A TEST OF TWO EDUCATIONAL STRATEGIES FOR LOWERING BLOOD CHOLESTEROL AT THE WORKSITE

by

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Thesis submitted to the faculty of
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements
for the degree of
Master of Science
in
Health Education

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July, 1988

Blacksburg, Virginia

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(ABSTRACT)

One hundred and seventy male and female volunteers employed at Hubbell Lighting Inc., Christiansburg, Virginia were studied to determine the effectiveness of two alternative educational strategies for lowering elevated blood cholesterol by modifying the diet. Initially three hundred and twenty-eight employees were weighed and tested for elevated total blood cholesterol via a finger-stick procedure using a Reflotron. Two hundred of these employees had elevated total blood cholesterol readings (≥ 200 mg/dl) and were invited to participate in the study. The one hundred and seventy employees who consented to participate were divided into plant and office populations and then each of these two subpopulations was then randomized by sex into one of three experimental groups: individuals receiving worksite classes, those who received information on diet and blood cholesterol mailed to their homes, or a control group. Prior to the baseline blood cholesterol test, subjects completed and returned a pre-test questionnaire used to obtain demographic data and assess baseline knowledge, dietary practices and health-relevant attitudes such as self-efficacy, perceived susceptibility to heart disease, and perceived social support. Subjects also completed a three-day food record on the first and eighth week of the study as well as a post-test

questionnaire identical to the pre-test questionnaire prior to the second blood cholesterol test which was performed during the tenth week of the study. No significant differences were observed over the experimental period in body weight, knowledge, dietary practices, and health relevant attitudes. Significant differences were observed for the dependent measure of change in blood cholesterol with a group and education level effect identified between subjects receiving worksite classes vs. the control group ($p = .0284^{**}$) and subjects with only a grade school level education vs. all other education levels ($p = .0021^{**}$). Overall, subjects reduced total blood cholesterol levels by 18 mg/dl or 9% with the mean reduction for white and blue-collar groups receiving worksite classes (23 mg/dl or 11% and 19 mg/dl or 9%) significantly greater than the mean reduction for the control groups (13 mg/dl or 6% and 14 mg/dl or 7%). Subjects with only a grade school education reduced their cholesterol levels more than subjects at all other educational levels. The mean reduction in blood cholesterol for subjects receiving information mailed to the home about diet and blood cholesterol was less than the mean reduction for subjects in groups receiving the worksite classes. However, ANOVA revealed that there was no statistically significant difference between these two groups. Since, the mailed home approach is less costly for the employer, these findings suggest that while the two educational interventions may be similar in terms of effectiveness, the mailed home approach is more cost-effective.

ACKNOWLEDGEMENTS

First and foremost I would like to thank my Dad and Mom, and my best friend, Mr. Peter D. Balbirnie. They have shown me what can be achieved through honest, hard work, and dedication to a purpose. I am truly grateful to them for that. I would also like to thank them for their unselfishness, patience and, most of all, their love. Thanks Mom, Dad, and Pete, I love you.

I would also like to thank Dr. Elizabeth Howze and Lynda Hartson, R.N., for their advice, guidance, and understanding which has been invaluable to me. Thank you also to Sally Swart and Cindy Flynn for their assistance.

I would like to thank my committee members: Dr. Elizabeth Howze, Dr. Janet Walberg, and Dr. Douglas Southard. I believe I chose three outstanding, charismatic, and dedicated professionals who have always been an inspiration to me here at Virginia Tech. Thanks to all of you. Dr. Howze, thanks especially to you for your support, encouragement, and for teaching me how to think more critically and be more concise in my writing. And - for being a great lady!

I would also like to thank Mary Sitko, Pam Burwell, and Bob Broyden for their help. I would like to thank Hubbell Lighting Inc. and the College of Education at VPI&SU. This research was made possible by them through grants which were awarded prior to the research. I would like to thank Beth Barker. Your

kindness, warm smiles and word-processing skills will never be taken for granted. Most of all, I never could have completed this paper in time without you.

Lastly, I would like to thank the subjects who participated in this study. Thanks, I really enjoyed all of you.

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Chapter I

Introduction

Heart disease, stroke, and related cardiovascular disease kill more Americans than all other causes of death combined (NCHS, 1986). The three most clearly established risk factors for heart disease are smoking, hypertension, and high blood cholesterol (LRC-CPPT, 1984).

Many studies have confirmed that high cholesterol levels in the blood increase the risk of heart attack. The recent Lipid Research Clinic's Coronary Primary Prevention trial has shown that lowering blood cholesterol can however, reduce the risk of heart attack.

Data from two national surveys conducted in 1983 and 1986 also confirm the need for public cholesterol education as recommended in the NIH Consensus Conference. In particular, the Consensus Conference Statement suggests that adults need to become more informed about their own blood cholesterol levels and the methods for lowering levels. In response to this need The National Heart, Lung and Blood Institute, joined by many other health organizations, has recently initiated the National Cholesterol Education Program (Schucker et al, 1987).

Cholesterol belongs to the sterol group of fats or "lipids", a different class from the saturated and unsaturated fats. It's necessary and valuable in the process of synthesizing cell membranes, sex hormones, vitamin D and the bile salts necessary for proper

digestion. Too much cholesterol in the blood increases heart disease risk. Excess cholesterol and other fats in the blood can become deposited along the insides of artery walls. This accumulation damages vessel walls narrowing them and restricting the flow of blood to the heart and brain. This increases the likelihood of heart attack and stroke (Cooper, 1988).

Cholesterol is only found in animal foods and can be found in dairy products, egg yolks and organ meats as well as red meat, pork and poultry. Shellfish contain moderate amounts of cholesterol, but are not a major source. The other fats of concern to us fall into two major categories: the saturated "bad" fats and the unsaturated "good" fats. In general, saturated fats are solid fats from animal products or vegetable fats coming from either coconut or palm oil and hydrogenated vegetable oils. Hydrogenation is a process by which fats become more saturated. Thus previously unsaturated fats, derived from non-animal sources (without cholesterol) can become saturated fats. Unsaturated fats are primarily liquid vegetable oils, such as olive, peanut, safflower, sunflower, corn and soy oils. These fats do not directly elevate blood cholesterol, while saturated fats do (Katan et al., 1987). It is important to understand that saturated fats are capable of raising blood cholesterol levels to an even greater extent than the cholesterol found in foods. In other words, it's the saturated fats in the diet, not the dietary cholesterol, which is more responsible for elevating blood cholesterol levels (Katan et al., 1987; Proyler, 1987).

Cholesterol is transported, along with other lipids, through the blood stream by two major types of proteins called lipoproteins. The "bad" low-density lipoproteins (LDLs) contain more cholesterol, much of which becomes deposited along the insides of arterial walls. High-density lipoproteins (HDLs), are considered the "good" cholesterol carriers. HDLs contain more protein, and carry the fat out of the bloodstream from the cells and tissues, to the liver, where it is processed and excreted. HDLs are linked to a lowered heart attack risk (Cooper, 1988).

While elevated cholesterol is a documented health risk, relatively few studies have been undertaken to determine the effectiveness of educational approaches to lowering cholesterol in populations (Damberg, 1986). This research examines the effectiveness of two educational strategies to lower serum blood cholesterol in a workplace setting. The intervention was designed to determine which method, worksite classes or information mailed to the home, was most effective in reducing blood cholesterol, increasing knowledge, self-efficacy, social support, perceived susceptibility to heart disease and in producing positive changes in dietary practices.

A company-sponsored positive behavioral change program which is voluntary, free, and available to all employees, can assist individuals in making positive lifestyle changes. These changes, in turn, can affect not only the employee's health and job performance, but also the overall productivity and morale of the company, and can help to reduce health insurance costs over time (Bly et al., 1986). The "Live for Life" program conducted at Johnson & Johnson by Bly et al. (1986)

reported a savings of $980,316 over a five year period. Another five year study on employees at Blue Cross and Blue Shield of Indiana reported a 24% reduction in health care costs for employees participating in a comprehensive worksite health promotion program that included courses in nutrition, weight reduction, smoking cessation and fitness (Gibbs et al., 1985). The savings per participant was $519.00 over the five year period. When this reduction in cost was expressed for all employees rather than for the participants alone, the savings per employee was $143.60 (Gibbs et al., 1985).

A lifestyle change program built upon a communication-based self-help framework which encourages family involvement to provide support can often best ensure an active, useful, and cost-effective health promotion program extending maximal benefit to the employee and employer (Gibbs, et al., 1985). But additional methods must be developed and tested to enhance patient/employee adherence and participation, particularly with dietary interventions (Levy, 1986). The results of many studies suggest that adults may be willing to accept a new style of eating temporarily, but more work is needed to get patients committed to making the permanent dietary changes (Reeves et al, 1983) necessary to keep their blood cholesterol under control.

Overview

Through payroll inserts, posters and communications from formal and informal plant leaders, all employees at a local manufacturing plant were invited to obtain a free blood cholesterol test as "Phase I" of a Healthy Heart Program. Anyone with a blood cholesterol reading equal to or greater than 200 mg/dl was invited to participate in "Phase

II", the educational component, of the program. To obtain a serum cholesterol test employees were required to bring with them completed questionnaires measuring knowledge, dietary practices and health relevant attitudes toward and about food and cardiovascular health. Three-day dietary record forms were then distributed at the baseline test to subjects who had elevated blood cholesterol, and were to be turned in to the health educator prior to the start of the intervention.

Participants or subjects in the Healthy Heart Program were subdivided randomly into office and plant or white-collar and blue-collar subpopulations and then assigned by sex to one of three experimental conditions: worksite classes, information mailed home, or nothing (control). Subjects received either six 20-minute educational classes given on site, six informational mailings which included the same content and were sent home, or nothing until after the study was completed. All employees had the opportunity to attend the worksite classes after the study was completed. A post-intervention questionnaire and three-day food record were also administered prior to the second blood cholesterol test to measure changes.

For both experimental groups each week's information focused on a specific topic related to diet and blood cholesterol: introduction to heart health, label reading, low-fat cooking and substitutions, meal-planning and menu selection, exercise, and weight control. Emphasis was placed on the transfer of knowledge and skills believed to be important in the behavior change process. For example, reading

labels, selecting low-fat meats and dairy foods, reading menus and making low-fat substitutions in traditional recipes. Subjects were encouraged to elicit support from family and friends while trying to develop healthier eating styles. Barriers such as food costs, and the skill, time and effort required to plan, shop for, and prepare heart healthy foods were addressed to decrease the likelihood of noncompliance.

Statement of the Problem

The specific health problem of concern is elevated blood cholesterol. The health education problem is to evaluate the effectiveness of worksite classes and information sent home in order to determine which of these methods is more effective at lowering blood cholesterol, increasing knowledge and favorably changing health relevant attitudes and dietary practices. Although the data are not yet in on the long-term effect of many health education programs on corporate health care costs, evaluators have found that those with the poorest lifestyle habits and greatest cardiovascular risk have the highest health care costs and miss the most days of work because of illness (Gibbs et al., 1985).

The target population consisted of employees at Hubbell Lighting, a local manufacturing plant that employs approximately 450 men and women, 350 of whom are blue collar or plant workers in two shifts. One hundred white collar employees work in offices adjacent to the line. A large proportion (at least 65%) of the blue collar workers were women 35-55 years of age in contrast to the white collar or office workers

who were predominately male. The intervention targeted office and plant employees who had elevated blood cholesterol (>200 mg/dl). After the initial screening, everyone with blood cholesterol over 200 mg/dl was invited to, if willing, to participate. Three hundred and twenty eight employees were initially tested, two hundred of whom were found to have elevated blood cholesterol. One hundred and seventy employees chose to participate.

Research Questions and Hypotheses

The following research questions have been formulated to evaluate the effectiveness of worksite classes vs. information mailed home. The study also hopes to explain the differences (if any) observed when comparing results obtained from white and blue collar employees.

1. Do employees who participate in on-site blood cholesterol reduction classes show greater reductions in blood cholesterol over an 10 week period compared to employees who receive information on how to lower blood cholesterol mailed to their home?

2. Do employees in on-site classes make more positive changes in their eating habits than those receiving information at home (i.e. reduce dietary fat consumption).

3. Do those subjects participating in worksite blood cholesterol reduction classes show greater gains in knowledge and more positive attitudes as a result of the worksite classes compared to these receiving information by mail?

4. Are white collar employees more responsive to both interventions as evidenced by changes in serum cholesterol as well as in knowledge, attitudes and dietary fat consumption?

Ho_1: Subjects receiving worksite classes will achieve approximately the same reductions in blood cholesterol and dietary fat consumption as subjects receiving the same information at home and will similarly display more favorable changes in knowledge, dietary practices, self-efficacy, perceived social support and perceived susceptibility to heart disease.

Ho_2: White collar and blue collar employees receiving worksite blood cholesterol classes will respond similarly to the educational strategies used as evidenced by reductions in blood cholesterol, gains in knowledge, and more favorable changes in dietary practices, perceived social support, perceived susceptibility to heart disease and self-efficacy.

Significance of the Study

Attempts to change dietary behavior and reduce blood cholesterol pose several unique challenges to the health educator: (1) eating behaviors are habitual lifestyle behaviors requiring long-term behavior change, (2) "dietary recommendations are usually restrictive, and (3) are often only one aspect of a complex regimen, and (4) may be incompatible with individual and family eating habits" (Glanz, 1985). The most persistent problem in behavior change research, particularly with diet, is the disappointing maintenance of newly acquired skills and behaviors following the termination of therapeutic contact (Weiss, 1985). The educational strategies used in this study were targeted at reducing dietary fat consumption, especially saturated fat, and increasing water soluble fiber intake. The literature to date has shown that the question is no longer whether cholesterol reduction is beneficial for those with elevated blood cholesterol (Levy, 1986) but rather which approaches given in which settings, are most effective in reducing blood cholesterol at a reasonable cost. This study tests worksite classes with information mailed to the home. The approach focuses on a few simple dietary changes which have been proven effective at lowering blood cholesterol in studies conducted outside the workplace.

This study tests the effectiveness of two cholesterol reduction strategies in a company sponsored program utilizing an on-site testing procedure to identify employees who may be at a greater risk for cardiovascular disease. Non-pharmacological cholesterol reduction programs have been shown to be feasible at the worksite (Bruno, 1983). Bruno (1983) found participants showed an increase in nutrition knowledge, and had reductions in blood cholesterol and weight.

Effective courses are an important component of worksite health promotion. But they can only be successful if employees attend and participate in them. Classes at the worksite are only feasible if resources and educators are available and affordable to the company (fairly low start-up cost) and can produce benefits for all (white and blue-collar) employees as well as for the company itself. This research also attempts to determine which type of intervention, worksite classes or information mailed home, is reasonably effective at reducing cholesterol for the lowest cost. Data is also being collected to determine which type of intervention is more appropriate for use in work settings which employ both white and blue collar employees.

According to Harlan et al., 1985 and Lefebvre et al., 1986, data from this study will contribute to the present lack of data on low-cost, low-intensity worksite blood cholesterol reduction strategies.

Limitations

The following limitations may have affected the outcome of this investigation.

1. As with many programs offered on company time, and/or in the

workplace, circumstances over which the researcher had no control intervened. These are listed below:

a. The manufacturing plant where this study was conducted had three lay-offs during the period of time in which this experiment took place. As a result, a few subjects were lost and the stress produced may have served to hinder compliance with dietary recommendations. Stress may also raise blood cholesterol directly, by altering brain signals to the adrenal glands and causing the release of stress hormones such as cortisol and adrenaline. Both cortisol and adrenaline release fats, including cholesterol, from the body's stores or by other means, like signaling the liver to release them into the bloodstream (Kolata, 1984). Cortisol may also boost the liver's production of cholesterol (Axelrod & Reisine, 1984).

b. Production at the plant was behind schedule on two occasions due to computer malfunction and therefore many of the subjects from the plant (blue collar employees) were unable to attend several of the worksite classes. Approximately 60% of the blue-collar employees previously attending scheduled worksite classes were unable to attend on each occasion.

c. Cross over is possible despite instructions not to discuss the program information. Subjects receiving

worksite classes or information mailed home may have discussed the program details with employees in the control group. Likewise, the control group may have somehow obtained information from either or both groups.

2. The Reflotron may not have been working correctly on the first day of testing because the room in which it was located was very cold. This may have resulted in inaccurate readings for appoximately 3 employees who were not able to be reached for a re-test. All other employees tested on the first day were re-tested.

Summary

Reducing the consumption of fat, especially saturated fat, and increasing consumption of fiber, in particular water-soluble fibers are dietary strategies which can reduce total blood cholesterol for many individuals. These strategies were emphasized in the dietary recommendations/guidelines distributed during the first worksite class and the first mailing. The worksite is an attractive location to address changing individuals' dietary practices because it provides a larger, more accessible, almost "capture" audience for public health education. Through the use of payroll stuffers, posters, contests, drawings and mailings to the home, a broad health communications base can be established. A communications base which incorporates the family and/or significant others can not only provide a source of much needed support and encouragement for lifestyle change, but also can act as a

means of influencing the health behaviors of an even greater number of individuals (spouses and dependents). As a result, the marginal benefits resulting from a worksite based health/nutrition education program are potentially greater than a community based intervention (Castillo-Saldago, 1984). These benefits can be measured in terms of the numbers of lives saved and disability prevented by preventing cardiovascular disease. Unfortunately, long-term data (greater than five years) is not widely available.

In the workplace, other potential benefits resulting from health promotion and risk reduction programs include decreasing reducing health insurance claims due to cardiovascular disease, improving productivity and morale attracting new employees, retaining employees, and creating a greater awareness of the importance and responsibility of individuals to obtain available health information and adopt healthier lifestyles (Vickery et al., 1985 and Gibbs et al., 1986).

Chapter two will contain a review of the pertinent literature on cardiovascular disease, blood cholesterol and diet, worksite health promotion, behavior change strategies, and theories related to health and behavior change. Chapters three and four will address the methodology for this study and a discussion of its results, research implications and recommendations.

CHAPTER 2

Literature Review

Introduction

Heart disease, stroke, and related cardiovascular diseases account for more deaths in the United States than all other causes of death combined (NIH consensus, 1985). More than 500,000 Americans die from heart attacks each year, 65,000 are hospitalized for heart attacks and at least 5 million Americans have angina or other symptoms of heart disease (LRC-PPT, 1984). According to the National Institutes of Health (NIH), the three most clearly established, controllable risk factors for heart disease are cigarette smoking, high blood pressure and high blood cholesterol (NIH consensus, 1985). Other risk factors include obesity, family history of heart disease, diabetes and physical inactivity (Zifferblatt et al., 1980 and Coates et al 1981). In 1984, the NIH Lipid Research Clinic's Coronary Primary Prevention Trial convincingly demonstrated that risk for coronary heart disease can be reduced by lowering the serum cholesterol levels (Fletcher and Rogers 1985).

