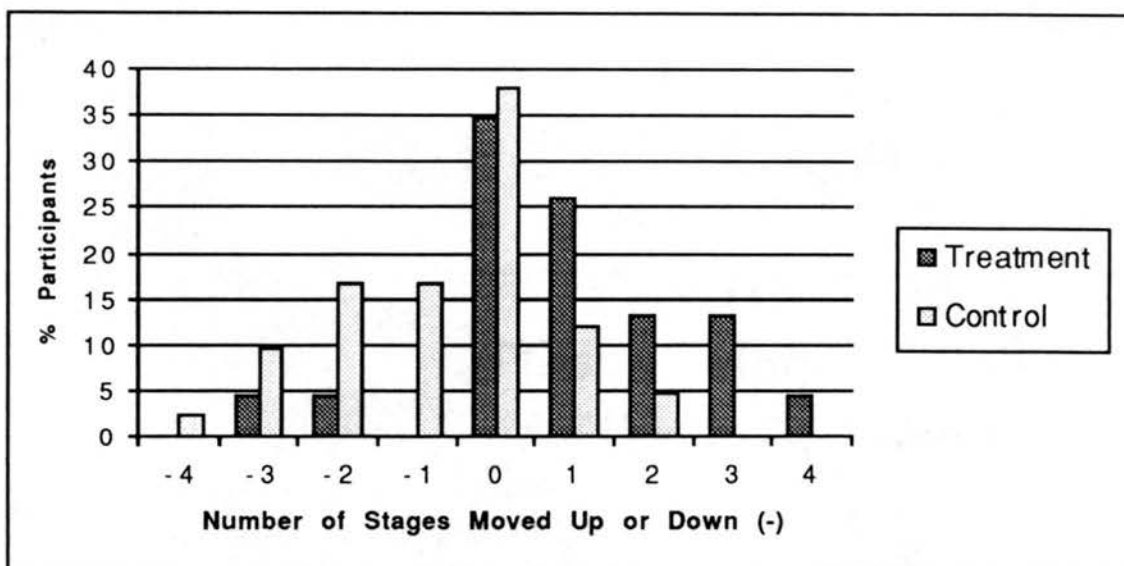


FIGURE 4. Movement through the Stages of Change for Fat Intake Behavior

composition, attitudes toward nutrition, self-efficacy scores, and nutrition knowledge. No significant covariates were found. An unpaired t-test revealed significant differences ($p < 0.001$) between treatment and control subjects in stage of change movement. Treatment subjects moved forward (to a higher stage of change) a mean ($\pm$ s.e.m.) of 0.87 ± 0.36 stages, while the control subjects moved backward (to a lower stage of change) a mean ($\pm$ s.e.m.) of 0.66 ± 0.20 stages. Subjects in the treatment group improved significantly while subjects in the control group actually regressed. No significant gender difference was observed in movement along the stage of change continuum.

At baseline, stage of change for fat intake behavior was significantly related to attitudes toward learning about nutrition ($r = 0.437$, $p < 0.05$) and

overall mean nutrition attitudes score ($r = 0.429, p < 0.05$). At post-test, stage of change for fat behavior was significantly related to several variables, including overall nutrition attitudes score ($r = 0.340, p < 0.05$), attitude toward caring about nutrition ($r = 0.324, p < 0.05$), self-efficacy for choosing low-fat foods ($r = 0.298, p < 0.05$), percent body fat ($r = 0.445, p < 0.01$), fat intake as measured by the Dietary Screening questionnaire ($r = -0.525, p < 0.001$), fat intake as measured by the 24-hour diet recall ($r = -0.350, p < 0.05$), and energy intake as measured by the 24-hour diet recall ($r = -0.398, p < 0.05$).

Stage of Change for Exercise

Table 7 and Figures 5 and 6 show the distribution of subjects according to their stage of change for exercise at baseline and again at the end of the 2-year intervention program. At baseline, there was no significant difference in the distribution among the various stages of change between the treatment and control subjects ($\chi^2 = 2.45, p = 0.29$), or between males and females ($\chi^2 = 4.04, p = 0.40$). By the end of the 2-year intervention program (post-test), there was a difference between the treatment and control subjects in their distribution among the stages of change for exercise, however, this difference was not significant ($\chi^2 = 9.36, p = 0.052$).

TABLE 7. Distribution of Subjects by Stage of Change for Exercise

Stage of Change ^a	Treatment (n = 23)		Control (n = 51)	
	Baseline	Post	Baseline	Post
Precontemplation	4 % (1)	0% ^b	4 % (2)	6 % (3)
Contemplation	4 % (1)	0 % ^b	4 % (2)	19 % (10)
Preparation	80 % (18)	13 % (3) ^b	51 % (26)	22 % (11)
Action	4 % (1)	35 % (8) ^b	12 % (6)	22 % (11)
Maintenance	8 % (2)	52 % (12) ^b	29 % (15)	31 % (16)

^a Percent (Frequency)

^b Distribution of treatment subjects into stages significantly ($p < 0.05$) different from control group

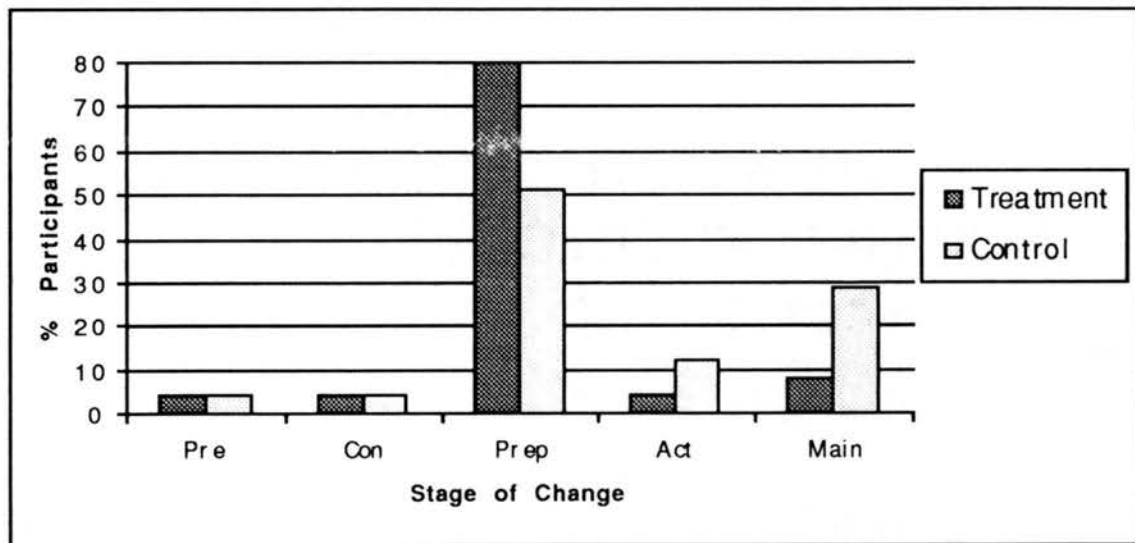


FIGURE 5. Stage of Change of Participants for Exercise at Baseline

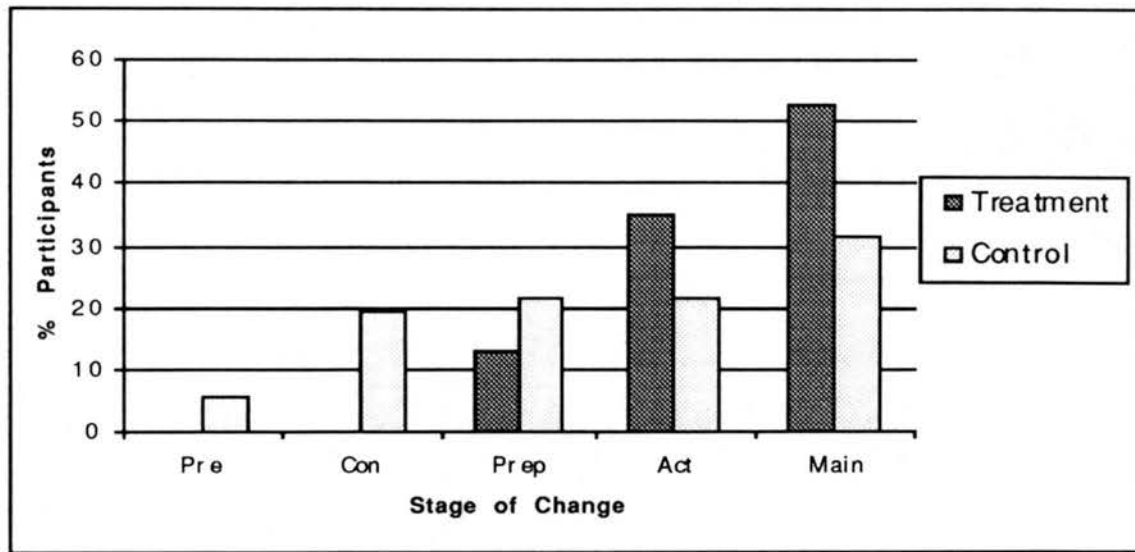


FIGURE 6. Stage of Change of Participants for Exercise at Post-test

Subjects were assessed by their “movement” along the stage of change continuum for exercise (Figure 7) over the 2-year intervention period by ANCOVA to account for pre-existing differences in body composition, and fitness indices (i.e. walk/run time and # sit-ups). The only significant difference was initial waist-to-hip ratio ($F_{1,63} = 4.27, p < 0.05$). The ANCOVA revealed significant differences ($p < 0.0001$) between treatment and control subjects in stage of change movement. Treatment subjects moved forward (adjusted mean $\pm$ s.e.m.) 1.42 ± 0.26 stages, while the control subjects moved backward (adjusted mean $\pm$ s.e.m.) 0.006 ± 0.18 stages. Subjects in the treatment group improved significantly while subjects in the control group

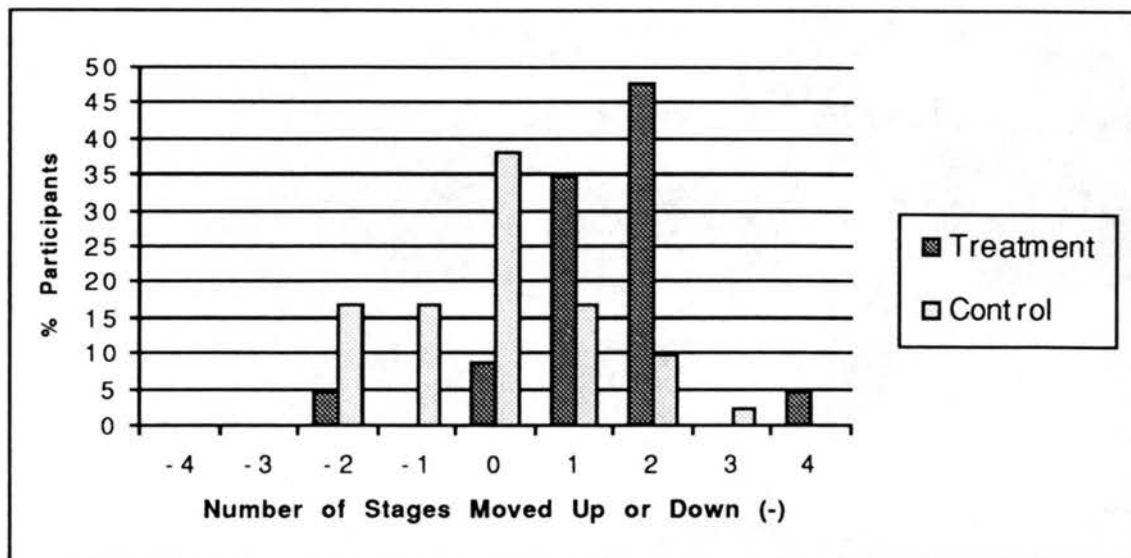


FIGURE 7. Movement through the Stages of Change for Exercise

basically remained in same stage of change. No significant gender difference was observed in movement along the stage of change continuum.

SELF EFFICACY DATA

Table 8 shows the mean self-efficacy scores ($\pm$ s.e.m.) at baseline and again at the end of the intervention program (post-test). There was a significant difference ($p < 0.05$) at baseline in the low-fat foods self-efficacy scores between the treatment and control group (2.96 versus 3.53) — subjects in the control group felt significantly more confident about choosing low-fat foods than subjects the treatment group. Due to baseline differences between the treatment and control subjects in this variable, as well as initial

TABLE 8. Mean^a Self-efficacy Scores of Subjects

	Treatment (n = 22)		Control (n = 41)	
	Baseline	Post	Baseline	Post
Choosing Low-fat Foods ^b	2.69 ± 0.22 ^c	3.02 ± 0.27	3.10 ± 0.16	2.90 ± 0.15
Exercising Regularly ^b	2.73 ± 0.24	3.02 ± 0.27	3.04 ± 0.19	3.53 ± 0.15

^a Mean score ± s.e.m. are adjusted if covariate is significant

^b Scores ranged from 1 ("not at all confident") to 7 ("extremely confident"), where a score equal to 4 is considered "neutral"

^c Significantly ($p < 0.05$) different from control group according to Student's unpaired *t* test

differences in body composition (i.e. weight, % body fat, and waist-to-hip ratio), a repeated measures ANCOVA was performed to account for these differences and to determine differences over time in the low-fat foods self-efficacy scores and exercise self-efficacy scores. Analysis of covariance revealed that there were no significant covariates for either self-efficacy score and that the baseline low-fat foods self-efficacy score was not a significant covariate for any of the other variables in this study, therefore it was removed as a covariate from all analyses. No significant gender differences were observed at baseline or at post-test.

Repeated measures ANOVA revealed that at the end of the two-year intervention program, there was no significant difference in low-fat foods self-efficacy scores ($F_{1,61} = 3.31, p = 0.07$) or exercise self-efficacy scores ($F_{1,58} = 0.64, p = 0.42$) between the treatment and control subjects. Both self-efficacy

scores in the treatment subjects improved, although not significantly when compared to the improvements in the control group.

Although not present at baseline, there were significant relationships at post-test between exercise self-efficacy scores and body composition, and also between exercise self-efficacy scores and fitness indices. As subjects' got larger — assessed by BMI ($r = -0.351, p < 0.05$) and % body fat ($r = -0.435, p < 0.01$) — they became less confident in their ability to exercise. However, as subjects became more physically fit by improving (decreasing) their 1-mile walk/run time ($r = -0.373, p < 0.05$) and increasing the number of sit-ups they could perform in 1 minute ($r = 0.469, p < 0.01$), they also became more confident in their ability to exercise.

The only significant relationship found for the low-fat foods self-efficacy score was with fat intake, as measured by the Block Dietary Screening Questionnaire, at post-test. As their fat intake decreased, they also became more confident in their ability to choose low-fat foods ($r = -0.387, p < 0.01$).

DIETARY INTAKE DATA

24-Hour Recall

Table 9 shows the dietary intake as measured by a 24-hour recall of subjects at baseline and again at the end of the intervention program (post-test). At baseline, treatment subjects consumed significantly ($p < 0.05$) less of their total kilocalories from high-fat snack foods than control subjects.

TABLE 9. Dietary Intake Data From 24-Hour Recalls of Subjects

Characteristic ^a	Treatment (n = 23)		Control (n = 47)	
	Baseline	Post	Baseline	Post
Kilocalories	2773 ± 274	1881 ± 184	2598 ± 157	1859 ± 120
Protein (g)	69.6 ± 5.91	62.5 ± 8.36	65.8 ± 5.05	75.2 ± 5.75
Fat (g)	72.4 ± 8.93	76.3 ± 10.14	70.1 ± 5.59	71.5 ± 5.47
Carbohydrate (g)	249 ± 20.08	237 ± 21.29	239 ± 18.32	238 ± 15.70
% Kcals from Protein	14.6 ± 0.53	12.5 ± 0.90 ^c	14.2 ± 0.56	15.7 ± 0.67
% Kcals from Fat	32.4 ± 1.71	34.2 ± 2.47	33.8 ± 1.17	33.5 ± 1.08
% Kcals from Carbohydrate	52.7 ± 1.87	53.0 ± 2.96	51.8 ± 1.45	50.8 ± 1.31
Cholesterol (mg)	226 ± 29.3	181 ± 35.5	209 ± 23.8	248 ± 30.0
Sodium (mg)	2773 ± 274	3427 ± 426	2870 ± 221	2902 ± 221
Breakfast Consumption ^b				
yes	48% (11)	30% (7)	58% (26)	38% (20)
no	52% (12)	70% (16)	42% (19)	62% (33)
Fast Food Eating Occasions per day	0.78 ± 0.14	0.56 ± 0.17	0.76 ± 0.11	0.51 ± 0.08
% of Total kcals from Fast Food	25.3 ± 5.43	23.0 ± 6.51	26.9 ± 3.98	19.7 ± 3.69
% of Total kcals from high-fat snacks	4.8 ± 2.03	3.4 ± 1.49	13.7 ± 1.62	9.1 ± 1.92
Soda Intake (oz/day)	16.3 ± 2.69	12.1 ± 2.17	14.2 ± 1.95	13.3 ± 1.83
% of Total kcals from Soda	11.5 ± 2.01	7.6 ± 1.49	9.0 ± 1.29	7.3 ± 1.09
Sweetened Juice (oz/day)	1.5 ± 0.89	0.69 ± 0.69	2.1 ± 0.72	2.5 ± 0.64
# Fruit servings per day	0.52 ± 0.25	0.30 ± 0.14	0.57 ± 0.16	0.80 ± 0.15
# Vegetable servings per day	0.43 ± 0.28	0.60 ± 0.19	0.45 ± 0.20	0.68 ± 0.20
Fried Potatoes (oz/day)	0.65 ± 0.28	0.95 ± 0.41	0.58 ± 0.18	0.94 ± 0.25

^a Mean ± s.e.m. are adjusted if covariate is significant^b Percent (frequency)^c Change in treatment group significantly ($p < 0.05$) greater than change in control group according to repeated measures ANOVA

ANCOVA revealed no significant covariates for changes in diet (as measured by the 24-hour recall) over time, therefore, a simple repeated measures ANOVA was used to evaluate changes in diet over time. The only significant dietary (as measured by the 24-hour recall) difference detected between the treatment and control subjects after two years of intervention was the % of total kilocalories from protein ($F_{1, 70} = 6.99, p < 0.05$), with the treatment group reporting lower % of kilocalories as protein than the control group (12.5% in treatment group versus 15.7% in the control group).

Fruit and Vegetable Consumption

Table 9 shows the mean fruit and vegetable consumption of the treatment and control subjects. There were no significant differences at baseline or at the end of the 2-year intervention program between groups for either fruit or vegetable consumption. Both groups consumed low amounts of fruits and vegetables. Seventy-one percent of all subjects consumed 0.25 or less servings of fruit per day, and 57% of all subjects consumed 0.25 or less servings of vegetables per day. American adults are currently recommended to consume 2 or more servings of fruit per day and 3 or more servings of vegetables per day (USDA, 1992) — only 4% of subjects met the recommendation for fruit intake and 3% of subjects met the recommendation for vegetable intake. Only 3% of subjects (4% of treatment subjects and 2% of

control subjects) at baseline met the recommended 5 or more servings of fruits and vegetables per day.

At post-test, fruit and vegetable consumption was still low. Sixty-three percent of control subjects and 83% of treatment subjects consumed 0.25 or less servings of fruit per day, and 52% of both control and treatment subjects consumed 0.25 servings or less servings of vegetables per day. Thirteen percent of treatment subjects and 22% of control subjects met the recommended fruit intake of at least 2 servings per day, while 4% of treatment subjects and 2% of control subjects met the recommended vegetable intake of 3 or more servings per day. Only 1.4% of subjects (0% of treatment subjects and 2% of control subjects) at post-test met the recommended 5 or more servings of fruits and vegetables per day.

There were no significant gender differences in fruit or vegetable intake at baseline or at post-test. There were also no significant socioeconomic or ethnic differences in fruit and vegetable intake at baseline or post-test.

Breakfast Consumption

Table 9 shows the distribution of subjects who consumed breakfast at baseline and again at the end of the intervention program (post-test). Overall, only 48% of subjects at baseline consumed breakfast, with significantly less treatment subjects consuming breakfast than control subjects ($\chi^2 = 4.45, p < 0.05$). By the end of the intervention program, there was no difference in the

distribution of breakfast eaters between the treatment and control group ($\chi^2=0.52$, $p = 0.46$). By the end of the 2-year intervention program, the percentage of breakfast eaters in both groups had fallen to 30% of treatment subjects and 38% of control subjects.

A discriminate analysis by breakfast eating at baseline revealed several differences. First, breakfast eaters consumed significantly fewer of their total daily kilocalories from soda than non-breakfast eaters ($p < 0.005$) — 7% of daily kilocalories from soda in breakfast eaters versus 13% of daily kilocalories from soda in non-breakfast eaters. Second, breakfast eaters ate significantly more fruit servings/day than non-breakfast eaters ($p < 0.005$), 1.0 serving per day versus 0.3 servings per day. Breakfast eaters also ate significantly more combined servings of fruits and vegetables per day ($p < 0.005$), with breakfast eaters consuming a 1.6 servings per day and non-breakfast eaters consuming only 0.8 servings per day. Although the third difference was not significant ($p = 0.08$), breakfast eaters tended to consume less of their total daily kilocalories from fast-food than non-breakfast eaters — 23% of daily kilocalories from fast food in breakfast eaters versus 31% of daily kilocalories from fast food in non-breakfast eaters. These differences were not found in breakfast eaters at the end of the 2-year intervention program except for fruit consumption ($p < 0.04$), where breakfast eaters consumed 0.98 servings per day and non-breakfast eaters consumed only 0.45 servings per day.

Sweetened Fruit Juice and Fried Potatoes Consumption

There were no significant differences at baseline or at the end of the 2-year intervention program between groups for either sweetened fruit juice consumption or fried potato consumption. There were also no significant gender differences in either sweetened fruit juice or fried potato intake. For those who did consume sweetened fruit juice (18% of all subjects) at baseline, mean ($\pm$ s.e.m.) intake was 11.8 ± 1.2 fluid ounces. For those who did consume sweetened fruit juice (13.5% of all subjects) at post-test, mean ($\pm$ s.e.m.) intake was 14.4 ± 2.3 fluid ounces.

Fast Food Eating

Table 9 shows the mean percent of kilocalories from fast foods for the treatment and control subjects. There were no significant differences at baseline or at the end of the 2-year intervention program between groups for either the number of fast food eating occasions or % of total kilocalories from a fast food meal — neither group improved significantly.

At baseline, meals eaten at fast food restaurants contributed 27% of total kilocalories for subjects. However, when non fast-food eaters were removed from the analysis, meals eaten at fast food restaurants contributed 44% of total kilocalories. Those eating at fast food restaurants at baseline consumed significantly ($p < 0.01$) less fruit servings than non fast food eaters

(0.4 servings versus 1.0 servings), and consumed significantly ($p < 0.01$) more fried potatoes than non fast food eaters (0.95 ounces versus 0.17 ounces).

There was no significant gender difference in the number of fast food eating occasions or % of kilocalories from fast food meals at baseline. However, for those who did eat at fast food restaurants, females consumed significantly more ($p < 0.05$) of their kilocalories from fast food meals than males (48% of kilocalories versus 38% of total daily kilocalories from fast-food meals).

At post-test, meals eaten at fast food restaurants contributed 21% of total kilocalories for subjects. However, when non fast-food eaters were removed from the analysis, this number increased to 49.5% of total kilocalories — with treatment subjects ($n = 9$) receiving 58.8% of kilocalories from fast-food meals, significantly more ($p < 0.05$) than the control subjects ($n = 25$), who received 40.3% of kilocalories from fast-food meals. Those eating at fast food restaurants at post-test consumed significantly ($p < 0.05$) more fried potatoes than non fast food eaters (1.45 ounces versus 0.56 ounces), and significantly ($p < 0.05$) more of their total kilocalories from soda (10% of kilocalories versus 5.5% of total daily kilocalories).

As before, there was no significant gender difference in the number of fast food eating occasions or % of kilocalories from fast food meals at post-test. However, for those who did eat at fast food restaurants, females consumed significantly more ($p < 0.05$) of their kilocalories from fast food meals than

males (58.7% of kilocalories versus 38.5% of total daily kilocalories from fast-food meals). Females in the treatment group ($n = 6$) tended to consume more ($p < 0.07$) of their kilocalories from fast food meals than females in the control group ($n = 12$) (68.6% of kilocalories versus 48.8% of total daily kilocalories from fast-food meals).

High-Fat Snack Foods Consumption

There were significant differences at baseline in % of kilocalories consumed as high-fat snack foods between the treatment and control group ($p < 0.05$). However a repeated measures analysis of covariance performed to account for this difference revealed that it was not a significant covariate for any of the variables in this study. A repeated measures analysis of variance showed that there was no significant improvement in the % of kilocalories from high-fat snack foods between the treatment and control group ($F_{1,67} = 0.56, p = 0.45$). There was also no significant gender difference at baseline or at the end of the 2-year intervention program.

There was a significant difference at baseline in the proportion of high-fat snack food eaters versus non-eaters between the treatment and control group ($\chi^2 = 14.44, p < 0.001$), with significantly more of the control group (78%) consuming high-fat snacks than the treatment group (30%). This difference was not present at post-test ($\chi^2 = 0.69, p = 0.41$), when only 45% of

the control subjects and 35% of treatment subjects consumed at least one high-fat snack food per day.

At baseline, when non high-fat snack food eaters were removed from the analysis (10 subjects removed from control group and 16 subjects removed from treatment group), high-fat snack foods contributed 17.2% (17.4% in control subjects and 16.0% in treatment subjects) of total kilocalories. For high-fat snack food eaters at post-test (23 control subjects and 8 treatment subjects), high-fat snack foods contributed 17.5% of total kilocalories. Although not significant, the contribution of kilocalories from high-fat snack foods was higher ($p < 0.07$) in control subjects (20.2%) than in treatment subjects (9.8%).

Soft Drink Consumption

Table 9 shows the mean percent of kilocalories from soda and the mean fluid ounces of soda consumed for the treatment and control subjects. There were no significant differences at baseline, neither were there significant differences in improvement during the 2-year intervention program between treatment and control subjects.

A discriminate analysis of subjects at baseline showed that soda drinkers consumed significantly less fruit ($p < 0.01$) than non-drinkers (0.4 servings versus 1 serving) and soda drinkers tended to eat more high-fat snack foods ($p = 0.07$) than non-drinkers (12% of kilocalories for soda drinkers

versus 8% of kilocalories for non-drinkers). None of these differences between soda drinkers and non-drinkers were observed at post-test.

Validity of 24-Hour Recall Data

According to calculated energy intake/expenditure ratio (EIER = reported energy intake ÷ estimated basal metabolic rate) of subjects, only 22% of treatment subjects and 19% of control subjects reported “invalid” 24-hour diet recalls at baseline — 22% of treatment and 19% of control subjects were “underreporters” of food intake. However, by the end of the 2-year intervention program (post-test) 50% of treatment subjects and 45% of control subjects were underreporters of food intake. There was no significant difference in the percent of subjects underreporting intake between the treatment and control subjects at baseline ($\chi^2 = 0.29, p = 0.59$) or at post-test ($\chi^2 = 0.057, p = 0.81$). Also, there was no significant gender difference in the percent of subjects underreporting intake at baseline ($\chi^2 = 0.58, p = 0.44$) or at post-test ($\chi^2 = 1.04, p = 0.30$).

