Reducing Dietary Fat and Cholesterol Consumption: An Evaluation of a Behaviorally Focused Nutrition Education Program

Peter F. Carey
Western Michigan University

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REDUCING DIETARY FAT AND CHOLESTEROL CONSUMPTION:
AN EVALUATION OF A BEHAVIORALLY FOCUSED
NUTRITION EDUCATION PROGRAM

by

Peter F. Carey

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
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Western Michigan University
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REDUCING DIETARY FAT AND CHOLESTEROL CONSUMPTION: AN EVALUATION OF A BEHAVIORALLY FOCUSED NUTRITION EDUCATION PROGRAM

Peter F. Carey, Ph.D.
Western Michigan University, 1994

Coronary heart disease (CHD) is the leading cause of death in the United States, killing more than 500,000 people annually. Serum cholesterol is a principal risk factor for the development of atherosclerosis, a primary precipitant of CHD. Unfortunately, elevated serum cholesterol is a common but often undetected health risk for many Americans. Furthermore, the typical American diet contains high levels of fat and cholesterol which contribute to elevated serum cholesterol levels. The National Cholesterol Education Program (NCEP), created to improve awareness of serum cholesterol as a CHD risk factor, recommends that dietary changes constitute the initial step in the treatment of elevated serum cholesterol. Unfortunately, many Americans find it difficult to alter their diet to produce and maintain significant reductions in serum cholesterol. In spite of widespread cholesterol counseling services, relatively little research has investigated the development and experimental validation of efficient interventions to promote such dietary changes.

The current study examines a brief, behaviorally focused nutrition education program designed to promote the dietary changes recommended by the NCEP. Intervention components included techniques to reduce fat and cholesterol consumption, establish and operationalize dietary goals, manipulate environmental stimuli to promote dietary change, and remove barriers which prevent dietary change. A second experiment incorporated two additional meetings designed to improve
adherence to dietary goals. Participants completed follow-up measures of serum cholesterol, dietary behavior, and stress to evaluate changes. A repeated measures analysis of variance including predicted scores for missing cell values revealed statistically significant improvements on a food frequency questionnaire for Experiment One (p<.005) and Experiment Two (p<.01), suggesting positive changes in low fat, low cholesterol food selection. Additionally, mean levels of serum cholesterol and saturated fat decreased in the first experiment. In the second experiment mean levels of total and saturated fat decreased; however, a slight mean increase in serum cholesterol occurred. Although the results did not demonstrate unequivocal support for the intervention, the findings are encouraging, particularly because of the low intensity and cost effective nature of the intervention. Future research should consider the use of supplementary techniques to enhance the intervention outcome, including physical exercise and weight management strategies.
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Reducing dietary fat and cholesterol consumption: An evaluation of a behaviorally focused nutrition education program

Carey, Peter F., Ph.D.
Western Michigan University, 1994
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Peter F. Carey
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CHAPTER I

INTRODUCTION

Coronary Heart Disease (CHD) ranks as the leading cause of death in the United States (McGinnis & Foege, 1993). Although the mortality rate has declined steadily since the early 1960's (Johnson et al., 1993), the prevalence of CHD persists (DeStefano, Merritt, Anda, Casper, & Eaker, 1993). Tsevat, Weinstein, Williams, Tosteson and Goldman (1991) estimate that nearly 5.4 million Americans have symptomatic CHD. In addition, over one million people suffer myocardial infarctions in the United States annually (Robinson & Leon, 1994). Of the 500,000 deaths attributed to CHD annually (Tsevat et al., 1991), approximately 41,000 die before the age of 50 (National Center for Health Statistics, 1991).

The estimated 50 to 100 billion dollar annual cost of CHD in health care expenditures and lost wages (National Cholesterol Education Program [NCEP] Expert Panel, 1993) also reflects the epidemic proportions of this problem. Particularly in the era of health care reform, a reduction in expenditures related to CHD would have a significant impact on the overall health care budget. Fiscal concerns alone, however, cannot account for the toll in lost productivity and human suffering caused by the disease. Not only do CHD patients experience significant life disruption, so also do their life partners, children, coworkers and others associated closely with them.

Atherosclerosis is a progressive disorder characterized by the accumulation of plaques in arterial walls which eventually results in CHD. Low density lipoprotein (LDL-a cholesterol rich lipid), foam cells, smooth muscle cells and inflammatory cells
(monocytes and T lymphocytes) compose the atherosclerotic plaque (O'Brien & Chait, 1994). Fuster (1993) described the process through which lesions develop in three stages of increasing severity. Initially, at vulnerable points, such as those areas where arterial branching occurs on the endothelium (lining of the interior arterial cell wall), lipids and monocytes accumulate. O'Brien and Chait (1994) report that the literature suggests that "intimal lipid deposition is the inciting event in atherosclerosis" (p. 42). Subsequently, the ensuing metabolic process causes the additional accumulation of smooth muscle cells on the lesion and "denudation of the endothelium" (p. 60). Finally, unstable "lipid rich lesions" (p. 61) tend to rupture leading to thrombosis. Although other types of arterial plaques exist (e.g. fibromuscular) (Fuster, 1993; Fuster, Badimon, Badimon, & Chesebro, 1992), those most likely to rupture are rich in lipids and contain large concentrations of cholesterol (O'Brien & Chait, 1994; Richardson, Davies, & Born, 1989). O'Brien and Chait (1994) provide a comprehensive review of the current understanding of the pathophysiological process of atherosclerosis.

Based on epidemiological and empirical evidence, the NCEP Expert Panel (1993) determined several risk factors which contribute to the development of CHD, including levels of total serum cholesterol greater than 200 mg/dL, LDL levels above 160 mg/dL, HDL levels below 35 mg/dL, smoking, high blood pressure, male gender, physical inactivity, excess weight, advancing age and a family history of CHD (NCEP Expert Panel, 1993). Multiple risk factors create an exponential effect, producing greater overall risk than the sum of individual risk factors. For example, experts consider young men and premenopausal women at low risk for CHD even if their LDL levels reach 220 mg/dL; however, the presence of additional risk factors requires intervention at an early age (NCEP Expert Panel, 1993).
The NCEP Expert Panel (1991) considers elevated serum cholesterol one of three primary modifiable risk factors for CHD. Several longitudinal studies, such as the Framingham Heart Study (Stamler, Wentworth, & Neaton, 1986), the Multiple Risk Factor Intervention Trial (Dolecek et al., 1986), and the Lipid Clinics Coronary Primary Prevention Trial (Lipid Research Clinics Program, 1984) have shown the association between decreased levels of serum cholesterol and decreased mortality rates from CHD. Because 41%-55% of Americans sustain serum cholesterol levels above the recommended level of 200 mg/dL (NCEP Expert Panel, 1991; Sempos et al., 1989) effective strategies for reducing these serum cholesterol levels would significantly reduce CHD mortality rates, a primary goal of the NCEP. The NCEP Expert Panel (1991) reported that evidence gathered from clinical trials indicates, “for each 1% reduction in blood cholesterol, an approximate 2% reduction in CHD incidence can be expected “(p. 2190). Kaplan (1991) estimated that a 35-year-old male could increase his life expectancy by up to five years if serum cholesterol levels decreased from 300 to 200 mg/dl. Epidemiologic evidence from the Framingham Heart Study supports this estimate and suggests that those with elevated cholesterol levels tend to die sooner than those with lower serum levels (LaRosa et al., 1991). Additionally, studies, such as the Seven Countries study (Keys, et al., 1985; Keys, 1970) have shown that levels of saturated fat intake strongly correlate with CHD and total mortality rates. Similarly, in studies such as the Western Electric study (Shekelle et al., 1981), and the Ireland-Boston study (Kushi et al., 1985), dietary cholesterol strongly correlated with CHD rates and mortality rates.

Dietary cholesterol and fat consumption clearly correlate with elevated serum cholesterol and subsequent development of atherosclerosis (Ranade, 1993; Neaton & Wentworth, 1992; Sleight, 1992; Stamler & Shekelle, 1988). Serum cholesterol levels
appear to increase after dietary cholesterol ingestion because LDL receptors which remove excess cholesterol become overburdened. The excess cholesterol, carried by the LDL molecule, subsequently collects in the coronary arteries (Connor & Connor, 1989). Generally, total and LDL cholesterol levels increase one mg/dL for every 25 mgs of dietary cholesterol consumed (Denke, 1994). Similarly, total and LDL cholesterol levels increase approximately ten mg/dL after consumption of ten grams of saturated fats over several weeks (Denke, 1994; Hegsted, McGandy, Myers, & Stare, 1965). Additionally, Denke (1994) noted that early studies reported that changes in saturated fat intake accounted for up to 80% of change in total serum cholesterol levels (Hegsted et al., 1965; Keys, Anderson, & Grande, 1957). Similarly, other early studies firmly established that dietary cholesterol does contribute to elevated serum cholesterol (Johnson & Greenland, 1990; Connor & Connor, 1989).

Dietary modification is the first level of treatment for elevated serum cholesterol (NCEP Expert Panel, 1993). There is sufficient support in the literature to suggest that dietary modification can reduce serum cholesterol levels. The NCEP (Expert Panel, 1993) suggested that dietary reduction in fat consumption can lead to more than a 10% decrease in serum cholesterol levels. Other studies reported that reduction in dietary cholesterol could result in serum cholesterol decreases of up to 18% (Katan, Beyner, DeVries & Nokels, 1986).

Generally, reports indicate that the American diet includes high levels of cholesterol and fat. Recent estimates indicated that the average American male's diet includes a daily intake of 435 mgs of cholesterol with 36% of calories derived from fat (Human Nutrition Information Service [HNIS], 1985). The average American woman's diet includes a daily intake of 304 mg of cholesterol with 37% of calories derived from fat (HNIS, 1986). Approximately 13% of calories for both genders
derive from saturated fat (HNIS, 1986). These levels are substantially above the NCEP recommended levels, supporting the need to develop effective dietary management strategies to reduce consumption rates of fat and cholesterol.

Based on the clear relationship between high levels of serum cholesterol and increased rates of CHD, the Adult Treatment Panel of the NCEP (1991) adopted dietary recommendations in the form of the Step I and Step II diets (American Heart Association, 1987). The Step I diet recommends that of the total calories consumed each day, no more than 30% come from fat and that no more than 10% come from saturated fat. The recommendations limit dietary cholesterol to no more than 300 mgs per day. Studies have shown that adherence to the Step I and Step II dietary recommendations corresponds to reductions in serum cholesterol levels (Anderson, 1993; Hunninghake et al., 1993), even after relatively minimal dietary instruction (Bae, Keenan, Wenz, & McCaffrey, 1991).

Managing dietary cholesterol intake, however, presents several distinct challenges which can interfere with effective intervention. First, high serum cholesterol, like high blood pressure, requires screening for detection. Unlike blood pressure, serum cholesterol screening is more expensive and more difficult to access. Furthermore, data from serum cholesterol screening, including total serum cholesterol, HDL, LDL and the ratios of the above, are often confusing, and may require interpretation by a health professional. Alternatively, a person can easily measure weight changes, and blood pressure screening is accurate and easily accessed.

Second, whereas caloric information on food labels is often clear, cholesterol and fat information tends to be complicated, requiring the consumer to know the number of calories per gram of fat (nine calories per gram of fat) in order to calculate the percentage of calories attributable to fat. Additionally, the American Heart
Association (1988) and the NCEP Expert Panel (1993) recommended that the consumer attend to the percentage of calories derived from saturated fat, polyunsaturated fat and mono-unsaturated fat, as well as the total fat value. Furthermore, consumer awareness of the contribution of saturated fat to CHD relative to the other dietary fats is important. Calculations to identify these various values and understanding the relative importance of each with regard to CHD can be confusing. Consequently, accurately tracking dietary cholesterol and fat consumption often involves a nutrient analysis, a traditionally time consuming and expensive process. Although the Food and Drug Administration recently implemented labeling changes which have improved label clarity regarding nutrient contents of foods (Denke, 1994), the difficult process of determining percentages of calories from dietary fat remains an issue. In contrast, tracking total caloric intake is generally less elaborate and patients can more easily count calories at home.

Third, individuals with elevated serum cholesterol levels are generally asymptomatic and, therefore, may not be aware of the health risks common to this condition. Other health problems, such as obesity and diabetes mellitus, often have readily discernable symptoms that motivate those afflicted to seek professional help or to adhere to a treatment regimen that may involve medication or diet management. Unfortunately, people have difficulty estimating their serum cholesterol levels (Smith, McKinlay & McKinlay, 1991) even when these levels are elevated. Tragically, the first indication that elevated serum cholesterol levels exist for many is the occurrence of a major cardiac event such as a myocardial infarction. Like other asymptomatic diseases, motivational variables to seek serum cholesterol testing or to initiate dietary changes are generally absent or ineffective.

Finally, dietary management strategies require reduction in the consumption of
high fat foods many of which are highly palatable, require minimal preparation, and are readily available to consumers. As a result, reduction in dietary intake of fat necessitates limitation of highly reinforcing foods that are convenient and that have a long history of reinforcement for many people. Unfortunately, there are few naturally occurring reinforcers for reducing fat consumption to offset the punishing consequences of avoiding high fat foods. Because serum cholesterol reductions are not discernable, alterations of physical symptoms cannot act as naturally occurring reinforcers for dietary modification. Furthermore, the consequences for switching to low fat foods typically involve some response effort to locate and prepare such foods. While a thorough review of the factors that determine food preference is beyond the scope of this paper, it is important to acknowledge that efforts to develop a taste for a whole new class of foods is a formidable task.

Aside from high serum cholesterol, health professionals commonly use dietary interventions to manage a variety of disorders, including diabetes, obesity, and high blood pressure. For example, the obesity literature includes numerous examples of dietary programs that result in weight loss and management, although problems with recidivism and sample bias do exist (Brownell, 1982, 1993). Comprehensive weight loss programs generally include group therapy, cognitive therapy, nutritional education, nutritional counseling and follow-up contact (Brownell & Kramer, 1989; Brownell & Wadden, 1986; Kalodner & DeLucia, 1991; Kirschenbaum, 1988). Interventions for obesity often include individual or group psychotherapy because psychological problems frequently co-occur with obesity (Foreyt & Goodrick, 1993; Robison, Hoerr, Strandmark & Mavis, 1993). Typically, the interventions are expensive and time consuming, but do result in some weight loss (Brownell & Kramer, 1989). Patients who participate in multi-disciplinary, behaviorally-based
programs, which incorporate cognitive-behavioral components, appear to be the most successful (Foreyt & Goodrick, 1993; Wadden, Van Itallie & Blackburn, 1990).

Current cholesterol reduction interventions incorporate educational components common to general nutrition education programs to promote dietary change. Glanz (1988) reviewed cholesterol reduction interventions implemented in health care settings, at worksites, and community wide programs. Health care settings and worksite interventions typically involve eight or more sessions, combine group and individualized dietary counseling, provide information about the impact of cholesterol on health, present strategies to decipher food labels and make food selections, provide nutrient information, and offer serum cholesterol screening (Chima et al., 1990; Crouch et al., 1986; Kris-Etherton, Miller, Remick & Wilkinson, 1983; Mojonnier et al., 1980; Murray, Kurth, Mullis & Jeffery, 1990). Community-wide interventions typically provide written information at public cholesterol screening sites and through the local media (Caggiula et al., 1981; James et al., 1991; Murray et al., 1991).

A recent high intensity intervention reported by Ornish et al. (1990) indicated that substantial lifestyle modifications can result in serum cholesterol reductions and may reverse atherosclerosis in individuals with advanced coronary heart disease. This intervention involved a week long residential seminar including nutrition education classes, group support, stress management techniques and exercise. The support groups continued to meet twice a week during the year long study. In this study, significant total serum cholesterol (p<.01) and LDL cholesterol (p<.007) reductions occurred. Significant dietary changes took place as well, including reductions in total fat from a mean of 31% of calories derived from fat to a mean of 6.8% of calories derived from fat (p<.0001) and in dietary cholesterol from a mean of 213 mgs per day to 12.4 mgs per day (p<.0001). These results are encouraging because they
demonstrate that not only are substantial dietary changes possible, but also that these changes can produce clinically significant changes in serum cholesterol and CHD indices.

There are some concerns about the generality and external validity of this research, however, which merit discussion. First, participants in this study carried a diagnosis of CHD or had experienced a significant coronary event. Furthermore, the intervention required participants to make a commitment to participate in a week long intensive seminar where investigators asked that they make major lifestyle alterations. It seems reasonable to assume that participants were motivated for a variety of reasons to alter their diet and lifestyle. The combination of a history of advanced CHD plus the extensive time and resource commitment resulted in a sample of subjects with unusually high levels of motivation. Additionally, the intervention involved a number of components in addition to diet changes (e.g., exercise, stress management) raising questions about the extent to which each component contributed to the encouraging impact on serum cholesterol. Finally, the intervention was time and money intensive thus raising concerns about its applicability on a larger scale and with participants at lower risk of CHD.

These concerns about the applicability of the intervention developed by Ornish et al. (1990) illustrate the need to develop and evaluate less intensive interventions for individuals who have elevated serum cholesterol but fewer powerful motivating variables (e.g., myocardial infarction) to participate in an intensive intervention and to make radical changes in their diet and lifestyle.

Foreyt, Scott, Mitchell and Gotto (1979) described an effective seventeen session, dietary intervention to reduce serum cholesterol. The intervention included nutrition education components similar to those described by Glanz (1985) combined
with a behavioral component which included self-monitoring, stimulus control and contingency management strategies. Researchers contrasted the nutrition education intervention with an identical nutrition education intervention coupled with the behavioral strategies. Results indicated statistically significant positive serum cholesterol changes in both the nutrition education (p<.001) and behavioral group (p<.001) at three and six month follow-up measurements. Although the changes were less substantial at a one year follow-up, they remained statistically significant (p<.05) for both groups. Additionally, the behavioral group experienced more consistent reductions through the six month post-intervention period, whereas serum cholesterol levels for the other group increased. Two important features of this study are: (1) that it recruited volunteers with serum cholesterol levels in the low borderline range and (2) demonstrated that at least for six months they could reduce serum cholesterol levels to the desirable range. For example, the behavioral group reduced mean levels from 212 mg/dL to 199 mg/dL. This study did not, however, measure changes in dietary consumption of targeted foods including those high in saturated fat and cholesterol.

Preliminary support does exist for brief serum cholesterol reduction interventions. Groth, Kirk, and Alvin (1991) developed a series of four weekly classes lasting two and one half hours each. Participants enrolled at the suggestion of their personal physician after becoming aware of elevated serum cholesterol, and paid a 60 dollar course fee. The classes included instruction regarding health risks resulting from elevated serum cholesterol, familiarization with low fat meals and meal preparation experience, individualized counseling to set specific dietary goals, and optional individualized counseling and follow-up group classes. The authors compiled pre-intervention and post-intervention data for serum cholesterol across three different sets of classes. Results indicated significant total serum cholesterol reductions.
(p<.003) during the final session and at a one year follow-up screening. Methodological issues, including variability introduced by heterogenous screening procedures and inconsistencies in the amount of participant contact with the intervention, places limitations on possible conclusions and generalizability.

Murray et al. (1990) reported an adequately controlled intervention which contrasted the effects of a nutrition education intervention to reduce cholesterol with a weight management intervention and a fitness program which served as a control group. The cholesterol intervention focused on food selection and preparation methods while the weight management group focused on changes in eating patterns and increased activity levels. Using a randomized repeated measures experimental design, the authors offered four weekly two hour class sessions to participants with elevated serum cholesterol levels. Results indicated that mean serum cholesterol levels did decrease in the treatment groups, although these changes did not vary significantly from the control group. Additionally, data from a 24 hour dietary recall did not indicate statistically significant changes between groups. This intervention did not utilize specific behavioral change strategies such as contingency management.

The NCEP Expert Panel (1993) dietary guidelines and statements regarding the dangers of serum cholesterol emphasized the need for dietary cholesterol reduction and management strategies. Laboratory and field research have demonstrated that dietary cholesterol affects serum cholesterol levels and that reductions in serum cholesterol levels have a positive effect on impeding the development of atherosclerosis. Empirical support exists for restrictive interventions in populations with advanced CHD (Ornish et al., 1990) and for time-intensive interventions (Caggiula et al., 1981; Foreyt et al., 1979). The relatively few published studies suggest interventions designed to reduce cholesterol correlate with statistically
significant decreases in serum cholesterol levels. These reductions, however, do not indicate that mean serum levels decrease to desirable levels as identified by the NCEP Expert Panel (1993). Other limitations to the dietary cholesterol management literature include the failure of participants to complete interventions and the absence of control groups. Additionally, behavioral strategies have not been used to supplement nutrition education programs to support dietary change and maintenance, although these strategies have received extensive support as components of intervention packages to modify dietary practices in the treatments of obesity. Finally, most brief outpatient studies have not utilized analysis of dietary consumption patterns to measure dietary change. Measuring dietary change is important because intervening variables, such as familial history of hyperlipidemia, CHD and gender, render correlations between serum cholesterol and dietary cholesterol imperfect. Thus, serum cholesterol measurements may not reflect dietary change. This suggests that the verification of dietary intervention efficacy requires measurement of dietary change. Similarly, measurement of dietary improvements is necessary to ensure that the intervention to reduce dietary cholesterol is not promoting changes by unsound dietary practices. For example, dietary cholesterol and fat can be affected by sharp reductions in caloric intake. Such a diet would not, however, follow nutrition guidelines to maintain and foster health. Promoting sound nutrition practices is an important goal of dietary research.

The current research evaluates changes in dietary behavior and the subsequent effect on serum cholesterol levels following a behaviorally-focused, short-term cholesterol education workshop. Others have demonstrated the effectiveness of behavioral strategies in dietary interventions (Foreyt & Goodrick, 1993; Wadden & Stunkard, 1986). This research extends the dietary cholesterol reduction literature
(Foreyt et al., 1979; Groth et al., 1991; Murray et al., 1990; Ornish et al., 1991) by utilizing stimulus control and contingency management strategies in a brief group intervention with asymptomatic participants. Additionally, this study extends the literature by measuring dietary consumption rates and providing participants with dietary feedback without formalized individual nutrition counseling. Success of such an intervention would provide the professional community empirical support for an effective, cost efficient and easily implemented intervention which could reach a substantially larger population than individually based interventions. Additionally, increasingly popular interdisciplinary managed care organizations would have the resources to provide such services, should such an intervention prove useful.

Empirical support for this intervention would also provide physicians a safer alternative to cholesterol lowering medication.

The purpose of the current project, then, is to investigate whether a brief, behaviorally based cholesterol education workshop, focusing on lifestyle changes, can effectively assist participants in altering their food consumption patterns and ultimately reducing elevated serum cholesterol levels.
CHAPTER II

METHOD

General Rationale

Two clinical trials, occurring consecutively, evaluated the effectiveness of a workshop series designed to reduce serum cholesterol, The Cholesterol Countdown Workshop. Originally designed as a multiple baseline evaluation of identical workshops, preliminary results revealed limited effects of the first workshop, thus prompting alteration in the intervention in an effort to enhance treatment effects. Consequently, a second intervention consisting of the workshop series plus booster sessions and serum cholesterol feedback was implemented. Thus, a two experiment series is reported herein with the second experiment constituting a modified replication of the first experiment.

Participants

A total of twenty-five faculty and support staff at Western Michigan University (WMU) agreed to participate in the study involving two experimental trials. Fifteen persons participated in the first experiment and eighteen persons participated in the second experiment. Three participants from the first experiment did not meet inclusion criteria, leaving 12 participants in the initial experiment. No participant had previously enrolled in a cholesterol management workshop and no participant reported existing cardiovascular problems.

The participants in Experiment One ranged in age from 44 to 71, with a mean
The participants in Experiment Two ranged in age from 37 to 66 with a mean age of 56 years. Nine women and six men volunteered as participants in the first experiment and five women and five men participated in the second experiment.

Recruitment Procedure

The University Wellness Programs at the Sindecuse Health Center (SHC) on the campus of WMU recruited participants through advertisements in the campus newspaper, The Western Herald, by a letter sent to individuals screened for serum cholesterol during the previous year, by flyers posted at the Sindecuse Health Center, and through the Wellness Program’s ongoing serum cholesterol screening activities. The SHC opened the program to faculty, support staff and students at WMU.

Individuals who indicated an interest in the workshop and whose serum cholesterol levels fell in the "at risk" range (>200 mg/dl) (National Cholesterol Education Program [NCEP] Expert Panel, 1991) met with investigators for an explanation of the intervention and to complete the informed consent document (See Appendix A). Participants were not randomly assigned to groups. Participant screening for the first experiment took place until the week prior to the study’s first meeting. Recruitment of participants for the second study and control group then ensued.

People who did not wish to participate in the study and people who did not meet the criterion for elevated serum cholesterol were allowed to participate in the workshop series. These people did not complete the dependent measures or additional cholesterol screenings.
Personnel

M. Petersons, a professor in the Human Resources and Technology Department at WMU who holds a doctorate in Nutrition, conducted the Cholesterol Countdown Workshop. Her assistant, M. Redford, was a postgraduate dietetic intern who took responsibility for presentations, food preparation and dietary analyses. R. W. Fuqua, a psychologist on faculty in the Psychology Department at WMU presented the behavior management component of the intervention.