Increasingly, evidence is demonstrating that the workplace is an effective locale in which to conduct health promotion programs (LaRosa, 1984). Work-site programs can affect the cost of hospitalization by obviating much of the need for acute care by teaching employees how to

recognize when medical care is needed, how to eat healthier, how to begin to exercise on a regular basis and also how to learn to manage stress in their lives. Potential savings to an employer are increased significantly by this approach (LaRosa, 1984).

Not only is there a high human price to pay for the ravages of heart disease but also an estimated $86 billion per year is spent on the direct and indirect costs of heart disease (LRC-PPT, 1984). Concerned over the large human and economic toll taken by heart disease, private corporations such as insurance companies, Fortune 500 companies and manufacturing plants as well as a wide variety of other private, public, and not-for-profit organizations have begun to take steps to prevent heart disease among their employees rather than bear the costs after it appears (Joseph & Glanz, 1986). With medical costs soaring, many companies try to cut expenses by reducing or redesigning their benefits packages (Castillo-Saldago, 1984 & Weiss, 1985). Many companies have chosen to increase deductibles, require co-payments, and/or raise premiums. Thus employees pay more out of their pocket for medical expenses.

It has been suggested that the understanding and control of CHD requires a dual approach: (1) identification and treatment of high risk individuals, and (2) modification of environmental and behavioral determinants to achieve more favorable distributions of serum cholesterol in populations and individuals (Proyler, 1987). A review written by the Expert Panel on Detection, Evaluation, and Treatment of

High Blood Cholesterol with the National Education Program identified pertinent educational issues in the categories of knowledge, attitudes, and skills (Harlan & Stross, 1985).

Chapter II reviews pertinent literature related to cholesterol and its relationship to heart disease and diet, as well as cholesterol intervention strategies at the worksite.

Cardiovascular Health and Blood Cholesterol

The relationship between elevated serum cholesterol levels and coronary artery disease is well established (NHL & BI, 1984). As predicted by the Framingham Study (Cornfield, 1962) and stated in the 1985 NIH Consensus Development Conference, a 10% decrease in blood cholesterol levels is associated with a 20% decrease in coronary events (Dalen, 1988).

Data published by the National Institute of Health (NIH) in the Lipid Research Clinic's Coronary Primary Prevention Trial and the NIH Consensus Conference Statement indicate that as much as 50% of the adult United States population has elevated levels of blood cholesterol. Unfortunately, health experts also note that most Americans don't know their blood cholesterol level or don't have their levels checked regularly. The NIH recommendations are for all adults to strive to keep your blood cholesterol level below 200 mg/dl. Individuals who have a their total blood cholesterol reading above 200 mg/dl, have "elevated blood cholesterol". Elevated cholesterol levels are further stratified into coronary risk categories. Those with a total cholesterol level of

200 to 239 mg/dL are classified as having "borderline high" blood cholesterol. The definition of "high-risk" cholesterol is ≥ 240 mg/dL. This represents the 75th percentile in the U.S. adult population (NHL&BI, 1984). The risk of coronary artery disease (CAD) at a cholesterol level of 240 mg/dl is twice that of a level of 200 mg/dl. Fasting lipoprotein analysis is recommended for those patients who are at high risk to determine HDL and LDL levels (Dalen, 1988).

Findings from a review of the experimental clinical trials and observational cohort evidence relating serum cholesterol level and its reduction to risk of coronary heart disease confirm the relationship between elevated blood cholesterol and heart disease (Proyler, 1987). Further, these findings confirm the lipid hypothesis: lowering serum blood cholesterol reduces CHD risk.

Our bodies make all the cholesterol we need, and its production is only partially suppressed by the amount of cholesterol in the diet (Proyler, 1987). Some people have a disorder called familial hypercholesterolemia - a family trait in which blood cholesterol levels are elevated even when the person adheres to an extremely low cholesterol, low saturated fat diet. These people often require medications to lower blood cholesterol when dietary restrictions and aerobic exercise do not work (Cooper, 1988). Aerobic exercise can increase levels of "good cholesterol" or HDLs, thereby offering individuals some degree of protection against heart disease.

Because cholesterol and other fats are insoluble in water, which is the primary component of blood, they are carried through the blood stream bound to proteins, and this combination is known as a lipoprotein. Lipoproteins are the mechanism by which lipids such as fat and cholesterol are transported through the body and can thus be considered as "cholesterol carriers" (Cooper, 1988).

Two categories of lipoproteins are particularly important - the high-density lipoproteins (HDLs) and the low-density lipoproteins (LDLs) (Cooper, 1988). HDLs have been dubbed "good cholesterol" whereas LDLs are referred to as "bad cholesterol." HDLs are beneficial because they tend to attract or combine with cholesterol and allow it to be carried to the liver for processing and excretion. In contrast, the "bad" LDLs carry large amounts of cholesterol and promote its deposition along the insides of artery walls. Over time, this can result in atherosclerosis (Jones et al., 1979). HDL levels are increased by sustained, regular aerobic exercise (Cooper, 1988), while dietary restriction of fat most effectively reduces LDLs (Levy, 1986). Giving up smoking and maintaining ideal body weight also help to increase HDLs (Lenfant, 1986). Generally, if an individual's ratio of HDL to total blood cholesterol is less than 4:1, then there is some protection from heart disease (Cooper, 1988). Lipoprotein levels can be determined most effectively through a fasting, venipuncture testing method.

Diet and Heart Disease

The content of the typical American diet is closely related to several of the major risk factors for heart disease. Elevated blood cholesterol, obesity and high blood pressure each have strong dietary determinants (Glanz, 1985). Since reducing blood cholesterol has been shown to decrease the incidence of heart disease, the American public is being urged to modify its diet, in particular, to eat less fat, especially saturated fat and include more fiber, especially water-soluble fiber, in the diet (Bruno et al., 1983).

In an effort to prevent heart and vascular diseases, the American Heart Association has also issued a position statement for Physicians and Health Professionals which was developed by its nutrition committee in 1986 (AHA Position Statement, 1987). The guidelines presented by the American Heart Association propose an optimal preventive diet for coronary heart disease. Emphasis is placed on the reduction of both saturated fat and total fat, and the inclusion of certain soluble fibers in the diet such as pectin, guar, and oat bran which help lower serum cholesterol (Anderson et al., 1984 and Rosenthal et al., 1985).

Saturated fat intake has been correlated with serum cholesterol values and coronary heart disease in many epidemiological studies (Glanz, 1985). In human experiments, increasing saturated fat intake increases the "bad" low density lipoproteins (LDLs) and total serum cholesterol levels. This rise in LDL and total serum cholesterol is followed by the development of atherosclerotic lesions that regress when saturated fat is removed from the diet (CAST, 1983). However, if serum

blood cholesterol levels are permitted to remain elevated, atherosclerosis develops. Atherosclerosis, a type of heart disease and the underlying cause of coronary artery disease, is the accumulation of plaque cholesterol, fat, and calcium along the inner wall of an artery or vessel that transport blood from the heart to organs and tissues of the body. This plaque build-up causes the artery to become thick, irregular, and narrowed, partially or totally blocking normal blood flow. Restriction of the blood flow causes damage or even heart attack and stroke. Epidemiological data from over a dozen clinical trials indicates that there is no doubt that appropriate changes in one's diet such as decreasing fat intake, especially saturated fat, and increasing fiber, particularly water soluble fiber - can reduce elevated blood cholesterol levels (Reeves et al, 1983).

Cholesterol is found only in animal foods. However, it is not dietary cholesterol or the cholesterol found in foods which is most capable of raising blood cholesterol levels but rather saturated fat intake (NIH consensus, 1985). Dietary cholesterol intake has been related to blood cholesterol level in many studies (Hegsted et al., 1965). However, as mentioned, cholesterol intake seems to be most important when there is also increased saturated fat intake (AHA Position Statement, 1987). Added emphasis is placed on dietary modifications which have been shown to reduce blood cholesterol. These modifications include reducing total fat to less than 30% of calories, decreasing dietary saturated fat intake to less than 10% of daily calories, restricting dietary cholesterol to less than 300 mg/day (AHA

Position Statement, 1987) and increasing consumption of foods rich in water-soluble fiber (Anderson et al., 1984). The adoption of a low-fat diet among patients and in the community has resulted in significant cholesterol reduction. In the Multiple Risk Factor Intervention Trial (MRFIT) program, the nutritional intervention focused on development of lifelong shopping, cooking, and eating patterns rather than specifying a structured diet (Cagguila et al., 1981). Similar results were also obtained from a comprehensive community health-promotion program in North Karelia, Finland (Glanz, 1985).

Currently, Americans are consuming an average of 15 to 20% of calories as saturated fats. Much of this is animal fat in which palmitic and stearic fatty acids are the major constituents. Coconut oil, palm oil, and cocoa butter are extremely saturated, and also contain a larger component of lauric and myristic fatty acids that raise serum cholesterol (Hegsted et al., 1965). In addition, hydrogenated vegetable oils which are unsaturated oils which have been made more saturated through the process of hydrogenation, also contribute to saturated fat intake. The AHA's recommended reduction in total fats to less than 30% of calories should be achieved largely by reducing the intake of saturated fat (AHA Position Station, 1987).

In addition to fat and cholesterol, several other dietary factors, most of which affect platelet function, apparently play a role in cardiovascular health (Fletcher & Rogers 1985). Evidence that platelet aggregation and adherance are factors in atherogenesis has prompted large clinical trials of antiplatelet agents such as water-soluble fiber

(Hammerschmidt, 1982). A cardioprotective role for water-soluble dietary fiber has been speculated and there appears to be strong evidence of its merits. In a study of guar gum, a water-soluble fiber, ten patients already receiving cholesterol-lowering drugs showed an additional 10.6% decrease in blood cholesterol levels within two weeks of adding guar gum to their diets (Jones et al., 1979). Guar gum is found in legumes such as dried beans and peas. Apple pectin, carrots, prunes, and oat bran are other hypocholesterolemic (cholesterol reducing) fiber agents (Fletcher and Rogers, 1985). During a recent investigation done at the Northwestern University Medical School in Chicago, 208 healthy men and women successfully reduced their blood cholesterol after consuming about one ounce of oat bran every day for a twelve week period (Cooper, 1988).

Blood Cholesterol Measurement

Despite the fact that a federal panel has issued precise recommendations on how and when to treat elevated cholesterol levels, determining those levels is often more difficult than generally acknowledged (Cooper, 1988). The standard method for blood lipid analysis has been by venipuncture with drawn blood analyzed in the laboratory. Innovations in medical technology have allowed for the development of sophisticated but compact and "user friendly" analysis systems. One of these, the Reflotron, is a compact, lightweight system designed for analysis of one specimen at a time. Specimen are pipetted onto a reagent strip which is loaded into the analyzer. The strip filters red cells and allows plasma to soak into a flap containing dry

reagents (Warnick et al., 1986). Specimen are usually collected (non-fasting) via a finger-stick procedure which involves puncturing the subject's finger with a lancet and collecting several drops of blood (Warnick et al., 1986). The use of the non-fasting serum cholesterol levels rather than the more expensive fasting venipuncture lipoprotein analysis for case finding is a practical, cost-effective approach for identifying high-risk individuals (Dalen, 1986).

Studies conducted by McManus et al. (1987) compared values obtained from venous blood (venipuncture) by a Centers for Disease Control standardized laboratory using the standard cholesterol esterase-oxidase-peroxidase assay (EOP) and values obtained by the Reflotron (REF) analyzer on samples of venous and capillary blood. Mean cholesterol values obtained by EOP were statistically higher than those from the REF (234 mg/dl vs. 213 mg/dl). However, EOP and REF values were highly correlated. The Reflotron cholesterol values consistently under-estimated EOP values by 6-9% in three different studies conducted by McManus and his associates (1987). The Reflotron has a few additional limitations. It only analyzes total blood cholesterol, is temperature sensitive, does not provide a print-out of its results, and can only analyze one specimen at a time. Another comparison of portable finger-stick screening methods was performed by the Northwest Lipid Research Center (NWLRC). According to the NWLRC's findings, the Reflotron, had marginal precision and accuracy due to the negative bias which should be considered in public cholesterol testing. Calibration of the Reflotron on a regular basis as well as the performance of

occasional test-retest comparisons and cleaning of the instrument were recommended.

Worksite Health Promotion

Employers are becoming highly involved in health care matters; their interests go far beyond a primary interest in the original issue of cost containment as other beneficial outcomes of promoting health in the workplace have been demonstrated. Potential outcomes include decreased medical visits and minor illness visits (Vickery, 1983), increased productivity, improved morale (Yen, 1987), decreased absenteeism, and enhanced efficiency of the corporation as a whole (Castillo-Saldago, 1984). The workplace is recognized as one of the most promising and challenging sites for promoting individual health behavior change (Joseph & Glanz, 1986). Offering programs in the workplace has several advantages over community based programs. For example, a captive or easily accessible audience, a built-in communications/support network and the ability to provide employees with incentives or rewards for participation (Kris-Etherton & Engelland, 1986). A study published by Robert Bruno and his fellow researchers at Columbia University (1983) targeting employees at the New York Telephone Company headquarters, reports a positive response to a nonpharmacologic behavioral education program at the worksite to reduce the risk of coronary heart disease. The 8 week program significantly increased employee's nutrition knowledge and participants significantly reduced their cholesterol and weight (Bruno, 1986). As part of its Center for Health Help,

Metropolitan Life Insurance Corporation offered a cholesterol reduction program to their employees with a serum cholesterol level greater than 220 mg/dl. The program consists of two one-hour educational sessions with follow-up blood tests and counseling at three and six months. The nearly 700 employees who participated had an average decrease of over seven percent in their total serum cholesterol values (Glanz et al., 1986). The Control Data "Stay Well" program similarly reported reductions in serum cholesterol and body weight as well as reductions in butter, salt, and sugar consumption (LaRosa, 1984). Both programs were held at the worksite.

Businesses which provide generous sick leave, disability coverage, and comprehensive health care insurance accrue even greater savings from successful worksite programs than will a company with fewer employee benefits (Yen, 1987). It has been stated that the most promising heart disease prevention intervention at the worksite for long-term health benefits is the control of blood lipids in those with elevated levels (Brennan, 1982). Comparing the costs and positive effects of various alternative uses of resources is invaluable to the continuance and advancement of worksite health promotion programs. Therefore, it is essential to document program costs, and to link programs to behavior changes, risk factor reduction, health and morale improvement, increased productivity, and over time, economic benefits (Joseph & Glanz, 1986).

Literature evaluating current approaches to worksite health promotion reveal that there is often an insufficient regard for the

influence of environmental and social factors acting as obstacles to promoting health and the maintenance of behaviors which are more condusive to good health (Castillo-Saldago, 1984). A paper published by Carlos Castillo-Saldago at Johns Hopkins University reviewed the main interpretations of what constitutes the meaning and scope of health promotion in the workplace. His paper advocates the use of an environmental-social approach, and opposes the use of the individual based lifestyle approach, which merely emphasizes the role and responsibility of the individual. Consequently, problems over which the individual has little direct control may be minimized with the latter approach. Combining the environmental-social and the individual-based lifestyle approaches yields a much more effective conceptual framework within which health program goals can be met. This means working to develop support networks, reduce barriers, and encourage or reward participation and compliance. For example, sending information to the family, inviting family members to become involved and be supportive, contacting vending machine distributors and cafeteria personnel to request their assistance, and informing local physicians about the program can be useful techniques. These actions increase the likelihood of program success.

BEHAVIOR MODIFICATION

Health education draws upon a diversity of theories, principles, and experiences from other disciplines. Health education in its simplest

form, can be considered as any combination of learning methods, designed to facilitate voluntary adaptation of behaviors to improve or maintain health. Today, the prevention of chronic diseases such as heart disease requires a far more active consumer role over a long period of time compared with the one time or short term responses such as obtaining an immunization necessary to prevent many infectious diseases (Elder et al., 1985). Promoting health however, also requires organizational, economic, and environmental supports, not only individual responsibility (Castillo-Saldago, 1984).

Behavior modification is based on the assumption that behavior is a function of environmental events which precede and follow the behavior. These are called antecedents and consequences. This conceptualization has been extended by social-learning theorists with the illustration of the role of social behavior as critical antecedents and consequences (Elder et al., 1985). Unfortunately many of the cardiovascular risk reduction practices that we recommend to the public are not very simple to understand, to implement, or maintain as a permanent lifestyle change. Thus, making long term behavior changes requires the building of skills and supportive networks in addition to merely presenting recommendations to increase individuals' knowledge concerning appropriate dietary practices.

Lefebvre et al. (1987) identified three major behavior change phases for cardiovascular risk factor reduction: (1) a promotion/motivation phase to interest people in changing the specific risk behavior, (2) a two stage skills/training phase in which specific behavior change skills

are acquired and support networks to maintain the new behavior are developed, and (3) a maintenance/generalization phase in which active efforts are undertaken to continue the process of behavior-change maintenance. This approach highlights the use of social learning theory, discussed later in this paper.

Behavior Change Strategies:

Behavior change strategies are those procedures which attempt to influence specific health risk or noncompliant behaviors directly through the use of techniques, such as feedback and shaping, reinforcement, barrier reductions, differential reinforcement and combination approaches such as contingency management (Elder et al., 1979). Positive feedback stimulates continuation and shaping of a behavior. Shaping involves reinforcing successive approximations of a target behavior until the desired behavior is reached. Barrier reduction involves removing an obstacle such as the lack of availability and accessibility of a variety of products, services, social support transportation, or facilities. Examples of differential reinforcment would include the use of a substitution in response to a stimulus or may also include an insurance company lowering its premiums for clients engaging in health promotive activities. Combination approaches involve a systematic arrangement of reinforcing and punishing consequences to increase or decrease a target behavior. For instance, using contingency contracts (Elder et al., 1979) to increase motivation and commitment.

