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Factors associated with adoption of dietary behavior to reduce heart disease risk

by

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INTRODUCTION

Despite small declines in recent years, coronary heart disease (CHD) remains the leading cause of death in the United States. Extensive research indicates that elevated low-density-lipoprotein cholesterol (LDL-C) levels and reduced levels of high-density-lipoprotein cholesterol (HDL-C) are strong risk factors for the development of CHD. Lowering LDL-C and raising HDL-C levels have become major public health goals to reduce CHD morbidity and mortality.

The expert panel of the National Cholesterol Education Program (NCEP) (1988) outlined strategies to reduce cholesterol levels that have dietary management as a cornerstone for treatment. Specifically, the NCEP guidelines recommend reducing fat to less than 30% of total Calories, saturated fat to less than 10% of Calories, and dietary cholesterol to less than 300 mg per day (the Step One Diet). If desirable results are not seen, the Step Two Diet is recommended that reduces saturated fat to less than 7% of total Calories and dietary cholesterol to less than 200 mg/day.

Several researchers have concluded that merely teaching people about a diet low in fat, saturated fat, and cholesterol is not sufficient to result in effective behavior change and diet compliance (Hochbaum, 1981). Food purchasing,

preparation, and consumption behaviors are determined more by psychological, cultural, and situational factors than by mere knowledge. People choose foods based largely on taste, cost, and convenience; on their lifestyle; and on the pressure of family and social group. Carmody et al. (1987) note that recommendations for dietary change that fail to consider a person's family patterns or the influence of a person's social group will be resisted. Jeffery et al. (1990) found that non-compliance with diets to reduce high blood pressure was associated with eating away from home, dealing with social situations, and resisting powerful old dietary habits that had to be changed. Cardiac rehabilitation patients and their spouses reported significant difficulty with both food shopping and reading labels (Montgomery and Amos, 1991). Most failed to enjoy their diets, and only one half reported enjoying eating foods low in fat. Carmody et al. (1987) noted that adherence to diets associated with a reduced risk for heart disease requires changes in food shopping, meal planning, cooking, and eating habits that may be perceived as difficult to make.

Studies of individuals with hypercholesterolemia have found that some dietary changes are easier than others. Individuals participating in the Multiple Risk Factor Intervention Trial easily reduced their intake of whole milk and egg yolks, and incorporated margarine and oils into their

diets (Gorder et al., 1986; Stone, 1990). In contrast, they were less successful in incorporating meatless meals, limiting meat portions, and avoiding high fat meats, crackers, snack items, and convenience foods. Barnes and Terry (1991) reported similar findings in 24 males with histories of myocardial infarctions.

Findings from many studies indicate that an increasing proportion of Americans know their blood cholesterol levels and have some understanding of the relationship between food choices and heart disease (Centers for Disease Control, 1990a; Schucker et al., 1987). Yet American food choices fail to reflect an application of this knowledge to changing food behaviors. More understanding is needed regarding both compliance with dietary behaviors associated with reducing the risk of CHD and factors associated with changes in behavior. Most research has focused on either change in lipid values or incidence in cardiac events and not on changes in long-term behavior. It is essential that factors that most significantly impact change or encourage desirable change be identified so that effective interventions can be implemented. The high rates of non-compliance often reported for dietary regimens may be due to failure of educators to adequately understand how people change and, thus, to develop effective strategies to direct change in a desirable direction.

Several researchers have identified linkages between attitudes held by a person and that person's behavior. Terry et al. (1991) found that Iowa males with more positive attitudes toward reducing consumption of fat, saturated fat, and cholesterol were more likely to report dietary behaviors consistent with a diet low in fat, saturated fat, and cholesterol. Barnes and Terry (1991) found similar associations between attitudes toward a diet low in fat, cholesterol, and sodium and diet-related behaviors in 24 males with histories of myocardial infarctions. Yang (1991) reported women with more positive attitudes toward a low fat diet were more likely to report behaviors consistent with a diet low in total fat and saturated fat. Further research is needed to evaluate whether attitudes predispose individuals to change their food intakes to reduce their risk for coronary heart disease.

The purposes of this study were to evaluate demographic characteristics and attitudes toward changing dietary behaviors among individuals with elevated cholesterol levels. Individuals with total serum cholesterol levels greater than 200 mg/dl and between the ages of 35 and 65 years of age were surveyed. The study identified descriptive and medical characteristics and attitudes related to the decision whether or not to pursue nutrition counseling to reduce blood cholesterol levels. In addition, the project focused on

attitudes toward the relative advantage, compatability, complexity, and observability of dietary changes and the relationship of these attitudes toward adoption of and compliance with dietary behaviors to reduce the intake of total fat, saturated fat, and cholesterol. Findings will hopefully provide insight into more effective strategies to initiate change in dietary behaviors to reduce the risk for developing coronary heart disease.

REVIEW OF THE LITERATURE

Coronary heart disease (CHD) is the leading cause of death in American adults and the third leading cause of years of potential life lost before the age of 65 (Department of Health and Human Services, 1987). Ischemic heart disease accounts for 71% of all deaths due to heart disease and 27% of all mortality (National Center for Health Statistics, 1987). Specifically, Iowa posted death rates due to heart disease of 199 males and 61 females per 100,000 population, slightly below the national figures of 204 males and 66 females per 100,000 population (Centers for Disease Control, 1988).

Evidence that elevated levels of low density lipoprotein cholesterol (LDL-C) and low levels of high density lipoprotein cholesterol (HDL-C) are strong risk factors for CHD comes from epidemiological, controlled human, and animal model evidence (Committee on Diet and Health, 1989). Approximately 20% of Americans have total cholesterol (TC) and LDL-C levels requiring active medical intervention (Gotto, 1989). Lowering LDL-C by dietary and drug interventions has been a focus of over a dozen randomized clinical trials. Their findings support the conclusion that lowering TC and LDL-C and raising HDL-C will reduce CHD morbidity and mortality. For individuals in the population subgroup with initial total cholesterol levels in the 250-300 mg/dl range, each 1% reduction in serum

cholesterol results in an approximate 2% reduction in CHD mortality rates after five to seven years with a greater reduction in CHD rates after several decades (Lipid Research Clinics Program, 1984). While the evidence is strongest for middle-aged males with high initial cholesterol levels, the Expert Panel of the National Cholesterol Education Program (NCEP) (1988, 1993) and the Committee on Diet and Health, National Research Council (1989) generalized that reducing blood cholesterol levels will also reduce CHD incidence and events in females, younger and older men, and persons with more moderate levels of cholesterol.

Preventive Trials to Reduce CHD Mortality and Morbidity

Nine randomized control primary prevention trials and several more on secondary prevention of CHD have been conducted. In only two, the Los Angeles Veterans Administration (VA) Domiciliary Study (Dayton et al., 1968) and the Finnish Mental Hospital Study (Miettinen et al., 1972), was change in diet the only intervention. The double blind VA study (Dayton et al., 1968) of 846 men ages 55 to 89 years compared the effects of two diets, each providing approximately 40% of kilocalories as fat. The experimental diet, containing 35-40% of the total fat as linoleic acid and lower in saturated fat, caused a sustained reduction of 13% in

serum cholesterol levels. When sudden death, definitive myocardial infarctions, cerebral infarctions, and other secondary end points were pooled, a 31% reduction in their incidence in the experimental diet group was observed.

In the second diet intervention study, 4,178 men and 6,434 females 15 years and older hospitalized in one of two mental hospitals near Helsinki, Finland, were subjects (Miettinen et al., 1972; Turpeinen et al., 1979). One hospital served a diet low in saturated fatty acids and cholesterol and high in polyunsaturated fatty acids, while the other continued its usual diet. Six years later, diets were reversed. In both hospitals, the experimental diet resulted in lower TC levels. Serum cholesterol levels were 15% lower (mean of 41 mg/dl lower) and CHD death rates were 53% lower in the male treatment group than in the male control group, while women in the experimental diet group showed a 12% difference in TC and 34% lower death rates compared with women in the control group. Due to lack of appropriate control groups and relatively small numbers in the VA study, findings from these two research projects must be interpreted with caution (Committee on Diet and Health, 1989).

Four studies--the Goteborg Multifactor Trial (Wihelmsen et al., 1986), the WHO Multifactor Trial (WHO European Collaborative Group, 1983), the U.S. Multiple Risk Factor Intervention Trial (MRFIT) (MRFIT Research Group, 1982), and

the Oslo Study (Hjermann et al., 1981)--were multifactorial studies in which the effects of change in diet were confounded by the effects of changes in cigarette smoking and/or blood pressure. The Goteborg study, the WHO trial, and the MRFIT project showed differences in mean TC between intervention groups and control groups of 0%, 1%, and -2%, respectively. Differences in coronary rates were 0%, -4%, and -7%, respectively, relatively small as well.

In contrast to the previously mentioned studies, the Oslo study reported a significant reduction in myocardial infarction rates (Hjermann et al., 1981). This project followed 1,232 hypercholesterolemic males, 40 to 49 years of age, for five years. The experimental group reduced its mean TC level by 13% as compared to controls. Seven years later, the experimental group had experienced a 47% lower rate of myocardial infarctions and sudden deaths due to myocardial infarctions. The researchers concluded that changes in cigarette smoking accounted for approximately one-fourth of the difference in CHD rates while diet-induced changes in TC accounted for most of the rest.

Several studies have evaluated the impact of drug therapy on lipid levels and CHD rates. Drugs used in CHD treatment can be classified as: bile acid sequestrants (such as cholestyramine and colestipol); 3-hydroxy-3-methylglutaryl coenzyme-A (HMG CoA) reductase inhibitors (lovastatin); fibric

acid derivatives; and nicotinic acid (Grundy, 1990). Bile acid sequestrants enhance the conversion of cholesterol into bile acids, which secondarily stimulates the synthesis of LDL receptors. They have been shown to be effective in reducing CHD risk and also generally safe to use (Lipid Research Clinics Program, 1984). On the other hand, they are relatively expensive, are inconvenient to use, and have gastrointestinal side effects that affect their tolerance by many (Grundy, 1990). HMG CoA reductase inhibitors inhibit the key enzyme in the synthesis of cholesterol, in turn stimulating the production of LDL receptors. At this time these drugs lack proven efficacy for CHD risk reduction, but further trials are underway to evaluate their effectiveness (Gotto, 1989).

Fibric acid and nicotinic acid derivatives largely modify triglyceride metabolism. Fibric acid derivatives, such as gemfibrozil, enhance lipoprotein lipase activity and interfere with hepatic synthesis of very low density lipoprotein (VLDL) triglycerides. They appear to be less effective in raising HDL-C than nicotinic acid and in lowering LDL-C than the HMG-CoA reductase inhibitors (Grundy, 1990). Nicotinic acid commonly lowers VLDL levels and raises HDL-C levels, and may reduce LDL-C levels.

Holme (1990) conducted an overview analysis of 19 randomized control primary and secondary clinical trials designed to test cholesterol lowering effects of drug therapy

as compared to dietary treatment in reducing plasma lipid levels. He concluded that drug trials tend to show better results in cholesterol lowering than dietary trials. However, Holme noted that drug trials are performed more often in individuals with higher risks for CHD than are dietary trials. It has been well established that cholesterol reduction is greatest at the highest initial levels. Thus, the drug trials may be somewhat biased by the choice of subjects with initially higher TC levels.

In addition to nicotinic acid, discussed above, supplements of certain nutrients, including beta-carotene and vitamins C and E, and food components, such as lecithin and fish oil supplements, have been proposed as possible agents to reduce the risk of and/or treat atherosclerosis and CHD. Oxidation of LDL within the arterial wall may be the critical step in the development of atherosclerosis and leading to CHD; thus, if this step can be blocked, atherosclerosis may be retarded or even stopped (Steinberg, 1989). Both vitamin C and vitamin E have been found to retard oxidation of LDL in vitro (Jialal et al., 1990; Kritchevsky, 1992). Riemersma et al. (1991) found that individuals with complaints of angina had lower plasma levels of vitamins C and E and beta-carotene than individuals without angina. After controlling for smoking, however, only vitamin E levels were statistically significant. Despite the findings of such correlational studies, at the

present time insufficient research has been completed to suggest that the use of vitamin C or E or beta-carotene is effective in reducing the risk for atherosclerosis and CHD.

Supplements of lecithin or fish oils rich in omega-3 fatty acids have been advocated to reduce CHD. After reviewing research surrounding the use of lecithin to reduce serum cholesterol concentrations, Knuiman and co-workers (1989) concluded, that most of the studies reporting a positive effect of lecithin were small in size and were often poorly designed. Well designed studies have failed to show any significant independent effect for lecithin. In contrast, omega-3 fatty acids, especially those found in cold water fish and their oils, have been shown to lower plasma triglyceride levels but have varying affects on cholesterol levels. Investigations have shown that 90 to 120 gm of fish oil, a quantity much greater than that contained in the usual diet, significantly reduces triglycerides (Herold and Kinsella, 1986). Questions about the safety, proper dose, duration of treatment, side effects, and consequences of long-term use of fish oil supplements are not fully answered. The National Cholesterol Education Program (1988) and the Committee on Diet and Health (1989) have not recommended the use of fish oil supplements at this time.

Identification of Individuals with Elevated Cholesterol Levels

The Committee on Diet and Health (1989) of the National Research Council advocates two approaches to reduce the plasma levels of total cholesterol and LDL-C in Americans. The first is a public health strategy aimed at shifting the distribution of cholesterol levels of all Americans into a lower range. Secondly, identification of high risk individuals and provision of appropriate medical intervention are promoted. The Committee concludes that this coordinated strategy will reduce cholesterol levels and CHD risk. Other health groups, including the American Heart Association (1988), recommend a similar strategy.

Intervention to reduce risk can best be implemented after accurate determination of an individual's risk level. To that end, diagnostic measurements in medical facilities and screening in work sites and public gatherings have been promoted. Additional objectives of screening include enhancing individuals' knowledge of their cholesterol levels, raising the public's awareness and knowledge about CHD and blood cholesterol levels, providing appropriate medical referral, and providing information about eating patterns and other approaches to achieve and maintain desirable blood cholesterol levels (Garber et al., 1989; Schucker et al., 1987).

Since the National Cholesterol Education Program was initiated in 1985, cholesterol screenings and the public's awareness of their cholesterol levels have increased significantly (Schucker et al., 1987). In 1987, the Centers for Disease Control added questions to the Behavioral Risk Factor Surveillance System regarding whether individuals had had their blood cholesterol levels measured and their knowledge of their blood cholesterol levels. The monthly telephone survey is conducted nationally using random digit dialing to reach individuals over the age of 18 years. Overall, between 40% and 58% of adults surveyed in 1988 stated that they had had their cholesterol levels checked but, of those, fewer than 21% knew their level at the time of the interview; in some states it was as low as 6% (Centers for Disease Control, 1990b). In 1989, 54% of Iowa respondents reported a history of cholesterol determinations, but only 25% knew what the level was at the time of the survey (Centers for Disease Control, 1990a). In a national sample, younger adults, blacks, those with less than 12 years of education, those with a sedentary lifestyle, smokers, and those with other risk factors for CHD were least likely to know their cholesterol levels (Centers for Disease Control, 1989).

While the Centers for Disease Control surveillance system does not follow up on whether individuals who participate in cholesterol screening programs follow through with

recommendations given to them at the screening, a few community screening followup studies have been reported (Wynder et al., 1986; Wynder et al., 1989; Havas et al., 1991). In a New York City primary screening of over 10,000 adults, over 38% of those screened had TC levels greater than 220 mg/dl (Wynder et al., 1986). Of those with TC levels greater than 220 mg/dl, only 33% consulted a physician later. Those who did consult a physician were those with the highest cholesterol levels. Forty percent reported that they were "watching their diet and cholesterol intake."

In a one year follow-up study of high risk respondents (TC >240 mg/dl) from a Hartford, Connecticut, screening, 70% had later seen a physician (Wynder et al., 1989). Physicians rechecked cholesterol levels in 85%, 28% were put on a diet (undisclosed type), 35% were prescribed diet and exercise, and 22% began drug therapy. Neither the New York City nor the Hartford study reported on specific dietary changes that individuals implemented.

Havas et al.(1991) reported on the Massachusetts Department of Public Health's Model System for Blood Cholesterol Screening Project, which focused on the assessment of those who participated in screenings and what actions participants took as a result of finding out their TC levels. Between two and four months following screening, trained nutritionist-interviewers attempted to contact all high risk

individuals who were previously referred at the screening to physicians due to their high TC levels. Overall, 25% of the participants were categorized as having high blood cholesterol levels and received a recommendation to see their physician for follow-up. Over 86% of this subsample were followed up by the researchers. More than 15% were given cholesterol lowering medications by their physicians within four months of the screening while 22% reported receiving no dietary advice.

The findings concerning treatment prescribed by physicians reported by Havas and co-workers (1991) conflict with the National Cholesterol Education Program (1988) recommendations that diet be the cornerstone of treatment even when medication is prescribed. Havas et al. (1991) and others (Wynder et al., 1989) fear that some physicians may be giving insufficient attention to nutritional counseling and overemphasizing drug therapy. In the Havas et al. study, only 13% of those who had seen a physician had been counseled by a dietitian or nutritionist, while over 45% reported counseling had been done by a physician or nurse. Over 60% had been given some written materials.

Six months after screening, a random sample of 15% of those with high cholesterol levels was invited to be rescreened and was asked to complete 10 questions about their dietary fat intake. The frequency with which foods representing the major sources of dietary fat were consumed

was identified. An additional question was added for each food item concerning whether serving size had increased, decreased, or remained the same since the initial screening. In terms of dietary change, 30% reported decreasing their intake of at least one high fat food item, while 10% increased their consumption of high fat foods. Approximately 75% of the participants reported overall improvements in their intake of fat, 6% had no change, and 19% had a higher intake of fat. No statistical difference in consumption of foods high in fat was found between those who had seen their physician and those who had not. Six months after screening, blood TC levels were 3.6% lower in those who failed to comply with recommendations for a low fat diet, 4.4% lower in those complying with a low fat diet but not taking cholesterol lowering medications, and 8.8% lower in those taking such medications.

It appears that while a larger number of Americans are having their cholesterol levels checked compared to previous years, not all remember the levels nor do they then follow the recommendations given to them. Very high cholesterol levels may provide more motivation to follow through with recommendations than more moderately elevated cholesterol levels. A significant proportion of individuals screened in these studies reported changing their diets, but the accuracy and significance of the change in their diets were not extensively evaluated. Finally, it appears that either

physicians often are not utilizing the services of dietitians or that persons with elevated TC levels are not seeing dietitians for counseling to reduce their risk for CHD. Research is needed to identify why some individuals with increased risk for CHD fail to utilize the expertise of dietitians.

National Cholesterol Education Program Guidelines

The reports of the Expert Panel of the National Cholesterol Education Program (NCEP) (1988, 1993) outline guidelines for the treatment of high blood cholesterol to reduce the incidence of CHD in adults 20 years and older. Because drug therapy is accompanied by some risk and dietary change has been shown to be effective in reducing cholesterol levels, diet therapy is the cornerstone of the NCEP recommendations. The report outlines the total and LDL-cholesterol levels at which dietary management should start, identifies goals of treatment, and provides guidance on the specifics of dietary changes.

Specifically, the NCEP outlines treatment approaches based on classification by either total cholesterol or LDL-cholesterol levels. Individuals with total cholesterol levels below 200 mg/dl are classified as having "desirable blood cholesterol levels" and are encouraged to have cholesterol

levels checked again in five years. Those individuals with total cholesterol levels between 200 and 239 mg/dl are defined as having "borderline-high blood cholesterol levels." If an individual does not have definite CHD or at least two other CHD risk factors, the report recommends that the person should be given dietary advice designed for the general public and that cholesterol levels be rechecked annually. Those persons with definite CHD or two or more risk factors should have further lipoprotein analysis completed and appropriate therapy instituted. Risk factors for CHD include: a prior history of myocardial infarction, angina pectoris, or cerebrovascular or occlusive peripheral vascular disease; cigarette smoking; hypertension; diabetes mellitus; family history of premature CHD; obesity (greater than 30% overweight); and being male. Individuals with total cholesterol levels greater than 240 mg/dl are defined as having "high blood cholesterol levels" and immediate treatment is recommended.

Dietary guidance for reducing the risk for CHD is aimed at reducing the LDL-fraction of total cholesterol. Specifically, the goal is to reduce LDL-C to below 160 mg/dl, or 130 mg/dl if other CHD risk factors are present, while maintaining a nutritionally adequate eating pattern. Total serum cholesterol levels of 240 and 200 mg/dl correspond approximately to LDL-C levels of 160 and 130 mg/dl, respectively. The diets recommended by the NCEP are designed

to progressively reduce intakes of saturated fatty acids and cholesterol, and to promote weight loss in obese individuals (Table 1). The Step-One Diet involves an intake of total fat less than 30% of Calories, saturated fatty acids less than 10% of total Calories, and dietary cholesterol less than 300 mg/day. If the Step-One Diet is insufficient to bring about the necessary blood lipid changes, the NCEP recommends the implementation of the Step-Two Diet. This diet outlines a

Table 1. Diet therapy for high blood cholesterol recommended by the Adult Treatment Panel of the National Cholesterol Education Program (1988)

	Recommended intake	
Nutrient	Step One Diet	Step Two Diet
Total fat	less than 30% of total Calories	less than 30% of total Calories
Saturated fat	less than 10% of total Calories	less than 7% of total Calories
Polyunsaturated fat	up to 10% of total Calories	up to 10% of total Calories
Monounsaturated fat	10% to 15% of total Calories	10% to 15% of total Calories
Carbohydrate	50% to 60% of total Calories	50% to 60% of total Calories
Protein	10% to 20% of total Calories	10% to 20% of total Calories
Cholesterol	less than 300 mg/day	less than 200 mg/day
Total Calories	to achieve and maintain desirable weight	to achieve and maintain desirable weight

further reduction in saturated fat intake of no more than 7% of total Calories and cholesterol intake less than 200 mg/day. Counseling by a registered dietitian is stressed, particularly for the Step-Two Diet. A permanent change in eating behavior is emphasized. If dietary management fails to produce the needed changes drug therapy is recommended, but as an adjunct to the diet, not as a substitute for dietary management (National Cholesterol Education Program, 1988, 1993).

Impact of Diet on Reduction of Hypercholesterolemia

Important questions need to be asked concerning how much dietary change can be expected of free living persons. A brief review of the diet-related results of selected studies aimed at reducing CHD risk may provide some insights. The Multiple Risk Factor Intervention Trial (MRFIT)) was a randomized clinical trial to prevent CHD, utilizing over 12,000 males between the ages of 35 and 57 years, who were free of overt CHD but at increased risk due to hypercholesterolemia, hypertension, and/or cigarette smoking (MRFIT Research Group, 1982). Subjects were randomly assigned to a special intervention (SI) or usual care (UC) group and participated in the study for at least six years. The SI group participated in

a multiple risk reduction intervention program including extensive dietary counseling throughout the study.

SI participants reduced their intake of dietary cholesterol by 40% and saturated fat by more than 25%, and total fat was decreased to less than 35% of total Calories (Gorder et al., 1986). Changes in diet made in the first year were continued throughout the remaining years of the study. Major changes in dietary intake included increased use of poultry, fish, yogurt, and low fat breads and cereals, and decreased consumption of ice cream, dairy cream, and high fat beef, pork, and cheeses. The UC group exhibited similar changes in diet but at much less magnitude, which was attributed largely to increasing public awareness about the relationship between diet and heart disease that occurred during the time of the study. Both SI and UC groups reduced their intakes of whole milk and increased their use of nonfat and low fat milks, suggesting to Gorder and coworkers (1986) that these changes were made relatively easily. Using margarine and oils and reducing egg yolk consumption were also relatively easy (Stone, 1990). Participants found it more difficult to substitute meatless meals, limit meat portions, and avoid high fat meats, crackers, snacks and desserts, and convenience foods (Stone, 1990). While the SI group reduced their use of high fat cheeses, they still accounted for over half the group's cheese protein at followup, reflecting the

popularity of these foods and/or the lack of acceptable substitutes (Gorder et al., 1986).

Dolecek et al. (1986) reported the greatest reductions in serum TC and LDL-C values in individuals who adhered the closest to the MRFIT diet. Smoking and hypertension negatively affected both dietary adherence and lipid changes. Better dietary adherence was seen in subjects with higher entry-level cholesterol levels. Those with the highest lipid levels also showed more significant reduction in those levels at final follow-up than those with more moderately elevated cholesterol levels.

Chima et al.(1990) described a lipid management approach based on the NCEP Step One Diet and involving an initial counseling session with six-week and twelve-week follow-up appointments with a dietitian. At least two-thirds of the 291 clients returned for at least one follow-up appointment. At three months, on the average, clients had reduced their caloric intake from fat by 18%, saturated fat as percent of Calories by 34%, and cholesterol intake by 51%. Total blood cholesterol levels were reduced an average of 27 mg/dl while LDL-C levels were lowered an average of 25 mg/dl.

Shenberger et al. (1992) evaluated the impact of intensive dietary counseling lasting three months on lowering LDL-C levels in 59 hypercholesterolemic males who had previously undergone coronary artery bypass grafting. None

were on cholesterol lowering medications. All were counseled on the NCEP Step One Diet by registered dietitians. At followup, mean fat intake was 25% of total energy, saturated fat contributed 7% of total Calories, and dietary cholesterol intake averaged 204 mg per day; all values were closer to the Step Two Diet than the Step One Diet. Overall, a 10.7% decrease in serum total cholesterol and a 12.4% decrease in LDL-C were seen. It appears from these studies that free living persons can significantly reduce their blood lipid levels through dietary management.

Factors Associated with Adoption of and Compliance with Dietary Behaviors Consistent with Reducing the Risk for CHD

Compliance with dietary recommendations such as those of the NCEP is vital if dietary management is to be effective in the reduction of CHD risk. Sachett and Haynes (1976) defined compliance as "the extent to which a patient's behavior (in terms of taking medications, following diets, or executing other lifestyle changes) coincides with the clinical prescription" (p.1). Rates of non-compliance with dietary regimens are often reported to be higher than for other medical recommendations (Glanz, 1980). Glanz (1980) points out that dietary management is usually only a control method, not curative. Diets are often perceived as restrictive by

individuals who must comply with them. Dietary management often must be prolonged indefinently, as in the case of CHD. These factors adversely affect compliance with dietary regimens.

Demographic characteristics

Early research on dietary compliance focused on easily measured characteristics of the patient or client. Race, marital status, and family size have not been consistently associated with adherence to a therapeutic diet (Sackett and Haynes, 1976; Daschner, 1986).

Females appear to comply better with a low cholesterol diet than do males (Mojonnier et al., 1980). Knapp and coworkers (1988) reported in a study of 1,210 Hispanics and 866 non-Hispanic white Americans that increased economic status was associated with greater avoidance of saturated fat and cholesterol. In contrast, Kushi et al. (1988) found that women from higher income households consumed diets with less saturated fat but ate higher total fat diets. Higher income allows for more options in choosing foods and overall lifestyle decisions that may affect heart disease risk.

Among 300 Iowa males, those who were older, had a higher level of education, smaller households, a working spouse, and were either professionals or administrators reported more behaviors consistent with a diet low in total and saturated

fat (Terry et al., 1991). Similarly, Iowa females from smaller households and with more formal education and occupations as professionals and administrators reported a higher degree of adoption of food behaviors consistent with a diet low in total and saturated fat (Yang, 1991). In addition, females who had a family history of elevated serum cholesterol levels were more likely to adopt such behaviors. A comparison of the two Iowa studies indicate that overall, females reported greater adoption of food behaviors to reduce the risk for heart disease than males.

