Division of labor in household food preparation tasks is of interest in dietary intervention projects. Randomly selected families were recruited to participate in a 5-year family-based study. A small group format that emphasized family involvement was used to promote change from the American diet (40% fat, 500 mg cholesterol P/S = .05) to the Alternative diet (20% fat, 100 mg cholesterol, P/S = 1.0). The change of division of labor in the households was evaluated from baseline to 60 months. A subsample of 109 male-female couples who were not divorced, pregnant or ill, responded to a questionnaire regarding who does the cooking, shopping and deciding what the family will eat. Plasma lipids and dietary intake were assessed at baseline and at 60 months.

At baseline, the majority of men and women indicated that the wives did most of the cooking, deciding and shopping, although both women and men indicated that they did more of the task than their spouse said they did. The overall distribution of labor in cooking
and deciding did not significantly change after 5 years of dietary intervention at the family level; however, there was a trend towards increased participation by the men in these tasks. Men's participation in shopping, however, significantly increased.

The couples were grouped according the husbands' reported increase or decrease in involvement in these tasks, and diet and lipid changes were evaluated. Increased involvement in household food preparation tasks did not lead to significantly greater dietary change except for consumption of polyunsaturated fat. The wives of men who increased their shopping reported an increase in total fat and saturated fat when compared to changes seen in the other wives. Taken as a group, both husbands and wives decreased their reported fat, cholesterol and saturated fat consumption and increased their reported carbohydrate intake in a manner similar to that suggested in Phase 1 of the Alternative diet. Plasma lipids remained stable in both men and women. Household food-related task performance does not profoundly change when couples participate in a family-based intervention project, and the small changes seen do not have an effect on the outcome variables.
Family Food Patterns and Dietary Change in an Intervention Study: The Family Heart Study

by

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Any faults and shortcomings in this paper are, of course, mine.
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PREFACE

I was a staff dietician in the Family Heart Study and participated in all aspects of the dietary study from planning to evaluation. I led three groups of participants in group discussions for 5 years and staffed morning clinics during the 5 years of the study. In addition, I edited the cookbook that grew out of the study and participated in the planning of the intervention study. Herein are the results of one small part of this ambitious project, an examination of the division of labor in the food habits of some of the families in the Family Heart Study.
Family Food Patterns and Dietary Change in an Intervention Study: The Family Heart Study

INTRODUCTION

The relationship of diet to the United States' number one killer, heart disease, is well documented, yet the exact nature of the relationship remains controversial. While metabolic studies, clinical trials and many epidemiological studies have shown a positive relationship between dietary cholesterol and fat on the development of atherosclerosis, evidence is lacking that Americans might voluntarily change their diets to prevent this disease.

Since effecting dietary change of any kind is usually difficult, slow, and can be expensive, a unique study protocol was needed to evaluate whether Americans would indeed change. To this end, a study whose aim was to gently persuade a cohort of approximately 200 families to change to a lower fat, lower cholesterol eating style was conceived. Based upon the concepts of the family as a unit, and of slow gradual change utilizing behavioral techniques, the Family Heart Study was conducted in Portland, Oregon from 1979 to 1984. The family unit was chosen as the sampling unit because the locus of food and nutritional decisions is generally the family. Individuals make food choices and changes within the context of the other people they live with.

Because family relationships, decisions and food preparation tasks appear to be important in effecting dietary change, the division of labor in food-related tasks was evaluated as one part of many behavioral and psychological assessments.
REVIEW OF LITERATURE

Coronary Heart Disease

Heart disease is the leading cause of death in the United States. It results in 550,000 deaths each year, and often hits people in their most productive years. Some kind of coronary event, or episode, attacks 1,250,000 Americans each year, resulting in enormous costs, both medical and societal [1]. It is estimated that lost productivity and national health expenditures attributed to coronary heart disease amount to about $44 billion annually [2].

Despite a gradual decline in the incidence of coronary heart disease mortality since the late 1960's [2], heart disease remains a formidable public health problem in the United States. It is a condition in which the oxygen supply to the myocardium is insufficient, usually resulting from pathogenic changes in the coronary arteries whereby the coronary circulation can no longer meet the metabolic requirements of the heart. Atherosclerosis is a thickening, hardening and degeneration of the artery wall. In the process, the arteries become clogged, leading to a decreased blood supply. While the precise etiology of the atherosclerotic process is not known, it is generally understood that a lesion, or "atheroma," in the arterial structure is necessary to start the process, which is followed by the build up of fatty, brittle tissue. Exactly how this lesion evolves into full-blown atherosclerosis is not well understood; however, there are several postulated mechanisms that may work in concert. The proposed mechanisms are: (1) cell injury, (2) transformation of smooth muscle cells, and (3) lipid accumulation [3]. It
has been proposed that a mechanical, biochemical, or immunological process stimulates the proliferation of smooth muscle cells, leading to a thickening of the artery wall. The transformation theory postulates that atherosclerosis results from smooth muscle cells which are transformed via a mutagen, possibly tobacco or lipid in origin. In the lipid accumulation theory, blood lipids, especially blood cholesterol, are given primary importance. It is postulated that, after an initial injury to the artery wall, an accumulation of cholesterol inside the artery ultimately leads to a blockage of the blood vessel. Since none of the proposed mechanisms accounts for all of the events leading up to atherosclerosis, the injury is thought to be a combination of these processes.

**Relationship of Diet to Heart Disease**

The actual development of atherosclerosis in humans is thought to be associated with several risk factors that may predispose an individual to manifest the disease. These risk factors are hyperlipidemia, hypertension, cigarette smoking, and obesity [4,5]. This can be seen to fit into a gradual disease process that is schematically represented in Figure 1.

A genetic predisposition to the disease is augmented by an overload of dietary fat and cholesterol, resulting in hypercholesterolemia and atherosclerosis. Hypertension (of unknown etiology) exacerbates the problem, as does cigarette smoking, lack of physical activity, and stress. While this model is simplistic and even
Figure 1
Development of Atherosclerosis

controversial, the role of diet and hypercholesterolemia is unquestionably significant [4].

Although the relationship of diet to coronary heart disease is controversial, four lines of evidence have implicated dietary factors, especially cholesterol and saturated fat, with atherosclerosis and coronary heart disease. These are (1) animal studies, (2) metabolic studies, (3) epidemiological studies, and (4) intervention studies.

**Animal Studies**

The relationship of diet to the development of atherosclerosis is illustrated in numerous studies involving subhuman primates [6,7,8]. In these studies, monkeys were fed diets rich in cholesterol (1,500 mg/day) for weeks or months and then sacrificed, autopsied, and evaluated as to the development of atherosclerotic plaque. Dietary cholesterol and fat were necessary to produce hypercholesterolemia and atherosclerosis. The dietary cholesterol induced hyperlipidemia, and the subsequent removal of cholesterol from the monkeys' diet resulted in a lowering of blood lipids from 712 mg/dl to 136 mg/dl.

**Metabolic Studies**

Many clinical investigations into the relationship of dietary cholesterol and fat to plasma cholesterol have been carried out since 1960 when Beveridge fed 93 students formula diets containing from 13 to 4493 mg of dietary cholesterol daily [9]. He found an increase in plasma cholesterol when subjects were fed a cholesterol rich formula, and a larger increase when butterfat was added to the formula.
Connor, in 1961 and subsequent studies, fed men cholesterol-rich (475 mg to 4800 mg) and cholesterol-free diets, keeping the fat content essentially the same and found consistent differences in blood cholesterol levels [10]. In 1962, Steiner performed feeding studies in which olive oil and corn oil were isocalorically substituted into cholesterol-rich (3000 mg) and cholesterol-free "cocktails" [11]. Substitution of corn oil for olive oil in the formula containing cholesterol failed to prevent, but did limit, the increase of plasma cholesterol seen on the high cholesterol diets. Quintao in 1971 and Mattson in 1972 fed subjects cholesterol-free and cholesterol-rich diets and found increases in plasma cholesterol when a cholesterol-rich diet was fed [12,13].

Hegsted and Keys both have developed formulas to predict the changes in plasma cholesterol when different fats are consumed [14, 15]. They fed different oils in differing amounts to hundreds of prisoners and found that polyunsaturated oils had a cholesterol lowering effect, while saturated fat raised plasma lipids and monounsaturated fats had a neutral effect. Their equations have been extensively used to predict plasma cholesterol lowering in metabolic experiments and to evaluate the effects of foodstuffs on plasma lipids [16,17,18].

Despite these metabolic experiments, in recent years a number of outpatient studies have failed to confirm the effects of dietary cholesterol on plasma lipids. In a 1981 report, Roberts, McMurry and Connor summarized these studies and suggested several reasons for the discrepancy [19]. They hypothesized that outpatient studies do not control for subjects' home diets and that actual dietary intake is
unknown. They then performed a randomized double blind crossover study using whole eggs and egg substitute as an addition to the subjects' home diets. In this way they were able to evaluate free-living individuals (as in an outpatient study) while altering their cholesterol intake (as in a metabolic ward study). The subject's total daily cholesterol intake ranged from a mean of 196 mg/day (egg substitute) to 728 mg/day (whole eggs). During the whole egg feeding period (4 weeks), plasma cholesterol rose 9% above baseline and 11% above the egg substitute period.