Research studies have shown that elevated blood cholesterol can be reduced through education and behavior modification (Harlan & Stross, 1985). Studies conducted by Singleton et al. on the use of Behavioral Contracting and Witsche & Singy (1978) on the use of family cooperation have both been successful at reducing dietary fat consumption and lowering serum blood cholesterol. A nutrition-education project operated by the Chicago Heart Association also showed a 12% reduction in serum cholesterol (Glanz, 1986). Educational interventions such as the Stanford Three Community Study and the HELP Your Heart Eating Plan both report decreases in dietary fat and cholesterol consumption as well as reductions in total serum blood cholesterol levels among participants in a cardiovascular health education program (Reeves et al., 1983). There are also good reasons for conducting research in the workplace, as opposed to the community. Employers have a vested economic interest in healthier employees and therefore can more generously fund programs which will benefit large numbers of individuals. Unfortunately however, evidence of long-term behavioral change and economic benefits of workplace programs remains elusive, and thus, further study is needed (Glanz, 1986).

Problems with Compliance

According to Cameron & Best (1987), the impact of a behavioral intervention is a function of the intervention is content, context, and the process of change. These authors also stated that the practice of inferring behavioral change from attitudinal and physical changes is

frequently misleading. This concern relates to the definition of compliance -- the sequence of behaviors and outcomes involved in "compliance" with a behavior change regimen is complex. Unfortunately, increasing health knowledge and skills does not always elicit appropriate action nor does it promote the maintenance of newly acquired health behaviors. Compliance, is the extent to which an individual health behavior coincides with health advice given, or congruence between recommendations or treatment and performance of target behaviors.

The negative perception of benefits to be accrued from adopting positive health behaviors, a lack of belief in the efficacy of treatment and/or the unwillingness to undertake the level of effort required are issues intimately related to compliance (Elder et al. 1979). Addressing these issues in planning behavior change strategies is vital. Factors which have been associated with improved compliance include: the setting or place and time of the program, satisfaction with care or services, and psychosocial factors such as perceived social support, perceived self-efficacy for changing the target behavior, and perceived susceptibility (Dunbar, 1979 and Green, 1979). These psychosocial factors are discussed in greater detail later in this paper with the Health Belief Model.

Buller (1978), was able to bring about changes in attitudes and behavior by using carefully developed self-instructional materials and interpersonal feedback and follow-up. Buller's study (1978) analyzed the effectiveness of a health communication campaign in bringing about

dietary changes in persons with hypercholesterolemia. A mail questionnaire used in this program indicated that the instructional technique was successful. The positive correlation shown between changes in attitude and behavior merely suggest that a change in knowledge and attitudes about food would be likely to bring about alterations in eating habits. Questionnaire replies demonstrated that the participants responded favorably to presentation techniques emphasizing the characteristics of simplicity, compatibility, trialability, and relative advantage (Buller, 1978).

Specific characteristics contributing to the compliance with behavior change prescriptions include the quality of the interaction or materials provided, the degree of personal contact, the frequency of contact, and the continuity of care (Elder et al., 1979). More extensive approaches to compliance focus on strengthening the cultural and social environment by building new and/or more supportive environments. Suggested approaches include taking available resources and using them to help family, friends and coworkers acquire the knowledge and skills necessary to change their family, work, and community environment such that they are supportive of healthier lifestyles.

SOCIAL LEARNING THEORY AND SELF-EFFICACY

According to Social Learning Theory (SLT), interventions promoting behavior change must develop within the person the perception of

confidence in being able to perform certain tasks. This explains why taking small steps in successive approximations to complete a target behavior seems to be so crucial in promoting behavior change: the person is building his/her self-efficacy with each new task increment. SLT goes on to suggest that behavioral capability is most readily acquired through observation of others performing a target behavior rather than through direct experience (Bandura, 1977). This is called social modeling. SLT applications to health education include four techniques based on SLT, modeling, skill training, contracting, and self-control. According to Parcel and Barononski (1981), health education programs cannot simply tell people what tasks they have to perform (knowledge promotion), but must also provide opportunities to observe (social modeling) and practice (skills training) performing specific tasks such as dietary change to promote the person's behavioral capability to perform the task while developing self-efficacy. For example, designing a blood cholesterol reduction program consisting of classes and educational materials supplemented with low-fat cooking demonstrations, sampling and recipe contests. Social Learning Theory (SLT) proposes that expectations about performing a particular behavior are learned from previous experiences in similar situations, observing others in similar situations, or learning from others about these situations (Parcel and Baranowski, 1981).

Bandura (1977) proposed the construct of "self-efficacy" as the crucial variable in mediating continued behavior change. Self-efficacy is specific to a particular task or behavior. Bandura's social learning

theory focuses upon the acquisition and regulation of behavior through modeling processes. This would include observing someone performing a skill or task such as reading a food label or removing high fat ingredients from a recipe. Regarding self-efficacy, perceptions of efficacy influence how much effort people will expend and how long they persist at a task. Successful or rewarding experiences stimulate individuals to maintain a desired behavior or continue to work towards altering or achieving the behavioral goal. When confronted with barriers or obstacles, persons who hold a higher sense of efficacy persist longer in their efforts, whereas those with self-doubts often slacken their efforts or give up altogether (Schunk and Carbonari, 1984). Bandura (1977) further noted that a strong sense of efficacy is not easily destroyed by a brief failure. Those who take responsibility for their actions, such as making a point to read ingredient labels at the grocery store often perceive themselves as capable and are apt to continue to alter their behaviors and environment to maintain healthy self- functioning (Schunk & Carbonari, 1984).

THE HEALTH BELIEF MODEL

The Health Belief Model (HBM) is a conceptual formulation for understanding why individuals will or will not engage in a variety of health related actions. The HBM is useful for explaining and predicting the acceptance of health and medical care recommendations (Janz & Becker, 1984). Specifically, the HBM consists of four dimensions:

perceived susceptibility, perceived severity, perceived benefits and perceived barriers.

Perceived susceptibility refers to one's subjective perception of the risk or the "chances" of contracting a condition. Rosenstock (1960) also notes that "the combined levels of susceptibility and severity can provide the energy or force for an individual to act or not to act, along with the perception of benefits to be obtained or provided and barriers which must be overcome. Larson et al. (1970) found that all of the HBM dimensions were significantly correlated with preventive health behaviors such as vaccination behavior, breast self-examination and others have correlated HBM dimensions with adherance to prescribed exercise programs (Janz & Becker, 1984). The "barriers" and "susceptibility" categories appear to be the most powerful dimensions of the HBM in terms of significance for preventive health behaviors (Janz & Becker, 1984).

SOCIAL SUPPORT

According to House (1981), social support refers to four broad classes of supportive behavior or acts: (1) emotional support (affect, esteem, concern), (2) appraisal support (feedback, affirmation), (3) informational support (suggestion, advice, information), and (4) instrumental support (aid in labor, money, time). There is a positive relationship between having social bonds and physical and mental health (Colletti & Brownell, 1982).

Family, friends, co-workers, as well as company management may be more capable of promoting and developing health in an individual. The workplace, community and home serve as potential sources of support for health behavior change. Convincing evidence of the relationship between social support, social networks and health has influenced the development of behavior change strategies. Stunkard and Brownell (1982) have found that the workplace may create a unique social environment for behavior change through the use of teams, contests, prizes, rebates, and reduction in group health insurance premiums. Jesse Bell, the president of Bonne Bell Cosmetics, offered his employees $5.00 for every pound lost, $1.00 for every mile run, and $250.00 for quitting smoking. Absenteeism declined 50% and in the first year the company received an insurance rebate of $36,000 (Coletti & Brownell, 1982). Coletti and Brownell also reported on another program in which The Colonial Bank and Trust of Chicago challenged two other banks to a weight reduction contests. The employees of the three banks lost a total of 2.5 tons. Prizes and gift incentives were also shown as effective.

The family is also a major source of social influence, particularly with eating behaviors. Since so many interactions within the family involve food, the home may provide an environment to aid or hinder the family member attempting to change his or her diet. Wilson and Brownell (1978) varied the amount of family support given and conducted several studies with structured programs. They found dieters with "cooperative" spouses were significantly more successful than those with "non-cooperative" spouses. Their structured programs invited, encouraged,

or, in the most structured case, required the participation of spouses. Regardless of the situation, spousal or significant other involvement produced greater reductions in weight than non-involvement. A six month follow-up also indicated that "cooperative spouse" or "significant other" involvement similarly influenced the maintenance of weight loss (Wilson & Brownell, 1978).

Enlisting the help of the family has also shown to be an effective means of reducing blood cholesterol through dietary change (Witschi et al., 1978). Witschi et al. (1978) found that forty-three out of forty-six families succeeded in lowering total serum blood cholesterol by 10 percent over a three week period. Witschi's study was a short-term study in which families participated for the express purpose of lowering serum cholesterol. The study consisted of two parts. First, a four-week baseline period, beginning with a blood cholesterol test and a three week dietary change period in which a food record was kept by each participant for two weeks and then a second blood sample was obtained at the end of the fourth week, which ended the baseline period. Second, for the next three weeks, food records were kept again and two more blood samples were drawn. A final blood sample was drawn approximately fourteen weeks later. Of the forty-three families, ten showed a 15% average decrease in serum cholesterol values. The study suggested that the dietary needs of one member may best be met by family cooperation and involvement.

SUMMARY

Clearly, we do know that elevated blood cholesterol increases risk for heart disease (NIH Consensus, 1985) and that reducing saturated fat intake, increasing the consumption of foods rich in water soluble fiber, quitting smoking, and exercising aerobically, on a regular basis, can reduce levels of serum blood cholesterol (Cooper, 1988). What we don't know is which types of educational interventions are most effective (and least costly) at lowering blood cholesterol levels and promoting the adoption and maintenance of healthier eating habits and behaviors among individuals at the workplace.

The next chapter will outline study hypotheses, and specific methods, procedures, and strategies used in a worksite blood cholesterol reduction program designed to assess the effectiveness of two alternative educational strategies in increasing knowledge about diet, heart disease risk and lowering blood cholesterol.

CHAPTER 3

Methodology

Setting

This research took place at Hubbell Lighting, Inc., Christiansburg, Virginia, one branch of a large manufacturing organization with corporate headquarters in Anaheim, California. Hubbell is one of the world's largest manufacturers of high intensity lighting.

In Christiansburg, Hubbell employs approximately 450 white and blue collar men and women on two shifts at the Christiansburg plant. The majority of blue collar or plant workers are females whereas white collar or office workers are predominately male. The plant appears to be an ordinary office building if viewed from its front, but at the back is a very active manufacturing plant and Hubbell's trucking line, ready at the loading/ unloading docks to send out or receive shipments. The plant itself is located off of a side street leading to the interstate which runs north towards Washington D.C. and south to Florida. Inside the plant, are actually two somewhat different cultures: white collar (office) and blue collar (plant) workers. The former are better educated and earn a higher income. The latter have educations ranging from grade-school to some college or a college degree and earn a much lower income. In the office end of the building, employees sit behind huge drafting boards, computer monitors,

and printers or talk on the phone with world-wide clients. Office employees work in an atmosphere which has become more stressful as there have been three rather significant layoffs within the last five months. In the plant, however, the union was able to protect employees from being layed-off until just recently when new employees and those on probation with the union were also layed-off. The plant environment is stark but more casual. Small fork-lift trucks carrying heavy pallets of lighting fixtures and ballasts travel from one end of the plant to the other. Because much of the work requires fine detail and small hands to fit wires into small places, mostly women work on the assembly lines in the plant. However, it is not uncommon to also see women operating heavy machinery as well.

Subject Selection

Prior to the selection of subjects, permission was obtained from the VPI&SU Human Subjects Committee to perform this study (Appendix A). Once approval was obtained from the Human Subjects Committee, payroll inserts, posters, and departmental meetings were used to advertise free cholesterol tests as Phase I of Healthy Heart Program at Hubbell Lighting. The test was performed in order to identify employees with elevated ($\geq$ 200 mg/dl) cholesterol). Employees interested in participating in the blood cholesterol screening which was offered during company time were given an informed consent form (see Appendix B) and a pretest questionnaire assessing cardiovascular

risk, knowledge, and diet or health related attitudes (Appendix C). The following week, employees wishing to participate turned in their questionnaire and consent form and received a blood cholesterol test using the Reflotron (finger-stick method) which provides quick on-site measurement of blood cholesterol. The test was made available on company time. Measures were interpreted for all employees; those with cholesterol readings greater than 240 mg/dl were asked to see their physician to obtain a lipoprotein profile. Employees without a regular physician were encouraged to see the company doctor. Medical insurance covered visits to the physician and follow-up lipoprotein profiles. Three hundred and twenty-eight employees were initially tested. Within this group two hundred employees had elevated readings ($\geq$ 200 mg/dl), thirty-four of those employees had readings $\geq$ 240 mg/dl, placing them at high risk for heart disease.

All subjects with elevated blood cholesterol ($\geq$200 mg/dl) were asked to participate in Phase II of the Healthy Heart Program as subjects in this study. One hundred and seventy employees who consented to participate were divided into plant and office populations and then randomized by sex into one of three groups: individuals receiving worksite classes (Group I), those who received information on diet and blood cholesterol at home through the mail (Group II) and a control group (Group III) who received nothing during the intervention but who later received the same interventions as Group I (Figure 3.1).

Table 3.1 Group Assignments for Subjects consenting to participate in the study, randomized by sex and worker type.

	Group I (Worksite classes)	Group II (Information mailed home)	Group III (Control)	
PLANT (Blue Collar) Males	7	11	7	
Females	26	25	24	
	N = 33	N = 36	N = 31	100 (59%)
OFFICE (White Collar) Males	17	15	14	
Females	8	8	8	
	N = 25	N = 23	N = 22	70 (41%)
	58 (34%)	59 (39%)	53 (31%)	

Educational Approach and Procedures

During and after the initial screening and subject recruitment, several focus group interviews were conducted among employees being tested to ascertain needs and desires regarding the program content and emphasis, convenient times and present health or fitness goals. Employees representing white and blue collar personnel at each level of management and a union steward or spokesperson also participated to determine what they felt were convenient times and places to deliver classes. Interviews also attempted to assess what individuals' problems were with: eating, food preparation, weight control, support networks, and what they would want most from a program. This kind of "interactive process" was continued during the worksite classes. On the first day of classes, employees in attendance were asked to identify their primary reason for being there, their favorite and least favorite foods, and what they felt would be either the most difficult thing to change in their diets or the greatest obstacle, barrier, or temptation that they anticipated would need to be overcome.

In an effort to facilitate and support positive changes in eating behaviors at the worksite, food service managers and workers as well as vending machine distributors and local grocers were contacted about the program and asked to change current practices and/or offer lower-fat, higher fiber food choices. For example, cafeteria staff were urged to prepare foods with less saturated fat by eliminating lard and hyrogenated shortenings and including more soluble fiber whenever possible and to offer a variety of fresh fruits and vegetables to

enable individuals in the program to stay within dietary recommendations designed to reduce their blood cholesterol and keep it under control. Venders were asked to make efforts to stock machines with items carrying less saturated fat and more fiber. The following changes were actually made by cafeteria staff approximately one week before the study:

1. Lard and hydrogenated shortenings were replaced with either vegetable oil or margarines which contain at least twice as many grams of polyunsaturated fat as saturated.
2. Pinto beans, black-eyed peas and bran muffins were added as weekly menu choices rich in water-soluble fiber.
3. More fresh fruits and vegetables were offered on a daily basis.
4. Fat is now drained off of or trimmed away from meats and less pork is now served.

The worksite classes (Group I) were given on company time, during breaks and during lunch. The classes focused on six themes: 1) how to change your eating behavior to reduce your health risk, 2) how to read labels, 3) how to make low-fat, high fiber substitutions in cooking, 4) how to plan low-fat, high fiber meals and select from a menu, 5) how to control your weight, and 6) how to begin an aerobic exercise program.

All instruction was supplemented with written information for participants to take home. Figure 3.1 presents the outlines for each educational session. For Group II, information was sent home weekly and consisted of only informational handouts and recipes from the

worksite classes on the same topics. Group I and Group II both received the same written information or handouts. The classes were offered on two days of each week at lunch, during company time and break-times. Employees could come to any class that was convenient for them. Each class session lasted for 20 to 30 minutes and concentrated on a different theme each week (see Figure 3.1).

Outline of Educational Sessions

Session I: How to Change Your Eating Behaviors to Reduce Your Health Risk

1) Three good reasons to lower your blood cholesterol.
2) Recommended dietary guidelines to follow in reducing and controlling blood cholesterol levels.
3) Facts about blood cholesterol and associated risk factors.
4) Description of the process by which Atherosclerosis develops.
5) Food Sample - "oat bran muffins" (Recipes provided).
6) Assignment - bring in cracker and margarine labels.

Session II: How to Read Labels

1) Facts about fat on food labels
   a) calories per gram
   b) percent by weight
   c) types of fat; characteristics and dangers.
2) The truth about fat and cholesterol claims
   a) deciphering ingredient labels and tips for health conscious consumers.
3) Brand names to look for - review on labels brought from home.
4) Food sample - "no-fat sweet potatoe-raisin cakes" (Recipes provided).

Session III: How to Make Low-fat, High Fiber Substitutions in Cooking - "A Healthy Heart Trip Around the World."

1) Silent substitutions - replacing ingredients rich in saturated fat with their low-fat counterparts.
2) Preparation and cooking tips to reduce fat intake, especially saturated fat and increase water-soluble fiber consumption.
3) Food samples and recipes for lower-fat, higher fiber ethnic dishes (identified as favorites in a class survey) .
   "Biscuits for Your Heart's Delight"
   "Kidney bean-corn chili"
   "Ground turkey sausage"
   "Ground turkey-pinto bean burritors"
   "Singapore Chicken and vegetables"
   "Lemony-bran cheese pie"
   "Chocolatey-Chocolate Cocoa cake".
4) Brand name samples of low-fat and high fiber food items.
   a) crackers without animal fat or hydrogenated oils - comparison with fat laden brands
   b) oat bran and oat bran products
   c) butter buds.

Figure 3.1 Outline of Educational Sessions for Worksite Classes and Information Sent Home

Session IV: How to Plan Low-Fat, High Fiber Meals and Select from a Menu

1) What should I buy - "Handy Reference" for meal planning.
2) Ten tips for cutting down on fat and saving money.
3) Eight ways to help your family say "no" to fat.,

Session V: How to Control Your Weight

1) How to spot a "Fad Diet" and recognize the characteristics of a good weight reduction plan
2) Behavior Moderation tips
3) Calculating your total energy need
4) Tips to keep your eating in balance

Session VI: How to Begin an Aerobic Exercise Program

1) The benefits of aerobic exercise
2) Monitoring your target heart rate
3) Stretching to warm-up and cool down
4) Tracking your progress - monitoring your recovery heart rate

Figure 3.1 (continued)

Prizes for compliance with program assignments included T-shirts, coffee mugs, refrigerator magnets, recipe cards, home-made healthy heart food items and gift certificates to local restaurants providing meals which meet guidelines established by the American Heart Association.