Materials

Laboratory technicians conducted serum cholesterol screenings at the SHC. The technicians used an Abbott Vision Analyzer (Abbott Laboratories, 1989), which utilizes a centrifuge procedure, to perform all serum cholesterol analyses. The same machine processed all the plasma samples except for the final analysis of the second study. A registered nurse, K. Johnson, working for a health promotion program at Bronson Methodist Hospital in Kalamazoo, used an identical Abbot Vision Analyzer and centrifuge procedure to conduct the last serum cholesterol screening for Experiment Two. The WMU Psychology Clinic functioned as the final screening site.

The Nutritionist III (N-Squared Computing, 1991) software program compatible with Macintosh Computer systems was used to process the dietary records. The output provided a list of foods recorded by the participant, information regarding dietary nutrients, percentage of recommended daily allowances (RDA) including amount of cholesterol in foods consumed, and pie charts providing graphic analyses of total fat intake and a breakdown of fatty acids.

Two software packages provided the statistical analyses. I employed The Statistical Program for the Social Sciences (SPSS PC+ Inc., 1991) to perform the
group comparison procedures and the statistical software package Statview 512+
(Brainpower Inc., 1986) to perform the repeated measures ANOVA procedures.

The three workshop sessions took place once a week for three weeks and were
held in the Department of Consumer Resources and Technology's Foods Laboratory.
Participants gathered at tables in groups of four to six. Overhead and slide projectors
augmented the didactic presentations. For three consecutive weeks, participants met
on a week night in sessions lasting approximately two hours.

Instruments

Two Day Dietary Record

A two day food record measured dietary intake. Participants wrote down all foods consumed during one weekday and one weekend day. Subjects recorded specific components of homemade or specialty dishes. The nutritional consultant made phone contact with participants to clarify food entries which seemed unclear or which required additional breakdown. At each data collection point, participants received an instruction sheet describing the proper procedure for filling out the dietary record. Appendix B contains the instruction sheet and Appendix C contains the dietary record form.

Serum Cholesterol Screening

At separate times over the course of Experiment 1 and Experiment 2, subject were screened for total serum cholesterol levels. Preceding the cholesterol measurement, participants fasted for 12 hours. Laboratory technicians collected blood products through venous draws between 8 am and 10 am and analyzed the samples the same morning at the SHC Laboratory. For both studies, the fasting serum
cholesterol screenings occurred at dates predetermined by the investigators in conjunction with the SHC. Participants received information about post-workshop screenings during the final workshop meeting, by letter the week prior to the screening, and by the phone the day prior to the screening. The SHC offered make-up dates within two weeks of the originally scheduled screening appointment for participants with schedule conflicts. Participants initially received results from the serum cholesterol screening during the first session of the workshop. Participants received results from subsequent screenings through the mail within one week of the screening on a form provided by the SHC (Please see appendix D).

Serum cholesterol screenings occurred during the week prior to the beginning of the intervention and at follow-up dates five weeks, three months, and six months post intervention. Participants in Experiment Two received an additional pre-intervention screening. The timing of this screening roughly corresponded to the initial screening in Experiment One. Participants received the cholesterol screenings free of charge, an advertised benefit of participation in the studies. The Zest for Life Program, a grant through the Graduate College at WMU and private monies funded the cholesterol screenings.

Food Frequency Questionnaire

A self-scoring food frequency questionnaire, "Are You Eating to Your Heart’s Content," prepared by the Minnesota Heart Health Program (1984), functioned as a supplementary measure to the participants’ food records (Please see Appendix E). This questionnaire contains two charts and each response has an assigned point value. The first chart includes eight questions relating to food consumption patterns concerning food groups across an average week for the respondent. The list asks the
respondent to identify the number of servings per day for each of eight food groups. A score is assigned to each of four serving choices. The respondent then identifies the score assigned to their choice. For example, if the participant consumed one serving a day of fruits and vegetables, they would assign a score of one to this response. The scoring system for the second chart parallels the first. The second chart lists groups of foods which are high in fat and/or cholesterol. Upon completion of the form, the respondent totals the scores for each chart and compares their score against the scoring categories on the back of the form. Three separate paragraphs, each associated with a range of the total score calculated from the responses to the questionnaire, broadly identified the dietary implication of the score. The first paragraph, titled “Stop and think” for scores between 0 - 17, suggests that the respondent is consuming an abundance of foods high in fat or cholesterol. Recommendations include increasing consumption of fruits and vegetables and using low fat cooking techniques. The second paragraph, titled “Getting better” for scores of 18 - 30, suggests that while most food choices are probably appropriate, improvement could take place. The third paragraph, titled “Nice going” for scores of 31 - 42, suggests that food choices are generally good and that the respondent should continue to “keep up the good work.” The questionnaire takes approximately five to ten minutes to complete. All participants scored their own questionnaires.

Hassles Scale

Participants completed the "Hassles Scale," a measure of stress developed and validated by Kanner, Coyne, Schaefer, and Lazarus (1981). This is a 118-item, self-report questionnaire which takes approximately 15 minutes to complete. Each item describes an event considered to be stressful. Participants chose an item, or hassle,
that they experienced during the previous month. The participants then rated the severity on a scale of one (somewhat severe), two (moderately severe), and three (extremely severe). The Hassles Scale functioned as an adjunct measure for the two experiments to account for variability in serum cholesterol measurement associated with stress. The authors of the Hassles Scale report statistically significant correlations with measures of psychological symptomology including the Bradburn Morale score (Bradburn and Caplowitz, 1965) and the Hopkins Symptom Checklist (Derogatis, Lipman, Covi, Rickels, & Uhlenhuth, 1970) which support their claim that the scale validly reflects the respondent’s perception of personal stress. Additionally, Kanner et al. (1981) reported that within the normative sample, the frequency of self-reported hassles scores month to month were highly correlated (r = .79).

**Consumer Satisfaction Survey**

Participants also completed a consumer satisfaction survey and skill assessment survey (Appendix F). This survey included three sections. The first section asked participants to rate their knowledge of ten key skills on a scale of one (low) to five (high) of their knowledge and skill prior to the intervention and after the intervention. The second section of the questionnaire asked the respondents to answer eight questions about skills introduced during the workshop. Participants were asked to respond regarding the degree to which they had already changed their behavior and their intent to change in the future. Lastly, participants made comments about their experiences during the workshop. Participants in both experiments completed the survey at the end of the third and final session. Participants did not complete the form anonymously.
Instrument Collection Procedure

Participants in Experiment One took part in the cholesterol screening and then received their packet of instruments with an addressed return envelope. Investigators asked participants to complete the forms and return them within one week to the Psychology Department. Participants who did not promptly return their materials received reminder telephone calls.

The procedure for the second experiment varied slightly. At the first and second post-intervention collection points the participants received the packet of forms at the screening with instructions to complete and return the materials by a specified date prior to the booster session so that an analysis of the food record could occur.

Dependent Measures

Both experiments utilized the same eight dependent measures. The two day food record provided data for five of these measures: (1) milligrams of serum cholesterol consumed, (2) percentage of calories derived from total fat, (3) percentage of calories derived from saturated fat, (4) percentage of calories derived from mono-unsaturated fat, (5) percentage of calories derived from poly-unsaturated fat. The Nutritionist III analysis averaged the two day food entries providing output in terms of an average day. Serum cholesterol measurements provided data in terms of mg/dL and served as an outcome measure of intervention efficacy. The food frequency questionnaire provided supplemental information about self-reported changes in participants' dietary behavior. Scores on the food frequency questionnaire ranged from 0 to 42. Additionally, the Hassles Scale (Kanner et al., 1981) provided a score which correlates to stress level. This measure provided a control for variability accounted for by the participants' perception of stress. The authors reported that a
score of 100 or more signifies clinical significance. Research suggests that variability in serum cholesterol measurements correlates to fluctuations in stressors (Rappaport, Raczynski, & Oberman, 1989; Ornish, 1982).

Reliability Issues

Studies which have used dietary food records typically do not report reliability information. The dietary analysis programs, including the Nutritionist III, may have reliability problems because of poor respondent specificity, the variety of choices available for many foods within the computer program, and because some foods are absent from the program’s data base. In these cases, the person entering dietary information into the Nutritionist III must make some judgements as to the composition of respondent’s dietary records. These judgements require some assessment of their reliability.

The author randomly chose approximately 20% of the participants’ food records from both groups for a reliability analysis. The rater independently entered data from the two day food records into the Nutritionist III dietary analysis program and derived a breakdown of nutrients for total fat, saturated fat, mono-unsaturated fat, poly-unsaturated fat, and dietary cholesterol. The rater then compared original and reliability nutrient values and scored agreements for each dietary fat dependent measure if the original and reliability nutrient values fell within six percent for total fat values and three percent for saturated, mono-unsaturated and poly-unsaturated fats. Additionally, the rater scored an agreement if the dietary cholesterol values fell within 75 mgs. Other studies in the literature have not reported reliability information regarding food record processing. Additionally, the manufacturers of the Nutritionist III software provide no reliability information. Thus, the investigator selected six and
three percent margins as acceptable ranges within which the rater could score an agreement. Inter-observer agreement was calculated using the number of agreements divided by agreements added disagreements and multiplied by .01. Based on the specified ranges for agreements, reliability values calculated for the five nutrient dependent measures indicate generally strong inter-rater agreement. Table 1 contains obtained reliability values.

Table 1
Reliability Data for Computerized Food Record Assessment

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Experiment 1: % Agree/Total Agree + Disagree</th>
<th>Experiment 2: % Agree/Total Agree + Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Dietary Fat</td>
<td>88% (n=9)</td>
<td>87.5% (n=8)</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>77%</td>
<td>100%</td>
</tr>
<tr>
<td>Mono Fat</td>
<td>88%</td>
<td>87.5%</td>
</tr>
<tr>
<td>Poly Fat</td>
<td>100%</td>
<td>75%</td>
</tr>
<tr>
<td>Dietary Cholesterol</td>
<td>66%</td>
<td>87.5%</td>
</tr>
</tbody>
</table>

General Procedure: Experiment One

Initial Screening

Participants met with the intervention team after the initial serum cholesterol screening. Investigators provided a program description, obtained informed consent, and distributed the initial recording instruments including the dietary record, and the Hassles Scale. The participants completed the food frequency questionnaire during the initial session. Participants received instructions to return the completed forms during the first workshop meeting.
Description of the Intervention

The Zest for Life Program at WMU offered the Cholesterol Countdown Workshop during fall semester (Experiment One) and winter semester (Experiment Two) at WMU to faculty, staff and students free of charge. Table 2 provides a program outline.

The Cholesterol Countdown Workshop consisted of three meetings held at one week intervals. Each session lasted approximately two hours and was held in the evening from 5:15 pm to approximately 7 pm. During each meeting, the instructor spent a specified amount of time on each topic area as outlined in the program manual. Sessions covered topics ranging from a description of the role of serum cholesterol in coronary heart disease, dietary factors which increase serum cholesterol, a description of the Step I diet, recipe modification techniques, reading labels for nutrient values and grocery shopping techniques, to strategies for eating outside the home. Appendix G provides a complete copy of the program manual.

Additionally, during the second and third sessions, the psychology instructor presented the behavioral techniques of goal setting and contingency management and stimulus control, and described how to build these skills into the participants’ behavioral repertoire. During a group discussion which followed the presentation, participants identified a dietary goal for the upcoming week. During the third week of the seminar, a review of the techniques took place followed by a group discussion in which participants reported back to the group regarding their success achieving the goal identified during the previous week. Please see Appendix H for the forms distributed during this discussion.
### Table 2
Summary of Topics Covered in the Cholesterol Countdown Workshop

<table>
<thead>
<tr>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of risk factors in the development of CHD</td>
<td>Review of Session 1 focused on the Step I Diet</td>
<td>Review of Sessions 1 and 2</td>
</tr>
<tr>
<td>Discussion of risk factors for CHD</td>
<td>Presentation of recipe modification techniques Substituting, reducing and eliminating ingredients to meet Step I Dietary guidelines</td>
<td>Distribute dietary feedback from food records Discussion regarding the computerized analysis and dietary problem areas</td>
</tr>
<tr>
<td>Excess weight</td>
<td>Small group exercise to practice recipe modification</td>
<td>Discussion about how participants' actual diets compare to the Step I dietary recommendations</td>
</tr>
<tr>
<td>Physical inactivity</td>
<td>Discussion about label reading and shopping techniques Small group exercise practicing product label reading using samples of packaging from common foods</td>
<td>Identification of changes required to modify personal dietary practices</td>
</tr>
<tr>
<td>Smoking</td>
<td>Consumption of moderate amounts of poly and mono-unsaturated fats and types of fiber decrease serum cholesterol</td>
<td>Discussion about eating meals out of the home Group activity: selecting low fat meals from menus of local restaurants</td>
</tr>
<tr>
<td>Dietary factors</td>
<td>Step I Diet Description and recommendations (1) Consumption of less than 300 mgs of dietary cholesterol (2) That less than 30% of calories come from fat and less than 10% of calories coming from saturated fat</td>
<td>Review of goal setting discussion and participant report about personal dietary goals</td>
</tr>
<tr>
<td>Presentation regarding nutrients which affect serum cholesterol levels</td>
<td>(1) Consumption of less than 300 mgs of dietary cholesterol</td>
<td>Presentation about barriers to dietary change and the use of structured reinforcement to support change</td>
</tr>
<tr>
<td>Excessive consumption of dietary cholesterol and saturated fat increases serum cholesterol</td>
<td>(2) That less than 30% of calories come from fat and less than 10% of calories coming from saturated fat</td>
<td>Discussion about incorporating effective goals into the participant’s lifestyles to increase dietary compliance</td>
</tr>
<tr>
<td>Consumption of moderate amounts of poly and mono-unsaturated fats and types of fiber decrease serum cholesterol</td>
<td>Assignments: identification of one or two dietary goals for group discussion</td>
<td></td>
</tr>
<tr>
<td>Review of recommendations for each of the food groups to avoid and select</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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General Procedure: Experiment Two

The initial screening process paralleled procedures for the first experiment. Similarly, the workshop intervention and the behavioral presentation duplicated the earlier proceedings from Experiment One.

Booster Sessions

Investigators requested that participants in the second experiment attend two booster sessions to improve preliminary results from the first experiment. One session took place three weeks after the first post-test cholesterol screening and the other booster session was held three weeks after the second post-test cholesterol screening. An invitation to attend a lunch meeting solicited the participants' presence at the Student Center on the Campus of WMU. During the one hour booster session meeting, participants received their dietary analyses and participated in a group discussion about the results from this analysis. Additionally, a review of the concepts presented during the workshop took place. The discussion also addressed problems participants experienced changing their diets. Each dietary analysis returned to the subjects included a personalized message from the dietetic intern indicating areas of strength and concern related to their nutrient intake.

Research Design and Analysis

Group Comparison

A two group quasi-experimental design compared the effects of the initial intervention against a wait list control group consisting of participants recruited for the second intervention. The participants comprising the control group completed
recording instruments (i.e. the two day food record, the food frequency questionnaire and the Hassles Scale) twice prior to the implementation of the second workshop series which corresponded (within three weeks) to the initial pre and second post measures completed by participants in the first experiment. This study did not have a true experimental design because investigators did not randomly assign participants to groups.

An analysis of covariance (ANCOVA) provided an analysis of mean differences between the experimental group and wait-list control groups. Use of the ANCOVA procedure corrected for variation which may have ensued due to the non-randomized group assignment of participants. The tendency for overweight individuals to encounter high cholesterol levels (Denke, 1994; Denke, Sempos & Grundy, 1993) and the role of weight as a risk factor for CHD (NCEP Expert Panel, 1993) determined the selection of weight as the covariate.

Research Design: Experiment One and Experiment Two

A one factor repeated measures design evaluated response changes across time. In this design, repeated observations occurred for each participant. A repeated measures analysis of variance (ANOVA) produced the statistical analysis for the eight dependent measures. This procedure allowed the investigator to partial out differences between participants that would otherwise contribute to the error term in a standard ANOVA analysis (Howell, 1987; Winer, 1971).

Occasionally, participants failed to complete the measures or attend cholesterol screening appointments. Because the repeated measures ANOVA deletes a participants entire data record when an empty data cell appears, a multiple regression analysis predicted missing data using other participant’s scores at that data collection
point in the regression equation. This allowed the inclusion of the participants’ data set for the analysis.

Chapter III presents a discussion of the results.
CHAPTER III

RESULTS

The demographic characteristics for participants in each trial were similar. Measures of stress, age and weight were comparable between groups one and two. No participant in either group reported symptoms of CHD. An ANCOVA on pre-test variables using weight as a covariate revealed no statistically significant differences between groups at baseline (Please see Appendix J for ANCOVA summary table). One participants’ serum cholesterol level, however, appeared to deviate from other participant levels. An outlier analysis confirmed this assumption (Bonferroni F=25, P<.05). An ANCOVA performed after eliminating this participant’s serum cholesterol scores then revealed statistically significant differences between Group 1 and Group 2 on this variable at baseline (p<.04). Table 3 presents a summary of the demographic information for both groups.

Design Modification

An analysis of the initial results from group one suggests that although participants lowered cholesterol and dietary intake of fat and cholesterol following the intervention, these reductions were not statistically significant compared to pre-test scores and compared to control group scores. Therefore, investigators introduced modifications to improve the effectiveness of the second intervention. The following section presents the results from each experiment independently.
Table 3
Demographic Information

<table>
<thead>
<tr>
<th>Demographic Variables</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age</td>
<td>56</td>
<td>50</td>
</tr>
<tr>
<td>Mean Weight</td>
<td>176</td>
<td>181</td>
</tr>
<tr>
<td>Mean Pre-test Hassles Scale Score*</td>
<td>33</td>
<td>38</td>
</tr>
<tr>
<td>Mean Serum Pre-test Cholesterol Levels</td>
<td>238.25</td>
<td>216.76**</td>
</tr>
<tr>
<td>Female</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Group N</td>
<td>12</td>
<td>10</td>
</tr>
</tbody>
</table>

* A score of 100 or more is clinically significant on the Hassles Scale.
** Excluding the outlier score

Results: Experiment One

Graphic Analyses

Figure 1 presents group means for the dependent measures at each assessment point. Appendix L presents table of mean scores for Experiment One.

An analysis of the means for the dependent measures indicates positive trends, particularly regarding improvements in dietary behavior. Means decreased following the intervention in two dietary categories, while in mono and poly unsaturated fatty acids increased slightly. Decreases in mean percentage of saturated fat intake occurred across time. By the second post-test the mean saturated fat percentage decreased 30%. Participants maintained saturated fat intake values 30% below baseline levels at the third post-test.

A decrease in percentage of total fat intake mean scores occurred between the pre-intervention and the second post-test scores. Although this change was less impressive by the third post-test (a four percent reduction from pre-intervention.
Figure 1. Summary of Means From Dependent Measures for Experiment One.
Means: % of Calories from Mono Fat

Means: % of Calories from Poly Fat

(Figure 1 - continued)
Means: Dietary Cholesterol

Means: Food Frequency Questionnaire

(Figure 1 - continued)

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Means: Serum Cholesterol Levels

Means: Hassles Scale Scores

(Figure 1 - continued)
levels), the decreasing trend suggests that participants maintained an appropriately low fat intake.

Additionally, mean scores on the food frequency questionnaire improved from a mean of 29.3 to a mean of 32.5 (scores between 31 and 40 are desirable). According to the Minnesota Heart Health Program, these scores reflect a reported improvement in healthy food choices and indicate a positive change in dietary practices and knowledge, a primary goal of the intervention.

Participants in the first trial successfully reduced serum cholesterol as well. A mean serum cholesterol decrease of 13 mg/dL (238.25 +/-24.89 mg/dL to 225.36 +/-28.82 mg/dL) occurred across time.

Statistical Analyses: Repeated Measures ANOVA

Physiological Measure: Total Serum Cholesterol

A repeated measures ANOVA analyzed results for total serum cholesterol measurements across time and revealed no statistically significant changes. A multiple regression analysis provided an equation used to predict values for missing cells. Again, a repeated measures ANOVA revealed no statistically significant within group changes.

Behavioral Measures: Food Record and Food Frequency Questionnaire

The Nutritionist III software (N-Squared Inc., 1991) analyzed dietary records for percentages of calories gained from dietary fat and average daily consumption of dietary cholesterol. A repeated measures ANOVA contrasted mean percentages for each dependent measure. The results indicated no significant changes across time on each dietary measure. Similarly, the repeated measures ANOVA revealed changes for
the food frequency questionnaire data that did not achieve statistical significance. An
additional repeated measures ANOVA using values for empty cells predicted from a
multiple regression analysis, however, revealed a statistically significant increase in
scores reflecting an improvements in self-reported dietary habits (F=5.84, p<0.0057).
Multiple comparison tests (Fishers PLSD) revealed statistically significant differences
between the pre-test and post-test one (F=2.31, p<.05), post-test two (F=2.31,
p<.05), and post-test three (F=2.31, p<.05).

Hassles Scale

A repeated measures ANOVA revealed non-statistically significant changes on
the Hassles Scale scores. Similarly, a repeated measures ANOVA utilizing predicted
scores also disclosed non-statistically significant scores. A correlational analysis
revealed a statistically significant relationship between serum cholesterol and Hassles
Scale scores at the pre-test measure (t=6.83, P<.01) but subsequent correlational
analyses did not reveal statistically significant results.

Appendix M contains a summary table for results from the repeated measures
ANOVA for Experiment One.

Results: Experiment Two

Graphic Analyses

Figure 2 presents group means for the dependent measures at each assessment
point. Appendix N presents table of mean scores for Experiment Two.

Mean values for the second experiment generally indicate beneficial
improvements. Total fat and saturated fat intake decreased from pre-intervention
levels. Prior to the intervention, 30% of calories were derived from fat. At the third
Figure 2. Summary of Means From Dependent Measures for Experiment Two.
Means: % of Calories From Mono Fat

Means: % of Calories From Poly Fat

(Figure 2 - Continued)
(Figure 1 - continued)
(Figure 1 - continued)
post-test, 23% of calories were derived from fat. Smaller reductions occurred in mono-unsaturated and poly-unsaturated fat data. Mean dietary cholesterol levels continued to be lower than levels recommended by the Step I diet and remained stable across the first four assessments. A mean dietary cholesterol intake increase of 71 mgs occurred, however, at the final data collection point. This occurred despite stability of earlier measurements. Food records indicated that some participants increased their consumption of eggs, cheese and fast food items which apparently contributed to the rise in mean dietary levels.

The mean serum cholesterol level for Experiment Two remained at the baseline level of 217 mg/dL at the first and second post-test measurements. At the third post-test, the mean serum cholesterol level increased slightly to 221 mg/dL.

As with the first experiment, participant responses on the food frequency questionnaire indicated improvements in healthy food choices and consumption, with a mean increase of 3.15 from 27.85 to 31.

Statistical Analyses: Repeated Measures ANOVA

Physiological Measure: Total Serum Cholesterol

A repeated measures ANOVA assessed serum cholesterol measures across time. This analysis revealed no statistically significant differences in total serum cholesterol for the second experiment.

Behavioral Measures: Food Record and Food Frequency Questionnaire

A repeated measures ANOVA on predicted values revealed a statistically significant change on the food frequency questionnaire responses (F=3.23, p<.01). The Fisher PLSD (F=2.892, p<.05) multiple comparison tests indicate a significant
difference between the second pre-test score and the second post-test score, a change consistent with a positive intervention effect.

A repeated measures ANOVA assessed mean differences for each of the fatty acid dependent variables. The results indicated no significant within group changes on the total fat, saturated, poly-unsaturated and mono-unsaturated fat data. Using values predicted from a multiple regression analysis equation, however, a repeated measures ANOVA revealed statistically significant within group decreases in poly-unsaturated fat consumption ($F=2.576, p<.05$). The Fisher PLSD multiple comparison test revealed significant pair-wise comparisons between pre-intervention and the first post-intervention measurement ($F=1.887, p<.05$) and the second post-intervention measurement ($F=1.887, p<.05$). An additional analysis, however, indicated that the second pre-test measure taken immediately prior to the intervention was not significantly different from post-intervention means. This suggests that the observed mean differences may not delineate a specific intervention effect.

The analysis of dietary cholesterol data also revealed a statistically significant effect. The repeated measures ANOVA revealed a statistically significant increase in dietary cholesterol intake ($F=2.994, p<.04$). The Fisher PLSD multiple comparison test revealed statistically significant increases in dietary cholesterol consumption between the first baseline assessment and the third post-intervention assessment ($p<.05$) and between the second baseline assessment and the third post-interventions assessment ($p<.05$). A repeated measures ANOVA using predicted values, however, revealed non-statistically significant results.

**Hassles Scale**

A repeated measures ANOVA revealed statistically significant decreases in
scores on the Hassles Scale scores (p<.04). The mean values at each assessment point, however, were well below the clinically significant score of 100. Additionally, a repeated measures ANOVA utilizing predicted scores, revealed non-statistically significant scores (p<.09).

A correlational analysis between the Hassles Scale and serum cholesterol did not reveal statistically significant correlations. This analysis did not include one participant’s scores after an outlier analysis determined that this person’s Hassles Scale scores constituted outliers (Bonferroni F=8, p<.01). Appendix O contains a summary table for results from the repeated measures ANOVAs for Experiment Two.