Connor and Connor suggested that a reason for some divergent cholesterol feeding results may relate to a "ceiling effect," shown in previous studies [10,16]. They postulated that there may be a physiologic ceiling beyond which diet cholesterol has no effect, i.e., about 500 mg per day. Since the usual American diet has contained between 500 and 800 mg of cholesterol per day [20,21,22], the addition of one or two eggs (250 to 500 mg cholesterol) would not change the plasma lipids. However, the removal of cholesterol to well below the proposed ceiling would decrease the plasma lipids [16]. This has been shown in several studies where cholesterol-free or low-cholesterol diets (100 mg/day) have been fed to subjects [9,12,17,19].

**Epidemiological Studies**

There have been numerous investigations into the relationships of diet, blood cholesterol and the development of coronary heart disease in populations. An international cooperative study on the epidemiology of coronary heart disease was carried out by Keys [23]. Keys and co-workers examined 12,770 men, assessed their diets, and took various clinical measurements. High serum cholesterol values
were found in men from countries with high rates of coronary heart disease, e.g., 56% of the subjects from Finland had serum cholesterol values greater than 250 mg/dl. On the other hand, low cholesterol values were found in men from countries with low rates of coronary heart disease, e.g., only 7% of the subjects from Japan had plasma cholesterol values greater than 250 mg/dl. Similar relationships existed for saturated fat. In Finland, the United States, and the Netherlands where consumption of saturated fat was high (18-20% of calories) the incidence of coronary heart disease was greater than in Japan, Greece, and Yugoslavia where consumption of saturated fat was less (3-10% of calories). According to Keys, the consumption of cholesterol was not related to the incidence of coronary heart disease, presumably because dietary methodology was inadequate and the diets did not show much variation. Keys noted that it was not possible to show a relationship between diet, plasma cholesterol, and heart disease mortality within countries because there was not adequate variation of diet composition among the population of any particular country.

Since factors other than diet, such as genetics, may affect incidence of coronary heart disease, it was deemed useful to look at genetically similar groups of people who eat different foods. One study was carried out with men of Japanese ancestry living in Japan, Hawaii, and California. Evaluation of dietary intake showed a positive association between saturated fat, animal protein, dietary cholesterol, and serum cholesterol in all three groups. Serum cholesterol was negatively correlated with complex carbohydrate consumption [24]. The men living in Japan had lower serum cholesterol
levels (181 mg/dl) than either those living in Hawaii (218 mg/dl) or California (228 mg/dl) and had much lower saturated fat in their diets (15% of calories versus 33% and 38%, respectively). The men having the lowest concentrations of plasma cholesterol had the lowest intakes of saturated fat, dietary cholesterol, and animal protein, and the highest intake of complex carbohydrate. It is interesting to note that there was a sufficient variation in diet composition among the three groups to enable statistically significant comparisons to be made.

Similarly, an examination of the Tarahumara Indians, a semi-acculturated tribe in Mexico, revealed compelling evidence towards the link between diet, heart disease, and serum lipids [25,26]. Subsisting on a diet made up almost completely by corn and beans, the Tarahumaras are famous for their extraordinary physical endurance. Heart disease (and indeed other diseases associated with the Western world) are essentially unknown. The mean plasma cholesterol concentrations of these people are 139 mg/dl for women and 136 mg/dl for men, and do not appear to rise with age. The diet of the Tarahumaras is very low in fat (12% of calories) and cholesterol (75 mg) and high in complex carbohydrate. In this population, positive correlations were seen between plasma cholesterol and dietary cholesterol, animal fat, total fat, and egg consumption. A metabolic study that challenged the Tarahumara with the American diet (40% fat, 500 mg cholesterol) resulted in a rise in blood cholesterol that mirrored metabolic studies performed in the United States using cholesterol-free and high cholesterol diets [27].
Other studies have observed one population over a period of years and have attempted to correlate the incidence of heart disease with such variables as age, diet, serum lipids, and lifestyle and health habits. Perhaps the most ambitious of these is the Framingham study. Investigators followed 5,127 men and women, observing their health habits and measuring their blood lipids over a 15-year period, beginning in 1949 [28]. They found that elevations of serum cholesterol in the range of 250-350 mg/dl were associated with a risk of coronary heart disease two to five times higher than values below 220 mg/dl. Even modest elevations (220 mg/dl to 265 mg/dl) represented a potent and common factor contributing to the development of heart disease. Those individuals with lipid levels less than 220 mg/dl were apparently protected from heart disease. It was found that blood cholesterol levels rose with age, a phenomenon not seen in the Tarahumara Indians [25]. Significant correlations between nutritional variables and serum cholesterol in individual persons were not found. This may have been related to methodological problems, such as lack of variation of the diets of the people in the Framingham community, i.e., virtually no one in Massachusetts eats a diet similar to the Tarahumaras.

A 20-year study of employees at a Western Electric facility in Chicago evaluated change in diet and blood lipids over time. There was a positive association between diet score (using the Keys and Hegsted formulas) and serum cholesterol concentration at the initial examination, and between change in diet score and change in serum cholesterol concentration [29]. In addition, there was a positive correlation between baseline and 19-year diet scores and the risk of
death from coronary heart disease, i.e., those who ate diets receiving higher scores (more saturated fat and cholesterol) had a greater risk of death from coronary heart disease.

A recently completed 20-year study that examined three cohorts of men in Ireland and Boston found that those who died of coronary heart disease had diets with higher Hegsted and Keys scores and had lower dietary intakes of fiber and complex carbohydrate [30].

**Intervention Studies**

In contrast to epidemiological studies, such as the Framingham study, intervention trials attempt to modify factors which are thought to cause coronary heart disease. They are often multifactorial, i.e., they attempt to modify several causative factors and involve groups consisting of different numbers of people. Since coronary heart disease is more common in men [28], intervention attempts have generally been directed at males. Numerous intervention studies have been performed since the 1960's.

That free-living Americans (men) can change their nutritional habits was illustrated by the pilot study of the National Diet Heart Study conducted in the 1960's [31]. The study demonstrated the feasibility of lowering plasma cholesterol levels by inducing dietary change. Five different meal plans with differing fat and cholesterol levels were presented to approximately 1,000 free-living men and 225 men institutionalized for mental illness. The diet intervention consisted of providing substitute products (filled cheeses, pastries) so that the men in the study did not know which diets they were "on." The subjects underwent clinical assessments (weight, plasma cholesterol, etc.) The results of the study are presented in detail...
in a report [31]. In general, it was found that men's serum cholesterol levels fell from 16-40% during the study, somewhat less than that predicted by the Keys and Hegsted equations [14,15,31]. There were several methodology problems, such as "drop-outs," diet adherence evaluation and inadvertent weight loss. It is interesting and relevant to note that there was greater plasma lipid change in the institutionalized men than in the free-living men. Clearly, getting people to change their eating habits on their own is not a simple procedure. The pilot study was considered to be successful; however, a large-scale intervention project was never carried out, due to very large projected cost.

Risk factor modification was the goal of the Multiple Risk Factor Intervention Trial (MRFIT) conducted nationally, over a 10-year period, with 12,886 men, aged 35 to 57 years, at risk for coronary heart disease. In this multifactorial primary prevention trial, the male subjects were assigned to either a usual care program or a special intervention program consisting of stepped up care treatment for hypertension, cigarette smoking, and dietary change. Mortality from coronary heart disease at the end of 10 years was not different in the two groups overall [32]. However, the anti-hypertensive drugs used in the subjects with high blood pressure may have confounded the results. If the group of men who received the drugs in question is eliminated from the study group, the special intervention group had almost a 22% lower mortality rate when compared to the usual care group [32].

The initial nutritional intervention consisted of individual counseling to reduce fat and cholesterol consumption to 35% of
calories and 350 mg/day, respectively [33]. Midway during the MRFIT project, a more "progressive" eating plan was introduced, consisting of a goal of 100 mg of cholesterol and less than 25% of calories from fat. Weight reduction per se was not emphasized, although weight loss was consistent with the MRFIT eating style. Recipes and cooking classes were made available to the wives of the participants; however, it should be noted that the intervention was directed at the men in the study. Participation by the wives was voluntary and in no way affected the status of the man in the study. Adherence to the diet was monitored by 24-hour recall, as well as by interviews with nutritionists.

The results of the MRFIT trial, and several other large-scale intervention trials, were mixed, indicating that such research efforts may not achieve the results desired [34]. The implications are that (1) adherence to a specific dietary and/or lifestyle change is an extremely difficult thing for people to do [35], and that (2) this is true for those who are at obvious risk for a certain disease, as well as for those who do not perceive that they are at risk [36].