Data Collection

All subjects were asked to complete and return two three-day food records -- the first prior to the first week of the study and the second prior to the eighth week of the study. Instructions were given to ensure their proper completion. Subjects also completed and returned a pre-test questionnaire before the baseline blood cholesterol test and the study itself began. During the tenth week of the study, subjects had their blood cholesterol measured again and completed a post-intervention questionnaire identical to the previous one to determine if there were any changes in knowledge, attitudes and behaviors. Subjects were given written and oral feedback on their three-day food records, and recommendations were made to reduce saturated fat and increase soluble fiber intake.

Questionnaires

Two questionnaires, a pretest and a post-test were administered. The pretest questionnaire consisted of multiple choice questions in a multiple choice and Likert format (see Appendix C). The post-test questionnaire also contained multiple choice items and was

identical to the pre-test questionnaire (see Appendix B). Questions were designed to assess general cardiovascular risk, and demographics such as family history, sex, height, marital status, educational level and living situation. Additional questions addressed individuals' knowledge about diet and blood cholesterol, their current dietary practices, perceived susceptibility to heart disease, perceived social support and self-efficacy for changing health behaviors. Composite scores were developed and analyzed for each category.

Food Records

All subjects with elevated blood cholesterol were requested to complete a 3-day food record at the initial screening and at the end (the eighth week) of the intervention (see Appendix D). Individuals were given instructions for completing the form and told to use the handouts and examples to assist them in determining specific amounts and types of all foods and beverages consumed over the three-day period.

Subjects completing the three-day food record were given written feedback and the number of servings from each fat and fiber group were recorded before and after the intervention to determine changes.

Fat and fiber groups included:

1) Low fat or < 30% fat content
2) Medium-High Fat > 30% fat content
3) Food items high in saturated fat and cholesterol, > 50% saturated fat, and containing cholesterol
4) Foods high in water soluble fiber (from a list which was provided).

Information used to determine fat content came from Jane Brody's Nutrition Book (1982) and the information on fiber was derived from a Health- Action Newsletter developed by the U.S. DHHS (1986).

Blood Cholesterol Measurement

Screening for elevated blood cholesterol is necessary for identifying those at greater risk for cardiovascular disease. Routine venipuncture is more accurate and provides more descriptive information (Dalen, 1988), but for this study venipuncture was not a practical nor an affordable alternative. Instead, a Reflotron was used to screen all employees at the plant. The Reflotron is a portable analyzer designed to give onsite, non-fasting total blood cholesterol results from finger-stick specimens. The Reflotron is a compact lightweight system which is capable of analyzing one specimen at a time. A specimen is pipetted onto a reagent strip which is then loaded into the analyzer. The strip filters red cells and allows plasma to soak into a flap containing dry reagents. It takes approximately three and a half minutes to obtain a single reading using the Reflotron.

The advantages to using the Reflotron (Warnick et al., 1986), include:

1. it is portable, compact and lightweight
2. it analyzes blood or plasma with convenient application
3. it requires minimum technical expertise
4. it requires as little as 30 ml of blood

5. results are determined within a matter of minutes such that test results and counseling can be provided for clients together with educational materials in a single encounter.

However, there are also disadvantages to using the Reflotron (Warnick et al., 1986). They include:

1. marginal precision and accuracy. The Reflotron generally underestimates total blood cholesterol by 6-9%
2. length of time required for processing. Only one blood sample can be processed at one time, each requiring approximately 3 minutes from skin preparation to display of results.
3. no print out of results is provided. All measures must be recorded by hand.

To ensure consistent and accurate readings, the Reflotron was calibrated daily before screening began and after every 30 tests performed as the manufacturer recommends. Several test-re-test procedures were performed on individuals and re-test results were found to be within 0-6 mg/dl of the first reading. Subjects who were tested on the first day of the screening were also re-tested because of the difficulties encountered in preventing air drafts from entering the room and causing temperature fluctuations which can result in extraneous readings with the Reflotron.

The collection of blood for the Reflotron procedure involves the use of a lancet to puncture the subject's finger. Before blood samples were drawn, all subjects were required to sign an informed consent document. Then, the subject's finger was cleansed with alcohol and

dried to avoid diluting the blood sample with alcohol. The finger was then punctured with a clean, disposable lancet. The first drop of blood was discarded, and the second drop was collected by capillary pipette tube and placed on a test strip which was inserted into the Reflotron for analysis. The following precautions were taken to ensure the safety of all subjects. Each subject's finger was cleansed with alcohol before and after the Reflotron procedure, a new lancet was used on each subject, and all lancets were accounted for by matching the number used with the number tested. The technician collecting blood was also required to wear rubber gloves and all materials exposed to the blood were appropriately labelled and then disposed of in a safe place.

Statistical Analysis

Changes in the dependent variables (blood cholesterol, weight, dietary practices, dietary consumption, knowledge, self-efficacy, perceived susceptibility to heart disease, and perceived social support) were analyzed to determine their importance both practically and significantly. Analysis of variance (ANOVA), and multiple comparisons were performed using SAS (Statistical Analysis System), which is a computer software package used for data management and analysis.

Changes in the dependent variable - blood cholesterol, for each of the three groups of office and plant (white and blue collar) subjects were analyzed by performance of a 4-way ANOVA and 2-factor interaction

with type of worker, group, sex, and educational level. The same statistical model was also used to determine changes in the other dependent variables of interest - weight, dietary practices, knowledge, perceived susceptibility, perceived social support, and self-efficacy. Data from the three-day food records were used to determine if there were reductions in the number of servings consumed in each of the fat categories and in the servings of water-soluble fiber. Food record data is presented in Chapter Four as changes in group mean.

Procedures

The statistical analysis which was performed using SAS involved an investigation of the intervention's or treatment effect on the dependent variables identified above by the four underlying factors: sex, type of worker, group (worksite classes vs. mailed home vs. control) and education level. A four-way analysis of variance (ANOVA) model was identified as the underlying statistical model. Initially, all two factor interactions were included in the model, but due to the limitations of not all two factor interactions being completely estimable, some were excluded from the model in performing multiple comparisons on significant factors.

The general statistical model is given by,

$$Y_{ijklm} = u + S_i + T_j + G_k + E_l + (ST)_{ij} + (SG)_{ik} + (SE)_{il} + (TG)_{jk} + (TE)_{jl} + (GE)_{kl} + E_{ijklm}$$

where

Y_{ijklm} is the observed response variable of interest

u is the overall mean

S_i is the sex effect, i = 1,2 (male, female)

T_j is the type of worker effect, j = 1,2 (office, plant)

G_k is the group effect, k = 1,2,3 (worksite classes, mailed home, control)

E_l is the education level effect l = 1,2,3,4 (grade school, some high school, high school, some college or college degree)

$(ST)_{ij}$, $(SG)_{ik}$, $(SE)_{il}$, $(TG)_{jk}$, $(TE)_{jl}$, $(GE)_{kl}$ are the two factor interaction effects, and

E_{ijklm} is the random error component

The hypotheses of interest, which will be discussed in greater detail, center around tests on the main effects which are given by:

Ho: $S_i = 0$ for all i

Ho: $T_j = 0$ for all j

Ho: $G_k = 0$ for all k

Ho: $E_l = 0$ for all l

Changes in fat and fiber intake were assessed via recording by group, self reported food intake and calculating the percentage changes in the mean number of servings consumed from each of the fat and fiber categories. Statistical Analysis System (SAS) Institute's computer package was used to conduct the statistical analyses on questionnaire, blood cholesterol, and body weight data and for investigating the effects of the interventions used upon each of the

dependent variables as well as to obtain demographic/descriptive information about the subjects in the study.

Chapter four contains the results of this study a discussion of its results, and recommendations for future research.

CHAPTER IV

RESULTS AND DISCUSSION

Description of the Study Population

Baseline questionnaire data in Table 4.1 describes the education level, marital status, and cardiovascular profile of the entire pool of 170 subjects.

RESULTS

Tests were performed initially for the two-factor interaction effects in an attempt to identify any possible interactions between sex, worker type, group, and education level. These interactions, if present, may cause the main effects tests to show nonsignificance even though a main effect may exist. Unfortunately, not all two-factor interactions were completely estimable because a very small number of post-intervention questionnaires were returned (31%), which severely limited the ability to assess changes in the following dependent variables: change in knowledge, change in dietary practices, change in perceived social support, change in perceived susceptibility to heart disease and change in self-efficacy. However, pre and post data was obtained from almost all subjects on the dependent measures for blood cholesterol and body weight.

Table 4.1

Population Characteristics for Office and Plant Subjects

	Frequency N	Percent %
Cardiovascular Profile (Total N = 170)		
Smokers	27	22
Family History of Heart Disease	106	66
Exercise Aerobically 3 times/week	35	28
Hypertensive	33	20
Been Advised by Physician to Lose Weight	45	27
Been Told by Physician that they have Heart Disease	2	1
Knew What their Blood Cholesterol Was	8	5
Baseline Mean Blood Cholesterol Levels		
White Collar		
200-219 mg/dl	34	20
220-239 mg/dl	22	13
≥ 240 mg/dl	14	8
Blue Collar		
200-219 mg/dl	39	23
220-239 mg/dl	37	22
≥ 240 mg/dl	24	14
Education (highest level completed)		
Grade School	10	6.1
Some High School	21	12.8
High School	59	36.0
Some College or College Degree	74	45.1
Married	145	88

	N	Questionnaire Item	Answered Correctly	%
Knowledge About Diet and Heart Disease. See Appendix Questionnaire Items 12 and 14	170	12	92	54
	170	14	29	17

For all variables except change in cholesterol, all two-factor interaction and main effects were found to be non significant. Four-way ANOVA test results for the dependent variable change in blood cholesterol as well as the overall and group changes in mean blood cholesterol values are shown in Tables 4.2-4.4. The .05 level was the established criteria for significance for the one-tailed tests performed.

Some small but insignificant change in cholesterol was observed among the groups and between office and plant workers (Table 4.4). A closer look at Table 4.4 illustrates a gradient of change in the plant population. In terms of blood cholesterol reduction, plant workers who received worksite classes reduced their levels similar to those who received information at home (11% vs 10%). Subjects in the class group reduced levels by 5% more than subjects in the control group whereas subjects in the group receiving information at home reduced cholesterol by 4% more than the control group. Among subjects in the office groups, subjects who received the classes lowered cholesterol levels by 9% whereas those who received the information at home only reduced cholesterol levels by 6% and interestingly enough, the control group lowered their cholesterol levels by more than the group who received information at home (6% vs. 7%).

Table 4.2

Four-Way ANOVA With Interaction for the Dependent Variable Change in Blood Cholesterol

Source	SS	df	MS	F	p
Sex	1004.4517	1	1004.4517	2.60	0.1092
Type*	441.387	1	441.387	1.14	0.2870
Group	2739.3855	2	1369.69275	3.55	0.0316 *
Education Level	3152.1181	3	1050.7060	2.72	0.0417 *
Sex * Type	753.5632	1	753.5632	1.95	0.1648
Sex * Group	163.1246	2	81.5623	0.21	0.8099
Sex * Education	2258.2255	3	752.74183	1.95	0.1248
Type * Group	162.5215	2	81.26075	0.21	0.8105
Type * Education	299.6043	2	149.80215	0.39	0.6793
Group * Education	2641.2053	6	440.2009	1.14	0.3429
ERROR	50982.1866	132	386.2287		
TOTAL	66504.9423				

Mean Change in Cholesterol = -18.5192 mg/dl (reduction)

Root Mean Standard Error = 19.6527 mg/dl

Level of Significance = .05 (one-tailed test)

* Type = Type of worker

Table 4.3

Overall Mean Change in Total Blood Cholesterol

N	Range (mg/dl)	Pre-Measurement (mg/dl)	N	Post-Measurement (mg/dl)	N	Standard Error	Mean Change (mg/dl)	%
170	200-295	227.0	170	209.0	165	1.5	18.0	9.0

Table 4.4

Mean Change in Blood Cholesterol Levels by Group and Worker Type

Group	N	Pre Ranges (mg/dl)	Pre (mg/dl)	Post (10 wks) mg/dl	N'	Standard Error mg/dl	Change mg/dl	% Change
Plant Subjects								
Worksite classes	33	201-289	237	214	32	3.3	23	11
Mailed home	36	200-281	227	207	35	3.4	20	10
Control	31	200-283	230	217	31	3.5	13	6
Total	100	200-289	231	213	98		19	9
Office Subjects								
Worksite classes	25	207-283	230	211	23	3.4	19	9
Mailed home	23	200-274	217	205	22	3.5	12	6
Control	22	200-295	222	208	22	3.4	14	7
Total	70	200-295	223	208	67		15	7

Note: Unbalancing of group sizes prior to the intervention exists due to scheduling requests from company management.

For change in cholesterol levels, a group effect (p = .0316*) and an education level effect (P = .0417*) were identified via an ANOVA F-test (Table 4.2). Multiple comparisons among the three groups (worksite classes, mailed home, and control) and the four education levels were performed using least square means (Table 4.5 and Table 4.6). Least square means are necessary because of the unbalancing that exists in the sample sizes. In order to estimate the least square means, a reduction of the model was necessary and therefore some highly nonsignificant two-factor interactions were removed from the model such that least squares means for group and education level are estimable.

The results of the multiple comparisons shown in Table 4.5 indicate that for the dependent measure change in blood cholesterol - the worksite class group (I) and the control group (III) - are significantly different from each other (p = 0.0284) but no other significant differences exist among the groups at the .05 level of significance. In addition as Table 4.6 illustrates, participants with only a grade school education show a significantly greater change in cholesterol levels than those at higher educational levels (p = .0021**, p = .0001**, p = .0003**). No significant differences exist among some high school, high school graduates, and college educational levels.

ANOVA results indicated no significant differences for the following dependent variables: body weight, knowledge, dietary practices, perceived susceptibility, perceived social support and

Table 4.5

Least Square Means for the Education Effect With Change in Blood Cholesterol

Educational Level	Least Square Means (Change in Cholesterol) mg/dl	Standard Error mg/dl
Grade School (I)	-41.9977	6.3499
Some High School (II)	-17.3847	5.5867
High School (III)	-15.0982	3.8067
Some College or Degree (IV)	-14.3124	2.9906

Least Square Means

Comparison	p
I vs II	0.0021**
I vs III	0.0001**
I vs IV	0.0003**
II vs III	0.7075
II vs IV	0.6544
III vs IV	0.8849

Table 4.6

Least Square Means for the Group Effect With Change in Blood Cholesterol

Group	Least Square Mean (Change in Cholesterol) mg/dl	Standard Error mg/dl
Worksite Classes (I)	-26.5648	3.3690
Mailed Home (II)	-22.1703	3.3727
Control (III)	-17.8597	3.4904

Least Square Means

Comparison	p
I vs II	0.2643
I vs III	0.0284**
II vs III	0.2780

self-efficacy. Baseline and post-intervention data was obtained from all subjects. However due to a poor return on post-test questionnaires and food records our analyses were limited. Except for blood cholesterol and body weight all analyses performed on the remaining dependent measures were limited to those members of the initial or pre-test sample who also completed the final or post-test questionnaire. A comparison of the responses to selected questionnaire items is addressed following body weight and compliance results. Tables 4.7 and 4.8 illustrate relative changes (nonsignificant) in body weight and available compliance data (class attendance).

As indicated in Table 4.8, office or white-collar employees attended more classes than plant or blue-collar employees. Both office and plant employees were permitted to attend on company time, during lunch, or during their break-times. However, during weeks three and four, plant workers from several of the assembly lines were not able to attend because production was behind schedule due to a serious computer malfunction.

The responses to selected questionnaire items in Table 4.9 indicate that a greater percentage of subjects were able to correctly identify saturated fat as being more capable of raising blood cholesterol levels than cholesterol and polyunsaturated fats (44% baseline vs. 81% post-intervention). A greater percentage of subjects were also able to correctly identify animal foods as a common source of saturated fats (20% baseline vs. 76% post-intervention).

Table 4.7

Mean Change in Body Weight by Group and Worker Type

Group	N	Pre (pounds)	Post (10 weeks) (pounds)	Change (pounds)	% Change (decrease)
Plant Subjects					
Worksite Classes	33	167	165	1	1.2
Mailed Home	36	168	165	3	1.8
Control	31	165	163	2	1.2
Total	100	167	165	2	1.4
Office Subjects					
Worksite Classes	25	172	170	2	-1.2
Mailed Home	23	169	170	1	-0.6
Control	22	172	172	0	0
Total	70	171	171	0	0

Std. error = 11.64

Table 4.8

Compliance Information: Percent Attendance for Worksite Classes by Worker Type

Class Week	Plant #	Plant %	Office #	Office %
1*	9	27	22	88
2	10	30	19	76
3*	6	18	13	52
4*	6	18	18	72
5	7	21	17	68
6	9	27	12	48

* Company's computer system shut-down

Table 4.9

Comparison of the Responses to Selected Pre-Post Questionnaire Items for Subjects Completing Pre and Post Questionnaires (31% Return)

Which of the following can raise blood cholesterol more?
1) cholesterol
2) saturated fat
3) polyunsaturated fat

Response Chosen	N	Baseline (Pre) Percent (%) #	%	Post-Intervention (10 weeks) Percent (%) #	%	% Change
	54					
1 and 3		24	44	10	19	25
2		30	56	44	81	25

Saturated fats mostly come from?
1) vegetables
2) animals
3) breads and potatoes

Response Chosen	N	Baseline (Pre) Percent (%) #	%	Post-Intervention (10 weeks) Percent (%) #	%	% Change
	54					
1 and 3		43	80	13	24	56
2		11	20	41	76	56

Table 4.9 (continued)

I usually eat a high fiber cereal for breakfast with low-fat milk.

1) yes
2) no

Response Chosen	N	Baseline (Pre) Percent (%) #	%	Post-Intervention (10 weeks) Percent (%) #	%	% Change
	54					
1		14	26	38	70	44
2		40	74	16	30	44

For the most part, I think that my diet is good for my heart.