Table 10 compares nutrient intakes of “valid” (adequate reporters) versus “invalid” (underreporters) 24-hour recalls. For this analysis, both treatment and control subjects were pooled together since there were no significant differences between the valid or invalid 24-hour recalls of the two groups at baseline or at post-test. Adequate reporters of food intake reported

Table 10 Comparison of Dietary Intake Data from Valid 24-hour Diet Recalls versus Invalid 24-hour Diet Recalls

Characteristic (mean $\pm$ s.e.m.)	Valid 24-hour Recalls		Invalid 24-hour Recalls	
	Pre (n = 93)	Post (n = 39)	Pre (n = 23)	Post (n = 34)
Kilocalories	3084 $\pm$ 98 ^a	2433 $\pm$ 103 ^b	1255 $\pm$ 112	1186 $\pm$ 79
Protein (g)	75.7 $\pm$ 3.5 ^a	91.6 $\pm$ 5.7 ^b	47.9 $\pm$ 6.3	47.0 $\pm$ 5.4
Fat (g)	81.5 $\pm$ 4.3 ^c	99.1 $\pm$ 5.8 ^b	50.5 $\pm$ 10.0	40.8 $\pm$ 3.2
Carbohydrate (g)	277 $\pm$ 11.7 ^c	302 $\pm$ 15.3 ^b	183 $\pm$ 29.5	160 $\pm$ 11.2
% Kcals from Protein	14.1 $\pm$ 0.3	14.6 $\pm$ 0.5	14.0 $\pm$ 1.0	15.0 $\pm$ 1.0
% Kcals from Fat	33.3 $\pm$ 0.8	35.8 $\pm$ 1.8 ^b	29.8 $\pm$ 1.8	30.7 $\pm$ 1.7
% Kcals from Carbohydrate	52.2 $\pm$ 0.9	49.0 $\pm$ 1.5	55.9 $\pm$ 2.5	54.1 $\pm$ 2.1
Cholesterol (mg)	236.8 $\pm$ 19.3 ^b	291.8 $\pm$ 30.2 ^b	113.5 $\pm$ 19.3	146.9 $\pm$ 30.4
Sodium (mg)	3365 $\pm$ 152 ^b	3905 $\pm$ 260 ^b	1702 $\pm$ 374	2030 $\pm$ 205
# Fruit servings per day	0.57 $\pm$ 0.12	0.83 $\pm$ 0.20	0.67 $\pm$ 0.30	0.50 $\pm$ 0.14
# Vegetable servings per day	0.55 $\pm$ 0.09 ^b	0.70 $\pm$ 0.14	1.14 $\pm$ 0.31	0.60 $\pm$ 0.15
% Kcals from Fast Food	27.84 $\pm$ 2.96	18.28 $\pm$ 3.87	28.58 $\pm$ 5.10	21.01 $\pm$ 5.25
Soda Consumed (fluid oz.)	16.49 $\pm$ 1.70	17.00 $\pm$ 2.27 ^b	16.19 $\pm$ 3.09	7.58 $\pm$ 1.52
% Kcals from High-fat Snack	10.88 $\pm$ 1.32	4.77 $\pm$ 1.86	8.92 $\pm$ 2.14	9.94 $\pm$ 2.32
Breakfast Consumption ^d				
yes	83% (30)	69% (18) ^e	17% (6)	31% (8)
no	80% (24)	42% (19)	20% (6)	58% (26)

^a Significantly ($p < 0.0001$) different from invalid diet recall according to Students' unpaired t test

^b Significantly ($p < 0.005$) different from invalid diet recall according to Students' unpaired t test

^c Significantly ($p < 0.05$) different from invalid diet recall according to Students' unpaired t test

^d Percent (frequency) — pre(valid) + pre(invalid) = 100% and post(valid) + post(invalid) = 100%

^e Distribution significantly ($p < 0.05$) different from invalid diet recall according Chi-Square analysis

significantly greater energy intakes ($p < 0.0001$), as well as greater protein ($p < 0.005$), fat ($p < 0.005$), and carbohydrate ($p < 0.005$) intakes than underreporting subjects. However, the percent of kilocalories from fat, protein, and carbohydrates were not significantly different between adequate reporters versus underreporters, except at post-test, where underreporters reported a significantly ($p < 0.05$) lower percentage of kilocalories from fat than adequate reporters (30.7% versus 35.8%). At baseline, underreporters reported significantly higher intakes of vegetables than adequate reporters ($p < 0.05$).

At post-test, there was a significantly lower percentage of underreporters who consumed high-fat snack foods ($\chi^2 = 7.22, p < 0.01$) (29% of underreporters versus 71% of adequate reporters consumed at least one high-fat snack), and sweetened soda ($\chi^2 = 11.14, p < 0.001$) (33% of underreporters versus 67% of adequate reporters consumed sweetened soda). Also, of those subjects who skipped breakfast, 20% were underreporters and 80% were adequate reporters ($\chi^2 = 4.81, p < 0.05$). So, breakfast skippers were significantly more like to underreport food intake. These differences were not observed at baseline.

Invalid 24-hour recalls were then disregarded so that dietary improvements in only the valid 24-hour recalls could be analyzed. Repeated measures analysis of covariance was performed to account for pre-existing

differences between the treatment and control group. The analysis of covariance found no significant covariates, therefore, repeated measures analysis of variance calculated improvements in dietary intake variables between the treatment and control subjects. The only significant improvement was in the control subjects, who increased their fruit servings from 0.49 servings/day at baseline to 0.90 servings/day at post-test, while the treatment subjects slightly decreased their fruit servings from 0.89 servings/day at baseline to 0.83 servings/day ($F_{1,32} = 5.61, p < 0.05$).

Block Dietary Screening Questionnaire

Table 11 shows the dietary fat and saturated fat intake as measured by the Block Dietary Screening Questionnaire of subjects at baseline and again at the end of the intervention program (post-test). As described previously, this food frequency questionnaire estimated total fat and saturated fat intake in grams per day of the subject during the 12 months prior to the questionnaire administration. At baseline, treatment and control subjects were not significantly different in fat or saturated fat intake, as measured by this questionnaire, both groups consumed a mean ($\pm$ s.e.m.) 50.1 ± 3.3 grams of fat/day and 19.0 ± 1.4 grams of saturated fat/day.

After a repeated measures ANCOVA found no significant covariates for fat grams/day and saturated fat grams/day (as measured by this questionnaire), a repeated measures ANOVA was used to determine

TABLE 11. Mean^a Fat Intake From Block Dietary Screening Questionnaire^b of Subjects

	Treatment (n = 23)		Control (n = 51)	
	Baseline	Post	Baseline	Post
Total Fat (g/day)	50.10 ± 7.08	34.4 ± 4.34 ^c	50.6 ± 3.76	47.1 ± 2.92
Saturated Fat (g/day)	20.5 ± 3.19	13.4 ± 1.70 ^c	18.5 ± 1.51	18.1 ± 1.30

^a Mean ± s.e.m. are adjusted if covariate is significant

^b Estimates total fat & saturated fat intake (g/day) during the past 12 months

^c Improvement in treatment group significantly ($p < 0.05$) greater than improvement in control group

differences in improvement between the treatment and control subjects. By the end of the 2-year intervention program (post-test), the treatment group had improved significantly over the control group by significantly decreasing their fat ($F_{1,66} = 4.62, p < 0.05$) and saturated fat intake ($F_{1,66} = 5.14, p < 0.05$) — as measured by this questionnaire. The total fat intake (g/day) at post-test reported by subjects on Table 11 was much lower than that reported by 'adequate' energy reporters shown on Table 10. This is most likely due to a desire on the part of subjects, to report a low fat intake during the administration of the Block Dietary Screening Questionnaire.

A significant gender difference ($p < 0.05$) was observed for both fat and saturated fat intake — but only in the control subjects. Males in the control group reported significantly ($p < 0.05$) higher fat and saturated fat intake than

females at baseline (males = 59.9 g fat and 24.0 g saturated fat versus females = 48.4 g fat and 17.1 g saturated fat), and again at post-test (males = 55.0 g fat and 20.6 g saturated fat versus females = 42.9 g fat and 16.4 g saturated fat). When improvements in fat and saturated fat intake during the 2-year intervention program were compared between males and females of each group, no significant gender differences were found.

Multiple regression analysis revealed that in the treatment subjects, total fat and saturated fat intake (as measured by this questionnaire) at post-test could be predicted by initial BMI and acculturation scores. BMI and acculturation scores, taken together, accounted for 53.2% (adjusted $r^2 = 0.532$) of the variability in total fat intake, as measured by this questionnaire, in treatment subjects at post-test. Likewise, BMI and acculturation scores and pre-test nutrition knowledge scores accounted for 67.3% (adjusted $r^2 = 0.673$) of the variability in saturated fat intake, as measured by this questionnaire, in treatment subjects at post-test. These results were not found in the control subjects.

Block Food Frequency Questionnaire For High-Fat Foods

Table 12 shows the mean ($\pm$ s.e.m.) scores of high-fat food items consumed by subjects over the 12 month period prior to assessment as measured by the Block Food Frequency Questionnaire for high-fat foods. At baseline, treatment subjects reported significantly lower consumption of beef,

TABLE 12. Mean Scores^a From Block Food Frequency Questionnaire^{b,c} for High-Fat Foods of Subjects

	Treatment (n = 23)		Control (n = 49)	
	Baseline	Post	Baseline	Post
Ground Beef	2.26 ± 0.20	2.17 ± 0.27	2.46 ± 0.12	2.32 ± 0.15
Regular Beef	1.13 ± 0.14	1.34 ± 0.20	1.68 ± 0.13	1.54 ± 0.12
Fried Chicken	0.82 ± 0.17	0.69 ± 0.15	1.00 ± 0.14	1.08 ± 0.14
Hot Dogs	1.26 ± 0.24	0.56 ± 0.16	1.08 ± 0.15	0.54 ± 0.11
Ham & Cold Cuts	2.39 ± 0.25	1.47 ± 0.21	2.36 ± 0.17	1.76 ± 0.16
Salad Dressings, Mayonnaise, Sour Cream, Avocado, and Guacamole	2.39 ± 0.19	2.17 ± 0.24	2.34 ± 0.15	1.92 ± 0.15
Butter and Margarine	2.82 ± 0.25	2.13 ± 0.27	2.51 ± 0.16	2.22 ± 0.19
Eggs	0.98 ± 0.26	0.72 ± 0.26	1.74 ± 0.14	1.71 ± 0.14
Bacon, Sausage, and Chorizo	1.30 ± 0.23	0.69 ± 0.15	1.66 ± 0.15	1.18 ± 0.15
Cheese, except cottage	3.26 ± 0.22	2.65 ± 0.21	2.63 ± 0.17	2.52 ± 0.17
Whole Milk	1.51 ± 0.40	0.39 ± 0.34	1.94 ± 0.27	1.56 ± 0.26
French Fried Potatoes	2.47 ± 0.22	2.34 ± 0.21	1.97 ± 0.13	2.14 ± 0.14
Potato/Corn/Tortilla Chips, and Buttered Popcorn	1.32 ± 0.21	1.76 ± 0.21	2.11 ± 0.17	2.14 ± 0.19
Ice Cream	1.78 ± 0.19	1.17 ± 0.18	1.55 ± 0.17	1.48 ± 0.14
Cake, Cookies, Pie, Pastries, etc.	1.65 ± 0.23	1.82 ± 0.19	2.49 ± 0.17	2.22 ± 0.16
TOTAL SCORE^e	28.65 ± 1.15	22.47 ± 1.51^f	29.93 ± 1.13	27.14 ± 1.04

^a Mean score ± s.e.m. are adjusted if covariate is significant

^b Scores fat intake during the past 12 months.

^c Individual scores of: 0 = usually eat food less than once per month
1 = usually eat food 2-3 times per month
2 = usually eat food 1-2 times per week
3 = usually eat food 3-4 times per week
4 = usually eat food 5 + times per week

^d Significantly ($p < 0.05$) different from control group according to Students unpaired t test

^e Total score of: more than 27 = diet is very high in fat
25-27 = diet is quite high in fat
22-24 = eating a typical American diet, which could be lower in fat
18-21 = you are making better low fat food choices
17 or less = you are making best low fat food choices — desirable score

^f Improvement in treatment group significantly ($p < 0.05$) greater than improvement in control group

bacon/sausage/chorizo, whole milk, and cake/cookies/pastries than control subjects ($p < 0.05$). The two groups also differed initially in the total high-fat food score ($p < 0.05$). To account for the above differences, as well as initial differences in body composition, attitudes toward learning about nutrition, and self-efficacy for choosing low-fat foods, an ANCOVA was performed using the listed variables as covariates.

Analysis of covariance revealed that initial percent body fat was the only significant covariates for some of the food items listed in the high-fat food frequency questionnaire — including eggs ($F\ 1, 64 = 8.64, p < 0.01$), chips/popcorn ($F\ 1, 64 = 4.36, p < 0.05$), and whole milk ($F\ 1, 64 = 8.88, p < 0.005$). However, for all three variables, when the covariate (initial % body fat) was accounted for, there were still no significant improvements in intake of eggs ($F\ 1, 64 = 0.001, p = 0.97$), chips/popcorn ($F\ 1, 64 = 1.83, p = 0.18$), or whole milk ($F\ 1, 64 = 0.06, p = 0.79$), between the two groups after two years of intervention. In fact, repeated measures ANOVA and analysis of covariance revealed no significant improvements between the treatment and control groups for any of the food items listed at the end of the 2-year intervention program. However, a repeated measures ANOVA revealed that after the 2-year intervention program, the treatment subjects had a significantly better (lower) score for high-fat foods than control subjects ($F\ 1, 69 = 4.37, p < 0.05$).

No significant gender differences were observed at baseline or post-test.

Block Food Frequency Questionnaire For Fruit, Vegetables, and High-Fiber Foods

Table 13 shows the mean ($\pm$ s.e.m.) scores of food items consumed by subjects over the 12 month period prior to assessment as measured by the Block Food Frequency Questionnaire for fruits, vegetables, and high-fiber foods. At baseline, there were no significant differences between the treatment and control groups in the frequency of consumption of the listed fruits, vegetables and high-fiber foods. However, to account for initial differences, such as body composition, nutrition knowledge, attitudes toward learning about nutrition, and self-efficacy for choosing low-fat foods, an ANCOVA was performed using the listed variables as covariates.

Analysis of covariance revealed that initial percent body fat was the only significant covariate for some of the food items listed in the fruit/vegetable/high-fiber foods questionnaire — including frequency of orange juice consumption ($F_{1, 51} = 5.67, p < 0.05$), fruits other than juice ($F_{1, 61} = 4.26, p < 0.05$) and dark breads ($F_{1, 61} = 9.43, p < 0.005$). When the pre-existing differences between the treatment and control subjects were accounted for, there were still no significant changes in reported orange juice consumption ($F_{1, 51} = 0.86, p = 0.35$) or in consumption of dark breads ($F_{1, 61} = 0.23, p = 0.87$) between the two groups after two years of intervention. For fruits other than juice, the control group reported significantly greater improvement in intake scores over the 2-year intervention period than the

TABLE 13. Mean Scores^{a,b} From Block Food Frequency Questionnaire^c for Fruits, Vegetables, and Whole Grains of Subjects

	Treatment (n = 23)		Control (n = 49)	
	Baseline	Post	Baseline	Post
Orange Juice	2.19 ± 0.32	1.80 ± 0.28	2.03 ± 0.18	2.18 ± 0.22
Fruits (other than orange juice)	2.68 ± 0.28	2.33 ± 0.27	2.43 ± 0.16	2.95 ± 0.16 ^d
Green Leaf Salad	1.17 ± 0.21	1.18 ± 0.21	1.27 ± 0.15	1.43 ± 0.16
Potatoes	1.34 ± 0.20	1.90 ± 0.24 ^e	1.51 ± 0.14	1.41 ± 0.15
Beans/Legumes	1.52 ± 0.25	1.18 ± 0.28	1.76 ± 0.18	1.77 ± 0.18
All Other Vegetables	2.39 ± 0.28	2.00 ± 0.28	2.04 ± 0.15	1.83 ± 0.16
High Fiber, Bran Cereals	0.91 ± 0.26	0.68 ± 0.23	1.12 ± 0.19	1.12 ± 0.19
Dark, Whole-wheat Breads, Corn Tortillas	1.38 ± 0.16	1.14 ± 0.23	1.16 ± 0.26	1.68 ± 0.20 ^d
Wheat Breads, Flour Tortillas, Biscuits, Muffins	2.87 ± 0.20	2.77 ± 0.27	2.61 ± 0.15	3.10 ± 0.13
TOTAL SCORE^f	17.34 ± 1.17	14.74 ± 0.95	16.13 ± 0.71	17.45 ± 0.70^d

^a Mean score ± s.e.m. are adjusted if covariate is significant

^b Individual scores of: 0 = usually eat food less than once per week
 1 = usually eat food 1 time per week
 2 = usually eat food 2-3 times per week
 3 = usually eat food 4-6 times per week
 4 = usually eat food every day

^c Scores fruit/vegetable/fiber intake during the past 12 months.

^d Improvement in control group significantly ($p < 0.05$) greater than improvement in treatment group

^e Improvement in treatment group significantly ($p < 0.05$) greater than improvement in control group

^f Total score of: 30 or more = desirable score
 20-29 = include more fruits, vegetables and whole grains in diet
 less than 20 = diet is low in important nutrients. Need to increase the fruits, vegetables and other fiber rich foods eaten daily

treatment group. Adjusted means show the control group increasing their score for fruits other than juice from 2.43 at baseline to 2.95 at post-test, while the treatment decreased their intake scores from 2.68 at baseline to 2.33 at post-test ($F_{1,61} = 4.04, p < 0.05$).

A repeated measures ANCOVA, with initial % body fat as the only significant covariate ($F_{1,61} = 4.87, p < 0.05$), revealed that after the 2-year intervention program, the control subjects had a significantly better (higher) total score for fruits, vegetables, and high-fiber foods than control subjects ($F_{1,61} = 6.67, p < 0.05$). The control subjects increased their intake scores from 16.13 at baseline to 17.45 at post-test (adjusted means), while the treatment decreased their intake scores from 17.34 at baseline to 14.74 at post-test (adjusted means). However, adjusted intake scores of fruits, vegetables, and high-fiber foods for both the treatment and control subjects were still considered inadequate.

No significant gender differences were observed at baseline or post-test.

Summary of Dietary Data

Dietary intake, as measured by the 24-hour diet recall, showed no significant dietary improvement in the treatment subjects after participation in the 2-year intervention program. However, dietary data obtained through use of this instrument may not have been a true indication of intake since it only measured one day of intake — recalled and reported by the subject the

next day. Also, 50% of treatment subjects and 45% of control subjects reported “invalid” 24-hour recalls at post-test, which could have definitely affected the significance of the data obtained from the 24-hour recall.

Data from the Block Food Frequency Questionnaire for fruits, vegetables and high-fiber foods indicated that treatment subjects did not improve their intake of high-fiber foods. In fact, the control subjects, who were not exposed to the 2-year intervention program, improved their intakes of fruits, vegetables, and high-fiber foods significantly over the treatment subjects.

According to two questionnaires, treatment subjects improved (decreased) their fat intake after participation in the 2-year intervention program. Data from both the Block Dietary Screening questionnaire and the Block Food Frequency Questionnaire for High-Fat Foods reported that treatment subjects decreased their fat and saturated fat intake significantly. Both questionnaires estimated intake over the 12 months prior to the questionnaire interview.

PHYSICAL FITNESS DATA

Table 14 shows the physical fitness indices of subjects at baseline and again at the end of the intervention program (post-test). At baseline, treatment subjects took a significantly ($p < 0.05$) longer amount of time to complete the 1-mile walk/run test (unadjusted mean = 17.0 min in treatment

TABLE 14. Physical Fitness^a Indices of Subjects

	Treatment (n = 22)		Control (n = 48)	
	Baseline	Post	Baseline	Post
# Sit-ups (per min)	24.6 ± 2.0 ^b	23.3 ± 2.0	32.6 ± 1.6	33.6 ± 1.8
Grip Strength (kg)	28.9 ± 1.5	30.8 ± 1.8	31.1 ± 0.9	34.5 ± 1.2
Sit and Reach (cm)	30.1 ± 1.9	30.6 ± 2.2	31.3 ± 1.3	24.0 ± 1.3
1-Mile Walk/Run (min)	13.4 ± 0.9 ^b	13.5 ± 0.6 ^c	13.4 ± 0.4	12.9 ± 0.3

^a Mean ± s.e.m. are adjusted if covariate is significant

^b Significantly ($p < 0.05$) different from control group according to Students' unpaired t test

^c Improvement in control group significantly ($p < 0.05$) greater than improvement in treatment group

subjects vs. 11.7 min for control subjects) and completed significantly ($p < 0.05$) less sit-ups in a one minute time period than control subjects. Due to baseline differences between the treatment and control subjects in these fitness indices as well as initial differences in body composition (i.e. weight, % body fat, and waist-to-hip ratio), a repeated measures ANCOVA was performed to account for these differences and to determine differences over time in physical fitness. Initial walk/run time was found to be the only significant covariate for both changes in flexibility and changes in the walk/run time, therefore, a repeated measures analysis of covariance was only performed for those two variables while a repeated measures ANOVA was performed for the other two variables (# sit-ups and gripstrength).

Repeated measures ANCOVA revealed that when initial differences the walk/run time were accounted for ($F_{1,60} = 8.42, p < 0.01$), there were significant differences in the amount of time needed to complete the 1-mile walk/run between the treatment and control subjects ($F_{1,60} = 7.90, p < 0.01$). However, these differences did not favor the treatment subjects. Adjusted means show that over the course of the 2-year intervention program, treatment subjects increased their walk/run time from 13.4 to 13.5 minutes, while the control group decreased their walk/run time from 13.4 to 12.9 minutes.

Repeated measures ANCOVA also revealed that when initial differences the walk/run time were accounted for ($F_{1,55} = 4.46, p < 0.05$), there were no significant differences in flexibility (as measured by the sit-and-reach test) between the treatment and control subjects ($F_{1,55} = 1.13, p = 0.29$). Adjusted means show that over the course of the 2-year intervention program, treatment subjects increased their flexibility from 30.1 to 30.6 cm — maintaining their flexibility, while the control group decreased their flexibility from 31.3 to 24.0 cm.

Repeated measures ANOVA revealed that at the end of the two-year intervention program, there was no significant difference in gripstrength ($F_{1,71} = 3.61, p = 0.06$) or number of sit-ups ($F_{1,69} = 0.98, p = 0.32$) between the treatment and control subjects.

Significant gender differences were observed in the physical fitness indices. Males in both the treatment and control groups were able to complete significantly more ($p < 0.05$) sit-ups than females at baseline (39.4 versus 26.1) and at post-test (40.7 versus 26.4), males were able to complete the 1-mile walk/run significantly ($p < 0.05$) faster than females at baseline (10.5 min versus 14.8 minutes) and post-test (9.8 min versus 14.2 min), and males had a significantly ($p < 0.05$) stronger gripstrength than females at baseline (38.3 kg versus 27.8 kg) and post-test (41.5 kg versus 29.6 kg). However, there was no significant gender differences in improvement in the walk/run time, # sit-ups, flexibility, or gripstrength over time. Females were just as likely as males to improve their fitness indices, and vice versa.

ANTHROPOMETRIC DATA

Table 15 shows the age and anthropometric characteristics of subjects. Subjects in the control group grew significantly taller during the 2-year intervention program than subjects in the treatment group ($p < 0.05$). However, this effect can be explained by the fact that there were significantly more males in the control group. When the increase in height in centimeters was compared in males versus females, males grew 4.04 ± 0.83 cm (mean $\pm$ s.e.m.) during the two year period, while females only grew 0.19 ± 0.21 cm — a difference which was significant ($p < 0.0001$). An analysis of covariance, which took into account pre-existing differences in height between males and

TABLE 15. Anthropometric Data of Subjects

Characteristic ^a	Treatment (n = 23)		Control (n = 50)	
	Baseline	Post	Baseline	Post
Age (years)	14.8 ± 0.1	16.59 ± 0.1	14.7 ± 0.1	16.21 ± 0.1
Height (cm)	162.1 ± 1.5	164.1 ± 1.7	162.1 ± 1.2	165.1 ± 1.7
Weight (kg)	65.1 ± 4.6 ^b	68.9 ± 5.3	65.6 ± 2.2	68.8 ± 3.2
Body Mass Index (kg/m ²)	24.7 ± 1.6 ^b	25.9 ± 1.9	25.4 ± 0.8	26.3 ± 1.2
Waist-to-Hip Ratio	0.801 ± 0.017 ^b	0.798 ± 0.011 ^c	0.801 ± 0.007	0.801 ± 0.010
% Body Fat ^d	38.28 ± 2.2 ^b	34.02 ± 2.1	25.68 ± 1.3	23.49 ± 1.4
Bioelectric Impedance Analysis	35.57 ± 1.6 ^b	35.12 ± 1.8	25.92 ± 1.2	24.43 ± 1.2
7 skinfold sites, adult	33.77 ± 1.9 ^b	31.04 ± 2.0	21.45 ± 1.4	20.11 ± 1.5
Triceps & Calf, Slaughter	41.92 ± 2.8 ^b	37.28 ± 2.7	26.87 ± 1.4	23.42 ± 1.5
Triceps & Subscapular, Slaughter	45.31 ± 2.9 ^b	41.47 ± 3.1	28.21 ± 1.7	25.31 ± 1.6
Systolic Blood Pressure (mm Hg)	105.7 ± 2.2	103.0 ± 3.4 ^c	101.9 ± 1.4	107.5 ± 1.5
Diastolic Blood Pressure (mm Hg)	66.3 ± 2.3 ^b	69.9 ± 2.7 ^e	60.6 ± 1.2	69.2 ± 1.4

^a Mean ± s.e.m. are adjusted if covariate is significant^b Unadjusted mean significantly ($p < 0.05$) different from control group at baseline according to Students' unpaired t tests^c Improvement in treatment group significantly ($p < 0.05$) greater than improvement in control group^d Mean % body fat of the four listed methods to measure percent body fat^e Improvement in control group significantly ($p < 0.05$) greater than improvement in treatment group

females, showed that when heights were adjusted to account for the significant gender differences there was no significant difference in change in height between the treatment and control groups ($p = 0.268$). The treatment group increased in height from 162.185 cm to 164.186, while the control group increased in height from 162.18 cm to 165.10 cm.

Treatment subjects were significantly “larger” than control subjects at baseline as measured by weight in kilograms, body mass index (BMI), waist-to-hip ratio, and percent body fat. The two groups also differed in initial diastolic blood pressures. Comparisons of treatment and control subjects were made with repeated measures analyses of variance (ANOVA) and analyses of covariance (ANCOVA), using initial BMI, weight in kilograms, waist-to-hip ratio and the mean percent body fat (mean of the four methods used to assess % body fat) as covariates.

Analysis of covariance revealed that initial percent body fat ($F\ 1, 57 = 8.55, p < 0.005$) and initial diastolic blood pressure ($F\ 1, 57 = 4.24, p < 0.05$) were significant covariates for weight in kilograms. However, even when these pre-existing differences between the treatment and control subjects were accounted for, there were still no significant differences in weight changes between the two groups after two years of intervention ($F\ 1, 57 = 0.22, p = 0.63$). Adjusted means show no difference in weight between groups at baseline or at the end of the 2-year intervention program. Initial BMI, weight in kilograms, and waist-to-hip ratio were not significant covariates for change

in weight during the 2-year intervention program, and were therefore not used in the model.

Initial percent body fat ($F\ 1, 57 = 8.49, p < 0.01$) and initial diastolic blood pressure ($F\ 1, 57 = 4.19, p < 0.05$) were also found to be significant covariates for changes in BMI over the 2-year study period. However, initial weight in kilograms, BMI, and waist-to-hip ratio were not significant covariates. Adjusted mean BMI's were not significantly different between groups at baseline or at the end of the 2-year intervention program. Repeated measures ANCOVA also showed no significant differences in BMI changes over time between the treatment and control group ($F\ 1, 57 = 0.55, p = 0.45$).