The Lipid Research Clinics Coronary Prevention Trial results were made public in January of 1984 [37]. In this randomized, double-blind study, 3806 middle-aged men with hypercholesterolemia, who were at risk but free of coronary heart disease, were randomly assigned to two groups and given either cholestyramine resin (a bile acid-sequestering agent) or a placebo for a 7-year period. Both groups followed a moderate cholesterol lowering diet. The cholestyramine group experienced an average plasma cholesterol reduction of 13.4%, which was 8.5% greater than the reduction seen in the placebo group, which
had the diet modification only. In addition, the drug group experienced a 19% reduction in risk of death from coronary heart disease. This trial showed that reduction of cholesterol lipids can diminish the incidence of coronary heart disease mortality and morbidity, and provided strong evidence for a causal role of blood lipids in the pathogenesis of coronary heart disease. Although lipid lowering was achieved by use of a drug, it is possible to hypothesize that a diet that would lower blood lipids to a similar extent would have a similar effect on heart disease mortality.

The Alternative Diet as a Strategy to Prevent Coronary Heart Disease

Nutritional factors have a significant role in the causation of atherosclerosis and coronary heart disease. Animal studies, metabolic studies, and epidemiological studies have provided evidence of a link between diet, plasma lipids, and heart disease. On the basis of these three lines of evidence, it is possible to identify a diet, or way of eating, that is compatible with the prevention of atherosclerosis and coronary heart disease. Such a diet must be nutritionally adequate and meet the nutritional needs of childhood and adult life. The alternative diet, so-called because it offers an alternative to the usual American diet, was devised by Dr. William Connor and Sonja Connor in 1972 [4]. The goals of the alternative diet are to reduce cholesterol consumption from 500 mg/day, the usual American intake, to 100 mg/day and to reduce fat from 40% of kilocalories to 20% of kilocalories. The cholesterol reduction is made possible by lowering the consumption of egg yolks and the quantity of meat and high fat
dairy products. Most of the reduction in fat is in saturated fat, so that the saturated fat content of the diet is maintained at no more than 5% of kilocalories. The polyunsaturated fat content remains constant at 6% to 7% of kilocalories. Because the saturated fat is decreased, the P/S value increases from 0.4 to 1.3. Most of the reduction in total fat from 40% to 20% of total kilocalories is accomplished by cutting down on foods which are rich in saturated fatty acid (red meat, high fat dairy products, cheese). In addition, added fat, such as butter, salad dressings, and nut butters, is kept to a minimum (3-5 tsp/day). Protein remains at about 15% of kilocalories.

If kilocalories and protein levels are to be maintained, and the fat content of the diet is decreased, the carbohydrate content must rise. The goal of the alternative diet is to increase carbohydrate to 65% of kilocalories, from the usual 45% of the American diet. This increase will come from complex carbohydrate, such as grains, beans, pasta and potatoes. This will also help to reach the goal of increasing dietary fiber to 40-60 g/day. A comparison of the composition of the American diet [38] and the alternative diet is in Appendix 1 [39].

This is a style of eating that is very different from the usual American diet, although there is evidence that the U.S. diet is slowly changing to a lower fat composition [2,40]. Because the change in diet may be profound, the Connors suggest a slow, phased approach to dietary change. This phased approach is outlined in Table 1. It is to be emphasized that each phase could take from 1 to 5 years. Implicit in this approach is a slow, gradual long-lasting lifestyle
Table 1

Summary of the Three Phases of the Alternative Diet

PHASE I: SUBSTITUTIONS

This is accomplished by:
. avoiding egg yolks, butterfat, lard and organ meats (liver, heart, brains, kidney, gizzards);
. substituting soft margarine for butter;
. substituting vegetable oils and shortening for lard;
. substituting skim milk and skim milk products for whole milk and whole milk products;
. substituting egg whites for whole eggs;
. trimming fat off meat and skin from chicken;
. choosing commercial food products lower in cholesterol and fat (low-fat cheeses, egg substitutes, soy meat substitutes, frozen yogurt, etc.);
. modifying favorite recipes by using less fat or sugar and vegetable oils instead of butter or lard.

PHASE II: NEW RECIPES

This step involves:
. reducing amounts of meat and cheese eaten and replacing them with chicken and fish;
. eating meat, chicken or fish only once a day;
. cutting down on fat as spreads, in salads, cooking and baking;
. eating more grains, beans, fruit and vegetables;
. making low-fat, low-cholesterol choices when eating out;
. finding new recipes to replace those which cannot be altered.

PHASE III: A NEW WAY OF EATING

The final phase means:
. eating meat, cheese, poultry and fish as "condiments" to other foods, rather than as main courses;
. eating more beans and grain products as protein sources;
. using no more than 3-5 teaspoons of fat per day as spreads, salad dressings, or in cooking and baking;
. drinking 4-6 glasses of water per day;
. keeping extra meat, shellfish, regular cheese, chocolate, candy, coconut, and richer home-baked or commercially prepared food for special occasions (once a month or less);
. enjoying a wide variety of new food and repertoire of totally new and savory recipes.
change. This is in opposition to another proposed way of lowering blood lipids and preventing coronary heart disease, the Pritikin Plan [41]. The Pritikin regime calls for an abrupt dietary change to a 10% fat diet, a diet that in many ways resembles that of the Tarahumara Indians [26].

Predicted plasma cholesterol changes would be in the order of 53 mg/dl if one changed from the American diet to the alternative diet based upon metabolic ward conditions. Free-living individuals would not necessarily show such a drastic change [4]. Although this dietary plan has been considered quite drastic [42], it is useful to note that other investigators and organizations have adopted similar, if not identical, goals.

The American Heart Association recommends a 30% fat, 300 mg cholesterol diet [43]. The Multiple Risk Factor Intervention Trial began with recommendations similar to those of the Heart Association and then modified its dietary suggestions to the Progressive Eating Plan, a 20% fat, 100 mg cholesterol diet [33].

In 1977 the U.S. Senate Select Committee issued a report called Dietary Goals for the United States, in which they recommended that Americans reduce their consumption of saturated fat, total fat and dietary cholesterol to levels essentially the same as recommended by the American Heart Association [44].

Behavior Change

Much has been written about the process of changing health behavior associated with risk factors for coronary heart disease, be it weight loss, smoking cessation, hypertension control, or stress management. While there are many opinions and methods preferred for
inducing a lasting change of behavior (or habits), there is consensus that the results of the many attempts are ambivalent at best, and lackluster at worst [45]. However, in the last three decades many advances have taken place in the field of behavior and attitude change [46]. What emerges from a review of the behavioral psychology literature is a validation of Lewin's early work, which showed that the most effective way to induce and maintain behavior change is through small, interactive groups of people interested in changing their behaviors [46,47].

In 1972, Stuart and Davis advocated that the training of significant others was a vital component in behavioral treatment programs for obesity [47]. Since then, numerous studies integrating the spouse's involvement in weight loss programs have shown that the participation of the spouse facilitates weight loss [47,48,49,50]. Perhaps most important from a coronary heart disease prevention perspective, diet changes seem to be maintained over a longer period of time when the spouse is involved in the intervention [48,49,50].

Becker and Green reviewed the literature of compliance to medical care with regard to a family approach. Their findings indicated that the family's influence on compliance with medical treatments, such as medications, dental appointments, alcoholism treatment, and weight loss programs, was formidable [51].

One illustration of the family's effect is provided by Heinzelmann and Bayley's study of factors influencing the undertaking and continuance of a fitness exercise program related to coronary heart disease prevention [52]. The study was directed at men. It was found that of the men whose wives had a positive attitude towards the
program, 80% had good or excellent compliance, while of the men whose wives were neutral or negative, only 49% had good or excellent adherence. The researchers concluded that "the husband's pattern of adherence was directly related to his wife's attitude toward the programme."

**Family Studies**

In 1976, Stare and colleagues conducted a short-term study to evaluate family cooperation in a cholesterol-lowering diet regimen [53]. A cohort of 45 families participated in a 4-week program that consisted of weekly meetings with a nutritionist, recipe dissemination and the provision of polyunsaturated cooking oil and margarine to be used in place of saturated fat. Blood samples were taken prior to the diet period and 14 weeks after the test diet period ended. Mean plasma cholesterol levels fell significantly in men from 241 mg/dl to 219 mg/dl and in women from 206 mg/dl to 184 mg/dl. After 14 weeks of normal diets mean plasma cholesterol values returned to or surpassed baseline values: men's levels rose to 252 mg/dl; women's rose to 210 mg/dl. Dietary intake was monitored by use of a Dietary Achievement score and evaluated in terms of food groups eaten, rather than nutrient analysis. Egg, meat and saturated fat consumption declined during the 4 weeks of intervention. The authors concluded that the members of the family unit helped each other with adherence to the diet, and that there is a need for long-term monitoring and support in order to maintain dietary (and plasma cholesterol) changes.