Group Comparison

Statistical Analyses: Group Comparison

Figure 3 presents a graphic display showing the data collection times. To evaluate differences between experimental and control groups, an ANCOVA compared the initial post-test results for group one and second pretest results for group two. Again, the use of an ANCOVA adjusted for pre-existing differences between groups on self-reported weight measurement. The statistical analysis revealed no significant differences on dependent measures between participants in the experimental group and those in the control group. Because scheduling recruiting issues caused a six week time difference between the first post-test measure in group one and the second pre-test measure in group two, a second ANCOVA performed an analysis comparing data from the second post-test from group one and the second pre-test from group two, measurements which took place in closer temporal proximity. Again, these analyses revealed no significant group differences. These results are presented in Appendix J.
Figure 3. Graphic Display of Data Collection Points Showing the Between Group Comparisons.

Pre-test serum cholesterol differences between groups indicated the need for an additional ANCOVA using the pretest serum cholesterol scores as a covariate. This analysis revealed non-significant differences between groups at the post-test comparison point after the first workshop. The covariate was significant (p<.004), however, indicating that serum cholesterol differences between groups not attributable to the intervention existed after the workshop. These results are presented in Appendix K.

Consumer Satisfaction Survey

Participants rated their knowledge and skill after the final workshop session. Table 4 presents the percentages of ratings of four or five on the scale of one (low) to five (high) to contrast pre-intervention and post-intervention responses on ten
questions regarding participant satisfaction for Experiments One and Two, respectively. These scores indicate that participants perceived that they improved their knowledge and skills regarding major components of the workshop. Additionally, all participants in the both trials responded positively when asked if they would recommend the workshop to others.

**Table 4**

**Consumer Satisfaction Survey Data**

<table>
<thead>
<tr>
<th>Question</th>
<th>Experiment One</th>
<th></th>
<th>Experiment Two</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>CHD Risk Factors</td>
<td>37%</td>
<td>100%</td>
<td>27%</td>
<td>91%</td>
</tr>
<tr>
<td>Dietary Factors and CHD</td>
<td>26%</td>
<td>100%</td>
<td>9%</td>
<td>100%</td>
</tr>
<tr>
<td>Step-One Diet</td>
<td>5%</td>
<td>74%</td>
<td>27%</td>
<td>82%</td>
</tr>
<tr>
<td>Menu Planning</td>
<td>37%</td>
<td>89%</td>
<td>27%</td>
<td>82%</td>
</tr>
<tr>
<td>Food Preparation Strategies</td>
<td>16%</td>
<td>95%</td>
<td>18%</td>
<td>82%</td>
</tr>
<tr>
<td>Recipe Modification</td>
<td>11%</td>
<td>95%</td>
<td>18%</td>
<td>82%</td>
</tr>
<tr>
<td>Restaurant Food Choices</td>
<td>37%</td>
<td>89%</td>
<td>0%</td>
<td>91%</td>
</tr>
<tr>
<td>Label Reading</td>
<td>21%</td>
<td>89%</td>
<td>18%</td>
<td>91%</td>
</tr>
<tr>
<td>Grocery Shopping</td>
<td>26%</td>
<td>84%</td>
<td>9%</td>
<td>91%</td>
</tr>
<tr>
<td>Evaluating Personal Eating</td>
<td>11%</td>
<td>84%</td>
<td>0%</td>
<td>91%</td>
</tr>
</tbody>
</table>

**% of participants rating each item as high knowledge and skill (rating of 4 or 5).**
CHAPTER IV

DISCUSSION

The results from this series of experiments suggest that a brief, behaviorally-focused nutrition education workshop can have a positive impact on dietary behaviors and serum cholesterol. Participants in both experiments reported improvements in healthy eating practices based on results from the food frequency questionnaire. Post-intervention measurements for both Experiment One and Experiment Two indicated statistically significant improvements in healthy food choices and reflected improvements toward the desirable dietary range as described by the questionnaire. Similarly, results indicated that participants in both trials reduced the percentage of calories derived from total fat and saturated fat. Participants in Experiment Two reached a statistically significant reduction in percentage of calories derived from polyunsaturated fat consumption and a slightly less robust decrease in calories derived from total fat. Participants in the second experiment also reduced the percentage of calories derived from poly and mono unsaturated fat after receiving additional dietary feedback and two supplementary group meetings. These reductions occurred in spite of the fact that in both experiments the baseline measurements for these dietary variables were below levels recommended by the Step I Diet. Dietary measurements for both groups at baseline indicated cholesterol intake was below the recommended dietary levels as well, although consumption levels increased over the course of the experiments. Additionally, while serum cholesterol levels remained relatively stable in the second experiment, participants in the first experiment did reduce their serum cholesterol levels, moving from near the high blood cholesterol range to the mid-
borderline range as defined by the NCEP (Expert Panel, 1993). Also, except for the pre-test for the first experiment, there were no statistically significant correlations between serum cholesterol levels and the Hassles Scale. Lastly, participants reported improvements in cholesterol lowering knowledge and skills as a result of attending the workshop series.

Presently, the cholesterol management literature does not document the use of behavioral components in brief interventions structured to reduce dietary fat and cholesterol consumption. In the only other cholesterol management intervention reported in the literature which utilized behavioral principles, Foreyt et al. (1979) demonstrated that an eighteen week, behaviorally focused intervention, enhanced the effectiveness of nutrition education for serum cholesterol reduction. The current research evaluated a concise behavioral intervention paired with a brief nutrition education intervention. It is possible that a clinically significant dietary change requires a more intensive behavioral strategy as in Foreyt et al. (1979). Collecting data on additional intervention components, such as asking the participants to provide written goals or utilizing food diaries which include additional dietary information beyond that provided by the food record, may provide further insight into the effectiveness of a short-term behavioral intervention for cholesterol management.

In a second departure from other short-term dietary cholesterol management research, the current study did not provide individualized time-intensive professional dietary counseling. Utilizing a group format, participants attended three workshop sessions totaling approximately six hours. Attendance rates were very high with only one person from each experiment missing one session. Additionally, participants received dietary feedback through a computerized dietary analysis which provided information regarding the nutrient content of food selections. Dietary self-monitoring,
without intensive supervision by professional nutrition staff, approximates a potentially cost effective and easily disseminated clinical application for cholesterol management. Although serum cholesterol reductions did not reach desirable levels, the improvements in dietary fat consumption, perceptions about food choices, and participant reports regarding skill and knowledge improvements suggest that time limited cholesterol management interventions merit further study and development.

As an additional feature, the second experiment examined the use of group booster sessions to improve dietary changes and to assist participants in reducing cholesterol levels to the NCEP's recommended "desirable" range (Expert Panel, 1993). These sessions provided participants a quick review of workshop topics, a feature not evaluated elsewhere in the cholesterol management literature. All participants received dietary feedback generated from the Nutritionist III (N-Squared Computing, 1991) dietary analysis; however, out of ten participants in the second study, seven participants attended the first session and only two attended the second session. These attendance rates were surprising considering the strong attendance rates during the workshop sessions. These less than perfect attendance rates may have weakened the potential impact of this intervention component.

The results for fat consumption following the booster sessions in the second experiment were inconsistent, increasing slightly after the first session, and then decreasing below baseline levels after the second session. Because of this variability it is not clear how the booster sessions and feedback contributed to these changes, particularly because dietary cholesterol consumption increased during this time. The pattern of changes, however, was consistent across all measures of fat. These results deviated from the less consistent changes in measures of fat in the first experiment. It is possible that because the feedback participants received indicated that dietary...
consumption was within recommended levels, participants relaxed their attention to strategies to maintain a low fat, low cholesterol diet.

Dietary cholesterol consumption rates differed from those of other targeted nutrients. For both experiments, cholesterol consumption increased over the course of the experiment although dietary cholesterol consumption rates were still below NCEP recommended levels of dietary cholesterol intake (Expert Panel, 1993). These increases may in part explain the lack of serum cholesterol reductions. For example, the statistically significant increase in dietary cholesterol consumption (p<.04) may have contributed to the slight increase in mean serum cholesterol levels for Experiment Two. The first experiment mean values also indicated a moderate increase in dietary cholesterol consumption; however, serum cholesterol levels decreased steadily. It is not clear why this occurred. It is possible that participants initially under reported cholesterol consumption and improved their reporting practices over time. This practice effect would have reduced the sensitivity of the dietary measures to actual dietary changes over time. An alternative explanation suggests that other factors not measured in these experiments, including family history of CHD and frequency of exercise, may have contributed to the differences between experiments regarding the patterns of serum and dietary cholesterol changes. Thus, it is possible that participants in the first experiment had already reached the lowest possible serum cholesterol reductions achievable through dietary changes at baseline, as suggested by low baseline levels of fat and cholesterol intake, and that the decline in serum cholesterol levels was attributable to other causes.

A related issue involves the discrepancy between the statistically significant improvements on the food frequency questionnaires and the less impressive dietary consumption improvements. The relatively high scores on the food frequency
questionnaire at baseline may explain the discrepancy. The mean scores for both experiments on the food frequency questionnaire were nearly in the desired range at baseline reflecting low fat and cholesterol food choices. This is consistent with the dietary records which also indicated low fat and cholesterol diets at baseline. An alternative explanation is that participants actually over-estimated the amount of high fat and cholesterol foods they were eating initially. Subsequently, after participants received feedback from the dietary analysis, their perceptions about the composition of their diet improved.

Methodological concerns require that readers exercise caution when interpreting findings from this research. First, although the groups did compare demographically with regard to age, weight, and stress levels, the lack of random assignment limits the generalizability of conclusions drawn from these results. Initially, the study design directed the SHC staff to respond to participant inquiries by assigning volunteers alternately to either the first or second workshop series. After the recruitment process began, however, it became apparent that the workshop would not reach capacity due to low participant registration rates. Because the Wellness Program needed to ensure adequate workshop enrollment, SHC staff abandoned the group assignment protocol. Instead, for the second group, the recruitment process continued for approximately five weeks until obtaining the desired number of participants.

The low recruitment rate for these experiments is a perplexing issue and may indicate a low level of awareness of the general population regarding the dangers of elevated serum cholesterol. Based on the potential participant pool at Western Michigan University, with an enrollment of 25,000 and a staff of several thousand, the national rates of elevated cholesterol would suggest a large pool of potential
participants. According to the NCEP (Expert Panel, 1993), approximately 40% of the people in the United States have elevated serum cholesterol levels. Although the Wellness Program at Western Michigan University provides a free cholesterol screening service from which investigators obtained participants for these studies, difficulty reaching the anticipated enrollment levels occurred. It is possible that if the screening and recruitment had taken place in a public setting, such as the student union, larger numbers of people would have participated in the screenings and subsequently volunteered to participate. In the clinical setting at the SHC, however, the recruitment rate was less than staff anticipated. An alternative explanation for this low rate suggests that young adults may not have the same concerns about elevated serum cholesterol levels and CHD common to older adults. This is an important issue, however, since unhealthy eating patterns during young adulthood will have a lasting health-related effect. Additional benefits of such interventions may accrue for young adults who are also parents, as they can potentially alter their families’ rate of their dietary consumption of fat and cholesterol. It may be that the most effective and long-lasting interventions will occur for those who establish health eating patterns early in life.

Recruitment of participants also appears to be a problem in other cholesterol management studies reported in the literature. Due to the lack of symptoms, early detection of elevated serum cholesterol is more problematic than with other diet-related disorders such as obesity or diabetes. As a result, this problem can go untreated for a significant length of time without symptoms. Because a majority of the people who are seeking to reduce their serum cholesterol will not have symptoms of CHD, they may represent a population subgroup that is more concerned about health related issues and maintenance of a healthy lifestyle than the general population. In addition,
people who seek to make healthy lifestyle improvements may characterize a group more inclined toward making necessary changes to improve and maintain health. Because elevated serum cholesterol levels affect such a large segment of the general population, knowledge about reaching those who do not seek help is important and worthy of research efforts. Harlan and Stross (1985) noted that the campaign sponsored by the National Institutes of Health to reduce high blood pressure in the early 1980's resulted in significant improvements in people seeking services, as well as improvements in medication compliance. Currently, awareness about dangers related to elevated serum cholesterol appear to be moving in this direction.

A related methodological concern involves the population from which the participants from this study were drawn. Although the present research utilized a relatively well-educated group of people, the literature suggests that education level does not correlate with ability to modify risk factors (Winkleby, Fortmann & Rockhill, 1992). Evidence does exist suggesting that less-educated individuals tend to have elevated levels of risk for CHD (Feldman, Makuc, Kleinman, & Cornoni-Huntley, 1989). It is possible that increased awareness of the dangers related to serum cholesterol and the relationship to CHD exists in a university population, thus motivating faculty, staff and students to increase or maintain appropriate dietary and other healthy behaviors. Such awareness may relate to university wellness programs similar to SHC program available at WMU. If this awareness exists, and is different from the general population, it could compromise the generalizability of results to other populations. A comparison of health status awareness regarding serum cholesterol between university and other populations is worthy of future research efforts, and could strengthen the validity of utilizing university employees and students for such research.
Another methodological concern for the present research involves the absence of a control group for Experiment Two and relates to the concerns regarding potential participants’ interest about reducing serum cholesterol. The experimental design originally called for the recruitment of a no-treatment control group with the second intervention. The initial recruitment and screening of control group participants took place; however, only one person from the control group returned for follow-up screening even though the SHC offered the follow-up screening at no cost. The other control participants either missed their appointments or withdrew, citing schedule conflicts or lack of interest. It appeared that several of these participants did not return for the follow-up assessment because the screening took place during the University’s final examination week at the end of the semester. Because the Wellness Program developed an agreement with the laboratory at the SHC to provide cholesterol screenings at certain times, it was difficult to provide appointments on an individual basis. While participants in both experiments generally made the screening appointments, the control group participants may simply have had an inopportune date for screening. The absence of a control group limits confidence regarding conclusions based on results from the second experiment because the changes which occurred may have taken place without the intervention.

A methodological issue which became apparent after the initiation of the study involved the low consumption rates of dietary fat and cholesterol. While the inclusion criteria for this research was that participants have elevated serum cholesterol levels, self-reported dietary intake of fat and cholesterol were below recommended levels. In the first experiment, reduction of total and saturated fat corresponded to reductions in serum cholesterol. In the second experiment, however, reductions in dietary intake did not correspond to serum cholesterol reductions. At the final post-
test for each experiment, the serum cholesterol levels were comparable. It is possible that participants may have reached the lowest serum cholesterol levels possible without resorting to more stringent dietary modifications and that adherence to the Step I Diet results in serum cholesterol levels in the mid-borderline range. Thus, dietary recommendations may be too liberal and more conservative guidelines for fat and cholesterol consumption are necessary.

A possible explanation for the low levels of fat and cholesterol consumption in the participants’ dietary reports is that they did not accurately report dietary intake. Generally, the food record is felt to be a valid measure of dietary behavior (Block, 1982). In the present research, anecdotal reports from participants suggest that food records appeared to accurately reflect food consumption rates. Some participants in this research, however, occasionally required phone contacts during the study for clarifications about the types of foods they reported. When responding to these prompts, participants recalled foods consumed several days earlier which may have influenced the accuracy of their recall.

Similarly, it did not appear that the evaluation of the participants’ dietary patterns by nutritionists involved in this study influenced dietary reporting. Participants appeared genuinely interested in feedback as reflected in the questions asked by the group during the feedback portions of the meetings. This does not preclude the possibility that demand characteristics accounted for the reported low dietary consumption rates of fat and cholesterol. Evaluating the influence of dietary evaluation on accurate dietary reporting in cholesterol management programs is worthy of future research endeavors.

A final methodological issue involves the participants’ completion rate of the dependent measures. While participants maintained a high attendance rate for the
cholesterol screenings in both groups (five missed screenings out of 48 in Trial One, and three missed screenings out of 50 in Trial Two), they had some difficulty returning other dependent measures. For example, in Experiment One, there were seven missing food records over the course of the experiment, and in Experiment Two there were four missing food records. Because a repeated measures ANOVA requires that all data cells be complete, a missing data point eliminated from the analysis other data on that particular variable. Although scores predicted from a regression analysis filled in these missing cells, this obviously is not an ideal technique. Use of the actual values from each participant would have eliminated this methodological concern.

Results from this study suggest a number of future research directions. First, because the results from this study achieved positive but modest changes, future research regarding brief serum cholesterol management interventions should investigate the contribution of specific components of the nutrition education program. This would attempt to focus intervention efforts on retaining effective components and eliminating elements which do not prove effective as change agents. The recipe modification component, for example, may prompt significant changes. It is not clear in this study, however, if participants adequately acquired this skill as they did not formally demonstrate skill acquisition and utilization. Homework assignments function as a method to measure specific workshop components. To maintain the low intensity format, participants could discuss these assignments during group activities. For example, asking participants to bring modified recipes from home and evaluating the amount of fat and cholesterol in the dishes they intend to prepare or had prepared could provide information about the efficacy of this component. Additionally, the frequency of preparation of a particular food item could reflect a participant’s application of the new or modified skills. Future projects may consider investigating
the contribution of such components by contrasting experimental groups which either include or exclude the particular component in question.

Similarly, in consideration of the important role behavioral management techniques play in obesity interventions, future investigations should continue to evaluate the efficacy of the techniques used with obesity management in the dietary management of serum cholesterol. The current intervention utilized a group presentation demonstrating goal setting and an overview of self-management techniques with a group follow-up session. Future studies might expand the current procedure to determine the intensity of behavioral intervention required to reach the desired results.

A second direction for future research involves an analysis of the role of dietary feedback in cholesterol management. The current study utilized booster sessions to provide a post-intervention review of workshop topics. Participants also received post-intervention dietary feedback during these sessions. The data suggest that changes did not occur after the additional intervention. The Nutritionist III (NSquared Computing, 1991) provides relatively general feedback about overall nutrient intake. Development of increasingly specific dietary feedback which focuses on specific behavioral recommendations may improve the efficacy of the intervention. This type of strategy appears worthy of future research efforts. For example, feedback on food purchases may function as an effective strategy to reduce dietary fat and cholesterol consumption. This feedback could provide an individual with specific information about unhealthy food choices. Grocery receipts which name foods could function as a vehicle to improve feedback efficacy and initiate more specific behavioral changes. This would allow nutrition consultants to specifically address the individual's food selections and provide efficient feedback as well as evaluate the
efficacy of intervention programs which target food shopping to improve diet composition. Additionally, food receipts may provide a more comprehensive picture of the individual's actual dietary behavior that may be the case of a two day food record. A potential limitation is that food purchases do not necessarily reflect the amount of actual consumption. When used in combination with self-report measures, a more accurate portrayal of food consumption may result.

The literature suggests that more restrictive dietary interventions correspond to greater changes in serum cholesterol levels (Hunninghake et al., 1993; Ornish, 1990). Such restrictive interventions, however, retain limited value for general consumers, particularly for those who are asymptomatic. This phenomenon probably relates to difficulties involving long-term maintenance of dietary behavior change such as the high reinforcing value of palatable high fat foods, infrequent feedback about cholesterol levels, difficulty of lifestyle change and the lack of salient physiological markers which indicate poor health. The current intervention promoted recommended dietary change in terms of lifestyle changes. Participants learned several different strategies designed to become a part of their behavioral repertoire. Reading labels on products at the grocery store, for example, represents a relatively minimal behavior change; however, the label could prompt low fat and cholesterol food choices. Results from the present research suggest that the intervention was moderately successful in promoting the desired changes. It is possible that more structured behavioral strategies and use of additional feedback and diet monitoring strategies could improve the current results. Ongoing research in this area should continue to investigate the ideal intensity and content of interventions designed to maintain recommended serum cholesterol levels in asymptomatic people.

Another research suggestion considers compliance to the dietary changes
promoted by nutrition education interventions. An examination of the results from the present research suggests that although participants moderately decreased fat consumption while remaining within recommended levels, cholesterol consumption for both trials increased. Serum cholesterol levels showed modest improvements for the first group, but did not improve in the second. Because those who attended the workshop received information about the effect of dietary cholesterol on serum cholesterol, one would expect that follow-up feedback regarding serum cholesterol levels would at least prompt maintenance of the low levels of dietary intake reported. This result did not occur. As suggested earlier, it is possible that the feedback prompted relaxed dietary monitoring because intake levels were in the appropriate range.

Future studies in this area may explore methods which incorporate compliance techniques, such as those suggested by Marlatt (1985) or Foreyt and Goodrick (1993) to maintain improvements. In the Lifestyle Heart Trial, Ornish et al. (1990) implemented major lifestyle changes which significantly reduced CHD risk in their sample and which participants maintained at follow-up assessments. The strong motivating variable of possible sudden death in their sample may have strengthened adherence to intervention strategies, thus resulting in positive changes. The participants in the present study did not have such a strong motivating variable because they were asymptomatic. A more structured, broadened intervention may address additional motivating variables which could promote more impressive changes in serum cholesterol levels. For example, incorporating families in interventions may produce changes which maintain for longer periods of time. A similar strategy might include promoting the development of eating clubs whose members prepare low fat low cholesterol meals for the group. Additionally, newsletters, such as the free Lipid
Clinic News published through Oregon Health Sciences University, and more frequent booster or support sessions may enhance intervention results by providing reminders about appropriate dietary behaviors.

Future research in this area should also focus on improvements in dietary behavior. While serum cholesterol screening provides an accepted outcome measure, it is actually the dietary change which indicates the efficacy of the nutrition education intervention. This is particularly true of serum cholesterol because several factors contribute to serum cholesterol levels. The current study evaluated dietary change using two day food records and a food frequency questionnaire. These assessments occurred across three different follow-up points, a feature not included in most cholesterol management studies. While the food records and food frequency questionnaires are standard evaluations of dietary change, it is difficult to evaluate the reliability of participant responses. For example, the food frequency questionnaires in the present study indicated improvements in dietary food selections; however, the actual dietary information provided by the food record did not suggest such changes. It is possible that the questionnaire is actually measuring improvements in knowledge about food selections rather than changes in actual daily food choices.

Additional objective measures related to food consumption may provide information about dietary behavior which investigators could use to examine the reliability and validity of the food record. Participants could, for example, record food choices from a restaurant menu before and after the menu reading component of the intervention. An analysis of these choices could provide information about the effectiveness of the menu selection portion of the intervention and provide specific feedback to participants about their food choices outside of the home. In addition, cash register receipts, as mentioned earlier, provide excellent objective indicators of
dietary composition. Similarly, other techniques, including videotaping kitchen activities and researcher and participant phone contact during the course of meal preparation, may provide additional information about dietary routines. While added assessments increase professional involvement and possibly monetary expenditures, identification of effective tools to measure change will ultimately improve the strength of the findings.

Another important research direction involves the consideration of other CHD risk factors related to diet. These include HDL cholesterol levels and LDL cholesterol levels. Participants volunteering for the current study had total serum cholesterol levels beyond levels recommended by the NCEP (Expert Panel, 1993). The present study did not incorporate measurements of LDL and HDL levels. Providing feedback about other dietary risk factors related to CHD (e.g. HDL and LDL level) may supply participants with enough additional incentive to maintain a favorable heart healthy diet.

Similarly, future serum cholesterol management programs should evaluate the potential effects of exercise interventions on cholesterol levels, particularly HDL cholesterol levels. Aside from other physiological benefits, such as weight loss, researchers have found that consistent exercise positively impacts HDL cholesterol by raising serum HDL levels (Campagne, Fontaine, Park & Rymaszewski, 1993; NCEP Expert Panel, 1993; Goldberg, 1989; Kannel & Sorlie, 1979; Superko & Wood, 1986; Thompson et al., 1991). Future studies might contrast the use of additional activities such as an aerobic exercise intervention with the traditional workshop intervention. A physical exercise component may improve both the effectiveness and the attractiveness of the intervention, thus increasing its viability and clinical utility.

In summary, this study extends the dietary cholesterol management literature by providing support for a brief, behaviorally-focused, low intensity dietary
intervention designed to improve skills in choosing a low fat, low cholesterol diet. Despite the limitations of these experiments, notably the general lack of statistical significance for dietary and serum cholesterol changes, the participants' improved perceptions about food choices and the modest reductions in dietary fat provide sufficient evidence to suggest that a cost-effective, brief workshop can improve healthy food choices. Additionally, the methodological improvements (e.g., using several measures repeatedly across time) in the present study compared to other brief cholesterol management research improves the strength of the findings which were statistically significant. A methodological problem in the present research involved participant recruitment. Future studies should explore other strategies to improve the recruitment rate such as public cholesterol screenings in gathering places such as the student union to improve contact with potential participants. Other future research directions include (a) determining the effects of additional risk factor and dietary feedback on adherence to NCEP dietary guidelines regarding dietary cholesterol consumption; (b) measurement of specific skills needed to maintain a low-cholesterol, low-fat dietary behavior; (c) developing interventions to address motivating variables which impact dietary behavior; and (d) determining the usefulness of a physical exercise program as an additional component in brief nutrition education interventions to modify dietary cholesterol and fat consumption.
Appendix A
Informed Consent Document
INFORMED CONSENT DOCUMENT

As a participant in the evaluation of the Zest for Life Program's Cholesterol Countdown Workshop, I have been informed of and agree to the following:

This program is offered conjointly through the Department of Psychology, the Department of Consumer Research and Technology, and the Zest for Life Program. Responsibility for the evaluation component of the program is provided by Wayne Fuqua, Ph.D, and Peter Carey, M.A., T-LLP of the Department of Psychology. The evaluation component of the project will primarily function as a dissertation research project for Peter Carey, while also contributing to continuing development of Zest for Life's Cholesterol Countdown workshops.

I understand that my participation is voluntary and that I may withdraw from the evaluation component of this program at any time without jeopardizing my participation in the workshop series.

This evaluation will involve no risk for me and involves procedures which have been shown to be clinically useful. The Cholesterol Countdown Workshop has been in existence for three years, and has been reported by previous participants to be useful and enlightening.