Using data from the second National Health and Nutrition and Examination Survey, Schecktman and co-workers (1990) compared demographic and anthropometric characteristics of individuals who stated that they were or were not following a cholesterol lowering diet. Those who perceived themselves as complying with the diet were significantly more likely to be female and older, and yet to have a higher body mass index than those not on a cholesterol lowering diet (Schecktman et al., 1990).

Characteristics of the dietary regimen

Complexity of the diet appears to affect dietary compliance. Jeffery et al. (1990) evaluated difficulties of compliance with a variety of diets in hypertensive patients. The most common problems associated with non-compliance were

handling "environmental" situations such as eating away from home, handling social problems, a "lack of will power", difficulty with the strength of old dietary habits, and difficulty with the complexity of the diet. Hegsted (1982) notes that dietary regimens that are overly restrictive, monotonous, expensive, or that make finding or preparing food difficult are not likely to be followed.

Social and cultural factors

Food purchasing, preparation, and consumption behaviors are determined more by social and cultural factors that influence a person's attitudes toward specific foods and food behaviors than by physiological or demographic factors. Individuals are guided in their food selections by their own and their families' taste preferences, food costs, and convenience, among other factors. Widely held popular beliefs equate healthful, nutritious diets with costliness and inconvenience (Hochbaum, 1981). Palatability, affordability, and convenience are prime motivators of people's food decisions. The popularity of "fast food" restaurants reflects a lifestyle that emphasizes saving time and convenience (Hochbaum, 1981). However, convenient food may not always be conducive to health-promoting behavior. For example, Brown (1968) reported that men who ate frequently in restaurants

were less compliant with low fat diets compared to less frequent restaurant diners.

Cultural and social influences are also evident in situations such as when the wish to be a good host prevents the preparation of certain foods, or social amenities prevent a guest from selecting foods that are believed to be healthy. These examples illustrate how the desire to join and be accepted by one's peers may impose complications for eating a healthy diet (Carmody et al., 1987). Thus, food-related behaviors are not simply a result of knowledge, or lack thereof, of what to eat or a fear of consequences. Instead, they are a result of social and cultural factors that are as complex and varied as those factors which determine all of human behavior (Hochbaum, 1981).

Attitudes toward diet and health

Several studies have linked specific attitudes and beliefs held by a person with his/her dietary behaviors (Cialdini et al., 1981; Foley et al., 1979). Researchers have suggested that attitudes toward specific foods and food behaviors are good predictors of diet-related behaviors (Shepherd and Stockley, 1985; Kline and Terry, 1986b; Terry et al., 1991). Individuals with positive attitudes toward specific dietary recommendations, such as to reduce the intake of fat, saturated fat, and cholesterol, are most likely to

adopt and continue to practice behaviors consistent with their beliefs.

Kline and Terry (1986b) reported on beliefs about heart disease risk factors among 710 females who were the major decision makers about food purchasing and preparation in their homes. While respondents were Cooperative Extension Service clients who were likely to have more knowledge of nutrition than the general public, the results provide interesting insights. Over 75% of the respondents agreed that regular exercise, refraining from smoking, avoiding dietary cholesterol, and reducing sodium in the diet would reduce their risk for heart disease. Significantly less agreement was seen regarding the roles of avoiding eggs, increasing polyunsaturated fat, limiting saturated fat, and maintaining a desirable body weight. The women most likely to express attitudes about diet and lifestyle consistent with reducing the risk for heart disease were older, were more educated, had higher incomes, and reported histories of heart disease.

In a follow-up study, 57 pairs of males and females were matched for age, education level, income, and health status (Kline and Terry, 1986a). Women were more likely than men to believe that dietary and lifestyle factors reduce the risk for heart disease. Highest agreement between the gender subsamples was found for the value of exercise, while the men and women disagreed most often concerning avoiding eggs and increasing

the intake of polyunsaturated fat in the diet. Women were more likely than men to agree that limiting saturated fat and sodium and increasing polyunsaturated fat were helpful in reducing the risk for heart disease.

Among rural Iowa males between the ages of 35 and 55 years, those who were older, were living in smaller households, held professional or administrative occupations, had previous diagnoses of elevated cholesterol levels, and were involved in food shopping and meal preparation were most likely to have positive attitudes toward dietary behaviors to reduce the risk for CHD (Terry et al., 1991). Those males who felt the strongest that diet affected the development heart disease reported more food behaviors consistent with a lower total and saturated fat diet than those with less positive attitudes.

The same instrument of Terry et al. (1991) was used to evaluate the relationships between several demographic characteristics, attitudes toward a low fat diet, and the degree of adoption of food behaviors to reduce the risk for heart disease in 300 non-urban Iowan women between the ages of 35 and 55 years (Yang, 1991). Women with more education, occupations as professionals and administrators, smaller household sizes, and family histories of high serum cholesterol reported the highest degrees of adoption of dietary practices consistent with a low total and saturated

fat intake. Women with more positive attitudes toward a low fat diet were more likely to have adopted dietary behaviors consistent with reduced risk for heart disease than those with less positive attitudes. Positive attitudes were significantly associated with younger age, more education, employment as professionals or administrators, higher income, smaller household size, and previous personal or family history of heart disease.

The effects of a cardiac education program and attitudes toward diet and heart disease on the adherence to a low-fat, low-cholesterol, low sodium (cardiac) diet were investigated in 24 males with a history of myocardial infarctions (Barnes and Terry, 1991). All participants attended a series of five classes on cardiac nutrition. Using reported frequency of intake, participants had the most difficulty eating more fish, limiting cheese and fried foods, and reducing meat portions. On the other hand, limiting whole milk, organ meats, pork, and beef were easier. Compliance with recommendations for the use of cooking oils and the use of appropriate margarines was high. The findings of Barnes and Terry (1991) are similar to other research findings (Gorder et al., 1986). Barnes and Terry (1991) found strongest agreement with statements that the diet could reduce the risk for having another heart attack and lower blood cholesterol and body weight, and that family support in following the diet was important. The strongest

negative attitudes were held toward the taste of low fat foods, time required to select foods in the grocery store, difficulty eating away from home, and cooking skills needed to prepare a cardiac diet. Forty-one percent felt that it was difficult to find foods in the grocery store that were compatible with the diet and 37% felt that the diet required more cooking skills than the previous diet. Individuals who felt the strongest that diet could reduce the risk for another heart attack were the most likely to report behaviors most consistent with compliance with the cardiac diet.

Montgomery and Amos (1991) identified concerns of 35 cardiac rehabilitation patents and 29 spouses toward their cardiac diets. Almost half reported difficulty shopping for appropriate foods and reading labels. Only one-third enjoyed being on the diet. Approximately one-half enjoyed eating foods low in fat, cholesterol, and sodium.

Theoretical Basis for Effecting Dietary Behavior Changes

Many early health education efforts were based on two assumptions (Hochbaum, 1981). The first was that ignorance is the cause of health problems and thus, programs placed a heavy emphasis on creating a better informed public. Educators expected that once people knew more about health and disease they would act more intelligently to improve their health. The

second assumption was that people are naturally afraid of disease and death and would respond appropriately to appeals based on fear. Thus, the focus of educational efforts was often the threat of disease and all its horrifying aspects.

Ample evidence exists that knowledge about good nutrition and what people should eat to remain healthy have only a limited effect on nutrition-related practices. Certainly, it is necessary that people be knowledgeable about nutrition to make rational decisions, but such knowledge functions as a tool only when and if people are ready to make a change. Knowledge, by itself, is not an instigator of change (Hochbaum, 1981). There must be a readiness on the part of the person to change behavior. Hochbaum (1981) suggests that nutrition facts are used to justify and rationalize the decision to change, not stimulate the change.

Kirscht (1983) argues that the traditional biomedical view of preventative behavior change is ineffective, and recommends a psychosocial perspective. Strategies used by the health care professional to guide the patient/client must consider the conditions and forces that lead to change.

Several theories that consider the psychosocial components of change have been proposed to explain why compliance with medical regimens, including dietary regimens, is difficult. The Health Belief Model is perhaps the most widely applied explanation of medically-based actions (Becker,

1974; Rosenstock and Kirscht, 1979). The model proposes that behavior is based on an individual's beliefs about the threat of a health condition, subjective susceptibility, evaluation of actions recommended to reduce the threat, and barriers to taking actions. A wide range of health-related behaviors has been studied using this model.

Evidence for the success of such psychosocial models as the health belief model is weak with respect to changing personal health habits, such as dietary behaviors. For example, Avis et al. (1989) found that individuals tend to underestimate their own susceptibility to developing heart disease and fail to find a relationship between increases in perceived risk and behavior changes. The researchers argue that if people do not perceive themselves as vulnerable, they are not likely to adopt recommendations. Thus, the usefulness of the health belief model as a guide in planning change may be limited, especially for health risks for "silent" problems such as hypercholesterolemia and CHD.

Many of the intervention strategies used by large-scale dietary intervention studies, including the MRFIT study (MRFIT Research Group, 1982) and the National Diet-Heart Study Research Group (1968), are based on the social cognitive theory, formerly called social learning theory (Bandura, 1977, 1982). Applying this theory, a person's dietary behavior is established and maintained or changed by cognitive (including

attitudinal), interpersonal, and environmental factors. Eating habits are influenced by the repeated sharing of information about food by family members and others in the environment and by the repeated modeling of related attitudes and behaviors (Carmody et al., 1987). The entire food environment, including the community at large, affects the way a person eats. The long-term effectiveness of strategies to change eating behaviors based on social learning theory has not been well established (Carmody et al., 1987).

The innovation-decision model proposed by Rogers (1983) attempts to explain the process of adopting new behaviors (the innovation). Rogers proposed that individuals go through five stages: knowledge of the innovation, forming an attitude toward it (persuasion), deciding to adopt or reject the innovation (decision), implementation of the decision, and confirmation of the decision. The first stage, knowledge, is affected by characteristics of the individual, including age, educational background, occupation, and social environment. Five attributes of the innovation--relative advantage, compatibility, complexity, trialability, and observability--appear to affect the outcome at the persuasion stage. Relative advantage is the degree to which an innovation is seen as being superior to present ideas or behaviors. A second characteristic is compatability, or the degree to which an innovation is seen as consistent with the individual's

existing values, needs, and previous experiences. Complexity is the degree to which an innovation is perceived to be difficult to use and understand. Trialability is the degree to which an innovation may be tried on a limited basis. Finally, observability is the extent to which the results of the innovation are visible to others. Innovations which are perceived to have a relative advantage, are compatible with existing needs and values, are simple to use and understand, can be tried on a limited basis, and for which the results can be seen are more likely to be adopted than those that do not have these characteristics (Rogers, 1983).

While the innovation-decision model has been used to study a variety of behavior changes, only a few studies have used the model to study food-related behaviors. Buller (1978) developed instruction booklets for the dietary management of hyperlipidemia utilizing the characteristics of the persuasion stage outlined by Rogers and Shoemaker (1971). The booklets stressed compatability and relative advantage of dietary recommendations, and provided opportunities to practice new ideas (trialability). Buller found the materials effective in changing attitudes toward the diet and self-reported dietary behaviors.

Barnes and Terry (1991) used the innovation-decision model (Rogers, 1983) to investigate factors affecting adherence to a cardiac diet in males who had previously

suffered from myocardial infarctions. The strongest negative attitudes were those associated with the relative advantage factor of the model including those of the taste of foods high in fat, time required to shop for food, difficulty shopping and preparing foods, and eating away from home. Most of the 24 males expressed positive attitudes towards statements related to the compatability, observability, and complexity of the diet.

Using the same innovation-decision model, Terry et al. (1991) found positive relationships between attitudes toward reducing total and saturated fat and adoption of corresponding dietary behaviors in healthy Iowa males between the ages of 35 and 55 years. The highest correlations were with trialability and compatability factors although all five characteristics, outlined by Rogers (1983), were significantly associated with adoption of CHD dietary risk reduction behaviors. The authors concluded that the factors which most seriously prevented adoption of desirable behaviors were perceived good taste of high fat foods, difficulty obtaining low fat foods when eating away from home, and a lack of support from family, friends, and physicians.

Yang (1991) also used the Rogers model to evaluate relationships between demographic characteristics, attitudes toward a low fat diet, and the degree of adoption of dietary behaviors consistent with reducing the risk for developing

heart disease in Iowa women. Women with more positive attitudes toward a low fat diet were more likely to practice behaviors consistent with reducing the risk for heart disease. All five factors identified by the Rogers model were found to be associated with adoption of dietary behaviors.

A comparison of Yang's (1991) findings with a previous study of Iowa males (Terry et al., 1991) provided insights into possible differences between males and females regarding adoption of food behaviors to reduce the risk for CHD. Females tended to have more positive attitudes toward a low fat diet than males. Males were more likely to feel that it was difficult give up high fat foods. Yang (1991) concluded that a positive attitude toward diet is a key factor in changing dietary behaviors.

These studies support the usefulness of the innovation-decision model proposed by Rogers (1983). They illustrate that characteristics of change, including dietary change, can be identified, and that attitudes relating to these characteristics are associated with dietary behaviors.

RESEARCH GOALS, OBJECTIVES, AND METHODS

Research Goals

For individuals between the ages of 35 and 65 years identified as having elevated serum total cholesterol levels, the goals of this study were to:

1. Identify factors related to the decision of whether or not to pursue nutrition counseling by registered dietitians to reduce serum cholesterol levels.
2. Identify factors related to the adoption of dietary behaviors to reduce serum cholesterol levels among the subsample counselled by registered dietitians.

Research Objectives

Among individuals between the ages of 35 and 65 years identified as having elevated serum total cholesterol levels, the research objectives related to the first research goal were to:

1. Identify descriptive and medical characteristics related to the decision whether or not to pursue nutrition counseling to reduce serum total cholesterol levels.
2. Identify attitudes toward relative advantage, compatability, complexity, and observability of dietary

change to reduce serum cholesterol levels related to the decision whether or not to pursue nutrition counseling to reduce serum total cholesterol levels.

Among individuals between the ages of 35 and 65 years identified as having elevated serum total cholesterol levels and who undergo counseling regarding dietary changes to reduce serum cholesterol levels, the research objectives related to the second research goal were to:

1. Identify descriptive and medical characteristics associated with the adoption of dietary behaviors consistent with reducing serum total cholesterol levels.
2. Determine the relationship of attitudes toward the relative advantage, compatibility, complexity, and observability of dietary change to reduce serum cholesterol levels to the practice of dietary behaviors to reduce serum total cholesterol levels.
3. Evaluate the relationship of descriptive and medical characteristics to attitudes toward the relative advantage, compatibility, complexity, and observability of dietary change to reduce serum total cholesterol levels.

Research Hypotheses

Among individuals between the ages of 35 and 65 years identified as having elevated serum total cholesterol levels, the hypotheses of this study were:

1. The degree of practice of dietary behaviors to reduce total cholesterol levels is positively correlated with age, income, level of education, family history of heart disease, and serum total cholesterol level.
2. Attitudes toward dietary change to reduce serum cholesterol levels are positively correlated with age, income level, education, family history of heart disease, but inversely correlated with serum total cholesterol level.
3. Attitudes toward dietary change to reduce serum cholesterol levels are positively related to the practice of dietary behaviors to reduce serum total cholesterol levels.
4. Individuals who decide to pursue nutrition counseling to reduce serum total cholesterol levels have more positive attitudes toward dietary change to reduce total cholesterol levels than those individuals who do not pursue nutrition counseling.
5. Individuals who decide to pursue nutrition counseling to reduce serum total cholesterol levels are likely to be

younger and female, and to have higher serum cholesterol levels and stronger family histories of heart disease than individuals who do not pursue nutrition counseling.

Subject Selection and Data Collection

Participant admission criteria

The criteria for participation in the study were: between the ages of 35 and 65 years, at least one total serum cholesterol level greater than 200 mg/dl, and referral to or screened by the Iowa Heart Center's Lipid Clinic (IHCLC), Des Moines, Iowa. Individuals with insulin dependent diabetes mellitus, who had a history of myocardial infarctions or cardiac surgery (including coronary artery bypass graft or angioplasty) in the past twelve months, or who had other serious diseases requiring significant dietary modifications were excluded from the study.

Two groups were studied: Responders--individuals who participated in at least one nutrition counseling session with an IHCLC registered dietitian; and Non-responders--those who decided not to pursue nutrition counseling with the IHCLC dietitians.

Responders. The IHCLC dietitians identified possible study participants from the pool of IHCLC clients who had

serum total cholesterol levels greater than 200 mg/dl. The registered dietitian briefly explained the purpose of the study and the requirements for participation, and requested the client's participation in the project. All potential subjects received a letter from the Iowa State University (ISU) research project director outlining the research project, the purposes of the study, participation requirements, and solicitation of their agreement to participate (Appendix A) along with the research instrument and the usual materials sent to all new clients of the IHCLC. The letter included a copy of the Permission to Release Medical Information form. The packet also included a self-addressed, stamped envelope for the return of the permission form. Responders were instructed to complete the research instrument and bring it to their first appointment with the IHCLC dietitian. Upon receipt of the Permission to Release Medical Information form, an Iowa State University researcher collected data, outlined later, from the client's IHCLC medical record.

Approximately two months after the Responder's first appointment with the IHCLC dietitian, the Responder received a letter reminding him or her of his/her earlier commitment to the research project, a follow-up questionnaire, and a self-addressed, stamped envelope for returning the questionnaire to ISU. If the Responder failed to return the questionnaire

within three weeks, a second reminder letter and another questionnaire were mailed to him/her in an attempt to improve response rate. A thank you letter was sent to each participant upon receipt of the follow-up questionnaire.

Non-responders. The Non-responders were individuals who were identified as having serum total cholesterol levels greater than 200 mg/dl by the IHCLC staff through the usual IHCLC screening procedure or were referred to the IHCLC dietitians by physicians. Individuals who made appointments with the IHCLC dietitians but later canceled or failed to keep appointments and individuals who refused to schedule appointments with the IHCLC dietitians were considered as the Non-responder sample. Names and telephone numbers of all possible Non-responders were provided to the researchers by the IHCLC staff.

Potential Non-responders for the study were contacted by the ISU research project director by telephone. The purpose of the study, requirements of participants, including completion of one questionnaire and permission to release medical information, and assurance of confidentiality were explained. Each individual was asked if he/she would be willing to participate in the study. If the individual agreed to participate, his/her mailing address was obtained. A letter outlining the research study in more detail, the

questionnaire, the Permission to Release Medical Information, and a self-addressed, stamped envelope were mailed within three days of the telephone call. The letter is found in Appendix B. If the questionnaire and the Permission to Release Medical Information were not received within three weeks, a second letter, questionnaire, and permission form were mailed in an attempt to improve response rate. Upon receipt of the Permission to Release Medical Information, an ISU project researcher collected appropriate medical data from the IHCLC medical record. A thank you letter was sent to each participant upon receipt of the permission form and the questionnaire.

Instrument development

Instruments were developed to collect data from two sources: the individual's medical record at the IHCLC and the individual's responses to items on a mailed questionnaire.

Medical record data. Data collected from the medical records of all participants in the study included: gender, presence or absence of personal and/or family history of coronary heart disease, smoking behavior, height and weight, whether or not cholesterol lowering medications were prescribed, and lipid panel results (serum total cholesterol, LDL-cholesterol, HDL-cholesterol, and triglyceride values).

The body mass index (BMI) was calculated for each participant by dividing the individual's weight (in kilograms) by his height (meters^2). In addition, for Responders, the total number of appointments kept with the IHCLC dietitians and the total length of nutrition counseling over the two months since the initial appointment with the IHCLC dietitians were recorded.

Survey instruments. A four part questionnaire was developed for gathering initial responses from the Responders and is found in Appendix C. The first part of the instrument contained a series of 31 attitudinal items designed to assess the individual's attitudes toward a diet low in total fat, saturated fat, and cholesterol. Statement content was based on factors identified that influence food behavior change from a review of the current literature. The items were constructed from a table of specifications based on four of the five characteristics outlined by Rogers (1983) for the persuasion stage of the Innovation-Decision Model: relative advantage, compatability, complexity, and observability. Attitude statements were listed randomly on the questionnaire and were written in both positive and negative forms to avoid response set by the participants. Individuals responded to each item using a five-point (strongly agree to strongly disagree) Likert format scale.

The second part of the questionnaire measured self-reported compliance with 20 food-related practices consistent with behaviors recommended by the National Cholesterol Education Panel (1988) and taught at the IHCLC for reducing total fat, saturated fat, and cholesterol. Sixteen of the foods were self-reported consumption frequencies of foods that were recommended by the IHCLC dietitians to be avoided to reduce total and saturated fat and cholesterol. Eleven of the behaviors have been identified as contributing the most to the intake of total and saturated fat and cholesterol in the American diet (Block, 1985). Participants indicated the frequency with which they consumed each food.

The frequency response categories for 13 of the foods were: "eat less than once a week", "eat one-to-two times a week", "eat three-to-five times a week", and "eat six or more times a week". Frequency of egg consumption ranged from "three or fewer" to "six or more" in the past week. Frequency of red meat consumption ranged from "four or fewer times" to "more than eight times" in the past week. The frequency of eating organ meats in the past month was assessed using options from "once or not at all" to "four or more times" in the last month. The food frequency format used in this study has been shown to be valid and reliable (Block, 1982; Pietenen et al., 1988).

The remaining four food behaviors assessed were the types of cooking fats and salad dressings used in the home, the brand name of the table fat used by the family, and the form of margarine used. The product label of each table fat that the subjects reported using was later checked by the researcher for the primary fat ingredients. Information on the polyunsaturated fat and saturated fat content was used to determine each margarine's polyunsaturated fat to saturated fat ratio (P:S).

The third section of the instrument consisted of seven questions concerning the degree to which the individual potentially controlled the source and amount of fat in his/her diet. Three questions dealt with participation in preparation of and shopping for food for the home and the frequency of reading food ingredient labels for type and amount of fat. Possible responses ranged from "all the time" to "never". Four of the seven questions assessed the frequency of eating away from home at various types of restaurants. Subjects were asked about the frequency of buying meals or snacks from vending machines or convenience stores; eating in fast food restaurants; eating in cafeterias, delicatessens, or full service restaurants; and eating meals in other peoples' homes or at community events using response options ranging from "never" to "five or more times" a week.

The fourth section of the questionnaire assessed descriptive characteristics of the participants in the study. This section solicited information on highest level of education completed, income, marital status, number in household, size of community, and perception of health status. The use of non-prescribed fish oil supplements, niacin, lecithin, beta-carotene, ascorbic acid, vitamin E supplements, or other supplements was assessed. In addition, questions regarding knowledge of personal cholesterol level, and history of therapeutic diets were included.

Approximately two months after the first appointment by the Responders with the IHCLC dietitians, a follow-up questionnaire was completed. This survey included only the first three sections described above and asked similar questions regarding frequency of consumption of selected foods, food purchasing and preparation behaviors, and attitudes toward adoption of the new diet. The questionnaire also solicited any changes in the use of self-prescribed supplements, and perceptions of desirability of personal cholesterol level and overall health. A copy of the follow-up questionnaire is found in Appendix D.

Non-responders completed a questionnaire similar to that of the Responders (Appendix E). The instrument included items that measured self-reported compliance with food-related practices consistent with behaviors to reduce total fat,

saturated fat, and cholesterol; food procurement and preparation behaviors; dietary attitude statements; use of selected supplements; recent dietary changes; perceptions of personal cholesterol levels and health status; and selected demographic items. In addition, Non-responders were asked why they decided not to make an appointment with the IHCLC dietitians for nutrition counseling.

Expert Review and Pilot Testing

The questionnaire was reviewed for clarity by seven nutrition and education specialists. To establish content validity, these professionals reviewed the 31 attitude statements organized within the table of specifications based on Rogers' Innovation-Decision Model (Rogers, 1983) to evaluate correspondence between each item and the attitude it was intended to measure. The table of specifications is found in Appendix F. In addition, the experts reviewed the other three parts of the questionnaire for clarity, content validity, and relevance to the study. Minor revisions were made in the questionnaire based on the expert panel recommendations.

Six clients of the IHCLC who met research study admission criteria completed the questionnaire. The questionnaire was

assessed for clarity of items and questions, readability of items, and time required to complete the instrument.

Prior to data collection, the research instruments and the research protocol were approved by the Iowa State University Committee on the Use of Human Subjects in Research, by the IHCLC registered dietitians, and by the Research Department of the Iowa Heart Center, Des Moines, Iowa.

Data Analysis

The Statistical Package for the Social Sciences 3.0 (SPSS, Inc., 1988) was utilized to analyze all data. Due to the large number of comparisons necessary in this study and, thus, the increased likelihood of type I error, the Bonferroni test was used to determine an adjusted significance level ($p=0.01$) for t-tests (Keppel, 1973). A level of 0.05 level of probability was used to test the significance of all other statistical tests, including chi square and correlation coefficients.

Frequencies and percentages were determined for each variable in the study. Differences between nominal level variables were tested using chi-square tests. T-tests, analysis of variance tests, and Pearson's correlation coefficients were used to determine significant relationships between interval level variables.

A mean food behavior score was calculated for each participant from the responses to 19 of the 20 food behavior items in the second part of the research instrument. Data concerning the form of margarine and the brand name of the margarine were used to determine the ratio of polyunsaturated fat to saturated fat (P:S). Behaviors were scored by giving a value of three for behaviors consistent with a diet low in fat, saturated fat, and cholesterol, two for near compliance, one for partial compliance, and zero for behaviors not consistent with dietary recommendations. Individual scores for the 19 behaviors were summed and divided by the number of items to which the individual responded to arrive at an average behavior score, called the Average Overall Behavior Score. Higher behavior scores indicate a higher degree of adoption of food behaviors consistent with a diet low in total and saturated fat and cholesterol while lower scores indicate less adoption of such behaviors. For Responders, change in behavior score was calculated by subtracting the initial Average Overall Behavior Score from the two month follow-up Average Overall Behavior Score.

Four questions on the survey referred to eating away from home. The frequency of each was estimated by using the midpoint for each frequency option. The responses were summed to obtain total frequency of eating away from home.

The 31 attitude statements were coded so that a score of one indicated the most negative attitude toward adopting a low fat diet while a five indicated the most positive attitude. All items were initially used for factor analysis. After factor analysis was used to determine which items were most relevant, an average score of the items remaining in the attitude inventory was determined for each subject by summing the response value for each attitudinal item and dividing by the number of items to which the subject responded.

Factor analysis, a statistical technique whose purpose is to represent a set of variables with a smaller set of variables, called factors, was used to identify factors within the 31 attitude items. Initially, factors that accounted for at least 5.0% of variance and had an eigenvalue of at least 1.0 were included. Varimax rotation was used to identify individual attitudinal statements which loaded on each factor. Items with high inter-correlations load on one factor. Combining all the statements which load on a single factor produces one variable which represented these statements. Items loading at .40 or higher on a factor were considered representative of that factor (Gorsuch, 1983). Items included in each factor were reviewed for content consistent with the other items within the factor. Individual statements that did not appear consistent with the concept defined by the factor

were omitted from the final attitude inventory used in the remainder of the study. Factors were then summed into multi-item scores. Weighting of items was not undertaken in this study.

Reliability analysis was then used to assess the consistency of the factors. Cronbach's alpha (SPSS, Inc., 1988) was used to examine the estimate of reliability among the items within each factor. Carmines and Zeller (1979) suggest that a Cronbach's alpha value of .80 or higher indicates reliability for widely used scales. Other statisticians and researchers are less willing to designate a specific cut-off value (Jackson and Borgatta, 1981). Because of the preliminary nature of the factor analysis part of the study, a Cronbach's alpha value of .70 was chosen as the minimal acceptable value. Pearson's correlation coefficients were computed to check for correlations between the factors. Factors were defined as discrete and independent if correlations were less than .70 (Gorsuch, 1983).