1) disagree
2) tend to disagree
3) tend to agree
4) agree

Response Chosen	N	Baseline (Pre) Percent (%) #	%	Post-Intervention (10 weeks) Percent (%) #	%	% Change
	54					
1		8	15	3	5	10
2		16	30	5	9	21
3		22	41	24	45	4
4		8	14	22	41	27

Table 4.9 (continued)

I sometimes worry a lot about what I eat.
1) disagree
2) tend to disagree
3) tend to agree
4) agree

Response Chosen	N	Baseline (Pre) Percent (%) #	%	Post-Intervention (10 weeks) Percent (%) #	%	% Change
	54					
1		9	18	15	28	10
2		12	23	12	23	0
3		21	36	16	29	7
4		12	23	11	20	3

My friends have a lot to do with what I eat.
1) disagree
2) tend to disagree
3) tend to agree
4) agree

Response Chosen	N	Baseline (Pre) Percent (%) #	%	Post-Intervention (10 weeks) Percent (%) #	%	% Change
	54					
1		4	7	7	14	7
2		7	13	4	7	6
3		14	26	22	43	17
4		29	54	21	36	18

Dietary Adherence

Three-day food records distributed prior to the first and eighth week of the study were analyzed to determine changes in the mean number of servings from each of the fat categories and for water-soluble fiber. Again, a very small number of subjects in the study (38%) completed and returned both the baseline and eight week three-day food-records. The group percentage change in the mean number of servings from each of the fat categories and water soluble fiber are presented in Table 4.10 Subjects who received the worksite classes or information mailed home consistently showed more favorable changes in self-reported intake of dietary fats, dietary cholesterol, and water-soluble fiber.

The Discussion section of this chapter addresses the implications of the findings in relation to the research hypotheses introduced in Chapter One.

Table 4.10

Three-Day Food Record Data: Percentage Change from Baseline to 8 Weeks for the Mean Number of Servings From Each Fat Category and Water-Soluble Fiber

Group	N	High Cholesterol %	# servings	Medium High Fat %	# servings	Low Fat %	# servings	High Water-Soluble %	# servings
Plant									
Worksite classes	12	108	[12.5 vs 6]	45	[22 vs 15]	47	[8.5 vs 12.5]	125	[4 vs 9]
Mailed home	12	114	[15 vs 7]	42	[27 vs 19]	24	[14.5 vs 18]	129	[3.5 vs 8]
Control	12	56	[19.5 vs 12.5]	23	[24 vs 19.5]	60	[10 vs 16]	75	[11.5 vs 24]
TOTAL (PLANT)	36	90	[39.5 vs 21]	35	[72 vs 53]	41	[33 vs 46.5]	109	[11.5 vs 24]
Office									
Worksite classes	10	171	[9.5 vs 3.5]	60	[16 vs 10]	31	[14.5 vs 19]	260	[2.5 vs 9]
Mailed home	10	93	[13.5 vs 7]	145	[21 vs 8.5]	21	[17 vs 20.5]	60	[5 vs 8]
Control	10	19	[12.5 vs 10.5]	21	[17 vs 14]	11	[14 vs 15.5]	25	[4 vs 5]
TOTAL (OFFICE)	30	69	[35.5 vs 21]	66	[54 vs 32.5]	21	[45.5 vs 54.5]	96	[11.5 vs 22.5]
OVERALL TOTAL	66	80		49		29		105	

Discussion

Statistical analysis using the available data from the baseline and post-intervention blood cholesterol test and body weight measurement showed that all groups experienced reductions in blood cholesterol over ten weeks but particularly the two experimental groups which received worksite classes or information mailed to their homes. Based upon these findings the first research hypothesis is retained.

H_o1: Subjects receiving worksite classes will achieve approximately the same reductions in blood cholesterol as subjects receiving the same information at home and will also display similar gains in knowledge and more positive health relevant attitudes over a ten week period.

Although there was not a statistically significant difference between the two experimental conditions, subjects in the worksite classes reduced their blood cholesterol levels by more than subjects receiving information on diet and blood cholesterol mailed to their home. However, because only 31% of subjects returned post-test questionnaires, it is not possible to make inferences about the knowledge and attitudinal effects of either educational strategy. However, Buller (1978) conducted a similar educational program in which results revealed that participants made positive changes as a result of a hyperlipidemia communication campaign. Significant correlations were found between attitude and behavioral change at the .01 level. Buller's study compared interpersonal contact with

mass media messages. In contrast, Crouch et al. (1986) compared face to face counseling with mail and telephone counseling. Interestingly enough, both studies concluded that mailed information and mass media message were almost as effective as the in-person or personal contact interventions in terms of cholesterol reduction and attitude change. Buller (1978) and Courch (1986) also reported that there were no significant differences by condition for body weight, which supports the findings of the present study. Bruno (1983) conducted a worksite nonpharmacologic behavioral change program to reduce the risk for heart disease among employees at the New York Telephone Company who participated in an eight week program. Bruno's (1983) program significantly increased employee's knowledge, reduced their blood cholesterol and body weight, and improved morale. Unfortunately, the present study lacks sufficient data to determine effect upon knowledge and attitudes.

Statistical analysis revealed that the control group was significantly different ($p = 0.0284^*$) from the group receiving worksite classes for the dependent variable blood cholesterol. However, the control group was <u>not</u> significantly different from the group receiving information at home, which suggests that the health educator may play an important role in helping patients to lower blood cholesterol levels. For white collar employees, this does not appear to be true. In fact, the control group outperformed the mailed home group (nonsignificant). Table 4.4 illustrates this observation. One possible explanation for these findings is that perhaps blue-collar employees in the mailed home group were more

responsive because the information was new to them whereas the white collar employees, who are generally more well educated already know this information and were less eager to change their eating habits. The smaller amount of change in blood cholesterol for office employees compared to plant or blue-collar workers may be a reflection in part due to environmental differences. Office or white collar workers have been under more stress. Since just prior to the beginning of this study, two significant layoffs have occurred within the office population. (Plant or blue-collar workers are protected by the union.) According to Axelrod et al. (1984) hormones produced by the body's response to stress can elevate serum blood cholesterol levels.

As shown in Table 4.4, both control groups lowered mean blood cholesterol levels over the period of time from baseline to ten weeks. It is possible that several factors could account for this observation. Crossover may have created confounding or the baseline cholesterol test could have prompted reductions in blood cholesterol in all groups. Table 4.4 also indicates that with plant workers there was an additional 5% reduction in blood cholesterol among subjects in the worksite class group over and above the 6% reduction obtained by the control group. This is nearly a 100% gain over blue-collar employees who received the blood test alone. Blue-collar workers who received mailings at home achieved a 66% improvement in blood cholesterol over controls. Other studies such as a recent study by Cummings et al. (1988) designed to evaluate the effects of

two features of self-help smoking cessation booklets found that informational booklets were no more effective than the control booklet.

It was not possible to draw accurate inferences about the possible effects of work environment or income level from the data in this study. Also, because of the insufficient number of post-intervention questionnaires completed and returned (31%) for statistical analysis, changes in the additional dependent variables (knowledge, dietary practices, perceived social support, perceived susceptibility, and self-efficacy) were not estimable. Therefore it was not possible to determine interaction effects.

Thus, based upon the test presented earlier in Table 4.2, we also fail to reject the second null hypothesis ($p = 0.2870$) which states:

H_o2: White collar and blue collar or office and plant employees receiving worksite classes will respond similarly to the educational strategies used as evidenced by reductions in blood cholesterol and weight, changes in dietary practices, gains in knowledge, and improvements in: self-efficacy, perceived social support and perceived susceptibility to heart disease from baseline to ten weeks.

An education level effect was identified in Table 4.5. Participants with only a grade school education show a significantly greater change in cholesterol levels than those completing some high school ($p = 0.0021$), high school ($p = 0.0001$), and some college or a college degree ($p = 0.0003$).

Subjects with only a grade school education (most often, blue-collar workers) may have shown greater changes in blood

cholesterol because they received crucial information on diet and blood cholesterol about which they were previously unaware of or were unable to apply because they lacked the skills or support necessary. On the other hand, these subjects may have simply taken the program more seriously, or perceived themselves as being more susceptible to heart disease once they learned that their blood cholesterol was elevated and that their current eating behaviors may increase their risk for heart disease. As a result, they may have been more apt to comply with the dietary guidelines provided.

The mailed home groups in this cholesterol study were not statistically different from the control groups which may be due to several factors. One explanation may be in the fact that subjects in all three groups were exposed to or influenced by the same environmental changes such as changes in the types of foods and preparation methods of foods served in the cafeteria, removal of non-dairy creamers from coffee lounges and substitution with milk and nonfat milk powder, new vending machine items, and an aggressive promotional campaign which began several weeks prior to the study. The screening itself may have been enough to prompt some individuals to change their eating habits. It is also possible that the sample size was not sufficiently large to detect small changes. Again, insufficient post-test data, due to a mere 31% return rate on questionnaires makes it difficult to measure the effect of either educational strategy upon knowledge, attitudes and dietary practices. However, based upon the statistical evidence, we can not

conclude that the mailed home approach was any more effective at lowering cholesterol levels than the control situation, particularly for white-collar workers. It is apparent from our data that the worksite classes were more effective than the control in lowering blood cholesterol for both white and blue-collar workers.

Also, Table 4.4 reveals that all groups succeeded in reducing blood cholesterol levels, as noted above there are various possible explanations. It is possible that seasonal variation, natural decline over time or regression to the mean could explain this over-all trend in blood cholesterol reduction within all groups or simply removal of barriers associated with the cafeteria and vending machines. Dishman (1986) suggests that removing barriers to exercise among blue-collar workers will not necessarily increase compliance. He also stated that barriers to health interventions will differ according to whether a barrier is real or perceived or is only a rationalization or excuse for noncompliance. Dishman also found in his review of over 15 years of research findings on exercise compliance, that "blue-collar workers appear less likely to adopt or maintain a supervised or self-initiated fitness program" (Dishman, 1986). The results from this study differ from Dishman's findings and show that blue-collar workers, typically lower educated individuals, tend to reduce blood cholesterol levels significantly more than subjects completing some high school, high school, and some college or a college degree. Dietary habits and exercise habits are, however, very distinct, complicated behaviors.

The results of no significant differences for change in blood cholesterol between subjects receiving information at home and subjects in the control group raise several questions. This difference ($p = 0.2780$), was not significant at the .05 level, and this suggests that although the mailed home format lacks the potentially motivating interaction of instructor led courses, it provides all the materials needed to help someone make positive eating behavior changes to reduce blood cholesterol. However, the findings of this study indicate that one approach is not significantly more effective than the other in reducing blood cholesterol. Wilson and Brownell (1978) reported that regardless of the situation, family member, spousal, or significant other involvement produced greater reductions in body weight for participants in a weight loss program than non-involvement. Perhaps with more data, we would have found the mailed home group statistically significant from the control group.

Observations regarding dietary adherence are cautiously taken into consideration due to the small sample size, the fact that changes were "self-reported" and because of the bias present with the use of a prize drawing as an incentive for subjects to complete and return food records. It is also possible that those individuals who chose to complete and return food records were more motivated or in some way different from their fellow employees or group members and are thus not representative of the entire group or population studied.

Findings in Table 4.11 are congruent with those of Fortmann et al. (1981) who reported declines in dietary cholesterol and dietary saturated fatty acids. Fortmann's study, a 2 year mass media cardiovascular health education program in two communities, found that dietary saturated fat and cholesterol showed almost identical declines in the two educated communities and little change in a control community. Similarly, the Control Data "Stay Well" program reported reductions in butter, salt, and sugar consumption among employees in their risk reduction program (LaRosa, 1984).

Case Studies

The following case studies reflect observations based upon empirically validated physiological data as well as self-reports from the patient/subject. Names of subjects have been changed to protect their privacy.

Case #1

John, 38 years of age, was a subject who received the "worksite class" treatment as an office or white-collar employee. John attended every class and complied with all assignments (ie. food records and questionnaires). Over the ten week period, John successfully reduced his blood cholesterol from 211 mg/dl to 133 mg/dl and lost 8 pounds. A closer look at John's food record indicates a dramatic increase (4 servings vs 23 servings or 475%) in foods rich in water-soluble fiber such as beans, peas, prunes, oat

bran and fresh fruits and vegetables and also a decrease in total fat intake, especially saturated fat. John remarked that he felt the most valuable part of the program's classes was the practical information and skills. For instance, learning how to read labels and modify recipes, lists of "healthier" brand names to look for and rich sources of water-soluble fiber. John reported that his whole family had made changes in their diets such as switching to skim milk and avoiding coconut, palm, and hydrogenated oils. John's success and his family's support and participation illustrate the value of providing practical, salient information and encouraging family involvement.

Case #2:

Lydia, 42, an office employee was assigned to the group receiving worksite classes. Unfortunately, due to the commitments and responsibilities associated with her position, she was only able to attend two of the six classes. Lydia failed to complete the post-test questionnaire but all other dependent measures were collected. Despite the fact that she lost a few pounds and made significant improvements in her diet, Lydia's blood cholesterol rose 25 mg/dl from 201 mg/dl to 226 mg/dl. There are several possible explanations, each of which seems to point to the tremendous amount of stress in her life. A recently acquired and very demanding job, financial difficulties and an unpleasant divorce proceeding contributed to the physical and emotional drain. As noted in Chapter II, the literature to date suggests that the body's response to

stress can elevate blood cholesterol levels. Lydia's case illustrates the need for further investigation into methods and means of measuring perceived stress levels and tailoring dietary/lifestyle recommendations to suit the subject's needs while avoiding the possibility of contributing to stress or merely making subjects more aware of stress in their lives.

Case #3:

The last case, Bob, is a plant worker who received information mailed to his home. Bob is 43 years old and he reduced his blood cholesterol by 15 mg/dl. Bob reported that he and his wife found the information extremely helpful and he added quite easy to incorporate into their present eating habits. Bob stated that the changes in his diet didn't both him or his wife a bit. He said that if he'd known better, they would have incorporated them into their lifestyles much sooner. These comments may suggest that the information alone is sufficient to motivate dietary change in individuals for whom the information is new to, and who are in the early stages of behavior adoption. The recipes and food lists enhance the trialability of new behaviors and reduce barriers such as time and effort.

Confounding Events/Artifacts

During this study several circumstances occurred which may have influence its results, and are therefore listed below.

1) Over the ten week period, two layoffs occurred among office personnel. The first layoff occurred prior to the first week of the

study and the second occurred on the fourth week of the study. Several subjects dropped out and because of the impending threat of more layoffs, and the work environment became mores stressful for subjects concerned about the security of their jobs.

2) One two separate occasions during the study, the plant's mainframe computer system shut down. As a result, production at the plant was behind schedule and many subjects participating in the worksite class group were not able to attend classes for one to two weeks of the six week intervention.

3) In an effort to encourage subjects to complete and return post-intervention questionnaires and the second three day food record, a price drawing was advertised as an incentive. The drawing was not particularly effective at securing the completion and return of these items. Only 31 percent of the subjects completed and returned their questionnaires and 38 percent of the subjects completed and returned their three-day food record. It should be noted that it is also possible that a disproportionate number of "less actively" involved subjects returned their materials carelessly completed, merely to be included in the prize drawing. Consequently, subjects whose questionnaire responses comprised the bulk of the statistical analysis on changes in knowledge, changes in dietary practices and changes in perceived social support, change in perceived susceptibility to heart disease and self-efficacy may not have been representative of those subjects who actually received the program's benefits.

4) Contamination via crossover is another factor which could have caused some confounding with the data. Subjects in the worksite classes may have discussed the program with subjects receiving information mailed to them at home, despite instructions not to do so. Likewise, the subjects in these groups may have discussed the program with subjects in the control group.

Research Implications and Recommendations

The findings of this study provide information about a number of factors to be considered by health educators and employers prior to planning and implementing a blood cholesterol reduction program. Questionnaires and other data collection/measurement tools must be carefully designed, distributed and collected. Lengthy questionnaires, such as the ones used in this study, may tend to decrease the likelihood of completion and return. Also, offering prizes and other incentives may have a tendency to create biases or confounding when conducting research such as this but in non-research based studies that may enhance participation.

Based upon changes in the dependent variable blood cholesterol, the results of this study suggest that worksite classes were slightly more successful at helping employees lower blood cholesterol than information on how to lower blood cholesterol mailed to the home but this difference was not statistically significant.

The mailed home approach appears to be more cost-effective for employers (see Figure 4.1). Subjects in this study who received

	Worksite Classes	Mailed Home
· Materials for Pre and Post Cholesterol Tests	$137.50	$137.50
· Preparing Materials (time)	$324.00	$216.00
· Photocopying/Envelopes	$ 75.00	$ 90.00
· Postage	--	$363.00
· Food for Samples and Demonstrations (materials)	$330.00	--
· Preparation of samples (time)	$108.00	--
· Teaching Classes (time)	$270.00	
ESTIMATED TOTAL COST	$1244.50	$806.50

Figure 4.1 Comparison of Estimated Program Costs for Worksite Classes vs. Information Mailed Home

information at home on how to lower blood cholesterol succeeded in reducing blood cholesterol an average of 8% over the ten week period whereas subjects receiving the worksite classes only performed slightly better by reducing blood cholesterol levels an average of 10%.

The communications based or mailed home approach is attractive for employers to consider for several reasons (Vickery, 1983):

1) "pre-packaged," organized, materials can be purchased and distributed at a reasonably low cost per employee.
2) low-intensity, practical and "easy to read" information and materials reach a greater number of individuals when sent home and therefore have a higher potential of creating a sound support network for the employee. And can also influence the health behaviors of the entire family.
3) by sending information home instead of hiring a health educator to prepare and present class materials on site, program staffing requirements can be minimized and start up costs could be lower.

Based upon the experience of this study mailed home education can avoid some of the problems encountered when programs are offered at work, most notably lack of attendance. Effective courses are an important component of worksite health promotion. But they can only be successful if employees participate in them. Unforeseen circumstances or events such as the computer system going down and putting production behind schedule, can often make attendance

impossible for some employees or perhaps a low priority for others. Certain job groups are often excluded as well. For example, those which require frequent travel, making it difficult for employees to participate in a multi-session course or switchboard operators and security guards who cannot leave their positions. To meet the needs of these individuals and circumvent attendance problems arising from production schedules and other factors, self-study or mailed home information is a feasible alternative (Vickery, 1983) for effectively delivering health information to the home where spouses and family members will potentially have access to it and may encourage compliance or help maintain eating behavior changes by building the social support network. Frequent travelers are not the only ones to benefit from this approach. Spouses and dependents may also adopt healthier behaviors as a result of the exposure to health information. Also, individuals who do not like to attend courses or feel awkward in group situations also find mailed home information useful (Damberg, 1986). Mailings are also well-suited for use at small or remote sites where it is difficult or expensive to provide instructions.