**Division of Labor Between Husbands and Wives**

Much of the burden of dietary change often falls on the one who prepares the family meals rather than on the target person alone.
This assumption is based upon early work which describes the role of the wife (or mother) as the "gatekeeper" of the family's food [54].

The assumption that the wife does most of the household food related tasks is well established in the literature. Even though the number of wives in the labor force has increased dramatically in the last 20 years, several studies have shown that wives participate to a greater extent than husbands in food shopping, preparation and decision making. This state of affairs remained stable throughout a 10-year period, according to a report by Sanik [55]. She found that husbands' and children's input into household tasks was unaffected by a change in wives'/mothers' working status. The period between 1967 and 1977 saw no change in number of hours that women spent in daily food preparation time. Total time spent dishwashing decreased (presumably due to use of mechanical dishwashers) and time spent shopping increased. At both points in time, the wives spent considerably more time than their husbands on household chores, reporting an average of 1.4 hours a day in food preparation as compared to .1 hours a day for the husbands, .7 hours a day versus .05 in dishwashing, and .8 hours versus .3 hours in shopping.

Stafford compared the reported division of labor in couples who were either married or cohabited [56]. Men and women agreed that the women took most responsibility for menu planning, cooking, and dishwashing. Only 3.7% of the respondents to a questionnaire said that the men performed these tasks, while 60.0%, 46.6%, and 36.6% said the women did these tasks, respectively. Interestingly, there was no difference in the responses between the legally married versus cohabiting couples.
One hundred young couples (aged 29 or less) were the subject of a study by Lovingood and Firebaugh [57]. They asked the husbands and wives to rate how much responsibility they had for several household tasks. Both the husbands and wives said they had more responsibility than their spouses said they did. However, both husbands and wives indicated that the wives decided the dinner menu, prepared dinner and did the food shopping. Shared tasks included money allocation decisions, doctor-related responsibilities, and household furnishing decisions.

Burt and Hertzler found that in 72% of 46 families studied, the mothers were responsible for grocery shopping [58]. Although the father was never indicated as solely responsible, he shared this task in 28% of the households.

In a 1970 study of 283 families, Lampkin found that husbands shopped in 9% of the families and that it was a shared task in 15% of the families [59]. The women shopped in 76% of the cases.

Several studies have attempted to correlate the amount of wives' employment and/or education with their husbands' degree of involvement in household chores [60,61,62,63,64]. All these have shown that the more educated (and "successful") the wife, relative to the husband, the more time the husband spends in household tasks. However, even when the wife is well-educated and working, and the husband is "unsuccessful," the wife still does more around the house than her spouse.

While there is universal agreement as to the woman's greater involvement in food-related activities, there is some disagreement as to whether or not the woman actually makes the food choices or merely
carries out her husband's requests. In an attempt to elucidate the decision-making process behind family food consumption patterns, Schaefer and Bohlen questioned 116 young married couples about the kind of power used by husbands and wives with regard to family food preferences [65]. The results indicated that the majority of the wives perceived they would comply with their husbands' desires, regardless of the kind or amount of power they perceived that they or their husbands' wielded. The authors did not dispute the "gatekeeper" theory, but they suggested that the husband has more influence than the wife in determining the continued use of a specific food. Wives tend to comply with husbands if and when there is disagreement over the meal.

Diet Change and Division of Labor

Since diet change in the family unit has not been well-studied, it is not surprising that there is scant evaluation of the division of labor and diet change.

Woolcott and colleagues questioned the assumption that women are sole gatekeepers and studied the food-related participation of men and how it affected their nutrition behavior [66]. Participants in the study were 151 men in Ontario, Canada, who responded to questionnaires regarding nutrition, health beliefs, and participation in food-related activities. Reported change in nutrition behavior was measured by a questionnaire that asked the participant to indicate how much he had changed various aspects of his diet in the past two to three years, which was then compared to recent Canadian dietary guidelines. Perceived dietary change scores were factor analyzed with food participation behaviors. Three factors, change in consumption of
sweets and pastries, fast food and snacks, and condiments and fatty extras, correlated significantly with reported food participation scores. The authors reported that scores on the participation scale indicated that most of the men were involved to some extent with food-related activities, although some of these "activities" turned out to be perceptions of the importance of family meals, good mealtime ambiance, and a good breakfast. Actual chores, i.e., food shopping or meal preparation, received lower scores by the men. It is not clear from the data whether or not the performance of these actual chores correlated with diet change.
STATEMENT OF THE PROBLEM

There has been considerable research into the process of effecting dietary change. Much of this work has focused on either weight loss or change in diet to prevent atherosclerosis and heart disease. The majority of studies have included individuals at risk or suffering from the particular disorder and have tried to change their habits. Lifestyles as per food-related tasks in the home have not been examined in a systematic way nor have intervention studies attempted to alter the eating habits of the family as a unit. By intervening at the family level, the behaviors associated with menu planning, cooking and shopping are brought into the realm of the entire family, not just the mother or the "gatekeeper." An increase in food-related activities by other members of the family could lead to increased and longer lasting dietary changes.

The Family Heart Study provides a unique opportunity to look at the division of food-related labor among spouse pairs. In addition, changes that occurred in this division of labor after 5 years of instruction and motivation can be assessed.

It is evident from the literature that wives perform most of the food-related tasks. In the Family Heart Study, both husbands and wives were invited to participate in all aspects of the program--from cooking classes to discussion groups to recipe testing and development. The men (not usually involved in food-related tasks) were drawn into situations in which cooking, menu planning and shopping were discussed; thus, it is of interest to determine if any men became more involved in food-related activities.
Because the Family Heart Study was a voluntary study, with both spouses invited to participate to an equal extent, the amount that each spouse perceived that they participated in food-related activities could be relevant to the magnitude of dietary change that they experienced. Thus, the extent to which the husbands became more involved is of interest.

Despite the gatekeeper theory, it can be hypothesized that increased involvement by the men leads to greater dietary change as a result of direct or indirect attention to the family food habits. The purpose of this study was to describe the division of labor and the changes in this labor allocation that ensue over a 5-year period, and relate that change to dietary change.

**Analytic**

The specific questions asked in this study were as follows:

1. What is the reported division of labor (cooking, shopping and deciding what the family will have to eat) in the families, as reported by the husbands and the wives? Do the spouses respond in the same way to both open and closed questions?

2. Does the reported division of labor of the husbands and wives change after 60 months of dietary intervention?

3. Do the diets and plasma lipids of the group as a whole change after 5 years of dietary intervention?

4. How many of the husbands and wives agree with each other in their perception of who does the three tasks? Does this change after 60 months?
5. Is there a change in the amount of involvement by the husbands as a group at 60 months? How many perceive that they become more, or less, involved in cooking, deciding, and shopping?

6. Is there a difference between the men who said they participated to a greater, lesser, or similar extent and their respective wives in terms of diet change, plasma lipids, and attendance in the study?
DESIGN OF THE STUDY

The Family Heart Study was a 5-year community intervention study. The purpose of the study was to evaluate the average American family's ability to change from the American eating style to a lower fat, lower cholesterol style designed to reduce plasma lipids. Two hundred thirty-three families participated in the 5-year intervention program, which consisted of monthly small group meetings and discussions to promote a change of diet.

Method of Recruitment

From May 1978 through May 1978, a random cluster sample of 936 dwelling units was selected from 3,579 homes in a predominantly white middle-class neighborhood in Portland, Oregon. Each month, four intersections and one side of the street were randomly picked. Starting with the second house from the corner, every other house was selected until 50 interviews were obtained. Since this study was designed to focus on the family unit over a 5-year period, an eligible household had to consist of two or more persons aged 6 to 65 who ate together regularly (at least several times a week) and who expected to remain at their current residence for at least 6 months. The outcome of the 936 families selected for the survey was as follows. Five hundred and one families, 53.5% of the survey population, met the requirements. The professional interviewers excluded 38.4% of the households because they did not contain two or more individuals between the ages of 6 and 65 years. Some 3.1% of the households refused to be interviewed and 1.3% were never at
home. Later, 3.7% of households were excluded because family members did not eat together regularly, were planning to move within 6 months, or no one in the home spoke English. The excluded households of the study fit exclusions that would have occurred on the basis of household surveys in the United States. According to the composition or households in the United States in 1977, 32.2% of the households consisted of one-person households or households with the head of household being 65 and older compared to 38.4% of the households in this survey [67]. This difference of 6% might be explained by the fact that there were no households with the age of the household head less than 20 years, while the 32.2% contained households aged 14 to 65 years. Another explanation is that two-person households were excluded where one of the two people was less than 6 years of age.