In the final stage of data analysis, a regression model was developed to identify the "best" predictor for the decision whether or not to see a dietitian for dietary counseling. The backward procedure was used for the regression model. The acceptable level of significance was p=.05. To improve the model, individual variables were examined. Variables with zero or negligible F values were dropped from

the final model. In the model, the decision whether or not to see a dietitian was the dependent variable. The attitude inventory factors, the composite attitude score, and demographic and medical characteristics were entered into multiple regression as independent variables for the full model.

RESULTS AND DISCUSSION

Overall, 114 individuals met the project admission criteria and agreed to participate in the research study. Of the 83 Responders who agreed to participate in the study, 73 completed the entire project (88.0% completion rate). Eight males and two females did not complete the two month follow-up questionnaire and, therefore, were omitted from the study. The non-completers and those who completed the research project did not vary significantly in terms of the descriptive and medical characteristics considered in this research project. In addition, no significant difference in the mean food behavior scores was found between the two groups. Eleven of 31 potential individuals in the Non-responders group did not complete the study. Because of the loss of three males and 8 females the completion rate for the Non-responder group was 64.5%. No medical or other descriptive data is available on those Non-responders who did not return the survey. The overall study completion rate was 81.6%.

Descriptive Characteristics of Responders

Seventy-three adults between the ages of 35 and 65 years with serum total cholesterol levels greater than 200 mg/dl and who had been counselled by a registered dietitian at the Iowa

Heart Center Lipid Clinic (IHCLC), Des Moines, Iowa, completed the study. These subjects are hereafter referred to as Responders. Demographic characteristics of these individuals are outlined in Table 2. The sample contained a somewhat larger proportion of females than males. The mean age of the Responders was 52.0±8.8 years, with 28.8% between the ages of 60 and 65 years of age. There was no significant difference in age between males and females in the Responders group.

Three-quarters of the Responders were married. Overall, 15.1% lived alone, and approximately 40% lived with only one other person. This is not unexpected considering the ages of most Responders; children were most likely gone from the homes. This is further supported by the negative association between age of Responders and size of household ($r=-.5011$, $p=.000$). Forty-seven percent of Responders lived in cities with populations greater than 50,000. Only 28.7% lived in rural areas--on farms or in communities with fewer than 2,500 people.

Overall, Responders were well educated and had moderate to high incomes. Ninety-six percent of Responders indicated that they had at least a high school diploma. Twenty-six percent of Responders had completed college. Approximately three of every five (60.3%) Responders reported annual household incomes over $40,000, with 27.4% having incomes over $60,000 per year. Thus, the majority of the Responders could

Table 2. Demographic characteristics of Responders (n=73)

Characteristic	Frequency	Percentage
Gender		
Male	33	45.2
Female	40	54.8
Age (in years)		
35 to 39	9	12.3
40 to 44	8	11.0
45 to 49	13	17.8
50 to 54	14	19.2
55 to 59	8	10.9
60 to 65	21	28.8
Marital status		
Married	57	78.1
Single, widowed, divorced, separated	16	21.9
Household size		
One	11	15.1
Two	29	39.7
Three	15	20.5
Four	11	15.1
Five or more	7	9.6
Location of home		
Rural area, farm	6	8.2
Rural area, non-farm	5	6.8
Small town, <2,500 population	10	13.7
Town, 2,500 to 10,000	5	6.8
City, 10,001 to 25,000	8	11.0
City, 25,001 to 50,000	4	5.5
Large city, >50,000	34	46.6
Missing	1	1.4
Highest education level completed		
Some high school (grades 9-11)	3	4.1
High school graduate	19	26.0
Some college	22	30.1
Technical or trade school	10	13.7
College graduate	9	12.3
Post-graduate study	10	13.7

Table 2. continued

Characteristic	Frequency	Percentage
Annual household income		
Less than $10,000	2	2.7
$10,000 to $19,999	2	2.7
$20,000 to $29,999	10	13.7
$30,000 to $39,000	7	9.6
$40,000 to $49,999	11	15.1
$50,000 to $59,999	13	17.8
$60,000 or more	20	27.4
Missing	8	11.0

be generally described as urban, well-educated, with relatively high incomes and living in relatively small households.

Statistically significant relationships were found between descriptive characteristics. Age was negatively associated with annual household income ($r=-.3622$, $p=.003$). Thus, older participants tended to have less income than younger persons. Overall, no significant correlation was found between education level and income in the study. However, income was positively related to size of household ($r=.2768$, $p=.026$); participants living in larger households tended to have more income. It is important to note that household size was relatively small; the largest household reported was a single household of six persons. As anticipated, married Responders had significantly larger household sizes than those who were single, widowed, or divorced ($p=.002$). In addition, married Responders reported significantly higher incomes than

those who were not married (p=.006). For women, as age increased, income decreased (r=-.3902, p=.019); no similar relationship was seen among males in the study.

Medical Characteristics of Responders

The medical characteristics of Responders are found in Table 3. According to the Iowa Heart Center (IHC) medical records, only 20.5% of Responders had a history of a cardiac event, such as a myocardial infarction, or cardiac surgery, such as angioplasty, prior to being referred to the IHC. Approximately 18% of Responders reported having at least one parent with CHD diagnosed before the age of 55 years. Overall, 35.6% of Responders (n=26) reported either a personal or a family history of some form of heart disease.

About nineteen percent of the Responders were smoking at the time of admission into the study. This rate is below the national average of 29% of adults (Pierce et al., 1989) but is a serious concern due to the effect of smoking on the risk for coronary heart disease (Grundy, 1986). The National Cholesterol Education Program (1988) estimates that stopping smoking reduces the risk for CHD by 50%.

Obesity has been identified as a risk factor for numerous diseases including CHD (Burton and Foster, 1985). The

Table 3. Medical characteristics of Responders (n=73)

Characteristic	Frequency	Percentage
History of coronary heart disease[a]		
Self	15	20.5
Parent(s)	13	18.1
Sibling(s)	3	4.2
Child(ren)	1	1.4
Smoker	14	19.2
Body mass index, males (n=33)		
22.7 - 27.7	9	27.3
27.8 or greater	24	72.7
Body mass index, females (n=40)		
21.0 - 27.2	18	45.0
27.3 or greater	22	55.0
Serum total cholesterol level (mg/dl)		
200 to 239	21	28.8
240 to 279	31	42.4
280 to 319	11	15.1
319 to 359	6	8.2
360 or higher	4	5.5
LDL cholesterol level (mg/dl)		
Less than 130	5	6.8
130-159	19	26.0
160 or higher	38	52.0
Missing	11	15.1
HDL cholesterol level (mg/dl)		
Less than 35	16	21.9
35 or higher	48	65.7
Missing	9	12.3
Triglyceride level (mg/dl)		
Less than 250	41	56.2
250-499	24	32.9
500 or higher	4	5.5
Missing	4	5.5
Cholesterol lowering medications prescribed	19	26.0

Table 3. continued

Characteristic	Frequency	Percentage
Use of supplements[a]		
Vitamin E	7	9.6
Fish oil	6	8.2
Niacin	5	6.8
Ascorbic acid	5	6.8
Lecithin	4	5.5
Beta-carotene	2	2.7
Personal perception of own cholesterol level		
Fine	3	4.1
Somewhat high	35	47.9
Very high	30	41.1
Missing	5	6.8
Personal perception of health status		
Excellent	8	11.0
Good	47	64.4
Fair	14	19.2
Poor	4	5.5
Therapeutic diets prescribed[a]		
Reduced cholesterol	39	53.4
Reduced fat	33	45.2
Reduced Calories	26	35.6
Reduced salt/sodium	17	23.3
None	22	30.1
Number of diets prescribed in past year		
None	22	30.1
One	14	19.2
Two	14	19.2
Three	15	20.5
Four	8	11.0
Number of appointments with RD		
One	26	35.6
Two	23	31.5
Three	13	17.8
Four or more	10	13.7
Missing	1	1.4

Table 3. continued

Characteristic	Frequency	Percentage
Total length of counseling by RD		
Less than 1.0 hour	5	6.9
1.0 to 1.9 hours	26	35.6
2.0 to 2.9 hours	18	24.6
3.0 to 3.9 hours	9	12.3
4.0 or more hours	5	6.8
Missing	10	13.7

[a] More than one response possible

Framingham Heart Study found a direct association between the degree of obesity and CHD independent of other risk factors (Hubert et al., 1983). Body mass index (weight/height^2) values at or above 27.8 for men and 27.3 for women have been associated with hypercholesterolemia (Miller, 1978). In the present study almost 73% of males and 55% of females in the study had body mass index values that exceed these levels, indicating an additional risk factor in the development and progression of CHD.

The mean total serum cholesterol level of Responders was 270.5±49.9 mg/dl which would be classified as being a "high blood cholesterol level" (total serum cholesterol level 240 mg/dl or higher) (National Cholesterol Education Program, 1988, 1993). Using the NCEP guidelines, only 28.8% of Responders would be classified as having "borderline

cholesterol levels" (total serum cholesterol levels between 200 and 239 mg/dl).

Recent research indicates that certain lipid fractions may be more indicative of CHD risk than total serum cholesterol levels (National Cholesterol Education Program, 1988). The mean LDL-cholesterol level for Responders was 178.4±50.6 mg/dl. This is above the recommended maximum of 160 mg/dl. Only 6.8% of Responders had desirable LDL-cholesterol levels (below 130 mg/dl). About 52% of Responders had LDL-cholesterol levels 160 mg/dl or higher and would be classified as having "high risk LDL-cholesterol levels". Not unsurprisingly, LDL-cholesterol levels were strongly correlated with total cholesterol levels ($r=.8854$, $p=.000$). The mean HDL-cholesterol was 44.6±14.4. Approximately one in five Responders (21.9%) had HDL-cholesterol levels below the recommended minimum of 35 mg/dl, and thus had additional risk for CHD (National Cholesterol Education Program, 1988).

Triglyceride levels have also been implicated in the development of CHD. The mean triglyceride level for Responders was 263.0±170.3 mg/dl which is considered a "borderline high" level. Only 5.5% of the Responders would be diagnosed as having hypertriglyceridemia (triglyceride level 500 mg/dl or higher) according to the National Institutes of Health Consensus Development Conference on Treatment of Hypertriglyceridemia (National Institutes of Health, 1984).

No significant difference in total cholesterol, LDL-cholesterol, or triglyceride levels was found between male and female Responders. Females, however, had significantly higher HDL-cholesterol levels compared to males (p=.000). In addition, HDL-cholesterol level was negatively correlated with age in females (r=-.3399, p=.025). This is not uncommon in females and is largely attributed to the influence of estrogen present in relatively high concentrations in women before menopause (National Cholesterol Education Program, 1988).

Approximately one in four of the Responders (26.0%) had been prescribed a cholesterol-lowering medication either by the Responders' primary physicians or by physicians at the IHCLC prior to their appointment with an IHC dietitian. A comparison of lipid levels of Responders on such medications and those who were not on medications indicated no significant difference in total cholesterol, LDL-cholesterol, HDL-cholesterol, or triglyceride levels. This finding should be interpreted with caution as it was not possible to clarify cholesterol levels prior to the prescription of medications for all subjects in the study. Some Responders entered the study on these drugs while others were prescribed them at the time of referral. Prior research has repeatedly shown that cholesterol-lowering medications are more commonly prescribed when blood cholesterol levels are high (Holme, 1990). In support of the possibility that cholesterol levels might have

been higher prior to the study, Responders with a previous history of CHD were significantly more likely to be on cholesterol-lowering medications than those with no prior history of CHD (p=.005). Older subjects were more likely to be prescribed cholesterol-lowering medications than were younger subjects (p=.005). The IHC is a major cardiac referral clinic so it could be expected that clients were referred to the clinic by local physicians after earlier management approaches were less successful.

In general, few Responders took supplements that have been popularly promoted to reduce the risk for heart disease. Fewer than one in five (n=15) Responders took any form of supplement. The most commonly used supplements were vitamin E, fish oil, niacin, and ascorbic acid.

One of the major goals of the National Cholesterol Education Program (1988) is that Americans know their cholesterol levels. In this study, 89.0% of Responders (n=69) stated that they knew their total cholesterol levels, a value much higher than the 25% of Iowans who reported in a random telephone survey that they knew their cholesterol levels (Centers for Disease Control, 1990a). The actual serum total cholesterol levels as cited in the medical records and the cholesterol levels reported by the Responders were highly correlated (r=.9193, p=.000), again indicating that the Responders were knowledgeable about their cholesterol levels.

The high level of awareness of cholesterol levels among Responders may be due either to the recency of the lipid evaluation and notification of results or the intense interaction of Responders with the cardiac specialists at the Iowa Heart Center. When Responders were asked specifically about their perceptions of their total serum cholesterol levels, only 4.1% of Responders felt that their cholesterol levels were fine. It appears that elevated cholesterol levels did not seriously impact the Responders' perceptions of their overall health as most felt that their health was either good (64.4%) or excellent (11.0%). Interestingly, perceived health status was not associated with prior history of coronary heart disease or the use of cholesterol lowering medications, which are obvious indicators of the presence of a cardiac health problem.

About 70% of Responders (n=51) had been prescribed some type of therapeutic diet in the past year. Over one-half were told to reduce their cholesterol (53.4%) and/or fat (45.2%) intakes, while 35.6% of Responders were told to lose weight. Over one-half (50.7%) of Responders were instructed to follow multiple diets, significantly increasing the complexity of dietary changes required.

Seventy-two of the 73 medical records of Responders provided information on the frequency and extensiveness of counseling by the IHCLC dietitians. Of those 72 Responders,

63.9% returned for at least one follow-up appointment with a dietitian. Almost one-half (43.7%) of Responders spent two or more hours in counseling with a dietitian. Actual counseling hours were likely more than the data indicate as some records were incomplete.

Overall, the majority of Responders had either a personal or family history of heart disease and high total and LDL-cholesterol levels. They considered their overall health to be good although they recognized that their cholesterol levels were high. They were not likely to smoke, take cholesterol-lowering medications or over-the-counter supplements that have been promoted to reduce cholesterol levels. Most had been prescribed at least one diet in the past. With a few noted exceptions, descriptive characteristics were not associated with the medical characteristics of the Responder group.

Selected Food Behaviors of Responders

Comparison of consumption of high fat foods by Responders

Responders were asked to indicate the consumption frequency of 13 types of foods which have been shown to contribute the largest amount of fat in the American diet. Table 4 compares the reported intake of these foods prior to counseling by the IHCLC dietitians (baseline) and two months later (follow-up). Consumption of each food "less than once a

Table 4. Comparison of consumption of high fat foods by Responders at baseline and at two month follow-up (n=73)

Characteristic	Baseline		Follow-up	
	n	%	n	%
Fat on meat or skin on poultry				
Less than once a week	45	61.6	61	83.6
1-2 times a week	20	27.4	12	16.4
3-5 times a week	7	9.6	0	0.0
More than 5 times a week	1	1.4	0	0.0
Sausage, frankfurters, bacon, regular cold cuts/luncheon meats				
Less than once a week	52	71.2	64	87.7
1-2 times a week	13	17.8	9	12.3
3-5 times a week	6	8.2	0	0.0
More than 5 times a week	2	2.7	0	0.0
Regular ground meat (<85% lean) or foods containing regular ground meat				
Less than once a week	52	71.2	36	49.3
1-2 times a week	9	12.3	28	38.4
3-5 times a week	7	9.6	9	12.3
More than 5 times a week	5	6.9	0	0.0
>6 oz. meat, fish, or poultry/day				
Less than once a week	25	34.2	23	31.5
1-2 times a week	17	23.3	30	41.1
3-5 times a week	22	30.1	19	26.0
More than 5 times a week	9	12.3	1	1.4
Fried foods				
Less than once a week	30	41.1	48	65.8
1-2 times a week	23	31.5	20	27.4
3-5 times a week	16	21.9	4	5.5
More than 5 times a week	4	5.5	1	1.4
Ice cream				
Less than once a week	50	68.5	64	87.7
1-2 times a week	14	19.2	7	9.6
3-5 times a week	8	11.0	2	2.7
More than 5 times a week	1	1.4	0	0.0
Doughnuts, sweet rolls, cakes, cookies, pies				
Less than once a week	27	37.0	47	64.4
1-2 times a week	29	39.7	17	23.3
3-5 times a week	15	20.5	7	9.6
More than 5 times a week	2	2.7	2	2.7

Table 4. continued

Characteristic	Baseline n	Baseline %	Follow-up n	Follow-up %
Chocolate and/or candy bars				
Less than once a week	34	46.6	52	71.2
1-2 times a week	18	24.7	18	24.7
3-5 times a week	18	24.7	3	4.1
More than 5 times a week	3	4.1	0	0.0
Cream or imitation coffee creamers				
Less than once a week	59	80.8	63	86.3
1-2 times a week	5	6.8	1	1.4
3-5 times a week	3	4.1	5	6.8
More than 5 times a week	6	8.2	4	5.5
Whole or 2% milk				
Less than once a week	52	71.2	68	93.2
1-2 times a week	4	5.5	2	2.7
3-5 times a week	7	9.6	2	2.7
More than 5 times a week	10	13.7	1	1.4
Natural or processed cheeses				
Less than once a week	25	34.2	48	65.8
1-2 times a week	27	37.0	21	28.8
3-5 times a week	18	24.7	3	4.1
More than 5 times a week	3	4.1	1	1.2
Salad dressings or mayonnaise				
Less than once a week	18	24.7	41	56.2
1-2 times a week	29	39.7	28	38.4
3-5 times a week	18	24.7	3	4.1
More than 5 times a week	8	11.0	1	1.2
Chips or snack crackers				
Less than once a week	30	41.1	41	56.2
1-2 times a week	22	30.1	22	30.1
3-5 times a week	15	20.5	10	13.7
More than 5 times a week	6	8.2	0	0.0

week" is most consistent with the Step One Diet outlined in the NCEP guidelines (National Cholesterol Education Program, 1988) and the recommendations of the IHCLC dietitians.

Four items assessed meat consumption. Prior to counseling by the IHCLC dietitians, over half of Responders (61.6%) reported that they ate fat on meat or skin on poultry less

than weekly; at follow-up, the percentage increased to 83.6% of participants. At baseline, over 70% used high fat meats such as sausage, frankfurters, bacon, and cold cuts less than weekly. Two months later, frequency of consumption of these high fat meats was lower; 87.7% of participants reported eating high fat meats less than weekly. In contrast, the number of Responders eating high fat ground meat (<85% lean) less than once a week had decreased from 71.2% to 49.3% during the same time period. It is possible that Responders substituted ground meat entrees for other high fat meats in their diets. While this would reduce the total fat, saturated fat, and cholesterol content of their diets somewhat, leaner ground meat would be more consistent with the recommendations of the IHCLC dietitians and the National Cholesterol Education Program (1988).

The Step One Diet recommends no more than six ounces of meat, fish, or poultry per day (National Cholesterol Education Program, 1988). Prior to their first appointment, 65.8% of Responders averaged eating more than six ounces of meat, fish, or poultry at least once weekly. Even after counseling, Responders continued to have difficulty limiting the amount of meat they ate. At the two-month follow-up, 68.5% reported that they still ate larger than recommended amounts of meat, fish, and poultry.

Fried foods were also commonly eaten by Responders prior to seeing an IHCLC dietitian. At baseline, only 41.1% of subjects reported eating fried foods less than once a week, while another third ate such foods once or twice each week, and 27.4% ate fried items three or more times a week. After two months, the percentage of responders eating fried foods less than once weekly had almost doubled to 65.8% of Responders.

Desserts, pastries, and sweets such as ice cream, chocolate, and candy bars can provide significant amounts of total and saturated fat. Even before counseling by an IHC dietitian, almost 70% of Responders reported eating ice cream less than weekly. In contrast, only a little over one-third limited doughnuts and similar baked sweets to less than once a week and less than half limited chocolate and candy bars to less than weekly. At follow-up, the percentage of Responders eating ice cream less than weekly had risen to 87.7%. Greater reductions in the frequency of consumption of doughnuts and baked sweets and in the intake of chocolate and candy bars was reported on the two-month follow-up survey. Over 64% of Responders ate doughnuts and baked sweets less than weekly and 71.2% reported limiting their consumption of chocolate and candy bars to less than once a week.

Three items on the questionnaire asked about the usual intake of dairy products or dairy product substitutes. As a

group, Responders seldom used cream, imitation coffee creamers, whole milk or 2% milk. At baseline, about 80% used cream or imitation creamers less than once a week and 71.2% reported using whole or 2% milk less than once a week. Generally, even fewer Responders were using these high fat dairy products two months later. Over 85% of Responders reported consuming high fat milks, cream, or imitation coffee creamers on an average of less than once a week. On the other hand, Responders consumed natural and processed cheeses more frequently than other high fat dairy products studied. Only 34.2% of Responders consumed cheeses less than weekly prior to their first appointment with an IHC dietitian. Two months later, the percentage of Responders who reported that they ate natural and/or processed cheeses less than weekly had almost doubled.

The final two items asked the Responders about their intake of selected condiment and snack items. While only about one-fourth used salad dressings or mayonnaise less than once weekly at baseline, approximately 41% of Responders ate chips or snack crackers less than once a week. Two months later, while the percentage of participants who used salad dressings or mayonnaise less than once a week had more than doubled, salad dressings and mayonnaise continued to be common sources of fat in the diets of almost half of the Responders. In addition, only a little more than one half (56.2%) of

Responders reported limiting the consumption of chips and snack crackers to less than weekly on the two month follow-up survey. Further investigation into the types of chips and snack crackers that continue to be eaten is needed to identify whether Responders were consuming the few low fat or fat free crackers available.

Table 5 lists the Responders' practice of other food behaviors associated with fat and/or cholesterol intake. In general, limiting the richest sources of dietary cholesterol was not difficult for most Responders. While about 88% of Responders consumed three or fewer egg yolks a week at baseline, which is the recommended maximum in the Step One Diet (National Cholesterol Education Program, 1988), 94.5% reported doing so two months later. Restriction of organ meats was also not a problem. Only one Responder ate organ meats as frequently as twice in the past month at baseline, and this same Responder continued to do so at the two month follow-up. As expected, red meats were relatively frequently eaten. Red meats such as beef, pork, and lamb can provide significant amounts of total fat, saturated fat, and cholesterol to the diet. Prior to counseling by the IHCLC dietitians, about two-thirds of Responders ate such foods four or fewer times a week; 12.3% averaged eating red meats at least daily. Responders reported less frequent consumption of red meats two months after initial counseling; 84.9% reported compliance

Table 5. Comparison of selected food behaviors associated with fat and/or cholesterol intake practiced by Responders at baseline and at two month follow-up (n=73)

	Baseline		Follow-up	
Food Behavior	**n**	**%**	**n**	**%**
Egg yolks eaten/used per week				
3 or fewer	64	87.7	69	94.5
4	6	8.2	4	5.5
5	0	0.0	0	0.0
6 or more	3	4.1	0	0.0
Times ate organ meats in past month				
Once or not at all	72	98.6	72	98.6
Twice	1	1.4	1	1.4
Times ate beef, pork, or lamb in past week				
4 or fewer times	49	67.1	62	84.9
5-6 times	15	20.5	7	9.6
7-8 times	7	9.6	3	4.1
More than 8 times	2	2.7	1	1.4
Type of salad dressing used				
Did not use	2	2.7	5	6.8
Low Calorie/low fat	33	45.2	51	69.9
Regular oil-based	16	21.9	7	9.6
Sour cream or mayonnaise based	22	30.1	10	13.7
Type of fat used in cooking				
Did not use or used a liquid vegetable oil	6	8.2	14	19.2
Margarine	52	71.2	51	69.9
Shortening	13	17.8	6	8.2
Lard, bacon grease, or butter	2	2.4	2	2.7
Form of margarine used				
Squeeze bottle	4	5.5	6	8.2
Tub	39	53.4	54	74.0
Stick	30	41.1	13	17.8
Type of margarine used				
P:S[a] <2:1	34	46.6	7	9.6
P:S = 2:1	15	20.5	15	20.5
P:S >2:1	22	30.1	49	67.1
Could not determine	2	2.7	2	2.7

[a]P:S is the ratio of polyunsaturated fat to saturated fat

with the NCEP guidelines, eating red meats no more than four times a week (National Cholesterol Education Program, 1988).

Visible fat in salad dressings, cooking fats, and table spreads can also provide significant amounts of total fat and saturated fat. While about one-half of Responders reported using sour cream, mayonnaise-based, or regular oil-based dressings, the other one-half reported either not using any salad dressings or using low Calorie/low fat salad dressings prior to their first appointment with an IHC dietitian. At the two month follow-up, over two-thirds of Responders reported using low Calorie/low fat salad dressing; 23.3% were still using regular oil, sour cream, or mayonnaise-based salad dressings. Over 79% of Responders used margarine when preparing foods. At follow-up most Responders reported continued use of margarine but almost one in five were not using fat or were using a liquid vegetable oil in cooking.

Generally, margarines in squeeze bottles have the least amount of saturated fat, while margarines that are firmer and in sticks have the most saturated fat; the saturated fat content of margarines in tub containers is between the two other types. Prior to the first appointment with the IHCLC dietitians, over one-half of Responders used margarines in tub containers, with about 40% using stick margarines. Two months later, only 17.8% of Responders were still using stick margarines; almost three-quarters were now using margarines in

tub containers. Little change in the proportion of Responders using margarines in squeeze bottles occurred during this time. Thus, there was a tendency for Responders to switch to margarines in forms that tend to be lower in saturated fat.

Comparison of the polyunsaturated fat to saturated fat ratio (P:S) of cooking and table fat is another method to determine the appropriate sources of fat. Ratios of polyunsaturated fat to saturated fat of 2:1 or higher are recommended by the IHCLC dietitians. Further evaluation of brands of margarines identified by Responders revealed that only 50.6% of them were using such margarines at baseline. At the two month follow-up, over 90% of Responders were using margarines with acceptable polyunsaturated fat to saturated fat ratios, and only 9.6% were using margarines that would be considered unacceptable because of their low ratios of polyunsaturated fat to saturated fat.

A comparison of selected reported intakes of high-fat foods at baseline in the present study with two studies of Iowans (Terry et al., 1991; Yang, 1991) show similar behaviors, in general. In all three studies, over 60% of participants ate fried foods at least once a week. Responders in the current study were more likely to eat fat on meat or skin on poultry but less likely to eat sweets and doughnuts than female Iowans (Yang, 1991). However, the Responders ate chips and snack crackers at about the same frequency as

females (Yang, 1991) but more often than the males in Iowa (Terry et al., 1991) previously studied. Responders reported eating high fat meats such as sausage, bacon, and cold cuts more often than Iowans of either sex in previous studies.

In contrast to the two Iowa surveys (Terry et al., 1991; Yang, 1991) where liquid vegetable oil was used by over 70% of the participants, in this study over 70% of Responders used margarine as the primary fat in cooking. Age may be a factor in the difference in type of cooking fat used in the two Iowa surveys and the current study; Responders were older than those surveyed by Terry et al. (1991) and Yang (1991). While direct comparison of margarines cited in the three studies is not possible due to differences in questions, some implications can be made. Margarines low in saturated fat are likely to have liquid vegetable oil as their first ingredient and to have polyunsaturated fat to saturated fat ratios of 2:1 or better. Yang (1991) reported 96% of Iowa females used such margarines. In the current study, only 50.6% of Responders used margarines that had polyunsaturated fat:saturated fat of 2:1 or better at baseline.

It appears that, at baseline, salad dressings and mayonnaise, natural and processed cheeses, chips and snack crackers, fried foods, and large portions of meat, fish and poultry were the foods most commonly consumed at frequencies greater than recommended by the NCEP guidelines (National

Cholesterol Education Program, 1988). Margarines with less than desirable polyunsaturated fat:saturated fat were commonly used. Relatively few Responders exceeded the NCEP guidelines (National Cholesterol Education Program, 1988) for whole or 2% milk, cream, imitation coffee creamers, regular ground meat, and other high fat meats. Two months later, Responders were most successful in limiting their consumption of whole milk and 2% milk, ice cream, high fat meats, and fat on meat and skin on poultry. In contrast, they had more difficulty reducing the frequency of intake of high fat ground meat, salad dressing and mayonnaise, chips and snack crackers, and large proportions of meat, fish, and poultry.