Initial waist-to-hip ratio was found to be the only significant covariate for changes in the waist-to-hip ratio over time ($F\ 1, 68 = 10.43, p < 0.005$). Adjusted mean waist-to-hip ratios were not significantly different at baseline. However, repeated measures ANCOVA showed significant differences ($F\ 1, 68 = 10.06, p < 0.005$) in waist-to-hip ratios over time between the treatment and control group. The treatment group showed significant improvement in their waist-to-hip measurements over the control group during the 2-year intervention program.

Although there were significant differences in percent body fat at baseline between the treatment and control group, an ANCOVA revealed no significant covariates — either weight in kilograms, % body fat, BMI, waist-to-hip ratio, or diastolic blood pressure — found for changes in body fat percent

over time. For this reason, a simple repeated measures ANOVA was used to evaluate changes in body fat percent over time. There were no significant differences in percent body fat changes between the two groups after two years of intervention ($F\ 1, 63 = 1.94, p = 0.16$).

Although there were significant differences in diastolic blood pressure at baseline between the treatment and control group, an analysis of covariance revealed no significant covariates — either weight in kilograms, % body fat, BMI, waist-to-hip ratio, or diastolic blood pressure — found for changes in diastolic blood pressure over time. A simple repeated measures ANOVA found significant differences ($F\ 1, 61 = 4.34, p < 0.05$) in diastolic blood pressure over time between the treatment and control group favoring the control group. However, repeated measures ANOVA found significant differences ($F\ 1, 61 = 7.54, p < 0.01$) in systolic blood pressure over time between the treatment and control group favoring the treatment group.

Changes during the 2-year intervention period in the anthropometric measures were examined for gender differences. Except for the significant difference in height change over time discussed previously, there were no significant differences between males and females in either the treatment or control group for waist-to-hip ratio, % body fat, body mass index, systolic blood pressure, or diastolic blood pressure. Males did not improve significantly more than females, and vice versa.

DROPOUT ANALYSIS: TREATMENT VS. CONTROL

Baseline values of subjects in both groups who failed to complete the 2-year program were examined in order to evaluate the potential threat to internal validity associated with differential attrition. No differences were found between dropouts except for body mass index, % body fat, and the 1-mile walk/run time — which were also pre-existing differences found between the treatment and control subjects who remained in the study. Dropouts in the treatment group ($n=11$) had a significantly ($p < 0.005$) higher mean BMI and mean % body fat (27.8 and 34.3% respectively) than dropouts in the control group (23.3 and 25.1% respectively). Dropouts in the control group ($n=34$) were able to complete the 1-mile walk/run test significantly ($p < 0.005$) faster than dropouts in the treatment group (12.32 minutes versus 15.24 minutes).

For subjects in the treatment group, attrition was due to student transfers to a “reform” school ($n=5$), moving out of the city or state for family reasons ($n=2$), dropping out of high school ($n=6$), and lack of interest in remaining in study ($n=6$). Reasons for attrition in some of the control subjects were difficult to determine since the control school did not have knowledge of the whereabouts of some of the students. According to administrative personnel at the control school, the whereabouts of thirteen of the control subjects was unknown and most likely due to students dropping out of high school. Two of these ‘missing’ students were known to have fled

to Mexico to escape death threats and gang violence. Twenty of the control subjects still enrolled in the control school were not interested in continuing participation in the program. Another three control subjects were known to have moved out of the city of Denver and could not participate in the program.

CURRICULUM IMPLEMENTATION

Table 16 shows how much of the curriculum was actually implemented during the 2-year intervention program. Only 36% of the developed curriculum was actually taught to treatment subjects. The teacher of year 1 taught more of the curriculum ($\approx 55\%$) than the teacher of year 2 ($\approx 26\%$). It was determined that out of the 120 hours of possible instruction time per school year, with 50% of time devoted to physical activity and 50% devoted to teaching the developed nutrition education curriculum, treatment subjects should have been exposed to 120 classroom hours of nutrition education during the 2-year intervention period (60 hours per school year). However, since less than half of the curriculum was implemented, it was estimated that treatment subjects were only exposed to approximately 50 classroom hours of nutrition education during the 2-year intervention period (25 hours per school year).

The research team of this project understood the need for teacher training based on previous reports (Lytle, 1995, Resnicow et al, 1992, Resnicow

et al, 1991, Killen et al, 1989, and Lewis et al, 1988), however circumstances in the case of both of the teachers prevented adequate training before each school year began. The research team decided that teacher training, apart from studying the curriculum itself, would be accomplished two ways. First, the teacher would increase his/her overall knowledge base of nutrition by taking a class at the local college (paid for by the project). Second, the curriculum development team would meet with the teacher weekly to help prepare the teacher to teach upcoming units of the curriculum, and provide whatever support was necessary. This level of teacher training would not be considered less than adequate since in many school districts, "the current standard of teacher preparation for introduction of new curricula is limited to self-study of curriculum materials" (Killen et al, 1989).

Both teachers agreed, before they were hired, to take the nutrition class at the local college, however, neither teacher fulfilled this commitment. The teacher of year one did attend most of the weekly training meetings — approximately 90% of meetings. The teacher of year two attended the first few weekly training meetings. However, by the end of the third month, this teacher did not want to attend weekly meetings, and only wanted to meet with the curriculum development team once every 3-4 weeks, insisting that meeting more often was unnecessary.

Despite difficulties with curriculum implementation, this project was completed in June, 1997.

TABLE 16. Amount of Curriculum Implemented, By Unit, During the 2-year Intervention Program

Unit Title	Year Taught:	Percent of Information Taught & Activities Used:
Introduction To Health and Healthy Habits	1st	31%
The Food Guide Pyramid	1st	60%
Energy Balance	1st	75%
Weight Loss & Fad Diets	1st	41%
Nutrient Density and Food Choices	2nd	10%
How To Read Food Labels	2nd	50%
Shopping For Food	2nd	11%
Food Choices While Dining Out	2nd	10%
Snacks and Beverages	2nd	0%
Food Preparation & Recipe Modification	2nd	0%
Understanding Fat and Cholesterol	1st	20%
Diabetes	2nd	100%
Cardiovascular Disease & Hypertension	1st	100%

Chapter IV

Discussion

Overall, the most significant impact that this 2-year intervention program had on subjects was an increase in knowledge and an increased intention to change exercise and fat intake behaviors (stages of change). Although there were a few other findings which indicated improvement after exposure to the curriculum, success was limited. The following discussion addresses these findings as well as factors which may have limited the success of the 2-year curriculum presented here.

CURRICULUM IMPLEMENTATION

One of the most important factors affecting program success was curriculum implementation. As stated in the results, only 36% of the developed curriculum was used and delivered to the treatment subjects. This in itself could explain the lack of positive results. The single most important factor affecting the amount of curriculum implemented was the teacher.

The first teacher, who taught during the first year ('95-'96) delivered approximately 55% of the curriculum he was designated to deliver. Treatment subjects had relayed to the projects' research team that in general, they liked this teacher and were disappointed to see him leave the project. This teacher had developed a good rapport with the students, however, this job was very difficult for him because he lacked the experience and knowledge base to be comfortable teaching the material, and it ultimately led to his departure. Lewis and colleagues (1988) discovered that students learning about nutrition from teachers who were familiar with the content area (i.e. health and home economics teachers) made significantly greater gains in knowledge and 'how-to' nutrition information than students who learned nutrition from teachers less familiar with nutrition. Lewis and colleagues (1988) postulated that teachers whose area of specialty was more aligned to nutrition, such as health and home economics, were better at teaching nutrition because they had greater experience, training and overall comfort. Findings in this study confirm what happened to the teacher of year one in the present research project. This teacher had a personal interest in fitness, and was a high school volleyball and track-and-field coach, however, his education specialty was in music, and his lack of knowledge and overall comfort with the subject of nutrition had an impact on his ability to teach the information to students. Lewis and colleagues (1988) also found that students with teachers who had at least two years "experience teaching

nutrition made greater gains in nutrition knowledge and food-choice behavior intentions," indicating the importance of teachers having experience with nutrition education.

The next teacher, who taught during the second year ('96-'97) delivered approximately 26% of the designated curriculum. Interestingly enough, this teacher also had a personal interest in fitness and had a greater knowledge base of nutrition than the previous teacher, but she delivered far less of the curriculum than the teacher of year one.

Research has shown that apart from focusing the nutrition education on a specific behavior or behaviors related to a specific health problem, and allowing for adequate amount of time for the program, the other important elements for successful interventions include: 1) use of an appropriate theory to guide the development and implementation of the program as well as the learning tools/activities, and 2) teacher(s) trained in how to disseminate the curriculum and the materials properly (Lytle, 1995). The year two teacher repeatedly refused to acknowledge the importance of these two elements. She made it clear to the curriculum development team that she thought the 'concept' of having to follow a theoretical model "useless" and "silly" — apparently not understanding the importance of having a nutrition intervention based on a theoretical framework. She often refused to teach the information in the order in which it was presented — apparently not

agreeing with how one topic built on the previous topic. She also declined participation in teacher training.

Besides the problem of the year two teacher not teaching the curriculum the way in which it was intended, she also did not have a good rapport with the treatment subjects, especially by the end of the school year (Spring 1997). As explained previously, the year two teacher quit, seven weeks before the end of the school year. Treatment subject relayed to members of the research team that they felt abandoned and betrayed because she did not stay with them until the end of the school year. One student in particular said in May 1997, "Yah, you know, ever since Diane found out in December that the project didn't get funding for next year (and she would not have a job after June 1997), she just gave up. We've just been coming to class and exercising — sometimes." The treatment subjects made it clear that they disliked her immensely.

It is quite possible that the negative feelings which the treatment subjects felt towards the teacher upon her departure had a huge impact on post-test scores — which were collected only two weeks after this teacher quit. The post-test results most likely affected by the treatment subjects negative feelings were self-efficacy scores, nutrition attitude scores, and stage of change data, although other results may have been affected.

Findings in the present research agree with previous studies (Contento et al, 1992), quality and quantity of curriculum implementation — which is

dependent on the teacher — is one of the most important factors affecting success. "Effective programs that are not used as intended may be less desirable than programs that are more easily disseminated and implemented, even if they are slightly less effective" (Resnicow et al, 1991). No matter how effective a nutrition education program is, if it is not implemented properly, one cannot expect that it will elicit the desired outcomes.

KNOWLEDGE AND ATTITUDES

As mentioned previously, knowledge scores in the treatment group did improve significantly. However, results were not as positive for attitudes towards nutrition. The only significant attitude improvement made by the treatment group after two years of intervention was that they cared more about nutrition. Although this improvement was statistically significant, in reality, this attitude improved from only slightly above 'neutral' to slightly positive — not much of an improvement.

The absence of positive improvements in attitudes towards nutrition is not surprising given the difficulties with curriculum implementation. Connell and colleagues (1985) found in the "Know Your Body" program, that students required at least 50 classroom hours of nutrition education to achieve stable improvements in knowledge, attitudes, and behavior. As mentioned previously, treatment subjects in the present research project were exposed to approximately 50 classroom hours over a 2-year period. Although

this amount of exposure time was adequate to promote improvements in knowledge, attitudes, and behavior in other studies, it was not adequate to promote much improvement in attitudes or behavior in the present study. Improving attitudes towards nutrition was a priority in this intervention, it is unfortunate that no real positive changes in attitudes occurred.

SELF EFFICACY

There was no significant improvement for self-efficacy scores in the treatment (or control) group. In fact, self-efficacy scores in both the treatment and control subjects indicated that both groups were unconfident in their ability to exercise and in their ability to choose low-fat foods at baseline and again at post-test. This lack of positive improvement in the treatment subjects may again be related to curriculum implementation. As discussed before, only 36% of the curriculum was actually implemented, and most of the curriculum activities devoted to improving self-efficacy were not utilized. Also, the lack of improvement in the treatment subjects at post-test may be related to their negative feelings toward the teacher, which was also discussed previously.

Although self-efficacy scores did not improve significantly, they were significantly related to variables they were trying to predict. Self-efficacy scores for choosing low-fat foods were found to be significantly related to fat intake, as measured by a food frequency questionnaire. As fat intake

decreased, subjects also experienced an increased confidence in their ability to choose low-fat foods. Also, self-efficacy scores for exercise were found to be significantly related to body composition and physical fitness. As subjects got leaner and became more physically fit, they also experienced an increased confidence in their ability to exercise.

Marcus and colleagues (1992) looked at the relationship between exercise self-efficacy and exercise behavior, and found it to be significant. Individuals who exercised regularly were confident in their ability to exercise, unlike those who did not exercise regularly, who were unconfident in their ability to exercise. Reynolds and colleagues (1990) found that self-efficacy was not only correlated with exercise behaviors but it could also predict weekly participation in exercise among adolescents four months after the baseline measurements. Results from the present research study here did not agree with previous research findings. No relationship was found between self-efficacy and actual exercise behaviors at baseline or at post-test. However, if physical fitness could be considered a 'by-product' of previous exercise behaviors, then the findings in the present research study would agree with Marcus and colleagues (1992) and Reynolds and colleagues (1990), because physical fitness indices (1-mile walk/run and # sit-ups) were found to be correlated to self-efficacy.

To date, there has been no nutrition education interventions for adolescents that have assessed self-efficacy for exercise and choosing low-fat

foods. Many studies have indicated that self-efficacy scores are good indicators of program success (Edell et al, 1987, Marcus et al, 1992, Reynolds et al, 1990, Forster and Jeffery, 1986, and Desmond and Price, 1988), and more positive and significant improvements in self-efficacy scores may have occurred in the present research study if circumstances regarding curriculum implementation had been different.

STAGE OF CHANGE

One of the few positive improvements that treatment subjects made in this study had to do with stages of change movement. Treatment subjects improved significantly over control subjects in their intentions to change. For both exercise and fat intake behavior, the treatment subjects progressed to higher stages of change, while control subjects remained at their baseline stage or even regressed to lower stages of change. This indicates that although the treatment subjects did not make many (if any) actual behavioral changes during the 2-year intervention program, it is quite possible that they will make the desired behavior changes in the future, and that participation in this intervention program got them started.

Results at baseline showed how subjects were at various stages of behavior change for both exercise and fat intake behavior. This demonstrates the importance of a multi-staged approach when using the Stages of Change Model for nutrition education programs. Interventions using the Stage of

change model should incorporate activities and learning tools that address individuals in all stages of change throughout the entire intervention, otherwise, individuals in the stages not being addressed may lose interest and drop out of the program. Even in the present research study, there were still a few individuals in the earlier stages of change for fat intake behavior at post-test.

Measuring stage of change is very difficult to do when dealing with dietary intake. It is much easier to assess stage of change for behaviors such as exercise, smoking, or drug use because either an individual does the behavior or doesn't. Dietary change is much more complex because it "requires a person to continue with the behavior (eating) but to simultaneously adapt it" (Mhurchu et al, 1997). It is possible for person to be in several stages of fat intake behavior change at once. For example, a person may be in the action stage with regard to eating meals at fast food restaurants, but at the same time that person may also be in the precontemplation stage with regard to eating high-fat sweets. Both behaviors are part of the fat intake behavior change, however they are separate. It may be necessary to measure different categories of the dietary behavior change (i.e. fat behavior) to get a more accurate assessment of stage of change for dietary intake behaviors.

Another difficulty in the assessment of stage of dietary change is the level of dietary knowledge of the individual being assessed. "Many people think that they are following a low-fat or weight-reduction diet and therefore

affirm that they are in the action or maintenance stage of change. In fact, detailed dietary assessment may demonstrate that such diets do not meet the necessary guidelines. Therefore, traditional methods of assessing stages of change rely on an individual's understanding of the definition of a behavior may not be sufficiently accurate to assess stage of dietary change" (Mhurchu et al, 1997). Results from the present research study revealed that subjects in both the treatment and control groups had a low knowledge of nutrition and dietary intake at baseline, indicating that some subjects may have overestimated or misjudged their stage of change for fat intake behavior.

The difficulty in measuring stage of change, along with a lack of knowledge on the part of the individuals being assessed makes it extremely difficult to assess validity of the instruments used to measure stage of dietary change. Currently, there is no 'gold standard' with which to compare other stage of change questionnaires for dietary change — predictive validity cannot be established. In the present research study, subjects were shown examples of high-fat foods typically eaten by Mexican Americans and adolescents when administered the stage of change questionnaire for fat intake behavior in an attempt to control for this lack of nutrition and dietary knowledge.

DIETARY INTAKE

Dietary intake, as measured by the 24-hour recall, did not change significantly in treatment or control subjects during the 2-year intervention,

except for percent of kilocalories from protein — a change that could not be considered as either positive or negative. Dietary intake measured by the 24-hour recall did reveal dietary practices of inner-city adolescents that may be of interest for nutrition education interventions in the future.

Intake of fruits and vegetables was low in all subjects at baseline and again at post-test. Three percent of subjects at baseline (0% of control group and 2% of treatment group) and 1% of subjects at post-test (2% of control group and 0% of treatment group) met the recommendation for fruit and vegetable intake — which is 5 or more servings of fruit and vegetables per day (USDA, 1992). These intakes of fruits and vegetables are much lower than those reported by the 1991, 1993, and 1995 Youth Risk Behavior Surveys (Adams, 1997 and Kann et al, 1996), which reported 10% - 27% of the adolescents reported consumption of at least 5 or more servings of fruit and vegetables per day. Reported intake from these three national surveys is more than triple the intake of fruits and vegetables reported in the present research.

Results from the present research also revealed that between 51% to 83% of subjects consumed less than 0.25 servings of fruit or vegetables per day — meaning they consumed no fruits and vegetables the day of 24-hour recall. These percentages are much higher than previous reports (Neumark-Sztainer et al, 1996), where approximately 17% of adolescents reported consuming fruits and vegetables less than once a day. Interestingly, Neumark-Sztainer

and colleagues found that the percentage of subjects consuming low amounts of fruits and vegetables increased in Hispanic adolescents (18%) and those of low socioeconomic status (40%). No such decrease in fruit and vegetable consumption was found in the present study for Mexican-American adolescents or those of low socioeconomic status.

The fact that fruit and vegetable intake, especially fruit, did not improve in treatment subjects may be due to negative connotations they had towards the teacher of year two. During year two, the teacher instituted a voluntary breakfast program. Students paid \$2 per week, and were able to eat breakfast during the first ten minutes of class. The teacher required students to eat at least one serving of fruit, along with at least one serving of dairy and one or more servings of breads/whole grains. As the school year progressed, and students grew to dislike the teacher more and more, they also grew to dislike her rules — including those regarding breakfast. Many students discontinued participation in the breakfast program because they did not like being told what they could and could not eat. This might have had an impact on fruit and vegetable intake, as well as breakfast consumption.

At baseline, 52% of treatment subjects and 42% of control subjects skipped breakfast, and these numbers only increased by the end of the 2-year intervention. This was similar with findings in national surveys such as NHANES II and the National Adolescent Student Survey, where it was

reported that approximately one-half of adolescents in the U.S. skipped breakfast (Dausch et al, 1995).

It was a little surprising that the percentage of treatment subjects consuming breakfast actually decreased since it was strongly encouraged. There are several factors which may have contributed to reported decrease in breakfast consumption. First, within a month before post-test time, the breakfast program had been discontinued because the year two teacher decided to quit buying the breakfast foods, without consulting students or the research team. So, students did not have their usual access to breakfast. Second, breakfast consumption was measured at only one point in time using a 24-hour diet recall, which may not have been an accurate indication of usual breakfast consumption.

Studies with adolescents and young women have shown that breakfast skippers tend to consume more of their kilocalories as fat, greater amounts of high-fat snacks, and less high-fiber foods, like fruits, vegetables and whole grains, than breakfast eaters (Huang et al, 1997, Ruxton et al, 1993, and Gorbach et al, 1990). Results from the present research study agree with previous findings. At baseline and post-test, breakfast eaters consumed more fruit than breakfast skippers, and at post-test, breakfast eaters consumed significantly more vegetables and fruit, less of their daily kilocalories from soda, and less of their daily kilocalories from high-fat food items such as fast food meals and high-fat snacks. Results from the present study did not agree,

however, with findings by Summerbell and colleagues (1996) — no association was found between eating breakfast and BMI.

As found in previous studies, eating breakfast — which is considered by many health professionals as the most important meal of the day — does seem to be associated with other ‘healthful’ eating practices in adolescent. Not only is eating breakfast associated with eating less fat, via eating less calories from fast foods and high-fat snacks, but it seems to be the meal when fruit is most often eaten. Nutrition education programs for adolescents should strongly advocate eating breakfast on a regular basis because it may be a key for healthful eating practices in adolescents.

Percent of kilocalories from high-fat snack foods did not improve significantly in the treatment group after the 2-year intervention program. However, just among those who did consume high-fat snacks, the treatment subjects tended to consume less of their total kilocalories from the high-fat snacks than the control subjects. At baseline, 62% of subjects consumed at least one high-fat snack, a finding that agrees with NHANES II and the 1987 National Adolescent Student Health Survey, which reported that 62% -72% of adolescents consumed at least one high-fat snack daily (Dausch et al, 1995). At post-test, the percent of subjects consuming at least one high-fat snack decreased to 42%, but this percent is still close to previous findings.

It was very difficult to determine if the consumption of fast foods reported in this study was comparable to other U.S. adolescents since very

little information is available regarding fast food consumption. It is of concern, however, that for those who did consume fast foods, a large proportion of daily kilocalorie intake came from these high fat meals — as much as 68% of total kilocalories. A whole unit of the developed curriculum was devoted to dining at fast food and other restaurants, and how to make healthful choices. However, only 10% of this unit was actually taught to the treatment subjects.

All or part of the dietary data collected using the 24-hour diet recall instrument may be flawed, especially the post-test data. At baseline, only 20% of subjects were underreporting energy intake, however, at post-test, 45% of control subjects and 50% of treatment subjects were underreporting energy intake. Briefel and colleagues (1997) found that 18% of men and 28% of women surveyed in the NHANES III underreported energy intake. This overall level of underreporting was similar to rates in other studies (Johnson et al, 1994, deVries et al, 1994, Heywood et al, 1993, and Bingham, 1987). Briefel and colleagues (1997) suggested that overweight people, especially women, tend to underreport energy intake. Analysis of NHANES III data also showed that “the mean numbers of meals, snacks and foods were lower in underreporters than in adequate reports, indicating that omitted foods, meals, or snacks — rather than differences in portion sizes — may account for lower energy intakes” (Briefel et al, 1997). This may also apply to the present research study. It was found at post-test that significantly more of the

underreporters, than adequate reporters, reported a lower overall fat intake, reported drinking less sweetened soda, reported lower intakes of high-fat snack foods, and they also skipped breakfast more. These practices indicate that underreporters in this study were possible omitting meals, snacks, and beverages, hence, a lower energy and fat intake.

This high degree of underreporting may be due to a desire on the part of both the treatment and control subjects to report what they considered to be socially desirable dietary intake. This would introduce 'response set bias', where "participants report eating diets that match the goals of the intervention program rather than what they actually ate" (Kristal et al, 1998). Kristal and colleagues (1998) found that even a modest dietary intervention (20 minute video on nutrition) could bias dietary assessment based on self-report. It was also suggested that "qualitative reports of dietary habits (i.e. "yes" and "no" answers) may be less subject to bias than either quantitative recall of generic diet or episodic memory of yesterdays' events" (Kristal et al, 1998). This implies that not only the 24-hour diet recall used in the present research study may have been subject to bias, but also the two food frequency questionnaires, which were very quantitative in nature.

The two food frequency questionnaires used in the present research study assessed fat intake (Block Dietary Screening Questionnaire and Block Food Frequency Questionnaire for High-Fat Foods). Results indicated that the treatment subjects significantly reduced their fat intake as measured by these

two food frequency questionnaires. However, it is difficult to know for sure if fat intake actually decreased, given that 45-50% of subjects underreported energy intake as measured by the 24-hour diet recall.

At baseline, the Block Dietary Screening Questionnaire (DSQ) reported fat intake of 50 grams per day (Table 11), which is much lower than fat intake as measured by 24-hour recalls reported by 'adequate' reporters, which was 81.5 grams per day (Table 10). At post-test these differences were even greater, with the DSQ reporting fat intake between 34 to 47 grams per day versus the 'adequate' reporters of the 24-hour recall reporting 99 grams of fat per day. It is quite possible that subjects also underreported fat intake as measured by the two food frequency questionnaires, especially the DSQ, in order to report desirable food intake practices.

SOCIOECONOMIC STATUS AND ACCULTURATION

Socioeconomic status (SES) has been shown to be inversely related to obesity among women in developed countries, such as the United States (Sobal and Stunkard, 1989). The present research study, SES was not related to any indicator of obesity, including BMI, body weight (kg), % body fat or waist-to-hip ratio. This agrees with findings by Khan and colleagues (1997), who looked at the relationship between SES, acculturation, and obesity. BMI was not found to be associated with SES, but BMI was found to be weakly associated to acculturation (Khan et al, 1997).

In the present study, acculturation was also not associated to any indicator of obesity, including BMI, body weight (kg), % body fat or waist-to-hip ratio. This disagrees with previous findings by Khan and colleagues (1997) and Hazuda and colleagues (1988). Hazuda and colleagues (1988) reported that in Mexican American women, "as socioeconomic status and acculturation increased, body mass index progressively decreased". It is possible that similar results were not seen in the present research study because of the small sample size.

PHYSICAL FITNESS

As stated before, the overall goal of this 2-year intervention program was to increase metabolic fitness through improving dietary intake and increasing physical fitness. The developed nutrition curriculum did advocate and frequently recommend that treatment subjects should include regular physical activity into their daily routines, but the focus of the nutrition curriculum was not to improve physical fitness.

There were no significant improvements in physical fitness among treatment subjects — in fact, the control subjects actually improved their timed 1-mile walk/run. However, treatment subjects were able to maintain their fitness level. The fact that the treatment subjects did not decrease their physical fitness, and actually maintained their fitness level indicates that the

intervention program may have helped treatment subjects by preventing further deterioration of their physical fitness status.

ANTHROPOMETRIC MEASURES

Aside from blood pressure and waist-to-hip ratio, there were no significant anthropometric changes in the treatment subjects after exposure to the 2-year nutrition education program. Systolic blood pressures was found to be significantly improved in the treatment group, while diastolic blood pressure was found to be significantly improved in the control group. While these differences in blood pressure were statistically significant, they would not be considered clinically significant. Both treatment and control subjects had normal systolic and diastolic blood pressures before and after the 2-year intervention program.

The treatment and control subjects both decreased their percent body fat during the 2-year intervention program, although not significantly. The only statistically significant change related to body composition was waist-to-hip ratio. Control subjects maintained their waist-to-hip ratio, while treatment subjects decreased it significantly. However, the change in the waist-to-hip ratio was not considered a clinically significant difference.

The waist-to-hip ratio is a ratio of the circumference of the body at the waist level at the hips, and it is considered an indication of fat distribution (Albu et al, 1997). The higher the ratio, the larger the abdomen in relation to

the hips, and the more fat is distributed in the abdominal area. "Fat that accumulates in the abdomen is associated with a higher probability of developing certain risk factors such as plasma lipid abnormalities that could lead to the development of cardiovascular disease and abnormalities of insulin action (insulin resistance) and an increase in the production of insulin, which in turn can lead to the development of NIDDM" (Albu et al, 1997). The improved waist-to-hip ratio in the treatment subjects may indicate a possible decrease in the risk of the metabolic disorders associated with a high waist-to-hip ratio, and thus indicating an improved metabolic fitness, especially if the treatment subjects continue to decrease their waist-to-hip ratio as they grow older.

exercise frequency after they were exposed to the developed curriculum. The reported progression was significant when compared to the control subjects.

Hypothesis 5: Exposure to the curriculum would significantly improve self-efficacy towards choosing to eat low-fat foods.

Impact: Hypothesis 5 was rejected. Treatment subjects did not report a significant improvement in self-efficacy scores for choosing to eat low-fat foods when compared to the control group.

Hypothesis 6: Exposure to the curriculum would significantly improve self-efficacy towards exercise.