As a participant, I will attend three workshops that will cover basic information about cholesterol and dietary fat, food selection strategies, and coping strategies for maintaining a healthy, low cholesterol and low fat diet. Additionally, for evaluative purposes, I will fill out food records and brief questionnaires at four points prior to and after the workshops. Finally, I will provide up to four blood samples for cholesterol analysis to be provided at no cost to the participant. These blood samples will be collected by trained health care personnel at the Sindecuse Health Center and involve only minor discomfort. The above measures will be used in a doctoral dissertation research project designed to evaluate the effectiveness of the workshop. In summary, on four separate occasions, I will complete a serum cholesterol screening, a two day recall of my food consumption, and two brief questionnaires, one regarding stress and the other regarding my dietary knowledge. At the end of the workshop, I will complete a brief evaluation of the workshop.

Due to the nature of the research project and the limited space in the workshop, it is possible that I may be asked to delay my participation in the workshop series until a second identical program is offered in January, 1992.

I understand that I will not be subject to any discomfort beyond the taking of a blood sample. I will benefit from this project by learning strategies designed to help lower cholesterol and fat intake while maintaining a palatable diet. Also, my participation will allow the refinement of the program to increase its effectiveness for future participants. Furthermore, the results from this project may lead to publications and presentations that might alter the manner in which similar services are offered at other geographic locations thus

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contributing to the management of cholesterol on a larger scale.

I understand that any information that I provide will be kept confidential and that it will be impossible to identify me in any publication or presentation of the results of this research project. The persons having access to the information I provide will include Dr. Fuqua and Peter Carey of the Psychology Department, Chris Zimmer of the Sindecuse Health Center, and Dr. Petersons and Mary Redford (graduate student intern) of the Department of Consumer Resources and Technology. The information will be kept in a secure location.

I understand that I am advised to carry my own health insurance during this project as there will be no additional coverage provided. Furthermore, I understand that if my blood cholesterol levels are above 200mg/dl, I am advised to seek consultation from my physician, although this is not mandatory for participating in the study.

If I have any questions during this study about the research or about my rights as a participant in a research project, I may contact either Dr. Fuqua (387-4474), or Peter Carey (387-4492).

Signature: __________________________ Date: ________________

Signature of Witness: __________________________

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Appendix B

Instruction Sheet for the Dietary Record
Keeping A Daily Food Record

A daily food record is solely for your benefit, especially for the first couple of months as you begin to master new techniques for change in lifestyle.

Keeping a daily food record is important for several reasons. It can help to:

- Increase your awareness of foods consumed
- Identify portion sizes eaten
- Identify food consumption patterns over time
- Identify potential problem eating patterns (i.e. eating related to stress, boredom, fatigue)

To be useful, the data must be as complete as possible!
Therefore, it is important to identify:

1. The food item.
2. The type of food (i.e. if the food item is bread - the type would be white, wheat, rye, etc.)
3. The amount of the portion (i.e. one cup, 1/2 cup, tablespoon, ounce, slice size number of slices, etc.)
4. How food was prepared (i.e. baked, fried, broiled, fresh, etc.)
5. When food was eaten (i.e. 10:00 am/pm, breakfast, etc.)

Snack foods and beverages must also be included in the record as well as all “extras”, such as margarine on potatoes or gravies on meats.

Two tools will be essential for accurate food measurement: a measuring cup and a set of measuring spoons. A third item, a food scale, is recommended but not required.

Below is an example of how to record food items:

<table>
<thead>
<tr>
<th>Time</th>
<th>Food Item</th>
<th>Food Type</th>
<th>Portion</th>
<th>How Prepared</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 am</td>
<td>Bread</td>
<td>whole wheat</td>
<td>2 slices</td>
<td>toasted</td>
</tr>
<tr>
<td></td>
<td>Margarine</td>
<td>-</td>
<td>2 teaspoons</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Milk</td>
<td>2%</td>
<td>1 cup/8 oz.</td>
<td></td>
</tr>
<tr>
<td>10:00 am</td>
<td>Doughnuts</td>
<td>cinn. cake</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>jelly frosted</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coffee</td>
<td>regular</td>
<td>2 cups/16 oz.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C
Dietary Record Form
### Computerized Nutrition Assessment

**SINDECUSE HEALTH CENTER**  
**WESTERN MICHIGAN UNIVERSITY**

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
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<table>
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<tr>
<th>Address</th>
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<table>
<thead>
<tr>
<th>City</th>
<th>State</th>
<th>Zip</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Home Phone</th>
<th>Work Phone</th>
<th>SS#</th>
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<tr>
<th>Age</th>
<th>Sex</th>
<th>Height</th>
<th>Weight</th>
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</thead>
</table>

**University Status:**  
- Faculty/staff  
- Spouse  
- Student  
- Emeriti/Retiree

### Health History Profile

#### Family History:
Please check any of the following that apply to your family members (parents, grandparents, brothers, sisters):

- Diabetes
- Heart attack, stroke
- Elevated cholesterol/triglycerides
- High blood pressure
- Osteoporosis

#### Personal Health History:
Please check any of the following conditions which apply to your current health status:

- Diabetes  
- Take Insulin  
- Elevated cholesterol/triglycerides  
- High blood pressure  
- Hypoglycemia  
- Osteoporosis  
- 20 pounds or more overweight  
- Pregnancy  
- Eating disorder - take laxatives, diuretics, or induce vomiting to control weight  
- Food allergies  
- Other: Please explain ________________________________________________________________

### Please list any medications you are currently taking including any vitamin or mineral supplements:

<table>
<thead>
<tr>
<th>Medication</th>
<th>Purpose</th>
</tr>
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Two Day Food Diary Instructions

Please use this form to record the foods you eat for two days. One day should be a weekday; the other should be a Saturday or Sunday. Fill in your food choices and portions as accurately as possible at the times you eat. Waiting until the end of the day, then trying to remember may make your assessment less accurate.

Portions may be listed by any unit of measure, such as a cup, slice, item, etc. If the same food is eaten more than once, record it ONLY once and increase the portion size. For example, if one apple is eaten at lunch and another is eaten after dinner, enter Apple, Raw, 2 items.

<table>
<thead>
<tr>
<th>DAY ONE</th>
<th></th>
<th>DAY TWO</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td></td>
<td>Weekday</td>
<td></td>
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<tr>
<td>Date:</td>
<td>Saturday or</td>
<td>Date:</td>
<td>Saturday or</td>
</tr>
<tr>
<td></td>
<td>Sunday</td>
<td></td>
<td>Sunday</td>
</tr>
<tr>
<td>Complete Food Description</td>
<td>Portion</td>
<td>Complete Food Description</td>
<td>Portion</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

Please mail the food diary to the Psychology Department in the Stamped addressed enveloped provided within the next 2 weeks.
Appendix D

Serum Cholesterol Feedback Form
### Serum Cholesterol Profile Results

**Name______________________________________ Date________________**

<table>
<thead>
<tr>
<th>TOTAL CHOLESTEROL</th>
<th>RECOMMENDATIONS</th>
<th>YOUR SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desirable</td>
<td>Less than 200 mg/dl</td>
<td></td>
</tr>
<tr>
<td>Borderline High Risk (see page 3)</td>
<td>200-239 mg/dl</td>
<td></td>
</tr>
<tr>
<td>High Risk (see page 3)</td>
<td>240 mg/dl or greater</td>
<td></td>
</tr>
</tbody>
</table>

*Note: All blood cholesterol levels above 200 mg/dl should be confirmed by repeat measurement.*

<table>
<thead>
<tr>
<th>LDL CHOLESTEROL</th>
<th>Desirable</th>
<th>Borderline High Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 130 mg/dl</td>
<td>130-159 mg/dl</td>
<td>160 mg/dl or greater</td>
<td></td>
</tr>
</tbody>
</table>

*Note: LDL Cholesterol is now the key index for clinical decisions about cholesterol-lowering therapy.*

<table>
<thead>
<tr>
<th>HDL CHOLESTEROL</th>
<th>Desirable</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women - greater than 40 mg/dl</td>
<td>Men - greater than 37 mg/dl</td>
<td>Less than 35 mg/dl, confirmed by repeat measurement</td>
</tr>
</tbody>
</table>

*Note: To raise HDL Cholesterol level:*  
- Lose weight, if appropriate, by eliminating excess calories  
- Stop smoking  
- Exercise aerobically at least three times per week

<table>
<thead>
<tr>
<th>TRIGLYCERIDES</th>
<th>Desirable</th>
<th>Borderline</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 140-150 mg/dl</td>
<td>250-499 mg/dl</td>
<td>500 mg/dl or greater</td>
<td></td>
</tr>
</tbody>
</table>

*Note: There is little evidence that triglyceride levels below 250 mg/dl in the presence of normal cholesterol levels predict an increased risk of heart disease.*

*To reduce triglyceride level:*  
- Lose weight if appropriate, by eliminating excess calories  
- Increase aerobic exercise to at least three times per week  
- Restrict intake of alcohol  
- Restrict intake of dietary fat

Coronary heart disease (CHD) is a progressive disease of the arteries that begins early in life. It is caused by a gradual accumulation of fatty deposits on the inner walls of arteries called atherosclerotic plaques that restrict the flow of blood and precipitate blood clot formation, resulting in heart attack and stroke. In most Americans, fatty deposits begin to accumulate in artery walls as early as age ten, but coronary heart disease rarely produces symptoms until middle age. The first symptom may be a heart attack. Medical treatment has vastly improved the outlook for people who suffer heart attacks, but our best hope rests in prevention. The following risk factors have been strongly associated with the development of coronary heart disease.

<table>
<thead>
<tr>
<th>Non-Modifiable Risk Factors</th>
<th>Modifiable Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Smoking</td>
</tr>
<tr>
<td>Male sex</td>
<td>High blood pressure</td>
</tr>
<tr>
<td>Diabetes</td>
<td>High cholesterol</td>
</tr>
<tr>
<td>Family history of premature CHD (less than 55 years of age)</td>
<td>Obesity</td>
</tr>
<tr>
<td></td>
<td>Physical inactivity</td>
</tr>
<tr>
<td></td>
<td>Low HDL-cholesterol</td>
</tr>
</tbody>
</table>

The interaction of risk factors like smoking, high blood pressure and high cholesterol greatly increase coronary heart disease risk.

Your serum cholesterol profile measures the amount of several forms of cholesterol that affect coronary heart disease risk.

**Total Cholesterol**

Cholesterol is a fat-like substance that is an essential component of all animal cell membranes. Cholesterol is manufactured by the liver and intestinal wall in amounts sufficient for your body's needs. Your serum cholesterol level is determined partly by your inherited body chemistry and partly by the fat and cholesterol content of foods you eat. Other factors that may influence cholesterol levels include obesity and physical inactivity.

Because cholesterol is a fat and is not soluble in the serum of the blood, it is packaged in a protein covering for transport throughout the body. This combination of lipid (fat) and protein is called a lipoprotein. Two major classes of lipoproteins are measured in your serum profile:

- **Low density lipoprotein (LDL)**
- **High density lipoprotein (HDL)**

**Low Density Lipoproteins (LDL)** usually contain 60-70% of the total serum cholesterol in your blood. LDL carries cholesterol from the liver to destinations in the body. It is the lipoprotein that increases the risk of atherosclerosis. High levels of LDL-cholesterol produce an increased risk for coronary heart disease. LDL cholesterol is now the key index for clinical decisions about cholesterol-lowering therapy. Lowering LDL cholesterol decreases the incidence of coronary heart disease.

LDL cholesterol level is determined by the formula:

\[
\text{Total cholesterol - HDL cholesterol - triglyceride level} / 5
\]

If the triglyceride value is above 400 mg/dl, LDL cholesterol estimation by this formula becomes less accurate.

**High Density Lipoproteins (HDL)** usually contain 20-30% of the total blood cholesterol. HDL's are believed to transport cholesterol from outer destinations in the body back to the liver for excretion. Higher HDL levels are associated with less heart disease and are usually found in people who engage in regular aerobic exercise, don't smoke, and maintain a healthy weight.

**Triglycerides**

Triglycerides are lipids that are produced in the body from dietary intake of simple sugars, protein and fats. Ninety five percent of lipids in the diet are triglycerides.
**TOTAL CHOLESTEROL**

<table>
<thead>
<tr>
<th>Blood Cholesterol Level</th>
<th>Actions for Risk Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Blood Cholesterol 240 mg/dl and above</td>
<td>At 240 mg/dl, coronary heart disease risk rises steeply to almost double the risk at 200 mg/dl. Make an appointment with your physician to repeat your serum cholesterol profile and to have a clinical evaluation including dietary and risk factor education. (See Step One Diet)</td>
</tr>
</tbody>
</table>

| Borderline High Blood Cholesterol 200 - 239 mg/dl | * If you have:  
|                                               | a) A personal history of heart disease or  
|                                               | b) Two or more of the following additional coronary heart disease risk factors:  
|                                               | 1. Being male  
|                                               | 2. Family history of premature CHD (before age 55)  
|                                               | 3. Cigarette smoking  
|                                               | 4. High blood pressure  
|                                               | 5. Low HDL cholesterol (< 35 mg/dl)  
|                                               | 6. Diabetes mellitus  
|                                               | 7. History of cerebrovascular or peripheral vascular disease  
|                                               | 8. Obesity (30% over healthy body weight)  
|                                               | Make an appointment with your physician to repeat your serum cholesterol profile and to have a clinical evaluation including dietary and risk factor education. (See Step One Diet)  

| * If you have no coronary heart disease risk factors: Make dietary changes to lower saturated fats and cholesterol. |

| Step One Diet | Total dietary fat - less than 30% of calories  
|               | Saturated fat - less than 10% of calories  
|               | Dietary cholesterol - less than 300 mg per day  
|               | Lose weight, if appropriate, by eliminating excess calories.  
|               | Exercise aerobically at least three times per week.  
|               | Do not smoke.  
|               | Have your cholesterol checked again in one year.  

| Desirable Blood Cholesterol Below 200 mg/dl | Select foods that are low in fat.  
|                                           | Adjust calories to maintain a healthy weight.  
|                                           | Exercise aerobically at least three times per week.  
|                                           | Do not smoke.  
|                                           | Have your cholesterol checked again within three to five years.  

Your Cholesterol level today ______ mg/dl
GUIDELINES FOR CORONARY HEART DISEASE RISK REDUCTION

Diet greatly affects a number of risk factors that cause coronary heart disease, including high serum cholesterol, high blood pressure, obesity and blood clot formation. The same dietary lifestyle can be used to modify all four of these coronary risks.

* Limit intake of dietary cholesterol to 300 mg per day and
* Restrict saturated fat intake to no more than 10% of your total calories.
  * The body manufactures abundant amounts of cholesterol, so cholesterol is not required in your diet.
  * Saturated fats in the diet, in the presence of cholesterol, increase both total cholesterol and LDL-cholesterol levels. Saturated fats also increase blood clot formation.
  * Studies suggest that reducing saturated fat and cholesterol in your diet can reduce cholesterol levels by an average of 30 - 40 mg/dl.

Dietary cholesterol makes up about 5% of dietary fat and is found only in animal food sources, including egg yolks, organ meats (liver), some shellfish (shrimp and lobster), beef, pork, lamb, and dairy products containing butterfat.

Saturated fats generally come from animal food sources, dairy products containing butterfat (butter, milk greater than 1% fat, ice cream, cheese) and vegetable shortenings. In addition three plant oils - palm oil, palm kernel oil and coconut oil are especially high in saturated fat.

* Increase polyunsaturated and monounsaturated fat intake to 20% of your total calories
  * Polyunsaturated and monounsaturated fats that come from oils of fish, plant or vegetable origin mildly reduce blood clot formation and lower LDL cholesterol.

Major sources of polyunsaturated fats include safflower oil, sunflower seed oil, soybean oil and corn oil. Olive oil, canola oil and high oleic forms of sunflower seed and safflower oil are the major sources of monounsaturated fats.

* Reduce total fat intake to less than 30% of your total calories
  Choose lean meat, fish, poultry or dried peas and beans for your protein sources. Eat no more than three eggs per week, including those used in cooking. Limit your intake of butter, margarine, cheese, whole milk or whole milk products like yogurt. Additional high fat food sources include bacon, cold cuts (like bologna), frankfurters, peanut butter, cream sauces, pastries, cakes, potato chips, pancakes, waffles, nuts, salad dressings and olives. Choose boiled, baked or broiled foods rather than those that are fried, breaded, or served with sauces which increase fat content and calories.

* Reduce your intake of sugary foods.
  * Simple sugars have a triglyceride-and cholesterol-raising effect. Your carbohydrates should come from fruits, vegetables, and whole grain and enriched breads and cereals.

* Reduce excess caloric intake to achieve and maintain a healthy weight.
  * Excess calories stimulate the liver to over-produce LDL-cholesterol and triglycerides.

  * Weight reduction lowers LDL-cholesterol level, raises HDL-cholesterol level, and reduces plasma triglycerides.

* Limit alcohol intake
  * Alcohol intake can be a cause of increased triglycerides, high blood pressure and obesity.

* Make a commitment to aerobic exercise at least three times per week. Aerobic exercise includes fitness walking, swimming, bicycling, rowing, jogging or cross country skiing.

* If you smoke, quit.

UNIVERSITY WELLNESS PROGRAMS
SINDECUSE HEALTH CENTER
WESTERN MICHIGAN UNIVERSITY
Phone: 387-3262 or 387-3263

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Appendix E

Food Frequency Questionnaire:
"Are You Eating to Your Heart's Content?"
“Eating to your heart’s content” is a way of eating that’s high in flavor, variety, and satisfaction and that can help you protect your health from the risks of heart disease. Use this chart to help assess your eating habits and to plan changes for healthier eating.

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Circle the category for each food group that most closely describes your eating habits in an average week. Record your points for each row (food group) in the right-hand columns and add your chart totals on each page. Add your chart totals together for your total Eating Pattern Score, and find your score range and recommendations on the back.

<table>
<thead>
<tr>
<th>Food Group</th>
<th>0 points</th>
<th>1 point</th>
<th>2 points</th>
<th>3 points</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh or frozen fruits and vegetables</td>
<td>Eat less than 1 serving a day</td>
<td>Eat 1 serving a day</td>
<td>Eat 2-3 servings a day</td>
<td>Eat 4 or more servings a day</td>
<td></td>
</tr>
<tr>
<td>Canned soups or canned vegetables</td>
<td>Eat these foods 7 times a week</td>
<td>Eat these foods 4-6 times a week</td>
<td>Eat these foods 1-3 times a week</td>
<td>Rarely or never eat these foods</td>
<td></td>
</tr>
<tr>
<td>Breads, grains, and cereals</td>
<td>Eat less than 1 serving a day</td>
<td>Eat 1 serving a day</td>
<td>Eat 2-3 servings a day</td>
<td>Eat 4 or more servings a day</td>
<td></td>
</tr>
<tr>
<td>Dried beans and peas</td>
<td>Rarely or never eat these foods</td>
<td>Eat these foods less than once a week, on the average</td>
<td>Eat these foods once a week</td>
<td>Eat these foods twice a week or more</td>
<td></td>
</tr>
<tr>
<td>Poultry*</td>
<td>Rarely eat these foods</td>
<td>Eat less than 1 serving a week</td>
<td>Eat 1-2 servings a week</td>
<td>Eat 3 or more servings a week</td>
<td></td>
</tr>
<tr>
<td>Fish*</td>
<td>Rarely eat these foods</td>
<td>Eat less than 1 serving a week</td>
<td>Eat 1-2 servings a week</td>
<td>Eat 3 or more servings a week</td>
<td></td>
</tr>
<tr>
<td>Red meats*</td>
<td>Eat only high-fat red meats</td>
<td>Usually eat high-fat red meats</td>
<td>Usually eat lean red meats</td>
<td>Eat only lean red meats</td>
<td></td>
</tr>
</tbody>
</table>

*If you are a vegetarian, give yourself 3 points for this food group.

Chart 1 Total

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<table>
<thead>
<tr>
<th>Food Group</th>
<th>0 points</th>
<th>1 point</th>
<th>2 points</th>
<th>3 points</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>Usually use whole milk</td>
<td>Usually use 2% milk</td>
<td>Usually use 1% milk</td>
<td>Usually use skim milk</td>
<td></td>
</tr>
<tr>
<td>Dairy desserts</td>
<td>Eat ice cream more than twice a week</td>
<td>Eat ice cream twice a week or less</td>
<td>Eat ice milk, low-fat fruit yogurt, or low-fat frozen yogurt instead of ice cream</td>
<td>Eat sherbet or fruit ices instead of ice cream or rarely eat frozen desserts</td>
<td></td>
</tr>
<tr>
<td>Cheese</td>
<td>Eat only high-fat cheeses (such as American, cheddar, Swiss, cream cheese, etc.)</td>
<td>Usually eat high-fat cheeses</td>
<td>Usually eat low-fat cheeses (such as mozzarella, ricotta, farmer’s cheese)</td>
<td>Eat only low-fat cheeses or rarely eat cheese</td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td>Eat 6 or more egg yolks a week</td>
<td>Eat 4-5 egg yolks a week</td>
<td>Eat 3 egg yolks a week or less</td>
<td>Eat less than 3 egg yolks a week, and use only eggs whites or egg substitute in cooking and baking</td>
<td></td>
</tr>
<tr>
<td>Cooking oils and fats</td>
<td>Always use butter, shortening, and/or lard for cooking and eating</td>
<td>Usually use butter, shortening, and/or lard for cooking and eating</td>
<td>Usually use margarine and/or liquid vegetable oil for cooking and eating</td>
<td>Use only liquid vegetable oils and margarines for cooking and eating</td>
<td></td>
</tr>
<tr>
<td>Commercial baked goods (sweet rolls, cookies, cakes, donuts, etc.)</td>
<td>Eat these foods 7 times a week or more</td>
<td>Eat these foods 5-6 times a week</td>
<td>Eat these foods 3-4 times a week</td>
<td>Eat these foods twice a week or less</td>
<td></td>
</tr>
<tr>
<td>Salt and Salty Foods</td>
<td>Frequently use salt at the table and in cooking, and eat salty foods (salty snacks, pickles, olives, etc.)</td>
<td>Reduce use of salt at the table and cut down on salty foods</td>
<td>Reduce use of salt at the table and cut down on salt in cooking</td>
<td>Never use salt at the table and leave out of most recipes</td>
<td></td>
</tr>
</tbody>
</table>

Chart 2 Total

Turn to the back to figure your Eating Pattern Score

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Your Eating Pattern Score

0-17 Stop and Think
If your score is in this range, you probably are eating too many foods that are high in fat, cholesterol, calories, and salt. The Heart Health Program recommends that you try eating more fresh and frozen fruits and vegetables; more grains and cereals; more lean meats, fish and poultry; and more low-fat dairy products. When you prepare foods, choose steaming, broiling, or baking as cooking methods instead of frying, and serve meats and vegetables with spices instead of rich sauces and gravies.

18-30 Getting Better
If your score is in this range, you probably are eating many of the right foods. You could do even better, however, by using low-fat dairy products and by using beans and peas and smaller portions of lean meats, fish and poultry combined with foods such as pasta, rice, and breads. Make sure the cooking methods you choose are low in fat, too: broil or roast meats instead of frying, and serve them with vegetables and spices instead of with rich sauces and gravies.

31-42 Nice Going
If your score is in this range, you probably are eating most of the right foods. Keep up the good work, and use your creativity to keep your family and friends interested in healthier eating.

The Basics of Heart-Healthy Eating

Use more fresh fruits and vegetables, beans, and foods made from whole grains and cereals.

Use more lean meats, fish, and poultry.

Use more low-fat dairy products, including skim or low-fat milk, low-fat yogurt, and low-fat cheeses; and cut down on foods that are high in saturated fat, calories, and cholesterol.

Use less salt and sodium. Get in the habit of reading labels for the sodium content of canned and packaged foods, and experiment with other spices and flavorings.

Minnesota Heart Health Program
Stadium Gate 27
811 Beacon Street S.E.
Minneapolis, MN 55455

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Appendix F

Consumer Satisfaction Questionnaire
Cholesterol Countdown Consumer Satisfaction Questionnaire

Please help us evaluate the program's usefulness to you.

1. Please evaluate the level of cholesterol-lowering knowledge and skills you believe you had before program participation, as well as knowledge and skills you gained as a result of participation in the following areas:

<table>
<thead>
<tr>
<th>Knowledge and Skills Before Program Participation</th>
<th>Knowledge and Skills After Program Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Risk factors in the development of coronary heart disease</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>(2) Dietary factors affecting serum cholesterol</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>(3) The Step-One Diet</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>(4) Menu planning</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>(5) Strategies to prepare low-fat foods</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>(6) Recipe modification</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>(7) Selecting healthy alternatives when dining out</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>(8) Label reading</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>(9) Grocery shopping</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>(10) Ability to assess personal eating patterns that influence serum cholesterol levels and weight</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

11) Please rate the degree to which you have ALREADY CHANGED your dietary practices at home. If you have not yet changed these practices, please rate how much you INTEND TO CHANGE:

<table>
<thead>
<tr>
<th>Amount of Change</th>
<th>None</th>
<th>Moderate</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Following the Step-One Diet</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Already changed</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intend to change</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Reading labels prior to food purchases</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Already changed</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intend to change</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Amount of Change</th>
<th>None</th>
<th>Moderate</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. Purchasing low fat and low cholesterol foods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Already changed</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Intend to change</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>D. Calculating the amount of fat and cholesterol in your diet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Already changed</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Intend to change</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>E. Writing and following goals for dietary change</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Already changed</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Intend to change</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>F. Modifying recipes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Already changed</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Intend to change</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>G. Food preparation strategies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Already changed</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Intend to change</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>H. Snacking on healthy food alternatives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Already changed</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Intend to change</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

12) What components of the program were least valuable to you? ____________________________

13) What is (are) the most important thing(s) you learned as a result of participating in this program? ________________________________________________________________

14) Would you recommend this program to others? Yes ____ No ____
Appendix G

Cholesterol Countdown Workshop Manual
CHOLESTEROL COUNT-DOWN WORKSHOP

LEADERS MANUAL

"Mail "Food Knowledge, Attitudes and Habits: Low Fat, Low Cholesterol, Mild Sodium Restriction" pretest to program participants prior to the first session. Ask them to complete this form and bring it with them the first evening of class.