A mean food behavior score for each food behavior item was calculated as described in the data analysis section. The potential range is 0.00 to 3.00 with a score approximating three indicating behavior most consistent with a diet low in total fat, saturated fat and cholesterol, two indicting near compliance, one indicating partial compliance, and zero indicating low or no compliance. Using paired t-tests, comparisons of baseline and two month follow-up reported intakes of Responders revealed significant improvement in the level of compliance with most of the recommendations to reduce the sources of fat, saturated fat and cholesterol in their diets (Table 6). In the two month follow-up surveys, there

Table 6. Comparison of mean behavior scores between baseline and two month follow-up for Responders (n=73)

	Baseline	Follow-up
Fat on meat or skin on poultry	2.49±0.73[a]	2.84±0.37***
Sausage, frankfurters, bacon, regular cold cuts/luncheon meats	2.56±0.93	2.88±0.33***
Regular ground meat (<85% lean) or foods containing regular ground meat	2.55±0.93	2.37±0.70
>6 oz. meat, fish, or poultry/day	1.93±1.13	2.03±0.80
Fried foods	2.08±0.92	2.58±0.67***
Ice cream	2.55±0.75	2.85±0.43***
Doughnuts, sweet rolls, cakes, cookies, pies	2.11±0.83	2.49±0.78***
Chocolate and/or candy bars	2.14±0.93	2.67±0.55***
Cream or imitation coffee creamers	2.61±0.91	2.68±0.83
Whole or 2% milk	2.41±1.06	2.87±0.51***
Natural or processed cheeses	2.01±0.87	2.59±0.64***
Salad dressings or mayonnaise	1.78±0.95	2.49±0.65***
Chips or snack crackers	2.07±0.95	2.42±0.73***
Egg yolks eaten/used per week	2.79±0.65	2.94±0.23
Times ate organ meats in past month	2.99±0.12	2.99±0.12
Times ate beef, pork, or lamb in past week	2.52±0.78	2.78±0.58**
Type of salad dressing used	1.21±0.77	1.70±0.79***
Type of fat used in cooking	1.95±0.77	2.05±0.62
Type of margarine used	2.17±0.87	2.58±0.67***
Overall food behavior score	2.26±0.32	2.54±0.26***

[a]Mean±standard deviation
**p<.01
***p<.001

were highly significant changes in 13 of the 19 behaviors studied.

In general, the findings of this part of the study support the results of earlier research evaluating dietary behaviors of persons with elevated cholesterol levels and/or persons with histories of cardiovascular disease. Several other researchers have found that reducing the consumption of high fat milk and eggs and switching to a more polyunsaturated fat for cooking and table use were relatively easy (Barnes and Terry, 1991; Boeckner et al., 1990, Gorder et al., 1986; Stone, 1990; Witschi et al., 1978). In contrast to the MRFIT finding (Gorder et al., 1986) that reducing the consumption of baked goods and desserts appeared relatively easy, Responders in this study appeared to have more difficulty reducing the intake of these foods. Like this study, Barnes and Terry (1991) and the MRFIT researchers (Gorder et al., 1986; Stone, 1990) found that reducing the amount of meat, fish, and poultry eaten is one of the most difficult changes for persons with increased risk for cardiovascular disease to implement. MRFIT participants, like those in this study, also found it difficult to reduce the consumption of high fat snacks such as chips and crackers. No other published research has found increased consumption of regular ground meat.

This study also supports the findings of Barnes and Terry (1991) that reducing the consumption of cheese and fried foods

was difficult to achieve. The limited reduction in the consumption of cheese may be in part due to the lack of organoleptically satisfactory low fat cheese products available to shoppers or the overall popularity of cheeses and foods containing cheese (Gorder et al., 1986). The difficulty in reducing fried foods may require more counseling about alternate food preparation techniques. This study suggests that more emphasis on the use of lean ground beef is also needed during counseling. Finally, positive actions that result in reducing quantities of meat, fish, and poultry need to be emphasized. Stressing the use of animal protein foods as small components in entrees that are largely grain or vegetables in place of a solid piece of meat as the entree at meals would result in reduction in the portion of meat, fish, and poultry eaten at a meal. In addition, increased consumption of attractive and tasty vegetarian entrees could be emphasized. These last two recommendations may be difficult to implement in an agricultural-based area such as Iowa.

An overall food behavior score was calculated, as described earlier, by summing the 19 individual food scores in Table 6, and dividing by the number of item responses. The potential score range was 0.00-3.00. Higher scores indicated greater adoption of these 19 food behaviors. At baseline, the mean score was 2.26±0.32, indicating that most of the Responders were in near compliance with the overall dietary

recommendations to reduce total fat, saturated fat, and cholesterol. Scores ranged from 1.58 to 2.95. At two month follow-up, the mean overall food behavior score had increased to 2.54±0.26; most Responders reported significantly improved food behaviors (p=.000). The range was 1.68 to 2.89. Contrary to several other researchers (Gorder et al., 1986; Mandriota et al., 1980; Yang, 1991) there was no significant difference in the overall food behavior score at either time based on sex. In addition, no difference in the overall food behavior score was seen at either baseline or follow-up based on marital status, educational level, income, household size, size of community, the use of cholesterol lowering medications, or whether or not the responder smoked or had previously been told by a physician to reduce either fat or cholesterol intake in the past year. There was, however, an inverse relationship between the responder's perceived cholesterol level and the overall food behavior score at baseline (r=-.2876, p=.026) and two months later (r=-.2774, p=.028), indicating that individuals who perceived their cholesterol levels as being higher reported fewer dietary behaviors consistent with Step One Diet (National Cholesterol Education Program, 1988) recommendations.

A positive association between the two overall food behavior scores (baseline and follow-up) was found for females (r=.3601, p=.029) but not for males. Evaluating possible

associations between medical characteristics and overall food behavior scores showed that for females, body mass index was inversely associated with the initial food score (r=-.4109, p=.012); thus, more seriously obese females complied the least with guidelines at baseline. No association was found for males. At follow-up, total cholesterol levels of females were inversely associated with the overall food behavior score (r=-.4060, p=.009). For females, individuals with higher cholesterol levels are more likely to report behaviors inconsistent with NCEP guidelines (National Cholesterol Education Program, 1988) after counseling. Again, there was no significant association between lipid levels and the food behavior score for males either at baseline or two months later. Finally, a statistically significant correlation was seen between perceived health status among females and their overall food behavior score at baseline (r=.3626, p=.027). Those females who reported more positive perceptions of their health reported food selections that complied better with a diet to reduce the risk for coronary heart disease. This association was no longer apparent two months later. It may be that after counseling female Responders, regardless of their earlier perceptions of their health, became more aware of the need to change behavior and did so.

The extent of change in overall food behavior was determined by subtracting the baseline overall food behavior

score from the follow-up score. Relationships between the extent of behavior change and descriptive and medical characteristics were identified. Age was not associated with either baseline or the two months follow up overall food scores but was inversely associated with the extent of reported change in overall food behaviors (r=-.3293, p=.005). Adoption of food behaviors associated with a diet low in fat, saturated fat, and cholesterol declined with increasing age. Further analysis revealed this association held for females (r=-.4031, p=.013) but not males. Thus, age may not be a significant factor associated with changing food behaviors for males while it may be a negative influence for females.

The first hypothesis predicting a positive association between compliance with a low fat, saturated fat, and cholesterol diet and age, income, level of education, and family history of heart disease was generally not supported. At the two month follow-up, the total cholesterol level was inversely related to compliance with the diet. None of the other descriptive and medical characteristics identified in the original hypothesis was significantly related to the overall food behavior score of Responders.

Extent of counseling, measured as number of appointments kept with a dietitian, was positively associated with the extent of behavior change (r=.5835, p=.000) in females. More time in counseling allows for better identification of

problems, discussion of possible solutions, and reinforcement of appropriate behaviors. In addition, females with more positive perceptions of their health reported greater adoption of food behaviors consistent with the National Cholesterol Education Program (1988, 1993) guidelines ($r=.3413$, $p=.039$). It may be that individuals who perceive their health to be good are motivated to make changes in their diet to maintain their health.

Some trends, although not statistically significant, were also seen. Individuals who indicated knowing their cholesterol levels reported greater changes in behavior during the two months than those who did not know their cholesterol levels. Married Responders made more extensive changes in diet-related behaviors than single, widowed, or divorced individuals, as did those who had been prescribed cholesterol lowering medications compared to those not taking such drugs. Finally, non-smokers reported greater adoption of diet-related behaviors than did smokers.

Food-related activities of Responders

Compliance with a diet low in fat, saturated fat, and cholesterol is likely enhanced when an individual is involved with and has control over food selection and preparation. Responders were asked about their participation in grocery shopping, food label reading, and meal preparation activities,

and results are listed in Table 7. At baseline, 64.4% of Responders were responsible for all the food shopping for their households, and another 15.1% did over half. About 51% of Responders reported that they read food labels over half of the time with almost one-fourth of these individuals reading food labels all of the time. Over 50% prepared all the meals for their households, while another 12.3% prepared over half of all meals. Only 9.6% prepared no meals for their households. In general, prior to counseling with the IHCLC dietitians, Responders were more likely to shop for food and prepare meals than read food labels.

Table 7. Comparison of participation in food-related activities by Responders at baseline and at two month follow-up (n=73)

	Baseline		Follow-up	
Activity	**n**	**%**	**n**	**%**
Food shopping for household				
All the time	47	64.4	50	68.5
More than half the time, but not all the time	11	15.1	10	13.7
Less than half the time	12	16.4	13	17.8
Never	3	4.1	0	0.0
Reading food labels				
All the time	18	24.7	52	71.2
More than half the time, but not all the time	19	26.0	18	24.7
Less than half the time	26	35.6	3	4.1
Never	10	13.7	0	0.0
Preparing meals for household				
All the time	37	50.7	38	52.1
More than half the time, but not all the time	9	12.3	15	20.5
Less than half the time	20	27.4	15	20.5
Never	7	9.6	5	6.8

At the two month follow-up, no significant changes in the extent of responsibility for food shopping and meal preparation were seen, indicting these responsibilities were most likely held by certain members of the household and were affected little by special dietary needs of a family member. In contrast, the reported frequency of reading food labels increased significantly (p=.000). At follow-up, almost three times as many Responders reported reading food labels "all of the time" as had at baseline. Overall, all Responders had implemented this behavior at follow-up and reported reading food labels at least occasionally.

Involvement in food shopping was positively associated with the frequency of preparing meals, at both baseline (r=.6447, p=.000) and follow-up (r=.6332, p=.000). Reading food labels was correlated with food shopping as well (r=.2443, p=.037), but at baseline only. As was noted earlier, over 95% of Responders reported reading food labels at least one-half of the time on the two month follow-up, indicating that almost all of Responders, regardless of extent of their involvement in food purchasing and/or preparation, recognized the importance of evaluating the ingredient and nutrient content of foods.

In this study females were more likely than males to be responsible for both food shopping (p=.000) and meal preparation (p=.000). Cosper and Wakefield (1975), Terry et

al. (1991), and Yang (1991) have also reported similar findings. Interestingly, in the current study there was no significant difference between males and females in the frequency of reading food labels; men were as likely as women to report reading food labels both at baseline and at follow-up.

Overall, the frequency of reading food labels was positively associated with the overall food score at baseline ($r=.3394$, $p=.004$) and two months later ($r=.3905$, $p=.001$). Those who most frequently read food labels reported behaviors consistent with a diet low in fat, saturated fat, and cholesterol. Compliance with a diet low in total fat, saturated fat, and cholesterol requires evaluation of ingredients and the quantity of fat and cholesterol in foods (Haralson et al., 1990). At follow-up, individuals with higher incomes reported reading labels more frequently than those with lower incomes ($r=.3065$, $p=.013$).

The responses to the items describing food purchasing, reading labels, and food preparation were summed and an average was derived to estimate the level of control over food selection and preparation. As would be expected single, widowed, and divorced persons had significantly more control over food purchasing and preparation than those who were married ($p=.004$). As married Responders lived in significantly larger households than those who were not

married, responsibilities involving food could have been shared and/or may have been the responsibility of the spouse.

For females, the level of control of grocery shopping, label reading, and food preparation was statistically associated with their overall food behavior score ($r=.6444$, $p=.000$) but inversely correlated with total cholesterol level at follow-up ($r=-.3406$, $p=.032$). In addition, as stated earlier, the overall food behavior score was inversely associated with total cholesterol levels at follow up. Thus, women with relatively high total cholesterol levels at follow up were less likely than females with lower levels to purchase food, read labels, prepare food, and report behaviors consistent with the recommendations of the National Cholesterol Education Program (1988). No similar association was seen among the males in the study.

Other statistically significant associations were found. Overall, the level of food control was positively associated with income ($r=.3350$, $p=.046$). For males, but not females, perceived health status was inversely related to level of control over food ($r=-.3892$, $p=.025$). It may be that males in poorer health are more dependent on others for food selection and preparation, while women, because of the usual role expectations, continue to shop and prepare food despite poorer health.

Frequency of eating outside of the home by Responders

Four questions on the research instrument identified how often Responders ate away from home. As a group, Responders consumed food at other persons' homes, community events, cafeterias, delicatessens, full service restaurants, and fast food restaurants, and purchased food from vending machines and in convenience stores (Table 8). Prior to counseling with an IHCLC dietitian, over half of Responders (54.8%) ate at other peoples' homes or at community events at least once a week. Almost 80% ate in cafeterias, delicatessens, or other non-fastfood restaurants at least weekly, with 19.2% eating in such establishments five or more times a week. Over half of Responders ate in fast food restaurants one to two times weekly. In comparison to their frequency of eating at the prepared food outlets, Responders were less likely to obtain food items from vending machines or purchase foods in convenience stores; only 43.8% reported doing so at least weekly.

At the two month follow-up, no statistically significant reduction in eating at any of the types of food establishments was seen although some trends developed. No major change in frequency in eating at other peoples' homes or community events was reported, possibly relating to social demands that often accompany eating in these situations. Although not statistically significant, over 41% of Responders reported

Table 8. Comparison of frequency of eating at various types of food establishments each week by Responders at baseline and at two month follow-up (n=73)

	Baseline		Follow-up	
Type of food establishment	**n**	**%**	**n**	**%**
Other people's homes or community events				
Never	32	43.8	36	49.3
1-2 times/week	39	53.4	35	47.9
3-4 times/week	1	1.4	2	2.7
5 or more times/week	0	0.0	0	0.0
Missing	1	1.4	0	0.0
Cafeterias, delicatessens, or non-fast food restaurants				
Never	15	20.5	13	17.8
1-2 times/week	32	43.8	38	52.1
3-4 times/week	12	16.4	12	16.4
5 or more times/week	14	19.2	10	13.7
Fast food restaurants				
Never	18	24.7	30	41.1
1-2 times/week	42	57.5	38	52.1
3-4 times/week	10	13.7	3	4.1
5 or more times/week	3	4.1	2	2.7
Vending machines/ convenience stores				
Never	41	56.2	49	67.1
1-2 times/week	23	31.5	18	24.7
3-4 times/week	6	8.2	4	5.5
5 or more times/week	3	4.1	2	2.7

they never ate in fast food restaurants, up from the 24.7% prior to seeing the IHCLC dietitians. In addition, more Responders (67.1%) reported that they did not consume foods purchased from vending machines or convenience stores two months later.

At baseline, older Responders purchased food from vending machines or convenience stores less often than younger Responders (r-.2796, p=.017); age was not related to the use of vending machines or convenience stores two months later. At

the two month follow-up, the frequency of eating in fast food restaurants declined with increasing age (r=-.2804, p=.016), which is consistent with the findings of the Nationwide Food Consumption Survey 1977-1978 (Ries et al., 1987).

At baseline, persons with higher incomes were more likely to eat in cafeterias, restaurants, or delicatessens (r=.2569, p=.039) or at other persons' homes or community events (r=.2943, p=.018) than those with lower incomes. At follow-up, income continued to be associated with frequency of eating in restaurants and cafeterias possibly relating to the cost of eating in such establishments (r=.3239, p=.008). A relationship was not found between income and the use of vending machines and convenience stores or the frequency of eating in fast food restaurants. Individuals who ate frequently in fast food restaurants were also likely to frequently consume foods from vending machines and convenience stores both at baseline (r=.4126, p=.000) and two months later (r=.3085, p=.008), perhaps indicating that convenience and speed of obtaining food were factors in their choice of such sources of food.

A score for eating away from home was derived by summing the frequency with which each responder indicated he/she ate at each type of food establishment per week. The Responders ranged eating away from homes from 0 to over 12 times a week.

Two months later, Responders had not significantly reduced their eating away from home.

A positive association between total cholesterol level and frequency of eating away from home at baseline was found (r=.2790, p=.018), indicating that individuals who most frequently ate at places other than their own homes had higher cholesterol levels than those who ate out less frequently. Individuals who often eat away from home may be more limited in their food choices or make less wise food choices than when eating at home. This possibility is reinforced by the inverse relationship seen between the overall frequency of eating away from home and overall food behavior score at baseline (r=-.4148, p=.000) and two months later (r=-.3507,p=.002). Specifically, frequency of purchasing foods from vending machines and convenience stores (r=-.3193, p=.002) and frequency of eating in fast food restaurants (r=-.4097, p=.000) were inversely related to the overall food behavior score at baseline. Two months later, the apparent adverse effect of frequent eating in fast food restaurants on food behavior continued to be seen (r=-.3340, p=.002). Limited variety of foods, low nutrient density of many menu items, and standardized portions in spite of individual differences in Caloric needs can cause difficulty for individuals eating in such restaurants. Fried foods, large portions of meat, and difficulty ordering skim milk are common problems when eating

in fast food establishments. On the average, 40 to 50% of Calories from most fast food meals come from fat and much of the fat is saturated (Young et al., 1986). Thus, it appears that frequent eating away from home, particularly in fast food restaurants, adversely affects compliance with a diet low in total fat, saturated fat, and cholesterol, even with recent attempts by the industry to provide more nutritious alternatives (Lecos, 1983) and, in this study, counseling by registered dietitians.

Descriptive Characteristics of Non-responders and Comparisons with Responders

Twenty individuals between the ages of 35 and 65 years with cholesterol levels greater than 200 mg/dl and who failed to meet with a dietitian at the Iowa Heart Center Lipid Clinic, Des Moines, Iowa, completed a survey similar to that of the Responders, described previously. Descriptive characteristics of the subjects, hereafter referred to as Non-responders, are outlined in Table 9.

Almost twice as many males as females completed the study. Their mean age was 54.1±9.7 years with 45.0% between the ages of 55 and 65 years of age. The mean age for the 13 males was 57.7±8.9 years while the seven females averaged 58.3±10.3 years. Three-quarters of the Non-responders were married at

Table 9. Demographic characteristics of Non-responders (n=20)

Characteristic	Frequency	Percentage
Gender		
Male	13	65.0
Female	7	35.0
Age (in years)		
35 to 39	2	10.0
40 to 44	1	5.0
45 to 49	3	15.0
50 to 54	5	25.0
55 to 59	2	10.0
60 to 65	7	35.0
Marital status		
Married	15	75.0
Single, widowed, divorced or separated	5	25.0
Household size		
One	1	5.0
Two	13	65.0
Three	3	15.0
Four	1	5.0
Five	2	10.0
Location of home		
Rural area, farm	4	20.0
Rural area, non-farm	2	10.0
Small town, population <2,500	3	15.0
Town, 2,500 to 10,000	2	10.0
City, 10,001 to 25,000	1	5.0
City, 25,001 to 50,000	0	0.0
Large city, >50,000	8	40.0
Highest education level completed		
Grade school (grades 1-8)	3	15.0
High school graduate	10	50.0
Some college	4	20.0
Technical or trade school	3	15.0
Annual household income		
Less than $10,000	2	10.0
$10,000 to $19,999	1	5.0
$20,000 to $29,999	4	20.0
$30,000 to $39,000	5	25.0
$40,000 to $49,999	3	15.0
$50,000 to $59,999	1	5.0
$60,000 or more	2	10.0
Missing	2	10.0

the time of the study. Almost two-thirds lived in household of two persons, most likely consisting of the Non-responder and spouse. As was seen in the Responder group, older Non-responders lived in smaller households than younger Non-responders ($r=-.6409$, $p=.002$).

Non-responders tended to live in rural areas or small communities. For example, almost one-third of Non-responders lived either on farms (20.0%) or in non-farm rural areas (10.0%). An additional 15.0% of Non-responders lived in towns with fewer than 2,500 persons. Only 40.0% lived in communities with populations exceeding 50,000. Although not statistically significant at the $p=.01$ level, Non-responders tended to live in more rural areas than did Responders.

Non-responders were significantly less well educated as compared to the group of Responders ($p=.005$). Almost all of the Non-responders (85.0%) completed high school. No Non-responder reported completing college compared to 26.0% of Responders. Fifteen percent of Non-responders had not completed high school compared to only 4.1% of Responders.

Considering the educational background of Non-responders, it was not surprising to find that annual household incomes were lower in the Non-responder group than those reported by the Responders ($p=.008$). Almost half of the Non-responders reported annual incomes between $20,000 and $39,999. Fifteen percent of Non-responders had incomes below $20,000.

In general, Non-responders tended to be married, living in small, rural households, with less formal education and lower incomes than Responders. Because of the relatively small number of Non-responders, more extensive statistical analysis was not done.

Medical Characteristics of Non-responders

Medical information was less complete for Non-responders than Responders. Descriptive statistics from medical characteristics of Non-responders are shown in Table 10. Almost one-third of the Non-responders had a personal history of cardiac events or cardiac surgery. Fifteen percent of Non-responders had at least one parent with premature heart disease, and 20.0% had at least one sibling with heart disease. Overall, 65% of Non-responders had a personal and/or family history of CHD, which was almost double the rate seen in the Responders group.

One-fourth of Non-responders smoked at the time of the study. This is slightly below the national smoking rate of 29% (Pierce et al., 1989), but higher than the Responders (19.2%).

Only 14 medical records had complete height and weight data. All Non-responders for whom the body mass index was calculated were classified as overweight (Miller, 1978). The

Table 10. Medical characteristics of Non-responders (n=20)

Characteristic	Frequency	Percentage
History of coronary heart disease[a]		
Self	6	30.0
Parent(s)	3	15.0
Sibling(s)	4	20.0
Child(ren)	0	0.0
Smoker	5	25.0
Body mass index, males (n=13)		
22.7 - 27.7	3	23.1
27.8 or greater	6	46.1
Missing	4	30.8
Body mass index, females (n=7)		
21.0 - 27.2	0	0.0
27.3 or greater	5	71.4
Missing	2	28.6
Serum total cholesterol level (mg/dl)		
200 to 239	13	65.0
240 to 279	6	30.0
280 to 319	1	5.0
Personal perception of own cholesterol level		
Fine	2	10.0
Somewhat high	12	60.0
Very high	2	10.0
Missing	4	20.0
LDL cholesterol level (mg/dl)		
Less than 130	2	10.0
130-159	5	25.0
160 or higher	5	25.0
Missing	8	40.0
HDL cholesterol level (mg/dl)		
Less than 35	5	25.0
35 or higher	7	35.0
Missing	8	40.0

Table 10. continued

Characteristic	Frequency	Percentage
Triglyceride level (mg/dl)		
Less than 250	9	45.0
250-499	3	15.0
500 or higher	1	5.0
Missing	7	35.0
Cholesterol lowering medications prescribed	3	15.0
Use of supplements[a]		
Vitamin E	2	10.0
Fish oil	1	5.0
Niacin	2	10.0
Ascorbic acid	1	5.0
Lecithin	0	0.0
Beta-carotene	0	0.0
Personal perception of health status		
Excellent	0	0.0
Good	13	65.0
Fair	4	20.0
Poor	3	15.0
Number of diets prescribed in past year		
None	4	20.0
One	5	25.0
Two	4	20.0
Three	2	10.0
Four	5	25.0
Therapeutic diets prescribed[a]		
Reduced salt/sodium	13	65.0
Reduced Calories	12	60.0
Reduced fat	10	50.0
Reduced cholesterol	6	30.0

[a]More than one response possible

mean body mass index was 31.0±3.3 for females and 28.1±3.2 for males. All females and 84.6% of males had BMI values above levels associated with hypercholesterolemia (Miller, 1978). There was no significant difference in BMI between Responders and Non-responders for either sex. Thus, like Responders, most Non-responders had an increased risk for accelerating CHD due to obesity (Burton and Foster, 1985).

Almost two-thirds of Non-responders had total cholesterol levels between 200 and 239 mg/dl which is classified as "borderline cholesterol levels". Thirty-five percent had "high blood cholesterol levels" with levels 240 mg/dl and greater. The mean total cholesterol level of Non-responders was 234.5±27.5 mg/dl, a significantly lower average total cholesterol level than Responders (p=.000), yet Non-responders were more likely to have a history of heart disease than Responders. The mean total cholesterol level differed by more than 35 mg/dl between the two groups. Perhaps Non-responders did not consider their cholesterol levels as critical, and thus did not see the need to consult a dietitian. This is supported by the difference in the perceptions of their cholesterol levels by the two groups. Non-responders considered their cholesterol levels to be less elevated than Responders (p=.007). Of the 16 Non-responders who knew their cholesterol levels, 87.5% felt their cholesterol level was somewhat high (75.0%) or very high (12.5%). In

contrast, 41.1% of Responders classified their cholesterol levels as being "very high".

Twelve of the medical records contained complete lipid panel results. Only 16.7% of Non-responders had "desirable LDL-cholesterol levels" (LDL-cholesterol levels below 130 mg/dl). Over 41% of Non-responders would be classified as having "high risk LDL-cholesterol levels" as defined by the National Cholesterol Education Program (1988, 1993) guidelines. The mean LDL-cholesterol level for Non-responders was 160.4±27.2 mg/dl, which was lower than the mean LDL-cholesterol level of Responders, although not statistically significant at the p=.01 level.

Of the 12 medical records with HDL-cholesterol levels recorded, 41.0% were below the recommended minimum level of 35 mg/dl (National Cholesterol Education Program, 1988, 1993), indicating increased risk for heart disease. As was expected, females had higher HDL-cholesterol than males. The mean HDL-cholesterol was 48.6±8.8 mg/dl for five females and 36.0±12.7 mg/dl for the seven males.

Triglyceride levels were reported on the medical records of 13 Non-responders. Triglyceride levels were below 250 mg/dl for 69.2% of Non-responders. Over 23% had triglyceride levels between 250 and 499 mg/dl which are classified as "borderline high" triglyceride levels (National Institutes of Health, 1984). Only one Non-responder had a triglyceride level above 500 mg/dl.

While the mean triglyceride level was 234.1±146.1 mg/dl, the median level of 173.0 is a more accurate reflection of triglyceride levels, because one subject had a triglyceride level of 617 mg/dl, which skewed the mean of the small number of Non-responders.

Cholesterol-lowering medications were prescribed for 15.0% of Non-responders but approximately 26% of Responders were prescribed similar drugs. The lower frequency of prescribed cholesterol-lowering medications for the Non-responders group is probably related to their lower total cholesterol levels.

Nutritional supplement use was low for both groups of participants in this study. Only 20.0% of Non-responders took supplements of any type. Vitamin E and niacin were taken by two persons; and fish oil and ascorbic acid, one.

Sixty-five percent of Non-responders considered their overall health to be "good" while 35.0% evaluated their health as either "fair" (20.0%) or "poor" (15.0%). None ranked his/her overall health as "excellent". Although differences were not statistically significant, Non-responders rated their health to be lower than Responders.