Impact: Hypothesis 6 was rejected. Treatment subjects did not report a significant improvement in self-efficacy scores for exercise when compared to the control group.

Hypothesis 7: By improving knowledge and attitudes towards nutrition and fitness, exposure to the curriculum would also have a significantly positive effect on behavior. This will be accomplished by improving the quality of dietary intake and decreasing fat intake. It would also be accomplished by the significant improvement in physical fitness parameters.

Impact: Hypothesis 7 was rejected. Although treatment subjects did report a significant decrease in their fat intake as measured by the two food frequency questionnaires, they did not report a significant improvement in the quality of their dietary intake as measured by the 24-hour diet recall or in

Chapter V

Conclusions and Recommendations

The measured outcome variables in this 2-year nutrition education intervention provided a great deal of information from which to draw conclusions and make recommendations. Conclusions were drawn from how the findings in the present research study addressed each hypothesis. In addition, recommendations have been included on how to improve future nutrition education programs.

ADDRESSING RESEARCH HYPOTHESES

Hypothesis 1: Exposure to the curriculum would significantly increase knowledge of nutrition and fitness.

Impact: Hypothesis 1 was partially accepted. Treatment subjects did demonstrate a significant increase in general nutrition knowledge, overall nutrition knowledge, and total knowledge after they were exposed to the developed curriculum. The improvement in knowledge scores were

significant when compared to the control subjects. However, treatment subjects did not demonstrate a significant increase in fitness knowledge when compared to control subjects.

Hypothesis 2: Exposure to the curriculum would significantly improve attitudes towards nutrition.

Impact: Hypothesis 2 was partially accepted. Treatment subjects did report a significant improvement in one out of four nutrition attitude constructs, “caring about nutrition” after they were exposed to the developed curriculum. The improvement in “caring about nutrition” attitude scores were significant, but not substantial, when compared to the control subjects.

Hypothesis 3: Exposure to the curriculum would lead subjects to progress from one stage (Prochaska's Stages of Change) to the next concerning fat intake behavior.

Impact: Hypothesis 3 was accepted. Treatment subjects did report significant progression from one Stage of Change to the next concerning fat intake behavior after they were exposed to the developed curriculum. The reported progression was significant when compared to the control subjects.

Hypothesis 4: Exposure to the curriculum would lead subjects to progress from one stage (Prochaska's Stages of Change) to the next, concerning exercise frequency.

Impact: Hypothesis 4 was accepted. Treatment subjects did report significant progression from one Stage of Change to the next concerning

their physical fitness parameters after they were exposed to the developed curriculum.

Hypothesis 8: The improvement of dietary and exercise behaviors would lead to a significant change in body composition, with a lower body mass index, lower percent body fat, and lower waist-to-hip ratio.

Impact: Hypothesis 8 was not accepted. Although they did not get fatter, treatment subjects did not demonstrate a significant improvement in their body composition as measured by body mass index and % body fat when compared to control subjects. Treatment subjects did demonstrate a statistically significant improvement in their waist-to-hip ratio when compared to the control subjects, but this improvement was not clinically significant.

RECOMMENDATIONS

The following recommendations are suggested for future nutrition education programs:

- 1. Make sure that the developed nutrition education program actually gets implemented.** The true effectiveness of a nutrition education program cannot be determined when it is not implemented properly or thoroughly. The adequacy of curriculum implementation is heavily dependent on the teacher, which has been repeatedly noted in literature.

2. Pay careful attention when selecting the teacher for the nutrition education program. The teacher chosen for a nutrition education program, especially

when dealing with adolescents should possess the following attributes:

- a) Teacher must have a knowledge base of nutrition, a knowledge of fitness and physical activity would also be beneficial. Teachers with a knowledge of nutrition are more comfortable teaching nutrition, and have been shown to be better nutrition educators.
- b) Although not essential, it would be beneficial to have a teacher who has had experience teaching nutrition and/or fitness.
- c) The teacher should be a living example of what the nutrition education program is advocating, especially when teaching adolescents. The teacher should demonstrate a lifestyle of healthful eating and regular exercise.
- d) The teacher should be mature and of good character — a real role model for students — by being responsible, committed, reliable, and professional.
- e) The teacher should have an understanding of the theoretical framework of the nutrition education program, what is trying to be accomplished, and why it is important to follow the developed program.
- f) The teacher should be a good communicator with students, peers, and co-workers.
- g) The teacher must be able to motivate the students, and the teacher, as well, should be a motivated individual.

3. Nutrition education programs for adolescents should target certain dietary habits. Breakfast consumption seems to be a key component to healthful eating in adolescents. A healthful breakfast may also lead to decreased high-fat snack food consumption and increased fruit consumption. Other dietary habits to target in the adolescent population are soda consumption, fast food consumption, and fruit and vegetable consumption.

IMPLICATIONS AND RESEARCH DIRECTIONS

Results from this study indicate a need for further research into the eating habits of adolescents. The adolescents in this study consumed very low amounts of fruits and vegetables, tended to skip breakfast, and consumed a large proportion of their calories from fast-foods, sweetened soda, and high-fat snacks. More information needs to be gathered on whether the above eating patterns are truly the norm for all adolescents, or just for those in this study. Also, more information is needed on how strongly the eating habits acquired during childhood and adolescence persists into adulthood.

Another area requiring further research is the use of the Stages of Change Model in adolescents. No published studies to date have used the Stages of Change Model to measure dietary behaviors in adolescents. Many young adolescents may not yet have the cognitive skills to comprehend behavior changes one, three, or six months from the present — either in the past or future. Also, the adolescents' desire for social acceptability may

influence their responses when Stage of Change questionnaires are administered by interview.

There is a strong need for nutrition education to be integrated into the health curricula of public schools. Results from this study indicated that adolescents in this population — inner-city and low SES — had relatively unhealthful eating practices, knew very little about nutrition and fitness, had somewhat negative attitudes towards nutrition, and had low confidence in their abilities to exercise regularly and make healthful food choices. These adolescents need a comprehensive nutrition education program to be implemented in their schools. Currently, their only chance of receiving any nutrition education at school is during a health or physical education class. When and if nutrition is included in health classes, it usually receives little attention since much of the health curricula taught in schools is focused on topics such as sex education, HIV/AIDS, tobacco use, drugs, and alcohol. These topics are often viewed as more important by health educators and school administrators — and programs focused on these issues also tend to receive more funding (Resnicow et al, 1991).

Policies should be initiated on a state-wide level to adopt coordinated school-nutrition policy that promotes healthy eating through classroom lessons and supportive school environments. Nutrition education should start during the primary school years, and carried out all the way through high school as part of a comprehensive school health education program.

Students will be more likely to adopt desirable health and nutrition behaviors if education begins early, during primary school, and continues throughout adolescence. To promote a supportive school environment, the school food service needs to be more involved with the nutrition education being given to students in the classroom. In addition, school principals and school board members need to be made aware of the importance of nutrition education as well as the nutritional impact of vending machines in schools. Schools may need to limit the number of vending machines selling candy and other high-fat snacks, and offer more healthful food choices.

In order to incorporate nutrition education into the public school system, teachers will need to be trained in nutrition. This may require the inclusion of nutrition courses into the educational curriculum at the university level. For those who are already teachers, continuing education credits or academic (university level) credits could be given to those teachers who take courses in order to learn more about nutrition and how to teach it. Teachers will be more comfortable teaching nutrition if they have knowledge of nutrition (Lewis et al, 1988), and being comfortable with nutrition will make them better nutrition educators. If nutrition education is to be adopted into the public school education curriculum, teacher training — possibly in the form of a 1-semester nutrition course during college — will be necessary so that when teachers are called upon to either teach nutrition or incorporate nutrition into their classes, they will have some knowledge of nutrition.

In conclusion, the results from this study showed the need for further research in the area of adolescent nutrition issues, and the need for ongoing development of nutrition curricula that addresses the needs and concerns of adolescents — especially those from low socioeconomic and inner-city neighborhoods.

SUMMARY

The nutrition education curriculum described here was somewhat successful, despite the overwhelming difficulties with curriculum implementation and problems with the teachers. Previous work has shown that an intensive approach in nutrition education programs are quite effective, especially when exposure to curriculum is greater than 50 total hours. Subjects in this study received approximately 50 hours of nutrition education, however, since these hours were spread unevenly throughout a 2-year period, exposure to the curriculum could hardly be considered intense. The teachers failed to devote the time and attention required for the program, and therefore did not implement the curriculum properly.

It is indeed impressive that this nutrition education program had the success that it did. Treatment subjects demonstrated a significant improvement in knowledge, intentions to change behaviors, fat intake, and waist-to-hip ratio. If this curriculum had been implemented adequately, it is most likely that more positive results would have been found.

References

- Adams LB. An overview of adolescent eating behavior barriers to implementing dietary guidelines. *Ann NY Acad Sci.* 1997;817:36-47.
- Albu J, Allison D, Boozer CN, Heymsfield S, Kissileff H, Kretser A, Krumhar K, Leibel R, Nonas C, Pi-Sunyer X, VanItallie T, Wedral E. Obesity solutions: Report of a meeting. *Nutrition Reviews.* 1997;55(5):150-156.
- Anderson J. *"Smart-START for a Healthy Heart" Jr.-Sr. High School Curriculum.* Colorado State University, Metro Life Foundation, 1987. Revised J. Anderson 1992.
- Angus RM, Sambrook PN, Pocock NA, Eisman JA. A simple method for assessing calcium intake in Caucasian women. *J Am Diet Assoc.* 1989;89(2):209-213.
- Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review.* 1977;84(2):191-215.
- Bandura A. *Social Learning Theory.* Englewood Cliffs, N.J.: Prentice-Hall, 1977a.
- Berg FM. Children and teens in a weight crisis. *Healthy Weight Journal.* 1995; supplement.
- Bingham SA. The dietary assessment of individuals; methods, accuracy, new techniques and recommendations. *Nutr Abstr Rev.* 1987;57:705-742.
- Bingham SA, Nelson M, Paul AA, Haraldsdottir J. Loken EB, vanStaveren WA. Methods for data collection at an individual level; weighed records. *Manual on Methodology for Food Consumption Studies.* Oxford University Press: New York, New York, 1988.

Block G. A review of validations of dietary assessment methods. *Am J Epidemiology*. 1982;115(4):492-513.

Block G, Clifford C, Naughton MD, Henderson M, McAdams M. A brief dietary screen for high fat intake. *J Nut Ed*. 1989;21:199-207.

Bowen DJ, Meischke H, Tomoyasu N. Preliminary evaluation of the processes of changing to a low fat diet. *Health Educ Res*. 1994;9:85-94.

Briefel RR, Sempos CT, McDowell MA, Chien SCY, Alaimo K. Dietary methods research in the third National Health and Nutrition Examination Survey: underreporting of energy intake. *Am J Clin Nutr*. 1997;65(suppl):1203s-1209s.

Brownell KD, Kaye FS. A school-based behavior modification, nutrition education, and physical activity program for obese children. *Am J Clin Nutr*. 1982;35:277-283.

Brownell KD, Kelman JH, Stunkard AJ. Treatment of obese children with and without their mothers: changes in weight and blood pressure. *Pediatrics*. 1983;71:515-523.

Byrd-Bredbenner C, O'Connell LH, Shannon B, Eddy JM. A nutrition curriculum for health education: its effect on students' knowledge, attitude, and behavior. *JOSH*. 1984;54(10):385-388.

Callaway CW, Chumlea WC, Bouchard C, Himes JH, Lohman TG, Martin AD, Mitchell CD, Mueller WH, Roche AF, Seefeldt VD. Circumferences. In: Lohman TG, Roche AF, Martorell R, eds. *Anthropometric Standardization Manual*. Champaign, IL: Human Kinetics Books, 1988:39-54.

Cann B, Coates A, Schaffer D. Variations in sensitivity, specificity, and predictive value of a dietary fat screener modified from Block et al. *J Am Diet Assoc*. 1995;95(5):564-568.

CDC. Prevalence of overweight among adolescents — United States, 1988 - 1991. *J Am Med Assoc*. 1994;272(22):1737.

CDC. Guidelines for school health programs to promote lifelong healthy eating. *J School Health*. 1997;67(1):9-26.

CDC. Update: prevalence of overweight among children, adolescents, and adults — United States, 1988 - 1994. *J Am Med Assoc*. 1997;277(14):1111.

Chapman G, Maclean H. "Junk Food" and "Healthy Food": meanings of food in adolescent women's culture. *J Nutr Ed.* 1993;25:108-113.

Contento IR, Balch GI, Bronner YL, Lytle LA, Maloney SK, Olson DM, Swadener SS. The effectiveness of nutrition education and implications for nutrition education policy, programs, and research: a review of research. *J Nutr Ed.* 1995;27(6):277-422.

Contento IR, Manning AD, Shannon B. Research perspective on school-based nutrition education. *J Nut Ed.* 1992;24:247-260.

Connell DB, Turner RR, Manson EF. Summary findings of the School Health Education Evaluation: health promotion effectiveness, implementation, and costs. *J School Health.* 1985;55:316-321.

Cross AT, Babicz D, Cushman LF. Snacking patterns among 1800 adults and children. *J Am Diet Assoc.* 1994;94:1398-1403.

Cuellar I, Harris LC, Jasso R. An acculturation scale for Mexican American normalized clinical populations. *Hispanic J Behav Sci.* 1980;2(3):199-217.

Cummings SR, Block G, McHenry K, Baron RB. Evaluation of two food frequency methods of measuring calcium intake. *Am J Epidemiology.* 1987;126(8):796-801.

Dausch JG, Story M, Dresser C, Gilbert GG, Portoy B, Kahle LL. Correlates of high-fat/low-nutrient dense snack consumption among adolescents: results from two national health surveys. *Am J Health Promot.* 1995;10(2):85-88.

Delgado JL, Johnson CL, Roy I, Trevino FM. Hispanic Health and Nutrition Examination Survey: methodological considerations. *Am J Pub Health.* 1990;80(suppl):6-10.

Desmond SM, Price JH. Self-efficacy and weight control. *Health Ed.* 1988; Feb/March:12-18.

Devaney BL, Gordon AR, Burghardt JA. Dietary intakes of students. *Am J Clin Nutr.* 1995;61(suppl):205s-212s.

Devine CM, Olson CM, Frongillo EA. Impact of *Nutrition for Life* Program on junior high students in New York state. *J School Health.* 1992;62(8):381-385.

de Vries JHM, Zock PL, Mensink RP, Katan MB. Underestimation of energy intake by 3-d records compared with energy intake to maintain body weight in 269 nonobese adults. *Am J Clin Nutr*. 1994;60:855-860.

Dietz WH. Critical periods in childhood for the development of obesity. *Am J Clin Nutr*. 1994;59:55-59.

Dietz WH. Periods of risk in childhood for the development of adolescent obesity — what do we need to learn? *J Nutr*. 1997;127:1884s-1886s.

Dietz WH, Gortmaker SL. Do we fatten our children at the TV set? obesity and television viewing in children and adolescents. *Pediatrics*. 1998;33:409-421.

Edell BH, Edington S, Herd B, O'Brien RM, Witkin G. Self-efficacy and self-motivation as predictors of weight loss. *Addictive Behaviors*. 1987;12:63-66.

Epstein LH, Wing RR, Valoski A. Childhood Obesity. *Pediatr Clin N Am*. 1985;32:363-379.

Epstein LH, Valoski A, Wing RR, McCurley J. Ten-year follow-up of behavioral, family-based treatment for obese children. *J Am Med Assoc*. 1990;264:2519-2523.

Feldman SS, Elliot GR, ed. *At the Threshold*. Harvard University Press: Cambridge, Massachusetts, 1990.

Forster JL, Jeffery RW. Gender differences related to weight history, eating patterns, efficacy expectations, self-esteem, and weight loss among participants in a weight reduction program. *Addictive Behaviors*. 1986;11:141-147.

Fraenkel JR, Wallen NE. *How To Design and Evaluate Research in Education*, 2nd ed. McGraw-Hill Inc: New York, New York, 1993.

Frank GC, Nicklas TA, Webber LS, Major C, Miller JF, Berenson GS. A food frequency questionnaire for adolescents: defining eating patterns. *J Am Diet Assoc*. 1992;92:313-318.

Frankle RT. Obesity a family matter: creating new behavior. *J Am Diet Assoc*. 1985;85:597-602.

Gibson RL. *Principles of Nutrition Assessment*. Oxford University Press: New York, New York, 1990, pg 39.

Glanz K, Lewis FM, Rimer BK (ed). *Health Behavior and Health Education*. San Francisco, CA: Jossey-Bass Publishers; 1990.

Glanz K, Patterson RE, Kristal AR, DiClemente CC, Heimendinger J, Linnan L, McLerran DF. Stages of change in adopting healthy diets: fat, fiber, and correlates of nutrient intake. *Health Ed Q*. 1994;21(4):499-519.

Goldberg GR, Black AE, Jebb SA, Cole TL, Murgatroyd PR, Coward WA, Prentice AM. Critical evaluation of energy intake using fundamental principles of energy physiology: 1. Derivation of cut-off limits to identify under-recording. *Eur J Clin Nutr*. 1991;45:95-105.

Gorbach SL, Morrill-LaBrode A, Woods MN. Changes in food patterns during a low-fat dietary intervention in women. *J Am Diet Assoc*. 1990;90:802-809.

Gortmaker SL, Dietz WH, Sobol AM, Wehler A. Increasing pediatric obesity in the United States. *Am J Dis Child*. 1987;141:5335-540.

Gortmaker SL, Must A, Sobol AM, Peterson K, Colditz GA, Dietz WH. Television viewing as a cause of increasing obesity among children in the United States, 1986-1990. *Arch Pediatr Adolesc Med*. 1996;150:356-362.

Greene GW, Rossi SR, Reed GR, Willey C, Prochaska JO. Stages of change for reducing dietary fat to 30% of energy or less. *J Am Diet Assoc*. 1994; 94:1105-1110.

Guendelman S, Abrams B. Dietary intake among Mexican-American women: generational differences and a comparison with white non-Hispanic women. *Am J Public Health*. 1995;85(1):20-25.

Haffner SM, Hazuda HP, Mitchell BD, Patterson JK, Stern MP. Increased incidence of type II diabetes mellitus in Mexican Americans. *Diabetes Care*. 1991;14(2):102-108.

Haraldsdottir J. Methods for data collection at an individual level; dietary history. *Manual on Methodology for Food Consumption Studies*. Oxford University Press: New York, New York, 1988.

Haraldsdottir J, VanStaveren WA. Methods for data collection at an individual level; food frequency. *Manual on Methodology for Food Consumption Studies*. Oxford University Press: New York, New York, 1988.

Hart J, Einav C, Weingarten MA, Stein M. *J Am Diet Assoc*. 1990;90:1270-1271.

Hazuda HP, Haffner SM, Stern MP, Eifler CW. Effects of acculturation and socioeconomic status on obesity and diabetes in Mexican Americans. *Am J Epidemiology*. 1988;128(6):1289-1301.

Heath GW, Pratt M, Warren CW, Kann L. Physical activity patterns in American high school students: results from the 1990 Youth Risk Behavior Survey. *Arc Pediatr Adolesc Med*. 1994;148:1131-1136.

Heyward VH. *Advanced Fitness Assessment and Exercise Prescription*, 2nd ed. Champaign, Illinois: Human Kinetics Books, 1991;102-103,142-170, 220.

Heywod P, Harvey PWJ, Marks GC. An evaluation of energy intakes in the 1983 Australian National Dietary Survey of Adults. *Eur J Clin Nutr*. 1993;47:603-606.

Hertzler AA. Obesity — impact of the family. *J Am Diet Assoc*. 1981;79(5):525-530.

Hollingshead AB. *Two Factor Index of Social Position*. Yale Station: New Haven, Connecticut, 1957.

Houtkooper LB, Going SB, Lohman TG, Roche AF, Van Loan M. Bioelectrical impedance estimation of fat-free body mass in children and youth: a cross-validation study. *J Appl Physiol*. 1992;72(1):366-373.

Huang YL, Hoerr SL, Sont WO. Breakfast is the lowest fat meal for young adult women. *J Nutr. Ed*. 1997;29:184-188.

Hunt SM, Groff JL. *Advanced Nutrition and Human Metabolism*. Los Angeles, California: West Publishing Company, 1990; 408-411.

Johnson RK, Goran MI, Poehlman ET. Correlates of over- and under-reporting of energy intake in healthy older men and women. *Am J Clin Nutr*. 1994;59:1286-1290.

Johnson RK, Johnson DG, Wang MQ, Smiciklas-Wright H, Guthrie HA. Characterizing nutrient intakes of adolescents by sociodemographic factors. *J Adolescent Health*. 1994;15:149-154.

Kann L, Warren CW, Harris WA, Collins JL, Williams BI, Ross JG, Kolbe LJ. Youth risk behavior surveillance—United States, 1995. *J School Health*. 1996;66(10):365-377.

- Khan LK, Sobal J, Martorell R. Acculturation, socioeconomic status, and obesity in Mexican Americans, Cuban Americans, and Puerto Ricans. *Int J Obesity*. 1997;21:91-96.
- Killen JD, Robinson TN, Telch MJ, Saylor KE, Maron DJ, Rich T, Bryson S. The Stanford Adolescent Heart Health program. *Health Ed Quarterly*. 1989;16(2):263-283.
- Killen JD, Telch MJ, Robinson TN, Maccoby N, Taylor CB, Farquhar JW. Cardiovascular disease risk reduction for tenth graders. *J Am Med Assoc*. 1988;260(12):1728-1732.
- King AC, Saylor KE, Foster S, Killen JD, Telch MJ, Farquhar JW, Flora JA. Promoting dietary change in adolescents: a school-based approach for modifying and maintaining healthful behavior. *Am J Prev Med*. 1988;4(2):68-74.
- Kingsley RG, Shapiro J. A comparison of three behavioral programs for control of obesity in children. *Behav Ther*. 1977;8:30-36.
- Klaver W, Burema J, VanStaveren WA, Knuiman JT. Definition of terms. *Manual on Methodology for Food Consumption Studies*. Oxford University Press: New York, New York, 1988.
- Krebs-Smith SM, Cook DA, Subar AF. Fruit and vegetable intakes of children and adolescents in the United States. *Arch. Pediatr. Adoles. Med*. 1996;150:80-86.
- Kristal AR, Andrilla HA, Kiepsell TD, Diehr PH, Cheadle A. Dietary assessment instruments are susceptible to intervention-associated response set bias. *J Am Diet Assoc*. 1998;98(1):40-43.
- Krueger RA. *Focus Groups: A Practical Guide For Applied Research*. Sage Publication: Newbury Park, California, 1988.
- Kumanyika S. Diet and chronic disease issues for minority populations. *J Nut Ed*. 1990;22(2):89-95.
- Kushner RF. Bioelectrical impedance analysis: a review of principles and applications. *J Nutr*. 1992;11(2):199-209.
- Lewis M, Brun J, Talmage H, Rasher S. Teenagers and food choices: the impact of nutrition education. *J Nut Ed*. 1988;20(6):336-340.

- Lamb R, Sissons JM. The stages model and processes of change in dietary fat reduction. *J Hum Nutr Diet.* 1996;9:43-53.
- Laforge RG, Greene GW, Prochaska JO. Psychosocial factors influencing low fruit and vegetable consumption. *J Behav Med.* 1994;17:361-374.
- Loken EB. Methods for data collection at an individual level; 24-hour recall. *Manual on Methodology for Food Consumption Studies.* Oxford University Press: New York, New York, 1988.
- Lopez LM, Masse BR. Income, body fatness, and fat patterns in Hispanic women from the Hispanic health and nutrition examination survey. *Health Care for Women Int.* 1993;14:117-128.
- Lytle L. Chapter 4: nutrition education for school-aged children. *J Nut Ed.* 1995;27(6):298-311.
- Marcus BH, Rossi JS, Selby VC, Niaura RS, Abrams DB. The stages and processes of exercise adoption and maintenance in a worksite sample. *Health Psychology.* 1992;11(6):386-395.
- Marcus BH, Selby VC, Niaura RS, Rossi JS. Self-efficacy and the stages of exercise behavior change. *RQES.* 1992;63(1):60-66.
- Margetts BM, Cade JE, Osmond C. Comparison of a food frequency questionnaire with a diet record. *Int J Epidemiology.* 1989;18(4):868-873.
- Mischel W. Toward a cognitive social learning reconceptualizations of personality. *Psychological Review.* 1973;80:2522-283.
- Mhurchu CN, Margetts BM, Speller VM. Applying the stages of change model to dietary change. *Nutrition Reviews.* 1997;55(1):10-16.
- Must A, Jacques PF, Dallal GE, Bajema CJ, Dietz WH. Long-term morbidity and mortality of overweight adolescents. *N Eng J Med.* 1992;327:1350-1355.
- National Center for Health Statistics; Planning and Operation of the Hispanic Health and Nutrition Examination Survey, 1982-1984. *Vital Health & Statistics.* Series 1, No. 19. DHHS Publication No. (PHS) 85-1321. Public Health Service. Washington. US Government Printing Office, September 1985.

National Center for Health Statistics and U.S. Department of Health and Human Services. Consensus Workshop of Dietary Assessment: Nutrition Monitoring and Tracking the Year 2000 Objectives. Public Health Service: Hyattsville, Maryland, September 1993.

Nelson M. Methods for data collection at an individual level; estimated records. *Manual on Methodology for Food Consumption Studies*. Oxford University Press: New York, New York, 1988.

Neumark-Sztainer D, Story M, Resnick MD Blum RW. Correlates of inadequate fruit and vegetable consumption among adolescents. *Prev Med*. 1996;25:497-505.

Nicklas TA, Webber LS, Thompson B, Berenson GS. A multivariate model for assessing eating patterns with cardiovascular risk factors: the Bogalusa Heart Study. *Am J Clin Nutr*. 1989;49:1320-1327.

Nickman MZ, Garcia G. Obesity in Hispanic Americans. *Diabetes Care*. 1991;14(7)Suppl 3:691-694.

Parcel GS, Baranowski T. Social learning theory and health education. *Health Ed*. 1981;May/June:14-18.

Parks CP. Nutrition knowledge test for low socioeconomic women. unpublished — MDAAHPERD. 1994.

Pawson IG, Martorell R, Mendoza FE. Prevalence of overweight and obesity in US Hispanic populations. *Am J Clin Nutr*. 1991;53:1522S-8S.

Physical Best. Reston, V.A., American Alliance for Health, Physical Education, Recreation, and Dance, 1988.

Pinhas-Hamiel O, Dolan LM, Daniels SR Standiford D, Khoury PR, Zeitler P . Increased incidence of non-insulin-dependent diabetes mellitus among adolescents. *J Pediatr*. 1996;128:608-615.

Pollock ML, Wilmore JH, Fox SM. *Exercise in Health and Disease*. W.B. Saunders Company: Philadelphia, Pennsylvania, 1984.

Potosky AL, Block G, Hartman AM. The apparent validity of diet questionnaires is influenced by number of diet-record days used for comparison. *J Am Diet Assoc*. 1990;90:810-813.

Prochaska JO. Strong and weak principles for progressing from precontemplation to action on the basis of twelve problem behaviors. *Health Psychology*. 1994;13(1):47-51.

Prochaska JO, Why do we behave the way we do? *Can J Cardiol*. 1995;11(suppl A):20A-25A.

Prochaska JO, Velicer WF, DiClemente CC, Fava J. Measuring processes of change: applications to the cessation of smoking. *J Consult Clin Psych*. 1988;56(4):520-528.

Prochaska JO, Velicer WF, Rossi JS, Goldstein MG, Marcus BH, Rakowski W, Fiore C, Harlow LL, Redding CA, Rosenbloom D, Rossi SR. Stages of change and decisional balance for 12 problem behaviors. *Health Psychology*. 1994;13(1):39-46.