Shortly after the initial home interview, eligible families were telephoned by a psychologist who briefly described the Family Heart Study nutrition intervention program and answered any questions. Each family was then invited to an evening recruitment meeting at the Family Heart Study center (housed in the neighborhood YMCA) to learn more about the role of family eating patterns and lifestyle in coronary heart disease, the purpose of the project, and the time commitment and clinical assessments that would be necessary.

At the recruitment meeting, family members were told that their participation would entail three 90-minute clinics during the first month to allow multiple baseline assessments of plasma lipids, lipoproteins, blood pressure and anthropometrics, a 24-hour urine sample, and a wide variety of dietary and psychological measurements. In addition, attendance at follow-up assessment clinics was expected
three times per year throughout the 5 years of the program. Intervention activities were primarily to consist of monthly small group meetings co-led by nutritionists and psychologists.

Of the 501 eligible families who were invited to join this 5-year nutrition education program, 233 (47%) agreed to participate. Since 53% of the eligible families declined to participate, the potential for the existence of self-selection bias in the sample could have been sizeable. However, family members had initial values similar to those reported from studies of Western populations, with regard to plasma lipids and lipoproteins, a 24-hour urinary sodium potassium, and creatinine, blood pressure, and dietary intakes [67]. The method of recruitment and a comparison of joining and non-joining families have been described elsewhere [67]. The evidence is good that, for the purposes of the study, the population was a reasonable representation of white, middle-class American families.

While most of the families who joined did so as a unit, in 44 (19%) cases one or more family members chose not to enter the program along with the rest of the family. Non-joining members were most often teenage or older children (27 cases), although housemates (n = 7), husbands (n = 9) and one wife also refused.

Assessments Used

In order to evaluate both the nature of the families in this study, and the expected changes in diet and behavior, early morning assessment clinics were held at the YMCA in the Hollywood District of Portland, Oregon, the site of the project. Each family was
scheduled for three consecutive clinic visits at baseline, and then subsequently at 4-month intervals for the 5-year study. Clinic visits consisted of three areas--Clinical Assessment, Dietary Assessment, and Psychological Assessment--and were staffed by the appropriate personnel.

Clinical Assessment

A variety of anthropometric and clinical measures were evaluated. Body weight, height, triceps skinfold, apical heart rate, blood pressure and fasting plasma lipids were measured on every consenting individual above 6 years of age. Reported in this study are plasma cholesterol and triglyceride values obtained from male-female adult spouse pairs.

At baseline, three measurements of plasma cholesterol and triglycerides were taken at weekly intervals. During the study, the same determinations were carried out at 4-month intervals. Thus, the baseline results are the mean of three values, and the yearly blood lipid values are those that were measured on the year anniversary of the baseline visit. The plasma cholesterol and triglyceride determinations were performed at the Lipid and Atherosclerosis Research Laboratory at the Oregon Health Sciences University, Portland, Oregon, using standard techniques [68]. The details of the laboratory procedures for cholesterol and triglyercide determinations are given in Appendix 2.

Dietary Assessment

Because a precise evaluation of nutrient intake is difficult to obtain [69,70], a total of five instruments were used to attempt to quantitate an individual's eating habits and any changes therein.
Four of these instruments—the Household Food Inventory, the Diet Habit Survey, and grocery and restaurant assessments—were developed by the Family Heart Study dieticians. A standardized dietary assessment tool, the 24-hour recall, was also utilized. The 24-hour recall provides a reliable estimate of dietary intake when the number of individuals is greater than 50 [71]. The diet data used in this substudy were taken from the 24-hour dietary recalls.

Each participant 12 years of age and older reported 24-hour dietary intake following the procedure used in the Lipid Research Clinic's prevalence study [72]. This assessment was made once during baseline on a Tuesday, Thursday, or Friday. Subsequent assessments were made at 12-month intervals throughout the study. The 24-hour dietary recall technique consists of a verbal accounting by the participant of everything that he or she was able to recall having eaten or drunk during the previous 24-hour period. This information was collected in accordance with the standards established by the National Heart Lung and Blood Institute [72]. Dietary recall interviews were conducted by staff dieticians who were certified by the Nutrition Coding Center (NCC), Minneapolis, Minnesota. Standardized food models, measuring utensils, and geometric models were used wherever possible to describe and ascertain portion size of food eaten. The diet recalls were sent to the NCC, coded and analyzed using the Center's data base.

**Psychological Assessment**

A total of ten standardized psychological assessment instruments, such as the Cornell Medical Index and the Hopkins Symptom Checklist, were administered by the psychologists to
each adult throughout the study. In addition, a three-part interview was conducted at baseline and then at 12-, 24-, 36-, 48- and 60-month clinics. These interviews were conducted in a private setting and dealt with any health, emotional, or attitudinal issue that the client brought up.

One instrument, designed by the Family Heart Study psychologists, attempted to assess the food-related patterns and habits of the families. Called Family Food Patterns (Appendix 3), it consisted of 21 questions that relate to the number of meals eaten together as a family, who makes the decision as to what the family will eat, and who does most of the cooking, shopping, and cleaning up after meals. Each adult responded to the psychologists' questions in the interview according to respondent's perception of his or her family's food-related problems. The responses and change in responses to three of the questions in the Family Food Patterns questionnaire were evaluated and used as predictors of dietary change.

**Intervention**

The primary method used in the Family Heart Study to stimulate long-term dietary change was small group discussions led by a medical psychologist and dietician. Group discussions have been shown to an effective technique for habit change in the early studies of Lewin [46] and in situations such as Weight Watchers and Alcoholics Anonymous.

At the beginning of the study, the families were divided into groups of approximately ten families (often, several were neighbors
or knew each other from community contacts or church). The groups met in the evening once a month during the first year, and nine times a year for the remaining 4 years of the study. Regular attendance of the whole family at small groups was encouraged; child care was offered, and reminder calls were made by the leaders 1 or 2 days prior to the scheduled meeting.

A dietician and a medical psychologist ran the groups as nonjudgemental, supportive and educational experiences. Classes were planned by teams of dieticians and psychologists, and every group received essentially the same sequence of group discussion topics. The group leaders received training in small group discussion techniques, such as asking open-ended questions, facilitating sharing of ideas and dealing with disgruntled or disruptive participants. A key aspect of this training was the emphasis on the reliance of the group members to solve problems and help each other out with suggestions and ideas for longlasting behavior change. Group cohesiveness was encouraged as was a commitment to the project and to the desired change in eating behaviors.

The purpose of the groups was to promote an incremental and steady change of diet, thus information about new foods and suggested meal plans was presented gradually over the 5 years. During the first year, the basics of a lower fat, lower cholesterol diet were emphasized, and in subsequent years, more subtle behavior change concepts were presented, always in the framework of suggestions and options, never as prescribed actions. Practical skills and ideas for meals, such as menus and shopping guides, were shared and stressed.
In order to change to a lower fat eating style, new foods and new ways of preparing foods need to be sampled. Thus, a food product related to the topic at hand was served to the participants at each session. In addition, store coupons for appropriate low fat or low sodium foods were distributed to those who attended the groups. A cookbook, compiled of low fat, high fiber, low sodium recipes submitted by participants and staff, was developed and given to the families so that they would have ideas and practical suggestions. Cooking demonstrations, food testing luncheons, and potluck dinners were held to promote the concept of enjoyment of eating in a low fat style. (See Appendix 4 for a description of the complete intervention protocol).

Periodically the results of laboratory tests, and dietary and psychological questionnaires were presented to the group as progress reports and feedback. Since attendance at all of these groups was strictly voluntary, a regular, consistent method of communicating with the families was deemed essential. Monthly newsletters, with recipes, scientific articles, progress reports, and staff profiles were mailed to every family.

Limitations and Exclusions

This substudy of the Family Heart Study involved couples meeting the following criteria: male-female couple; healthy; woman not pregnant or lactating at baseline or at 60 months; living together for the duration of the study (60 months). Of the 233 families who joined, 109 families met these criteria. Of those excluded, 36
couples moved out of town; 31 families were not male-female couples; women in 18 couples were pregnant or lactating; and 26 couples were divorced during the study. In addition, 13 families were excluded due to serious illness which would affect normal lipid levels, such as surgeries, diagnosed hyperlipidemia, and cancer. The excluded families did not differ significantly in age, diet, clinical, or anthropometric measurements from the study population (Appendix 5). Pregnant and lactating individuals were excluded because of the well-documented effects of pregnancy on plasma lipids [74]. Divorced couples were excluded because the purpose of this study was to evaluate household task division of labor among husbands and wives who lived together, and those who moved were excluded because they were unavailable for 60-month data collection. The couples did not have to be legally married to be considered a "couple," and the men and women are referred to here as "husbands" and "wives" for clarity, although they may not be married.

With the exception of the plasma lipid determinations, all the endpoint measures were self-reported and were subject to self-report bias. It was expected that the degree of self-report bias among the subjects at baseline would not be different at 60 months.