Overall, 80% of Non-responders were advised by their physicians to make changes in their diets. Over half of Non-responders received multiple diet prescriptions in the past year. The most frequent changes recommended were to reduce sodium/salt intake (n=13), energy (n=12), and/or fat (n=10).

Thus, both groups were faced with the possibility of making several complex changes in their food habits in the past year. Glanz (1980) argues that complexity is a significant factor in poor compliance with therapeutic diets.

As was seen with Responders, LDL-cholesterol was associated with total cholesterol levels ($r=.8571$, $p=.000$). In addition, for those who knew their cholesterol levels, their perceptions about their cholesterol levels were related to their actual level ($r=.7151$, $p=.002$). Individuals with the highest cholesterol levels recognized that their levels were high. Because of the small numbers of Non-responders, differences in lipid values between sub-groups based on sex, smoking practices, and the prescription of cholesterol-lowering medications were not analyzed.

A comparison of the medical characteristics of Responders and Non-responders reveals that Responders had higher total cholesterol levels and perceived their cholesterol levels as higher than Non-responders. Although differences between the two groups were not significant at the $p=.01$ level, Responders had higher LDL-cholesterol levels, were more likely to take cholesterol-lowering medications, and rate their overall health as higher than Non-responders.

No research was found comparing characteristics of individuals who seek counseling for CHD risk reduction from dietitians and those who do not. However, some tentative

comparisons can be drawn from the cholesterol screening studies discussed in the review of the literature. In the current study, individuals with more education and higher blood cholesterol levels were more likely to see a dietitian than were individuals with less elevated cholesterol levels. Havas et al. (1991) reported that individuals with more education and higher cholesterol levels were more likely than those with lower levels of education and blood cholesterol to follow through with screening program recommendations to see their physicians for further evaluation. It may be that better educated individuals were more knowledgeable about the relationship between diet, cholesterol levels, and CHD and/or perceive that dietary management is effective in the prevention and management of CHD (Pierce et al., 1984). Individuals with the highest cholesterol levels may recognize the seriousness of the elevated value. Applying the explanation of Havas et al. (1991), the IHCLC dietitians may have emphasized the seriousness of the elevated cholesterol levels to individuals with very elevated levels when informing prospective clients about their cholesterol levels. The individuals with high cholesterol levels may have responded to the stronger message by making and keeping appointments with the dietitians.

Selected Food Behaviors of Non-responders

Consumption of high fat foods of Non-responders

Non-responders, like Responders, were asked to indicate the frequency of consumption of the 13 types of foods which contribute the greatest proportion of fat in the American diet. Table 11 lists the frequency of consumption for each group of food by Non-responders.

Evaluation of the four questions assessing meat consumption revealed that approximately half of Non-responders reported eating high fat ground meat (less than 85% lean) and the fat on meat or the skin on poultry less than once a week. However, almost one-third of the group reported consuming high fat ground meat three to five times a week. While 30.0% of Non-responders ate high fat meats such as sausage, frankfurters, bacon, and luncheon meats three to five times a week, 45.0% of Non-responders ate these meats less than once a week. In contrast, over 70.0% of Responders at baseline reported eating such high fat meats less than weekly. Non-responders' consumption of larger than recommended amounts of meat, fish, and poultry was similar to the Responders. Only one-fourth of Non-responders complied with the National Cholesterol Education Program (1988) recommendations to consume no more than six ounces of meat, fish, or poultry a day. Twenty percent of Non-responders reported eating more than the recommended amount of meat almost

Table 11. Consumption of high fat foods by Non-responders (n=20)

Food or type of food	Frequency	Percentage
Fat on meat or skin on poultry		
Less than once a week	11	55.0
1-2 times a week	7	35.0
3-5 times a week	2	10.0
Regular ground meat (<85% lean) or foods containing regular ground meat		
Less than once a week	10	50.0
1-2 times a week	4	20.0
3-5 times a week	6	30.0
Sausage, frankfurters, bacon, regular cold cuts/luncheon meats		
Less than once a week	9	45.0
1-2 times a week	4	20.0
3-5 times a week	6	30.0
More than 5 times a week	1	5.0
>6 oz. meat, fish, or poultry/day		
Less than once a week	5	25.0
1-2 times a week	7	35.0
3-5 times a week	4	20.0
More than 5 times a week	4	20.0
Fried foods		
Less than once a week	4	20.0
1-2 times a week	8	40.0
3-5 times a week	6	30.0
More than 5 times a week	2	10.0
Chocolate and/or candy bars		
Less than once a week	8	40.0
1-2 times a week	8	40.0
3-5 times a week	3	15.0
More than 5 times a week	1	5.0
Ice cream		
Less than once a week	13	65.0
1-2 times a week	5	25.0
3-5 times a week	2	10.0

Table 11. continued

Food or type of food	Frequency	Percentage
Doughnuts, sweet rolls, cakes, cookies, pies		
Less than once a week	6	30.0
1-2 times a week	5	25.0
3-5 times a week	5	25.0
More than 5 times a week	4	20.0
Whole or 2% milk		
Less than once a week	13	65.0
1-2 times a week	3	15.0
3-5 times a week	2	10.0
More than 5 times a week	2	10.0
Cream or imitation coffee creamers		
Less than once a week	15	75.0
1-2 times a week	1	5.0
3-5 times a week	2	10.0
More than 5 times a week	2	10.0
Natural or processed cheeses		
Less than once a week	9	45.0
1-2 times a week	5	25.0
3-5 times a week	5	25.0
More than 5 times a week	1	5.0
Salad dressings or mayonnaise		
Less than once a week	6	30.0
1-2 times a week	9	45.0
3-5 times a week	4	20.0
More than 5 times a week	1	5.0
Chips or snack crackers		
Less than once a week	7	35.0
1-2 times a week	8	40.0
3-5 times a week	2	10.0
More than 5 times a week	3	15.0

daily. In contrast, only 12.3% of Responders reported a similar frequency of consumption. Barnes and Terry (1991) and the MRFIT results (Gorder et al., 1986) also found reducing meat, fish, and poultry portions difficult for individuals with heart disease.

Most of the Non-responders ate fried foods regularly with only 20.0% eating this type of food less than weekly. Forty percent ate fried foods once or twice a week, while an additional 30.0% ate such foods almost every other day. Thus, fried foods were a common source of fat in the diets of many Non-responders. Barnes and Terry (1991) reported that individuals with previous myocardial infarctions also had difficulty decreasing the frequency of eating fried foods.

As was previously reported for the Responders group, Non-responders added significant amounts of fat to their diets from desserts, pastries, and sweets. Non-responders were more likely to eat chocolate and/or candy bars than ice cream. Forty percent ate candy less than once a week and a similar proportion ate candy on the average of once to twice a week. Sixty-five percent of Non-responders ate ice cream less than weekly. Only 30.0% of Non-responders kept their intake of doughnuts, sweet rolls, cakes, pies, and cookies to less than once a week. Almost one half of Non-responders ate this type of food over three times per week, while only 23.2% of Responders did so.

Dairy products can provide significant amounts of total fat, saturated fat, and cholesterol to the diet unless low-fat items are chosen. Almost two-thirds of Non-responders used whole or 2% milk less than weekly, and three-fourths reported the same frequency of use for cream and/or artificial coffee creamers. A similar proportion of Responders consumed high fat milk, cream and imitation coffee creamers less than once weekly. On the other hand, Non-responders were less likely to report consuming natural and processed cheeses than Responders at baseline. Forty-five percent of Non-responders consumed these high-fat dairy products less than once a week as compared to 34.2% of Responders. Thus, Non-responders were more likely to obtain fat in their diets from cheese products than from milk. This finding supports those of previous studies which indicated that reducing the consumption of cheese is difficult (Barnes and Terry, 1991; Gorder et al., 1986).

Condiments, such as salad dressings and snack foods, such as chips and snack crackers, often provide significant amounts of fat in the American diet (Block, 1985). Results indicated that is also true in the diets of Non-responders. Less than one-third of Non-responders reported using salad dressings less than weekly. A similar proportion (35.0%) reported eating chips and snack crackers less than weekly. Like the Responders at baseline, a majority of Non-responders reported using salad

dressings and eating snack items at least once or twice a week.

A comparison of reported consumption of high-fat foods by Non-responders with two previous studies of Iowans show some differences in intakes of such foods (Terry et al., 1991; Yang, 1991). Non-responders reported eating fried foods, ground meat, cheeses, fat on meat and skin on poultry less often than either Iowa males (Terry et al., 1991) or females (Yang, 1991). Only 7% of females and 21% of males in the earlier studies limited ground meat to less than once a week as compared to about 50% of Non-responders. Forty-five percent of Non-responders consumed fat on meat or skin on poultry at least once a week as contrasted to 81% of Iowa males (Terry et al., 1991).

Table 12 outlines other food behaviors reported by Non-responders. Non-responders apparently had little difficulty adhering to the National Cholesterol Education Program (1988) guidelines to limit the richest sources of cholesterol in the diet, egg yolks and organ meats. Ninety percent of Non-responders limited egg yolks to three or fewer per week and 85% of Non-responders ate organ meats less than once in a month. These results were similar to the Responders group and

Table 12. Other food behaviors associated with fat and/or cholesterol intake by Non-responders (n=20)

Food Behavior	Frequency	Percentage
Number of egg yolks eaten/used in one week		
3 or fewer	18	90.0
6 or more	2	10.0
Ate organ meats in past month		
Once or not at all	17	85.0
Twice	3	15.0
Times ate beef, pork, or lamb in past week		
4 or fewer times	12	60.0
5-6 times	4	20.0
7-8 times	3	15.0
More than 8 times	1	5.0
Type of salad dressing used		
Low Calorie/fat	9	45.0
Regular oil based	5	25.0
Regular sour cream or mayonnaise based	6	30.0
Type of fat used in cooking		
Do not use fat or use a liquid vegetable oil	2	10.0
Margarine	14	70.0
Shortening	2	10.0
Lard, bacon grease, or butter	2	10.0
Form of margarine used		
Tub	13	65.0
Stick	7	35.0
Type of margarine used		
P:S[a] <2:1	7	35.0
P:S = 2:1	7	35.0
P:S >2:1	6	30.0

[a] P:S is the ratio of polyunsaturated fat to saturated fat

those reported by Barnes and Terry (1991) and the MRFIT researchers (Gorder et al., 1986).

As was seen in the Responders group, a smaller proportion of Non-responders limited their consumption of red meats. Less than two-thirds reported eating such foods no more than four times a week. Considering that Non-responders were likely to report eating more than six ounces of meat, fish, or poultry a day, it is likely that red meats contributed a significant amount of total fat, saturated fat, and cholesterol to their diets.

Approximately the same proportion of Non-responders and Responders reported using the various types of salad dressings. Almost one-half of Non-responders used low Calorie or low fat dressings, while 25.0% used regular oil-based dressings, and 30.0% used dressings containing sour cream or mayonnaise which are rich in saturated fat.

Seventy percent of Non-responders used margarine as their major cooking fat, which is a much higher proportion than reported in two earlier Iowa surveys (Terry et al, 1991; Yang, 1991). Approximately two-thirds of Non-responders reported using margarines sold in tubs while the remainder used the stick form of margarine. Further evaluation of type of fat in the margarines revealed that almost two-thirds of Non-responders purchased margarines that had polyunsaturated fatty acid to saturated fatty acid ratios of at least 2:1. Only

50.6% of Responders used these types of margarines at baseline.

Thus, it appears that Non-responders were consuming a considerable amount of fat, saturated fat, and cholesterol from salad dressings and mayonnaise; doughnuts and baked desserts; chips and snack crackers; fried foods; and larger than recommended amounts of meat, fish, and poultry. Cheeses, chocolate and candy, and high fat meats and ground meat also contributed fat to their diets. On the other hand, a majority of Non-responders were restricting the frequency of eating eggs, organ meats, whole and 2% milk, ice cream, cream, and imitation coffee creamers.

A mean food behavior score was calculated for each food behavior item as previously described. A score of three was given when the behavior was consistent with the Step One Diet (National Cholesterol Education Program, 1988), a score of two indicating near compliance, a one indicating partial compliance, and zero if the food behavior was not in compliance with the recommendations.

An overall food behavior score was calculated by summing the scores for the individual food groups and food behaviors and dividing by the number of items answered by the Non-responder. The mean for the overall food behavior score was 2.11±.44, indicating that most Non-responders were in near compliance with the general dietary guidelines to reduce the

intake of foods high in total fat, saturated fat, and cholesterol. The range was 1.16 to 2.74. At baseline, Responders reported better compliance with a diet low in fat, total fat, and cholesterol than Non-responders, but only at a significance level of p=.05.

There was no significant difference in overall food behavior score between males and females in the Non-responders group. This result agrees with results of male and female Responders but conflicts with earlier work (Yang, 1991) who concluded that Iowa females had adopted more food behaviors consistent with a low fat diet than Iowa males (Terry et al., 1991).

Because of the small sample size, comparisons of the overall food behavior score based on marital status, education level, smoking, use of cholesterol lowering medications, and history of being on a low cholesterol diet were not calculated. However, associations between the overall food behavior score and several other descriptive and medical characteristics were studied. Age was positively associated with behavior (r=.6338, p=.003). Older Non-responders were more likely to report dietary behaviors consistent with recommendations of the National Cholesterol Education Program (1988) than younger individuals in the group. This confirms the findings of Terry et al. (1991) of better compliance with a low fat diet with increased age in Iowa males. In contrast

with Terry et al. (1991), an inverse relationship was found between the overall food behavior score and household size in the Non-responders group. This likely reflects the negative association between age and household size discussed earlier. Thus, older Non-responders in smaller households were more likely to report behaviors consistent with a diet low in fat, saturated fat, and cholesterol than younger persons living in larger households. In addition, those persons with less formal education had higher overall food behavior scores ($r=-.4668$, $p=.038$), indicating a higher degree of adoption of food behaviors to avoid total and saturated fat and cholesterol with more advanced education. This finding needs to be interpreted with caution due to the narrow range in education level of Non-responders. Several other researchers (Kushi et al., 1988; Terry et al., 1991; Yang, 1991) have found that education is a significant factor in compliance with a diet low in fat.

Total cholesterol levels were inversely associated with overall food behavior score ($r=-.4941$, $p=.027$). Thus, those Non-responders who reported diet practices consistent with the National Cholesterol Education Program (1988) guidelines had lower total cholesterol levels than those who did not. Finally, those Non-responders who evaluated their health more positively were more likely to have higher overall food behavior scores ($r=.7168$, $p=.000$) suggesting better adoption

of food behaviors that limit fat and cholesterol intake. It may be that those who perceived themselves as healthier were motivated to eat a diet that would help maintain their good health.

Food related activities of Non-responders

Non-responders were asked how frequently they were involved in food selection and preparation activities. The results are listed in Table 13. Forty percent of the group completed all the food shopping and another 20.0% shopped for their households over half the time. Almost two-thirds reported reading food labels over half the time. Forty percent of Non-responders prepared all the meals for their households, while an additional 15.0% did over half the food preparation. No statistically significant difference was found between Responders and Non-responders for these activities, although the percentage of Non-responders who reported doing all the shopping and meal preparation were somewhat lower than that of Responders. This may reflect the larger proportion of males in the Non-responders group. Food gatekeeping activities have traditionally been the responsibility of the female in the household (Cosper and Wakefield, 1975).

Grocery shopping was positively associated with meal preparation responsibilities ($r=.8765$, $p=.000$) for the Non-responders. This finding was similar for the Responders.

Table 13. Frequency of participation in food-related activities by Non-responders (n=20)

Activity	Frequency	Percentage
Food shopping for household		
All the time	8	40.0
More than half the time, but not all the time	4	20.0
Less than half the time	3	15.0
Never	5	25.0
Reading food labels		
All the time	6	30.0
More than half the time, but not all the time	7	35.0
Less than half the time	1	5.0
Never	6	30.0
Preparing meals for household		
All the time	8	40.0
More than half the time, but not all the time	3	15.0
Less than half the time	6	30.0
Never	3	15.0

Therefore, it appears in both groups in this study food selection and preparation were the responsibility of the same person in the household. In contrast to the Responders, reading food labels was not associated with either food shopping or preparation.

Further analysis revealed that age was associated with the frequency of reading food labels ($r=.5225$, $p=.018$); older Non-responders read labels more frequently than younger persons. Responsibility for grocery shopping was associated with education level ($r=.5273$, $p=.017$). Those with higher

levels of education were more likely to be responsible for food purchasing than those with less education.

As was seen in the Responders group, the frequency of reading food labels was positively associated with the overall food behavior score ($r=.6562$, $p=.002$), perhaps leading to more awareness and committment to adhering to a low fat diet. As mentioned previously, reading labels helps in the evaluation of specific foods for their fat and cholesterol content, aiding in compliance with a low fat diet (Haralson et al., 1990). No similar relationship was seen with either food shopping or meal preparation. This may be at least partially due to the larger proportion of males in the Non-responder group.

Thus, over one-half of Non-responders were responsible for the majority of the food shopping and meal preparation in their households. Those who purchased the food were also largely responsible for its preparation. Reading food labels was associated with better compliance with a diet low in total fat, saturated fat and cholesterol.

Frequency of eating outside of the home by Non-responders

Non-responders were asked how often they ate at several types of restaurants, other peoples' homes or community events, or purchased food from vending machines and convenience stores (Table 14). Non-responders were more likely

Table 14. Frequency of eating at various types of food establishments each week by Non-responders (n=20)

	Never		1-2 times		3-4 times		>4 times	
Type of food establishment	n	%	n	%	n	%	n	%
Cafeterias, delicatessens, or full-service food restaurants	5	25.0	10	50.0	3	15.0	2	10.0
Fast food restaurants	10	50.0	7	35.0	3	15.0	0	0.0
Vending machines/ convenience stores	10	50.0	8	40.0	2	10.0	0	0.0
Other people's homes or community events	13	65.0	7	35.0	0	0.0	0	0.0

to eat in full-service restaurants, cafeterias, and delicatessens than the other locations; three-quarters ate in such establishments at least once a week. Half of the participants reported eating in fast food restaurants and foods from vending machines and convenience stores at least once a week. Interestingly, almost two-thirds of Non-responders reported never eating in other peoples' homes or at community events; the remainder did so once or twice a week.

Those individuals who most frequently purchased food from vending machines or conveniences stores were also likely to eat outside of the home at fast food restaurants ($r=.7472$, $p=.000$) and full service restaurants, cafeterias, and delicatessens ($r=.4919$, $p=.028$). Individuals who reported eating at other peoples' homes or community events reported overall food practices least consistent with guidelines of the

National Cholesterol Education Program (1988) (r=-.4579, p=.042). In contrast, those who ate in full service restaurants, cafeterias, and delicatessens reported more compliance with the guidelines as evidenced by higher overall food behavior scores (r=.4805, p=.032). Individuals who eat in full service restaurants, cafeterias, and delicatessens have several food options, and thus Non-responders may be better able to make food choices that comply with a diet low in fat, saturated fat, and cholesterol than those who obtain prepared food from other outlets. Food selections at community events and at other person's homes may be much more limited making dietary compliance difficult. It is important to note that the frequency of eating in other peoples' homes and community events was low in this group, so conclusions are drawn with caution. Frequency of consumption from fast food restaurants, vending machines and convenience stores was inversely associated with dietary compliance, but no similar association was seen with Responders.

A total score for eating away from home was derived by summing the frequency with which each Non-responder indicated he/she ate at each of the four types of eating establishments listed on the survey. A higher score indicated more frequent eating away from home. The potential score for eating away from home ranged from zero to more than 16 times a week, and the actual range was from 0 to more than 12 times a week.

Interestingly, no association was found between overall frequency of eating away from home and total cholesterol levels or overall food behavior score in the Non-responder group, a contrast to findings in the Responder group. Apparently dietary compliance was less affected by frequency of eating away from home for Non-responders, than by the specific types of food establishments chosen. However, the small sample size and the limited range in frequencies of eating in specific types of food establishments may have affected the results.

Attitudes Toward Adoption of a Low Fat Diet

Prior to their first appointment with an IHCLC dietitian and two months later, Responders were asked to respond to 31 statements regarding their attitudes toward adopting a low fat diet. Non-responders also completed the same 31 items.

Factor analysis

Using the previously described criteria for factor analysis, that of including factors accounting for at least 5.0% of variance and an eigenvalue of at least 1.0, four interpretable factors were identified accounting for 50.5% of the total variance in attitudes (Table 15). Evaluation of the

Table 15. Factors generated from responses to attitude statements regarding adopting a diet low in fat, saturated fat, and cholesterol

Factor	Item Loading	Eigen-value
Factor 1: Adoption of core foods low in fat		7.28
It will be hard to cook foods for a low fat diet.	.70	
The foods for a low fat diet will not taste as good as the foods I currently eat.	.69	
It will be hard for me to eat little or no fried foods.	.68	
The foods for a low fat diet will take more time to prepare than the foods I currently eat.	.64	
Following a low fat diet will take too much time.	.64	
The foods for a low fat diet will be different from the foods eaten by my family.	.61	
It will be hard for me to change to eating mostly fish, poultry without its skin, and lean meats.	.60	
A low fat diet will be hard to understand.	.58	
It will be hard for me to limit the number of egg yolks to three per week.	.55	
It will be hard for me to limit the amount of chips and snack crackers that I eat.	.45	
I will feel uncomfortable following a low fat diet in front of my friends.	.40	
Percent variance = 26.9 Alpha = 0.8536		
Factor 2: Diet and health		3.26
Following a low fat diet will reduce my chances of having heart disease.	.74	
I will feel healthier if I follow a low fat diet.	.71	

Table 15. continued

Factor	Item Loading	Eigen-value
Factor 2: Diet and health continued		
Following a low fat diet will help me manage my weight.	.66	
My doctor believes that it is very important for me to follow a low fat diet.	.65	
Following a low fat diet will help me lower my blood cholesterol level.	.64	
Percent variance = 12.1		
Alpha = 0.7564		
Factor 3: Adoption of added sources of fat		1.57
It will be hard for me to add little or no fat, like sour cream and gravy, to the foods that I eat.	.70	
It will be hard for me to eat little or no regular cheese and ice cream.	.68	
It will be hard for me to use little or no butter, shortening, and lard in my diet.	.56	
It will take more time in the grocery store to choose foods for a low fat diet than the foods I currently eat.	.50	
Following a low fat diet will make it more difficult to eat away from home.	.49	
Percent variance = 5.8		
Alpha = 0.7571		
Factor 4: Compatability with lifestyle		1.48
My friends will think it is very important for me to follow a low fat diet.	.68	
My friends will help me follow a low fat diet.	.63	

Table 15. continued

Factor	Item Loading	Eigen-value
Factor 4: Compatability with lifestyle continued		
My family will think it is very important for me to follow a low fat diet.	.51	
In the grocery store, it will be hard to find the foods that I need to eat on a low fat diet.	.47	
The foods for a low fat diet will be different from the foods eaten by my friends.	.46	
The foods for a low fat diet will cost more than the foods I currently eat.	.45	
Percent variance = 5.1 Alpha = 0.7220		

attitude statements within each factor revealed that four of the original 31 statements did not appear consistent with the constructs identified by factor analysis and were omitted from the final attitude inventory. Those items addressed concerns about the amount of food allowed by the diet, the use of skim and 1% milk, family help in following the diet, and difficulty limiting sweets and baked desserts.

The items in the first factor, Adoption of Core Foods Low in Fat, relate to the individual's expectations regarding difficulty cooking and limiting certain high fat foods. Four items address attitudes toward difficulty limiting fried foods; meat, fish, and poultry; egg yolks; and chips and snack crackers. This factor also includes attitudes toward the taste

of low fat foods, time and difficulty involved in their preparation, and difficulty in understanding and following the diet in general. Finally, the factor includes attitudes regarding differences in foods eaten by the individual and his/her family and the individual's discomfort following the diet in the presence of friends. This factor accounts for more than one-fourth of the overall variance in the attitude inventory.

The second factor, Diet and Health, consists of five items and considers the relationship between adoption of a low fat diet and several aspects of health. Attitudes regarding the effect of a low fat diet on reducing the risk for heart disease, managing body weight, and lowering blood cholesterol levels are included in this factor. Items related to support by the individual's physician and a perception that a low fat diet will help the individual feel healthier, overall, also load on this factor. This factor accounts for 12.1% of the variance.

The third factor, Adoption of Added Sources of Fat, appears similar to the first factor in that it also identifies items relating to difficulty making changes in food selections. The five items that cluster in this factor include difficulty limiting the amount of sour cream and gravy; cheese and ice cream; and butter, shortening, and lard in the diet. Items describing the amount of time needed for food selection

in the grocery store and difficulty eating away from home are also included. These five items account for 5.8% of the variance in the inventory.

The fourth and final factor, Compatability with Lifestyle, includes six items concerning the individual's support system, food cost, and finding food items in the grocery store. Specific items addressing friend and family support for following a low fat diet, and friends' perceptions that the diet is important are the most influential items in the factor. In addition, concerns about grocery shopping, foods choices differing from those of friends, and food costs cluster in this factor. These six items account for 5.1% of the total variance among the 27 items in the attitude inventory.

Reasons for splitting the numerous items relating to limiting specific high fat foods into Factors 1 and 3 need more consideration. Looking at the diet-related behaviors identified by the participants in the study may provide some clues. Many of the high fat foods that clustered in Factor 1 were items that large proportions of both Responders and Non-responders were eating more frequently than is recommended in the Step One Diet (National Cholesterol Education Program, 1988). These foods include high fat meats such as ground meat and sausage, the fat on meat and skin on chicken, fried foods, and chips and snack crackers. On the other hand, foods that

clustered in Factor 3 include foods that most participants were already limiting in their diets at the time of the initial attitude inventory.

Attitudes toward limiting foods that are eaten in excess may be different than toward limiting foods that are already rarely eaten. Exceptions to this involve the items related to limiting egg yolks, cheeses, and ice cream. Limiting egg yolks was included in Factor 1, yet over 90% of both groups of participants in this study were already restricting egg yolks prior to the first attitude inventory. Factor 3 included difficulty limiting natural cheeses and ice cream. Both foods were addressed in one item. Large proportions of both groups reported they were limiting ice cream at the time of the initial inventory, which makes ice cream similar to those food items clustering in Factor 3. Fewer participants were limiting cheese, however, which would appear to make this food more like food items clustering in Factor 1. It may be that separating cheeses and ice cream into two items in the attitude inventory in future research would clarify this issue.

A comparison of the four factors identified in this study with the original table of specifications built on Rogers' (1983) model indicates that the model was useful in identification of attitudes toward changing behaviors consistent with a diet low in fat, saturated fat, and

cholesterol. Items with the strongest correlations in Factor 2 and Factor 4 are items originally built from the Compatability and Observability variables identified by Rogers (1983). Factors 1 and 3 contain items only from the Complexity and Relative Advantage variables. It may be that participants in this study considered complexity and relative advantage to be intertwined. Many of the complexity and relative advantage statements dealt with the difficulty in limiting or preparing certain foods, and the time involved in complying with the diet.

Further evaluation of the usefulness of the four factors identified involves estimates of reliability and independence. Factor estimates of reliability ranged from 0.772 to 0.854. All four factors exceeded the study's minimum acceptable estimate of reliability of 0.70 and were close to the recommendation of Carmines and Zeller (1979) of 0.80. All four factors were judged to have acceptable reliability. In addition, the Cronbach's alpha scores used in this study are considered to be "lower bound" measures. This means that the true reliability is never lower than the computed alpha value making Cronbach's alpha a conservative reliability measure (Carmines and Zeller, 1979). Table 16 shows correlation coefficients for each factor. The degree of independence between factors is determined by the common variance (r^2). Inspection of the table shows the common variance between

Table 16. Correlation coefficients among the four factors in the attitude inventory

	Factors			
Factors	**1**	**2**	**3**	**4**
Factor 1: Adoption of core foods low in fat	____	.1583	.6372	.5410
Factor 2: Diet and health		____	.0088	.3272
Factor 3: A adoption of added sources of fat			____	.4410
Factor 4: Compatability with lifestyle				____

factors ranges from about 40% (0.6372^2) to less than 1% (0.0088^2). Some dependence exists between Factor 1 and Factors 3 and 4. All other factor relationships are relatively independent of one another.