Ray WJ. Disease processes and behavior. In: Susman EJ, Feagans LV, Ray WJ, ed. *Emotion, Cognition, Health, and Development in Children and Adolescents*. Hillsdale, NJ:Lawrence Erlbaum Associates, Publishers;1992:105-108.

Resnicow K, Cohn L, Reinhardt J, Cross D, Futterman R, Kirschner E, Wynder EL, Allegrante JP. A three-year evaluation of the Know Your Body program in inner-city schoolchildren. *Health Ed Quarterly*. 1992;19(4):463-480.

Resnicow K, Cross D, Lacosse J, Nichols P. Evaluation of a school-site cardiovascular risk factor screening intervention. *Prev Med*. 1993;22:838-856.

Resnicow K, Cross D, Wynder E. The role of comprehensive school-based interventions: The results of four Know Your Body studies. *Ann NY Acad Sci*. 1991;623:285-298.

Resnicow K, Morley-Kotchen J, Wynder E. Plasma cholesterol levels of 6,585 children in the United States: results of Know Your Body screening in five states. *Pediatrics*. 1989;84(6):969-976.

Resnicow K, Orlandi MA, Vaccaro D, Wynder E. Implementation of a pilot school-site cholesterol reduction intervention. *J School Health*. 1989;59(2):74-78.

Reynolds KD, Killen JD, Bryson SW, et al. Psychosocial predictors of physical activity in adolescents. *Prev Med*. 1990;19:541-551.

Rockett HRH, Colditz GA. Assessing diets of children and adolescents. *Am J Clin Nutr*. 1997;65(suppl):1116s-1122s.

Rolfes SR, DeBruyne LK, Whitney EN, ed. *Life Span Nutrition: Conception through Life*. West Publishing Company: Los Angeles, California, 1990.

Romero-Gwynn E, Gwynn D, Grivetti L, McDonald R, Stanford G, Turner B, West E, Williamson E. Dietary acculturation among Latinos of Mexican descent. *Nut Today*. 1993;July/August:6-12.

Ruggiero L, Prochaska JO. Stages of change and decisional balance for twelve problem behaviors. *Diabetes Spectrum*. 1993;6(1):22-60.

Ruxton CH, Kirk TR, Belton NR, Holmes MA. Breakfast habits in children. *Nutr Food Sci Edinburgh*. 1993;4:17-20.

Sanjur D. *Social and Cultural Perspectives in Nutrition*. Prentice Hall: New York, New York, 1982.

Serrano CV. A conceptual framework for understanding "problems" in adolescence and youth. *J Adolescent Health*. 1993;14:613-618.

Shepard R, Dennison CM. Influences on adolescent food choice. *Proceedings of the Nutrition Society*. 1996;55:345-357.

Simmons-Morton BG, Parcel GS, Baranowski T, Forthofer R, O'Hara NM. Promoting physical activity and a healthful diet among children: results of a school-based intervention study. *Am J Public Health*. 1991;81:986-991.

Slaughter MH, Lohman TG, Boileau RA, Horswill RJ, Stillman CA, Van Loan MD, Bembien DA. Skinfold equations for estimation of body fatness in children and youth. *Human Biology*. 1988;60(5):709-723.

Sobal J, Stunkard AJ. Socioeconomic status and obesity: A review of the literature. *Psychological Bulletin*. 1989;105(2):260-275.

Step toe A, Wijetunge S, Doherty S, Wardle J. Stages of change for dietary fat reduction: associations with food intake, decisional balance and motives for food choice. *Health Educ J*. 1996;55:108-122.

Stern MP, Knapp JA, Hazuda HP, Haffner SM, Patterson JK, Mitchell BD. Genetic and environmental determinants of type II diabetes in Mexican Americans: is there a 'descending limb' to the modernization/diabetes relationship? *Diabetes Care*. 1991;14(7)Suppl 3:649-654.

Story M, Resnick MD. Adolescents' views on food and nutrition. *J Nut Ed*. 1988;18(4):188-192.

Stuff JE, Garza C, Smith EOB, Nichols BL, Montandon CM. A comparison of dietary methods in nutritional studies. *Am J Clin Nutr.* 1983;37:300-318.

Stunkard AJ. Presidential address—1974: from explanation to action in psychosomatic medicine: the case of obesity. *Psychosom Med.* 1975;37:195-236.

Summerbell CD, Moody JS, Stock MJ, C. Relationship between feeding pattern and body mass index in 220 free-living people in four age groups. *European J Clin Nutr.* 1996;50:513-519.

Thompson FE, Byers T. Dietary Assessment Resource Manual. *J Nutr.* 1994;124:2245s-2317s.

Tinsley AM, Houtkooper LB, Engle M, Gibbs JC. Evaluation of implementation methods using a nutrition-fitness curriculum in fifth and sixth grades. *J Nut Ed.* 1985;17(3):100-104.

Troiano RP, Flegal KM, Kuczmarski RJ, Campbell SM, Johnson CL. Overweight prevalence and trends for children and adolescents. *Arch Pediatr Adolesc Med.* 1995;149:1085-1091.

Urzúa RF. Risk factors and youth: the role of family and community. *J Adolescent Health.* 1993;14:619-625.

U.S. Department of Agriculture. *The food guide pyramid. Home and Garden Bulletin No. 252.* Washington, DC:Government Printing Office, 1992.

U.S. Department of Agriculture, U.S. Department of Health and Human Services. *Dietary Guidelines for Americans*, 4th ed. Washington, DC, 1995; Home and Garden Bulletin No. 232.

U.S. Department of Health and Human Services, Public Health Service. Eat more fruits and vegetables: 5-A-Day for better health. Washington, DC, 1991; NIH Publication No. 92-3248.

Wadden TA, Stunkard AJ, Rich L, Rubin CH, Sweidel G, McKinney S. Obesity in black adolescent girls: a controlled clinical trial of treatment by diet, behavior modification and parental support. *Pediatrics.* 1990;85:345-352.

Walter HJ. "Know Your Body" intervention trials. *Health Ed Quarterly.* B 1989;16(2):201-214.

Walter JH, Hofman A, Vaughan RD, Wynder EL. Modification of risk factors for coronary heart disease: five-year results of a school-based intervention trial. *N Engl J Med.* 1988;318:(17):1093-1100.

Zakarian JM, Hovell MF, Hofstetter R, Sallis JF, Keating KJ. Correlates of vigorous exercise in a predominantly low SES and minority high school population. *Prev Med.* 1994;23:314-321.

Appendices

Appendix A: Focus Group Results

Summary of Focus Group Responses Lincoln High School Project, June, 1996

Two focus group discussions were conducted in June, 1996 with students (n = 17) who had participated in the experimental class during the '95-'96 school year. One group included students who had completed three semesters of the class, i.e., the pilot group, and the other included students (referred to below as the newer class) from one of the three new sections. The latter were purposely selected because they were seen as neither the "best" nor "worst" of the three newer sections and, therefore, more representative.

Virtually all of the students strongly agreed that the class was worthwhile and fun and there was no doubt that most thought it was the best class they had. Almost all intend to take it again next year. However, their specific comments indicated several problem areas which will be highlighted below under the appropriate issues addressed in the focus group discussions.

Generally, students did not provide detailed responses and were often unwilling to discuss issues in depth. Most of the comments in each focus group were made by three or four students and a few students refused to respond to anything but a direct question. However, these "nonresponders" did provide nonverbal cues that indicated they agreed with most of what was said. Thus, conclusions from the focus groups must be made with caution because of the participant's reluctance to talk, though what was said is likely representative of their feelings.

Best and Worst Parts of Course - It was quite apparent that the physical activities (PA) and field trips were the best liked parts of the class. Most saw real benefits in these two activities, though for some, it was simply the opportunity to get out of class or school. The newer students were all frustrated with the number of surveys that had to be completed as part of this class. The pilot class expressed their dislike of the surveys, though not as emphatically as the newer class, and they also commented on not liking the amount of note-taking this year.

Field Trips - These were seen as the "best (and most fun) part" of the course. Students specifically mentioned the skiing/snowboarding, hiking to Mother Cabrini, and roller blading but had the most positive comments for the YMCA, Ballerama (rope's course), and the Hall of Life. The rope's course was less effective than it might have been due to cold, snowy weather.

A number of students stressed the value of going to restaurants to evaluate menus/meals by fat content and to taste different foods.

"How fattening food could be. The food that I order, I didn't know that it was that fattening - scary."

Students indicated that they learned more outside of the classroom and encouraged having more of these activities.

Examples of Classroom Activities - For most of the items discussed, students “listed” components of the course that they liked or, in some cases didn’t like, but did not provide much detail even when probed for more information. Both classes, but particularly the pilot class, appeared to like learning about the Food Guide Pyramid (FGP). They found the FGP to be interesting and useful relative to judging diets though some felt less time could have been spent on it.

Two other activities received very positive comments: evaluating fad diets and diet drinks (Slim Fast) and the visual demonstrations of the amount of fat in foods using mayonnaise. Most of the comments indicated that these were good learning experiences and that the information learned carried over into food decisions. Other classroom activities mentioned as being useful included learning about diseases, especially diabetes, how the body uses energy (sugar by the brain, for example), and tasting food.

Course Structure - The majority of negative comments arose around this topic. Both groups, but especially the newer class, perceived the course as being too disorganized. This included both classroom and physical activities. Examples of problems stemming from the perceived lack of organization included: too much standing around, e.g., at YMCA, instead of doing PA; lack of places to have PA, especially when the weather was bad; lack of access to the gym; and changing the date for the parent’s night potluck which reduced attendance. Relative to course organization, a couple of participants suggested having a syllabus and more comprehensive year-long planning (weekly physical activities) as ways to improve the course.

It was also evident that any thing requiring work (note taking, reading, homework) was absolutely not appreciated. The teacher’s insistence at the beginning of the year on these types of academic endeavors created some early animosity between him and the students. (Aside - considering this is a high school, the students refusal to do “school work” must be quite discouraging to the project team and create problems for the teacher).

Students also indicated that when given choices for activities and no consensus was reached, sometimes PA was canceled. They thought that those who were unwilling to exercise prevented others from participating in PA and that regardless of the number of PA options or student enthusiasm, PA should occur.

A related area of concern was class size. Many of the students wanted the classes to be larger, especially when doing PA. Since some students are absent and others might refuse to participate, having larger classes would make volleyball and softball, for example, more fun.

Teacher and UCHSC Staff - This year’s teacher was generally well-liked. He was seen as “cool,” respectful of them, not rude or stuck-up, and supportive. The pilot class admitted that they enjoyed giving him a hard time (arguing, teasing) but said they wouldn’t be doing it if they didn’t like him. He was also seen as providing the right mix of encouragement and flexibility relative to the PA. He “wants you to try but will take it easy on you.” One female student

admitted that she had no intention of trying roller blading but after he insisted that she at least try, she found she liked it.

Relative to the two UCHSC staff members who were involved in the course, RT, who was dubbed the “food lady,” was generally seen in a positive light. D was liked by the pilot class but received mixed comments from the newer group of students. They felt that there were conflicts over control of the class; students saw Mr. A as the teacher and D as undermining his authority. There was also an issue around D and money (payment for participating in assessments at the HSC) where a number of students said they hadn’t been paid. As I understand it, they were to receive a certain amount for completing the assessments in a “timely” manner and less money if they procrastinated. Regardless of whether their perceptions were an accurate assessment of the situation or simply a case of miscommunication, students felt very strongly about the perceived lack of fairness in distributing the money.

What Was Learned - When pinned down as to what they had learned in this course, most students responded in general terms but indicated some changes in attitudes and behaviors. Many of the students in both groups reported “thinking more about what they eat,” particularly as it relates to fat in food (a possible outcome of the activities related to fat in food and evaluating different restaurant menus). Others were convinced they were eating fewer fast foods.

Several mentioned using their increased awareness of the FGP and other information to “know how to eat right” or “live healthy.” They also specifically mentioned energy balance (calories in versus out) and ways to control that balance. A number of the pilot group mentioned doing more physical activity as a result of the course. One girl noted going from size 14 to 7 as a result of what she had learned in the course.

At least some of them seemed to have learned the difference between short-term diets and lifestyle changes as indicated by the following exchange. In response to one student’s comment that the class taught them which diets were bad but didn’t tell them which ones were good, a second student pointed out -

“ He (teacher) said you can’t go on a diet and lose the weight and then go back to your eating. You have to change your eating thing forever. You have to eat - he tells you what the right foods are and everything. You just can’t eat all that fat stuff. It’s not like you can just diet for a few months and then quit. You have to stay with it forever.”

Others mentioned now knowing more about diseases including diabetes mellitus. Participants in both groups reiterated that the class was fun and worth attending.

Suggestions for Next Year - Not surprisingly, students hoped that next year there would be more field trips, activities involving team work and physical activities but fewer surveys. They reiterated the need for larger classes for PA and that when PA choices were given, something had

to be picked. They also strongly felt that PA should occur more consistently throughout the school year.

A few students felt that they might benefit by having fewer types of PA but spending more time on them. This would allow for more skill building not just exposure to a variety of PA.

The issue of class organization came up again as well as the need to better organize the evaluations conducted at the HSC. Students noted inconsistencies at HSC relative to how long students had to spend there, the types of food offered (or not), and the reimbursements.

Recommendations: While the limited number of focus groups means that conclusions must be made with caution, data from these discussions, when combined with information gathered from other evaluations, should contribute to planning next years course. For all the “griping” and somewhat negative comments, the students seemed to genuinely like the course and recognize that they were benefitting from it.

1. Considering the difficulty in obtaining detailed information from students and the reluctance of some to speak up in focus groups, it might be better to conduct one-on-one interviews with them next year. It would also be better to do qualitative evaluations earlier (April or early May), before students begin to “disengage” from school.
2. In conversations with the students after the tape was turned off, it became apparent that most of them do at least some shopping and cooking at home. Thus, they may be responsive to actual cooking demonstrations or hands-on cooking activities and be interested in recipes.
3. Physical activities are popular and should continue to be encouraged. However, the more organized and consistent (relative to frequency), especially during the winter, the better.
4. The practical and immediately applicable classroom activities (how much fat is in food; evaluating fast food menus) were well received and perceived as useful by the students. Activities and information that have immediate benefits will likely be better received and applied by students. This may also provide another avenue for evaluation.
5. The importance of having a teacher that students respect and relate to was evident. Although some felt the course might have been better organized or structured, the teacher has to be able to balance expectations relative to work in the classroom and PA with the need for positive personal relations with the students. This issue, particularly in this school will not be easily resolved.

Appendix B: Denver Public Schools Curriculum

Denver Public Schools
Department of Curriculum and Instructional Services
1994-1995
APPROVED COURSE SYLLABUS

I. Department(s) Science Course Title Science for Healthy Living 1 Course Code 3740
Designated Grade Level(s) 9 Course Duration One Sem. Credits Per Sem. 5.00
Prerequisite (if any) Approval of the instructor; must be taken concurrently with Lifetime Activities for Health and Fitness 1 Fees, materials, etc. None

II. Course Description

This course provides the student with an understanding of the basic principles of nutrition and physical activity along with an awareness of the relation between lifestyle and chronic diseases. It further provides students with the tools to assess nutritional status and physical fitness status. Finally, this class is designed to introduce and reinforce methods available to improve overall health and prevent chronic disease. The class will offer a unique format, affording students the opportunity to participate in physical exercise during class time, while also providing the physiological and psychological bases for exercise and healthy food choices. In each ten-day class block, students will participate in physical activity five days and will have classroom discussion/lab the other five days.

III. Guaranteed Graduate Outcomes

1. The student can demonstrate understanding of how lifestyle factors, genetics, and environment impact overall health and the development of chronic disease.
2. The student can demonstrate understanding of how participation in regular physical activity relates to current and future personal health and fitness.
3. The student can assess nutritional status and physical fitness status.
4. The student can personal goals to optimize lifestyle factors related to health.
5. The student can develop a personal exercise prescription in order to achieve the goals of optimizing a healthy lifestyle and preventing the onset of chronic disease.

IV. Objectives

- Identify health risks and associate diseases.
- Identify lifestyle factors that impact overall health.
- Describe individual family health history and the interaction between lifestyle and family history.
- Explain the physiological and psychological benefits of exercise.
- Describe the psychosocial issues surrounding exercise and eating.
- Identify nutritional problems associated with chronic disease.
- Identify the components of a healthy diet.
- Assess personal nutritional status and physical fitness status.
- Explain why physical inactivity is a major factor in the development of chronic disease.
- Describe the interaction between a healthy diet and optimal physical activity.
- Describe the benefits for overall health of moderate levels of physical activity.
- Set personal lifestyle goals for school program and for time away from school.

V. Curriculum Outline

Course Content

A Chronic diseases and risk factors

B Basic nutrition

Learner Outcomes

The student will:

- A1. compare the leading causes of death today with those of a century ago
- A2. list and describe the major chronic diseases associated with lifestyle risk factors including diabetes, obesity, hypertension, cardiovascular disease
- A3. identify lifestyle risk factors for disease, including: smoking, alcohol consumption, sedentary lifestyle, diet, and obesity
- A4. identify physiological measures that can be used as identifying markers for disease risk including poor blood lipid profiles, hypensulinemia, poor glucose tolerance, and elevated hemoglobin A1C
- A5. demonstrate awareness of how risk factors and chronic diseases are linked
- A6. relate risk factors to genetics
- A7. relate risk factors to home, school, and family environment
- A8. identify the usual blood lipids measured and list the recommended ranges for each parameter
- A9. list the range for normal blood glucose and distinguish between hyper- and hypoglycemia

- B1. describe the roles and functions of the six classes of nutrients
- B2. distinguish between macro- and micronutrients and list sources of each in the diet
- B3. distinguish between vitamins and minerals
- B4. describe the importance of water in the human diet
- B5. explain the development of the RDAs and list what the RDAs are for protein, ~~three vitamins,~~ and ~~three minerals~~
- B6. explain what a calorie is and how calories relate to nutrition and exercise
- B7. identify the health consequences of nutritional deficiencies and excesses for both macro- and micronutrients
- B8. discuss the concept of energy balance for both calorie and macronutrient intake
- B9. compare the effects of a nutrient rich and nutrient poor diet on the growth of meal worms over a period of 10 days
- B10. identify dietary sources of cholesterol
- B11. describe the hierarchy of the Food Pyramid and classify various foods into their respective food groups
- B12. interpret food labeling in order to analyze nutritional breakdown

B. Basic nutrition (continued)

- B13. identify reasons for food selection including personal preference, habit, tradition, social pressure, availability, convenience, economy and nutritional value

C. Exercise and health

- ~~C1~~ describe three physical benefits of exercise
~~C2~~ describe two psychological benefits of exercise
C3. list the categories of physical fitness
C4. distinguish between aerobic and anaerobic exercise
C5. identify the recommended frequency, duration, and types of aerobic exercise for optimal health
C6. develop a personalized system for recording physical activity, including mode, frequency, intensity, and duration of activity
~~C7~~ explain the concept of spontaneous activity
~~C8~~ identify three ways student can increase own level of spontaneous activity
~~C9~~ explain the impact of aerobic exercise on overall health
~~C10~~ explain the affects of weight lifting on overall health and its role in exercise prescription
~~C11~~ calculate own target heart rate zone using the Karvonen formula (maximum and resting heart rates)
C12. participate in endurance activities that elevate heart rate to target for a total of 90–120 minutes per week
~~C13~~ describe and explain the importance of a warm-up and cool-down to exercise and to injury prevention
~~C14~~ participate in flexibility exercises before and after aerobic and resistive exercises
C15. describe three ways to prevent the occurrence of injury
C16. identify the relationships between exercise and cardiovascular disease, diabetes, obesity, and the functioning of the immune system
C17. describe the level of physical activity necessary to prevent the occurrence of injury
C18. describe the level of physical activity necessary to prevent the onset of chronic disease

D. Nutritional assessment

- D1. complete a three-day dietary record including two weekdays and one weekend day
D2. calculate personal nutritional requirements using RDAs
D3. calculate percent of calories from carbohydrates, fats, and proteins
D4. relate food intake to food pyramid

D. Nutritional assessment (continued)

- D5. assess nutritional intake of family members
- D6. assess the relative proportions of macronutrients and total calories the student is using in a 24-hour period
- D7. assess personal excess or deficiency in daily intake
- D8. modify a high fat recipe, meal, and entire menu to one that is lower in fat
- D9. analyze menus from local restaurants to determine the macronutrient composition offered

E. Physical assessment

- E1. assess maximum oxygen uptake
- E2. assess body composition
- E3. assess muscular strength and endurance
- E4. assess flexibility
- E5. assess current level of physical activity
- E6. estimate the number of calories used, and the macronutrient proportions used, during a 24-hour period

F. Psychosocial issues of food and exercise

- F1. describe reasons people eat other than hunger
- F2. produce a chart indicating times of food consumption outside of meal times
- F3. list typical foods of three different cultures
- F4. identify and give examples of innate, cultural, and individual factors that influence food preferences
- F5. develop strategies to maintain a healthy diet during family holidays and other social occasions
- F6. describe how cultural definitions of ideal body shape and size affect health
- F7. describe factors that may be symptoms of eating disorders
- F8. identify how stress impacts overall health
- F9. identify recurring sources of stress and stress management techniques
- F10. describe influencing factors on amount and type of food intake
- F11. explain how exercise impacts self-esteem (locus of control)
- F12. describe the impact of poor body image on overall lifestyle and health

G. Physiological benefits of exercise

- G1. describe the effect of exercise on blood pressure
- G2. describe the effect of exercise on blood lipids
- G3. explain how aerobic exercise might prevent the onset of CVD
- G4. describe the effect of exercise on the control of body weight
- G5. define the training effect and list the physiological changes that accompany regular aerobic exercise

G Physiological benefits of exercise (continued)

- G6. define detraining and explain when it occurs
- G7. describe the impact of exercise on diabetes
- G8. state the impact of weight bearing exercise on osteoporosis

H Goal setting

- H1. identify the steps in the change process
- H2. identify differences between short term and long term goals
- H3. set long term goals to modify personal diet and level of physical activity
- H4. set short term goals to meet long term goals
- H5. assist an individual with nutritional and physical fitness assessment
- H6. assist an individual with goal setting
- H7. plan an exercise/diet program that includes the possibility of relapse

Appendix C: Table of Contents For Curriculum

TABLE OF CONTENTS FOR CURRICULUM

UNIT 1 — Introduction to Health & Healthy Habits 1

Key Concepts	1
What To Teach	1
Preparation and Needed Materials	1
Introduction	1
Glossary	1
<i>Fitness</i>	1
<i>Health</i>	2
<i>Metabolic Fitness</i>	2
<i>Risk Factor</i>	2
<i>Stress</i>	2
<i>Stressor</i>	2
Student Objectives.....	2
What Can Be Used To Teach	2
Background Information For Teacher.....	4
General Health	4
How Lifestyle Affects Health.....	4
Physical Activity	6
Stress	8
What is Stress?	8
Stress Management Techniques	9
Application of Theoretical Model	10
Teaching Tools:	
Overhead 1 — Lifestyle Habits Associated with Good Health	13
Activity 1 — Discussion Questions on Heredity and Lifestyle Habits.....	14
Overhead 2 — ACSM Exercise Guidelines.....	15
Activity 2 — Discussion Questions on 3 Physical Activity Problems.....	16
Overhead 3 — Dietary Guidelines	17
Activity 3 — Acting Out The Dietary Guidelines	18
Activity 4 — Health Issues Grid	19
Activity 5 —Test for Better Health	20
Activity 6 —'Hall of Life'	22
Activity 7 — 'Hall of Life' fact hunt	23
Overhead 4 — Stress: Ways to handle stress.....	25
Activity 8 — Stress In My Life (Use Stress Overhead)	26
Activity 9 — Identifications of Coping Styles.....	27
Activity 10 — Discussion Questions on Stress.....	29
Activity 11 — Parent Interview.....	30
Activity 12 — Progressive Muscle Relaxation	31

UNIT 2 — The Food Guide Pyramid..... 32

Key Concepts	32
What To Teach.....	32
Preparation and Needed Materials	32

Introduction	32
Student Objectives.....	32
Teaching Tips	33
What Can Be Used To Teach	34
Background Information For Teacher.....	35
Variety, Moderation and Proportionality	36
What Are The Nutrients.....	36
Fat and Sugar.....	38
Serving Sizes	38
The Food Groups	38
Application of Theoretical Model	40
Teaching Tools:	
Activity 1 — Video “Eating For Life: The Nutrition Pyramid.....	43
Activity 2 — Discussion Questions	44
Overhead 1 — Food Guide Pyramid.....	45
Overhead 2 — Variety, Moderation, and Proportionality	46
Handout 1 — Bread, Cereal, Rice, and Pasta Group.....	47
Handout 2 — Vegetable Group	48
Handout 3 — Fruit Group	49
Handout 4 — Milk, Yogurt, and Cheese Group.....	50
Handout 5 — Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts Group.....	51
Handout 6 — Fats, Oils, and Sweets Group	52
Overhead 3 — What Counts as a Serving?.....	53
Overhead 4 — Food Group Nutrients	54
Activity 3 — How Does Your Diet Rate For Variety?	55
Activity 4 — Score Your Diet for Vegetables, Fruits, and Grain Products	56
Activity 5 — Discussion Questions	57
Overhead 5 — Combination Foods and the Food Guide Pyramid	58
Activity 6 — Combination Foods and the Food Guide Pyramid	59
Overhead 6 — Mexican American Foods and the Food Guide Pyramid.....	61
Handout 7 — Glossary of Mexican American Foods	62
Handout 8 — Glossary of Ethnic Combination Foods	63
Overhead 7 — Where's the Sugar?.....	64
Overhead 8 — Where's the Fat?.....	65
Overhead 9 — Sweet Choices	66
Overhead 10 — Your Choice Can Make a Big Fat Difference	67
Overhead 11 — Snack Foods and Hard-to-Place Foods.....	68
Activity 7 — Rate Your Plate	69
Handout 9 — How To Make the Pyramid Work For You.....	70
Activity 8 — Design A Day's Diet.....	71
Activity 9 — Heart Healthy Word Find.....	72

UNIT 3 — Energy Balance 74

Key Concepts	74
What To Teach.....	74
Preparation and Needed Materials	74
Introduction	75
Glossary	75
<i>Adipose</i>	75
<i>Basal Metabolic Rate (BMR)</i>	75

<i>Calorie</i>	75
<i>Energy</i>	75
<i>Energy Balance</i>	75
<i>Glycogen</i>	75
<i>Kilocalorie</i>	75
Student Objectives.....	75
What Can Be Used To Teach.....	75
Background Information For Teacher.....	78
What is energy balance?.....	78
Where do calories come from?.....	78
What is the ideal % of calories?.....	79
Energy Output.....	79
Weight Control and Physical Activity.....	81
Body Composition.....	81
Storage of Energy.....	83
Summary.....	83
Application of Theoretical Model.....	83
Teaching Tools:	
Handout 1 — Running In Neutral.....	85
Overhead 1 — How Your Body Uses Energy.....	86
Activity 1 — How Many Calories Do I Need?.....	87
Handout 2 — Running In Gear.....	88
Handout 3 — The Survival Mission ¹	90
Handout 4 — Action Calories.....	93
Activity 2 — Survival Mission Activity.....	94
Activity 3 — Survival Mission Diet.....	95
Overhead 2 — Where Do Calories Come From?.....	99
Overhead 3 — What is Ideal?.....	100
Activity 4 — What's What.....	101
Demonstration 1 — Density Demonstration.....	102
Handout 5 — The Energy Store.....	103
Activity 5 — You're in Charge — Partly.....	105
Activity 6 — Estimate Your Own Body Recipe.....	108
Activity 7 — Discussion Questions.....	113
Handout 6 — Balancing Calories.....	114
Handout 7 — Calories Used For Different Activities.....	115
Handout 8 — Activities Chart.....	116
Activity 8 — Goal Setting & Guidelines.....	117

UNIT 4 — Obesity and Weight Loss.....120

Key Concepts.....	120
What To Teach.....	120
Preparation and Needed Materials.....	120
Introduction.....	120
Glossary.....	121
<i>Eating Disorders</i>	121

¹ Penn State Nutrition Center — Science Experiments. The Survival Mission Diet Recall and Calorie Expenditure, 1994.