Session I

Welcome and Introductions
*By the time you've completed three sessions with us, you should be able to:
1. Describe the role of serum cholesterol and other risk factors in the development of coronary heart disease.
2. Identify dietary, behavioral and genetic factors affecting serum cholesterol.
3. Assess and modify personal eating patterns that influence serum cholesterol, blood pressure, and body weight.
4. Develop skills in planning menus that meet Step-One dietary guidelines.
5. Develop skills in label reading and shopping to meet Step-One dietary guidelines.
6. Develop skills in food preparation to meet Step-One dietary guidelines.

* Introduce self, professional background, staff.

* Introduce program purpose.
  - Serum cholesterol levels can be lowered in just 4-6 weeks by diet alone.
  - For every 1% that you reduce your serum cholesterol, your risk of CHD is reduced by 2%.
  - The diet that lowers serum cholesterol provides guidelines for a reduction in total fat, saturated fat and cholesterol.
  - We hope to share with you not only the knowledge, but also the skills that will help you make these changes.
  - In addition, we would like to emphasize that healthy food should look and taste delicious.
  - We can all learn by sharing with each other.
  - I hope that this will be a supportive group for you - one where you can make friends, have fun and feel comfortable asking questions and getting lots of help in enhancing your health.

*Review Agenda

** Ask group to pair off for introductions.
  (Partners introduce each other to large group.)
  Please spend about five minutes. 2 1/2 minutes for each person to talk.
  I will let you know when 2 1/2 minutes have passed.

Introduce slides

- Role of serum cholesterol and other risk factors in the development of CHD.
- Dietary, behavioral and genetic factors affecting serum cholesterol.

Refer to Program Agenda

(25 minutes)

(20 minutes)
Use slides to show role of serum cholesterol and other risk factors in the development of CHD.

Use flip chart to address risk factors.

Continue with flip chart to show modifiable and non-modifiable factors affecting serum cholesterol.

---

**Slides**

- Coronary heart disease (CHD) is the leading cause of death in the U.S. today.
- The major cause of CHD is atherosclerosis, a disease condition in which blood flow is restricted.
- The major cause of atherosclerosis is high serum cholesterol.
- Cholesterol is a fat-like, waxy substance that is an essential component of animal cell membranes.
- It is manufactured in the liver and intestinal wall in amounts sufficient to meet body needs.
- Because foods of animal origin contain cholesterol, we also get cholesterol from the food we eat.
- High serum cholesterol levels are associated with the development of atherosclerotic plaque and subsequent narrowing of the arteries.

**Refer class to the pictures of atherosclerosis and blood clots in the booklet "If You Smoke, Here's What Your Doctor May See"**

**Triglycerides are fats (lipids)**

- 95% of the fats in our diet are triglycerides
- Our bodies produce triglycerides from dietary simple sugars, protein, and fats.
- Because cholesterol and triglycerides are not soluble in the blood, they are packaged in a protein covering for transport throughout the body.
- This combination is called a lipoprotein.
- Two major classes of lipoproteins that affect your cholesterol levels are low density lipoproteins (LDL) and high density lipoproteins (HDL).
  1. LDL carries cholesterol from the liver to body tissues. High levels increase risk for CHD.
  2. HDL is believed to transport cholesterol from body tissues back to the liver for excretion. High levels are associated with decreased risk of heart disease.
- Both HDL and LDL can be affected by lifestyle choices.
- There are also other risk factors associated with the development of heart disease.

- In addition to elevated blood cholesterol, having two or more of the following risk factors increases the risk for CHD:
  - **Male**
    - Cigarette Smoking
      - More than 10 per day
    - High Blood Pressure
      - 138/88 or greater, exerts force which damages artery walls
    - Low HDL Cholesterol
      - Less than 35 mg/dl
    - Diabetes
      - Decreases circulation, increases cholesterol
    - Family History of CHD
      - Before age 55
    - History of Vascular Disease
      - Circulatory problems
    - Obesity
      - 30% or more over healthy body weight

**Serum cholesterol levels can be affected by both non-modifiable and modifiable factors.**

**Non-modifiable**

* Male
• Genetic disorders
• Diabetes
• Age (usually increases with age)

Modifiable
• Overweight (weight reduction decreases LDL, increases protective HDL, decreases triglycerides)
• Physical activity (regular, at least 3 times per week, aerobic exercise increases HDL levels and aids in weight reduction)
• Smoking (decreases HDL levels)
• Dietary factors, which include the following.

• DIETARY FACTORS THAT INCREASE SERUM CHOLESTEROL INCLUDE:
  - High intakes of cholesterol and saturated fat
  - Excess calories.
• Cholesterol in the diet comes from animal products. Particularly rich sources are egg yolks and organ meats such as liver. Other sources of cholesterol include beef, pork, lamb, shellfish, and dairy products containing butterfat.
• Saturated fats, in addition to raising serum cholesterol, stimulate the production of blood clots.
• Saturated fats generally come from animal food sources, such as meats and dairy products containing butterfat (e.g., butter, whole milk, ice cream, sour cream, cheese) and also vegetable shortenings (e.g., Crisco).
• Three plant oils that are high in saturated fat are coconut oil, palm oil, and palm kernel oil. In addition, the cocoa butter found in chocolate is saturated. Many processed foods are made with large amounts of these oils. Saturated fats are usually solid at room temperature.
• Saturated fat may be "visible" such as the trimmable fat on meat, or "hidden" in frankfurters, whole milk and processed foods.

• DIETARY FACTORS THAT DECREASE SERUM CHOLESTEROL INCLUDE:
  - Polyunsaturated and monounsaturated plant oils, which take the place of saturated fats in the diet.
  - Certain types of fiber.
• Polyunsaturated fats are liquid at room temperature.
• The major polyunsaturated plant oil sources include safflower, sesame, sunflower, soybean, and corn oils.
• Monounsaturated fats are also liquid at room temperature.
• The major monounsaturated plant oil sources include olive oil, canola oil (e.g., Puritan brand), and the oil in avocados, nuts, and peanuts.
• Hydrogenated or partially hydrogenated fats are vegetable oils that have been made more saturated. The more hydrogenated, the more saturated and the more solid at room temperature (e.g., a hard stick of margarine would be more saturated than soft tub and liquid margarine).

• In addition to polyunsaturated and monounsaturated oils, certain types of fiber also lower serum cholesterol.
• Fiber makes up the cell walls of plants.
• Wheat bran is one type of fiber.
• There are different kinds of fiber, some can bind bile salts and cholesterol.
• The types of fiber most effective in lowering serum cholesterol levels are called soluble gums and pectins. Gums are found in oat bran (but not wheat bran) and dried beans and peas. Pectins are found in the skin of fruits (such as apples).
**There are some drugs that affect serum cholesterol.** Drugs that increase cholesterol include:

- Progestins (give examples)
- Anabolic steroids
- Oral contraceptives

**Drugs that decrease cholesterol include:**

- Mevacor (Lovastatin)
- Bile acid sequestrants (Cholestyramine)
- Nicotinic acid (large doses of niacin may be toxic)

- You may have heard about the Omega-3 fish oils. While they do not affect serum cholesterol levels, they do decrease blood clot formation. They are found in fatty cold water fish.

- Salmon
- Mackerel
- Tuna
- Swordfish
- Bluefish

There are also small amounts of Omega-3 oils in fish such as lake trout and catfish. It is best to purchase fish canned in water rather than oil, because the Omega-3 oils are leached into the packing oil.

**Step One Diet** A guide that has been designed to help you simplify the process of decreasing dietary sources of saturated fat and cholesterol. Use it to help you in food selection and preparation and to discover an endless variety of tasty, healthy food choices.

*Slides*

- Select from a wide variety of foods. Variety helps to ensure that the diet is enjoyable and nutritionally balanced, providing essential nutrients, adequate fluids, and fiber.
- Protein, needed for cell growth and repair, can be found in lean red meats, poultry, fish, egg whites and low-fat dairy products. Lean red meats contain a highly absorbable form of iron and need not be eliminated from the diet. Low-fat dairy products are an excellent source of calcium and at least two servings should be included daily. (May wish to include RDA Guidelines)
- Complex carbohydrates, the body's preferred energy source, are found in fruits, vegetables, cereals, pasta, bread, grains, and dried beans and peas. These foods are excellent sources of vitamins, minerals, and fiber. The Step One Diet recommends 50 - 60% coming from carbohydrates, preferably complex carbohydrates.
- The current American diet averages 35 - 40% of calories from fat. No more than 30% of calories should be provided by fat.
- Protein should contribute 12 - 20% of calories.
- Step One Diet cholesterol lowering guidelines:
  - Reduce total fat intake to less than 30% of your total calories.
  - Reduce saturated fat intake to less than 10% of your total calories.
  - Limit polyunsaturated fat intake to no more than 10% of your total calories.
  - Increase monounsaturated fat intake to a level of 10 - 15% of your total calories.
- Reduce cholesterol intake to less than 300 mg per day. We have looked at some foods that are high in cholesterol, such as those pictured here.
- Reduce excess calorie intake to achieve and maintain a healthy weight. Excess calories stimulate the liver to over-produce cholesterol and triglycerides. Minimum caloric levels in weight reduction are 1200 kcal for women and 1500 kcal for men. Weight loss should be no more than 1 - 2 lbs. per week.
Extremely low calorie levels cause the breakdown of lean body tissue to meet energy needs.

- (Slide demonstrating the concept of caloric density.) All of these foods are about 100 calories each.
- Reduce refined sugar intake.
  - Refined sugars provide concentrated calories, but no nutrients and have a triglyceride raising effect. They should make up no more than 10% of total calories. (What about fructose?)
- When reading food labels look for these other names for sugar (e.g. corn syrup, dextrose).
- Limit alcohol
  - Alcohol provides excess calories, but no nutrients and can contribute to increased triglycerides, high blood pressure and obesity.
- We saw earlier that high blood pressure is a risk factor for CHD because it damages artery walls. Caffeine and sodium can both contribute to high blood pressure. Caffeine constricts your arteries. Sodium can increase the fluid volume of your blood. It is recommended that no more than 250 mg of caffeine be consumed in one day (about 2 cups of coffee). Recommended sodium intake is 1100-3300 mg per day. Please refer to the handouts in your packet on caffeine and sodium; there is also a list of herbs and spices to be used in place of salt. Please note that many soft drinks are high in caffeine.
- We consume much more sodium than we need.
- One teaspoon of salt equals 2300 mg of sodium.
- Sodium is hidden in many processed foods.
- Read food labels for these other sources of sodium (e.g. baking soda).

MEAT, POULTRY, AND FISH
- Meat consumption (red meat, poultry, or fish) should be limited to 6 ounces per day. A 3 to 4 ounce serving is the size of a deck of cards.
- As the serving size goes up, so do the calories and fat.
- Begin by selecting lean cuts. - Beef - round, flank, sirloin tip, lean sirloin steak, tenderloin and rump.
- Veal - all cuts except the breast are lean.
- Pork - lean cuts are tenderloin, loin chops, and sirloin roast.
- Meat grades include prime, choice, and select (which is most lean).
- Trim all visible fat.
- You may want to use a tenderizing method such as grinding, pounding or marinade. Commercial tenderizers may contain large amounts of sodium.
- You can make your own marinade with oil plus an acid such as vinegar or lemon juice.
- Slow moist cooking is another way to tenderize meat.
- Use a low fat cooking method. These are: bake, broil, saute, stir fry, grill, steam, poach, stew. For flavor use herbs, spices, and marinades.
- Remove fat when making sauces and gravies by placing drippings in the refrigerator and scraping away the concealed fat.
- Paper towels and slotted spoons are other ways to remove excess fat.
- Avoid organ meats, and processed meats such as sausage, hot dogs, and bologna.
- Also avoid frozen meals that are high in fat and sodium.

EGGS
- Limit egg yolks to three per week because they are very high in cholesterol. This includes the egg yolks contained in prepared foods and salad dressings. Egg white is an excellent source of protein and two egg whites may be used in place of each whole egg.
MILK PRODUCTS

- Half of the calories in a glass of whole milk come from fat.
- The composition of dairy products that contain butterfat is similar to that of cream. Foods actually contain all three types of fat, saturated, polyunsaturated, and monounsaturated; however, they are classified according to the predominant fat. As you can see, cream contains predominantly saturated fat.
- Select skim milk, nonfat yogurt and low-fat cottage cheese (1% or less milkfat). These may be used on a regular basis. Avoid whole milk cheeses such as cheddar. Also avoid sour cream and cream cheese. When using cheeses, select lower fat varieties such as part skim mozzarella (5 gm fat per ounce vs. the 9 gm fat per ounce in regular cheddar) and special reduced fat cheeses.
- Beware of products labeled “cholesterol free” which may actually contain large amounts of saturated fat. Many imitation creamers and sour creams fall into this category.
- Frozen desserts should contain no more than 2 gm fat per serving. There are many new desserts that fall into this category. Read the labels carefully. Avoid ice cream and frozen desserts that contain large amounts of fat. Just as all yogurts are not low-fat, all frozen yogurts are not low-fat.

FRUITS AND VEGETABLES

- Select fresh, frozen, dried or canned fruits. Avoid those in heavy syrup.
- Coconut is high in saturated fat and should be avoided.
- Avocados and olives, although high in monounsaturated fat, should be limited because they are high in total fat.
- Select fresh or frozen vegetables.
- Avoid vegetables that have been fried or prepared with butter or high-fat sauces. Also avoid processed vegetables and soups that contain large amounts of fat and/or sodium.

BREADS, CEREALS, DRIED BEANS AND PEAS

- Select low-fat whole grain breads and crackers, rolls, muffins, bagels, cereals, rice and egg-free pasta.
- Avoid commercially baked goods such as croissants that are high in fat.
- When making pancakes, muffins, or cornbread use unsaturated oils sparingly.
- Avoid crackers, chips and mixes containing large amounts of fat and/or coconut, palm or hydrogenated oils.
- Combine dried beans and peas with any of the grain products listed to get complete protein. Use this combination often instead of meat.

FATS AND OILS

- All of these are concentrated sources of calories and should be used sparingly.
- Use polyunsaturated oils such as safflower, corn, sunflower, sesame, soybean and monounsaturated oils such as olive and canola oils.
- Margarines should be made from these oils and have at least 2 times as much polyunsaturated fat as saturated.
- Choose salad dressings made from these oils. Avoid those with egg yolk, sour cream and large amounts of sodium. (i.e., ) Lite margarines and salad dressings may be good selections, but read the label for amount and types of fat used.
- Nuts, seeds, and peanut butter are high in unsaturated oils, but should be limited because they are high in total fat.

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- Avoid saturated fats such as lard, butter, coconut oil, palm oil, palm kernel oil, coconut and chocolate.
- Chocolate contains cocoa butter which is saturated. Substitute 3 tablespoons of baking cocoa powder plus 1 tablespoon of unsaturated oil for each baking chocolate square.
- Avoid items which list “vegetable oil” as an ingredient. This could mean a saturated fat such as coconut oil.
- Also avoid hydrogenated fats.

Ask for questions

** We will mail you a post-test when three months have passed. If you return the test and have also turned in pre and post-cholesterol scores, your name will be entered in a raffle for one of two copies of the Borgess Light Hearted Living Cookbooks.

** Explain assignments

1) Please bring hand held calculator to session II
2) Computerized Nutrition Assessment - describe how to complete
3) Keeping Track of Fat - work through sample with group

Session II

- Review Session I with focus on Step - One Diet.
- Ask group to give examples of foods that are high in cholesterol and saturated fat. Then ask for examples of polyunsaturated and monounsaturated fats.

- Collect Computerized Nutrition Assessments.

- In large group identify the type of fat contained in each person's highest fat item in their "Keeping Track of Fat" record. Use "Eating to Lower Your High Blood Cholesterol" as a reference for foods that are difficult to classify.

RECIPES MODIFICATION AND FOOD PREPARATION TECHNIQUES TO MEET STEP - ONE DIETARY GUIDELINES.

- Recipe Modification principles:
  - Eliminate an ingredient
  - Reduce an ingredient
  - Substitute an ingredient
  - Change a cooking technique

- Give some examples, e.g., eliminate whipped cream topping, reduce the amount of cheese, substitute non-fat yogurt for sour cream (must be beaten before adding to cooked dishes to prevent curdling), or bake instead of fry.

- Hand out recipes to small groups for modification.

- Small groups report back to large group and compare results.

LABEL READING AND SHOPPING TO MEET STEP - ONE DIETARY GUIDELINES

- Ingredient and nutrition labeling.
  - Ingredients are listed in order by weight
  - Nutrition labeling gives calories per serving and also grams of fat per serving. Protein - 4 cal/gm, Carbohydrate - 4 cal/gm, Fat - 9 cal/gm, Alcohol - 7 cal/gm.

Stress importance of turning in both pre and post cholesterol scores to Zest for Life.

(10 minutes)

Review (10 minutes)

Questions

Discuss - "Keeping Track of Fat" assignment

Use flip chart to show recipe modification principles.

(5 minutes)

(10 minutes)

(10 minutes)

BREAK

(45 minutes) - Use flip chart to explain ingredient and nutrition labeling.

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To find per cent of calories coming from fat: divide
\[ \frac{\text{grams of fat per serving} \times 9}{\text{total calories in one serving}} \times 100 \]

- **Individuals practice calculations from each section, determining**
  best selections.
- **Continue to emphasize that type of fat is very important in addition to total amount of fat.** Encourage questions and comments.

### Margarines
- Heart healthy margarines list a liquid polyunsaturated oil as the first ingredient. They also have at least twice as much polyunsaturated fat as saturated. Some of the liquid margarines have six times as much polyunsaturated fat.
- Butter, margarine, and oils all have about the same number of calories in a serving - and 100% of these calories come from fat! Even heart healthy fats should be used sparingly.

Examples of heart healthy margarines:
- Promise Sunflower Oil Spread
- Fleischmann’s Corn Oil Margarine

Examples of heart healthy oils:
- Puritan Oil (canola)
- Mazola Oil (corn)

- Although foods may be labeled “No Cholesterol” they may contain tropical oils or hydrogenated fats.

### Peanut Butter
- Choose one that is non-hydrogenated (i.e., natural style) or one such as Peter Pan that has twice as much polyunsaturated as saturated fat.

### Milk
- Best choice is skim or 1/2%.

<table>
<thead>
<tr>
<th></th>
<th>Grams of fat</th>
<th>% kcal from fat</th>
<th>Kcal total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skim</td>
<td>1g</td>
<td>10%</td>
<td>90</td>
</tr>
<tr>
<td>1% buttermilk</td>
<td>2g</td>
<td>16%</td>
<td>110</td>
</tr>
<tr>
<td>2% milk</td>
<td>5g</td>
<td>35%</td>
<td>120</td>
</tr>
<tr>
<td>3.3% whole milk</td>
<td>8g</td>
<td>48%</td>
<td>150</td>
</tr>
</tbody>
</table>

### Yogurt
- Not all yogurts are low-fat. Identify low-fat and nonfat yogurts. Suggest plain nonfat yogurt as a substitute for sour cream or mayonnaise.

### Cream/Sour Cream
- Nondairy creamers often contain palm oil. Substitute skim or nonfat dried milk.
- Sour cream has 100% of calories coming from fat. Lean cream still has 50% coming from fat.

### Salad Dressings
- Compare lite vs regular dressings for calories and percent of calories from fat. Small amounts of salad dressings can be a good way to get your essential fatty acid (linoleic acid, found in polyunsaturated oils).
* "Lean" or "extra lean" ground beef means nothing. Buy beef containing the lowest percentage of fat (e.g., diet lean). If ground beef is 75% lean.
* 3.5 oz patty has 295 calories and 25 grams of fat. 
  
  \[(25 \times 9 = 225 \text{ calories})\] 75% of the calories come from fat.
* Remove skin from poultry before cooking to reduce fat content.
* Fish is an excellent source of low-fat protein.
* Low-fat processed meats should have 3 grams or less of fat per ounce. Turkey and chicken hot dogs are just as high or higher than regular hot dogs. Ground turkey advertises fat-content 50% less than ground beef, but they are not comparing it to the leaner types of ground beef. It is similar in total fat to the very leanest ground beef; however, the fat in poultry is less saturated.

**Frozen Entrees**
- Should have a maximum of 30% of calories from fat
- Should be no more than 300 calories
- Should have no more than 750 mg of sodium per serving

* You can help balance these meals with side dishes high in fiber, calcium, and vitamins A and C. Select canned and frozen dinners that are no more than 10 grams of fat per serving. Soups should have no more than 3 grams of fat per cup.

**Cereals**
* In general, cereals will be low in fat and good sources of fiber. Read labels for added fats and large amounts of sugar and sodium. Heart healthy cereals should have no more than 2 grams of fat per ounce.

**Bread, Crackers**
* Check labels for large amounts of animal or hydrogenated fats (e.g., Ritz crackers are high in fat). Crackers and cookies should have no more than 3 grams of fat per ounce. Some crackers, such as hardtack and rice cakes have no fat.

**Dried Beans, Peas, Pasta, Noodles, Rice**
* Whole grains and beans are an excellent source of fiber and trace minerals. When these come in prepared mixes, you need to check labels for fat and sodium content. There are pastas available made with no egg yolks.

**Produce**
* Although avocados and coconuts are high in fat, this section is generally low in fat and calories and high in fiber, vitamins and minerals. Some fruits contain pectin, which lowers cholesterol.

In summary, it is very important to read and understand your food labels.