Figure 4.1 compares the approximate cost per 55 employees for subjects in this study who received either the worksite classes or information mailed to their home. The comparison is based upon: a total of 55 employees for each group. It also includes a health educator's wages of $9.00'hour and a cost of approximately $1.25 per employee for each of the cholesterol test using the Reflotron. in

addition, information sent home required envelopes and postage amounting to $.55 per subject per week for six weekly mailings and required an estimated total of four hours of the health educator's time per week to prepare for each of the mailings. In comparison, for the employees in the worksite classes, the health educator taught classes for five hours per week for six weeks of different classes, spent at least two hours preparing samples and food demonstrations and spent at least six hours per classweek preparing the lecture materials. Both the worksite groups and mailed home groups received the same written materials or handouts.

The estimated program costs presented in Figure 4.1 indicate that in this study the mailed home approach was less costly than the worksite approach in reducing elevated blood cholesterol levels among employees. There was not a statistically significant difference between the two approaches. This suggests that employers should consider this approach as a viable option if their health promotion budget is small. Indeed, the expense of health promotion should be viewed as a prudent business investment as well as an employee benefit expenditure.

This research study also shows that employees with low levels of education appear to be receptive to the mailed home information. Carefully designed educational materials have the potential to effectively reach low as well as better educated individuals. It may be the case as well that less well educated employees responded more out of a realization or fear that the Reflotron test indicated they had elevated blood cholesterol rather than to the intervention.

PRACTICAL IMPLICATIONS

If this study were to be carried out again, it may be more successful if the following recommendations should be taken into consideration:

a) acquire a written, understood commitment of support for the program from top management down with sufficient resources and authority to implement the program as planned.

b) attempt to influence the corporate culture and facilitate support for the program by closely working with supervisory personnel and encouraging the participation of spouses and family members.

c) do not overlook the unions, employee groups and committees as well as the formal and informal leaders -- use them to generate enthusiasm and support for the program. Also, attempt to obtain cooperation and support from vending machine distributors, cafeteria personnel and local grocery stores. Inform them about the programs goals, invite and encourage their participation at least 2 months in advance of the program's initiation.

d) develop appropriate and effective tools for assessing program benefits. Questionnaires should be simple, brief, and straight forward.

e) have the company physician more involved in planning and implementation stages -- have him/her send out newsletters

or payroll stuffers explaining the Reflotron procedure and its advantages.

To ascertain long-term effectiveness employees' blood cholesterol levels should be measured periodically. It is not possible to tell from this study which intervention will retain the longest lasting impact or to what extent the drop in blood cholesterol among less well educated employees will persist. It is also not possible to know at what point appropriate booster education would be required to sustain or increase the changes already observed. As a practitioner, one should consider the possibility of accessing data bases from insurance claims and medical records to document long-term effects in the hopes of justifying future program expenditures through a cost-benefit analysis.

From the results of the present study, the researcher concluded that a company sponsored blood cholesterol reduction program that utilizes either worksite classes or information mailed home on how to make dietary changes which can reduce blood cholesterol and be successful at reducing elevated blood cholesterol among employees involved. Three major findings emerged from this study. First, short-term, low-intensity health education, emphasizing behavioral skills training, barrier reduction and the development of social support networks, produced decreases in total blood cholesterol among subjects involved in the Hubbell Healthy Heart program. Second, the less intensive and less costly educational strategy via the mailed home approach was nearly as effective as worksite classes in helping

employees reduce elevated blood cholesterol. Third, less well educated subjects who are typically blue-collar workers reduced their mean blood cholesterol levels significantly more than subjects from all other educational levels. This suggests that contrary to the current body of knowledge on blue-collar workers and compliance in health programs, these individuals were receptive to adopting healthier eating habits which in turn helped reduced blood cholesterol levels. Thus, the present study had demonstrated the feasibility of a low-cost, low-intensity educational strategy for lowering elevated blood cholesterol at the worksite.

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APPENDIX A

Hubbell Lighting Healthy Heart Program

and

Virginia Polytechnic Institute and State University
Division of Health and Physical Education

Informed Consent

The purpose of this program is to identify employees at Hubbell Lighting with cholesterol levels greater than 200 mg/dl and to help those employees who want to reduce their cholesterol levels. Individuals with blood cholesterol levels greater than 200 mg/dl are at greater risk of developing heart disease.

Those who wish to participate in Phase I of the study will be asked to complete a questionnaire on health and eating beliefs and practices. They will also have a free blood cholesterol test. A finger-stick will draw two drops of blood. Those with elevated blood cholesterol will be invited to participate in Phase II of the study. Those with blood cholesterols greater than 240 mg/dl will also be asked to see their physician.

In Phase II individuals will either be assigned to attend classes at work or will receive information at home on ways to lower cholesterol. Not all participants will be able to receive the educational program initially. However, all participants will be given the opportunity to receive this instruction at a later date.

All who participate in Phase II will have their blood cholesterol retested within two to three months to determine their progress. Those whose levels are greater than 240 mg/dl will be referred again to their physician.

Employees who participate may expect to benefit from the program by learning more about the influence of diet upon blood cholesterol, by learning how they can make positive dietary changes, and by receiving blood cholesterol tests results and counseling to reduce heart disease risk.

I understand that the finger-stick may produce slight discomfort. I understand that the finger-stick procedure involves: cleansing the middle finger of the non-dominant hand with alcohol pricking the skin with a lancet ejected from a hand-held dispenser and the collection of two drops of blood into a capillary tube where the blood is then placed on a test strip to be analyzed. Each test on each individual shall be administered using a clean, unused lancet and capillary tube. I also understand that there is a small risk of infection or disease contraction from the finger-stick procedure. However, every precaution will be taken to ensure the safety of all individuals. All

procedures will be carefully carried out to ensure that everything is done under the most sanitary conditions and that no persons shall be exposed to foreign blood.

I understand that any data of a personal nature will be kept strictly confidential and will only be viewed by persons directly associated with this testing. All data collected will become the property of Virginia Tech and will not be shared with others. If the results of this study are to be published or presented publicly, all information that would identify any participant as an individual will be withheld. The management of Hubbell Lighting will not have access to any data of a personal nature.

I also understand that I may abstain from participation in this study or withdraw from it at any time. I understand that I may ask the researchers involved with this study any questions about the study at any time I wish.

I realize and understand that there is no compensation or medical treatment available if injury should be suffered as a result of this study.

I have read the above statements and have had the opportunity to ask questions. I understand all of the above noted statements. Specifically, I understand the finger-stick procedure and the potential risks.

I, _____ voluntarily agree and consent to participate in a blood cholesterol testing and education program developed by the Division of Health and Physical Education at Virginia Tech. I voluntarily agree not to sue Virginia Polytechnic Institute and State University or any division thereof, or any technicians or counselors for any negligence in the performance of this blood cholesterol testing and education program.

DATE _____ TIME _____

SIGNATURE _____

WITNESS _____

PROJECT DIRECTOR - DR. ELIZABETH HOWZE 961-7116

HUMAN SUBJECTS CHAIRMAN - DR. CHARLES BAFFI 961-6561

APPENDIX B

January 11, 1988

REQUEST FOR THE APPROVAL OF RESEARCH PROPOSAL IN THE DIVISION OF HPER

submitted to

Dr. Charles Baffi
Chairman, Division Human Subjects Committee

by

Christine M. Beecy
Principal Investigator

Introduction/Scientific Justication:

Heart disease, stroke, and related carediovascular diseases account for more deaths in the United States than all other causes of death combined. More than 500,000 Americans die from heart attacks each year, 65,000 are hospitalized for heart attacks and at least 5 million Americans have angina or other symptoms of heart disease. According to the National Institute of Health (NIH), the three most clearly established risk factors for heart disease are: cigarette smokiing, high blood pressure and high blood cholesterol. Other factors include: obesity, family history of heart disease, diabetes and physical inactivity. An estimated $86 billion per year is spent on the direct and indirect costs of heart disease. Concerned over these issues, American public health institutions, private corporations, and insurance companies have taken steps in an effort to prevent heart disease rather than bear its costs after it appears.

Strategies are being employed in a variety of settings which target cardiovascular risk reduction. I have chosen to research educational approaches to lowering blood cholsterol levels in the workplace by changing dietary consumption patterns. I have chosen elevated blood cholesterol because of its indisputable link to heart disease. NIH researchers have established beyond any reasonable doubt that lowering elevated blood cholesterol will reduce the risk of heart attacks due to coronary heart disease. Epidemiological data from over a dozen clinical trials indicates that there is no doubt that appropriate changes in one's diet can reduce elevated blood cholesterol levels. Recent research on the cost-effectiveness and cost benefit of worksite health programs has stated that programs designed to reduce blood lipids may be one of the most promising interventions for long-term benefits. This research compares worksite classes with information sent home in order to evaluate which method is most cost-effective relative to reducing dietary fat intake and lowering serum blood cholesterol.

Purposes:

The purpose of this research is to identify individuals at Hubbell Lighting with elevated blood cholesterol and invite them to participate in a study designed to help them lower their blood cholesterol. The study is also being conducted to compare the effectiveness of two educational strategies in lowering blood cholesterol and changing eating behaviors. The target population consists of the employees at Hubbell Lighting, a local manufacturing plant that employs 500 men and women, 400 of whom are line workers in two shifts. One hundred employees work in offices adjacent to the line. A large proportion (at least 65%) of the day shift workers are women; many are divorced or single parents living off of one income. The proposed intervention targets office and line employees on the first shift who have elevated blood cholesterol (>200 mg/dl). Everyone with blood cholesterol over 200 mg/dl will be invited to, if willing to participate. The research method will compare the effectiveness of worksite classes and information sent home.

1. Do subjects who participate in a worksite program show greater reductions in blood cholesterol over an 8 week period compared to employees who receive information on how to lower blood cholesterol mailed to their home?

2. Do employees in worksite classes make more positive changes in their eating habits than those receiving information at home (i.e. reduce dietary fat consumption)?

3. Do those subjects participating in worksite classes show greater gains in knoweldge and more positive attitudes as a result of the worksite classes compared to these receiving information by mail?

4. Are white collar employees more responsive to both interventions as determined by changes in serum cholesterol as well as in knowledge, attitudes and dietary fat consumption?

Background/Literature Review

A diet which is high in saturated fat and dietary cholesterol elevates blood cholesterol and thereby contributes to the development and progression of heart disease. One of the most debated issues in medicine in the last decade has been put to rest since the Cornoary Primary Prevention Trial convincingly demonstrated that risk of cornary heart disease can be redued by lowering the serum cholesterol level.

Data published by the National Institute of Health (NIH) in the Lipid Research Clinic's Coronary Primary Prevention Trial and the Consensus Conference Statement indicate that as much as 50% of the adult United States population has elevated levels of blood cholesterol. Unfortunately, health experts note that most Americans never have their blood cholesterol levels checked regularly. The NIH recommendations are very definite: strive to keep your blood

cholesterol level below 200 mg/dl. Individuals who have a blood cholesterol reading above 200 mg/dl, have elevated blood cholesterol. NIH studies have also established beyond any reasonable doubt that lowering elevated blood cholesterol will reduce the risk of heart disease. In fact, clinical trials indicate that each 1% reduction in blood cholesterol levels yields approximately a 2% decrease in coronary heart disease rates. Findings from a review of the experimental clinical trials and observational cohort evidence relating serum cholesterol level and its reduction to risks of coronary heart disease (CHD) published in September of 1987 confirms the relationship between elevated blood cholesterol and heart diease. These findings confirm the lipid hypothesis; indicating that lowering serum blood cholesterol reduces CHD risk. It has been suggested that the understanding and control of CHD requires a dual approach: (1) identification and treatment of high risk individuals, and (2) modification of environmental and behavioral determinants to achieve more favorable distributions of serum cholesterol in populations and individuals.

Research studies have shown that elevated blood cholesterol can be reduced through education. Studies conducted by Singleton et al. on the use of Behavioral Contracting and Wilsche et al. on the use of family cooperation have both been successful at reducing dietary fat consumption and lowering serum blood cholesterol. A nutrition-education project operated by the Chicago Heart Association also showed a 12% reduction in serum cholesterol. Educational interventions such as the Stanford Tree Community Study and the HELP Your Heart Eating Plan both report decreases in dietary fat and cholesterol consumption as well as reductions in serum blood cholesterol among participants in a cardiovascular health education program. Finally, "An Educational View of a National Initiative to Lower Lipid Levels" (NIH) identifies education as an important and critical dimension for both the public and health professionals. The pertinent educational issues are identified in the categories of knowledge, attitudes, and skills.

The nature of the proposed educational intervention strategies employ theory in developing the approaches to be used. These theories are grounded in the literature pertaining to knowledge, relevant health attitudes, and skills, as well as the influence of social support and self-efficacy.

Statement of Need

While elevated cholesterol is a documented health risk relatively few studies have been undertaken to determine effective educational approaches to lowering cholesterol in populations. This research proposes to examine the effectiveness of two strategies in a workplace setting. Levy remarked that methods must be developed to enhance patient adherence to diet therapy. Reeves et al., state that their results suggest that adults may be willing to accept a new style of eating temporarily but more work is needed to get patients committed to making permanent dietary changes.

Experimental Methods and Procedures

Hubbell employees who are interested in participating in a blood cholesterol screening will complete an informed consent and a pre-test questionnaire that assesses cardiovascular risk, knowledge, and diet or health related attitudes. The following week the blood cholesterol screening will be held using the Reflotron (finger-stick method) which provides on-site measurement of blood cholesterol. Measures will be interpreted for those with elevated readings.

Those with elevated blood cholesterol (>200 mg/dl) will be asked to participate in the study. Those who consent to participate would be randomized into one of three groups: individuals receiving worksite classes, those who receive information on diet and blood cholesterol in the mail and a control group who receives nothing. All subjects with elevated blood cholesterol will be given a chance to attend the worksite classes once the experimental study is over. The worksite classes will focus on 7 themes: 1) introduction to risk reduction (patients will be asked to sign a behavioral contract), 2) reading labels, 3) menu planning, 4) heart health cooking demonstrations (substituting low fat ingredients), 5) dining out lightly, and 6) the benefits of water soluble fiber and 7) maintenance strategies. Information sent home will be an abbreviated version of the worksite classes on the same topics. The classes and mailings will be conducted or mailed six times. Subjects will be asked to complete and return a 3-day dietary recall on the first and seventh week of the study. During the eighth week of the study, subjects will have their blood cholesterol measured again and complete a questionnaire to determine changes in knowledge attitudes and behaviors. All subjects will be given feedback and recommendations. Data will be analyzed statistically in an effort to answer the research questions posed.

Confidentially of subjects will be mainted by identifying individuals by number; results will be discussed only in the aggregate and all materials will be kept in locked files.

The committee members guiding this research include: Dr. Elizabeth Howze, Dr. Doug Southard, and Dr. Janet Walberg.

DESCRIPTION OF THE REFLECTRON FINGER-STICK PROCEDURE:

The collection of blood with this procedure involves the use of a lancet to puncture the subject's finger rather than venipuncture which is a much more invasive procedure. All subjects must sign a separate informed consent document for each fingerstick. First, the subject's finger is cleansed with alcohol and then dried to be sure not to dilute the blood sample. The first drop of blood is discarded and the second drop is carefully collected by capillary pipette tube and placed on a test to be analyzed by the reflotron. The following precautions will be taken to ensure the safety of all subjects:

PRECAUTIONS

1) Each subject's finger will be cleansed with alcohol before and after the Reflotron procedure.

2) A new lancet will be used on each subject.

3) All technicians will be required to wear rubber gloves.

4) All materials exposed to the blood will be appropriately labeled and disposed of in a safe place.

5) All subjects will sign a statement of informed consent to be tested prior to having their cholesterol checked.

STATEMENT DESCRIBING LEVEL OF RISK TO SUBJECTS

Reducing consumption of dietary fat is considered an advisable health practice. The National Institute of Health has recommended that all Americans over the age of two adopt a low-fat diet to prevent heart disease and various forms of cancer.

The risk level associated with the completion of the questionnaires can be considered minimal. This technique is completely non-invasive and measures will be taken to maintain confidentiality.

The finger-stick blood collection method involves minimal risk to subjects and technicians, especially with the precautions being taken as mentioned above. Every known precaution will be taken and subjects will be made aware of any risk in signing the informed consent document.

All subjects must be greater than 18 years of age, in good health and not pregnant. In light of the high degree of concern about AIDs infection and precautions which must be taken with blood, subjects and technicians will not be permitted to participate unless they have signed the informed consent document to acknowledge their understanding of any risks and verify their desire to participate and agree not to hold program staff liable.

RISK/BENEFIT RATIO

The benefits clearly outweigh the risks in this study. All subjects participating in the screening will be given valuable information related to diet and heart disease prevention. They will be advised of changes that can be made in one's diet to decrease blood cholesterol levels and reduce the risk of heart disease and will be given assistance to help them change their dietary practices. At the end of the study, all subjects with elevated blood cholesterol will have the chance to be re-tested. All tests are free, classes and information that will be sent home are also free for the employees at Hubbell Lighting with elevated blood cholesterol. Subjects' jobs will not be in jeopardy if they do not participate or, if they do, regardless of their cholesterol level or progress in the program. The risks associated with participating in the study are small. Blood drawn by finger-stick poses only a very small risk of contracting AIDS or hepatitis because of the precautionary procedures and protocol to be used.

Confidentiality of questionnaire responses will be maintained by identifying participants by assigned numbers only, by keeping questionnaires in a locked filed separate from identifying names and by reporting data only in the aggregate so that no individuals can be identified.

APPENDIX C

THE HUBBELL HEALTHY HEART PROGRAM

Subject # _____ weight _____ Age _____ male or female _____

Please answer the questions below as best as you can. There are no right or wrong answers, we only want to learn more about your current health habits and opinions. If you can't answer a question or it doesn't apply to you, just leave it blank. Each question has answers to choose from either next to it or below it that match a number. Circle or make a mark through your answer please. Remember that there are no right answers, we are only interested in what you think. Thanks Folks!!

Please answer yes or no to each of the following questions.