<i>Fad Diets</i>	121
<i>Obesity</i>	121
<i>Overweight</i>	121
<i>Weight Cycling</i>	121
<i>Weightism</i>	121
Student Objectives.....	121
What Can Be Used To Teach	122
Background Information For Teacher.....	124
Fad Diets.....	124
Body Image.....	128
Eating Disorders	128
Obesity.....	130
Definition of Obese and Overweight.....	131
How Measured.....	131
Body Fat Distribution	132
How Fat is Deposited in the Body	132
Causes of Obesity.....	133
Health Problems Associated with Obesity	133
Weightism	134
Weight Cycling.....	134
Proper Weight Loss Methods.....	135
Changing Diet — Decreasing Fat Intake	135
Increasing Physical Activity.....	137
Changing Behavior.....	137
Hunger.....	138
Summary	139
Application of Theoretical Model	139
Teaching Tools:	
Overhead 1 — Characteristics of Fad Diets.....	143
Activity 1 — Discussion Questions on Fad Diets	144
Handout 1 — Fad Diet Example — “Dr. Atlas’ Wonder diet”	145
Activity 2 — Fad Diet Evaluator	146
Activity 3 — Weight Loss Book Evaluator	147
Activity 4 — Body Image Inventory.....	148
Activity 5 — Self-Concept Inventory.....	149
Activity 6 — Weightism Scoreboard	151
Activity 7 — Discussion Questions on Body Image & Weightism.....	152
Activity 8 — Perfect Body Survey	153
Activity 9 — Discussion Questions on Eating Disorders.....	154
Activity 10 — Video “The Myth of the Perfect Body”	154
Handout 2 — Replace the Negative and Emphasize the Positive.....	155
Activity 11 — Discussion Questions on obesity/overweight	156
Overhead 2 — Are you an apple or pear?.....	157
Activity 12 — Exercise and Weight.....	158
Handout 2 — Food Record Instructions.....	159
Activity 13 — Personal Food Record	163
Activity 14 — My Eating Style.....	164
Activity 15 — Discussion Questions — Are You Really Hungry?.....	165
Activity 16 — Hunger Assignment	167
Handout 3 — Not-So-Secrets to Success.....	168
Handout 4 — Making Light and Healthy Choices.....	169
Activity 17 — Weekly Goals & Examples.....	170
Handout 5 — Summary Chart of Weight Reduction Diets.....	172

UNIT 5 — Changing Food Intake: Nutrient Density & Food Choices.....189

Key Concepts	189
What To Teach.....	189
Student Objectives.....	189
Preparation and Needed Materials	190
Glossary	190
<i>Calories</i>	190
<i>Carbohydrates</i>	190
<i>Dietary Fiber</i>	190
<i>Energy Density</i>	191
<i>Nutrient Density</i>	191
<i>Simple Sugar</i>	191
<i>Starch</i>	191
Background Information For Teacher.....	191
Nutrient and Energy Density	191
Food Choices: Fat.....	192
Fat Intake Recommendations.....	193
Food Choices: Refined (simple) Sugars.....	194
What is sugar?.....	194
Sugar is found naturally	194
Sugar is also added to foods.....	194
What do carbohydrates do?	194
Is refined sugar a “bad” food?	194
Food Choices: Fruits, Vegetables, and Dietary Fiber	195
Function.....	196
Recommendations.....	197
To Your Future Health.....	197
What Can Be Used To Teach	198
Application of Theoretical Model	198
Teaching Tools:	
Activity 1 — What is Nutrient & Energy Density?	201
Activity 2 — Video “Look Before You Eat”	204
Activity 3 — How Do You Score On Fat?	205
Activity 4 — Quick and Dirty on Fat	206
Activity 5 — Where’s the Fat & Directions for Assembling Food Samples	207
Overhead/Handout 1 — Small Steps To Make a Big Fat Difference In Your Diet	208
Activity 6 — Healthy Choices Worksheet 1.....	209
Activity 7 — PROS AND CONS: Making a Decision to Change Fat Intake.....	210
Activity 8 — How Sweet Is Your Diet?	211
Overhead/Handout 2 — Percentage Sugar Content of Common Foods	212
Activity 9 — Where’s the Sugar & Directions for Assembling Food Samples.....	213
Activity 10 — Soda Pop Analogy.....	214
Activity 11 — Soft Drink Trivia.....	215
Activity 12 — PROS AND CONS: Making a Decision to Eat Less Refined Sugars.....	220
Activity 13 — Check Your Diet for Starch and Fiber	221
Activity 14 — Score Your Diet for Fruits and Vegetables	222
Overhead/Handout 3 — Fiber.....	223
Activity 15 — PROS AND CONS: Making a Decision to Eat More Fruits /Veg.....	224
Activity 16 — Discussion Questions on Sugar and Fiber.....	225

UNIT 6 — Changing Food Intake: How To Read Food Labels226

Key Concepts	226
What To Teach.....	226
Student Objectives.....	226
Preparation and Needed Materials	226
Glossary	226
<i>Nutrition Labels</i>	226
<i>Percent Daily Value</i>	227
<i>Serving Size</i>	227
Background Information For Teacher.....	227
Regulations.....	228
Health Claims	229
What Can Be Used To Teach	230
Teaching Tools:	
Activity 1 — Video "How to Read the New Food Label"	230
Handout 1 — How to Read the New Food Label.....	232
Activity 2 — The New Food Label	233
Activity 3 — Looking At Food Labels	234
Activity 5 — Take Glances, Not Chances: Read the Label.....	260
Activity 6 — Comparing 3 Nutrients In 3 Food Groups	262
Activity 7 — Comparing The Calcium Content of 4 Foods	266
Activity 8 — Brownie Breakdown.....	267

UNIT 7 — Changing Food Intake: Shopping For Food.....268

Key Concepts	268
What To Teach.....	268
Student Objectives.....	268
Preparation and Needed Materials	268
Glossary	268
<i>Price Per Serving</i>	268
<i>Unit Pricing</i>	268
Background Information For Teacher.....	269
Types of Food Shops.....	269
Selecting Foods at the Supermarkets.....	270
Wise Shopping	274
What Can Be Used To Teach	276
Application of Theoretical Model	276
Teaching Tools:	
Handout 1 — Shopping For Food.....	277
Activity 1 — To Market	278
Handout 2 — A Food Time Line	279
Activity 2 — Capsules of Food History	280
Activity 3 — Video "Supermarket Persuasion: How Food is Merchandised".....	281
Activity 4 — Supermarket Tour Directions.....	282
Activity 5 —Discussion Questions	287
Activity 6 — Cartoon Times & TV Advertising Worksheet	288
Activity 7 — Making a Shopping List.....	290
Activity 8 — Values Clarification Test	291
Appendix — Information Sheets For Supermarket Tour	292

UNIT 8 — Changing Food Intake: Dining Out316

Key Concepts	316
What To Teach.....	316
Student Objectives.....	316
Preparation and Needed Materials	316
Glossary	317
<i>Salt</i>	317
Background Information For Teacher.....	317
Sodium	318
Eating Fast Food	319
Eating At The Salad Bar.....	320
Eating Mexican Food	321
Eating Chinese Food.....	322
What Can Be Used To Teach	323
Application of Theoretical Model	323
Teaching Tools:	
Activity 1 — Video "Hip To Be Fit".....	325
Activity 2 — How Does Your Diet Rate for Sodium?.....	326
Activity 3 — Test Your Sodium Knowledge	327
Activity 4 — Pros and Cons: Making a Decision to Change Fast Food Choices.....	329
Activity 5 — Fast Food Challenge.....	328
Activity 6 — Fast Food Fat Quiz	358
The Fast Food Fat Quiz Answers.....	359
Greasy Joe's Burger Hut	360
Fast Food Fact Sheet.....	361
Handout 1 — Fast Food Fact Sheet: Low Fat vs. High Fat Items.....	362
Handout 2 — Foods In The Fast Lane.....	365
Activity 7 — How To Survive Eating Out!	366
Handout 3 — Hidden Menu Surprises!.....	367
Activity 8 — Greasy Grill Fast Food Menu.....	368
Activity 9 — Family and Friends Survey: Choice of Eating Establishment.....	369
Handout 4 — Multicultural Dining	370
Handout 5 — S.O.S. (Special Occasion Smarts).....	371
Handout 6 — Frequent Travelers Fat Savers.....	372
Handout 7 — Delicious, Nutritious Dining Out.....	373
Activity 10 — Healthy Choices Worksheet	374
Activity 11 — Discussion Questions	375

UNIT 9 — Changing Food Intake: Snacks and Beverages.....376

Key Concepts	376
What To Teach.....	376
Student Objectives.....	376
Preparation and Needed Materials	376
Glossary	376
<i>Caffeine</i>	376
Background Information For Teacher.....	377
Snacks	377

Beverages.....	378
What Can Be Used To Teach	378
Application of Theoretical Model	380
Teaching Tools:	
Activity 1 — Brown Bag Fat Display	382
Activity 2 — Nutrient Dense Snacks.....	383
Handout 1 — Food labels of various snack foods.....	384
Activity 3 — Good Goodies Quiz	388
Handout 2 — Filling The Fruit Bowl.....	389
Activity 4 — In The News.....	390
Activity 5 — Water Logged	391
Activity 6 — Name That Drink	392
Handout 3 — Caffeine.....	394
Activity 7 — How Much Caffeine?.....	395
Handout 4 — Sources of Caffeine.....	396

UNIT 10 — Changing Food Intake: Food Prep. & Recipe Modification.....397

Key Concepts	397
What To Teach.....	397
Student Objectives.....	397
Preparation and Needed Materials	398
Background Information For Teacher.....	398
When To Modify Recipes.....	398
How To Modify Recipes.....	399
Tips For Healthy Modifications.....	499
Ingredient Substitutions.....	401
Keep Your Food Safe To Eat.....	401
What Can Be Used To Teach	402
Application of Theoretical Model	403
Teaching Tools:	
Activity 1 — Soft Pretzels.....	404
Handout 1 — The Best Fat Substitutes	406
Activity 2 — Chocolate Chip Cookie Challenge.....	408
Activity 3 — Muffin Makeovers	410
Activity 4 — Another Muffin Makeover	412
Activity 5 — Muffin Label	414

UNIT 11 — Understanding Fat and Cholesterol415

Key Concepts	415
What To Teach.....	415
Preparation and Needed Materials	415
Introduction	415
Glossary	416
<i>Adipose</i>	416
<i>Cholesterol</i>	416
<i>Fat</i>	416
<i>Fatty Acids</i>	416

<i>Fish Oils</i>	416
<i>High Density Lipoproteins</i>	416
<i>Lipids</i>	416
<i>Low Density Lipoproteins</i>	416
<i>Monounsaturated Fat</i>	416
<i>Polyunsaturated Fat</i>	416
<i>Polyunsaturated-to-Saturated Fat Ratio</i>	416
<i>Saturated Fat</i>	416
<i>Triglycerides</i>	417
Student Objectives.....	417
What Can Be Used To Teach	417
Background Information For Teacher.....	419
Fat and Cholesterol	419
Exercise and Blood Lipids.....	423
Current Recommendations.....	423
Application of Theoretical Model	424
Teaching Tools:	
Overhead 1 — What is Fat & Cholesterol ?	426
Overhead 2 — Functions of Fat.....	427
Overhead 3 — Fat and Cholesterol Sources.....	428
Overhead 4 — Fat Content of Foods.....	429
Activity 1 — How Do You Score on Fat.....	430
Activity 2 — Quick and Dirty on Fat	431
Activity 3 — Classification of Fats	432
Overhead 5 — Lipoproteins in Your Blood	437
Activity 4 — Where's the Fat? (Fat Display)	438
Activity 5 — Switching to a Low-fat Milk ¹	440
Activity 6 — Video "Look Before You Eat"	442
Overhead 7 — Small steps to make a big difference in your diet	443
Activity 7 — Heart Healthy Choices Worksheet.....	444
Activity 8 — Discussion Questions	445

UNIT 12 — Diabetes Mellitus446

Key Concepts	446
What To Teach.....	446
Preparation and Needed Materials	446
Introduction	446
Glossary	447
<i>Calories</i>	447
<i>Carbohydrates</i>	447
<i>Glucose</i>	447
<i>Hyperglycemia</i>	447
<i>Insulin</i>	447
<i>Insulin Dependent Diabetes Mellitus</i>	447
<i>Ketoacidosis</i>	447
<i>Kidney</i>	447
<i>Non-Insulin Dependent Diabetes Mellitus</i>	447

¹ Source: Penn State Nutrition Center Science Experiments. Nutrition Science Activity — The Effects of Switching to a Lowfat Milk.

<i>Pancreas</i>	447
<i>Simple Sugar</i>	447
<i>Starch</i>	447
Student Objectives.....	447
What Can Be Used To Teach	447
Background Information For Teacher.....	447
Physiology of Diabetes Mellitus.....	450
Glucose	450
Pancreas	451
Insulin	451
What happens in IDDM?.....	452
What happens in NIDDM?.....	452
Insulin-Dependent Diabetes Mellitus.....	452
Non-Insulin-Dependent Diabetes Mellitus.....	453
The Risk Factors for NIDDM.....	453
Primary Risk Factors.....	453
Secondary Risk Factors.....	454
Symptoms of NIDDM.....	457
Hypoglycemia vs. Hyperglycemia	457
Screening Procedures for NIDDM	459
Treatment for NIDDM.....	460
Health Ramifications of NIDDM.....	463
Summary	465
Teaching Tools:	
Activity 1 — Diabetes Demonstration	466
Overhead 1 — Sugar Needs Insulin.....	467
Overhead 2 — Insulin Is The Key	468
Overhead 3 — Insulin Resistance.....	469
Overhead 4 — High Blood Sugar	470
Overhead 5 — Low Blood Sugar	471
Activity 2 — My Risk For Developing NIDDM.....	472
Activity 3 — My Parents' Risk For Developing NIDDM.....	474
Activity 4 — My Family Health Tree	475
Activity 5 — My Blood Glucose Level.....	476
Activity 6 — How Food Affects Blood Glucose Levels.....	476
Activity 7 — Guest Speaker.....	476

UNIT 13 — Cardiovascular Disease.....477

Key Concepts	477
What To Teach.....	477
Preparation and Needed Materials	477
Introduction	477
Glossary	478
<i>Artery</i>	478
<i>Atherosclerosis</i>	478
<i>Blood Pressure</i>	478
<i>Cardio</i>	478
<i>Chronic Diseases</i>	478
<i>Heart Attack</i>	478
<i>Hemorrhage</i>	478

<i>Hypertension/High Blood Pressure</i>	478
<i>Occlusion</i>	478
<i>Plaque</i>	478
<i>Risk Factor</i>	478
<i>Stroke</i>	478
<i>Systolic Pressure</i>	478
<i>Thrombus</i>	479
Student Objectives.....	479
What Can Be Used To Teach	479
Background Information For Teacher.....	481
Overview of the Heart.....	481
Cardiovascular Disease	481
Heart Disease Risk Factors	481
Hypertension.....	482
What Causes High Blood Pressure?.....	483
How Can High Blood Pressure Hurt You?.....	483
What Can Be Done About High Blood Pressure?.....	484
Application of Theoretical Model	485
Teaching Tools:	
Overhead 1 — The Circulatory System.....	487
Overhead 2 — Arteries, Veins, Capillaries.....	488
Overhead 3 — Blood Flow	489
Overhead 4 — The Heart.....	490
Overhead 5 — Heart Blood Flow	491
Overhead 6 — How Plaque Builds up	492
Overhead 7 — How Heart Attacks Occur.....	493
Activity 1 — Heart Notes & Word Find	494
Activity 2 — Heart Parts.....	496
Activity 3 — Heart Facts.....	497
Activity 4 — Zig-Zag	498
Overhead 8 — Risk Factors.....	499
Activity 5 — Video "Heart Disease: The Magnificent 7 Risk Factors".....	500
Activity 6 — Heart Sounds	501
Overhead 9 — Hypertension.....	502
Activity 7 — Discussion Questions.....	503
Activity 8 — Blood Pressure Analogy	504
Activity 9 — RISK: A Way To Alert You To The Risks Of Heart Attack.....	505
Activity 10 — Pulse Rate Variation.....	507
Activity 11 — Discussion Topic: Cardiovascular Disease Statistics	508

Appendix D: Human Subjects & Consent Forms

COLORADO MULTIPLE INSTITUTIONAL REVIEW BOARD

Office of the COMIRB

Participating Institutions

Room 1803J
Campus Box C-290
4200 East Ninth Avenue
Denver, Colorado 80262
(303) 270-7960
FAX (303) 270-8540

The Children's Hospital
Colorado Prevention Center
Denver Health & Hospitals
University of Colorado Health
Sciences Center
Department of Veteran Affairs
Medical Center, Denver
University Hospital

(Studies of Drugs & Devices)

TO: JAMES O. HILL, PH.D. BOX C225 DATE: 10-19-93

FROM: Colorado Multiple Institutional Review Board

YOUR APPLICATION ENTITLED "IMPROVING METABOLIC FITNESS IN OBESE ADOLESCENTS"

PROTOCOL NUMBER # 93-482

as been unanimously approved by the COMIRB as of 10-17-93 which includes your protocol and consent form/revised consent form.

The COMIRB is constituted to evaluate the scientific merits of clinical investigations. This **protocol/consent form has been approved** by the COMIRB because of its assessment that the protocol poses minimal or no risk to the subjects or that the benefits of the proposed investigation outweigh the risks. Such an approval, however, does not imply an endorsement by the COMIRB of the merits of this study. Thus, it is your responsibility as principal investigator to assure that any risks to the subjects are balanced by the scientific merits of this study.

The COMIRB will require a follow-up report on the status of this project within a 12 month period from the date of approval unless a restricted approval applies. If you have a restricted or high risk protocol, specific details will be spelled out with a special set of instructions. We shall send you a form to be completed to define the status of your project.

The investigator bears the responsibility to inform the COMIRB immediately of any deaths, serious complications or other untoward effects of this research.

Please notify the COMIRB if you intend to change the experimental design in any way.

As of July 1, 1983, the COMIRB REQUIRES that the subject be given a copy of the consent form which includes the name and telephone number of the investigator.

Any questions about the COMIRB's action on this project should be referred to the Secretary, Mary Jane Peratt (Ext. 7960 or Mail Container C-290)

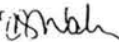

Adam Rosenberg, MD
Chairman
Colorado Multiple Institutional Review Board



Office of Regulatory Compliance
Office of Vice President for Research
and Information Technology
Fort Collins, CO 80523
(970) 491-1563
FAX (970) 491-1938

MEMORANDUM

TO: Christopher Melby, Food Science and Human Nutrition
Jennifer Anderson, Food Science and Human Nutrition

FROM: Celia S. Walker, Administrator 
Human Research Committee

SUBJECT: PROJECT APPROVAL
Title: Improving Metabolic Fitness in Hispanic Adolescents
Protocol No.: 96-197H
Funding Agency: NIH
Funding Agency Deadline: 7/1/96

DATE: October 22, 1996

I am pleased to inform you that the above-referenced project was approved by the Human Research Committee on October 18, 1996 for the period October 18, 1996 to October 18, 1997 with the condition that the attached consent forms are signed by the subjects and each subject is given a copy of the form. It is the investigator's responsibility to obtain these consent forms from all subjects. NO changes may be made to this document without first obtaining the approval of the Committee.

A status report of this project will be required within a 12-month period from the date of approval. The necessary form (H-101) will be mailed to you prior to that date.

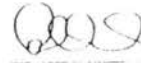
It is the responsibility of the investigator to immediately inform the Committee of any serious complications, unexpected risks or injuries resulting from this research.

It is also the investigator's responsibility to notify the Committee of any changes in experimental design or consent procedures (file Form H-101).

Any questions about the Committee's action on this project should be directed to me.

Attachment

Consent Form Approved



Adam R. Rosenberg, MD
Chairman, COMIRB

1/12/95
DATE

COLORADO MULTIPLE INSTITUTIONAL REVIEW BOARD

SUBJECT CONSENT

PROJECT TITLE: Improving metabolic fitness in adolescents

PROJECT DESCRIPTION: The purpose of this study is to help you change your lifestyle to improve your health. We will help you change your diet and physical activity to make you more healthy, lose body fat and become more fit.

SELECTION AND RECRUITMENT OF SUBJECTS:

You have been asked to participate in this study because you demonstrate an inactive lifestyle, but are otherwise healthy.

DURATION AND PARTICIPATION

You will be in this study for 2 years (through the end of your sophomore year).

PROCEDURES

If you agree to participate in this study, you will be enrolled in classes at Lincoln High School to help make your lifestyle more healthy. You will begin these classes in the second semester of your freshman year. The program will last two years (through the end of your sophomore year). You will participate in the following:

ASSESSMENTS:

You will have the following measurements done at the beginning of the study and then at the beginning and end of each semester you are in the study.

1. Weight, height, waist and hip measurements
2. Blood Pressure will be measured by clinic personnel.
3. Body composition: to determine body composition we will use 2 techniques
 - a) Bioelectrical impedance: In this procedure, we will put an electrode on one

hand and one foot. We will pass a tiny electrical current through your body. The electrodes measure the amount of electricity passing through the body. The current is too small to be felt, so that the procedure is painless. There are no known risks to this procedure.

- b) **Skinfold thickness:** In this procedure, we will measure the thickness of fat at seven locations on your body using skinfold calipers. Skinfold calipers simply measure how thick the layer of fat is just below the skin. Skinfold calipers are similar to tweezers. The procedure is painless and takes about 10 minutes.
4. **Blood sample:** a small amount of blood will be drawn to measure levels of glucose, insulin, total cholesterol, HDL-cholesterol, triglycerides, and hemoglobin-A1C.
5. **Physical fitness:** you will be measured for flexibility (sit and reach), abdominal muscular strength/endurance (sit-ups), upper body strength/endurance (modified pull-ups), and aerobic endurance (timed run/walk for a specified distance). We will use standard measurement techniques that are used in many high schools across the country.
6. **Physical activity:** for one week, you will be asked to wear a small movement-measuring device to measure usual physical activity. This device is about the size of a deck of cards and attaches to a belt. It is small and does not interfere with daily routines. At the end of each day that this device is worn, you will be asked to record numbers from this device on a recording form.
7. **Subgroup Measurements -** Students who volunteer will participate in the following tests to take place at the University of Colorado Health Sciences Center Campus:
 1. 24 hour energy expenditure. A subgroup of you will be asked to spend a 24 hour period in a specially designed room located at University Hospital. The room has a TV/VCR, a bed, a toilet and sink, a telephone, and 24 hour nurse support. During this procedure we will be measuring the number of calories that you use during the entire 24 hour period.
 2. Maximal Aerobic Exercise Test. The same subgroup of students will also be asked to perform a maximal aerobic exercise test which is used to measure your level of physical fitness. The test will be performed at the University of Colorado Health Sciences Center. For this test, you will ride a stationary bicycle. The mouthpiece you will wear during the test is connected to an instrument which measures the gases you expire throughout the test. As you are riding, the resistance against which you are riding will be increased, until it reaches the point that you must stop due to fatigue. This test will take approximately 15 minutes.
 3. Resting Metabolic Rate will be determined at the University of Colorado Health Sciences Center. You will lie on a bed in a relaxed position for 15 minutes. At this time, a clear plastic dome will be placed over your head so that the gases you expire can be measured. This dome in no way hinders your ability to breathe, and it will be over your head for a total of 15 minutes. The total time for this

test is 30 minutes

- 4 Underwater Weighing will be done at the University of Colorado Health Sciences Center to estimate the amount of fat and fat free (muscle, bone and organs) you have. The procedure requires that you be weighed while submerged under water. You will breathe through a mouthpiece while you are under water.

QUESTIONNAIRES:

You will be asked to fill out a number of questionnaires at the beginning of the study and then at the beginning and end of each semester that you participate in the study.

You will be asked to complete a variety of questionnaires that evaluate your attitudes about food and eating (Eating Disorders Inventory, Eating Behavior Questionnaire, the Eating Attitudes Test, and the Three Factor Eating Questionnaire). Using an interactive computer program, you will be asked to give us information about the way you feel about your body image. In addition, you will be asked to complete questionnaires that evaluate the way you feel about your life (Adolescent Coping Orientation for Problem Experience, The Center for Epidemiology Study Depression Scale, Self-Perception Profile for Adolescents and the Youth Evaluation Survey). Filling out the questionnaires will take about one hour.

In addition to the questionnaires described above, you will be asked to complete 3 more questionnaires at the beginning and end of the study only. You will not have to fill out these questionnaires if you do not wish to.

Health & Physical Education Class

You will meet 3 days/week for a morning class in health and physical education. This class will be a combination of engaging in sports and physical activities and further teaching in lifestyle modification (2 days/week). One day each week, you and your classmates will discuss the benefits and necessities of an active lifestyle for healthy living. You will learn how to improve your physical fitness and why exercise and an active lifestyle are important. The class will involve some study of muscle and food metabolism, and discussion of the effects of exercise, the effects of different types of exercise, and the relationship between physical fitness and metabolic fitness will be included. As part of the course, participants will learn about how to evaluate physical fitness and metabolic fitness and why we are making the particular assessments proposed in the present study. We will also discuss the social aspects of exercise and discuss how friendships can be created and maintained. The goal of the physical activity intervention is to get you physically active during the class and to get you interested in sports or outdoor activities and interested in an active lifestyle.

Science for Healthy Living Class

~~You will also meet 5 days/week in the afternoon for a class which discusses topics which will help you learn to lead a healthier life, not only in the ways you eat and exercise, but in how you think about yourself. In this class, you will learn about healthy diets and will help make improvements in the school food program (lunch and breakfast).~~

Extracurricular Activities

As part of this program, you will be encouraged to participate in extracurricular physical activity programs (e.g. baseball, soccer, etc.). Group members will be encouraged to organize teams in different sports. We will take you on field trips to the mountains, beginning with easy

hikes and continuing (only with those who are interested) to more difficult hikes. We will also encourage you to begin cycling.

DISCOMFORTS AND RISKS:

There is minimal risk to any of the measurements that we will perform. Obtaining blood samples by inserting a needle into a vein can cause discomfort and may result in bruising or clotting. Both discomfort or bruising should disappear in a few days, if they occur. There is risk of injury during the physical education class and physical fitness assessments. However, this risk is no different than would be present for other high school students. For the subgroup of students undergoing tests at the University of Colorado Health Sciences Center, there is a slight risk (1 in 10,000) of heart problems associated with the fitness test. Underwater weighing presents no risk, but there is a possibility of claustrophobia or potential fear of being underwater for some subjects.

BENEFITS:

There may be no benefit to participating in this study. However, you may learn how to make changes in your life to prevent the development of diseases such as diabetes and high blood pressure. You will get school credit for attending these classes. You will receive \$10.00 for completing each assessment period, i.e., at the beginning of the study and at the beginning and end of each semester you are in the study, for a total of \$50.00.

ALTERNATIVE TREATMENTS AVAILABLE:

As this is a school class for which you will be receiving credit you may not drop out of the study after the beginning of each semester. You may decide at the end of a semester not to continue in the study the next semester. In this case, you may choose to attend another class.

RESEARCH SPECIFIC PROCEDURES:

This study is entirely for research purposes.

SOURCE OF FUNDING:

This study has been submitted to NIH for funding.

RIGHTS AND CONFIDENTIALITY:

Please ask questions about any aspect of this research or this consent either now or in the future by calling James O. Hill, Ph.D. or Renee Commerford at 270-4721. If you have questions regarding your rights as a research subject, please call John Moorhead, Ph.D., of the COMIRB at 270-7960. The investigators will treat your identity with professional standards of confidentiality. However, the U.S. Department of Health and Human Services has the right to inspect all of your medical records related to this research for the purpose of verifying data. The information obtained in this study may be published in medical journals, but your identity will not be revealed.