It is important to recognize that this is the first attempt to identify factors within this attitude inventory. Due to the design of the study, participants were fairly homogeneous in terms of age, elevated cholesterol levels, the absence of other major illnesses, and geographic location. More extensive work needs to be done using a larger, more heterogeneous sample to confirm the existence of these actors. Finally, it is important to interpret the items within each factor carefully. It is not unusual, with a relatively small sample size such as used in this study, for items to cluster that may not be apparently connected, as in the case of the last item in Factor 1. Further testing of this

inventory is important to validate the attitude inventory and its factors.

Attitudes held by Responders

The average attitude score for Responders was calculated from their responses to the final 27 items after factor analysis. A range of 1.00 to 5.00 was possible with low scores representing more negative attitudes and high scores more positive attitudes. The Responders had an average attitude score of 3.41±0.50 with a range of 2.56 to 5.00, indicating generally favorable attitudes toward changing their dietary behaviors prior to counseling with IHCLC dietitians. At the two month follow-up, the average attitude inventory score ranged from 2.33 to 4.89 with a mean of 3.57±0.49. Responders had significantly more favorable attitudes after two months than at baseline ($p=.008$). It may be that the effort to make actual changes in diet was less difficult than anticipated or that counseling positively influenced the Responders' attitudes toward a low fat diet.

Analysis of individual items within each of the four factors revealed that Responders held differing attitudes toward specific items at baseline and at the two month follow-up (Table 17). In the first factor, Adoption of Core Foods Low in Fat, over half of Responders held positive attitudes toward ease of cooking for a low fat diet and the time involved in

Table 17. Comparison of attitudes related to adoption of low total fat, saturated fat, cholesterol diets by Responders at baseline and at two month follow-up expressed in percentages (n=73)

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Factor 1: Adoption of core foods low in fat					
It will be hard to cook foods for a low fat diet.					
Baseline	4.1	21.9	19.2	46.6	8.2
Two month follow-up	2.7	15.1	21.9	50.7	9.6
Following a low fat diet will take too much time.					
Baseline	2.7	12.3	26.0	46.6	12.4
Two month follow-up	1.4	11.1	26.4	52.8	8.3
It will be hard for me to limit the number of egg yolks to three per week.					
Baseline	2.7	11.0	11.0	57.5	17.8
Two month follow-up	5.5	15.1	9.6	49.3	20.5
It will be hard for me to limit the amount of chips and snack crackers that I eat.					
Baseline	1.4	24.7	13.7	47.9	12.3
Two month follow-up	8.2	24.7	6.8	41.1	19.2
I will feel uncomfortable following a low fat diet in front of my friends.					
Baseline	1.4	12.3	19.2	57.5	9.6
Two month follow-up	0.0	16.4	11.0	60.3	12.3
A low fat diet will be hard to understand.					
Baseline	2.7	24.7	24.7	42.5	5.5
Two month follow-up	4.1	4.1	20.5	56.2	15.1
The foods for a low fat diet will take more time to prepare than the foods I currently eat.					
Baseline	5.5	24.7	24.7	38.4	6.8
Two month follow-up	9.6	23.3	19.2	42.5	5.5
It will be hard for me to change to eating mostly fish, poultry without its skin, and lean meats.					
Baseline	9.6	26.0	8.2	43.8	12.3
Two month follow-up	6.9	19.4	9.7	41.7	22.2

Table 17. continued

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
The foods for a low fat diet will be different from the foods eaten by my family.					
Baseline	5.5	30.1	19.2	39.7	5.5
Two month follow-up	6.8	27.4	16.4	45.2	4.1
It will be hard for me to eat little or no fried foods.					
Baseline	5.5	38.4	12.3	38.4	5.5
Two month follow-up	5.5	31.5	6.8	49.3	6.8
The foods for a low fat diet will not taste as good as the foods I currently eat.					
Baseline	8.2	32.9	28.8	23.3	6.8
Two month follow-up	8.2	32.9	19.2	27.4	12.3
Factor 2: Diet and health					
Following a low fat diet will help me lower my blood cholesterol level.					
Baseline	45.2	49.3	4.1	0.0	1.4
Two month follow-up	39.8	46.6	9.4	2.8	1.4
Following a low fat diet will reduce my chances of having heart disease.					
Baseline	35.6	61.6	2.7	0.0	0.0
Two month follow-up	42.5	50.7	4.1	0.0	2.7
Following a low fat diet will help me manage my weight.					
Baseline	30.1	53.4	13.7	2.7	0.0
Two month follow-up	24.7	59.7	13.9	1.7	0.0
I will feel healthier if I follow a low fat diet.					
Baseline	38.4	47.9	11.0	1.4	1.4
Two month follow-up	26.8	40.8	28.2	2.8	1.4
My doctor believes that it is very important for me to follow a low fat diet.					
Baseline	37.0	56.2	6.8	0.0	0.0
Two month follow-up	51.4	41.7	6.9	0.0	0.0

Table 17. continued

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Factor 3: Adoption of added sources of fat					
It will be hard for me to add little or no fat, like sour cream and gravy, to the foods that I eat.					
Baseline	2.7	31.5	11.0	49.3	5.5
Two month follow-up	6.8	30.1	15.1	39.7	8.2
It will be hard for me to use little or no butter, shortening, and lard in my diet.					
Baseline	2.7	28.8	11.0	47.9	9.6
Two month follow-up	4.1	21.9	8.2	47.9	17.8
It will take more time in the grocery store to choose foods for a low fat diet than the food I currently eat.					
Baseline	11.0	39.7	17.8	26.0	5.5
Two month follow-up	17.8	49.3	15.1	13.7	4.1
It will be hard for me to eat little or no regular cheese and ice cream.					
Baseline	9.6	45.2	8.2	30.1	6.8
Two month follow-up	8.2	39.7	8.2	34.2	9.6
Following a low fat diet will make it more difficult to eat away from home.					
Baseline	15.1	49.3	12.3	21.9	1.4
Two month follow-up	11.1	48.6	15.3	22.2	2.8
Factor 4: Compatability with lifestyle					
My friends will think it is very important for me to follow a low fat diet.					
Baseline	13.7	41.1	35.6	8.2	1.4
Two month follow-up	9.6	28.8	50.7	11.0	0.0
My friends will help me follow a low fat diet.					
Baseline	13.7	41.1	35.6	8.2	1.4
Two month follow-up	1.4	23.3	43.8	28.8	2.7

Table 17. continued

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
The foods for a low fat diet will be different from the foods eaten by my friends.					
Baseline	8.2	56.2	21.9	11.0	2.7
Two month follow-up	13.7	58.9	17.8	8.2	1.4
My family will think it is very important for me to follow a low fat diet.					
Baseline	16.4	60.3	17.8	5.3	0.0
Two month follow-up	21.9	49.3	19.2	8.2	1.4
In the grocery store, it will be hard to find the foods that I need to eat on a low fat diet.					
Baseline	2.7	17.8	16.4	57.5	5.5
Two month follow-up	5.5	12.3	13.7	46.6	21.9
The foods for a low fat diet will cost more than the foods I currently eat.					
Baseline	6.8	24.7	24.7	37.0	6.9
Two month follow-up	12.3	23.3	27.4	28.8	8.2

following the diet. A majority also did not think it would be hard to limit egg yolks and chips and snack crackers. Approximately two-thirds of Responders felt that they would feel comfortable following the diet in the presence of their friends. Slightly less than half felt that the low fat diet would not be hard to understand and that low fat foods would not take longer to prepare than the foods they were presently eating. More division occurred over the ease in eating more fish, lean poultry and meat; almost one-half felt that this would not be a difficult change, while one-third of Responders thought that it would. A similar division was seen over the

issue of whether the low fat diet would be different from the foods eaten by the rest of the family. Responders were evenly split on the difficulty of limiting fried foods. Over 40% felt that low fat foods would not taste as good as their current food choices; only 30.1% felt that low fat foods would taste as good. Negative attitudes toward the taste of low fat foods have been reported by other researchers (Terry and Barnes, 1991; Yang, 1991). Overall, Responders tended to have positive attitudes toward the ease of cooking low fat foods; time needed for their preparation; eating lean meats, fish and poultry; limiting egg yolks and chips and snack crackers; and the level of comfort when following the diet in the presence of friends.

All items relating to aspects of health clustered in the Diet and Health Factor. Over 80% of Responders felt that the low fat diet would improve several aspects of their health including reducing their blood cholesterol levels, reducing the risk for heart disease, managing their weight, and increasing their subjective feelings of health. They also reported support from their physicians for adhering to a low fat diet. It appears from responses to items in this factor that Responders needed little convincing about the health benefits of a low fat diet. Similar strongly held positive perceptions regarding the health benefits of a low fat diet were reported by Iowa females (Yang, 1991). This is a change

from earlier studies, and may reflect the intense public education efforts of recent years (Schucker et al., 1987).

The third factor--Adoption of Added Sources of Fat--contained items with more divided attitudes than reported above. Only slightly more than half of Responders held positive attitudes toward the ease in limiting fat added to foods, such as sour cream and gravy, and avoiding the use of butter, shortening, and lard. In contrast, over half of the Responders held negative attitudes toward the time needed to grocery shop, limiting their intake of cheeses and ice cream, and following a low fat diet when eating away from home. Perceptions of the difficulty adhering to the diet when eating away from home were also found in the two random sample telephone surveys of Iowa adults (Terry et al., 1991; Yang, 1991).

In the last factor, the Compatability with Lifestyle Factor, over one-third of Responders reported neither positive nor negative attitudes as to whether their friends would either feel that it was important for the Responders to follow a low fat diet or help them follow the diet. Over 60% also felt that their friends did not eat low fat foods. On the other hand, most Responders believed that their family would feel that their following a low fat diet was important. Generally negative or ambivalent attitudes toward the support of friends is a concern as social support is important in

determining food choices (Sanjour, 1982). While almost two-thirds of Responders did not feel it would be difficult to find low fat foods in the grocery, they were divided over the foods' cost.

While overall attitudes toward adopting a low fat diet became more positive after counseling, review of individual items in the two month follow-up attitude inventory revealed that changes in attitudes were not consistent. Of the items in the Adoption of Core Foods Low in Fat Factor only the attitude toward whether the diet would be hard to understand changed significantly after two months and became significantly more positive ($p=.000$). It is likely that both the nutrition counseling and the opportunity to actually experience the diet impacted on the change in this attitude. Rogers (1983) argues that the opportunity to try an innovation (new dietary behaviors, in this case) is an important dimension in the willingness to adopt an innovation.

Responders held generally negative attitudes toward the taste of a low fat diet at baseline and continued to hold negative attitudes two months later. Failure to see significant improvement in this item is a particular concern as the palatability of a food has been shown to be an important determinant of people's long term eating habits (Hochbaum, 1981). Barnes and Terry (1991) and Montgomery and Amos (1991), among others, have reported similar negative

attitudes toward the taste of low fat foods. This finding supports the need for further development of acceptable low fat foods and recipes.

Only one item in the Diet and Health Factor showed significant change between baseline and two months later. Although still holding strongly positive attitudes at two months, a significant decline in attitude responses was seen for the item concerning feeling healthier when following a low fat diet ($p=.006$). It may be that Responders expected too much from the diet or were somewhat disappointed in the lack of observable change in their health (Rogers, 1988). Glanz (1980) notes that one difficulty with many diets is the absence of clear outcomes such as a cure. It is important to note, however, that this factor represented the most positive attitudes of all four factors at both baseline and two months later. Responders appeared to believe strongly that a low fat diet has significant health benefits.

For items in the third factor, a significant negative shift in attitudes toward the amount of time needed to choose low fat foods in the grocery was seen at two months ($p=.002$). Responders may have discovered that grocery shopping was time consuming, supporting the findings of Barnes and Terry (1991) and Montgomery and Amos (1991). Reading food labels may be at least partially responsible for the perception that more grocery shopping time was required as over 70% of Responders

reporting reading labels "all of the time" in the two month follow-up survey. This attitude may become more positive with time as Responders identify a larger number of appropriate low fat foods by brand name, reducing the time needed to grocery shop.

Only one item in the Compatability with Lifestyle Factor exhibited significant change at follow-up. Unfortunately, after two months, Responders held more negative attitudes toward the help friends provide for following the diet ($p=.010$). Although not significant at the $p=.01$ level, Responders also held less positive attitudes after two months toward the importance that their friends attached to the Responders following the diet ($p=.066$) and toward the attitude that their low fat diet and their friends' food choices were different ($p=.132$). Thus, as found at baseline, it appears that a lack of social support by friends continued to be an issue for Responders two months later. Carmody et al. (1987) and Hochbaum (1981) argue that the desire to be accepted by one's peers is an important factor in compliance. It may be very important for nutrition counselors to focus on dealing with friends and the support system as a whole to improve long-term dietary compliance.

Possible associations between the baseline average attitude score, its four factors, and descriptive and medical characteristics were evaluated. Only educational level and

body mass index of the Responders were significantly associated with their attitudes at baseline. A low but positive relationship between educational level of Responders and their overall attitude scores (r=.1992, p=.050) was found. In addition, more highly educated Responders were likely to have more positive attitudes related to items in the Diet and Health factor than Responders with less formal education (r=.2859, p=.006). Other researchers have also reported that the educational level of Iowans was significantly related to the willingness to adopt new food behaviors to reduce the risk of coronary heart disease (Terry et al., 1991; Yang, 1991).

The body mass index of Responders was negatively associated with the first factor in the attitude inventory, the Adoption of Core Foods Low in Fat (r=.1940, p=.050). Perceived difficulty in adopting behaviors to reduce fat in the diet may affect food choices associated with both body weight and heart disease.

Perceived health status was positively associated with both of the factors encompassing attitudes toward the difficulty in changing specific food behaviors--Adoption of Core Foods Low in Fat (r=.2809, p=.006) and Adoption of Added Sources of Fat (r=.2169, p=.037).

At follow-up, the average attitude score was inversely related to age (r=-.2831, p=.017) and positively associated with the size of the Responder's family (r=.2513, p=.035).

Older Responders may have felt that making changes in their food behaviors would be difficult or that the dietary changes had less clear cut benefits for them than for younger people. Family size was likely a reflection of the age of the Responders as an inverse relationship between these two variables was found, as reported earlier. No other association between the average attitude score and descriptive and medical characteristics was found.

As differences in dietary behaviors between males and females had been seen in previous studies, further analyses of the attitude inventory and descriptive and medical characteristics were completed separately for male and female Responders. Overall, no significant difference in the attitudes toward the adoption of a low fat diet was seen between males and females in this study. At baseline, educational level was positively associated with the average attitude score for males ($r=.3826$, $p=.019$) but not for females. More educated males were more likely to hold positive attitudes toward adopting a low fat diet than were less well educated male Responders. At the two month follow-up, educational background was no longer significantly associated with the attitude score for either sex. At follow-up, age was negatively associated with females' attitudes toward a low fat diet ($r=-.3930$, $p=.015$). No similar association was seen for male Responders. As women became older, they were more likely

to hold more negative attitudes toward making changes in their diets to reduce the risk for heart disease. This finding conflicts with another survey of Iowa females which found no such association (Yang, 1991).

Thus, the second hypothesis predicting that attitudes toward dietary change would be positively correlated with age, income level, education, family history of heart disease, but inversely related to the serum cholesterol level was not generally supported by the Responders in this study. Age was inversely related to attitudes of females and educational level was found positively associated with attitudes for males but not females.

At baseline, the Responders' average attitude score was positively associated with behaviors consistent with a diet low in total fat, saturated fat, and cholesterol ($r=.3270$, $p=.004$). This finding supports the study's third hypothesis predicting a positive relationship between an individual's attitudes and his/her dietary behavior. Further analysis revealed that the two factors in the attitude inventory significantly associated with reported dietary behaviors were those describing changes in specific food behaviors-- Adoption of Core Foods Low in Fat ($r=.4332$, $p=.000$) and Adoption of Added Sources of Fat ($r=.2960$, $p=.007$). Thus, those Responders who initially reported positive attitudes toward adopting a

low fat diet were most likely to report behaviors consistent with a diet to reduce the risk for heart disease.

These associations continued to be seen at the two month follow-up. The average overall food behavior score was positively associated with the average attitude score (r=.3889, p=.000), the Adoption of Core Foods Low in Fat (r=.3696, p=.000) and the Adoption of Added Sources of Fat (r=.2920, p=.006). In addition, at follow-up, the overall food behavior score was significantly associated with the remaining two factors--the Diet and Health Factor (r=.2166, p=.035) and the Compatability with Lifestyle Factor (r=.2058, p=.042). Using different attitude scales, researchers in the United States and Great Britain have reported similar positive relationships between attitudes toward a diet low in fat and reported food behaviors consistent with reducing the risk for heart disease (Barnes and Terry, 1991; Hollis et al., 1981; Shepherd and Stockley, 1985, 1987; Terry et al., 1991; Yang, 1991).

At baseline, the overall dietary behavior score was positively related to the attitude score for both males (r=.3617, p=.020) and females (r=.3123, p=.036). Further analysis of baseline data revealed that the only factors significantly related to the overall food behavior score for males were the two factors encompassing attitude items related to difficulty in choosing low fat foods or restricting high

fat foods--Adoption of Core Foods Low in Fat (r=.4193, p=.007); Adoption of Added Sources of Fat (r=.4418, p=.005). Thus, perceptions about the health benefits of a low fat diet and the compatability of the dietary behaviors to their lifestyle did not appear to significantly influence the dietary behaviors of male Responders at baseline. However, at the two month follow-up, associations were no longer apparent between any of the attitude inventory factors and reported dietary behaviors of male Responders.

In addition to the significant association between overall food behavior and attitudes among females at baseline, reported earlier, the Adoption of Core Foods Low in Fat Factor was positively associated with the initial behavior score (r=.4580, p=.002). At the two-month follow-up, overall reported food behaviors of females were even more strongly associated with overall attitudes toward a low fat diet (r=.5729, p=.000). All four factors were linked to reported dietary behaviors in female Responders: Adoption of Core Foods Low in Fat (r=.5139, p=.000); Diet and Health (r=.2871, p=.040); Adoption of Added Sources of Fat (r=.4512, p=.002); and Compatability with Lifestyle (r=.3249; p=.022). Thus, while diet-related behaviors of females were linked to their overall attitudes toward adopting a diet to reduce their risk for heart disease, the same association is less clear in males. Moreover, data from both sexes revealed significant

associations between dietary behaviors and the two factors in the attitude inventory most closely addressing specific food behaviors. However, only in females were attitudes concerning the health benefits of the diet and how well the diet conformed to their usual lifestyles linked to the reported food behaviors.

Subtracting the baseline average overall behavior score from the two month follow-up behavior score indicated the extent of change in dietary behaviors reported by the Responders, and, thus, was a measurement of the adoption of the innovation, using Rogers' (1988) terminology. Seventy-four percent of Responders reported behaviors more consistent with the Step One Diet (National Cholesterol Education Program, 1988) after two months. Overall, the extent of change in dietary behavior was not associated with the average attitude score or its factors. However, females who held more positive attitudes in the Diet and Health Factor were likely to report more extensive dietary changes in the two month follow-up survey ($r=.3917$, $p=.010$), suggesting greater adoption of dietary behaviors limiting fat and cholesterol intake. It may be that those females who perceived that dietary behavior changes would improve their health were more motivated to change their diets. At follow-up, the extent of dietary change was positively correlated with the Adoption of Added Sources of Fat ($r=.3530$, $p=.035$).

A different picture emerged for male Responders. The extent of dietary behavior change was inversely related to the Adoption of Added Sources of Fat (r=-.3615. p=.039) at baseline. Thus, males who initially reported negative attitudes toward limiting added fats, cheese, and ice cream; who felt that shopping for low fat foods would be more time consuming; and that following a low fat diet when eating away from home would be difficult made greater changes in their diets. This appears to contradict Rogers' (1983) model but may, instead, reflect the impact of nutrition counseling and two months of experience with the dietary changes. No other significant associations between the extent of dietary behavior changes and the average attitude score and its factors were seen in either male or female Responders.

The data failed to indicate a clear-cut, simple relationship between the decision to adopt further dietary behaviors to reduce the risk of heart disease and attitudes toward a low fat diet, at least as measured using the extent of behavior change as the criterion for the decision. As noted earlier, a significant proportion of Responders were in near compliance with a diet low in fat, saturated fat, and cholesterol prior to the study. Thus, the possible extent of change in dietary behaviors was limited. As was reported earlier in the paper, the overall dietary behavior score was highly correlated with the average attitude score at the two

month follow-up. Thus, the usefulness of the Rogers' (1983) Innovation-Decision Model should still be considered valid. Further analysis of the decision stage of the model is needed using individuals who report dietary behaviors less consistent with current dietary recommendations than was seen in this study.

Involvement in food purchasing and preparation was measured as the proportion of time Responders were responsible for grocery shopping, reading food labels, and preparing meals. As this study found, and reported earlier, significant differences in responsibilities for food purchasing and preparation activities existed between male and female Responders, further analysis was completed for each sex separately. Those females with more responsibilities for food selection and preparation held more positive attitudes toward adopting a diet low in fat than females who reported less responsibilities in these areas ($r=.4837$, $p=.002$). In addition, the level of involvement with food was positively associated with three of the four factors of the attitude inventory, including Adoption of Core Foods Low in Fat ($r=.5151$, $p=.001$); Adoption of Added Sources of Fat ($r=.4029$, $p=.010$); and Compatability with Lifestyle ($r=.3241$, $p=.044$). These three factors contain all of the food shopping and preparation statements. It appears that females involved with such activities were confident that changing to a diet low in

fat would not be difficult nor take more time. Terry and co-workers (1991) reported a similar relationship between extent of food procurement and preparation responsibilities and attitudes toward making dietary changes. No similar associations were found for male Responders who, in large part, had little responsibility for these activities. Thus, it appears that linkages between an individual's responsibility for obtaining and preparing foods, attitudes toward changing their food choices, and reported food behaviors may exist, at least in females.

Finally, eating away from home was also positively associated with the average attitude score ($r=.2873$, $p=.016$). Further analysis revealed that only the first factor that evaluated attitudes toward changing to selected low fat foods (Adoption of Core Foods Low in Fat Factor) was associated with the frequency of eating in restaurants, cafeterias, delicatessens; eating at other peoples' homes or community events; and purchasing foods from vending machines or convenience stores ($r=.3768$, $p=.001$). As noted earlier in the study, one of the most negative attitudes held by Responders concerned the difficulty eating away from home. Overall, Responders reported eating most frequently in cafeterias, delicatessens, and full-service restaurants. The greater variety of foods offered in such food service operations may have impacted the overall attitudes expressed

by the Responders. In addition, only a few Responders reported eating away from home frequently. Thus, it may be that eating away from home is considered a special occasion and not usual behavior by Responders.

Attitudes of Non-responders

The 20 Non-responders had an average attitude scores ranging from 2.59 to 4.07 with a mean of 3.25±0.45. The distribution of their responses to specific items are found in Table 18. Generally, Non-responders tended to hold slightly more neutral or negative attitudes toward items in the first factor, Adoption of Core Foods Low in Fat, than was reported by Responders, but not significantly so. Non-responders generally felt that it would not be difficult to cook low fat foods or to limit egg yolks, chips, and snack crackers. In addition, over half felt that it would not take more time to follow the diet or prepare low fat foods. Almost three-fourths reported that they would feel comfortable following the diet in the presence of their friends. They were divided on whether low fat foods would be different from those eaten by their families, whether the diet would be difficult to understand, and whether it would be difficult to change to eating largely lean meats, poultry, and fish. As seen with Responders, this group also largely felt that low fat foods would not taste as

Table 18. Attitudes related to adoption of low total fat, saturated fat, cholesterol diets by Non-responders expressed in percentages (n=20)

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Factor 1: Adoption of core foods low in fat					
It will be hard to cook foods for a low fat diet.	0.0	15.0	30.0	55.0	0.0
It will be hard for me to limit the number of egg yolks to three per week.	10.0	15.0	5.0	60.0	10.0
It will be hard for me to limit the amount of chips and snack crackers that I eat.	5.0	30.0	10.0	40.0	15.0
Following a low fat diet will take too much time.	0.0	10.0	25.0	60.0	5.0
The foods for a low fat diet will take more time to prepare than the foods I currently eat.	0.0	25.0	25.0	45.0	5.0
I will feel uncomfortable following a low fat diet in front of my friends.	0.0	15.0	15.0	60.0	10.0
The foods for a low fat diet will be different from the foods eaten by my family.	5.0	40.0	10.0	45.0	0.0
A low fat diet will be hard to understand.	5.0	30.0	25.0	35.0	5.0
It will be hard for me to change to eating mostly fish, poultry without its skin, and lean meats.	0.0	45.0	15.0	35.0	5.0
The foods for a low fat diet will not taste as good as the foods I currently eat.	10.0	50.0	35.0	5.0	0.0
It will be hard for me to eat little or no fried foods.	0.0	70.0	0.0	30.0	0.0

Table 18. continued

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Factor 2: Diet and health					
Following a low fat diet will reduce my chances of having heart disease.	25.5	65.0	10.0	0.0	0.0
Following a low fat diet will help me lower my blood cholesterol level.	25.5	70.0	5.0	0.0	0.0
Following a low fat diet will help me manage my weight.	10.0	75.0	10.0	5.0	0.0
My doctor believes that it is very important for me to follow a low fat diet.	10.0	80.0	10.0	0.0	0.0
I will feel healthier if I follow a low fat diet.	15.0	55.0	25.0	5.0	0.0
Factor 3: Adoption of added sources of fat					
It will be hard for me to use little or no butter, shortening, and lard in my diet.	0.0	30.0	20.0	35.0	15.0
It will be hard for me to add little or no fat, like sour cream and gravy, to the foods that I eat.	0.0	50.0	10.0	40.0	0.0
It will be hard for me to eat little or no regular cheese and ice cream.	5.0	45.0	10.0	30.0	10.0
It will take more time in the grocery store to choose foods for a low fat diet than the food I currently eat.	0.0	55.0	10.0	30.0	5.0
Following a low fat diet will make it more difficult to eat away from home.	10.0	70.0	5.0	15.0	0.0

Table 18. continued

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Factor 4: Compatability with lifestyle					
In the grocery store, it will be hard to find the foods that I need to eat on a low fat diet.	0.0	20.0	15.0	55.0	10.0
The foods for a low fat diet will cost more than the foods I currently eat.	5.0	35.0	30.0	30.0	0.0
The foods for a low fat diet will be different from the foods eaten by my friends.	5.0	80.0	10.0	5.0	0.0
My friends will think it is very important for me to follow a low fat diet.	5.0	40.0	35.0	15.0	5.0
My family will think it is very important for me to follow a low fat diet.	10.0	50.0	30.0	10.0	0.0
My friends will help me follow a low fat diet.	5.0	45.0	30.0	20.0	0.0

good as the foods they were currently eating. Finally, 70.0% felt that limiting fried foods would be difficult.

As was seen in the Responders group, at least 70% of Non-responders expressed positive attitudes toward the role of a low fat diet in several components of health (Diet and Health Factor). Over three-fourths of the group felt that adopting a low fat diet would reduce their risk for heart disease, lower their cholesterol levels, and aid in weight management. They also felt that their physicians were supportive of the adoption of a low fat diet. Interestingly, one-fourth of Non-

responders were unsure whether they would feel healthier following a low fat diet. This was the only item in which the Responders and Non-responders differed significantly ($p=.01$); Non-responders held significantly more negative attitudes.