Dietary data were incomplete or missing for four individuals at 60 months (one woman and three men); therefore, the number of subjects at 60 months was 105.

Only about 64% of American families live in households consisting of a husband and wife [75]. This project used a model of the
standard nuclear family consisting of husband and wife; therefore, this model may not be applicable to the current population of American households.

**Statistical Methods**

The paired *t* test was used to compare the mean percentages of time that each spouse reported doing the task. Because the responses to the closed questions were categoric such that there could be no assumption of normal distribution, a nonparametric test was used to compare the overall distributions between husbands and wives, and between baseline and 60 months. The test used was the Kolmogorov-Smirnoff test of two distributions [76]. Analysis of variance, followed by post hoc Newman Keuls analysis was performed on the changes in diet and plasma lipids.
RESULTS

Baseline

Description of Population

The age, number of children, education, and occupations of the study population are shown in Table 2. Of the 109 couples, the average age of the women was 38.2 years, and of the men, 40.1 years. The ages ranged from 23 to 65 years for women, and 25 to 70 years for the men. Generally, the years of schooling experienced by the women were less than for the men. Of the women, 78% had college degrees and/or graduate work, compared to 83% of the men. The men had completed an average of 15.5 years of school; the women, 14.4 years.

The average number of children living in the home was $1.5 \pm 1.3$ per family. The number of children per household ranged from 0 to 6. This is slightly less than the average number of children in American families reported in 1978 [75]. Since several families with older children who had left home were not included in this average, the true mean number of biological children is probably closer to the reported average.

The income levels indicated by the 109 families are reported in Table 2. The questionnaire was designed in such a way as to group together those who made $20,000 to $34,999, which accounts for 50% of the men, and 40% of the women. This is a wider range ($14,999) than the other categories ($4,999), so it is not clear what the distribution of annual income actually was. However, it is evident that most of the families were generally within the middle range of income for their ages [75]. It is interesting to note that more men
Table 2
Description of Study Population at Baseline (n = 218)

<table>
<thead>
<tr>
<th></th>
<th>Men (n = 109)</th>
<th>Women (n = 109)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>40.1±11.6</td>
<td>38.2±10.7</td>
</tr>
<tr>
<td>Range</td>
<td>25-70</td>
<td>23-65</td>
</tr>
<tr>
<td>Children in households</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean number</td>
<td>1.5±1.3</td>
<td>1.5±1.3</td>
</tr>
<tr>
<td>Range of number</td>
<td>0-6</td>
<td>0-6</td>
</tr>
<tr>
<td>Percent of Men</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent of Women</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Completed*</td>
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<td></td>
</tr>
<tr>
<td>High school</td>
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<td>22</td>
</tr>
<tr>
<td>College</td>
<td>51</td>
<td>67</td>
</tr>
<tr>
<td>Graduate level</td>
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<td>11</td>
</tr>
<tr>
<td>Yearly Family Income (dollars)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5,000</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5,000-9,900</td>
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<td>3</td>
</tr>
<tr>
<td>10,000-14,999</td>
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<td>7</td>
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<td>15,000-19,999</td>
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<td>50</td>
<td>40</td>
</tr>
<tr>
<td>35,000-49,999</td>
<td>11</td>
<td>9</td>
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<tr>
<td>&gt;50,000</td>
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<td>2</td>
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<td>Occupation</td>
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<td></td>
</tr>
<tr>
<td>Professional/Technical</td>
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<td>17</td>
</tr>
<tr>
<td>Managers/Administration</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td>Sales</td>
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<td>3</td>
</tr>
<tr>
<td>Clerical</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>Craftsmen</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Laborers</td>
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<td>1</td>
</tr>
<tr>
<td>Service workers</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Retired</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Homemaker</td>
<td>0</td>
<td>44</td>
</tr>
<tr>
<td>Student</td>
<td>&lt;1</td>
<td>1</td>
</tr>
<tr>
<td>Unemployed</td>
<td>15</td>
<td>8</td>
</tr>
</tbody>
</table>

*Average years of education completed: men, 15.5±2.6; women, 14.4±2.1
than women reported family incomes of $20,000 or greater, and more women than men reported family incomes of $15,000 to $19,999. The question the men and women responded to was "What is the annual income?" It was unclear whether the question referred to the husband's, the wife's, or both of their income. Thus, the annual income was presented as descriptive data only.

Baseline clinical and dietary assessments are presented in Table 3. The average of three baseline lipid determinations was 203.9±37.9 mg/dl cholesterol for the men and 192.9±37.0 mg/dl for the women. The mean plasma triglyceride was 118.1±68.6 mg/dl for the men and 85.7±53.0 mg/dl for the women. The women weighed an average of 63.3±13.5 kg and measured 165.0±6.9 cm in height. The men, predictably, weighed more and were taller (78.5±0.6 kg and 177.0±6.7 cm).

At baseline, the 109 couples' dietary recalls yielded diets very similar to the average American diet [21]. The men reported a mean intake of 2507 kilocalories, of which 39.0% were fat, 15.2% protein, and 42.9% carbohydrate. The ratio of polyunsaturated fat to saturated fat was 0.60; alcohol consumption was 2.9% of kilocalories. The women reported the consumption of less kilocalories than the men, 1825, with very similar protein, fat, and carbohydrate distributions (16.2%, 39.1%, and 42.1% of kilocalories, respectively). The women's reported alcohol consumption was 2.3% of kilocalories; the P/S ratio was 0.67. Dietary cholesterol was an average of 348.0 mg for the men, and 314.3 mg for the women.
Table 3
Baseline Plasma Lipids, Height, Weight, and Dietary Intake

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>((n = 109))</td>
<td>((n = 109))</td>
</tr>
<tr>
<td>Plasma Cholesterol (mg/dl)</td>
<td>203.9±37.9</td>
<td>192.9±37.0</td>
</tr>
<tr>
<td>Plasma Triglyceride (mg/dl)</td>
<td>118.1±68.8</td>
<td>85.7±53.0</td>
</tr>
<tr>
<td>Body Weight (kg)</td>
<td>78.5±10.6</td>
<td>63.3±13.5</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>177±6.7</td>
<td>165±6.9</td>
</tr>
<tr>
<td>Dietary Intake (24-hour recall)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kilocalories</td>
<td>2507±905</td>
<td>1825±724</td>
</tr>
<tr>
<td>Protein (% Kcals)</td>
<td>15.2±3.9</td>
<td>16.2±5.4</td>
</tr>
<tr>
<td>Fat (% Kcals)</td>
<td>39.0±9.5</td>
<td>39.1±9.4</td>
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<tr>
<td>Saturated (% Kcals)</td>
<td>13.4±3.7</td>
<td>13.7±4.7</td>
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<tr>
<td>Poly-unsaturated (% Kcals)</td>
<td>7.6±3.6</td>
<td>8.1±3.7</td>
</tr>
<tr>
<td>Mono-unsaturated (% Kcals)</td>
<td>14.8±4.6</td>
<td>14.3±4.6</td>
</tr>
<tr>
<td>Carbohydrate (% Kcals)</td>
<td>42.9±11.1</td>
<td>42.1±11.4</td>
</tr>
<tr>
<td>Alcohol (% Kcals)</td>
<td>2.9±5.8</td>
<td>2.3±5.4</td>
</tr>
<tr>
<td>Cholesterol (mg)</td>
<td>348.0±223.8</td>
<td>314.3±225.1</td>
</tr>
<tr>
<td>P/S ratio</td>
<td>0.60</td>
<td>0.67</td>
</tr>
</tbody>
</table>
Response to Family Food Patterns Questionnaire

Two sets of questions were posed to the participants. One set asked "Who usually does (the task)." A response was required to this closed question on each of four tasks. The respondent was given a choice of five answers: mother, father, mother and father, parents and children, and children. The other question posed was "what percentage of the time does the mother (or father) usually do the task". Responses to this question were entirely open.

Table 4 shows the responses given by the husbands and wives to three of the closed questions regarding division of labor of food-related tasks. It should be noted that the responses to the questions were framed in terms of mother, father and children, even though not every man or woman was a parent. The staff psychologist who administered the questionnaire rephrased the possible responses to indicate wife/husband or man/woman, when appropriate. For clarity's sake, the terms mother and father are used to denote woman and man, respectively, and are used in that way throughout this report.

The distribution of division of labor reported by the husbands was very close to that reported by the wives. In fact, there was no significant difference between the husbands' overall indication of the task roles and the wives', as measured by the Kolmogorov-Smirnoff two sample test [76]. The majority of both husbands and wives indicated that the mother usually decides what the family will have to eat, cooks the meals at home, and does the grocery shopping (69%, 73%, and 60% of the husbands, and 72%, 73%, and 67% of the wives,
Table 4

Family Food Patterns--Baseline Responses to Questionnaire
(values are in percent, n = 109 couples)

Who usually decides what the family will have to eat?