INJURY AND COMPENSATION: If you are hurt by this research, we will provide medical care if you want it, but you will have to pay for the care that is needed. You will not be paid for any other loss as a result of the injury, such as lost wages, pain and suffering.

AUTHORIZATION.

I have read this paper about the study or it was read and explained to me. I know what will happen, both the possible good and bad (benefits and risks). I freely and voluntarily choose to participate. I understand that I may withdraw at any time and it will not affect my standard health care. I will get a copy of this consent form.

Signature: _____ Date _____

Consent form explained by: _____ Date _____

Investigator: _____ Date _____

Consent Form Approved



Adam R. Rosenberg, MD
Chairman, COMIRB

6/26/95
DATE

COLORADO MULTIPLE INSTITUTIONAL REVIEW BOARD

SUBJECT CONSENT

PROJECT TITLE: Improving metabolic fitness in adolescents

PROJECT DESCRIPTION:

The purpose of this study is to help your son/daughter change his/her lifestyle to improve his/her health. We will help your son/daughter change his/her diet and physical activity to make them more healthy, lose body fat and become more fit.

SELECTION AND RECRUITMENT OF SUBJECTS:

Your son/daughter has been asked to participate in this study because he/she demonstrates an inactive lifestyle, but is otherwise healthy.

DURATION AND PARTICIPATION

Your son/daughter will be in this study for 2 years (beginning in the Fall of 1995).

PROCEDURES

If you agree to allow your son/daughter to participate in this study, he/she will be enrolled in a class at Lincoln High School to help make his/her lifestyle more healthy. He/She will begin this class in the Fall of 1995. The program will last two years (four consecutive semesters) and he/she will receive both physical education and science credit for being in the class. While in the class, your son/daughter will participate in the following:

ASSESSMENTS:

Your son/daughter will have the following measurements done in the Fall of 1995, and again in the Springs of both 1996 and 1997.

1. Weight, height, waist and hip measurements.
2. Blood Pressure will be measured by clinic personnel.
3. Body composition: to determine body composition we will use 2 techniques:
 - a) Bioelectrical impedance: In this procedure, we will put an electrode (this

measures the amount of electricity passing through the body) on one hand and one foot. We will pass a tiny electrical current through your son/daughter's body. The current is too small to be felt, so that the procedure is painless. There are no known risks to this procedure.

- b) **Skinfold thickness:** In this procedure, we will measure the thickness of fat at seven locations on your son/daughter's body using skinfold calipers. Skinfold calipers simply measure how thick the layer of fat is just below the skin. Skinfold calipers are similar to tweezers. The procedure is painless and takes about 10 minutes.
4. **Blood sample:** a small amount of blood will be drawn to measure levels of glucose, insulin, total cholesterol, HDL-cholesterol, triglycerides, and hemoglobin-A1C.
5. **Physical fitness:** your son/daughter will be measured for flexibility (sit and reach), abdominal muscular strength/endurance (sit-ups), upper body strength/endurance (modified pull-ups), and aerobic endurance (timed run/walk for a specified distance). We will use standard measurement techniques that are used in many high schools across the country.
6. **Physical activity:** for two days, your son/daughter will be asked to wear a small movement-measuring device to measure usual physical activity. This device is about the size of a deck of cards and attaches to a belt. It is small and does not interfere with daily routines. At the end of each day that this device is worn, your son/daughter will be asked to record numbers from this device on a recording form.
7. **Subgroup Measurements - Students who volunteer will participate in the following tests to take place at the University of Colorado Health Sciences Center Campus:**
 1. **24 hour energy expenditure.** A subgroup of these students will be asked to spend a 24 hour period in a specially designed room located at University Hospital. The room has a TV/VCR, a bed, a toilet and sink, a telephone, and 24 hour nurse support. During this procedure we will be measuring the number of calories that your son/daughter uses during the entire 24 hour period.
 2. **Maximal Aerobic Exercise Test.** The same subgroup of students will also be asked to perform a maximal aerobic exercise test which is used to measure the level of physical fitness. The test will be performed at the University of Colorado Health Sciences Center. For this test, your son/daughter will ride a stationary bicycle. The mouthpiece your son/daughter will wear during the test is connected to an instrument which measures the gases he/she expires throughout the test. As your son/daughter is riding, the resistance against which he/she is riding will be increased, until it reaches the point that your son/daughter must stop due to fatigue. This test will take approximately 15 minutes.
 3. **Resting Metabolic Rate** will be determined at the University of Colorado Health Sciences Center. Your son/daughter will lie on a bed in a relaxed position for 15 minutes. At this time, a clear plastic dome will be placed over your

son's/daughter's head so that the gases he/she expires can be measured. This dome in no way hinders his/her ability to breathe, and it will be over his/her head for a total of 15 minutes. The total time for this test is 30 minutes.

4. Underwater Weighing will be done at the University of Colorado Health Sciences Center to estimate the amount of fat and fat-free (muscle, bone and organs) your son/daughter has. The procedure requires that your son/daughter be weighed while submerged under water. He/She will breathe through a mouthpiece while he/she is under water.

QUESTIONNAIRES:

Your son/daughter will be asked to fill out a number of questionnaires at the beginning of the study (Fall, 1995), in the middle of the study (Spring, 1996) and then at the end of the study (Spring, 1997). The questionnaires address a variety of topics including his/her attitudes about food, exercise and eating (Eating Disorders Inventory, Eating Behavior Questionnaire, the Eating Attitudes Test, and the Three Factor Eating Questionnaire). Using an interactive computer program, he/she will be asked to give us information about the way he/she feels about his/her body image. In addition, he/she will be asked to complete questionnaires that evaluate the way he/she feels about his/her life (Adolescent Coping Orientation for Problem Experience, The Center for Epidemiology Study Depression Scale, Self-Perception Profile for Adolescents and the Youth Evaluation Survey). Filling out the questionnaires will take between one and two hours.

In addition to the questionnaires described above, your son/daughter will be asked to complete 3 more questionnaires at the beginning and end of the study only. He/She will not have to fill out these questionnaires if he/she does not wish to.

Science for Healthy Living Class

Your son/daughter will meet 3 days/week for a class in health, nutrition, and physical education. This class will be a combination of engaging in sports and physical activities and learning ways to improve eating habits. Additionally, the course content will address ways to modify lifestyle. Each class period, your son/daughter and his/her classmates will discuss the benefits and necessities of an active lifestyle and proper eating habits for healthy living. He/She will learn how to modify meals so the fat content in the meal is less, but the food still tastes good. Additionally, he/she will be instructed on how to make healthy food choices while shopping in the grocery store or while eating out. We will also discuss the social aspects of exercise and how friendships can be created and maintained.

The goal of the physical activity intervention is to get your son/daughter physically active during class and to get him/her interested in sports or outdoor activities which will, in turn, help him/her develop a more active lifestyle. The nutrition topics discussed in class will help him/her learn to lead a healthier life, not only in the ways he/she eats and exercises, but in how he/she thinks about him/herself.

Extracurricular Activities

As part of this program, your son/daughter will be encouraged to participate in extracurricular physical activity programs (e.g. baseball, soccer, etc.). Group members will be encouraged to organize teams in different sports. We will take your son/daughter on field trips to the mountains, beginning with easy hikes and continuing (only with those who are interested)

to more difficult hikes. We will also encourage your son/daughter to begin cycling.

Family Involvement:

We will provide material for the parents, explaining the program and its goals. We will also describe how you, as a parent, can contribute to your son/daughter's success. As a parent of a participant in this program we would like your help in making your son/daughter successful in making lifestyle changes. Occasionally, you may be asked to meet with other parents to discuss the program. In addition, the nutrition/exercise specialist and the social worker will attend the monthly parent meeting at Abraham Lincoln High School.

At the beginning of the study, you will be asked to fill out a questionnaire called the Parent Attitude and Behavior Scale. This will take about 20 minutes and you will only need to fill it out once.

To help you learn more about our program we will offer free screening for diabetes, high blood pressure and cholesterol for parents. In addition, the program participants will organize evening classes for their parents. In these classes, participants will teach their parents information based on what they have learned in the program.

If you agree to have your son/daughter participate in this program, you are not obliged to attend any meetings, classes or screenings.

DISCOMFORTS AND RISKS:

There is minimal risk to the measurements that we will perform. Obtaining blood samples by inserting a needle into a vein can cause discomfort and may result in bruising or clotting. Both discomfort or bruising should disappear in a few days, if they occur. There is risk of injury during the physical education class and physical fitness assessments. However, this risk is no different than would be present for other high school students. For the subgroup of students undergoing tests at the University of Colorado Health Sciences Center, there is a slight risk (1 in 10,000) of heart problems associated with the fitness test. Underwater weighing presents no risk, but there is a possibility of claustrophobia or potential fear of being underwater for some subjects.

BENEFITS:

There may be no benefit to your son/daughter participating in this study. However, he/she may learn how to make changes in his/her life to prevent the development of diseases such as diabetes and high blood pressure. Your son/daughter will receive school credit for attending this class in both physical education and science. He/She will receive \$10.00 for completing each assessment period, i.e., in the Fall of 1995, and each of the Springs of 1996 and 1997. For those students who volunteer to participate in the subgroup measurements, they will be awarded an additional \$10.00 each time they complete those assessments.

ALTERNATIVE TREATMENTS AVAILABLE:

As this is a school class for which your son/daughter will be receiving credit, he/she may not drop out of the study after the beginning of each semester. Your son/daughter may decide at the end of a semester not to continue in the study the next semester. In this case, he/she may choose to attend another class.

RESEARCH SPECIFIC PROCEDURES:

This study is entirely for research purposes.

SOURCE OF FUNDING:

This study has been submitted to NIH for funding.

RIGHTS AND CONFIDENTIALITY:

Please ask questions about any aspect of this research or this consent either now or in the future by calling James O. Hill, Ph.D. or Renee Commerford at 270-4721. If you have questions regarding your son/daughter's rights as a research subject, please call John Moorhead, Ph.D., of the COMIRB at 270-7960. The investigators will treat your son/daughter's identity with professional standards of confidentiality. However, the U.S. Department of Health and Human Services has the right to inspect all of your son/daughter's medical records related to this research for the purpose of verifying data. The information obtained in this study may be published in medical journals, but your son/daughter's identity will not be revealed.

INJURY AND COMPENSATION: If your son/daughter is hurt by this research, we will provide medical care if you want it, but you will have to pay for the care that is needed. You or your son/daughter will not be paid for any other loss as a result of the injury, such as lost wages, pain and suffering.

AUTHORIZATION:

I have read this paper about the study or it was read and explained to me. I know what will happen, both the possible good and bad (benefits and risks). I freely and voluntarily choose to have my son/daughter participate. I understand that I may withdraw my son/daughter at any time and it will not affect my standard health care. I will get a copy of this consent form.

Signature: _____ Date: _____

Consent form explained by: _____ Date: _____

Investigator: _____ Date: _____

Consent Form Approved



Adam R. Rosenberg, MD
Chairman, COMIRB

11/1/95
DATE

COLORADO MULTIPLE INSTITUTIONAL REVIEW BOARD

SUBJECT CONSENT

PROJECT TITLE: Improving metabolic fitness in adolescents

PROJECT DESCRIPTION:

You are asked to serve as a control subject for a study involving improvement of metabolic fitness in high school students. Students at another high school are being enrolled in special nutrition and physical activity classes. We hope that these classes improve the physical fitness and overall health of the students. Since there is not such a program at your high school, you are being asked to participate in the same measurements as the students in the other school. This will allow us to determine whether our special classes were effective.

We will measure your height and weight, body composition, physical fitness, serum cholesterol, and attitudes about eating and exercise three times over the next two years (beginning in the Fall of 1995). We will meet with you at school three times in each of the Fall of 1995, the Spring of 1996, and the Spring of 1997 (for a total of nine meetings). Each meeting will involve a combination of physical assessments and/or completing questionnaires. Whenever physical assessments are taken in the meeting, you will receive \$10.00. If the meeting only involves completion of questionnaires, you will receive \$5.00. Consequently, in the Fall of 1995, you will receive a total of \$25.00 if you complete all the physical assessments and questionnaires. If you complete both years of the study, you will receive a total of \$75.00.

SELECTION AND RECRUITMENT OF SUBJECTS:

You have been asked to participate in this study because you demonstrate an inactive lifestyle, but are otherwise healthy or because you are a student in one of the Physical Education classes at North High School.

DURATION AND PARTICIPATION

You will be in this study for 2 years (beginning in the Fall of 1995).

PROCEDURES

If you agree to participate in this study, you will have the following done in the Fall of 1995, the Spring of 1996, and the Spring of 1997.

1. Weight, height, waist and hip measurements
2. Blood Pressure will be measured by clinic personnel
3. Body composition: to determine body composition we will use 2 techniques
 - a) **Bioelectrical impedance:** In this procedure, we will put an electrode (this measures the amount of electricity passing through the body) on one hand and one foot. We will pass a tiny electrical current through your body. The current is too small to be felt, so that the procedure is painless. There are no known risks to this procedure.
 - b) **Skinfold thickness:** In this procedure, we will measure the thickness of fat at seven locations on your body using skinfold calipers. Skinfold calipers simply measure how thick the layer of fat is just below the skin. Skinfold calipers are similar to tweezers. The procedure is painless and takes about 10 minutes.
4. Blood sample: a small amount of blood will be drawn to measure levels of glucose, insulin, total cholesterol, HDL-cholesterol, triglycerides, and hemoglobin-A1C
5. Physical fitness: you will be measured for flexibility (sit and reach), abdominal muscular strength/endurance (sit-ups), upper body strength/endurance (modified pull-ups), and aerobic endurance (timed run/walk for a specified distance). We will use standard measurement techniques that are used in many high schools across the country.
6. Physical activity: for two days, you will be asked to wear a small movement-measuring device to measure usual physical activity. This device is about the size of a deck of cards and attaches to a belt. It is small and does not interfere with daily routines. At the end of each day that this device is worn, you will be asked to record numbers from this device on a recording form.
7. Subgroup Measurements - Students who volunteer will participate in the following tests to take place at the University of Colorado Health Sciences Center Campus. It will not be required that the students do all of these tests so that if a student is interested in only doing two or three of these tests, he or she will be permitted to do so.
 1. 24 hour energy expenditure. A subgroup of you will be asked to spend a 24 hour period in a specially designed room located at University Hospital. The room has a TV/VCR, a bed, a toilet and sink, a telephone, and 24 hour nurse support. During this procedure we will be measuring the number of calories that your son/daughter uses during the entire 24 hour period. If you decide to do this test you will receive an additional \$10.00.
 2. Maximal Aerobic Exercise Test. The same subgroup of students will also be asked to perform a maximal aerobic exercise test which is used to measure your level of physical fitness. The test will be performed at the University of Colorado Health Sciences Center. For this test, you will ride a stationary bicycle. The mouthpiece you will wear during the test is connected to an

instrument which measures the gases expire throughout the test. As you are riding, the resistance against which you will be riding will be increased, until it reaches the point that you must stop due to fatigue. This test will take approximately 15 minutes. If you decide to do this test, you will receive an additional \$5.00.

3. Resting Metabolic Rate will be determined at the University of Colorado Health Sciences Center. You will lie on a bed in a relaxed position for 15 minutes. At this time, a clear plastic dome will be placed over you so that the gases you are expiring can be measured. This dome in no way hinders your ability to breathe, and it will be over your head for a total of 15 minutes. The total time for this test is 30 minutes. If you decide to do this test, you will receive an additional \$5.00.
4. Underwater Weighing will be done at the University of Colorado Health Sciences Center to estimate the amount of fat and fat-free (muscle, bone and organs) you have. The procedure requires that you be weighed while submerged under water. You will breathe through a mouthpiece while you are under water. If you decide to do this test, you will receive an additional \$5.00.

QUESTIONNAIRES:

You will be asked to fill out a number of questionnaires at the beginning of the study in the Fall of 1995, again in the Spring of 1996, and finally in the Spring of 1997.

You will be asked to complete a variety of questionnaires that evaluate your attitudes about food, exercise, and eating (Eating Disorders Inventory, Eating Behavior Questionnaire, the Eating Attitudes Test, and the Three Factor Eating Questionnaire). Using an interactive computer program, you will be asked to give us information about the way you feel about your body image. In addition, you will be asked to complete questionnaires that evaluate the way you feel about your life (Adolescent Coping Orientation for Problem Experience, The Center for Epidemiology Study Depression Scale, Self-Perception Profile for Adolescents and the Youth Evaluation Survey). Filling out the questionnaires will take between one and two hours.

In addition to the questionnaires described above, you will be asked to complete 3 more questionnaires at the beginning and end of the study only. You will not have to fill out these questionnaires if you do not wish to.

DISCOMFORTS AND RISKS:

There is minimal risk to the measurements that we will perform. Obtaining blood samples by inserting a needle into a vein can cause discomfort and may result in bruising or clotting. Both discomfort or bruising should disappear in a few days, if they occur. There is risk of injury during the physical fitness assessments. However, this risk is no different than would be present for other high school students participating in physical education classes.

BENEFITS:

There may be no benefit to participating in this study. You will receive \$25.00 for completing each assessment period (i.e. in the Fall of 1995, the Spring of 1996, and the Spring of 1997) for a total of \$75.00. You will also receive results of all your tests. If you choose to participate in the measurements for the subgroup, you will receive additional payment as described above (see PROCEDURES, section 7), each time you complete those measurements.

ALTERNATIVE TREATMENTS AVAILABLE:

There is no alternative treatment available

RESEARCH SPECIFIC PROCEDURES:

This study is entirely for research purposes

SOURCE OF FUNDING:

This study has been submitted to NIH for funding

RIGHTS AND CONFIDENTIALITY:

Maribeth Flanagan at 315-3046

Please ask questions about any aspect of this research or this consent either now or in the future by calling James O. Hill, Ph.D. or ~~Renee Commerford at 270-4724~~. If you have questions regarding your rights as a research subject, please call John Moorhead, Ph.D., of the COMIRB at 270-7960. The investigators will treat your identity with professional standards of confidentiality. However, the U.S. Department of Health and Human Services has the right to inspect all of your medical records related to this research for the purpose of verifying data. The information obtained in this study may be published in medical journals, but your identity will not be revealed.

INJURY AND COMPENSATION: If you are hurt by this research, we will provide medical care if you want it, but your parents will have to pay for the care that is needed. You will not be paid for any other loss as a result of the injury, such as lost wages, pain and suffering

AUTHORIZATION:

I have read this paper about the study or it was read and explained to me. I know what will happen, both the possible good and bad (benefits and risks). I freely and voluntarily choose to have my son/daughter participate. I understand that I may withdraw at any time and it will not affect my standard health care. I will get a copy of this consent form

Signature: _____ Date _____

Consent form explained by: _____ Date _____

Investigator: _____ Date _____

Consent Form Approved



Adam R. Rosenberg, MD
Chairman, COMIRB

1/3/95

DATE

COLORADO MULTIPLE INSTITUTIONAL REVIEW BOARD

SUBJECT CONSENT (PARENT)

PROJECT TITLE: Improving metabolic fitness in adolescents

PROJECT DESCRIPTION

Your son/daughter is being asked to serve as a control subject for a study involving improvement of metabolic fitness in high school students. Students at another high school are being enrolled in special nutrition and physical activity classes. We hope that these classes improve the physical fitness and overall health of the students. Since there is not such a program at your son/daughter's high school, he/she is being asked to participate in the same measurements as the students in the other school. This will allow us to determine whether our special classes were effective.

We will measure your son/daughter's height and weight, body composition, physical fitness, serum cholesterol, and attitudes about eating and exercise three times over the next two years (beginning in the Fall of 1995). We will meet with him/her at school three times in each of the Fall of 1995, the Spring of 1996, and the Spring of 1997 (for a total of nine meetings). Each meeting will involve a combination of physical assessments and/or completing questionnaires. Whenever physical assessments are taken in the meeting, your son/daughter will receive \$10.00. If the meeting only involves completion of questionnaires, your son/daughter will receive \$5.00. Consequently, in the Fall of 1995, your son/daughter will receive a total of \$25.00 if he/she completes all the physical assessments and questionnaires. If he/she complete both years of the study, he/she will receive a total of \$75.00.

SELECTION AND RECRUITMENT OF SUBJECTS

Your son/daughter has been asked to participate in this study because he/she demonstrates an inactive lifestyle, but is otherwise healthy or because he/she is a student in one of the Physical Education classes at North High School.

DURATION AND PARTICIPATION

Your son/daughter will be in this study for 2 years (beginning the Fall of 1995).

PROCEDURES

If you agree to allow your son/daughter to participate in this study, he/she will have the following measurements done in the Fall of 1995, the Spring of 1996, and the Spring of 1997:

1. Weight, height, waist and hip measurements

2. Blood Pressure will be measured by clinic personnel
3. Body composition: to determine body composition we will use 2 techniques
 - a) **Bioelectrical impedance:** In this procedure, we will put an electrode (this measures the amount of electricity passing through the body) on one hand and one foot. We will pass a tiny electrical current through your son/daughter's body. The current is too small to be felt, so that the procedure is painless. There are no known risks to this procedure.
 - b) **Skinfold thickness:** In this procedure, we will measure the thickness of fat at seven locations on your son/daughter's body using skinfold calipers. Skinfold calipers simply measure how thick the layer of fat is just below the skin. Skinfold calipers are similar to tweezers. The procedure is painless and takes about 10 minutes.
4. Blood measures: a small amount of blood will be drawn to measure levels of glucose, insulin, total cholesterol, HDL-cholesterol, triglycerides and hemoglobin-A1C.
5. Physical fitness: your son/daughter will be measured for flexibility (sit and reach), abdominal muscular strength/endurance (sit-ups), upper body strength/endurance (modified pull-ups), and aerobic endurance (timed run/walk for a specified distance). We will use standard measurement techniques that are used in many high schools across the country.
6. Physical activity: for two days, your son/daughter will be asked to wear a small movement-measuring device to measure usual physical activity. This device is about the size of a deck of cards and attaches to a belt. It is small and does not interfere with daily routines. At the end of each day that this device is worn, your son/daughter will be asked to record numbers from this device on a recording form.
7. Subgroup Measurements - Students who volunteer will participate in the following tests to take place at the University of Colorado Health Sciences Center Campus. It will not be required that the students do all of these tests so that if a student is interested in only doing two or three of these tests, he or she will be permitted to do so.
 1. 24 hour energy expenditure. A subgroup of these students will be asked to spend a 24 hour period in a specially designed room located at University Hospital. The room has a TV/VCR, a bed, a toilet and sink, a telephone, and 24 hour nurse support. During this procedure we will be measuring the number of calories that your son/daughter uses during the entire 24 hour period. If your son/daughter decides to do this test, he/she will receive an additional \$10.00.
 2. Maximal Aerobic Exercise Test. The same subgroup of students will also be asked to perform a maximal aerobic exercise test which is used to measure the level of physical fitness. The test will be performed at the University of Colorado Health Sciences Center. For this test, your son/daughter will ride a stationary bicycle. The mouthpiece your son/daughter will wear during the test is connected to an instrument which measures the gases he/she expires throughout the test. As your son/daughter is riding, the resistance against which he/she is riding will be increased, until it reaches the point that your son/daughter must stop due to fatigue. This test will take approximately 15 minutes. If your

- son/daughter decides to do this test, he/she will receive an additional \$5.00.
3. Resting Metabolic Rate will be determined at the University of Colorado Health Sciences Center. Your son/daughter will lie on a bed in a relaxed position for 15 minutes. At this time, a clear plastic dome will be placed over your son's/daughter's head so that the gases he/she expires can be measured. This dome in no way hinders his/her ability to breathe, and it will be over his/her head for a total of 15 minutes. The total time for this test is 30 minutes. If your son/daughter decides to do this test, he/she will receive an additional \$5.00.
 4. Underwater Weighing will be done at the University of Colorado Health Sciences Center to estimate the amount of fat and fat-free (muscle, bone and organs) your son/daughter has. The procedure requires that your son/daughter be weighed while submerged under water. He/She will breathe through a mouthpiece while he/she is under water. If your son/daughter decides to do this test, he/she will receive an additional \$5.00.

QUESTIONNAIRES:

Your son/daughter will be asked to fill out a number of questionnaires in the Fall of 1995, and again in the Springs of both 1996 and 1997.

Your son/daughter will be asked to complete a variety of questionnaires that evaluate his/her attitudes about food, exercise, and eating (Eating Disorders Inventory, Eating Behavior Questionnaire, the Eating Attitudes Test, and the Three Factor Eating Questionnaire). Using an interactive computer program, he/she will be asked to give us information about the way he/she feels about his/her body image. In addition, he/she will be asked to complete questionnaires that evaluate the way he/she feels about his/her life (Adolescent Coping Orientation for Problem Experience, The Center for Epidemiology Study Depression Scale, Self-Perception Profile for Adolescents and the Youth Evaluation Survey). Filling out the questionnaires will take between one and two hours.

In addition to the questionnaires described above, your son/daughter will be asked to complete 3 more questionnaires at the beginning and end of the study only. He/She will not have to fill out these questionnaires if he/she does not wish to.

DISCOMFORTS AND RISKS

There is minimal risk to the measurements that we will perform. Obtaining blood samples by inserting a needle into a vein can cause discomfort and may result in bruising or clotting. Both discomfort or bruising should disappear in a few days, if they occur. There is risk of injury during the physical fitness assessments. However, this risk is no different than would be present for other high school students participating in physical education classes.

BENEFITS

There may be no benefit to your son/daughter participating in this study. He/She will receive \$25.00 for completing each assessment period i.e. in the Fall of 1995, the Spring of 1996 and the Spring of 1997 (for a total of \$75.00). He/She will also receive results of all your tests. For those students who volunteer to participate in the subgroup measurements, they will be given additional payment as outlined above (see PROCEDURES, section 7), each time they complete those assessments.

ALTERNATIVE TREATMENTS AVAILABLE

There is no alternative treatment for this study.

RESEARCH SPECIFIC PROCEDURES

This study is entirely for research purposes

SOURCE OF FUNDING

This study has been submitted to NIH for funding

RIGHTS AND CONFIDENTIALITY

Maribeth Flanagan at 315 3046

Please ask questions about any aspect of this research or this consent either now or in the future by calling James O. Hill, Ph.D. or ~~Renee Commerford at 270-4721~~. If you have questions regarding your son/daughter's rights as a research subject, please call John Moorhead, Ph.D. of the COMIRB at 270-7960. The investigators will treat your son/daughter's identity with professional standards of confidentiality. However, the U.S. Department of Health and Human Services has the right to inspect all of your son/daughter's medical records related to this research for the purpose of verifying data. The information obtained in this study may be published in medical journals, but your son/daughter's identity will not be revealed.

INJURY AND COMPENSATION: If your son/daughter is hurt by this research, we will provide medical care if you want it, but you will have to pay for the care that is needed. You or your son/daughter will not be paid for any other loss as a result of the injury, such as lost wages, pain and suffering.

AUTHORIZATION

I have read this paper about the study or it was read and explained to me. I know what will happen, both the possible good and bad (benefits and risks). I freely and voluntarily choose to have my son/daughter participate. I understand that I may withdraw my son/daughter at any time and it will not affect my standard health care. I will get a copy of this consent form.

Signature: _____ Date _____

Consent form explained by: _____ Date _____

Investigator: _____ Date _____

Appendix E: Evaluation Instruments

Nutrition Knowledge

Section I — Food High in Fat, Sugar, Salt, Cholesterol, and Calories

In this section, you will read some statements about foods that have the most fat, sugar, salt, cholesterol, and calories in them. For each question, read the list of two foods. Circle the letter of the food you think has the most of each of these. If you don't know the answer, then circle "e".