Of the five items in the Adoption of Added Sources of Fat, only the item concerning the ease in limiting butter, shortening, and lard reflected a largely positive attitude. Non-responders were almost evenly split over whether it would be difficult to refrain from adding fats such as sour cream and gravy, to foods and to limit cheese and ice cream consumption. Like the Responders, this small group also felt that grocery shopping would be more time consuming and eating away from home would be more difficult. No significant differences were found between Responders and Non-responders concerning this factor.

Generally, Non-responders held similar attitudes toward the six items in the final factor, Compatability with Lifestyle, as did the Responders at baseline. Only one clearly positive attitude was expressed; 65.0% felt that it would not be difficult to find appropriate foods in the supermarket. Non-responders were unclear about the impact of a low fat diet on their food costs, with almost equal distribution of responses in the agree, disagree and the neither agree nor disagree categories. Eighty-five percent felt that low fat foods would be different from those chosen by their friends.

On the other hand, from 45.0 to 60.0% of Non-responders felt that their friends and families would feel that they should follow a low fat diet, but only one-half felt their friends would help them comply with the diet. Thus, anticipated support from their friends was felt to be limited by the Non-responders.

Non-responders expressed somewhat more negative attitudes toward making dietary changes consistent with a diet low in fat and the relationship between diet and health risk than did Responders at baseline, but not significantly so. Thus, the hypothesis predicting significantly more positive attitudes toward adoption of a low fat diet by individuals who later underwent nutrition counseling was not supported by this study. Individual item comparisons at baseline failed to find any differences at the p=.01 level. Three items were different at the p=.05 level of significance, however. Non-responders held more negative attitudes than Responders toward the taste of low fat foods (p=.016), their physicians' support of a low fat diet (p=.020), and whether they would feel healthier following a low fat diet (p=.025).

As was seen with the Responders' female group, the average attitude score of Non-responders was significantly associated with the degree of adoption of dietary behaviors consistent with a diet low in total fat, saturated fat and cholesterol (r=.5658, p=.009), thus supporting the third

hypothesis. It appears that for both groups attitudes toward changing dietary behaviors to reduce the risk for heart disease is linked to reports of such behaviors.

As was done with the Responders, possible relationships between medical and descriptive characteristics and the average attitude score were investigated in the Non-responder group. The level of education was negatively associated with the average attitude score in Non-responders ($r=-.6776$, $p=.001$). Increasing education appeared to adversely affect Non-responders' attitudes. This is in contrast to the association previously seen in the Responders' group and reported in other Iowa studies (Terry et al., 1991; Yang 1991). This finding must be interpreted with caution due to the small number of Non-responders ($n=20$) and the limited range of education attained by the group (only 35.0% of Non-responders reported some education beyond high school).

Of the medical characteristics of the Non-responders, only the total cholesterol level was significantly related to the Non-responders' average attitude score ($r=-.5665$, $p=.009$). Non-responders with higher total serum cholesterol levels expressed more negative attitudes toward a change in diet to reduce the risk for heart disease. This finding contrasts with that of Terry et al. (1991) who reported a positive association between total serum cholesterol levels and perceptions toward a low fat diet. As reported earlier, total

cholesterol levels in Non-responders were inversely related to the overall food behavior scores.

Thus, as was seen in the Responders group, descriptive and medical characteristics were infrequently associated with attitudes toward adoption of a low fat diet by Non-responders. For the two variables that did exhibit correlations with the average attitude score, one relationship was opposite that which was predicted. Level of education was negatively related to the average attitude score, not positively related as hypothesized. However, as predicted, serum cholesterol levels were negatively associated with the average attitude score.

As was seen in the Responders, attitudes toward a low fat diet and connection between such a diet and the risk for heart disease were positively associated with reported behaviors consistent with a low fat diet ($r=.5658$, $p=.005$). This relationship has been reported by several other researchers (Baird and Schultz, 1980; Barnes and Terry, 1991; Carmody et al., 1987; Carruth et al., 1977; Shepherd and Stockley, 1987; Terry et al., 1991; Yang, 1991). It appears that Non-responders with high serum total cholesterol levels were more likely to hold negative attitudes toward a low fat diet and were less likely to report dietary behaviors consistent with a low fat diet. Thus, it may be that negative attitudes result in less compliance with a low fat diet which, in turn, is one factor leading to increased blood cholesterol levels.

Reasons for Refusal to Make and Keep Appointments with the Dietitian

In the setting used for this study, and in most clinical settings, counseling by dietitians regarding changing dietary behaviors is possible only if the client makes and keeps appointments with the health professional. When Non-responders were asked why they did not keep their appointments with the IHCLC dietitians, a variety of answers were given and are listed on Table 19. The most common reason given was that a health professional, either a dietitian or a physician, had already given them a low cholesterol diet. Three felt that they were already following an appropriate diet, and three others felt they were already knowledgeable about the prescribed diet. As was noted earlier, 70.0% of Non-responders had been prescribed a low cholesterol diet prior to the initial call by the IHCLC dietitians.

The cost of counseling was a deciding factor for only three of the Non-responders. Morris et al. (1990) found that about one-fourth of individuals participating in a Portland, Oregon, cholesterol screening program who had failed to comply with cholesterol screening recommendations to see their primary physician cited expense of referral as the major reason.

Table 19. Reasons cited by Non-responders regarding why they did not make and/or keep appointments with dietitians (n=20)

Reason[a]	Frequency	Percentage
Another dietitian gave me a diet	5	25.0
Local doctor gave me a diet	3	15.0
Already follow a good diet	3	15.0
Already aware of necessary changes	3	15.0
Costs too much	3	15.0
Taking medications that will lower cholesterol level	2	10.0
Distance is too far	1	5.0
Family would have to take time off to bring me	1	5.0
Fear of not sticking to the diet	1	5.0
Local MD did not recommend seeing RD; felt that cholesterol levels were not a danger	1	5.0

[a]More than one response is possible

Two Non-responders felt that their cholesterol lowering medications were sufficient to manage their cholesterol levels. This is contrary to the National Cholesterol Education Program (1988) recommendations which stress diet as the mainstay of any cholesterol management strategy, even when cholesterol-lowering drugs are used.

Inconvenience was likely influential for two Non-responders--one indicted that distance to the clinic was a factor and another indicated that a family member would have had to leave work to bring her to the clinic. The low response to the issue of distance was somewhat surprising considering that most of the Non-responders lived in rural areas while the

Iowa Heart Center is located near downtown Des Moines. Distance may be more important to individuals who are older than those in this study. One subject questioned whether he could comply with the diet. Finally, one Non-responder indicated that his local physician did not feel that his cholesterol level warranted intervention.

Descriptive and medical characteristics, the average attitude score and the four attitude factors, were used to determine factors associated with the decision whether or not to participate in nutrition counseling to reduce elevated blood cholesterol levels. Using multiple regression analysis, only the participants' level of education, serum total cholesterol level, and level of annual household income were independently associated with the decision (Table 20). The resulting multiple regression equation is:

Decision = -0.3857 + 0.1142 (level of education) +
0.0018 (serum total cholesterol level as mg/dl) +
0.052 (level of annual household income).

As the resulting value approaches "0" there is an increased likelihood that the individual will not seek nutritional guidance to reduce his/her elevated blood cholesterol level. A value closer to "1" indicates that the individual is more likely to see a dietitian for counseling. It is important to note that the magnitude of the coefficients do not indicate their relative importance due to the difference in their units

Table 20. Standardized beta weights of variables entering in regression analysis for predicting the decision whether or not to participate in nutrition counseling

Variable	Beta
Level of education	.3225
Serum total cholesterol level	.2475
Level of annual household income	.1735

of measure. This equation accounts for approximately 25% of the variance in the decision, indicating that other factors not considered in this study have an impact on the decision. Gorder et al. (1990) also identified the total cholesterol level as a significant predictor in the decision to follow-up with a physician in individuals who participated in public cholesterol screenings. These researchers also found that a prior history of coronary heart disease was significant in the decision, but such was not found in the present study. Further research is needed to determine why some people with elevated cholesterol levels do not seek the assistance of nutrition professionals.

Thus, the hypothesis that individuals who decide to seek the services of dietitians to lower their cholesterol levels would be younger, female, have higher serum cholesterol levels, and have stronger family histories of coronary heart disease was only partially supported. Elevated cholesterol level was found to be significant in the decision. Age may not

have been significant due to the study design which limited the participants to those between 35 and 65 years of age. Repeating the study but expanding the age range may have some usefulness. Of the eight potential Responders who were eliminated from the study five were eliminated because they were less than 35 years of age. All five Non-responders eliminated were older than 65 years of age.

SUMMARY

The purposes of this study were to: 1) identify factors related to the adoption of dietary behaviors to reduce serum cholesterol levels in adults with elevated serum total cholesterol levels and 2) identify factors related to the decision by persons with elevated serum cholesterol levels of whether or not to pursue nutrition counseling. Descriptive and medical characteristics were considered as well as the attitudes of the study participants toward adopting a low fat diet to reduce the risk for heart disease. The theoretical base for the research was Rogers' (1983) Innovation-Decision Model.

Adults 35 to 65 years of age with at least one serum total cholesterol level greater than 200 mg/dl and who had been referred to the Iowa Heart Center, Des Moines, Iowa, were invited to participate in the study. Individuals who had insulin dependent diabetes mellitus, who had a recent history of myocardial infarctions or cardiac surgery, or who had diseases requiring significant diet modifications were excluded. Two groups were studied. The first group consisted of those who participated in at least one nutrition counseling session with registered dietitians at the IHCLC (called Responders). The second group in the study were those who refused to make appointments/or failed to keep their first

appointment with the IHCLC dietitians (labeled Non-responders). Prior to initial nutrition counseling, Responders completed a four section questionnaire which provided information on descriptive and medical characteristics, attitudes about adopting a low fat diet, reported compliance with 19 diet-related practices consistent with the Step One Diet (National Cholesterol Education Program, 1988, 1993), and questions regarding food selection and preparation and eating away from home. The 31 attitudinal items were constructed from a table of specifications based on four of the five characteristics of innovations described in the Innovation-Decision Model (Rogers, 1983). Two months later, a similar questionnaire was completed by Responders to detect changes in reported dietary behaviors and attitudes toward the adoption of a low fat diet after nutrition counseling. A similar questionnaire was completed by Non-responders. In addition, Non-responders were asked why they decided not to make or keep appointments with the IHCLC dietitians. The medical records of both groups were reviewed for pertinent medical data.

Seventy-three Responders completed the entire study. The group contained slightly more females than males, averaged 52 years of age, and were largely married, urban, and well-educated with moderate to high incomes. Approximately one-third had a personal or family history of heart disease and over one-half were significantly overweight. Almost three-

fourths of Responders were at high risk for heart disease based on their total and LDL-cholesterol levels (National Cholesterol Eduction Program, 1988, 1993). Low levels of HDL-cholesterol and hypertriglyceridemia were less common in the Responder group. Responders were generally knowledgeable about their personal cholesterol levels. While few Responders had been prescribed cholesterol-lowering medications or were taking supplements, over one-half had been prescribed at least one diet in the past year. Over two-thirds of Responders kept at least two appointments for nutrition counseling with the IHCLC dietitians.

Prior to nutrition counseling, a significant proportion of Responders consumed large portions of meat, fried foods, high fat and red meats, doughnuts and baked sweets, cheeses, chips and snack crackers, salad dressings and mayonnaise, and margarines with low polyunsaturated fat to saturated fat ratios at frequencies greater than recommended by the Step One Diet (National Cholesterol Education Program, 1988). After two months, overall compliance with dietary recommendations to reduce total fat, saturated fat, and cholesterol was significantly improved. Responders continued to have difficulty limiting the consumption of high fat ground meat, salad dressings and mayonnaise, and chips and snack crackers. They reported more success in reducing the consumption of

other high fat meats, ice cream, and doughnuts and baked sweets.

Responders who perceived their blood cholesterol levels to be high reported fewer dietary behaviors consistent with the NCEP (1988) guidelines than those who perceived lower blood cholesterol levels. At follow-up, women with seriously elevated cholesterol levels or who were significantly overweight were less likely to report compliance with the Step One Diet recommendations (National Cholesterol Education Program, 1988) than female Responders with less elevated cholesterol levels and lower weights. In females, the length of nutrition counseling was associated with extent of change in dietary behaviors under study.

Prior to nutrition counseling, Responders were more likely to shop and prepare food than read food labels. Two months after the initial counseling, a significant increase in the frequency of reading food labels was reported. Those who reported reading food labels most consistently also reported more dietary behaviors consistent with a low fat diet at both baseline and at follow-up. Eating away from home appeared to adversely affect compliance with a low fat diet, especially eating in fast food restaurants.

Twenty individuals who did not participate in nutrition counseling at the IHCLC also completed the study (Non-responders). They tended to be married and live in small

households in rural communities. They were significantly less well educated and reported lower incomes than those in the Responders group. They were almost twice as likely as Responders to have a personal or family history of coronary heart disease. Most had body mass index values associated with increased risk for coronary heart disease. Their total serum cholesterol and LDL-cholesterol levels were significantly lower than those of the Responders, and they considered their cholesterol levels to be less elevated as compared to the other group. Over 80% of Non-responders had been prescribed at least one diet in the past year.

In general, Non-responders reported less compliance with dietary behaviors associated with reducing the risk for heart disease than did Responders at baseline, but not significantly so. Non-responders reported frequent consumption of high fat meats, large meat portions, fried foods, and pastries and sweets. A majority reported limited intake of egg yolks, organ meats, whole and 2% milk, ice cream, and cream and imitation creamers. Better compliance with a low fat diet was associated with older age, smaller household size, less formal education, better perceived health, lower serum total cholesterol levels, and more frequent food label reading.

Factor analysis of the 31 attitude statements regarding adoption of a low fat diet yielded four factors accounting for over 50% of the total variance in the final 27 item attitude

inventory. Two factors, Adoption of Core Foods Low in Fat and Adoption of Added Sources of Fat included items regarding difficulty limiting specific high fat foods; difficulty selecting or cooking low fat foods at home and eating away from home; and displeasure with the taste of high fat foods. The Diet and Health Factor encompassed items relating a low fat diet to several health problems including blood cholesterol levels, heart disease, obesity, and overall health. The fourth factor, Compatability with Lifestyle, included issues surrounding family and friend support for dietary adherence, perceptions of the diet's importance among family and friends, and concerns that low fat foods would be different than those eaten by family or would be costly.

Rogers' (1983) model was useful in the identification of attitudes toward the adoption of a low fat diet to reduce the risk for heart disease. Items in the Adoption of Core Foods Low in Fat and Adoption of Added Sources of Fat contained items built originally from the Complexity and the Relative Advantage variables described by Rogers (1983), while the Diet and Health and the Compatability with Lifestyle factors in the attitude inventory included items developed from Rogers' Compatability and Observability variables. The four factors contained in the attitude inventory were judged to have acceptable reliability.

Both Responders and Non-responders held generally favorable attitudes toward adopting a low fat diet. After two months, Responders held significantly more positive attitudes as compared to baseline. Negative attitudes toward the taste of low fat foods were held by both groups in the study and confirm the findings of other researchers. This finding also indicates a need for development of more acceptable, tasty low fat foods and recipes. Overall, the highest agreement in attitudes among both groups were seen for the items in the Diet and Health Factor. Most study participants felt following a low fat diet had several specific health benefits. However, Non-responders were less likely than Responders to indicate that adoption of a low fat diet would make them healthier. Relatively negative attitudes were expressed by both groups concerning the time needed for grocery shopping, and the problems associated with following the diet when dining away from home. Other issues of concern included a perceived lack of support to follow a low fat diet among friends. Failure to see any significant improvement in these attitudes among Responders at the two month follow-up indicates a perceived lack of strong social support among Responders' friends to follow a low fat diet.

Associations between the average attitude score and descriptive and medical characteristics were seen. Overall, the body mass index of Responders was inversely associated

with the average attitude score, indicating a linkage between attitudes toward a low fat diet and obesity as well as heart disease. Highly educated male Responders held generally more positive attitudes toward adoption of a low fat diet than those with less formal education. At the two month follow-up, older female Responders held more negative attitudes than younger females, suggesting that older females may not have felt that changing their diets had strong advantages. Total cholesterol levels were negatively related to the average attitude score in Non-responders but not Responders.

Attitudes toward adoption of a low fat diet were strongly associated with both groups' overall food behavior score, including both baseline and follow-up scores for male and female Responders. Both Responders and Non-responders reported diet behaviors consistent with their attitudes toward adoption of a diet low in fat, saturated fat, and cholesterol, supporting the findings of several other researchers. At baseline for both groups, food behaviors were significantly associated with the two attitude factors that encompassed most of the specific food items in the inventory. At the two month follow-up for Responders, however, food behavior scores were significantly related to all four factors in the attitude inventory.

Overall, the extent of dietary change was not found to correlate with the average attitude score in the Responders

group. The Diet and Health Factor positively correlated with the extent of behavior change in females while the Adoption of Added Sources of Fat was inversely related to the extent of dietary change in male Responders. Most of the Responders were in near compliance with the Step One Diet (National Cholesterol Education Program, 1988) at baseline so they needed to make only limited changes. Further evaluation of the usefulness of the Innovation-Decision Model (Rogers, 1983) involving individuals who report less initial compliance with a low fat diet is needed.

Greater involvement in food-related activities including label reading and food purchasing and preparation was also positively related to the overall attitude toward a low fat diet as well as Adoption of Foods Low in Fat and the Compatability with Lifestyle factors. Individuals most involved with food felt most strongly that adopting a low fat diet would be desirable.

The most common reasons given by Non-responders for not making or keeping appointments for nutrition counseling were that either a dietitian or a physician had previously given them a diet, they were already following an appropriate diet, or they were already knowledgeable about a low fat diet. The cost of counseling, the use of cholesterol medications precluding the need for diet modification, and inconvenience were less frequently cited by Non-responders. Regression

analysis revealed that an individual's household income, educational level, and total cholesterol level were predictive of whether or not he/she would pursue nutrition counseling to reduce the risk for heart disease.

CONCLUSIONS

Dietary therapy is the initial treatment of choice in reducing elevated cholesterol levels and, thus, coronary heart disease because it is safe, effective, relatively inexpensive, and has overall health benefits. Yet, research has repeatedly recorded that individuals are often reluctant to make the necessary dietary changes and, if they initially do so, often comply poorly with the diet over time. Thus, it is important for nutrition professionals to identify influences associated with the decision to seek assistance in making dietary changes and factors affecting maintenance of those dietary behaviors in the long term.

In this study, descriptive and medical characteristics, with a few notable exceptions, were not found to relate significantly to the participants' reported food behaviors. Exceptions to this include the serum total cholesterol level, which several studies have indicated correlates with the total fat and saturated fat content of the diet. Not surprisingly, the body mass index in females was positively associated with poor compliance to a diet low in total fat. In addition, again only in females, perception of one's health was positively associated with compliance with a diet to reduce the risk of heart disease. These findings suggest that women who report eating a diet to reduce the risk of heart disease also feel

that their health is better. Dietitians need to recognize that improvement in dietary behaviors may be more difficult to achieve in obese females with seriously elevated cholesterol levels and who perceive themselves to be in poor health.

This study confirms previous work that many adults have difficulty complying with all of the recommendations of the NCEP (1988) Step One Diet. In particular, the participants in this study, as in several previous ones, consumed greater than recommended amounts of meat, fish, and poultry, and ate fried foods, cheeses, salad dressings and mayonnaise, and chips and snack crackers more frequently than is recommended. Nutrition counseling needs to target these difficult to change behaviors. For instance, incorporating meat as an ingredient in casseroles and in stir-fry vegetable dishes rather than serving it as a single item on the plate, and using tasty, easy to prepare vegetarian entrees may need to be a larger part of suggested coping strategies. Counseling could emphasize the use of the new low fat cheeses, offer samples, and provide tips on the moderate use of high fat cheeses, such as substituting strongly flavored cheeses for milder ones so that much less cheese is needed in familiar recipes. Assisting individuals in learning to read the new food labels mandated this year is also important to reduce the time needed for grocery shopping. Providing the client with a list of acceptable foods by specific brand names would also be helpful

in making the diet appear less complex and enhancing appropriate food choices for such items as salad dressings, mayonnaise, and snack crackers. These food types have acceptable low fat alternatives that clients could identify with careful reading of food labels or with help lists provided by the dietitian.

The finding that the extent of nutrition counseling was significantly and positively associated with the extent of dietary changes in females is important in verifying the benefits of long-term counseling. A single session is not sufficient to allow for the development of rapport, problem identification, mutual identification of goals, and reinforcement of appropriate behaviors. Follow-up counseling provides opportunities for continuous feedback and team building between the nutrition counselor and the client.

This study found strong linkages between an individual's attitudes toward adoption of a low fat diet and dietary behaviors. While participants in this study generally expressed positive attitudes toward adoption of a low fat diet, perceived barriers to dietary behavior change were recognized. These included the perceived inferior taste of low fat foods, difficulty eating outside the home, and the lack of positive support from friends.

Emphasis on how to eat appropriately when away from home continues to be needed. This research found that persons who

frequently ate outside their homes, especially in fast food restaurants, reported less compliance with a low fat diet. In addition, participants' responses to items in the attitude inventory reflected this difficulty. Alternative sources of meals, such as lunches brought from home, and appropriate food choice strategies when eating in restaurants need to be emphasized in more detail with clients. The use of specific restaurant menus and nutrient analysis charts provided by national food chains could be useful in helping clients anticipate sensible food choices prior to entering the establishments.

Participants recognized an apparent conflict between the social value of food and its nutritional and health benefits. In particular, there is need to identify ways clients can change their social system to one of support and to reduce the conflict between what should be eaten, i.e., foods low in fat, and what others provide or eat when the client is present. Dietitians need to recognize these difficulties and identify ways the client can comply with the diet within a social setting, such as by shifting emphasis to low fat foods that are considered tasty, attractive, and acceptable by friends for social functions.

Attitudes, appropriately identified and evaluated, are important in the design of effective nutrition education and counseling strategies. From the results of this study, it

appears that attitudes are effective in predicting food behaviors and may be useful in predicting the success of counseling efforts long term. Common to all attempts to change long-standing habits is the problem of maintaining the new habit once it has been adopted. Rogers (1983) labels this stage "confirmation". Additional research is needed to identify what events or factors that occur in an individual's life after the adoption of new dietary behaviors that solidify the behaviors or cause recidivism. Use of the attitude inventory described in this study may be useful.

Little is known about the dietary behaviors, attitudes, and characteristics of persons who refuse to participate in nutrition counseling. According to the results of this study, persons with moderately elevated blood cholesterol levels, lower incomes, and less education were less likely to seek the services of a dietitian to reduce their risk for heart disease. Health professionals need to more strongly emphasize that even moderately elevated blood cholesterol levels are risky. The most common reasons given by those who did not receive nutrition counseling was that they already had/were following a low fat diet. Yet, this group reported behaviors that were not in compliance with the NCEP (1988) guidelines; they could have benefited from additional guidance. Increased emphasis on the importance of lowering blood cholesterol levels via diet and better screening to identify whether

someone who indicates that he/she is familiar with a low fat diet is adhering to it need to occur. Due to the small size of the Non-responders group and its homogeneous nature, more extensive research is needed to understand why some individuals refuse to participate in nutrition counseling.

Overall, the findings presented here provide initial support for the use of the Innovation-Decision Model (Rogers, 1988) and the validity of four attitude factors as measures of important attitudinal dimensions underlying dietary behaviors. The demonstration of relationships among food attitudes and dietary behaviors underscores the importance of addressing expectations and the belief systems of those attempting to alter their eating patterns. Additional research is needed to assess the degree to which the attitudes measured by the attitude inventory predict the successful adoption and maintenance of improved dietary behaviors within a heart disease risk reduction program. Further testing of the attitude inventory is needed to validate the existence of the four factors using more heterogenous populations. Research that evaluates the effectiveness of nutrition counseling that targets specific attitudes expressed by individual clients is necessary to determine if improved dietary compliance results. Little is yet known about effective methods that permanently changes peoples' attitudes and dietary behaviors.

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APPENDIX A
LETTER TO RESPONDERS

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Department of Food Science
and Human Nutrition
107 MacKay Hall
Ames, Iowa 50011-1120
515 294-4436
FAX 515 294-6193

Dear Client:

You have been especially selected to participate in a research study coordinated between Iowa State University and the Iowa Heart Center Lipid Clinic. The project was recently discussed with you by the dietitians at the Lipid Clinic. The purpose of the study is to investigate factors that influence adherence to a diet designed to lower an individual's cholesterol levels. The study consists of persons between the ages of 35 and 65 years of age who have been to the Iowa Heart Center Lipid Clinic. We would like to have your input into the study.

Your participation in this study will involve two steps:

First, we ask that you sign the Medical Release Form on the next page to allow us to obtain information about your height, weight, your responses to the questions you are answering for the IHC dietitians, selected medical information, and blood test results from your medical record at the Iowa Heart Center Lipid Clinic. The Medical Release Form can be returned in the self addressed, stamped envelope that is attached.

Second, you will be contacted in two months to fill out a second, short questionnaire that asks questions about your food habits and your opinion about your diet. This should only take about 15 minutes.

There are no risks or additional costs to you for participating in this research. Participation in this project is voluntary and will not affect the counseling you receive at IHC. You are free to withdraw from the project at any time or to refuse to answer any questions on the questionnaire. There are no financial benefits for participating in the study. However, if you desire, a summary of the research findings will be available to you at the completion of the project.

Confidentiality of all information from your medical record and from the questionnaire is assured. No published or unpublished materials will include your name or in any way enable someone to identify you. The number found on the ISU questionnaire is for ISU record keeping only.

Finally, any questions regarding the research project can be addressed to the IHC dietitians (phone number: 515-288-8573) or to the ISU project researcher, Janice Goodwin (phone number: 515-294-4436). If you would like to receive a brief summary of the research findings, please include your name and address on a separate piece of paper with this questionnaire. Results should be available within the next 18 months.

Thank you for your help in this research.

Sincerely,

Janice Goodwin, M.S., R.D.
Research Assistant, ISU

Mandy Corliss, R.D., L.D.
Lipid Clinic Coordinator

PERMISSION TO RELEASE MEDICAL INFORMATION AND PARTICIPATE IN THE STUDY

I give permission for the Iowa Heart Center to release to the researchers at Iowa State University, the following information from my medical record: height; weight; cholesterol lowering drugs prescribed; total, LDL, and HDL cholesterol, triglyceride levels; personal and family history of coronary heart disease; and smoking history.

I understand that this information will be handled in a confidential manner by the researchers, and will be used for research purposes only.

_____ _____

Date Signature

_____

Name Printed

_____

Witness

APPENDIX B
LETTER TO NON-RESPONDERS

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Department of Food Science
and Human Nutrition
107 MacKay Hall
Ames, Iowa 50011-1120
515 294-4436
FAX 515 294-6193

Dear

As recently discussed with you, you have been especially selected to participate in a research study that is coordinated between Iowa State University and the Iowa Heart Center Lipid Clinic. The purpose of the study is to investigate factors that influence adherence to a diet designed to lower an individual's cholesterol level. The study consists of persons between the ages of 35 and 65 years of age who have had their blood cholesterol level recently checked. We would like to have your input into the study.

Your participation in this study will involve two steps:

First, we ask that you sign the Medical Release Form that is attached to allow us to obtain information about your height, weight, selected medical information, and blood tests from your medical record at the Iowa Heart Center.

Secondly, we are asking you to complete the enclosed ISU questionnaire that asks about your food habits and your opinion about your diet. This should take about 20 minutes to complete. Both the questionnaire and the Medical Release Form can be returned in the self-addressed, stamped envelope.

There are no risks or costs to you for assisting us in this research. Participation in this project is voluntary and you are free to withdraw form the project at any time or to refuse to answer any questions on the questionnaire. If you desire, a summary of the research findings will be available to you at the completion of the project.