1. I have been told by a doctor that I have heart disease
   1) yes 2) no

2. A close relative or family member has had a heart attack or stroke or has heart disease. 1) yes 2) no

3. I have been told by a doctor or nurse that I have high blood pressure. 1) yes 2) no

4. I have been told by a doctor that I need to lose weight.
   1) yes 2) no

5. I am diabetic (too much sugar in the blood).
   1) yes 2) no

6. I exercise for at least 30 minutes three times each week.
   1) yes 2) no

7. I have been told by a medical professional that I have high blood cholesterol. 1) yes 2) no

8. I smoke cigarettes. 1) yes 2) no

9. The foods you eat can have an effect on your heart.
   1) disagree 2) tend to disagree 3) tend to agree 4) agree

10. To keep from getting heart disease I should avoid eating foods with a lot of
    1) saturated fat 2) unsaturated fat 3) starch

11. Unsaturated fats come from:
    1) vegetables 2) meats and dairy foods 3) breads

12. Which food can raise your blood cholesterol more?
    1) cholesterol 2) saturated fat 3) polyunsaturated fat

13. Which food has more saturated fat in it?
    1) whole milk 2) buttermilk 3) non-dairy creamers

14. Saturated fats mostly come from:
    1) vegetables 2) animals 3) breads and potatoes

15. Which has more fat in it?
    1) cornbread 2) biscuits 3) succotash 4) beer

16. Which foods should be avoided by people who are concerned about heart disease.
    1) bacon and sausage 2) vegetable oils 3) oats and beans

17. Which foods are high in fiber and can help keep you from getting heart disease or cancer?
    1) meats and cheeses 2) fruits and vegetables 3) butter

18. People with high cholesterol in their blood may get:
    1) headaches 2) diarrhea 3) heart disease 4) acne

19. The best way to lower the level of your blood cholesterol is by eating less.
    1) cholesterol 2) saturated fat 3) unsaturated fat

20. Which foods can raise the cholesterol in your blood.
    1) baked potatoes 2) non-dairy coffee creamers 3) buttermilk

21. People who want to lower the cholesterol in their blood should eat more
    1) fruits, vegetables, oats, and beans
    2) meats and cheeses
    3) margarine

22. A food in the store that says "no cholesterol" on the lable is always a good choice. 1) true 2) false

23. Losing weight can help to lower the cholesterol in my blood.
    1) true 2) false

24. Cholesterol only comes from:
    1) vegetable oils 2) foods from animals 3) eggs

25. The three most important things I can change that may cause heart disease are: smoking, high blood cholesterol, and high blood pressure. 1) true 2) false

26. I usually trim away the fat or remove the skin on any meats I eat. 1) yes 2) no

27. The vegetables that I eat are often cooked with meat grease, butter or salt pork. 1) yes 2) no

28. The vegetables, meat, and fish I eat are usually fried.
    1) yes 2) no

29. I usually eat three or more eggs each week.
    1) yes 2) no

30. I eat red meat or pork at least twice each week.
    1) yes 2) no

31. I eat out at a fast food restaurant such as McDonalds or Wendy's more than twice each week. 1) yes 2) no

32. I usually eat a high fiber cereal for breakfast with lowfat milk. 1) yes 2) no

33. The best way to prepare meat if you are trying to eat less fat is by 1) baking 2) broiling 3) frying

34. Learning to eat a heart healthy diet means giving up all of my favorite foods.
    1) disagree 2) tend to disagree 3) tend to agree 4) agree

35. A diet that is good for your heart, tastes good too.
    1) disagree 2) tend to disagree 3) tend to agree 4) agree

36. Foods low in fat taste good to me.
    1) disagree 2) tend to disagree 3) tend to agree 4) agree

37. I am able to make good food choices to avoid getting heart disease.
    1) disagree 2) tend to disagree 3) tend to agree 4) agree

38. I can't change the kinds of foods I eat, it's too hard to give up my favorite foods.
    1) disagree 2) tend to disagree 3) tend to agree 4) agree

39. When I read a food label to compare two items, I feel like I can tell which one is a healthier choice.
    1) disagree 2) tend to disagree 3) tend to agree 4) agree

40. For the most part, I think that my diet is good for my heart.
    1) disagree 2) tend to disagree 3) tend to agree 4) agree

41. When I am eating out it is hard for me to choose foods that are better for me.
    1) disagree 2) tend to disagree 3) tend to agree 4) agree

42. Whenever I have wanted to try to lose weight, I've always been pretty successful, so I think I could do it again.
    1) disagree 2) tend to disagree 3) tend to agree 4) agree

43. I think I can take care of my health pretty easily
1) disagree 2) tend to disagree 3) tend to agree 4) agree

44. I worry about having a heart attack.
1) disagree 2) tend to disagree 3) tend to agree 4) agree

45. I sometimes worry a lot about what I eat.
1) disagree 2) tend to disagree 3) tend to agree 4) agree

46. Having a heart attack is a realistic possibility in my life
1) disagree 2) tend to disagree 3) tend to agree 4) agree

47. I am concerned about my weight because of my health.
1) disagree 2) tend to disagree 3) tend to agree 4) agree

48. My chances of having a heart attack are less than most people my age.
1) disagree 2) tend to disagree 3) tend to agree 4) agree

49. My family has a lot to do with what I eat.
1) disagree 2) tend to disagree 3) tend to agree 4) agree

50. My friends have a lot to do with what I eat.
1) disagree 2) tend to disagree 3) tend to agree 4) agree

51. If I wanted to lose a few pounds I could count on my family to help me.
1) disagree 2) tend to disagree 3) tend to agree 4) agree

52. My friends are usually helpful when I want to improve my health by exercising or watching what I eat.
1) disagree 2) tend to disagree 3) tend to agree 4) agree

We'd like to ask you a few things about yourself so that we can try to get to know you a little better.

53. I live 1) alone 2) with other adults

54. Do you have children? 1) yes 2)no If yes, how many? ___

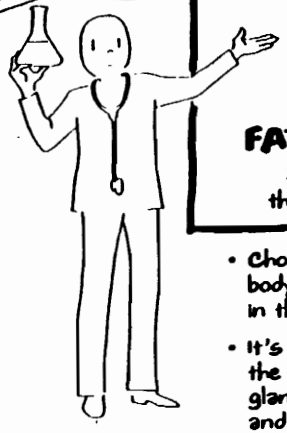
55. Please check the highest level of school you have completed.
1) grade school _____
2) some high school _____
3) high school_____
4) some college or college degree _____

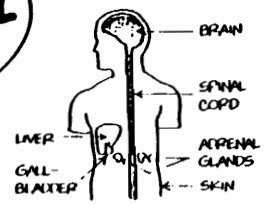
56. What is your weight and height?

57. Are you the one who usually buys food for yourself and the people you live with? 1) yes 2) no

58. Do you usually do the cooking for yourself and the people you live with? 1) yes 2) no

What is CHOLESTEROL (ka les' ta rolé) ?





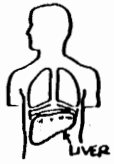
It's a **FATTY, WAX-LIKE SUBSTANCE** that is essential to life.

- Cholesterol is found in all body cells, and it circulates in the blood.
- It's most concentrated in the brain, spinal cord, adrenal glands, liver, gallbladder and skin.

We get the cholesterol we need by **PRODUCING IT IN OUR BODIES.**

A large amount of cholesterol is manufactured by the liver.

Every body cell makes a small amount.



That's ~~why~~ we don't need much of it in our diet.

We also get cholesterol by **EATING ANIMAL PRODUCTS.**

Cholesterol is found in meat, milk, eggs, etc.

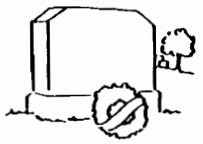
These foods also contain saturated fat, which raises the levels of cholesterol in your blood.

Why should I KNOW ABOUT cholesterol ?

Because too much cholesterol in the blood is associated with these

SERIOUS HEALTH PROBLEMS:

CORONARY HEART DISEASE
– the number one killer in America



STROKE
– which afflicts nearly 2 million Americans

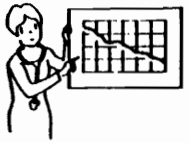
You can help **PREVENT** these problems if you learn:

- how blood cholesterol can affect your health
- how you can help control your blood cholesterol level, if necessary.
- how you can lower your blood cholesterol level.

Can a special diet OVER THE RISKS ?

Many experts believe that a diet that lowers blood cholesterol levels reduces the risk of heart disease.

Many studies indicate that a low-fat, low-cholesterol diet lowers blood cholesterol levels in most people.



Experts also believe that heredity helps determine the way people's bodies use cholesterol, which also affects blood cholesterol levels.

Many physicians believe that most people should be on a prudent (strict) low-fat, low-cholesterol diet.

Should I consider a CHOLESTEROL-LOWERING DIET ?

YES -- IF YOUR BLOOD LEVEL IS HIGH, YOUR PHYSICIAN RECOMMENDS IT!

A low-fat, low-cholesterol diet may be advised* if you have:

DIAGNOSED HEART DISEASE

ince cholesterol nay be a contrib- ıting factor.

HIGH BLOOD CHOLESTEROL LEVEL >200mg

– which can result from dietary and/ or hereditary factors.

FAMILY HISTORY OF HEART DISEASE

– since heart disease may be hereditary. (Especially important if there is evidence of heart disease before age 45.)

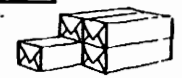
Your physician may also consider other factors, such as overweight, high blood pressure, cigarette smoking, diabetes, and lack of exercise.

To help lower blood cholesterol levels, many physicians recommend these 3 basic

CHANGES IN DIET:

❶ CUT DOWN ON SATURATED FATS

-- they RAISE blood cholesterol levels.



- Saturated fats are usually found in foods of animal origin (eggs; meat, lard; butter, cream, milk; etc.).
- Some vegetable fats (palm, coconut oils), chocolate, most shortenings, some margarines and many dairy substitutes also contain saturated fats.
- They're usually hard at room temperature.

❷ SUBSTITUTE POLYUNSATURATED FATS

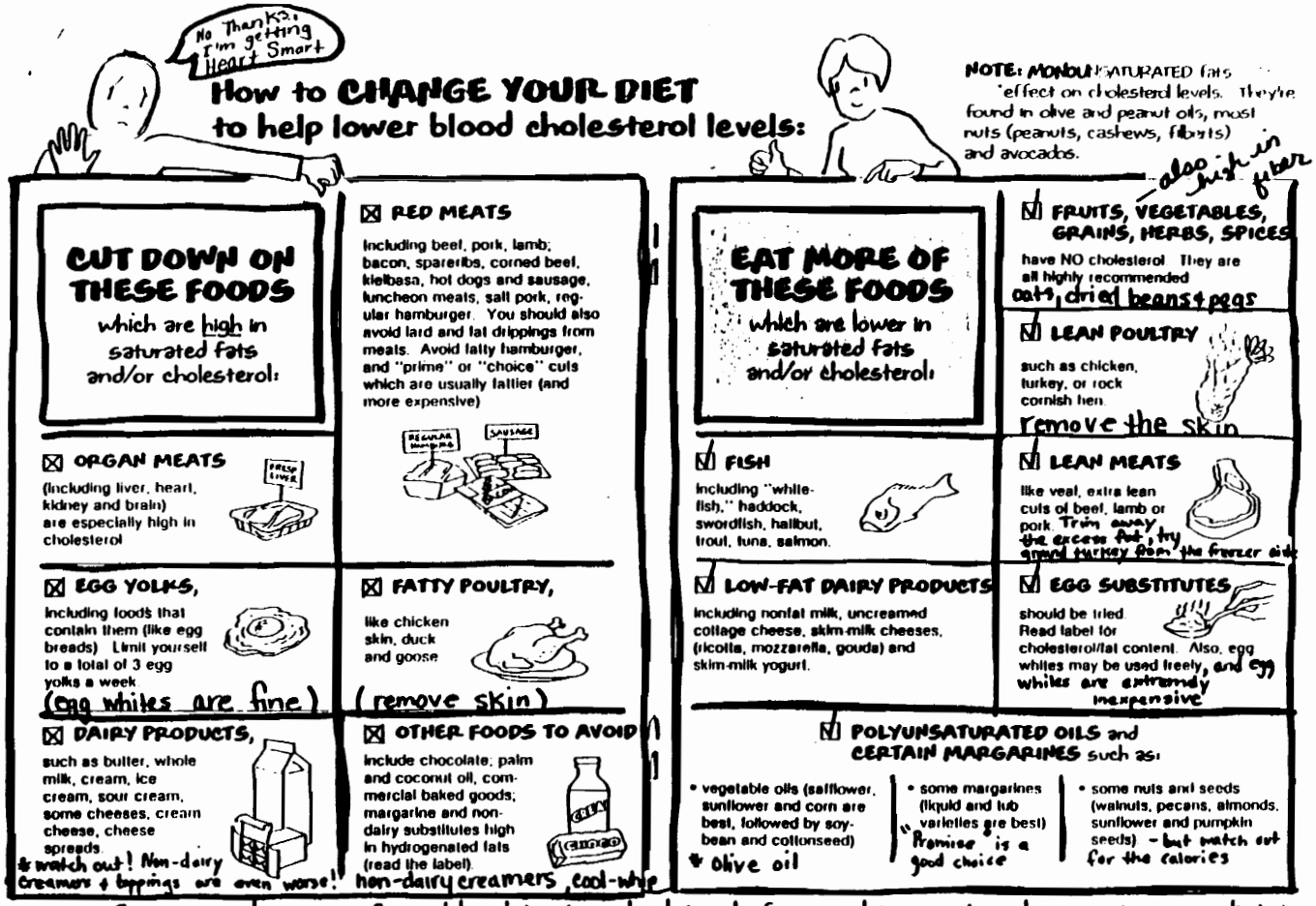
for saturated fats when you must use fats. Polyunsaturated fats help LOWER blood cholesterol levels.

- Polyunsaturated fats are usually liquids of plant origin.
- They're found in most vegetable oils (safflower, sunflower, corn, soybean, cottonseed oils) plus some nuts (walnuts, pecans, almonds) and seeds (sunflower, pumpkin).

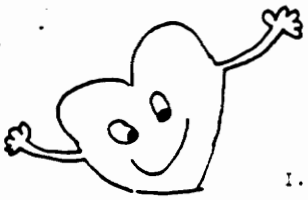
❸ CUT DOWN ON HIGH-CHOLESTEROL FOODS.

It makes sense to limit the amount of foods eaten that are high in cholesterol, since several studies indicate that some of the cholesterol we eat is absorbed into the blood. This RAISES the blood cholesterol level.

"HYDROGENATION" is a process that chemically combines hydrogen gas with liquid oil to harden it. This makes a polyunsaturated fat more saturated and therefore less desirable for people trying to lower their blood cholesterol level. Hydrogenation affects the fats in many shortenings and margarines.



See your physician for a blood test and advice before making major changes in your diet + if you decide not to participate in the Hubbell Healthy Heart Program. Making the right choices can be difficult on your own.



THE HUBBELL HEALTHY HEART PROGRAM

I. INTRODUCTION TO RISK REDUCTION

STRAIGHT TALK, HERE ARE 3 GOOD REASONS TO LOWER YOUR BLOOD CHOLESTEROL:

1. Too much cholesterol in your blood is one of the three MAJOR risk factors for heart disease. The other two important risk factors are smoking and high blood pressure.

2. Blood cholesterol levels can be raised or lowered by the foods you eat.

3. Lowering blood cholesterol reduces the risk of coronary heart disease.

Blood cholesterol levels tends to rise as we grow older, this is why you need to do something about it now.

A family history of heart disease may increase your risk for elevated blood cholesterol and heart disease.

THE HUBBELL HEALTHY HEART PROGRAM

There are many things that can influence or affect your blood cholesterol level, and the Hubble Healthy Heart Program is going to help you to change one thing that can help you lower your blood cholesterol, and that is: the kinds of foods you eat. Reductions of up to 25% in blood cholesterol can be done by changes in the diet alone. But, it takes time, this is not a "diet", its a new way of living that can save your life. For every 1% decrease in blood cholesterol, you lower your risk for heart disease by 2%, and thats pretty good! We are also going to tell you a little about some of the other things you can do to reduce your risk of heart disease.

THE 3 MOST IMPORTANT THINGS FOR YOU TO DO

1. Eat less fat, especially saturated fat, and cholesterol which come mainly from animal foods but saturated fat is also found in some vegetable fats such as: palm oil, coconut oil, and cocoa butter (in chocolate). Substitute unsaturated vegetable oils when cooking, but use as little as possible. Refer to the lists we have given you.

2. Eat more fiber-rich foods, especially foods high in water soluble fiber. Refer to the list that we have given you of foods high in this kind of fiber, it can actually help you lower your blood cholesterol even more while you are cutting down on the fat you eat.

3. Become more aware of obstacles that may make it harder to change the way you eat and ask for help in trying to work around them. The other factors that can lower your risk and begin to think about working on them once you've completed the program and feel better about you diet. For example, starting to exercise, getting help to quit smoking and joining a stress management program that will be offered here soon.

Oils & Fats:

It's the ***difference*** that counts

Type of Oil or Fat	Percent Polyunsaturated Fat	Percent Saturated Fat
Safflower Oil	74%	9%
Sunflower Oil	64%	10%
Corn Oil	58%	13%
Average Vegetable Oil (soybean plus cottonseed)	40%	13%
Peanut Oil	30%	19%
Chicken Fat (Schmaltz)	26%	29%
Olive Oil	9%	14%
Average Vegetable Shortening	20%	32%
Lard	12%	40%
Beef Fat	4%	48%
Butter	4%	61%
Palm Oil	2%	81%
Coconut Oil	2%	86%

All fats and oils are equally high in calories. so see how little you can use. When you do use fats and oils, choose those *high in polyunsaturated fats*—the ones at the top of the chart.