- | | | Don't
Know |
|---|---|-----------------------|
| Which of these two foods has the <u>most</u> fat? | | |
| 1. | (a) chicken fried in lard (b) baked chicken | (e) |
| 2. | (a) butter (b) cottage cheese | (e) |
| 3. | (a) skim milk (b) sweet condensed milk | (e) |
| 4. | (a) hamburgers (b) potato | (e) |
| 5. | (a) cabbage w/ham hock (b) cabbage w/smoked turkey | (e) |
| Which of these two foods has the <u>most</u> sugar added to it? | | |
| 6. | (a) Frosted Flakes (b) Cheerios | (e) |
| 7. | (a) crackers (b) cookies | (e) |
| 8. | (a) ketchup (b) soy sauce | (e) |
| 9. | (a) oatmeal (b) pork and beans | (e) |
| 10. | (a) candied sweet potatoes (b) Spanish rice | (e) |
| Which of these two foods has the <u>most</u> salt? | | |
| 11. | (a) green beans w/salt pork (b) green beans w/margarine | (e) |
| 12. | (a) bacon (b) baked veal | (e) |
| 13. | (a) frozen carrots (b) canned carrots | (e) |
| 14. | (a) pot pie (b) boiled noodles | (e) |
| 15. | (a) white rice (b) Rice-a-Roni | (e) |
| Which of these two foods has the <u>most</u> cholesterol? | | |
| 16. | (a) eggs (b) 2% milk | (e) |
| 17. | (a) turkey (b) liver | (e) |
| 18. | (a) lean beef (b) chorizo sausage | (e) |
| 19. | (a) peanut butter (b) mayonnaise | (e) |
| 20. | (a) mayonnaise (b) potatoes fried in oil | (e) |
| Which of these two foods has the <u>most</u> calories? | | |
| 21. | (a) hard candy (b) chocolate candy | (e) |
| 22. | (a) fried plantains (b) steamed plantain | (e) |
| 23. | (a) chicken with skin (b) lean beef | (e) |
| 24. | (a) baked fish (b) breaded fish sticks | (e) |
| 25. | (a) potato salad (b) baked potato | (e) |

Section II — Multiple Choice Items

In this section, read each statement and then the list of answers to choose from. Write one response that you think is the best. If you don't know the answer, then write the letter "e".

- _____ 26. The best way to get all the nutrients your body needs is to:
- a. eat a lot of food
 - b. eat a lot of meat
 - c. eat many different kinds of foods
 - d. take a vitamin pill every day
 - e. don't know
- _____ 27. Which of these habits has not been found to be associated with good health:
- a. eating breakfast regularly
 - b. learning to handle stress
 - c. exercising at least 5 to 6 days/ week
 - d. sleeping 7 to 8 hours/day
 - e. don't know
- _____ 28. Which of the following is part of the U.S. Dietary Guidelines?
- a. Use salt only when necessary, and only in small amounts.
 - b. If you drink alcoholic beverages, do so in moderation.
 - c. Use sugar only in small amounts.
 - d. Maintain a low body weight.
 - e. don't know
- _____ 29. In Type II Diabetes, the body no longer responds to which hormone?
- a. glucagon
 - b. hypoglycemia
 - c. insulin
 - d. pancreas
 - e. don't know
- _____ 30. Which of the following is not a risk factor for Type II Diabetes ?
- a. a diet high in sugars
 - b. a diet high in fat
 - c. being Hispanic
 - d. excess fat around the abdomen
 - e. don't know
- _____ 31. The treatment for Type II Diabetes includes the following?
- a. weight loss
 - b. no smoking
 - c. exercise
 - d. all of these
 - e. don't know
- _____ 32. Which of these foods should not be eaten often if you want to lose weight or stay the same weight?
- a. rice
 - b. fried foods
 - c. potatoes
 - d. tortillas
 - e. don't know

- _____ 33. Which of the following foods are high in saturated fat?
- a. olive oil
 - b. avocados
 - c. whole milk
 - d. fish
 - e. don't know
- _____ 34. Concerning nutrient density, which of the following is correct?
- a. vitamins provide 7 calories per gram
 - b. protein provides 5 calories per gram
 - c. carbohydrates provide 5 calories per gram
 - d. fat provides 9 calories per gram
 - e. don't know
- _____ 35. We should eat the most from which food group of the Food Guide Pyramid?
- a. meat, poultry, fish dry beans, eggs, and nuts
 - b. milk, yogurt, and cheese
 - c. vegetables
 - d. bread, cereal, rice, and pasta
 - e. don't know
- _____ 36. A piece of pizza would fit into which groups of the Food Guide Pyramid?
- a. vegetable
 - b. bread
 - c. milk
 - d. all of these
 - e. don't know
- _____ 37. When you want to decrease the fat in your favorite cake recipe, you can substitute the oil for:
- a. margarine
 - b. apple sauce
 - c. egg whites
 - d. milk
 - e. don't know
- _____ 38. When eating at a restaurant, which of the following is not considered a low-fat choice?
- a. order a salad with creamy dressing
 - b. order a roast beef sandwich instead of a hamburger
 - c. order grilled, baked, or broiled chicken
 - d. order a baked potato instead of french fries
 - e. don't know
- _____ 39. The best way to lose weight in the long run is to:
- a. stop eating potatoes and bread
 - b. use Slim Fast or take diet pills
 - c. exercise more and eat less calories
 - d. eat one meal a day
 - e. don't know

- _____ 40. The body is composed of:
a. water c. bone e. don't know
b. fat and muscle d. all of these
- _____ 41. Which of the following statements is not true about iron?
a. The iron in meat, poultry, and fish is absorbed best.
b. The iron in vegetables is absorbed much less efficiently than in meats.
c. Iron absorption is decreased if iron-rich foods are eaten at the same meal as vitamin C-rich foods.
d. all of these
e. don't know
- _____ 42. Your chances of having a heart attack are higher if you have a:
a. high blood cholesterol level d. low blood sugar level
b. low blood cholesterol level e. don't know
c. high blood count
- _____ 43. Which of these food habits may lower your chances of having heart trouble?
a. eating less fatty foods d. eating garlic
b. eating less starchy foods e. don't know
c. eating more meat
- _____ 44. The build up of plaque in the heart's vessels can come from eating foods that are high in:
a. protein d. salt
b. fat and cholesterol e. don't know
c. sugar
- _____ 45. What is not a characteristic of fad diets?
a. unlimited food choices d. lacks certain nutrients
b. causes too rapid a weight loss e. don't know
c. can only be followed for short periods of time
- _____ 46. Fiber is important to eat because it can help prevent:
a. arthritis d. constipation
b. diarrhea e. don't know
c. bladder trouble
- _____ 47. Which of these health problems may come from not eating enough foods like milk and cheese?
a. diabetes d. bone disease
b. heart trouble e. don't know
c. high blood pressure

- _____ 48. The main health problem caused by eating too many sugary foods is:
- a. diabetes
 - b. cancer
 - c. cavities
 - d. heart trouble
 - e. don't know
- _____ 49. Which of these diseases could come from drinking too much beer, wine, or whiskey?
- a. bone disease
 - b. liver disease
 - c. kidney disease
 - d. lung disease
 - e. don't know
- _____ 50. People who are overweight have a higher chance of getting:
- a. heart trouble
 - b. high blood pressure
 - c. Diabetes
 - d. all of these problems
 - e. don't know
- _____ 51. Which of the following substances are sources of energy?
- a. proteins, carbohydrates, minerals
 - b. proteins, carbohydrates, vitamins
 - c. fat, carbohydrates, proteins
 - d. water, vitamins, minerals
 - e. don't know
- _____ 52. In negative energy balance, you:
- a. are eating more food energy than you are burning.
 - b. are eating less food energy than you are burning.
 - c. are eating food energy and burning energy equally.
 - d. none are correct
 - e. don't know
- _____ 53. Which of the following body functions are considered to be part of the basal energy requirement?
- a. walking 3 miles
 - b. digesting food
 - c. breathing
 - d. all of these
 - e. don't know
- _____ 54. Which of the following diets promotes sustained weight-loss and is considered healthy:
- a. high-fat, low-carbohydrate diet
 - b. high-protein, low-carbohydrate diet
 - c. low-fat, high-carbohydrate diet
 - d. total fast
 - e. don't know

- ____ 55. What is the first step to take in any permanent weight control program?
- a. stop snacking
 - b. plan a diet lower in calories
 - c. understand your own eating and exercise patterns
 - d. begin to exercise
 - e. don't know
- ____ 56. Maintaining weight loss likely requires:
- a. dieting at regular intervals
 - b. a permanent change in eating habits
 - c. exercising on a regular basis
 - d. only b and c
 - e. don't know
- ____ 57. Which of the following is considered "good" cholesterol:
- a. LDL
 - b. HDL
 - c. chylomicrons
 - d. VLDL
 - e. don't know
- ____ 58. The use of vitamin and mineral supplements is most justified for:
- a. preventing colds
 - b. improving athletic performance
 - c. meeting the needs of a pregnant woman
 - d. relieving stress
 - e. don't know
- ____ 59. Which of the following organs of the body would be affected by anorexia nervosa?
- a. skin
 - b. bones
 - c. teeth
 - d. all of these organs
 - e. don't know
- ____ 60. When should water or other fluids be consumed relative to exercise?
- a. before exercise
 - b. after exercise
 - c. during exercise
 - d. all of these
 - e. don't know
- ____ 61. Dehydration can cause:
- a. decrease in performance
 - b. decrease in body temperature
 - c. an increase in blood pressure
 - d. all of these
 - e. don't know
- ____ 62. Diabetes that develops when a person is an adult is called:
- a. Insulin-dependent diabetes
 - b. Type I diabetes
 - c. Non-insulin dependent diabetes
 - d. Juvenile-onset diabetes
 - e. don't know

Section III — Characteristics of Diabetes

Put "yes" on the line by all of the following characteristics that are related to the development of diabetes among adults. Put "no" if the characteristic is not related to diabetes. Put the letters "DK", for "don't know", in the line by the characteristic if you do not know whether the characteristic is related to diabetes.

- _____ 63. Excessive amounts of body fat in the belly
- _____ 64. An increase in total body fat
- _____ 65. Smoking
- _____ 66. A high fat diet
- _____ 67. A diet high in starch
- _____ 68. A diet high in fiber
- _____ 69. More calories consumed than expended
- _____ 70. Lack of physical activity
- _____ 71. Stress
- _____ 72. Other family members who have diabetes
- _____ 73. Small bone structure

Put "yes" on the line by all of the health problems listed below that can occur from having diabetes. Put "no" if the health problem unrelated to diabetes. Put the letters "DK", for "don't know", in the line by the health problem if you do not know whether the problem is related to diabetes.

- _____ 74. High blood pressure
- _____ 75. Kidney problems
- _____ 76. Lung cancer
- _____ 77. Eye problems
- _____ 78. Arthritis
- _____ 79. Foot problems
- _____ 80. Heart disease
- _____ 81. Cavities in the teeth
- _____ 82. Fragile bones
- _____ 83. Stomach ulcers

PHYSICAL ACTIVITY KNOWLEDGE TEST

Check the line under the word "True" if the statement is true, check the "False" column if the statement is false. If you honestly do not know the answer, then check the column labeled, "Don't Know"

True	False	Don't Know	
—	—	—	1. During a bout of strenuous exercise, blood pressure usually goes up.
—	—	—	2. The best way to reduce a fat belly is to do lots of sit-ups.
—	—	—	3. Glucose is stored in skeletal muscle as glycogen.
—	—	—	4. If a person goes for a fast walk for 30 minutes, their metabolic rate would stay elevated for many hours after her/his walk.
—	—	—	5. A person's <u>resting</u> heart rate (their pulse rate) will often go down when they become more physically fit.
—	—	—	6. An adult who has blood sugar levels that are always too low might have diabetes.
—	—	—	7. Sitting in a sauna or a steam bath for an hour a day is a good method for decreasing body fat.
—	—	—	8. Regular exercise which is easy and painless to do (like walking) has no health benefits.
—	—	—	9. The best exercise to prevent heart disease is the type that causes the maximum heart rate to be reached.
—	—	—	10. The energy for muscle contraction is supplied by ATP.
—	—	—	11. When exercising in hot weather, it is best to drink water only when you feel thirsty.
—	—	—	12. Weight lifting, if done properly, can improve flexibility.
—	—	—	13. The warm-up period prior to exercising should last about 5 to 10 minutes.
—	—	—	14. Wearing extra layers of clothing while exercising will help the body get rid of body fat.
—	—	—	15. Aerobic exercise involves greater use of oxygen than does anaerobic exercise.

Multiple Choice- Choose the one best answer for each of the following questions. If you do not know the correct answer, mark "don't know".

16. A 150-lb. person will expend about how many Kcalories by walking one mile?
- A. 25 Kcalories
 - B. 100 Kcalories
 - C. 500 Kcalories
 - D. 300 Kcalories
 - E. don't know

17. A 16 year-old girl would have an estimated maximum heart rate of about
- A. 204 beats per minute
 - B. 150 beats per minute
 - C. 262 beats per minute
 - D. 104 beats per minute
 - E. don't know
18. Regular exercise can help a person with diabetes because:
- A. Exercise helps the muscle to use the glucose in the blood
 - B. Exercise helps a person lower their body fat
 - C. Exercise increases blood sugar levels
 - D. A and B are correct
 - E. don't know
19. Regular exercise seems to enhance the action of what hormone that regulates blood sugar levels?
- A. Testosterone
 - B. Estrogen
 - C. Insulin
 - D. Thyroid hormone
 - E. don't know
20. The major muscle fuel used for lifting a heavy weight is:
- A. Phosphocreatine
 - B. Fat
 - C. Protein
 - D. Lactic Acid
 - E. don't know
21. Which of the following components of daily energy expenditure accounts for the majority of calories expended during a 24-hour day?
- A. Physical activity
 - B. Calories used to digest and absorb the food you eat
 - C. Resting metabolic rate
 - D. Planned exercise
 - E. don't know
22. As exercise intensity increases toward a maximal effort, there is an increase in the percentage of _____ used for fuel in the exercising muscle:
- A. Fat
 - B. Carbohydrate
 - C. Alcohol
 - D. Urea
 - E. don't know

ID# _____

Date _____

23. An increase in the amount of oxygen you use during heavy exercise compared to when you are resting can be predicted based on the
- A. Increase in the amount of fat you use for fuel
 - B. Decrease in your blood pressure
 - C. Increase in your heart rate
 - D. Increase in your appetite caused by the exercise
 - E. don't know
24. A very low calorie diet can cause:
- I. Loss of both fat and muscle tissue
 - II. Loss of fat tissue only
 - III. A decrease in metabolic rate
- A. Both I and II are correct
 - B. Both I and III are correct
 - C. Both II and III are correct
 - D. I, II and III are correct
 - E. don't know
25. In order to build up maximum stores of muscle glycogen, you should consume a high _____ diet.
- A. Carbohydrate
 - B. Protein
 - C. Fat
 - D. Calorie
 - E. don't know
26. Training for muscular strength as opposed to muscular endurance involves
- A. Light weights with a low number of repetitions
 - B. Heavy weights with a low number of repetitions
 - C. Light weights with a high number of repetitions
 - D. Stretching rather than weight lifting
 - E. don't know
27. The single most important factor in improving strength with a weight training program is:
- A. Progressively but gradually overloading the skeletal muscle
 - B. Exercising the skeletal muscles only every third day to allow adequate rest
 - C. A high protein diet
 - D. Using free weights rather than weight machines
 - E. don't know

28. Which one of the following activities involves primarily aerobic metabolism?
- A. Weight lifting
 - B. 100 meter dash
 - C. High jump
 - D. 2-mile jog
 - E. don't know

ID #: _____

Nutrition Attitudes

For each statement, please write the response number that corresponds to how you feel:

- 1 = I strongly disagree
- 2 = I disagree
- 3 = I am neutral
- 4 = I agree
- 5 = I strongly agree

- _____ 1. I seldom think about my eating habits.
- _____ 2. I like tasting foods I do not know about.
- _____ 3. I stop eating only when I cannot eat anymore.
- _____ 4. I like to eat vegetables.
- _____ 5. I only like foods I know about.
- _____ 6. I like eating different foods.
- _____ 7. I like tasting foods I have not seen before.
- _____ 8. I like trying new foods.
- _____ 9. I think nutrition is important to my health.
- _____ 10. I do not care about the food I eat.
- _____ 11. Eating well can help prevent certain diseases.
- _____ 12. I eat what I want regardless of what is good for me.
- _____ 13. The foods I eat now will help keep me healthy.
- _____ 14. I try hard to learn about nutrition.
- _____ 15. I am not concerned about the number of calories in my diet.
- _____ 16. I like learning about food sources of nutrients.
- _____ 17. I like learning about foods and health.
- _____ 18. I like learning about the food groups.
- _____ 19. I try hard to keep up with the latest nutrition information.
- _____ 20. I am too busy to concern myself with nutrition.
- _____ 21. I like learning about what to eat for breakfast.
- _____ 22. Knowing that a food is good for me has little influence on what I choose to eat.

Fat Intake Behavior Stages

High fat foods include:

whole milk	sour cream	cream cheese	french fries
lard	fatty meats	margarine	Fast-food burgers & sandwiches
mayonnaise	butter	creamy salad dressings	
pastries & donuts	cheese	meat drippings added to vegetables	

Please circle "yes" or "no" to the questions that apply to you.

Do you choose few of these foods with high fat as a part of your meals and snacks every day
AND do you try to include low-fat or non-fat food choices in your diet daily?
(For example choosing 1% milk instead of whole milk)

YES (Go on.)

NO (Go on.)

Have you been doing this
since last spring ?

YES

(Please stop here.)

NO

Have you thought about
starting to choose fewer of these
high-fat foods sometime in the
future (like before winter)?

NO
(Please stop
here)

YES

Have you though about starting
to choose fewer of these high-fat
foods very soon (like in the next
month)?

NO
(Please stop
here)

YES

Are you now taking steps to learn about
high-fat foods and how they relate to
health?

NO
(Please stop
here)

YES (Please stop here)

ID#: _____

Date: _____

Exercise Stages

For this question, "exercise" must be done on a regular basis. This means you exercise 3 or more times per week for at least 20 minutes each time. Also, this exercise must be vigorous enough to make cause you to sweat, make your heart beat faster and make you breathe harder than usual.

Examples of vigorous exercise include running or jogging, aerobic dance, biking, swimming, or in-line skating.

DO NOT consider the following as exercise: walking to and from classes during school, walking to and from school, or walking around the mall while shopping.

Please indicate 'yes' or 'no' for each of the questions that apply to you:

Do you currently exercise, as described above? _____

If you answered 'yes' then go to Part A, and do not answer Part B

If you answered 'no' then go to Part B, and do not answer Part A

PART A (IF YES)

When answering the 3 questions for Part A, keep in mind the above description for exercise. To answer, place either "yes" or "no" in the blank in front of each question.

_____ Have you been exercising for more than 6 months?

_____ Have you only just started exercising within the last 6 months?

_____ Have you been exercising occasionally, but not regularly?

PART B (IF NO)

When answering the 3 questions for Part A, keep in mind the above description for exercise. To answer, place either "yes" or "no" in the blank in front of each question.

_____ Have you been exercising occasionally, but not regularly?

_____ Have you exercised regularly in the past, but you are not doing so currently?

_____ Are you thinking about starting to exercise in the next six months?

ID# _____

EXERCISE SELF-EFFICACY

Directions: Please answer the following questions by circling the number above the response that is appropriate to you.

I am confident I can participate in regular exercise:

A. when I am tired.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

B. when I am in a bad mood.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

C. when I feel I don't have the time.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

D. when I am having a good day.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

E. when I am on vacation.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

F. when I am feeling good.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

G. if it is raining or snowing.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

H. on an average day.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

I. in good weather.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

ID# _____

LOW-FAT FOODS SELF-EFFICACY

Directions: Please answer the following questions by circling the number above the response that is appropriate to you.

I am confident I can choose low-fat foods to eat:

A. when I am at home.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

B. when I am with my friends.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

C. when I am at a restaurant.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

D. when I am in a hurry.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

E. when I am at school.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

F. when I am at the grocery store.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

G. when I am at a party.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

H. during the week.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

I. when I am on vacation.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

J. when I am in a bad mood.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

K. when I am having a good day.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

L. when I am tired.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

M. when I am well rested.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

N. when I am not rushed.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

O. on the weekend.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

P. after school.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

Q. when I am watching TV.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

R. when I am on a date.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

S. when I go to the movies.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

T. when I am bored.

0	1	2	3	4	5	6	7
does not apply to me	not at all confident	slightly confident		confident		very confident	extremely confident

Dietary Screening Questionnaire

268

	MEDIUM SERVING	YOUR SERVING SIZE			HOW OFTEN						OFFICE USE
		S	M	L	Day	Week	Month	Year	Rarely/ Never		
EXAMPLE: Hamburgers, cheeseburgers, meat loaf	1 medium										
Hamburger, cheeseburgers, meat loaf, ground beef in tacos/burritos	1 medium										11
Beef steaks, roasts	4 oz.										15
Pork, including chops, roasts	2 chops or 4 oz.										19
Hot dogs, sausage, chorizo	2 dogs										23
Ham, lunch meats	2 slices										27
Whole milk not incl. on cereal	8 oz. glass										31
Cheese, excluding cottage	2 slices or 2 oz.										35
Doughnuts, cookies, cake, pastries	1 pc. or 3 cookies										39
Eggs	1 egg = small, 2 eggs = medium										43
White bread, rolls, bagels, etc., incl. sandwiches, tortilla	2 slices, 3 crackers										47
Margarine or butter	2 pats										51
Salad dressing or mayonnaise (incl. on sandwiches), sour cream, avocado, guacomole	2 Tblsp.										55
French fries, fried potatoes	3/4 cup										59
Do you eat the following foods every day?											
Breakfast Cereal Yes No											63
Dark Bread, such as whole wheat, rye, pumpernickel? Yes No											64

Name

LHS

Block Food Questionnaire

Think about your eating habits over the past year or so. About how often do you eat each of the following foods? Mark an "X" in one box for each food.

	(0) Less than once per MONTH	(1) 2-3 times per MONTH	(2) 1-2 times per WEEK	(3) 3-4 times per WEEK	(4) 5+ times per WEEK	points SCORE
Hamburgers, cheeseburgers or ground beef in tacos/burritos	☐	☐	☐	☐	☐	_____
Beef such as steaks, roasts	☐	☐	☐	☐	☐	_____
Fried chicken	☐	☐	☐	☐	☐	_____
Hot dogs, franks	☐	☐	☐	☐	☐	_____
Cold cuts, lunch meats, ham, etc.	☐	☐	☐	☐	☐	_____
Salad dressings, mayo (not diet), sour cream, avocado/guacamole	☐	☐	☐	☐	☐	_____
Margarine or butter	☐	☐	☐	☐	☐	_____
Eggs	☐	☐	☐	☐	☐	_____
Bacon, sausage or chorizo	☐	☐	☐	☐	☐	_____
Cheese or cheese spread	☐	☐	☐	☐	☐	_____
Whole milk	☐	☐	☐	☐	☐	_____
French fries	☐	☐	☐	☐	☐	_____
Potato chips, corn chips, popcorn	☐	☐	☐	☐	☐	_____
Ice cream	☐	☐	☐	☐	☐	_____
Doughnuts, pastries, cake, cookies	☐	☐	☐	☐	☐	_____
<i>Meat/Snacks Score=</i>						

	(0) Less than once per WEEK	(1) About 1 time per WEEK	(2) 2-3 times per WEEK	(3) 4-6 times per WEEK	(4) Every day	points SCORE
Orange juice	☐	☐	☐	☐	☐	_____
Not counting juice, about how often do you eat any fruit?	☐	☐	☐	☐	☐	_____
Green salad	☐	☐	☐	☐	☐	_____
Potatoes	☐	☐	☐	☐	☐	_____
Beans, such as baked beans, pintos, kidney beans or in chili	☐	☐	☐	☐	☐	_____
About how often do you eat any other vegetables?	☐	☐	☐	☐	☐	_____
High-fiber or bran cereal	☐	☐	☐	☐	☐	_____
Dark bread, such as whole wheat, rye	☐	☐	☐	☐	☐	_____
White bread, including french, italian, biscuits, muffins, tortillas	☐	☐	☐	☐	☐	_____
<i>Fruit/Vegetable/Fiber Score=</i>						

ID#: _____

- 1) How many adults live in your home? (Please identify them)

- 2) About your female guardian (mother, step-mother, foster mother, grandmother, or aunt):
How many years of education has she completed? _____

Is she currently employed? (Please circle one)
A) No. If no, what was her previous job? _____

B) Yes. If yes, what type of employment? _____
- 3) About your male guardian (father, step-father, foster father, grandfather, or uncle):
How many years of education has he completed? _____

Is he currently employed? (Please circle one)
A) No. If no, what was his previous job? _____

B) Yes. If yes, what type of employment? _____
- 4) Are you currently employed? (Please circle one)
A) No
B) Yes If yes, what type of employment? _____
How many hours per week? _____
- 5) Number of children in your family: (please circle one)
A) 1 B) 2 C) 3 D) 4 E) 5 F) 6 G) 7 H) > 7
- 6) What is your birth order: (circle one)
A) oldest B) 2nd oldest C) 3rd oldest D) 4th oldest E) other
- 7) How many brothers _____ and sisters _____ do you have ?
(please place a number in the blank)
- 8) How long have you lived at your current address?
- 9) Do you plan on moving in the near future? (Please circle one)
A) No B) Yes If yes, when? _____

ACCULTURATION

ID#: _____

Date: _____

1. Do you speak any Spanish? ☐ yes ☐ no
2. Would you say that you speak mostly Spanish or mostly English, or do you speak Spanish and English about the same? ☐ Mostly Spanish
☐ Mostly English
☐ both about the same
3. What language do you prefer? ☐ Spanish only
☐ Mostly Spanish
☐ Mostly English
☐ English only
☐ both equally
4. Can you read Spanish? ☐ yes ☐ no
5. Can you read English? ☐ yes ☐ no
6. Which do you read better? ☐ Spanish
☐ English
☐ both the same
7. Can you write Spanish? ☐ yes ☐ no
8. Can you write English? ☐ yes ☐ no
9. In which language do you write better? ☐ Spanish
☐ English
☐ both the same
10. Which of these groups best describes your ethnic identification? Check only one.

☐ Puerto Rican	☐ Boricuan
☐ Cuban	☐ Cuban-American
☐ African	☐ African-American
☐ Mexican	☐ Chicano
☐ Mexican-American	☐ Hispano
☐ Latin American	☐ Other Hispanic
☐ American	☐ Anglo-American
☐ Asian	☐ Asian-American
☐ Other group	

11. In which country were you born?

(specify)

12. Which of these groups best describes your mother's ethnic identification? Check only one.

☐ Puerto Rican
☐ Cuban
☐ African
☐ Mexican
☐ Mexican-American
☐ Latin American
☐ American
☐ Asian
☐ Other group

☐ Boricuan
☐ Cuban-American
☐ African-American
☐ Chicano
☐ Hispano
☐ Other Hispanic
☐ Anglo-American
☐ Asian-American

13. Which of these groups best describes your father's ethnic identification? Check only one.

☐ Puerto Rican
☐ Cuban
☐ African
☐ Mexican
☐ Mexican-American
☐ Latin American
☐ American
☐ Asian
☐ Other group

☐ Boricuan
☐ Cuban-American
☐ African-American
☐ Chicano
☐ Hispano
☐ Other Hispanic
☐ Anglo-American
☐ Asian-American

14. In what country or state was your father born?

☐ U.S., except Puerto Rico
☐ Puerto Rico
☐ Cuba
☐ Mexico
☐ Other _____

(specify)

15. In what country or state was your mother born?

☐ U.S., except Puerto Rico
☐ Puerto Rico
☐ Cuba
☐ Mexico
☐ Other _____

(specify)