Confidentiality of all information from your medical record and from the questionnaire is assured. No published or unpublished materials will include your name or in any way enable someone to identify you. The number found on the ISU questionnaire is for ISU record keeping only.

Finally, any questions regarding the research project can be addressed to the Iowa Heart Center dietitians (515-288-8573) or to the ISU researcher, Janice Goodwin (515-294-4436). If you would like to receive a brief summary of the research findings, please indicate your name and address on a separate piece of paper with this questionnaire. Results should be available within the next 18 months.

Sincerely,

Janice Goodwin, M.S., R.D.
Research Assistant, ISU

PERMISSION TO RELEASE MEDICAL INFORMATION AND PARTICIPATE IN THE STUDY

I give permission for the Iowa Heart Center to release to the researchers at Iowa State University, the following information from my medical record: height; weight; cholesterol lowering drugs prescribed; total, LDL, and HDL cholesterol, triglyceride levels; personal and family history of coronary heart disease; and smoking history.

I understand that this information will be handled in a confidential manner by the researchers, and will be used for research purposes only.

_____ Date

_____ Signature

_____ Name Printed

_____ Witness

APPENDIX C
BASELINE QUESTIONNAIRE FOR RESPONDERS

IOWA
HEART•CENTER

Lipid Clinic

Food For Thought

Please check the box that best describes how you feel at the present time about each statement. Because these statements measure your attitudes, there are no right or wrong answers.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. The foods for a low fat diet will not taste as good as the foods I currently eat.					
2. My friends will help me follow a low fat diet.					
3. Following a low fat diet will help me lower my blood cholesterol level.					
4. A low fat diet will be hard to understand.					
5. It will be hard for me to change to eating mostly fish, poultry without its skin, and lean meats.					
6. I will not be able to eat the amount of food that my body needs on a low fat diet.					
7. It will be hard for me to limit the amount of chips and snack crackers that I eat.					
8. In the grocery store, it will be hard to find the foods that I will need to eat on a low fat diet.					
9. It will be hard for me to use mostly skim and 1% milk.					
10. I will feel healthier if I follow a low fat diet.					
11. The foods for a low fat diet will take more time to prepare than the foods I currently eat.					
12. My family will help me follow a low fat diet.					
13. It will be hard for me to eat little or no fried foods.					
14. Following a low fat diet will help me manage my weight.					

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
15. It will be hard for me to limit the number of egg yolks (including yolks in prepared foods) to three per week.					
16. It will take more time in the grocery store to choose foods for a low fat diet than the foods I currently eat.					
17. My friends will think it is very important for me to follow a low fat diet.					
18. It will be hard to cook foods for a low fat diet.					
19. I will feel uncomfortable following a low fat diet in front of my friends.					
20. It will be hard for me to eat little or no regular cheese and ice cream.					
21. Following a low fat diet will take too much time.					
22. My family will think it is very important for me to follow a low fat diet.					
23. It will be hard for me to use little or no butter, shortening, and lard in my diet.					
24. The foods for a low fat diet will be different from the foods eaten by my family.					
25. It will be hard for me to limit the amount of doughnuts, sweet rolls, cakes, cookies, and pies that I eat.					
26. Following a low fat diet will make it more difficult to eat away from home.					
27. Following a low fat diet will reduce my chances of having heart disease.					
28. The foods for a low fat diet will cost more than the foods I currently eat.					
29. It will be hard for me to add little or no fat, like sour cream and gravy, to the foods that I eat.					
30. My doctor believes that it is very important for me to follow a low fat diet.					
31. The foods for a low fat diet will be different from the foods eaten by my friends.					

Please put a check mark under the column that best describes how often you usually eat each of the foods listed below.

	Eat less than once a week	Eat 1-2 times a week	Eat 3-5 times a week	Eat 6 or more times a week
*1. Fried foods				
*2. Fat on meat or skin on poultry				
3. Extra lean ground meat (90% lean) or foods containing extra lean ground meat				
4. Lean ground meat (85% lean) or foods containing lean ground meat				
*5. Regular ground meat (less than 85% lean) or foods containing regular ground meat				
6. Other beef products Please specify cuts of beef: _____				
7. Pork				
8. Lamb				
9. Chicken or turkey				
10. Ground turkey				
11. Fish Prepared how? _____				
*12. More than 6 oz. of meat, fish, or poultry in a day (3 oz. of meat, fish, or poultry is about the size of a deck of cards)				
*13. Sausage, frankfurters, bacon, or regular cold cuts/luncheon meats such as salami and bologna (does not include sliced ham, chicken, or turkey)				
14. Turkey or chicken frankfurters or bologna				
*15. Natural cheeses (such as American, Swiss, cheddar, or monterey jack) or processed cheese (include cheese in cooked foods, on sandwiches, or by itself)				
16. Low fat cheeses Please specify types(s): _____				
*17. Ice cream (do not include ice milk, frozen yogurt, or sherbet)				
18. Ice milk, frozen yogurt, or sherbet				
*19. Chocolate and/or candy bars				
*20. Cream or imitation coffee creamers				

	Eat less than once a week	Eat 1-2 times a week	Eat 3-5 times a week	Eat 6 or more times a week
*21. Doughnuts, sweet rolls, cakes, cookies, or pies				
*22. Whole or 2% milk				
23. Skim or 1% milk				
*24. Salad dressing or mayonnaise				
*25. Chips or snack crackers Specify type(s) of snack crackers eaten: _____				
26. Popcorn Prepared how? _____				
27. Peanut butter				
28. Nuts				
29. Oil				
30. Olives				
31. Avocados				
32. Butter				
33. Sour cream				
34. Cream cheese - light or regular				
35. Pizza Cheese Meat - Please specify type: _____				
36. Frozen dinners (such as regular TV dinners or pot pies)				
37. Low calorie frozen dinners (such as Weight Watchers, Lean Cuisine, Healthy Choice)				
38. Packaged dinners (macaroni and cheese, Rice-A-Roni, etc.)				
39. Soda pop- regular or sugar free				
40. Alcohol				
41. Coffee				

*42. During the past week, how many egg yolks did you eat either as whole eggs or in cooking?
_____ 3 or fewer
_____ 4
_____ 5
_____ 6 or more

*43. During the past week, how many times did you eat beef, pork, or lamb?
_____ 4 or fewer times
_____ 5-6 times
_____ 7-8 times
_____ more than 8 times

*44. During the last month, how often did you eat organ meats such as liver?
_____ once or not at all
_____ twice
_____ 3 times
_____ 4 or more times

*45. What type of salad dressing do you usually use?
_____ do not use salad dressing
_____ low calorie/low fat
_____ regular oil based (such as vinegar and oil, or French)
_____ regular sour cream or mayonnaise based (such as ranch, blue cheese, or thousand island)

*46. What type of fat do you most often use for cooking in your home?
_____ do not use fat or oils
_____ liquid vegetable oil
_____ margarine
_____ shortening
_____ lard, bacon grease, or butter

*47. What is the brand of margarine or butter that you most commonly use in your home? (please write in brand name): _____

*Is it in a:
_____ squeeze bottle
_____ tub
_____ stick

*48. When you are considering buying a new food, how often do you read the food label for the type and amount of fat?
_____ all the time
_____ more than half the time, but not all the time
_____ less than half the time
_____ never

*49. How often do you usually do or help with the food shopping for your household?
_____ all the time
_____ more than half the time, but not all the time
_____ less than half the time
_____ never

Who usually does the grocery shopping? _____

*50. How often do you usually fix or help fix the meals for your household?
_____ all the time
_____ more than half the time, but not all the time
_____ less than half the time
_____ never

*51. How often per week do you usually buy meals or snacks from vending machines or convenience stores?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

*52. How often per week do you usually eat meals in fast food restaurants?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

*53. How often per week do you usually eat meals in cafeterias, delicatessens, or other non-fast food restaurants?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

*54. How often per week do you usually eat meals in other people's homes or at community events?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

55. How often, during a day, do you snack?
_____ never
_____ once a day
_____ 2-3 times a day
_____ more than 3 times a day

*56. Are you presently taking any of the following for heart disease? (Check any that you are taking)
_____ fish oil supplements
_____ niacin supplements
_____ vitamin E supplements
_____ lecithin
_____ beta-carotene
_____ ascorbic acid (vitamin C)
_____ other, please specify _____

What vitamins or other supplements do you use? _____
_____

*57. Do you know what your cholesterol level is?
_____ yes
_____ no (go on to question 60)

*58. What is your cholesterol level? _____ (please write in level)

*59. Do you feel that your cholesterol level is:
_____ too low
_____ fine
_____ somewhat high
_____ very high

*60. How would you describe your health status?
_____ excellent
_____ good
_____ fair
_____ poor

*61. What is the highest level of education that you have completed?
_____ Grade school (grades 1-8)
_____ Some high school (grades 9-11)
_____ High school graduate
_____ Some college
_____ Technical or trade school
_____ College graduate
_____ Post graduate study

*62. Which best describes where you live?
_____ rural area, farm
_____ rural area, non-farm
_____ small town, population of less than 2,500
_____ town, 2,500 to 10,000
_____ city, 10,001 to 25,000
_____ city, 25,001 to 50,000
_____ large city, more than 50,000

*63. How many people currently live in your home, including yourself?
_____ 1
_____ 2
_____ 3
_____ 4
_____ 5
_____ more than 5, please specify _____

*64. What is your marital status?
_____ married
_____ single, widowed, divorced, or separated

*65. Approximately what was your annual household income last year, before taxes? (Be assured that this information is confidential.)
_____ less than $10,000
_____ $10,000 - 19,999
_____ $20,000 - 29,999
_____ $30,000 - 39,999
_____ $40,000 - 49,999
_____ $50,000 - 59,999
_____ $60,000 or more

*66. Check the changes that you have been asked to make in your diet in the past year, but before you had your blood cholesterol level checked at the Iowa Heart Center Lipid Clinic. Check all that apply.
_____ none
_____ reduce cholesterol
_____ reduce calories
_____ reduce fat
_____ reduce salt or sodium
_____ other (please specify) _____

67. Have you experienced any recent weight change? If so, please describe.

68. Have you ever followed a weight loss program? If yes, please describe.

69. Are you currently on a special diet? If yes, please describe.

70. Have you ever had nutrition instruction? If yes, please describe.

71. Have you or any these relatives had any of the following? Please circle "Y" for YES, or "N" for NO.

	Self	Father	Mother	Sister/ Brother	Children
High Blood Cholesterol	Y N	Y N	Y N	Y N	Y N
Heart Attack	Y N	Y N	Y N	Y N	Y N
Open Heart Surgery	Y N	Y N	Y N	Y N	Y N
Balloon Angioplasty	Y N	Y N	Y N	Y N	Y N
High Blood Pressure	Y N	Y N	Y N	Y N	Y N
Smoke	Y N	Y N	Y N	Y N	Y N
High Stress	Y N	Y N	Y N	Y N	Y N

72. Are you currently taking or have you ever taken any cholesterol or triglyceride medications? If yes, please list and identify any problems you had with them.

MEDICATION PROBLEM

_____

_____

APPENDIX D
FOLLOW-UP QUESTIONNAIRE FOR RESPONDERS

IOWA STATE UNIVERSITY STUDY

Please check the box that best describes how you feel at the present time about each statement. Because these statements measure your attitudes, there are no right or wrong answers.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. The foods for my low fat diet do not taste as good as the foods I previously ate.					
2. My friends help me follow my low fat diet.					
3. Following a low fat diet helps me lower my blood cholesterol level.					
4. My low fat diet is hard to understand.					
5. It is hard for me to eat mostly fish, poultry without its skin, and lean meats.					
6. I am not able to eat the amount of food that my body needs on my low fat diet.					
7. It is hard for me to limit the amount of chips and snack crackers that I eat.					
8. In the grocery store, it is hard to find the foods that I need to eat on my low fat diet.					
9. It is hard for me to use mostly skim and 1% milk.					
10. I feel healthier following my low fat diet.					
11. The foods for my low fat diet take more time to prepare than the foods I previously ate.					
12. My family helps me follow my low fat diet.					
13. It is hard for me to eat little or no fried foods.					
14. Following my low fat diet helps me manage my weight.					
15. It is hard for me to limit the number of egg yolks (including yolks in prepared foods) to three per week.					

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
16. It takes more time in the grocery store to choose foods for my low fat diet than the foods I previously ate.					
17. My friends think it is very important for me to follow my low fat diet.					
18. It is hard to cook foods for my low fat diet.					
19. I feel uncomfortable following my low fat diet in front of my friends.					
20. It is hard for me to eat little or no regular cheese and ice cream.					
21. Following my low fat diet takes too much time.					
22. My family thinks it is very important for me to follow my low fat diet.					
23. It is hard for me to use little or no butter, shortening, and lard in my diet.					
24. The foods for my low fat diet are different from the foods eaten by my family.					
25. It is hard for me to limit the amount of doughnuts, sweet rolls, cakes, cookies, and pies that I eat.					
26. Following my low fat diet makes it more difficult to eat away from home.					
27. Following my low fat diet reduces my chances of having heart disease.					
28. The foods for my low fat diet cost more than the foods I previously ate.					
29. It is hard for me to add little or no fat, like sour cream and gravy, to the foods that I eat.					
30. My doctor believes that it is very important for me to follow my low fat diet.					
31. The foods for my low fat diet are different from the foods eaten by my friends.					

Please put a check mark under the column that best describes how often you usually eat each of the foods listed below.

	Eat less than once a week	Eat 1-2 times a week	Eat 3-5 times a week	Eat 6 or more times a week
1. Fried foods				
2. Fat on meat or skin on poultry				
3. Regular ground meat (less than 85% lean) or foods containing regular ground meat				
4. More than 6 oz. of meat, fish, or poultry in a day (3 oz. of meat, fish, or poultry is about the size of a deck of cards)				
5. Sausage, frankfurters, bacon, or regular cold cuts/ luncheon meats such as salami and bologna (does not include sliced ham, chicken, or turkey)				
6. Natural cheeses (such as American, Swiss, cheddar or monterey jack) or processed cheese (include cheese in cooked foods, on sandwiches, or by itself)				
7. Ice cream (do not include ice milk, frozen yogurt, or sherbet)				
8. Chocolate and/or candy bars				
9. Cream or imitation coffee creamers				
10. Doghnuts, sweet rolls, cakes, cookies, or pies				
11. Whole or 2% milk				
12. Salad dressing or mayonnaise				
13. Chips or snack crackers				

14. During the past week, how many egg yolks did you eat either as whole eggs or in cooking?
    _____ 3 or fewer
    _____ 4
    _____ 5
    _____ 6 or more

15. During the past week, how many times did you eat beef, pork, or lamb?
    _____ 4 or fewer times
    _____ 5-6 times
    _____ 7-8 times
    _____ more than 8 times

16. <u>During the last month</u>, how often did you eat organ meats such as liver?
    _____ once or not at all
    _____ twice
    _____ 3 times
    _____ 4 or more times

17. What type of salad dressing do you usually use?
_____ do not use salad dressing
_____ low calorie/low fat
_____ regular oil based (such as vinegar and oil, or French)
_____ regular sour cream or mayonnaise based (such as ranch, blue cheese, or thousand island)

18. What type of fat do you most often use for cooking in your home?
_____ do not use fat or oils
_____ liquid vegetable oil
_____ margarine
_____ shortening
_____ lard, bacon grease, or butter

19. What is the brand of margarine or butter that you most commonly use in your home? (please write in brand name): _____

20. Is it in a:
_____ squeeze bottle
_____ tub
_____ stick

21. When you are considering buying a new food, how often do you read the food label for the type and amount of fat?
_____ all the time
_____ more than half the time, but not all the time
_____ less than half the time
_____ never

22. How often do you usually do or help with the food shopping for your household?
_____ all the time
_____ more than half the time, but not all the time
_____ less than half the time
_____ never

23. How often do you usually fix or help fix the meals for your household?
_____ all the time
_____ more than half the time, but not all the time
_____ less than half the time
_____ never

24. How often <u>per week</u> do you usually buy meals or snacks from vending machines or convenience stores?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

25. How often <u>per week</u> do you usually eat meals in fast food restaurants?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

26. How often <u>per week</u> do you usually eat meals in cafeterias, delicatessens, or other non-fast food restaurants?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

27. How often per week do you usually eat meals in other people's homes or at community events?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

28. Are you presently taking any of the following for heart disease? (Check any that you are taking)
_____ fish oil supplements
_____ niacin supplements
_____ vitamin E supplements
_____ lecithin
_____ beta-carotene
_____ ascorbic acid (vitamin C)
_____ other, please specify _____

29. Do you know what your cholesterol level is?
_____ yes
_____ no (go on to question 32)

30. What is your cholesterol level? _____ (please write in level)

31. Do you feel that your cholesterol level is:
_____ too low
_____ fine
_____ somewhat high
_____ very high

32. How would you describe your health status?
_____ excellent
_____ good
_____ fair
_____ poor

Thank you for completing the questionnaire. Please use the self-addressed stamped envelope for returning the questionnaire to Iowa State University.

APPENDIX E
QUESTIONNAIRE FOR NON-RESPONDERS

IOWA STATE UNIVERSITY STUDY

Please check the box that best describes how you feel at the present time about each statement. Because these statements measure your attitudes, there are no right or wrong answers.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. The foods for a low fat diet would not taste as good as the foods I currently eat.					
2. My friends would help me follow a low fat diet.					
3. Following a low fat diet would help me lower my blood cholesterol level.					
4. A low fat diet would be hard to understand.					
5. It would be hard for me to change to eating mostly fish, poultry without its skin, and lean meats.					
6. I would not be able to eat the amount of food that my body needs on a low fat diet.					
7. It would be hard for me to limit the amount of chips and snack crackers that I eat.					
8. In the grocery store, it would be hard to find the foods that I would need to eat on a low fat diet.					
9. It would be hard for me to use mostly skim and 1% milk.					
10. I would feel healthier if I followed a low fat diet.					
11. The foods for a low fat diet would take more time to prepare than the foods I currently eat.					
12. My family would help me follow a low fat diet.					
13. It would be hard for me to eat little or no fried foods.					
14. Following a low fat diet would help me manage my weight.					
15. It would be hard for me to limit the number of egg yolks (including yolks in prepared foods) to three per week.					

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
16. It would take more time in the grocery store to choose foods for a low fat diet than the foods I currently eat.					
17. My friends would think it is very important for me to follow a low fat diet.					
18. It would be hard to cook foods for a low fat diet.					
19. I would feel uncomfortable following a low fat diet in front of my friends.					
20. It would be hard for me to eat little or no regular cheese and ice cream.					
21. Following a low fat diet would take too much time.					
22. My family would think it is very important for me to follow a low fat diet.					
23. It would be hard for me to use little or no butter, shortening, and lard in my diet.					
24. The foods for a low fat diet would be different from the foods eaten by my family.					
25. It would be hard for me to limit the amount of doughnuts, sweet rolls, cakes, cookies, and pies that I eat.					
26. Following a low fat diet would make it more difficult to eat away from home.					
27. Following a low fat diet would reduce my chances of having heart disease.					
28. The foods for a low fat diet would cost more than the foods I currently eat.					
29. It would be hard for me to add little or no fat, like sour cream and gravy, to the foods that I eat.					
30. My doctor believes that it is very important for me to follow a low fat diet.					
31. The foods for a low fat diet would be different from the foods eaten by my friends.					

Please put a check mark under the column that best describes how often you usually eat each of the foods listed below.

	Eat less than once a week	Eat 1-2 times a week	Eat 3-5 times a week	Eat 6 or more times a week
1. Fried foods				
2. Fat on meat or skin on poultry				
3. Regular ground meat (less than 85% lean) or foods containing regular ground meat				
4. More than 6 oz. of meat, fish, or poultry in a day (3 oz. of meat, fish, or poultry is about the size of a deck of cards)				
5. Sausage, frankfurters, bacon, or regular cold cuts/luncheon meats such as salami and bologna (does not include sliced ham, chicken, or turkey)				
6. Natural cheeses (such as American, Swiss, cheddar, or monterey jack) or processed cheese (include cheese in cooked foods, on sandwiches, or by itself)				
7. Ice cream (do not include ice milk, frozen yogurt, or sherbet)				
8. Chocolate and/or candy bars				
9. Cream or imitation coffee creamers				
10. Doughnuts, sweet rolls, cakes, cookies, or pies				
11. Whole or 2% milk				
12. Salad dressing or mayonnaise				
13. Chips or snack crackers				

14. During the past week, how many egg yolks did you eat either as whole eggs or in cooking?
    _____ 3 or fewer
    _____ 4
    _____ 5
    _____ 6 or more

15. During the past week, how many times did you eat beef, pork, or lamb?
    _____ 4 or fewer times
    _____ 5-6 times
    _____ 7-8 times
    _____ more than 8 times

16. <u>During the last month</u>, how often did you eat organ meats such as liver?
    _____ once or not at all
    _____ twice
    _____ 3 times
    _____ 4 or more times

17. What type of salad dressing do you usually use?
_____ do not use salad dressing
_____ low calorie/low fat
_____ regular oil based (such as vinegar and oil, or French)
_____ regular sour cream or mayonnaise based (such as ranch, blue cheese, or thousand island)

18. What type of fat do you most often use for cooking in your home?
_____ do not use fat or oils
_____ liquid vegetable oil
_____ margarine
_____ shortening
_____ lard, bacon grease, or butter

19. What is the brand of margarine or butter that you most commonly use in your home? (please write in brand name): _____

20. Is it in a:
_____ squeeze bottle
_____ tub
_____ stick

21. When you are considering buying a new food, how often do you read the food label for the type and amount of fat?
_____ all the time
_____ more than half the time, but not all the time
_____ less than half the time
_____ never

22. How often do you usually do or help with the food shopping for your household?
_____ all the time
_____ more than half the time, but not all the time
_____ less than half the time
_____ never

23. How often do you usually fix or help fix the meals for your household?
_____ all the time
_____ more than half the time, but not all the time
_____ less than half the time
_____ never

24. How often <u>per week</u> do you usually buy meals or snacks from vending machines or convenience stores?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

25. How often <u>per week</u> do you usually eat meals in fast food restaurants?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

26. How often <u>per week</u> do you usually eat meals in cafeterias, delicatessens, or other non-fast food restaurants?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

27. How often per week do you usually eat meals in other people's homes or at community events?
_____ never
_____ one to two times
_____ three to four times
_____ five or more times

28. Are you presently taking any of the following for heart disease? (Check any that you are taking)
_____ fish oil supplements
_____ niacin supplements
_____ vitamin E supplements
_____ lecithin
_____ beta-carotene
_____ ascorbic acid (vitamin C)
_____ other, please specify _____

29. Do you know what your cholesterol level is?
_____ yes
_____ no (go on to question 32)

30. What is your cholesterol level? _____ (please write in level)

31. Do you feel that your cholesterol level is:
_____ too low
_____ fine
_____ somewhat high
_____ very high

32. How would you describe your health status?
_____ excellent
_____ good
_____ fair
_____ poor

33. What is the highest level of education that you have completed?
_____ Grade school (grades 1-8)
_____ Some high school (grades 9-11)
_____ High school graduate
_____ Some college
_____ Technical or trade school
_____ College graduate
_____ Post graduate study

34. Which best describes where you live?
_____ rural area, farm
_____ rural area, non-farm
_____ small town, population of less than 2,500
_____ town, 2,500 to 10,000
_____ city, 10,001 to 25,000
_____ city, 25,001 to 50,000
_____ large city, more than 50,000

35. How many people currently live in your home, including yourself?
_____ 1
_____ 2
_____ 3
_____ 4
_____ 5
_____ more than 5, please specify _____

36. What is your marital status?
_____ married
_____ single, widowed, divorced, or separated

37. Approximately what was your annual household income last year, before taxes? (Be assured that this information is confidential.)
_____ less than $10,000
_____ $10,000 - 19,999
_____ $20,000 - 29,999
_____ $30,000 - 39,999
_____ $40,000 - 49,999
_____ $50,000 - 59,999
_____ $60,000 or more

38. Check the changes that you have been asked to make in your diet in the past year, but before you had your blood cholesterol level checked at the Iowa Heart Center Lipid Clinic. Check all that apply.
_____ none
_____ reduce cholesterol
_____ reduce calories
_____ reduce fat
_____ reduce salt or sodium
_____ other (please specify) _____

39. Please check all of the items that influenced you not to see the Iowa Heart Center Lipid Clinic dietitian about changing your diet.
_____ It costs too much to see the dietitian
_____ I already follow a good diet
_____ My local doctor gave me diet to follow
_____ I am taking medication that will take care of my cholesterol level
_____ I don't have time to see the dietitian
_____ Another dietitian gave me a diet to follow
_____ I live too far away from the Iowa Heart Center
_____ Other, please specify: _____

Thank you for completing the questionnaire. Please use the self-addressed, stamped envelope to mail the questionnaire to Iowa State University.

APPENDIX F
TABLE OF SPECIFICATIONS

Table of Specifications

A. **Relative Advantage:** The degree to which adopting the low fat diet is perceived as a better idea than eating the usual diet.

Taste

1. The foods for a low fat diet will not taste as good as the foods I currently eat.*

Cost

2. The foods for a low fat diet will cost more than the foods I currently eat.*

Convenience

3. The foods for a low fat diet will take more time to prepare than the foods I currently eat.*

4. It will take more time in the grocery store to choose foods for a low fat diet than the foods I currently eat.*

5. The foods for a low fat diet will be different from the foods eaten by my family and friends.*

6. The foods for a low fat diet will be different from the foods eaten by my friends.*

7. Following a low fat diet will make it more difficult to eat away from home.*

B. **Compatibility**: The degree to which following the low fat diet is consistent with perceived needs and existing values about the prevention of CHD.

Support for dietary change by friends, family and physician

8. My friends will help me follow a low fat diet.

9. My family will help me follow a low fat diet.

10. My doctor believes that it is very important for me to follow a low fat diet.

Social prestige

11. My friends will think it is very important for me to follow a low fat diet.

12. My family will think it is very important for me to follow a low fat diet.

Effectiveness for heart disease treatment

13. Following a low fat diet will reduce my chances of having heart disease.

Need for nutrients for health

14. I will not be able to eat the amount of food that my body needs on a low fat diet.*

C. **Observability:** The degree to which following the low fat diet or its results can be observed by the respondent, family, and friends.

Change in blood lipids

15. Following a low fat diet will help me lower my blood cholesterol level.

Change in weight

16. Following a low fat diet will help me manage my weight.

Sense of well-being

17. I will feel healthier if I follow a low fat diet.

Change in eating behavior in social situations

18. I will feel uncomfortable following a low fat diet in front of my friends.*

D. **Complexity**: The degree to which the low fat diet is difficult to understand or implement.

Difficult to understand

19. A low fat diet will be hard to understand.*

Difficult to purchase

20. In the grocery store, it will be hard to find the foods that I will need to eat on a low fat diet.*

Difficult to prepare

21. It will be hard to cook foods for a low fat diet.*

Difficult to fit into time schedule

22. Following a low fat diet will take too much time.*

Difficult to implement

23. It will be hard for me to change to eating mostly fish, poultry without its skin, and lean meats.*

24. It will be hard for me to use mostly skim and 1% milk.*

25. It will be hard for me to eat little or no fried foods.*

26. It will be hard for me to restrict the number of egg yolks (including yolks in prepared foods) to three per week.*

27. It will be hard for me to eat little or no regular cheese and ice cream.*

28. It will be hard for me to use little or no butter, shortening, and lard in my diet.*

29. It will be hard for me to restrict the amount of doughnuts, sweet rolls, cakes, cookies, and pies that I eat.*

30. It will be hard for me to add a little or no fat, like sour cream and gravy, to the foods that I eat.*

31. It will be hard for me to restrict the amount of chips and snack crackers that I eat.*

* Recoded to reflect a positive attitude toward adoption of a low fat diet.