* Ask participants to repeat "Keeping Track of Fat" assignment. Hand out fat-tracking record sheets.
* Turn in Computerized Nutrition Assessments
* Ask for volunteers to bring low-fat dishes for tasting to Session III.
<table>
<thead>
<tr>
<th>Session III</th>
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<tbody>
<tr>
<td><strong>Review</strong> - <em>(10 minutes)</em></td>
</tr>
<tr>
<td><strong>Questions</strong></td>
</tr>
<tr>
<td>* Review and follow-up discussion from Session II, including recipe modification and label reading.</td>
</tr>
<tr>
<td>* In large group identify the type of fat contained in each person's highest fat item.</td>
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<tr>
<td><strong>Assessment and Modification of Personal Eating Patterns that Influence Serum Cholesterol, Blood Pressure and Body Weight:</strong></td>
</tr>
<tr>
<td>* Ask participants to look for:</td>
</tr>
<tr>
<td>- total calories, so that they know how many grams of fat will provide 30% of their calories as fat.</td>
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<tr>
<td>- SMP ratio.</td>
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<tr>
<td>- sorts of SMP fats, so that they can see where these are actually found in their diet.</td>
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<tr>
<td>* Comment on other nutrients (e.g., folacin, calcium, zinc) and importance of balancing the Step-One Diet.</td>
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<tr>
<td>* Have participants write up changes in their diets for both days in order to meet Step-One and U.S. Dietary Goals.</td>
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<tr>
<td>* Go around the group and ask each person to identify the changes in one meal and the reasons for doing this.</td>
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<tr>
<td><strong>Dining Out</strong></td>
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<tr>
<td>* Mention AHA Healthy Heart Dining in this community and display sample menus.</td>
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<tr>
<td>* Ask participants to break into small groups. Each group selects a menu from a local restaurant and will identify the four best selections from this menu. Distribute “Dining Out Without Anxiety.” Participants may use these suggestions in making their selections.</td>
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<tr>
<td>* Small groups report back to large group.</td>
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<tr>
<td>* PREPARATION FOR SUPPORT AND FOLLOW-UP. Buddy system. Remind participants to have cholesterol checked in 3 months and turn in scores to Zest for Life. Remind them that post-test will be mailed.</td>
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<tr>
<td>* Ask participants to complete Program Evaluation</td>
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Appendix H

Handouts for Presentation Regarding Applications of Behavioral Strategies to Dietary Management
SOME SUGGESTIONS FOR EFFECTIVE SELF MANAGEMENT

CHOLESTEROL COUNTDOWN WORKSHOP

1. SELECTING A GOAL

   A. SELECT GOALS FROM STEP ONE DIET. FOR EXAMPLE
      
      REDUCE FAT INTAKE TO LESS THAN 30% OF TOTAL CALORIES
      REDUCE SATURATED FAT INTAKE TO LESS THAN 10% OF TOTAL CALORIES
      LIMIT POLYUNSATURATED FATS TO NO MORE THAN 10% OF TOTAL CALORIES
      INCREASE MONOUNSATURATED FATS INTAKE TO 10-15% OF TOTAL CALORIES
      REDUCE CHOLESTEROL INTAKE TO LESS THAN 300 mg PER DAY

2. IDENTIFY OBJECTIVES RELATING TO SELECTED GOAL

   A. OBJECTIVE SHOULD BE IMPORTANT TO ACHIEVING YOUR GOAL
   B. OBJECTIVE SHOULD BE REALISTIC AND ATTAINABLE
   C. IF OBJECTIVE INVOLVES REMOVAL OF BEHAVIOR, REPLACE IT WITH POSITIVE ALTERNATIVE

3. ANTECEDENT EVENTS

   A. SELF-OBSERVATION: ARE ANY ANTECEDENT EVENTS RELIABLE PREDICTORS OF DESIRABLE UNDESIRABLE BEHAVIOR
   B. ALTER SITUATION TO MAKE UNDESIRABLE BEHAVIOR LESS LIKELY (E.G., REMOVING TEMPTATIONS)
   C. ALTER SITUATION TO MAKE DESIRABLE BEHAVIOR MORE LIKELY (REMINDE RS, SELF MONITORING)
   D. MAKE PUBLIC COMMITMENTS (THIS ALSO ALTERS CONSEQUENCES)

4. ARRANGE CONSEQUENCES IF NECESSARY
A. RELY ON SELF-GENERATED OR SOCIAL CONSEQUENCES FOR DESIRABLE BEHAVIORS

B. ARRANGE MORE CONTRIVED CONSEQUENCES IF YOU ARE NOT MAKING ADEQUATE PROGRESS

C. ACCENTUATE POSITIVE CONSEQUENCES FOR DESIRABLE BEHAVIORS

D. USE NEGATIVE CONSEQUENCES FOR UNDESIRABLE BEHAVIORS AS A BACKUP

5. MONITOR PROGRESS AND REVISE SELF MANAGEMENT PLAN

A. ANTICIPATE AND PREPARE FOR BARRIERS AND LAPSES

B. GRADUALLY ADOPT MORE AMBITIOUS GOALS
SELF MANAGEMENT WORKSHEET

GENERAL GOAL: __________________________________________

________________________________________________________

BENEFITS OF OBTAINING GOAL:________________________________

________________________________________________________

SPECIFIC OBJECTIVE #1:______________________________________

________________________________________________________

CHANGES IN ANTECEDENT EVENTS: _____________________________

________________________________________________________

CHANGES IN CONSEQUENCES: ___________________________________

________________________________________________________

POTENTIAL BARRIERS:_________________________________________

________________________________________________________

SPECIFIC OBJECTIVE #2:______________________________________

________________________________________________________

CHANGES IN ANTECEDENT EVENTS: _____________________________

________________________________________________________

CHANGES IN CONSEQUENCES:____________________________________

________________________________________________________

POTENTIAL BARRIERS:________________________________________

________________________________________________________
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<th>Goal 2</th>
<th>Goal 3</th>
<th>Goal 4</th>
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**Key**

+ = Goal Achieved

+/- = Goal Partially Achieved

0 = Not Achieved

X = Goal Abandoned

Month ____________________________
Appendix I

ANCOVA Summary Table: Group Comparison
Pre-test 1, Group 1 With Pre-test 1
Group 2 With Weight as a Covariate
**ANCOVA Results: Group Comparison: Pre-test 1, Group 1 With Pre-test 1, Group 2 With Weight as a Covariate Based on Actual Values**

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<th>Source of Variation</th>
<th>F-Value</th>
<th>P-Value</th>
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</thead>
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<tr>
<td>Serum Cholesterol</td>
<td>Covariate (Weight)</td>
<td>.025</td>
<td>.876</td>
</tr>
<tr>
<td></td>
<td>Main Effects (Group)</td>
<td>.021</td>
<td>.886</td>
</tr>
<tr>
<td>Total Fat</td>
<td>Covariate (Weight)</td>
<td>.005</td>
<td>.945</td>
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### ANCOVA Results

Group Comparison: Pre-test 1, Group 1 With Pre-test 1, Group 2 With Weight as a Covariate Based on Predicted Values

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Appendix J

ANCOVA Summary Table: Group Comparison
Post-test 1, Group 1 With Pre-test 2
Group 2 With Weight as a Covariate
### ANCOVA Results (Post-Test 1-Group 1/Pre-test 2-Group 2 Between Groups Analysis) Based on Actual Values

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## ANCOVA Results (Post-Test 1, Group 1/Pre-test 2, Group 2 Between Groups Analysis) Based on Predicted Values

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Appendix K

ANCOVA Summary Table: Group Comparison
Post-test 2, Group 1 With Pre-test 2
Group 2 With Weight as a Covariate

105
### ANCOVA Results (Post-Test 2, Group 1/Pre-test 2, Group 2 Between Groups Analysis) Based on Actual Values

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Appendix L

Table of Mean Scores: Experiment One
## Table of Mean Scores: Experiment One

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Appendix M

Table of Mean Scores: Experiment Two
### Table of Mean Scores:
#### Experiment Two

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Appendix N

Repeated Measures ANOVA Summary
Table: Experiment One
One Factor Repeated Measure ANOVA Results: Experiment One (Pre 1-Post 3)

Source of Variation: Within Subjects: Treatment

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One Factor Repeated Measure ANOVA Results: Experiment One (Predicted Scores Pre 1-Post 3)

Source of Variation: Within Subjects: Treatment

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Appendix O

Repeated Measures ANOVA Summary
Table: Experiment Two
One Factor Repeated Measure ANOVA Results: Experiment Two (Pre 1, Pre 2-Post 3)

Source of Variation: Within Subjects: Treatment

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One Factor Repeated Measure ANOVA Results: Experiment Two Predicted Scores (Pre 1, Pre 2 - Post 3)

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<td>Total Fat</td>
<td>1.571</td>
<td>.2194</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>.936</td>
<td>.4544</td>
</tr>
<tr>
<td>Mono Fat</td>
<td>.308</td>
<td>.8706</td>
</tr>
<tr>
<td>Poly Fat</td>
<td>2.576</td>
<td>.0539 **</td>
</tr>
<tr>
<td>Dietary Cholesterol</td>
<td>1.637</td>
<td>.1861</td>
</tr>
<tr>
<td>Food Frequency Quest.</td>
<td>3.582</td>
<td>.016*</td>
</tr>
<tr>
<td>Hassles Scale</td>
<td>2.129</td>
<td>.0973</td>
</tr>
</tbody>
</table>
Appendix P

Behavioral Approaches to Managing Serum Cholesterol: A Review of Nutrition Education and Behavioral Interventions
Behavioral Approaches to Managing Serum Cholesterol: A Review of Nutrition Education and Behavioral Interventions

INTRODUCTION

Coronary Heart Disease (CHD) ranks as the leading cause of death in the United States (McGinnis & Foege, 1993). Although the mortality rate has declined steadily since the early 1960’s (Johnson et al., 1993), the prevalence of CHD persists (DeStefano, Merritt, Anda, Casper & Eaker, 1993). Tsevat, Weinstein, Williams, Tosteson and Goldman (1991) estimate that nearly 5.4 million Americans have symptomatic CHD. In addition over one million people suffer myocardial infarctions in the United States annually (Robinson & Leon, 1994). Of the 500,000 deaths attributed to CHD annually (Tsevat et al., 1991), approximately 41,000 die before the age of 50 (National Center for Health Statistics, 1991). Additionally, the Centers for Disease Control (1986) report that CHD ranks third in years of potential life lost (YPLL) before the age of 65.

The estimated $50 to $100 billion dollar annual cost of CHD in health care expenditures and lost wages (National Cholesterol Education Program [NCEP] Expert Panel, 1993) reflects the epidemic proportions of this problem. This figure includes costs for procedures such as coronary artery surgery, cardiac catheterization, and medication. The five year costs per case for myocardial infarction treatment is $51,211 (LaRosa et al., 1990).

Particularly in the era of health care reform, a reduction in expenditures related to CHD would significantly impact the overall health care budget. Fiscal concerns alone, however, cannot account for the toll in lost productivity and human suffering.
caused by the disease. Not only do CHD patients experience significant life disruption, so also do their life partners, children, coworkers and others closely associated with them. Clearly, CHD represents a major health problem.

Considerable evidence now exists suggesting that reductions in serum cholesterol and dietary cholesterol correlate with a decline CHD mortality (NCEP Expert Panel, 1991). In spite of the persistence of CHD as the leading cause of death in industrialized countries, and the role of serum cholesterol as a risk factor, relatively few studies have described and experimentally evaluated behavioral interventions designed to impact serum cholesterol.

This paper provides an overview of the role of serum cholesterol as a risk factor for CHD, and discusses the relationship between dietary cholesterol and serum cholesterol. A review and discussion of current nutrition education interventions designed to reduce dietary cholesterol consumption extends a review of this literature prepared by Glanz (1988). Additionally, this paper contrasts dietary interventions for obesity and interventions for dietary management of cholesterol, and discusses behavioral strategies for dietary change. Suggestions for future research conclude the paper.

**Physiology of Atherosclerosis and the Role of Serum Cholesterol**

Atherosclerosis is a progressive disorder characterized by the accumulation of plaques in arterial walls that eventually results in CHD. Low density lipoprotein (LDL—a cholesterol rich lipid), foam cells, smooth muscle cells and inflammatory cells (monocytes and T lymphocytes) compose the atherosclerotic plaque (O’Bien & Chait, 1994). Fuster (1993) described the process through which lesions develop in three stages of increasing severity. Initially, at vulnerable points, such as those areas where
arterial branching occurs on the endothelium (lining of the interior arterial cell wall), lipids and monocytes accumulate. O'Brien and Chait (1994) report that the literature suggests that “intimal lipid deposition is the inciting event in atherosclerosis” (p. 42). Subsequently, the ensuing metabolic process causes the additional accumulation of smooth muscle cells on the lesion and “denudation of the endothelium” (p. 60). Finally, unstable “lipid rich lesions” (p. 61) tend to rupture leading to thrombosis. Although other types of arterial plaques exist (e.g. fibromuscular) (Fuster, 1993; Fuster, Badimon, Badimon & Chesebro, 1992), those most likely to rupture are rich in lipids and contain large concentrations of cholesterol (O'brien & Chait, 1994; Richardson, Davies & Born, 1989). O'brien and Chait (1994) provide a comprehensive review of the current understanding of the pathophysiological process of atherosclerosis.

As early arterial deposits are generally difficult to detect, the first actual symptoms of CHD generally occur in middle age in the form of a myocardial infarction (Consensus Conference, 1985). Studies have shown that atherosclerosis can originate in early adulthood or younger. For example, pathology studies of young adult soldiers who died in the Korean War (Enos, Holmes & Byer, 1953) or in the Vietnam War (McNamara, Molot, Stremple & Cutting, 1971) revealed signs of atherosclerosis. Ideally primary prevention of atherosclerosis would preclude initial development of the disease. Presently, risk factor modification appears to reduce mortality from CHD (Neaton & Wentworth, 1992).

**Risk factors for Coronary Heart Disease**

Kannel et al. (1961) first described specific risk factors for CHD, based on data gathered from the Framingham Heart Study. Since 1961, data from the ongoing
Framingham study (Anderson, Castelli & Levy, 1987), the Lipid Clinics Coronary Primary Prevention Trial (Lipid Research Clinics Program, 1984) and the Multiple Risk Factor Intervention Trial (Stamler, Wentworth & Neaton, 1986; Dolecek et al., 1986) have contributed to the delineation of specific factors which contribute to the development of CHD. These risk factors include high levels of total serum cholesterol, high levels of LDL (above 160 mg/dL), low levels of high density lipoprotein [HDL] (below 35 mg/dL), smoking, high blood pressure, diabetes mellitus, severe obesity, female gender after menopause, male gender after age 45, and a family history of CHD (NCEP Expert Panel, 1993). Physical activity appears to contribute to lowered serum cholesterol levels as well, by increasing the HDL level, thus reducing overall CHD risk (NCEP Expert Panel, 1991). Additionally, the ratios of total cholesterol/HDL cholesterol and LDL/HDL levels suggest increased CHD risk as well (NCEP Expert Panel, 1991).

Multiple risk factors tend to have an exponential effect producing greater overall risk than the sum of the effects of individual risk factors (NCEP Expert Panel, 1991). For example, young men and premenopausal women prior to the age of 35 are considered at low risk with LDL levels up to 220 mg/dL; however, the in presence of multiple risk factors, elevated LDL levels in this age range would require treatment (NCEP Expert Panel, 1993).

Serum Cholesterol as a CHD Risk Factor

Longitudinal studies, such as the Framingham Study (Castelli et al., 1986) and the Multiple Risk Factor Intervention Trial (Stamler, Wentworth & Neaton, 1986; Caggiula et al, 1981), during the past 50 years have firmly established the relationship between serum cholesterol levels and coronary heart disease. Thirty year follow-up
data gathered from the Framingham Heart Study indicate that individuals with total serum cholesterol below 180 mg/dL have the lowest overall mortality (Anderson, Castelli & Levy, 1987). Results from the LCCPPT have shown that a reduction of eight percent in total serum cholesterol levels corresponds to a 19 percent reduction in CHD (Lipid Research Clinics Program, 1984). Additional evidence linking cholesterol to CHD comes from studies which show that decreases in cholesterol levels result in a reduction in both risk of cardiovascular events and mortality (Sempos et al., 1989; Lipid Research Clinics Program, 1984).

Prevalence of High Serum Cholesterol Levels in the USA

The NCEP Expert Panel (1991) reports that, based on the National Health and Nutrition Examination Survey, a majority of people have cholesterol levels high enough to increase the likelihood of coronary heart disease. Results from their survey indicated that 25% of people had serum cholesterol levels greater than 240 mg/dL and approximately 30% of Americans had levels between 200 and 239 mg/dL. Sempos et al. (1989) estimated that approximately 40 million Americans between the ages of 20 and 59 years have cholesterol levels which require medical consultation. A more optimistic report, based on information gained from the administrations of the periodic National Health and Nutrition Examination Survey [NHANES] (Johnson et al., 1993), found that levels of serum cholesterol have steadily declined from 1960 through 1991. Specifically, these authors noted that average cholesterol levels have declined from 220 mg/dL to 205 mg/dL. The current national average, however, remains above the NCEP recommended levels for serum cholesterol.
Dietary Cholesterol and Elevated Serum Cholesterol Levels

While research suggests that several factors contribute to elevated serum cholesterol levels, evidence indicates that dietary factors, including dietary cholesterol, saturated fat and obesity heighten serum cholesterol levels (Denke, 1994; Neaton & Wentworth, 1992; NCEP Expert Panel, 1991). Ginsberg (1994) reported that excess dietary cholesterol and fat can overload the systemic metabolism of these substances, thus increasing the LDL and serum cholesterol levels. The Expert Panel (1991) reported that results from the Framingham study indicate that “a lifelong low level of cholesterol is associated not only with a reduced rate of CHD but also with an increased life expectancy” (p. 2177). Other studies, such as the Oslo Heart Study (Leren, 1970) and the Lipid Research Clinics Coronary Primary Prevention Trial [LCRP] (Lipid Clinics Research Program, 1984) demonstrated that dietary interventions corresponded to decreased serum cholesterol levels and reduced incidence of myocardial infarction. Brown (1983) reported that for every 100 mg change in dietary cholesterol, there is a corresponding five mg/dL change in serum cholesterol. Similarly, Denke (1994) noted that early studies reported that changes in saturated fat intake accounted for up to 80% of change in total serum cholesterol levels (Hegsted, McGandy, Myers & Stare, 1965; Keys, Anderson & Grande, 1957).

On a broad scale, Larosa et al. (1990) predicted that if a population wide reduction of ten percent in serum cholesterol levels occurred, a reduction of 20 percent in the incidence of CHD would follow. Additionally, results from the LCRP (1984) suggested that for each one percent decrease in serum cholesterol level, a two percent reduction in risk for myocardial infarction ensues. These figures translate to a .03 to 3.16 year increase in life expectancy and a delay in onset of CHD symptoms of .06 to
4.98 years for reductions in serum cholesterol levels of 5% to 33% respectively
(Grover et al., 1992).

National surveys, however, continue to document that the American diet contains higher than recommended amounts of fat and cholesterol. Recent estimates indicate that the average American male's diet includes a daily intake of 435 mgs of cholesterol with 36% of calories derived from fat (Human Nutrition Information Service [HNIS], 1985). Similarly, the average American female's diet includes a daily intake of 304 mgs of cholesterol with 37% of calories derived from fat (HNIS, 1986). For both genders, approximately 13% of calories come from saturated fat (HNIS, 1986).

The development of effective dietary cholesterol management strategies can have a significant impact on the CHD rate (Glanz, 1988; Jeffrey, 1988). Several reports suggested that a low fat diet can reduce serum cholesterol levels (Sarkkinen et al., 1994; Hunninghake et al., 1993; Ginsberg et al., 1990; Grundy, Nix, Whelan & Franklin, 1986; Thuesen et al., 1986; Schaefer, et al., 1981), and preliminary reports suggest that low fat/low cholesterol diets can diminish or actually reverse the progress of atherosclerosis (Ornish, 1990; Putska et al., 1985). Early studies reported that total and LDL cholesterol levels increase following consumption of saturated fat over several weeks (Hegsted, McGandy, Myers & Stare, 1965; Keys, Anderson & Grande, 1957). Ernst and Cleeman (1988) reported that adherence to the American Heart Association's (1988) Step I Diet (described below) should produce a 10-15% decrease in serum cholesterol levels. Ginsberg et al. (1990) reported a study that contrasted the effects of compliance to the Step I diet with a typical American diet. Adherence to the Step I diet correlated with decreased serum cholesterol levels. Although the sample of medical and dental students may not represent the general population, these results
suggest that for these participants, following the Step I Diet positively affected serum cholesterol.

The NCEP: Recommendations to Lower Serum Cholesterol

The role of serum cholesterol as a strong predictor of CHD prompted the National Heart Lung and Blood Institute to create the NCEP. The NCEP's primary responsibilities include increasing awareness about the harmful effects of excess fat and cholesterol levels in the diet, providing education about strategies to reduce serum cholesterol levels, and encouraging serum cholesterol screenings of persons between the ages of 20-74 (NCEP Expert Panel, 1991).

The NCEP recommends dietary modification as the preferable strategy for reducing serum cholesterol. In 1988, the American Heart Association (AHA) published the Step I and Step II Diets (AHA, 1988), which recommend daily levels of dietary fat and cholesterol intake. The Step I diet recommends a maximum daily intake of 300 mg of cholesterol, and that 30% of calories in the diet come from fat with no more than 10% coming from each of saturated fat, mono-unsaturated fat, and poly unsaturated fat. The NCEP advises that patients follow the Step I diet for 6 months. If no changes in serum cholesterol levels occur, the patient should attempt to follow the slightly more restrictive Step II diet. This diet recommends a maximum daily intake of 200 mgs of cholesterol, and that 20% of calories from fat with fewer than 7% of calories coming from saturated fat. If after six months the Step II diet fails, the treatment protocol recommends pharmacological interventions to reduce serum cholesterol to an acceptable level (Dalen, 1988).

The NCEP's recommendations do not call for the elimination of fat and cholesterol from the diet. Instead the recommendations are similar to low calorie diets.
used to treat obesity by limiting consumption of nutrients or certain foods. The NCEP's dietary recommendations for fat and cholesterol intake allow continued consumption of a variety of foods high in targeted nutrients, although in reduced quantity. For those who consume average amounts of fat (38% of calories from fat) and dietary cholesterol [300-400 mgs] (HNIS, 1986), such modifications are not particularly restrictive. Thus the focus of interventions should involve relatively modest dietary changes.

Aside from pharmacological intervention, the physician's options for treatment of elevated serum cholesterol levels typically include informal dietary recommendations, or referral to a registered dietician (NCEP Expert Panel, 1991). Medical schools, however, generally do not prepare physicians for the role of nutrition educator (Nestle, 1988). Physicians, therefore, may be more likely to prescribe medication prior to trying and evaluating less intrusive dietary intervention. Prescriptions written for drugs which lower cholesterol have dramatically increased over the past seven years (Smith, Song & Sheldon, 1993) suggesting that physicians may use medication as the treatment of choice to lower serum cholesterol. Parenthetically, the NCEP reports that medication is not cost-effective for those with moderately high cholesterol (200 mg/dL to 239 mg/dL) and without additional risk factors (NCEP Expert Panel, 1993). The availability of a more systematic dietary intervention would enable physicians and other health professionals to ensure that they have attempted the least restrictive and least expensive intervention prior to prescribing medication.

Dietary Interventions and Health

Health professionals commonly use dietary interventions to manage various
disorders including diabetes, obesity, and high blood pressure. Dietary programs have received extensive research attention to provide obese patients strategies to lose weight, although problems with recidivism continue to exist (Brownell, 1982, 1993). Comprehensive weight loss programs generally include group therapy, cognitive therapy, nutritional education, nutritional counseling and follow-up contact (Klodner & DeLucia, 1991; Brownell & Kramer, 1989; Kirschenbaum, 1988; Brownell & Wadden, 1986). Interventions commonly include psychotherapy because of the frequent comorbidity between obesity and psychological problems (Foreyt & Goodrick, 1993; Robison, Hoerr, Strandmark & Mavis, 1993). Typically obesity interventions are expensive and time consuming, but do result in weight loss (Brownell & Kramer, 1989; Foreyt, 1987). Patients who participate in multi-disciplinary behaviorally based programs, which incorporate cognitive-behavioral components, appear to successfully reduce weight (Foreyt & Goodrick, 1993; Wadden, Van Itallie & Blackburn, 1990).

**Dietary Management of Serum Cholesterol**

Managing dietary cholesterol intake presents several distinct challenges which can interfere with effective intervention. First, high serum cholesterol, like high blood pressure, requires screening for detection. Unlike monitoring blood pressure, serum cholesterol screening is expensive and more difficult to access. Furthermore, data from serum cholesterol screening, typically include total serum cholesterol, HDL, LDL and the ratios of the above. These results can be confusing and may require interpretation by a health professional. Alternatively, a person can easily measure weight changes, and blood pressure screening is easily and accurately evaluated.

Second, whereas caloric information on food labels is often clear, cholesterol
and fat information tends to be complicated, requiring the consumer to know the number of calories per gram of fat (nine calories per gram of fat) in order to calculate the percentage of calories attributable to fat. Additionally, the American Heart Association (1988) and the NCEP (Expert Panel, 1993) recommend that the consumer attend to three different types of fat as well as the total value, which can be confusing and increases the number of calculations required. Further consumer confusion could occur because some dietary fats are more damaging than others. Consequently, accurately tracking cholesterol and fat intake often involves a nutritional analysis of the formulation of food products, a traditionally time consuming and expensive process. Although the Food and Drug Administration recently implemented labeling changes which have improved label clarity regarding nutrient contents of foods (Denke, 1994), the difficult process of determining percentages of calories from dietary fat remains an issue. In contrast, tracking total caloric intake is generally less elaborate and patients can more easily count calories at home.

Third, individuals with elevated serum cholesterol levels are generally asymptomatic and, therefore, may not be aware of the health risk this condition presents. Other health problems, such as obesity and diabetes mellitus, often have readily discernable symptoms that motivate those afflicted to seek professional help or to adhere to a treatment regimen that may involve medication or diet management. Unfortunately, people have difficulty estimating their serum cholesterol levels (Smith, McKinlay & McKinlay, 1991), even when these levels are elevated. Tragically, the first indication that elevated serum cholesterol levels exist for many is the occurrence of a major cardiac event such as a myocardial infarction. Like other asymptomatic diseases, motivational variables to seek serum cholesterol testing or to initiate dietary changes are generally absent or ineffective.
Finally, dietary management strategies require reduction in the consumption of high fat foods many of which are highly palatable, require minimal preparation, and are readily available to consumers. As a result, reduction in dietary intake of fat necessitates limitation of highly reinforcing foods that are convenient and that have a long history of reinforcement for many people. Unfortunately, there are few naturally occurring reinforcers for reducing fat consumption to offset the punishing consequences of avoiding high fat foods. Because serum cholesterol reductions are not readily discernable, an alteration of physical symptoms cannot act as naturally occurring reinforcers for dietary modification. Furthermore, the consequences for switching to low fat foods typically involve some response effort to locate and prepare such foods. While a thorough review of the factors that determine food preference is beyond the scope of this paper, efforts to develop a taste for a whole new class of foods is a formidable task.

Despite these problems, dietary changes are possible. Continuing development of foods which are palatable yet low in fat and cholesterol make dietary changes less bothersome. For example, consumers can now purchase fat and cholesterol free mayonnaise with reportedly little difference in taste from regular mayonnaise. Additionally, the recent legislation requiring food labeling changes to increase label specificity and accuracy (Denke, 1994), may make the nutrient information more accessible to consumers and ideally reduce consumer confusion regarding levels of fat and cholesterol in foods. The dietary changes required to lower serum cholesterol levels should be amenable to the type of brief, educationally-based interventions described below.
Nutrition Education Interventions

Nutrition education is an important strategy for dietary change. Glanz (1985) reported that nutrition education programs present information about food choices and consumption, increased utilization of healthy food resources, and the effects of food sources that are detrimental to health. Glanz (1985) noted that nutrition “interventions are usually designed to encourage voluntary behavior in free living patients or at risk individuals who are either self-referred or referred by a medical professional” (p. 721). Current cholesterol reduction interventions have incorporated these educational components in promoting dietary change.