Cholesterol is found only in animal foods

Check out your favorite foods below:	Cholesterol	
Fruits, grains, vegetables	0 milligrams	LOW
Scallops (cooked, about 3½ oz.)	53 milligrams	
Oysters (cooked, about 3½ oz.)	45 milligrams	
Clams (cooked, about 3½ oz.)	65 milligrams	
Fish, lean (cooked, about 3½ oz.)	65 milligrams	
Chicken/Turkey, light meat (without skin) (cooked, about 3½ oz.)	80 milligrams	
Lobster (cooked, about 3½ oz.)	85 milligrams	
Beef, lean (cooked, about 3½ oz.)	90 milligrams	
Chicken/Turkey, dark meat (without skin) (cooked, about 3½ oz.)	95 milligrams	
Crab (cooked, about 3½ oz.)	100 milligrams	
Shrimp (cooked, about 3½ oz.)	150 milligrams	
Egg Yolk, one	270 milligrams	
Beef Liver (cooked, about 3½ oz.)	440 milligrams	
Beef Kidney (cooked, about 3½ oz.)	700 milligrams	HIGH

Where to Find Soluble Fiber

Food	Serving	Soluble Fiber (g)
GRAINS		
Oat bran	⅓ cup dry	2.0
All-Bran	⅓ cup	1.7
Oat bran muffin*	1	1.6
Oatmeal	¾ cup, cooked	1.4
Rye bread	2 slices	0.6
Whole wheat bread	2 slices	0.5
DRIED BEANS & PEAS		
Black-eyed peas	½ cup, cooked	3.7
Kidney beans	½ cup, cooked	2.5
Pinto beans	½ cup, cooked	2.3
Navy beans	½ cup, cooked	2.3
Lentils	½ cup, cooked	1.7
Split peas	½ cup, cooked	1.7
VEGETABLES		
Peas	½ cup, canned	2.7
Corn	½ cup, cooked	1.7
Sweet potato	1 baked	1.3
Zucchini	½ cup, cooked	1.3
Cauliflower	½ cup, cooked	1.3
Broccoli	½ cup, cooked	0.9
FRUIT		
Prunes	4	1.9
Pear	1	1.1
Apple	1	0.9
Banana	1	0.8
Orange	1	0.7

Source: Personal communication. Janet Tietyen, Research Dietician with Dr. James Anderson, University of Kentucky Medical Center.

Note: Researchers are still perfecting methods of analyzing the total and soluble fiber

	LEAN CUTS	HIGH FAT CUTS
BEEF		
Steaks	Tenderloin Filet Mignon Chauteaubriand Sirloin Round Cubed Steak Flank London Broil	Chuck T-bone Porterhouse Rib Delmonico Club Strip
Roasts	Round Rump Sirloin Corned Beef Round	Corned Beef Brisket Chuck Rib
Ground Meat	Ground round	Ground Beef or Chuck
Other	Beef Stew Meat Short Ribs, Shank	Organ Meats, such as Heart, Liver, etc
PORK - FRESH		
Steaks or Chops	Fresh Ham Leg Loin Chops, Cutlets	Rib Chops Blade, Arm Chops
Roasts	Loin Sirloin Tenderloin	Rib Fresh Picnic Pork Butt
PORK - CURED		
Steaks or Chops	Boneless Ham Center - Cut Ham Slices Smoked Loin Chops Boiled, Sliced Ham	Boneless Rib Chops
Roasts	Smoked Ham Rump Tenderloin	Smoked Ribs Smoked Picnic Ham
Other	Canadian Bacon	Ground Pork, Cold Cuts, Sausage, Hot Dogs, Bacon, Salt Pork
LAMB AND VEAL	All but Breast	Breast
POULTRY	Any but high fat cut	Canned Chicken, domestic duck, or goose
FISH	Any	None
Other	Wild Game	Capon giblets

"Get Fit", Brown, C., M.S., R.D. St. Peter's Community Hospital 1986

The TYLERS

Shelly Tyler Finds a Heart Pleasing Margarine

Shelly Tyler's father pushed his grocery cart up to the margarine cooler in the supermarket and said, "Shelly, we need to find a margarine label that shows how much polyunsaturated and saturated fats the margarine contains."

"Polyunsaturated fats—they help lower the cholesterol in your blood?" asked Shelly thoughtfully.

"Right, Shelly," said Mr. Tyler. "Saturated fats raise your blood cholesterol. So we want a margarine that has at least twice as much polyunsaturated fats as saturated fats."

Mr. Tyler picked up a margarine package and said, "See this one won't do. It has the same amount of saturated and polyunsaturated fats."

Margarine A
Nutrition Information

Per Serving	
Serving Size	1 TBSP
Servings Per Container	(14g)
Calories	32
Protein	100
Carbohydrate	0g
Fat (100% of Calories) *	0g
Polyunsaturated Fats	11g
Saturated Fats	2g
Cholesterol (0mg per 100g)	2g
	0mg

Margarine B
Nutrition Information

Per Serving	
Serving Size	1 TBSP
Servings Per Container	(14g)
Calories	32
Protein	100
Carbohydrate	0g
Fat (100% of Calories) *	0g
Polyunsaturated Fats	11g
Saturated Fats	4g
Cholesterol (0mg per 100g)	2g
	0mg

"Got it!" cried Shelly, jumping up and down with excitement. "This one has twice as much polyunsaturated fat as saturated fat."

"That wasn't hard at all," said Shelly. "Changing what we eat can be easy, if we make just a few changes at a time," said Mr. Tyler. "But we have to remember that all fats have the same amount of calories. So we'll have to use our heart pleasing margarine wisely, too."

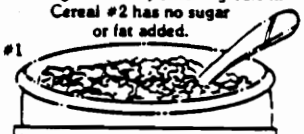
**Monounsaturated fats make up the remaining grams of fat. They do not appear to have any affect on blood cholesterol, but they do have as many calories as the other fats.*

INGREDIENT LABELS ARE Something Else!

Food labels list ingredients in order by weight: the item in the greatest amount is listed first; the item in the least amount is last.

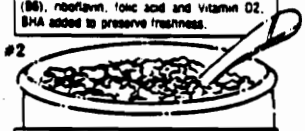
For example, the labels below describe two cereals. Cereal #1 has more sugar than any other ingredient. Cereal #2 has no sugar or fat added.

#1



Ingredients: sugar, corn, wheat and oat flour, salt, corn syrup, dried apples, cinnamon, partially hydrogenated vegetable oil (contains one or more of the following: palm oil, cottonseed oil, or corn oil), sodium ascorbate (C), natural apple flavorings, Vitamin A palmitate, artificial coloring, niacinamide, ascorbic acid (C), baking soda, reduced iron, zinc oxide, thiamin hydrochloride (B1), pyridoxine hydrochloride (B6), riboflavin, folic acid and Vitamin D2. BHA added to preserve freshness.

#2



Ingredients: 100% whole wheat. BHT added to the packing to preserve freshness.

What About Flavors and Colors?

Flavors must be labeled as artificial or natural. Added colors from any source (vegetable, animal, mineral or other) must be labeled as "artificial" colors.

WHY EVERY PACKAGE DOESN'T TELL AN INGREDIENT STORY

Some products, such as ketchup, are made according to government standards called "standards of identity." In such standard of identity products, the U.S. Food and Drug Administration does not have the authority to require listing of the mandatory ingredients. However, permitted optional ingredients must be listed. Some manufacturers and store brands voluntarily list all of the ingredients in standardized foods.

10 tips for cutting down on fat and saving money!

If YOU DECIDE to reduce the saturated fats, cholesterol and calories in your family's food, here are some practical suggestions. Many of these save money, too.

Foods to try more often:

1. **FISH & POULTRY (without skin)**
   They're low in saturated fat, so try substituting them more often for beef, lamb or pork.
2. **LEAN CUTS**
   When you do eat red meat, choose lean cuts and trim visible fat.
3. **FRUITS, NUTS & RAW VEGETABLES (except coconut and avocado)**
   Try them as a refreshing and different snack.
4. **SKIM MILK OR LOW FAT DAIRY PRODUCTS**
   Skim milk or low fat milk and low fat cheese offer a triple treat — less saturated fats, cholesterol and calories.
5. **GRAINS & STARCHY FOODS**
   These will help stretch your meat budget while giving you important vitamins, minerals and fiber.
6. **LIQUID VEGETABLE OILS & MARGARINES HIGH IN POLYUNSATURATED FATS**
   Go easy on all fats. But when you do use them, try these fats. They lower blood cholesterol.

Foods to eat less often:

7. **FATTY LUNCHEON & VARIETY MEATS & ORGAN MEATS**
   Try using less of these high fat and cholesterol items—"luncheon" and "variety" meats like sausage, bacon, salami and bologna, as well as organ meats (brain, liver and kidney).
8. **EGG YOLKS**
   People who are concerned about cholesterol eat fewer egg yolks, a food particularly high in cholesterol.
9. **BUTTER**
   When you do have to use fat, try a high polyunsaturated margarine instead.

Ways to prepare food:

10. **BROILING, BOILING, ROASTING & STEWING**
    These cooking methods help remove fat.

You can use this list as a handy reminder of just some of the varieties of foods that are low in saturated fats and cholesterol. For your meal planning convenience, items are listed within the basic food groups.

FRUIT • VEGETABLE

FRESH FRUITS (except coconut) such as apples, cantaloupes, grapefruits, oranges, peaches, pineapples, strawberries, tangerines; JUICE-PACK CANNED FRUIT; FROZEN FRUIT WITHOUT ADDED SUGAR; FRESH VEGETABLES such as spinach, broccoli, greens, sweet potatoes, carrots, acorn or butternut squash; CANNED OR FROZEN VEGETABLES WITHOUT SAUCES.

BREAD • CEREAL

ENRICHED OR WHOLE-GRAIN BREAD such as whole wheat, rye, or oatmeal; BULGUR OR KASHA; MATZO; MIDDLE EASTERN POCKET BREAD (pita bread); ENRICHED OR WHOLE GRAIN PASTA such as spaghetti, macaroni, bows, noodles; BROWN OR ENRICHED RICE; RYE OR SODA CRACKERS; CORN TORTILLAS; ENRICHED OR FORTIFIED CEREALS, hot or cold — oatmeal, shredded wheat, corn, wheat or oat flakes.

MILK

LOW FAT MILK; SKIM MILK; NONFAT DRY MILK; BUTTERMILK; milk substitutes; LOW FAT CHEESE; LOW FAT COTTAGE CHEESE; LOW FAT YOGURT; LOW FAT FROZEN YOGURT.

POULTRY • FISH • MEAT • BEANS

CHOICE GRADE & "LEAN" BEEF; LEAN CUTS OF BEEF (like round, chuck); LEAN PORK, LAMB, OR VEAL; CHICKEN OR TURKEY (without skin); FRESH OR FROZEN FISH such as haddock, sole or flounder, rockfish; CANNED FISH, water packed, or oil packed (drained & rinsed); VEGETABLE PROTEIN combinations of grains (such as rice, oats, bulgur), legumes (such as soy beans, split pea, dried beans), or nuts and seeds.

Fats: Oils high in polyunsaturates — such as safflower, sunflower, and corn oil. Margarines with at least 2 times as much polyunsaturated as saturated fats.

CHILI

Chili is traditionally made with beef. You will not miss the beef in the following vegetarian recipes. They are delicious and filling — wonderful for a fall or winter day.

CHILI NON CARNE

This is one of the best chili recipes we have ever tasted. It is filled with nutritious vegetables that provide texture but do not interfere with the delicious chili taste. Eat it hot in a bowl mixed with chopped onions, tomatoes, and lettuce, or spoon it into pita bread with chopped onion, lettuce, and tomatoes. Dried beans such as kidney beans and navy beans have been shown to be effective in lowering blood cholesterol.

- ⅓ cup chopped onion
- 2 cloves garlic, minced
- 3 tablespoons olive oil
- 2 tablespoons chili powder
- ¼ teaspoon basil
- ¼ teaspoon oregano
- ¼ teaspoon cumin
- 2 cups finely chopped zucchini
- 1 cup finely chopped carrot
- 1 large can (28 oz) tomatoes + 1 small can (14½ oz) tomatoes, drained and chopped
- 1 can (15 oz) kidney beans, *undrained*
- 2 cans (15 oz each) kidney beans, *drained* and thoroughly rinsed
- Chopped onions, tomatoes, lettuce, or green peppers, for garnish

In a large pot, sauté onion and garlic in olive oil until soft.

Mix in chili powder, basil, oregano, and cumin.

Stir in zucchini and carrots until well blended. Cook for about 1 minute over low heat, stirring occasionally.

Stir in chopped tomatoes, undrained kidney beans, and drained kidney beans.

Bring to a boil. Reduce heat and simmer for 30–45 minutes or until thick.

Top with chopped onions, tomatoes, and lettuce or green peppers.

Makes 8 one-cup servings
Per serving: 157 Total calories; 7 Sat-fat calories

CRAIG LEFEBVRE'S PAWTUCKET CHILI

Craig Lefebvre, community director of the Pawtucket Heart Health Program, created this scrumptious heart-healthy chili recipe for a contest, the Hot Healthy Chili Challenge. Eat it and you'll see why it's a winner!

- 1 large can (40 oz) kidney beans, or 2 small cans (16 oz each)
- 1 can (15 oz) chickpeas
- 2 cloves garlic, minced
- 1 medium onion, chopped
- 1 tablespoon olive oil
- 1 can (8 oz) tomato sauce
- 1 can (14½ oz) whole tomatoes
- 1 tablespoon oregano
- ½ teaspoon thyme
- 1 teaspoon cumin
- ½ teaspoon basil
- 3 tablespoons chili powder

Rinse kidney beans and chickpeas to remove salt. Set aside.

Sauté garlic and onion in olive oil.

Add beans, chickpeas, and remaining ingredients and bring to a boil.

Simmer for 20 minutes (or longer) until thick.

Makes 8 one-cup servings
Per serving: 115 Total calories; 4 Sat-fat calories

TORTILLAS

Who says you can't have tortillas on a low-sat-fat diet? Admittedly, these tortillas contain no meat or cheese, but they are spicy and great tasting, just like their Mexican counterparts. As a bonus, your arteries will be happier with these than with beef or cheese.

Corn Tortillas* Filling

- 1 cup dried lentils
- 2 cups water
- 2½ tablespoons raisins
- 3 cloves garlic, minced
- ¼ teaspoon red pepper flakes
- 2 teaspoons chili powder
- ½ teaspoon cumin
- ¼ teaspoon basil
- 7 tablespoons tomato paste
- 2 cups water

*Corn tortillas can be found in the refrigerator section of most supermarkets. Be sure they contain only corn, water, and lime — no lard or other saturated fat.

Place dough in a large oiled bowl, cover with a towel, and let rise in a warm place for 40 minutes. Punch down.

Roll into lengths about 5 inches long and ¼ inch wide. Pinch each into a circle to make a bagel.

Preheat oven to 350°F and grease cookie sheet with oil.

Fill a medium saucepan with water. Add sunflower oil and bring to a boil.

Drop a bagel into the boiling water.

When it rises to the top, remove it with a slotted spoon or spatula so the excess water can drip off.

Repeat this process with all the bagels.

Place bagels on cookie sheet and bake for 10 minutes.

Raise heat to 400°F and bake for 10 minutes more.

Makes 12 bagels
Per bagel: 115 Total calories; 1 Sat-fat calorie

OAT BRAN MUFFINS

Oat bran, a food rich in soluble fiber, has been found to lower blood cholesterol levels as much as 25 percent. Oat bran is available at supermarkets, packaged as Mother's Oat Bran (Quaker Oats). It may also be purchased in bulk at health food stores.

The following oat bran muffins are the best-tasting "medicine" your doctor could prescribe.

APPLE OAT MUFFINS

1½ cups oat bran	¼ cup skim milk
½ cup whole-wheat flour	1 egg
3 tablespoons brown sugar	2 tablespoons sunflower oil
2 teaspoons baking powder	2 tablespoons honey
½ teaspoon salt	1 cup cooking apples, peeled, cored, and diced
1 teaspoon cinnamon	2 tablespoons raisins
½ cup apple juice	

Preheat oven to 400°F. Grease a 12-cup muffin tin with margarine.

Combine oat bran, flour, brown sugar, baking powder, salt, and cinnamon and set aside.

In a large mixing bowl, combine apple juice, skim milk, egg, sunflower oil, and honey.

Add flour mixture, apples, and raisins and combine until just moistened.

Fill muffin tin and bake at 400°F for about 20 minutes or until golden brown and a cake tester comes out clean.

Makes 12 muffins
Per muffin: 125 Total calories; 4 Sat-fat calories

MOTHER'S OAT BRAN MUFFINS

These oat bran muffins (an adaptation of the Quaker Oats recipe) are made with no other grain but oat bran. They have twice as much oat bran and thus more soluble fiber than the preceding oat muffins. They are also delicious.

2¼ cups oat bran	½ teaspoon salt
¼ cup brown sugar	¼ cup skim milk
¼ cup chopped walnuts	1 egg + 1 egg white, beaten
¼ cup raisins	¼ cup honey
1 tablespoon baking powder	2 tablespoons sunflower oil

Preheat oven to 425°F. Grease a 12-cup muffin tin with margarine.

Combine oat bran, brown sugar, walnuts, raisins, baking powder, and salt.

Add skim milk, eggs, honey, and sunflower oil. Mix until ingredients are just moistened.

Fill muffin tin and bake for 15 minutes or until golden brown and a cake tester comes out clean.

Makes 12 muffins
Per muffin: 160 Total calories; 6 Sat-fat calories

APPENDIX D

Name _____
Dept. # _____ Shift _____

FOOD RECORD

THE HUBBELL HEALTHY HEART PROGRAM

DIRECTIONS FOR THE 3-DAY FOOD INTAKE RECORD

1) Record everything you eat or drink (except water) for 3 days in a row. Include gum, candies, snacks, etc... from getting up in the morning to going to bed. Use a separate sheet for each day.

2) In the amounts column, indicate the total amount of each food eaten. Estimate as accurately as possible in cups, tablespoons, slices, pieces, or ounces. Also record the type of milk, cheese, bread, meat (cut of meat also). For example:

cheese = one and one half inch cube swiss cheese
milk = one cup low-fat milk
meat = one 3 ox. hamburger patty, extra lean cut

**********Please remember to complete this food record as soon as possible and place it in the box outside of the nurse's station

FOOD RECORD SHEETS

THE HUBBELL HEALTHY HEART PROGRAM

FOOD/DRINK	AMOUNT	TYPE	ETC...
BREAKFAST			
LUNCH			
DINNER			
SNACKS			

FOOD/DRINK	AMOUNT	TYPE	ETC...
BREAKFAST			
LUNCH			
DINNER			
SNACKS			

FOOD/DRINK	AMOUNT	TYPE	ETC...
BREAKFAST			
LUNCH			
DINNER			
SNACKS			

VITA

Christine M. Beecy was born on May 21, 1964 in Pittsburgh, Pennsylvania. She attended grade school and high school in Reston, Virginia, where her parents, Barbara and David now live. She attended Virginia Polytechnic Institute and State University for undergraduate school and received a B.S. in Community Health in 1986. Upon completing her Masters in Health Education she has plans to begin her new position at Johns Hopkins University in Baltimore, Maryland.