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th>Father</th>
<th>Children</th>
<th>Other</th>
<th>Mother &amp; Father</th>
<th>Parents &amp; Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husbands</td>
<td>69</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>26</td>
<td>3</td>
</tr>
<tr>
<td>Wives</td>
<td>72</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>3</td>
</tr>
</tbody>
</table>

Who usually cooks the meals at home?

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th>Father</th>
<th>Children</th>
<th>Other</th>
<th>Mother &amp; Father</th>
<th>Parents &amp; Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husbands</td>
<td>73</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>Wives</td>
<td>73</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>2</td>
</tr>
</tbody>
</table>

Who usually does the grocery shopping?

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th>Father</th>
<th>Children</th>
<th>Other</th>
<th>Mother &amp; Father</th>
<th>Parents &amp; Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husbands</td>
<td>60</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>34</td>
<td>1</td>
</tr>
<tr>
<td>Wives</td>
<td>67</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>29</td>
<td>1</td>
</tr>
</tbody>
</table>
respectively). While 24% of the wives said that both the mother and father decided and cooked, 26% of the men said that deciding was a joint activity. The food shopping was reported to be done jointly by 34% and 29% of the husbands and wives, respectively. Only 2% of the men said they did most of the deciding and cooking, while 1% of the women said that the men did the cooking and deciding. Slightly more men (5%) than women (3%) responded that the fathers did the shopping. Children were involved to a relatively small extent, with 1% to 3% of the parents indicating that the children took part in the three tasks.

The response to the open-ended question "What percentage of the time does the mother (and father) decide what the family will have to eat?" as well as responses to three other questions is presented in Table 5. When the question was framed in this way, the wives indicated that they did a higher percentage of the tasks than their husbands said they did, as measured by the paired t-statistic. Conversely, the husbands reported higher percentages for themselves than those their wives reported for them (the husbands). That is, the average percentage of time the husbands said that the wives decided, cooked, shopped, or did the dishes (79.3%, 85.9%, 77.9%, and 63.4%, respectively) was less than the percentage that their wives said that they (the wives) did (82.7%, 88.7%, 80.7%, and 71.2%). This type of question (open-ended) was only asked at baseline.
Table 5
Comparison of Husbands' and Wives' Responses to Open-Ended Questions on Food Tasks

<table>
<thead>
<tr>
<th>Question: What percentage of the time does mother/father . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Decide what the family will have to eat?</td>
</tr>
<tr>
<td><strong>Husbands' Responses</strong>*</td>
</tr>
<tr>
<td><strong>Mean %</strong></td>
</tr>
<tr>
<td><strong>Mean %</strong></td>
</tr>
<tr>
<td>Mother</td>
</tr>
<tr>
<td>Father</td>
</tr>
<tr>
<td>b. Do the cooking?</td>
</tr>
<tr>
<td><strong>Mother</strong></td>
</tr>
<tr>
<td><strong>Father</strong></td>
</tr>
<tr>
<td>c. Do the shopping?</td>
</tr>
<tr>
<td><strong>Mother</strong></td>
</tr>
<tr>
<td><strong>Father</strong></td>
</tr>
<tr>
<td>d. Do the dishes?</td>
</tr>
<tr>
<td><strong>Mother</strong></td>
</tr>
<tr>
<td><strong>Father</strong></td>
</tr>
</tbody>
</table>

*Husbands' and wives' responses significantly different from one another at p<.05, paired, one-tailed students' t test.
Diet and Lipid Change

After 5 years of instruction and motivation to change their diet, did the couples lower their blood lipids and dietary fat and cholesterol? Taken as two groups (men and women), the participants showed no significant change in plasma lipids from baseline to 60 months (Table 6). However, the 24-hour recall revealed some differences in reported dietary intake. The women reported less total kilocalorie consumption and kilocalories derived from fat. Of the fat kilocalories, both saturated and monounsaturated fat were decreased, while polyunsaturated remained the same. Carbohydrate increased, approximately proportional to the decrease in fat, while protein stayed the same. The cholesterol content of the diet changed significantly from 316 mg to 170 mg for the wives. The men showed very similar patterns of change, except that there was no significant difference in their reported kilocaloric intake from baseline to 60 months. The change in fat content of their diets did not achieve statistical significance, although it did appear to move in the direction consistent with increased carbohydrate intake. The P/S ratio of the diets of both the men and women increased significantly from .60 to .76 for the men and from .67 to .79 for the women. The body weights of the men and the women did not change in spite of a reported decrease in kilocalorie consumption.

Response to Family Food Patterns Questionnaire

Table 7 shows the responses to the closed question about the division of labor at 60 months. The distribution of the division
Table 6
Comparison of Plasma Lipids, Body Weight and Dietary Intake (24-hour recall) Between Baseline and 60 Months (means and standard deviations)

<table>
<thead>
<tr>
<th></th>
<th>Wives</th>
<th>Husbands</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline 60-Month</td>
<td>Baseline 60-Month</td>
</tr>
<tr>
<td></td>
<td>n = 109</td>
<td>n = 109</td>
</tr>
<tr>
<td></td>
<td>n = 105</td>
<td>n = 108</td>
</tr>
<tr>
<td>n = 109</td>
<td>n = 105</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n = 108</td>
<td></td>
</tr>
<tr>
<td>Plasma Cholesterol (mg/dl)</td>
<td>192.9±37.0</td>
<td>203.9±38.0</td>
</tr>
<tr>
<td>Plasma Triglyceride (mg/dl)</td>
<td>85.7±53.0</td>
<td>118.1±69.0</td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td>63.3±13.5</td>
<td>78.5±10.6</td>
</tr>
<tr>
<td>Kilocalories</td>
<td>1825±724</td>
<td>2607±905</td>
</tr>
<tr>
<td>Protein (% Kcals)</td>
<td>16.2±5.4</td>
<td>15.2±3.9</td>
</tr>
<tr>
<td>Fat (% Kcals)</td>
<td>39.1±9.4</td>
<td>39.0±9.5</td>
</tr>
<tr>
<td>Carbohydrates (% Kcals)</td>
<td>42.1±11.4</td>
<td>45.9±11.1</td>
</tr>
<tr>
<td>Alcohol (% Kcals)</td>
<td>2.3±5.4</td>
<td>2.9±5.8</td>
</tr>
<tr>
<td>Saturated fat (% Kcals)</td>
<td>13.7±4.7</td>
<td>13.4±3.7</td>
</tr>
<tr>
<td>Polyunsaturated fat (% Kcals)</td>
<td>8.1±3.7</td>
<td>7.6±3.6</td>
</tr>
<tr>
<td>Monounsaturated fat (% Kcals)</td>
<td>14.2±4.6</td>
<td>14.8±4.6</td>
</tr>
<tr>
<td>Cholesterol (mg)</td>
<td>316±225</td>
<td>348±224</td>
</tr>
<tr>
<td>P/S</td>
<td>0.67</td>
<td>0.60</td>
</tr>
</tbody>
</table>

*Significantly different from baseline p<.05
Table 7
Family Food Patterns--60-Month Responses to Questionnaire
(values are in percent, n = 109)

Who usually decides what the family will have to eat?

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th>Father</th>
<th>Children</th>
<th>Other</th>
<th>Mother &amp; Father</th>
<th>Parents &amp; Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husbands</td>
<td>64</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td>Wives</td>
<td>75</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>19</td>
<td>2</td>
</tr>
</tbody>
</table>

Who usually cooks the meals at home?

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th>Father</th>
<th>Children</th>
<th>Other</th>
<th>Mother &amp; Father</th>
<th>Parents &amp; Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husbands</td>
<td>66</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>Wives</td>
<td>72</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>19</td>
<td>0</td>
</tr>
</tbody>
</table>

Who usually does the grocery shopping?

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th>Father</th>
<th>Children</th>
<th>Other</th>
<th>Mother &amp; Father</th>
<th>Parents &amp; Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husbands</td>
<td>75</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>Wives</td>
<td>79</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>3</td>
</tr>
</tbody>
</table>
of labor is in a pattern very similar to baseline. A comparison of baseline and 60-month responses to the Family Food Patterns questionnaire is in Table 8. The responses that consist of "children, mothers and fathers, parents and children" have been condensed into one grouping, i.e., "family," for analysis purposes. It is apparent that the perceptions of deciding, cooking, and shopping did not change in a statistically significant manner during the study. There were no significant differences between the distributions at 60 months and at baseline (using the Kolmogorov-Smirnoff test), although more men claimed that they did the cooking at 60 months than at baseline (13% versus 2%, and 9% vs. 1%). It should be noted that the Kolmogorov-Smirnoff test is a very conservative test; it is sensitive to differences in variance, since it is a test of the equality of distributions, rather than of specific parameters [76].