Empirical support exists in the literature for educational approaches to serum cholesterol management (Glanz, 1988). Several studies have examined the effect of nutrition education on serum cholesterol levels. Typically, the literature suggests that these interventions result in decreased serum cholesterol levels. Glanz (1988) raised several issues which the literature has yet to address including the optimal length of interventions, the amount of involvement required from various health care professionals, and the contribution of specific components in education based cholesterol management interventions. Additionally, the studies reviewed by Glanz (1988) generally did not systematically use behavioral techniques, such as goal setting and contracting, despite effective use of these strategies by health care professionals for other nutrition related disorders.

Review of Current Educational Strategies to Decrease Dietary Cholesterol Consumption

Overview

The following section examines the current state of the literature regarding the
effectiveness of nutrition education and behavioral strategies to modify dietary patterns regarding cholesterol and fat consumptions in individuals with elevated serum cholesterol levels. The steps involved in achieving and maintaining a diet low in cholesterol and saturated fat are the primary focus. A review of nutrition education strategies designed to teach dietary cholesterol reduction appears below. This section updates a review of this area by Glanz (1988). Studies selected for review meet criteria similar to those used by Glanz (1988). These include (1) an identified elevated serum cholesterol level; (2) the delineation of a nutrition education program focused on dietary cholesterol reduction; and (3) the inclusion of participants at risk for CHD, but not having identified coronary problems thus directing the focus of the review to outpatient interventions.

According to the NCEP Expert Panel (1991), "the goal of the NCEP is to reduce the prevalence of elevated blood cholesterol in the United States thereby contributing to the reduction of CHD morbidity and mortality" (p. 2158). The NCEP (1993) has concluded that "dietary therapy remains the first line of treatment of high blood cholesterol p. 3015." In a recent review of this literature, Glanz (1988) noted that although people in the US are more aware of healthy dietary practices, they have had difficulty when required to "apply specific dietary advice to their food choices (p. 240)." Glanz (1988) suggested that the goals of nutrition education are "primarily to build a knowledge base and enhance skills for adherence" (p. 251).

The two major approaches to reducing dietary intake of cholesterol are individualized and population-based interventions (NCEP Expert Panel, 1991). Typically, individually focused interventions take the form of counseling or small group educational meetings and include dietary analysis and serum cholesterol measurement. These interventions are often offered in a clinical setting or at the
worksite. In contrast, population strategies are usually community or nationally based, and include media campaigns, accessible public cholesterol screenings and brief nutrition education programs presented either didactically or in written form.

The NCEP Expert Panel (1991) defined the important steps involved in serum cholesterol management including awareness, detection and follow-up, and adherence to dietary recommendations. Glanz (1988) elaborated the awareness and detection issues and the reader will find this a comprehensive review of these topics. This paper addresses current dietary cholesterol intervention issues.

The literature review presented below evaluates current nutrition education research designed to reduce consumption of dietary cholesterol and fat. This paper updates the review by Glanz (1988) and considers similar categories of interventions. These categories include small group interventions in outpatient settings, worksite and community interventions. The current review also focuses on applications of behavioral technology, a topic not specifically addressed by Glanz (1988). Additionally, the review incorporates strategies which are useful in the treatment of obesity and discusses how they might also be useful for dietary cholesterol interventions.

As this paper focuses on dietary interventions, it does not review medical, pharmacological and exercise strategies designed to modify serum cholesterol. The reader is referred to other sources for this information (Hunninghake, 1994; Larsen & Illingworth, 1994; Johnson & Greenland, 1990; NCEP Expert Panel, 1991).

**Small Group Interventions in Outpatient Settings**

Small group interventions are generally outpatient clinic based programs developed to provide intervention to people identified with high serum cholesterol
levels. There are relatively few such programs reported in the literature, which is surprising considering the high rates of elevated serum cholesterol levels and the efficacy of similar dietary interventions reported in the obesity literature. Table 1 presents a summary of small group interventions.

The Multiple Risk Factor Intervention Trial [MRFIT] (Dolecek et al., 1986; Caggiula et al., 1981) continues to be the most comprehensive intervention program utilizing nutrition education to modify dietary intake of cholesterol. This longitudinal study utilized group sessions and individual counseling techniques emphasizing changes in shopping, cooking and eating behaviors. Families were also included and periodic monitoring took place during a six year time period. Professionals provided participants with dietary recommendations in three categories: "OK as is," "Once in a while," or "Avoid" in outpatient settings. Follow-ups to MRFIT reported serum cholesterol reductions of 7.5%, a rate which participants sustained six years at a follow-up assessment. This study was the first large-scale attempt to address elevated serum cholesterol through dietary management. The success of this demonstration has promoted additional research in this area.

Typically, education based dietary interventions utilize small groups which allow for efficient dissemination of information. McMurray et al. (1991) used a small group, family oriented intervention provided to individuals with hypercholesterolemia. The intervention included 13 class sessions which took place over six months. The classes focused on "dietary action goals, cooking demonstrations, food tasting and cholesterol screening" (p. 57), while emphasizing a very low fat/cholesterol diet. In addition, participants described three dietary goals they chose to incorporate into their lifestyle. Case reports on 49 participants who completed at least four classes following the intervention indicated statistically significant reductions in total cholesterol levels.
<table>
<thead>
<tr>
<th>Study/Participants</th>
<th>Design</th>
<th>Intervention</th>
<th>Dependent Variables</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singleton et al. (1988)</td>
<td>Quasi-experimental design; no random assignment to groups; study used a control group; Treatment participants were older, had higher cholesterol levels and weighed more</td>
<td>Tx Group: Behavioral contract; incentive for adherence; 3 individual counseling sessions; nutrition education</td>
<td>Dietary analysis based on 24 hour dietary recall, serum cholesterol, self-reported dietary adherence</td>
<td>30 of 51 participants were considered to have adhered to the AHA dietary guidelines -- the 28 dietary &quot;adherers&quot; achieved a significant decrease in serum cholesterol at follow-up -- adherer's more likely to participate in health related activities</td>
</tr>
<tr>
<td>Foreyt, Scott, Mitchell &amp; Gotto (1979)</td>
<td>Experimental design: Random assignment to 3 treatment groups with one group serving as a usual care treatment control group</td>
<td>Treatment Group 1: 17 hour nutrition education sessions Treatment Group 2: 17 hour long sessions incorporating behavioral principles including self-monitoring, stimulus control and contingency management Comparison Group: received copy of diet without professional contact</td>
<td>Serum Cholesterol levels measured at baseline, 3 months, 6 months and 12 months post-intervention</td>
<td>183 out of 255 completed the study Group 1 and 2: Statistically significant improvements at 3 and 6 months (p&lt;.001) and at 1 year (p&lt;.05) Comparison Group: Statistically significant improvements at 3 months and 6 months; no statistically significant changes at 12 mos.</td>
</tr>
<tr>
<td>Murray D. et al. (1990)</td>
<td>Experimental design: Random assignment to 4 treatment groups with group 4 serving as a treatment control group</td>
<td>Group 1: Eight Nutrition education classes plus food sampling component Group 2: Same as group 1 without the sampling component Group 3: Eight nutrition education classes focusing on weight management Group 4: Fitness focused control group</td>
<td>Serum cholesterol levels measured baseline, post-intervention and 1 year follow-up.</td>
<td>Nearly significant reductions in cholesterol for group 2 and 3 (p =.066) --excluding 39 participants who missed classes, statistically significant differences between experimental and control groups were observed.</td>
</tr>
</tbody>
</table>

Table 1: Clinically Based Small Group Interventions Utilizing Nutrition Education
Table 1 (continued): Clinically Based Small Group Interventions Utilizing Nutrition Education

<table>
<thead>
<tr>
<th>Study</th>
<th>Intervention Group</th>
<th>Comparison Group</th>
<th>Package Intervention</th>
<th>Serum Cholesterol Levels</th>
<th>Education/Usual Care</th>
<th>Follow-up</th>
<th>Significant Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ornish et al., (1990)</td>
<td>28 participants</td>
<td>20 patients</td>
<td>1) very low fat/low cholesterol diet, 2) aerobic exercise (3 hours per week), 3) Stress management including imagery and relaxation, 4) support group</td>
<td>Serum cholesterol levels; angigrams; Self-report measures</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Groth et al. (1991)</td>
<td>49 participants referred by physician</td>
<td>None</td>
<td>Four 2.5 hour weekly classes</td>
<td>Pre-post (prior to 4th class) measures of serum cholesterol, LDL-cholesterol, triglycerides, HDL-cholesterol</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Wiist and Flack, (1990)</td>
<td>174</td>
<td>174 Black Americans</td>
<td>Education: Six 1 hour classes focused on low fat food substitution; food sampling, shopping, label reading, eating in restaurants, nutrition and cholesterol education pamphlets distributed</td>
<td>Serum cholesterol measures: Pre-Post serum cholesterol measurements</td>
<td>Both Groups: Total serum cholesterol levels decreased significantly from baseline to follow-up. Education Group: 233.9 mg/dL to 210.4 mg/dL Usual care group 241.5 mg/dL to 202 mg/dL</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
Researchers pooled the data from 31 different educational groups. Out of 336 participants only 49 attended all four class meetings. The absence of an experimental design and the poor attendance rate to class sessions limits the generalizability of conclusions drawn from this study.

In other studies researchers have attempted to utilize short-term nutrition education interventions to reduce dietary intake of serum cholesterol. Groth, Kirk, and Alvin (1991) developed a four week course (2.5 hours a week) which emphasized a diet low in dietary fat and cholesterol. The course was designed for physician referred patients with elevated serum cholesterol levels. Participants in this clinical trial demonstrated statistically significant reductions in serum cholesterol (p<.003) at a one year follow-up; however, these results are especially difficult to interpret because the authors used different blood sampling protocols obtained from the participant’s personal physician. Different sampling procedures can add variability to the serum cholesterol measurements (National Heart, Lung and Blood Institute, 1989).

Murray, Kurth, Mullis, and Jeffery (1990) reported an adequately controlled intervention which contrasted the effects of a nutrition education intervention to reduce cholesterol with a weight management intervention. A fitness program served as a control group. The cholesterol intervention focused on food selection and preparation methods while the weight management group focused on changes in eating patterns and increased activity levels. Using a randomized repeated measures experimental design, the authors offered four weekly two hour class sessions to participants with elevated serum cholesterol levels. Results indicated that mean serum cholesterol levels did decrease in the treatment groups, although these changes did not vary significantly from the control group. At a one year follow-up, a mean total serum cholesterol decrease of 4% had occurred. Data from a 24 hour dietary recall did not indicate
statistically significant changes between groups. This intervention did not utilize specific behavioral change strategies.

Wiist and Flack (1990) reported a study in which subjects participated in cholesterol screening and received nutritional information about low cholesterol and low fat diets. A unique feature of this intervention was that investigators recruited participants from a church congregation. Half of those identified with elevated cholesterol levels participated in a six week nutrition education class. The class included information on CHD risk factors, food preparation, label reading and eating at restaurants. Participants in the nutrition education group were members of one church while those in the “usual care” comparison group were members of several different churches. Only 48% of participants attended more than three of the six sessions. Results indicated that a significant decrease in cholesterol levels occurred for both groups (p<.0001); however, only 36% of participants from the control group and 75% of participants from the experimental group returned for follow-up. The differential rates of attrition for each group limits comparisons between groups. Although 44 out of 174 participants from the education group did not return for rescreening, the results for those who did return from were encouraging, particularly because most attended a limited number of education sessions.

Foreyt, Scott, Mitchell, and Gotto (1979) described a seventeen session, dietary intervention to reduce serum cholesterol. The intervention included nutrition education components similar to those described by Glanz (1985) combined with a behavioral component which included self-monitoring, stimulus control and contingency management strategies. Researchers contrasted the nutrition education intervention with an identical nutrition education intervention coupled with the behavioral strategies. Results indicated statistically significant positive serum
cholesterol changes compared to baseline in both the nutrition education \( (p<0.001) \) and behavioral group \( (p<0.001) \) at three and six month follow-up measurements. Although the changes were less substantial at a one year follow-up, they remained statistically significant \( (p<0.05) \) for both groups. Additionally, the behavioral group experienced more consistent reductions through the six month post-intervention period whereas serum cholesterol levels for the other group increased. A feature of this study was that it recruited volunteers with serum cholesterol levels in the low borderline range and demonstrated that at least for six months they could reduce these levels to the desirable range. For example, the behavioral group reduced mean levels from 212 mg/dL to 199 mg/dL. This study did not, however, measure changes in dietary consumption of targeted foods including those high in saturated fat and cholesterol.

Ornish et al. (1990) reported an intensive approach designed to reverse symptoms of CHD. The intervention required participants with advanced CHD to consume a very low cholesterol and low fat vegetarian diet, engage in frequent aerobic exercise, participate in group support sessions and utilize stress reduction techniques (i.e. meditation). The intervention included a week long retreat during which couples and significant others received instruction regarding the Lifestyle Heart Program. The results indicated significant improvements on coronary angiography profiles, total serum cholesterol \( (p<0.01) \) and LDL cholesterol \( (p<0.007) \), as well as statistically significant reductions in dietary fat \( (p<0.0001) \) and cholesterol changes \( (p<0.0001) \) when compared to control subjects receiving typical care. Measures of adherence suggested that participants managed to maintain the recommended lifestyle changes for one year. This study represents an intensive and expensive intervention for seriously ill patients. Additional demonstrations with patients experiencing less severe symptomology are needed to evaluate the broader utility of this intervention.
Summary: Small Group Interventions in Outpatient Settings

Results from the clinic based interventions reviewed above generally reported some success managing dietary cholesterol through various nutrition education programs. The interventions reviewed had several similar components including low fat/cholesterol food tasting, restaurant menu review and instruction regarding the interpretation of food labels and dietary analysis. Generally, all studies reported a decrease in serum cholesterol levels. The intensive study presented by Ornish et al. (1990) reported significant improvements in dietary consumption of low fat and low cholesterol foods and reduced serum cholesterol levels. The study by Foreyt et al. (1979) was the only to specifically utilize behavioral strategies (i.e. Stimulus control techniques, contingency management) which correlated with consistent changes in serum cholesterol. Additionally, this study was the only one to reduce serum cholesterol levels to the desirable range as defined by the NCEP Expert Panel (1993), although the participants’ baseline levels were initially close to targeted levels.

Most small group outpatient studies evaluated package interventions. Only the study by Murray et al. (1990) considered the efficacy of a single intervention component (food tasting). Interestingly they found that the group with the food tasting component as part of the intervention package was less successful than the identical group without the food tasting component at reducing cholesterol levels. The authors attributed this finding to problems with the quality of the prepared food and suggested that future interventions should control for this component closely. Other components of these package interventions may deserve critical review as well. This would allow such time limited interventions to focus on strategies with the most significant impact on dietary change.

A consistent methodological problem in these studies relates to participant
attrition. Typically, a substantial number of participants in each study did not complete the intervention. This may seriously limit the generalizability of this research, particularly because, these interventions often use small numbers of participants. An analysis of differences between those who complete the intervention and those who only participate in a limited part of the intervention may provide useful information to assist in improving participant contact with the intervention.

**Worksite Interventions**

Worksite programs designed to reduce employee cholesterol levels have become increasingly popular (Glanz & Seewald-Klein, 1986). In a review of worksite health promotion interventions, Glascow, McCaul and Fisher (1993) noted that worksite interventions are fashionable because of the opportunity to reach a significant number of people consistently and reach those who typically may not practice health oriented behaviors. Additionally, the worksite provides people with a built-in support group, situations involving food choices and eating, and opportunity for follow-up investigations (Glanz & Sewald-Klein, 1986). Fielding and Piserchia (1989) suggested, however, that only 16% of reported worksite health promotion activities target nutrition education and weight control. Considering the impact of cholesterol on health and the efficacy of behaviorally oriented education programs on weight control, this is a surprising result. Summaries of recent worksite investigations appear in Table 2.

Combinations of individualized and group education are well suited for the worksite environment. Baer (1993) implemented a worksite nutrition education program which provided a year long individualized approach including bimonthly contact with a nutritionist, group meetings to review dietary strategies, and monthly
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<tr>
<td>Baer, J. (1993) 70 management level employees participated Experimental group n=33 Control group n=37.</td>
<td>Quasi-experimental Non-randomized groups; Group assignment based on willingness to participate Age and cholesterol level differences between groups present at baseline.</td>
<td>Package including -individual 90 minute nutrition counseling session involving an explanation of the Step-1 Diet, setting dietary goals, information about exercise; monthly phone contact, and group meeting once every three months also took place.</td>
<td>Serum cholesterol; Dietary analysis based on a three day food record; Self-reported physical activity (aerobic).</td>
<td>Significant reductions with in groups of cholesterol levels (444 mg/dL to 304 mg/dL) and decrease in fat intake from 38% to 31% of calories from fat at 1 year follow-up. No changes were reported in the control group. Statistically significant changes in physical activity occurred for the intervention group.</td>
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<tr>
<td>Hartman, J. et al. (1993) n=91; City employees of Phoenix, AZ.</td>
<td>Experimental design; Randomly selected intervention sites and control sites randomly assigned; Investigators invited employees with elevated serum cholesterol levels to participate.</td>
<td>Nutrition Education Program --Five 2 hour seminars regarding food preparation, CHD, nutritional values etc. --6 bimonthly individual counseling sessions with a registered dietitian.</td>
<td>Non-validated pre-post intervention questionnaire</td>
<td>Demonstrated statistically significant eating pattern changes according to responses on the questionnaire —significant changes in total cholesterol, LDL, and triglyceride levels.</td>
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<td>Briley, M. et al., (1990) 40 Police department employees agreed to participate; 24 completed the study.</td>
<td>Quasi-experimental design, no control group.</td>
<td>Fleischman's Cholesterol Management Program: eight 1/2 hour sessions --utilized &quot;eating pattern messages&quot; including directives about food choices, portions and preparations.</td>
<td>Serum cholesterol levels; Dietary analysis.</td>
<td>Demonstrated a significant reduction in dietary fat (41% of energy from fat to 36%, and decreased cholesterol intake (405 mg/day to 295 mg/day).</td>
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<td>Blankc, Stanek, &amp; Stacey, (1990) 22 participants; employees of Union Pacific Railroad and participating concurrently in the company's fitness program.</td>
<td>Quasi-experimental design; random assignment, no control group.</td>
<td>Eight 1/2 hour cholesterol education classes; dietary information; nutrients, fats and cholesterol, reading recipes, food tasting, and eating out; Group 2: Spouses participated in the classes.</td>
<td>Serum cholesterol levels; Dietary analysis.</td>
<td>Group 2 had significantly lower caloric, saturated fat and cholesterol intakes than Group 1 had statistically significant serum cholesterol levels decreases occurred in both groups from pre to post.</td>
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phone calls to participants. Out of 70 employees who met the criterion for inclusion in the study (elevated serum cholesterol levels), 33 agreed to participate. The remaining 37 functioned as control subjects. The author reported statistically significant reductions in serum cholesterol levels (p<.05), dietary intake of fat (p<.05) and cholesterol (p<.05) between baseline and post-intervention measurements for participants compared to no changes on either dietary fat, dietary cholesterol or serum cholesterol variables for the control subjects. Low return rates of dietary records by control participants limit dietary comparisons between groups because only 15 out of 37 control subjects returned the follow-up dietary record.

Worksite interventions designed to reduce cholesterol intake often attempt to create support among spouses and other participants. In a recent report, Blanke, Stanek, and Stacy (1990) found that participants whose spouses also volunteered for a worksite nutrition education course reduced dietary cholesterol (p<.01) and total fat consumption (p<.05) significantly more than those who simply received nutrition education. Both groups, however, achieved statistically significant reductions in serum cholesterol (p<.05). Only half of the eligible subjects agreed to participate, suggesting that the groups did not represent the sample studied.

Using a small group intervention, Briley, Montgomery, and Blewett (1990) evaluated a twelve month nutrition education program in a police department. These authors reported that participants significantly reduced dietary fat and cholesterol intake. Out of 40 initial participants, only 24 completed the study, an attrition rate described as "exceptional" (p. 66) by investigators because of the participants' job stress and work schedules. The intervention consisted of five seminars lasting approximately two hours each. In addition, participants received six hours of individual dietary counseling at bimonthly intervals. Participants set short and long
term goals during these sessions. Additional dietary and psychological services were available to participants, although investigators did not describe the frequency of use of these services. Results indicated significant reductions in total fat intake ($p < .05$), from a mean of 41% of calories derived from fat to 36% of calories derived from fat. Additionally, significant mean reductions ($p < .05$) in daily cholesterol intake (405 mgs to 295 mgs) occurred as well. While results for those participants who completed this study were positive, several questions remain including concerns about differences between those participants who failed to complete the study and those who did, and the effect of stress on serum cholesterol levels. Additional research in similar high stress settings should also consider using other agencies for experimental control settings, or use measures of stress to monitor this variable in relation to serum cholesterol.

Few worksite interventions have systematically considered or measured specific dietary behaviors. A recent study addressed this problem by using "eating pattern messages" to give specific directives for behavior change (Hartman, McCarthy & Himes, 1993). These authors defined eating patterns as “specific food choices and frequencies “(p. 1120). Each message involved one food item and included “directives on choosing what foods to eat, what an appropriate portion size is, or how and when to prepare a food” (p. 1120). Based on statistically significant pre-post-intervention changes on 11 of 15 responses to a questionnaire ($p < .05$), participants appeared to improve their dietary behavior. Positive results led to conclusions that a nutrition education program using such messages can effectively encourage changes in dietary behavior. This study is atypical in cholesterol education research because of the authors’ decision to focus on individual dietary behaviors rather than the combined effect of the overall nutrition package. Their conclusions may be limited, however, because the behaviorally focused "messages" were somewhat ambiguous. For
example, evaluating participants’ ratings of statements such as, “order a regular hamburger instead of a specialty burger” (p. 1121), which participants rated on a scale of 1 (usually) to 4 (never) is difficult. These messages may have had a variety of meanings for different participants. Anchoring the scale in discrete units/frequencies with clear definitions about food choices might have decreased any response variability among the participants.

**Summary: Worksite Interventions**

In Glanz’ s (1988) review of four worksite intervention strategies, two utilized experimental designs and two studies were non-randomized trials. Similarly, the worksite interventions summarized here utilized quasi-experimental designs or used non-randomized clinical trials, and did not employ rigorous controls. Employees were typically invited to participate based on elevated serum cholesterol levels, although typically, only half of those eligible participated.

A problematic issue common to worksite cholesterol education research involves the characteristics of participants recruited for worksite health promotion programs. Zavela et al. (1988) conducted a survey of 2503 employees at the University of Oregon to evaluate the health status of those who participate in worksite health promotions. Approximately 50% of those solicited responded. Based on these surveys, investigators determined that no lifestyle differences existed between individuals who expressed interest in participating in health promotion programs, and those who expressed no interest. Additional information of this nature will continue to develop the information base about characteristics of those who choose not to participate in such interventions. Surveys of employees who do not participate may provide useful information in reaching similar employees in the future. Information
about those who choose not to participate may be accessible at worksites and should be explored. The worksite is a useful place to gather such information because respondents are generally available as a captive audience.

Attrition from employee programs is also problematic and weakens experimental designs. A 30% drop-out rate was reported and considered to be acceptable based on Glanz and Seewald-Klein's (1986) review of 23 worksite nutrition education studies where subject completion rates were between 30% and 60%. This rate of non-completion is problematic at best for research designs lacking control groups and for which subject participation rates may reflect a biased sample. Variables related to participation, such as those reported by Zavela et al. (1988) including age and perceived health risk, should be closely scrutinized prior to simply the accepting the substantial attrition rates. Furthermore, assessment at follow-up of participants who do not finish interventions should be possible at worksites since these employees are present at the worksite regularly. This may provide information about persons who do not complete these interventions, and depending on the number and amount of treatment received, may provide information about a critical amount of intervention required for change to occur.

It is likely that companies involved in workplace health promotion may indirectly inhibit the use of rigorous experimental design and control groups. As Glascow, McCaul and Fisher (1993) noted, the company’s resources and expected time commitment by the employees of the company will exert some influence on the likelihood of employee participation. A company providing a service to its employees may have an interest in making that service available to all its employees, particularly if there is additional incentive to provide such services from the company’s insurers. The competing company interests may also interfere with the use of a no-contact
control group, or a comparison of two types of treatment.

Additional research utilizing stronger designs is needed as the worksite seems to be ideally suited for cholesterol management programs. Because of the self-contained nature of the worksite, goal and incentive based programs are relatively easy to implement and control with the support of management (Glanz & Seewald-Klein, 1988). Support from fellow employees and reduction in health care costs are additional benefits gained at worksites.

**Community Interventions**

Community interventions promoting reduction in dietary cholesterol generally function to encourage large numbers of individuals to participate in cholesterol screening where they then learn about the beneficial effects of a low fat/low cholesterol diet. Community serum cholesterol screening and education typically takes place in public places such as grocery stores or malls. The nutrition education component often involves literature distribution and occasionally brief individual counseling and dietary analysis as well. Community-based interventions usually provide two screenings and information about dietary changes to reduce cholesterol and fat intake. Table 3 summarizes community-based interventions.

In a typical broad based community intervention, James, Van Beurden, Tyler, Henrikson, and Ash (1991) implemented cholesterol screening and brief dietary counseling. Screening took place in shopping centers and in community mental health centers at a cost of two dollars each. Of the participants initially screened, 41% had elevated total cholesterol levels. Researchers invited participants with elevated serum levels to return for a follow-up rescreen. At a four month follow-up, 59% of those participants with elevated serum cholesterol returned for rescreening. Results indicated

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<tr>
<td>James, et al., (1991) Community Trial n=9076</td>
<td>Clinical trial in a community setting</td>
<td>Dietary counseling providing five brief recommendations to lower fat and cholesterol intake, and recommendations to see personal physician.</td>
<td>Initial and follow-up Serum Cholesterol measurements</td>
<td>59% of participants with elevated cholesterol levels returned for a re-test. Results at retest showed a reduction of 9.9% in total cholesterol levels in these participants at follow-up.</td>
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<td>Lackey, C.J. et al. (1992) Site A: n=201 Site B: n=181 Both groups were self-selected from rural U.S. communities</td>
<td>Quasi-experimental design; no control group; no differences in health or demographics between the two rural groups.</td>
<td>Site A: Individual dietary analysis (24 hour recall method); review of analysis, selected changes they would be willing to make Site B: Viewed diet education videotape; selected changes they would be willing to make</td>
<td>Post-test response to questionnaire</td>
<td>50% of participants responded in both groups. Self-reports of behavior change ranged from 56-100% for both groups depending on the selected behaviors</td>
</tr>
<tr>
<td>Murray, D. et al. (1986) Treatment Group: n=379 Control Group n=478</td>
<td>Post-test only design: includes random assignment to treatment and no-contact control groups. Pre-test measure for the experimental group; no pre-test for control group.</td>
<td>Participants were screened for serum cholesterol levels, blood pressure and other physical measures: when each measurement was taken, subjects received health education messages focused on reducing dietary fat and cholesterol intake, exercise, and reduce smoking</td>
<td>Serum Cholesterol, blood pressure, resting heart rate, and selection of meals in restaurants.</td>
<td>88.6% rescreen rate for treatment group Treatment group: Significant reduction in cholesterol level from pre to post-test (207.7 mg/dL to 201 mg/dL) Significant difference from control group at follow-up: Ex Grp: 201 mg/dL Ctr Grp: 205.1 mg/dL</td>
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that participants successfully reduced serum cholesterol (p<.001) to a mean of 226 mg/dL.

Large scale interventions have examined the effect of media campaigns on communities. The Stanford Three Community Study (Farquhar et al., 1977) contrasted the effect of a media based information campaign and an intensive face-to-face nutrition education program, with media based cholesterol management intervention and a control community. Results indicated that significant reduction in serum cholesterol levels occurred in the intervention communities. Interestingly, at the two year follow-up, the differences between those who had participated in the face-to-face education component and those who had only come into contact with the media campaign had diminished. As Brownell and Wadden (1986) noted, this is a significant finding because it suggests that information passed through the media may be as effective as more time consuming intensive nutrition education strategies. Other community interventions have shown similar results although these studies were not well controlled (Lefevbre et al., 1986; Murray et al., 1986; Lackey, Kolasa & Horner, 1992).

The Pawtucket "Know Your Cholesterol" screening program (Lefevbre et al, 1986) is an additional example of a large scale community program. In this non-randomized comprehensive community trial which included a newspaper campaign, recipe contests, and nutritional counseling, 600 people successfully lowered their cholesterol levels an average of 29 mg/dL at the two month follow-up screening. The results were difficult to interpret in that of the 1050 originally screened, 423 participants actually experienced an increase in serum cholesterol levels. Additionally, 1/3 of the original participants did not return for the follow-up screening, seriously limiting conclusions based on this study. Improvements in follow-up procedures and
descriptions about the characteristics of those whose serum cholesterol levels increased would strengthen the findings from this study. Lefevbre et al. (1986), however, reported that participation doubled pre-screening estimates and considered the effort to be successful in its purpose to educate people about their cholesterol levels and demonstrate reduction. Lefevbre et al. (1986) concluded that community education campaigns can effectively promote the benefits of reduction in serum cholesterol levels, and are particularly important because 60% of the individuals screened had elevated cholesterol levels.

A community intervention conducted in two rural communities (Lackey, Kolasa & Horner, 1992) compared video and live nutrition counseling in conjunction with a cholesterol screening program. These investigators asked participants to identify dietary changes they could make. Results were based on responses made to a questionnaire six weeks after the screening. Participants received a list of dietary modifications they had agreed to make and asked if they had made those changes. The results, based on a 50% questionnaire return rate, indicated that both groups achieved similar dietary changes and that 90% of the sample returning the questionnaires adopted changes such as using margarine rather than butter. The investigators concluded that the video method may be preferable in this setting because of the time intensive nature of individualized dietary analysis.

While this study had serious methodological problems, including significant differences between respondents at follow-up regarding age and body fat proportions, suggesting that the conclusions drawn may be premature, the concept of using video packages to deliver nutrition information at cholesterol screening sites has merit. It is clear that dietary analysis and nutrition education programs are time consuming for the professional and the participant and that alternatives, particularly those involving
materials the participant could keep at home for reference, would be useful. If additional research with stronger experimental controls indicates support for video-based nutrition education at community cholesterol screening sites, this may provide health professionals with a very useful cost effective strategy. This would, for example, reduce the need for professionals to repeat answers to typical nutritional questions related to a low fat diet and instead, concentrate on more complex or individualized questions.

**Summary: Community Interventions**

Community education programs appear to offer relatively effective strategies to increase knowledge and awareness about serum cholesterol and the effects of a diet low in fat and cholesterol. The strategies have the capability to reach large numbers of people who might otherwise not become aware of their serum cholesterol status. The cost effectiveness of such programs provides additional rationale for their use. Further support comes from studies which report that simply screening serum cholesterol levels in a community setting effectively improves knowledge and self-report dietary change (Stockbridge, Hardy & Glueck, 1989).

Future research should focus on improved experimental methodology to improve generalizability of results, particularly in relation to representative samples, and ensuring that a majority of participants who agree to participate come into contact with the intervention. Research efforts should also address maintenance issues to determine the strength of the effects this type of intervention, and the likelihood that such screenings will prompt visits to personal physicians and long lasting dietary changes.
Behavioral Technology and Nutrition Education for Cholesterol Management

Overview

The strategies using nutrition education to manage serum cholesterol have typically not introduced behavioral strategies to encourage and maintain change. Instead, this literature indicates that educational strategies have focused on providing information about the risk involving high fat/high cholesterol diets, and the nutrients participants should choose or avoid.

Several authors have realized the need for implementation of behavioral strategies to manage serum cholesterol. In her review, Glanz (1988) noted that "effectiveness of patient education interventions should be measured in terms of client behavior; in this case, adherence to a low fat eating pattern" (p. 249). Few studies, however, have actually used behavioral strategies to manage serum cholesterol, though others have recognized the need for the utilization of these techniques in this area. For example, McCann et al., (1990) suggested five requirements for improving adherence to diet including knowledge, goals, self-monitoring, social support and self-efficacy. Additional strategies suggested by Stunkard and Berthold (1987) included stimulus control procedures and reinforcement for dietary adherence. Similar suggestions have come from others (Southard et al., 1992; Holli, 1988; Mahoney & Caggiiula, 1978).

To date, however, only the Foreyt et al. (1979) study described above has provided empirical support for behavioral techniques to reduce serum cholesterol.

It is unclear why there is little research utilizing specific behavioral interventions to supplement nutrition education, particularly in light of the effective demonstration of behavioral intervention with other dietary problems. To date, most studies have relied on informational approaches to effect dietary change although
research suggests that these approaches are not effective as behavioral change agents in isolation (Glanz, 1988; Brownell & Felix, 1987; Brownell, 1982). The following sections provide an overview of behavioral interventions used in the treatment of obesity, and a discussion involving an application of these strategies to reduce serum cholesterol.

Behavioral Strategies and Dietary Interventions for Obesity

Although obvious differences exist between the problem of obesity and elevated serum cholesterol, such as the visible external feedback that occurs with weight changes compared to the unnoticeable change with serum cholesterol reduction (Glanz & Mullis, 1988), similarities between the two problems exist as well. Obesity, like elevated serum cholesterol, is a disorder which has physiological and behavioral components. Treatment for these disorders is similar as well. For example, obesity treatment also requires dietary fat reduction and lifestyle changes as well as nutrition education (Brownell & Kramer, 1989). Because the relatively large obesity literature indicates that dietary change (e.g., reduced caloric and fat intake) following a behavioral program, behavioral strategies should be extrapolated for use in the management of serum cholesterol.

In a review of obesity treatment, Brownell and Kramer (1989) reported that “behavioral program are among the most widely used approaches for weight loss” (p. 185). Lavery and Loewy (1993) reported that results from a follow-up survey indicated that the greater the number of behavioral strategies employed, the greater the maintenance of the weight loss. Foreyt and Goodrick (1993) suggest that behaviorally based strategies typically result in 9.9 kgs of weight loss and that 66% of participants maintain these changes at follow-up. Wilson (1984) reported that the core behavioral
components for behavioral management programs include "self-monitoring and goal setting, stimulus control for restricting the external cues that set the occasion for eating, changing the topography of eating patterns, and reinforcement of this altered behavior" (p. 659). Behavioral programs for obesity management currently last an average of eighteen weeks (Foreyt & Goodrick, 1993).

This following sections discusses behavioral strategies used in obesity interventions in the context of future applications to the dietary management of serum cholesterol. Nutrition interventions will then be considered in three categories: (1) stimulus control interventions, (2) contingency management strategies, and (3) maintenance and relapse prevention procedures.

Stimulus Control Interventions

Brownell and Kramer (1989) described several strategies which modify antecedent stimuli to treat obesity. These strategies typically use the principle of stimulus control, a behavioral concept describing the identification of environmental stimuli which correlate to an increased frequency of the behavior in question (e.g., eating). Stimulus control strategies in dietary interventions involve the identification of triggers or cues which precede eating. Brownell and Kramer (1989) listed dietary techniques which utilize the principle of stimulus control. These include keeping problem foods out of reach, keeping healthy foods within reach, planning for high risk situations (e.g., eating out at restaurants), shopping on a full stomach and following a dietary schedule.

The recognition of food as a stimulus which evokes and elicits behavior is an important, yet largely ignored consideration when developing cholesterol intervention strategies. These properties should receive attention when establishing environmental
control around palatable foods that have high cholesterol content. While providing information may improve knowledge about unhealthy food choices, other competing factors associated with the stimulus properties of food may interfere. Investigators should consider factors such as the individual’s physical state (deprivation or hunger) at the time of the food selection, cognitive rules about food, social support/influence (i.e. peer pressure), and cost/availability of foods when developing interventions to modify diets.

In summary, professionals working with people attempting diet modification should attend to antecedent cues that influence the likelihood that a particular eating behavior will occur. Because cholesterol and fat are common nutrients in many popular foods in American society, attention to these stimuli becomes an important component for successful dietary change. In addition to immediate dietary changes, attention to antecedent strategies may improve maintenance of changes as participants may be able to recognize and avoid stimuli which increase the likelihood that a behavior will occur.

**Contingency Management Strategies**

Contingency management strategies for dietary change describe procedures for which positive consequences occur following appropriate dietary behavior (Foreyt & Goodrick, 1993). A contingency contract, for example, lists rules describing acceptable or unacceptable eating behaviors and specifies the consequences for adhering or deviating from the target behavior. A similar less formal intervention for dietary change involves goal setting (Brownell & Kramer, 1989). The patient sets a goal for dietary change, specifying objectives which must be met to achieve the desired changes. The patient may also delineate positive consequences for achieving their
goals. While either the health care professionals or the patient can provide the consequences for dietary behavior, eventually the patient should manage his/her own behavioral program to maintain dietary changes.

Brownell and Kramer (1989) suggested that weight management strategies should "provide a better balance between positive and negative consequences during weight loss and to provide a bridge to the time when the benefits of weight loss achieve greater potency (p. 193)." Dietary strategies tend to restrict consumption of palatable foods which function as strong reinforcers. The use of alternative reinforcers can maintain desired dietary behaviors, particularly when these behaviors interfere with food seeking or eating behaviors. Exercise is a good example of a behavior which is not compatible with eating behavior. Exercise can also provide the individual with the opportunity for social and physiological reinforcement away from food. The physiological benefits associated with exercise, including social support and weight loss also can function as strong reinforcers, and interventions which incorporate these strategies increase the likelihood of success (Brownell & Kramer, 1989).

Tangible contrived rewards can serve as an alternative to naturally occurring reinforcers. The dieter can integrate these predictable reinforcers into an intervention to support dietary change. Using contrived reinforcers can insure that appropriate dietary behavior will receive reinforcement. Where social reinforcement or physiological benefits from exercise may not always act as reinforcers, contrived rewards always reinforce desired behavior. Brownell and Kramer (1989) suggested using social outings or purchasing a desired object as reinforcers for achieving dietary goals.

The cholesterol management literature has not systematically used reinforcement strategies. Use of these techniques, however, should improve the efficacy of dietary interventions to reduce cholesterol and fat consumption. Dietary
cholesterol interventions have typically encouraged the removal of palatable reinforcing food items from the diet without providing alternative reinforcers to maintain changes. This increases the likelihood of relapse to earlier unhealthy dietary behaviors. This is particularly true for cholesterol interventions since tangible physiological or psychological improvements such as those experienced by diabetics or obese patients who maintain an appropriate diet (Foreyt, 1987) do not take place following dietary cholesterol reduction.

Relapse Prevention and Maintenance in Dietary Interventions

Relapse prevention and maintenance procedures have become important strategies to maintain improvements after formal intervention ends (Foreyt & Goodrick, 1993). Evidence suggests that longer interventions and frequent follow-up improve maintenance (Brownell & Kramer, 1989). Sternberg (1985) noted that controlling food intake is different from other problems which require limited consumption of a substance. Treatment of drug addiction, for example, often requires the patient to abstain from the addictive substance. Dietary interventions, however, must only limit or change the foods consumed. As a result the patient continues to come in contact with stimuli which can evoke the undesired behavior. This may in part explain the difficulties dietary interventions have in maintaining change (Brownell, 1993).

Southard et al. (1992) noted the similarity between the obesity literature and the cholesterol literature in the inability to document greater than moderate changes in outcomes measures such as serum cholesterol levels or weight loss. Few of the dietary cholesterol interventions reviewed in this paper have incorporated structured maintenance procedures to ensure dietary improvements. Briley et al. (1990) did
provide six bimonthly dietary counseling sessions for police department employees. Additionally, the MRFIT program provided a one to four month follow-up to ten intervention session (Caggiula et al., 1981). Groth et al. (1991) offered follow-up as needed as well as a group meeting every three months, although these authors did not formally evaluate this study. Generally, however, brief outpatient and community interventions do not include a follow-up meeting beyond a serum cholesterol screening which functioned as the final contact with participants. Maintenance of desired serum cholesterol levels, however, will require ongoing maintenance of a low fat, low cholesterol diet. Strategies which promote adherence to such diets over time will prove the most beneficial.

Marlatt (1985) described implementation of procedures which focus on lifestyle modification. Initially the patient constructs a pattern of daily activities which portrays the situations which may lead to the problem behavior. Dietary logs can easily provide this information. Identifying foods consumed and the situations where these foods are eaten can help in the development of a program to reduce high fat and high cholesterol foods. Typically the patient learns to identify high risk situations. Subsequently, the patient develops strategies to avoid or engage these situations in a constructive manner. These plans of action are particularly important because the goal is simply to limit consumption of the target nutrients. As noted above, the patient is frequently in the stimulus environment which evokes behavior leading to the consumption of unhealthy foods. Thus, developing a plan to manage encounters with high risk situations is important in maintaining a low fat and low cholesterol diet.

Discussion

The NCEP has recommended dietary intervention as the treatment of choice for
individuals with elevated serum cholesterol levels. The most common dietary programs designed to reduce serum cholesterol utilize educational approaches. Typically these approaches disseminate information in three formats: individually or small group, at the worksite, or through larger scale community screening or media based programs. These approaches include didactic and written instruction, and practical activities such as food tasting, preparation, menu and label reading and dietary analysis. Generally most cholesterol interventions report modest decreases in cholesterol levels, which participants often maintain at follow-up assessment six months to a year after the intervention.

Nutrition education interventions represent a cost-effective approach to address the widespread problem of serum cholesterol management. These studies have shown that changes in serum cholesterol occur after people participate in these interventions, although methodological issues limit stronger statements regarding causality.

Although the research reviewed here suggests that nutrition education interventions are associated with serum cholesterol reductions, corresponding documentation of dietary change has not occurred. While a few of the studies reviewed successfully measured changes in fat and cholesterol consumption, most simply reported outcome measures of serum cholesterol. It is possible that cholesterol fluctuations which occur naturally may contribute to reductions. Adequately measuring dietary change would demonstrate provide information regarding the contribution of dietary change to the reported serum cholesterol reductions.

Most cholesterol reduction interventions using nutrition education did not attempt to modify serum cholesterol levels in hypercholesterolemic patients (e.g., patients with extremely high cholesterol levels--above 300 mg/dL). Because serum levels in participants were typically in the upper range of borderline risk, participants
may be able to make only modest changes. Documenting the dietary intake of fat and cholesterol will provide information about both the efficacy of the intervention and the actual changes an individual can or does make after dietary change has occurred.

Multiple intervention strategies may be particularly useful in the treatment of elevated cholesterol levels. Reduced serum cholesterol levels and reduction maintenance necessitate lifestyle changes requiring compliance to a low fat/low cholesterol diet, and frequent screening to monitor blood levels. In both the obesity literature (Brownell, 1982) and the addictive behaviors literature (Donovan & Chaney, 1985), support exists for comprehensive intervention strategies. Crucial components appear to include self-monitoring, stimulus control, reinforcement, nutrition knowledge, exercise, social support and cognitive change (Brownell and Kramer, 1989). These components have been shown to be useful in dietary change interventions when caloric decreases are targeted.

In general, the sporadic use of behavioral techniques, especially contracting and contingency management, is surprising considering the demonstrated effectiveness of these behavioral management strategies in interventions for obesity (Brownell & Kramer, 1989; Brownell, 1982). Interventions to manage serum cholesterol have relied on the impact of the education to prompt behavior change. As Southard et al. (1992) noted, interventions which rely on education and advice are not likely to be effective. Future behavioral research efforts are needed to develop effective strategies to alter dietary behavior to reduce serum cholesterol.

Overall there are surprisingly few studies evaluating cholesterol management considering the expansive obesity, eating disorders, and diabetes literatures, all of which involve dietary modification as a primary intervention. The unique features of elevated serum cholesterol levels, including the delayed and symptomless onset of
atherosclerosis, difficult and invasive screening procedures, confusing and complex nutritional information regarding foods high in dietary cholesterol, and the prevalence of high cholesterol food in the American diet suggest differences which should receive empirical study.

The development of effective dietary management strategies to manage serum cholesterol in individuals with risk factors for CHD addresses an important health issue (NCEP Expert Panel, 1991; Wolinsky, 1988). Furthermore, the low cost of dietary intervention (particularly because low fat/cholesterol foods often are less expensive) and the relatively low cost of cholesterol screening makes these strategies desirable. Because estimates suggest that treatment of a patient with CHD costs approximately $50,000, low cost primary prevention interventions are certainly appealing. Future research that demonstrates successful cost effective strategies to reduce serum cholesterol will improve the case for population based strategies to reduce cholesterol levels on a national level. As dietary strategies continue to evolve and incorporate more substantial focused behavioral components in interventions, it is likely that such interventions will become more widely accepted.

Future Research Directions

Since the NCEP developed recommendations for serum cholesterol reduction, research has considered applications of nutrition education strategies to improve dietary behavior regarding fat and cholesterol consumption. These strategies generally report modest improvements in serum cholesterol levels which diminish to some extent over time. Most education interventions reported in the literature did not make use of behavioral strategies demonstrated to be effective with other dietary problems. For example, most current educational strategies attempt to improve healthy eating practices.
do not focus on specific stimuli which might trigger unhealthy eating patterns occurs, or augment the reinforcement available to the patients. Additional research is needed to evaluate the added strength of brief interventions which systematically apply behavioral strategies. These strategies may help individuals to manage their diet independently of ongoing professional contact.

Most studies have not measured participant skill acquisition or their behavior change. It is not clear, therefore, if participants adequately acquired skills taught in these intervention programs, particularly when serum cholesterol outcome measures are showing only modest decreases. Investigators should develop methodology which could evaluate actual skill acquisition and utilization. For example, asking participants to bring modified recipes from home and evaluating the amount of fat and cholesterol in the dishes they intend to prepare could provide information about the efficacy of this component. Additionally, the frequency of preparation of a particular food item could reflect the participant's application of the new or modified skills. Homework assignments could provide a method to measurement specific workshop components. In keeping with the low intensity format, participants could discuss these assignments during group activities.

Another future research direction for brief serum cholesterol management interventions involves the contribution of specific components of the nutrition education program to dietary change. Eliminating superfluous intervention material would help to streamline these programs, particularly when studies are reporting less than impressive course attendance rates. It is possible that the components which investigators believe to be effective are actually not needed. The Murray et al. (1990) study, for example, reported the a group without a food tasting component performed better than the group with such a component.
Computer software programs, such as the Nutritionist III (N-Squared Computing, 1991) provide feedback regarding overall nutrient intake. Development of increasingly specific dietary feedback which focuses on specific behavioral recommendations (i.e., what specific foods are contributing to elevated dietary cholesterol intake) may improve the efficacy of the intervention and is worthy of future research efforts. For example, comparing the traditional use of feedback based on food records with feedback based on food purchases (e.g. measured by grocery receipts) would provide information regarding additional aspects of dietary behavior such as shopping behavior. The participant could then receive specific feedback regarding food choices and alternatives to these choices. Grocery receipts which provide names of foods could function as a vehicle to improve feedback efficacy and initiate more specific behavioral changes.

A related issue involves additional objective measures related to food consumption. Such measures might provide information about dietary behavior which investigators could use to examine the reliability and validity of the food record. Participants could, for example, record food choices from a restaurant menu before and after the menu reading component of the intervention. An analysis of these choices could provide information about the effectiveness of the menu selection portion of the intervention and provide specific feedback to participants about their food choices outside of the home. In addition, cash register receipts provide excellent objective indicators of dietary composition. Similarly, other techniques, including videotaping kitchen activities and phone calls placed during meals preparation may provide additional information about dietary routines. While any added assessments increase professional involvement and possibly monetary expenditures, identification of effective tools to measure change will ultimately improve the strength of
The literature suggests more restrictive dietary interventions correspond to greater changes in serum cholesterol levels (Hunninghake et al., 1993; Ornish, 1990). Such restrictive interventions, however, retain limited value for general consumers, particularly those who are asymptomatic. This probably relates to the high reinforcing value of palatable high fat foods, infrequent feedback about cholesterol levels and difficulty of incorporating dietary changes into one’s lifestyle. Results are mixed regarding brief interventions and inconclusive regarding the use of behavioral strategies. Ongoing research in this area should investigate the ideal intensity of intervention required to maintain recommended serum cholesterol levels in asymptomatic people.

Future studies in this area might also explore methods which incorporate compliance techniques, such as those suggested by Marlatt (1985) or Foreyt and Goodrick (1993) to maintain dietary improvements. In the Lifestyle Heart Trial, Ornish et al. (1990) implemented significant lifestyle changes which significantly reduced CHD risk in their sample and which participants maintained at follow-up assessments. These subject had received diagnoses of advanced CHD and made substantial time commitments to participant in the program. The strong motivating variable of possible sudden death may have strengthened adherence to intervention strategies, thus resulting in positive changes. For example, incorporating families in interventions may produce changes which maintain for longer periods of time. A similar strategy might include promoting the development of eating clubs whose members prepare low fat low cholesterol meals for the group. Additionally, newsletters, such as the free Lipid Clinic News published through Oregon Health Sciences University, and more frequent booster or support sessions may enhance
intervention results by providing reminders about appropriate dietary behaviors.

The magnitude of the problem of serum cholesterol requires interventions on a large scale as well. The community and worksite interventions described above suggest that such interventions can generate positive effects. Additional research should consider how to improve the response rate for follow-up rescreening. Also, future studies should consider possible differences between characteristics of participants who follow-up with those who fail to respond at follow-up. An interesting and potentially large scale project which could influence people to reduce serum cholesterol levels involves studying the effect of offering incentives through health insurance companies, such as rate reduction in health insurance, if cholesterol levels can be lowered. Such an incentive may provide a mechanism to encourage yearly/regular testing and to prompt adherence to dietary recommendations. Health insurance companies already employ such strategies to reward non-smokers and the use of seatbelts. Other strategies which utilize institutions, such as worksite interventions or community cholesterol screening in malls have the potential to reach large numbers of people.

Finally, future interventions should evaluate the effects of exercise interventions, an important strategy in obesity interventions. Aside from the physiological benefits, researchers have found that consistent exercise positively impacts HDL cholesterol by raising serum HDL levels. Future studies might contrast the use of additional activities such as an aerobic exercise intervention with the traditional workshop intervention. A physical exercise component may improve both the effectiveness and the attractiveness of the intervention, thus increasing its viability and clinical utility.


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Appendix Q

Approval Letter From the Western Michigan University
Human Subjects Institutional Review Board
Date: October 11, 1991
To: Peter Carey
From: Mary Anne Bunda, Chair
Re: HSIRB Project Number 91-05-04

This letter will serve as confirmation that your research protocol, "An evaluation of the effects of a nutrition education program on dietary fat and cholesterol consumption and serum lipid levels" has been approved after full review by the HSIRB. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the approval application.

You must seek reapproval for any change in this design. You must also seek reapproval if the project extends beyond the termination date.

The Board wishes you success in the pursuit of your research goals.

xc: Fuqua

Approval Termination: October 11, 1992
BIBLIOGRAPHY


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