Accord over who did the grocery shopping changed over the 5-year period. At 60 months, the men and women had differing responses when asked who usually did the shopping. More women thought they usually did the shopping (79% versus 60%) and more men thought it was shared (35% versus 17%) (p < .05). There was no change in the number of men who said they were mostly responsible for the shopping.

Agreement

The issue of agreement as to who does what in the household is of interest. For the closed questions, the responses by couple were tabulated. A comparison of the number of couples who agreed, partially agreed and disagreed on all three questions is presented in Table 9. There was no significant change in overall distribution of agreement at the end of the study, although not every couple who
Table 8
Comparison of Baseline and 60-Month Responses to Questionnaire
(values are in percent, n = 109 couples)

<table>
<thead>
<tr>
<th></th>
<th>Husbands' Responses</th>
<th>Wives' Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline 60-Month</td>
<td>Baseline 60-Month</td>
</tr>
<tr>
<td>Who usually decides what the family will have to eat?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother</td>
<td>69 64</td>
<td>72 75</td>
</tr>
<tr>
<td>Father</td>
<td>3 6</td>
<td>1 4</td>
</tr>
<tr>
<td>Family (Children, Mother &amp; Father, Parents &amp; Children)</td>
<td>28 30</td>
<td>27 21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Who usually cooks the meals at home?</th>
<th>Husbands' Responses</th>
<th>Wives' Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline 60-Month</td>
<td>Baseline 60-Month</td>
</tr>
<tr>
<td>Mother</td>
<td>72 66</td>
<td>72 72</td>
</tr>
<tr>
<td>Father</td>
<td>2 13</td>
<td>1 9</td>
</tr>
<tr>
<td>Family (Children, Mother &amp; Father, Parents &amp; Children)</td>
<td>26 21</td>
<td>27 19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Who usually does the grocery shopping?</th>
<th>Husbands' Responses</th>
<th>Wives' Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline 60-Month</td>
<td>Baseline 60-Month</td>
</tr>
<tr>
<td>Mother</td>
<td>75 60</td>
<td>67 79</td>
</tr>
<tr>
<td>Father</td>
<td>6 6</td>
<td>3 4</td>
</tr>
<tr>
<td>Family (Children, Mother &amp; Father, Parents &amp; Children)</td>
<td>19 35</td>
<td>30 17</td>
</tr>
</tbody>
</table>

*Husbands' and wives' responses different from each other at 60 months, Kolmogorov-Smirnoff two sample test, p<.05.
Table 9
Comparison of Agreement on Responses to All Three Questions Between Baseline and 60 Months (values in percent, n = 109 couples)

<table>
<thead>
<tr>
<th>Couples who:</th>
<th>Baseline</th>
<th>60-Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>49</td>
<td>56</td>
</tr>
<tr>
<td>Partially agree</td>
<td>41</td>
<td>37</td>
</tr>
<tr>
<td>Disagree</td>
<td>10</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 9a

<table>
<thead>
<tr>
<th>Couples who:</th>
<th>Baseline</th>
<th>60-Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>49</td>
<td>31</td>
</tr>
<tr>
<td>Partially agree</td>
<td>41</td>
<td>18</td>
</tr>
<tr>
<td>Disagree</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>
agreed at baseline continued to agree with each other when asked the same questions at 60 months (Table 9a). Nor did those who disagreed and those who partially agreed remain in the same category by 60 months. There were no differences in diet, lipids, age, or education between those who agreed and those who disagreed partially or completely.

**Change of Involvement**

Changes in the husbands' view of who was responsible for the cooking, shopping and deciding were evaluated. The husbands' responses were grouped into three categories—those who thought they were doing more of the task at 60 months than at baseline, those whose responses remained the same, and those who indicated that they did less. That is, the husbands who at baseline said that the mother usually did the shopping, or cooking or deciding, but at 60 months said that they themselves or they and their wives usually did the tasks were put in the "more involved" group. Similarly, those who said that they did the task at baseline but at 60 months said that the mother, the mother and father, or the parents and children shopped, cooked, or decided were placed in the "less involved" group.

Table 10 summarizes the classes of change in involvement from baseline to 60 months, and Table 11 shows the number of men in each category for each of the three tasks. Cooking and deciding what the family will have to eat are closely related (and are different from shopping in that shopping requires leaving the house, and is less closely linked to a sex-defined role); thus, the responses to these two questions were grouped together. Clearly most of the men (60-64%) did not perceive a change in who usually decides, cooks, or shops.
Table 10
Husbands' Perception of Their Change of Involvement

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>60-Month</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Husbands become more involved</strong> (perceive they do more).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answers at:</td>
<td>Mother</td>
<td>Father</td>
</tr>
<tr>
<td></td>
<td>Mother</td>
<td>Parents &amp; Children</td>
</tr>
<tr>
<td></td>
<td>Mother</td>
<td>Mother &amp; Father</td>
</tr>
<tr>
<td></td>
<td>Parents &amp; Children</td>
<td>Father</td>
</tr>
<tr>
<td></td>
<td>Parents &amp; Children</td>
<td>Mother &amp; Father</td>
</tr>
<tr>
<td><strong>Fathers' involvement does not change</strong> (perceive they do the same).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answers at:</td>
<td>Mother</td>
<td>Father</td>
</tr>
<tr>
<td></td>
<td>Father</td>
<td>Parents &amp; Children</td>
</tr>
<tr>
<td></td>
<td>Parents &amp; Children</td>
<td>Mother &amp; Father</td>
</tr>
<tr>
<td></td>
<td>Mother &amp; Father</td>
<td></td>
</tr>
<tr>
<td><strong>Fathers think they are less involved</strong> (perceive they do less).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answers at:</td>
<td>Father</td>
<td>Mother &amp; Father</td>
</tr>
<tr>
<td></td>
<td>Mother &amp; Father</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mother &amp; Father</td>
<td>Parents &amp; Children</td>
</tr>
<tr>
<td></td>
<td>Parents &amp; Children</td>
<td>Mother</td>
</tr>
</tbody>
</table>
Table 11

Change in Husbands' Perceptions of Who Usually Does Food-Related Tasks, from Baseline to 60 Months (values are in percent, n = 109 husbands)

<table>
<thead>
<tr>
<th></th>
<th>Deciding</th>
<th>Cooking</th>
<th>Shopping</th>
<th>Both Cooking &amp; Deciding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husbands more involved</td>
<td>22</td>
<td>26</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Husbands' involvement does not change</td>
<td>64</td>
<td>60</td>
<td>60</td>
<td>82</td>
</tr>
<tr>
<td>Husbands less involved</td>
<td>14</td>
<td>15</td>
<td>27</td>
<td>7</td>
</tr>
</tbody>
</table>
More men changed their responses at 60 months to indicate that they were less usually involved in shopping (27%) than in the other tasks. If cooking and deciding are taken together, 82% of the men did not perceive a change in their involvement while 12% thought they did more, and 7% thought they did less at 60 months than at baseline.

**Attendance**

There was no difference in attendance at either small group discussions or clinics between the husbands and wives taken as a group. When divided into groups according to change in involvement in cooking, deciding and shopping, there were no significant differences in attendance seen among the groupings in either the men or the women. A summary of the attendance is presented in Table 12.

**Diet and Lipid Changes and Change of Involvement**

Was there a difference in changes in blood lipids and diet between the men who said they participated to greater, lesser, or similar extents at the end of the study? A comparison of the dietary and lipid changes at 60 months are summarized in Table 13 for those men who said that they usually did the cooking and deciding. The responses to who usually decided what the family would have to eat and who usually did the cooking were grouped together for the reasons previously given.

Analysis of variance followed by Neuman Keuls procedure for multiple comparison was computed for the changes in plasma lipids and reported dietary intake from baseline to 60 months. For perception of cooking and deciding, the only difference in change of diet between groups was seen in the amount of polyunsaturated fat reported by the men who were more involved and the men who did not change their
<table>
<thead>
<tr>
<th></th>
<th>Husbands (n = 109)</th>
<th>Wives (n = 109)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinics</strong>(^a)</td>
<td>13.7±3.2</td>
<td>13.8±3.1</td>
</tr>
<tr>
<td><strong>Small group discussions</strong>(^b)</td>
<td>16.6±9.8</td>
<td>19.7±8.8</td>
</tr>
<tr>
<td><strong>Total intervention</strong>(^c)</td>
<td>30.5±11.8</td>
<td>33.15±11.2</td>
</tr>
<tr>
<td><strong>Total attendance</strong>(^d)</td>
<td>34.6±13.9</td>
<td>33.5±11.2</td>
</tr>
<tr>
<td><strong>Years good attendance</strong>(^e)</td>
<td>3.0±1.7</td>
<td>3.4±1.6</td>
</tr>
</tbody>
</table>

\(^a\) Mean number of clinics attended; maximum possible = 16

\(^b\) Mean number of small group discussion attended; maximum = 40

\(^c\) Mean clinic attendance plus mean small group attendance; maximum = 56

\(^d\) Mean attendance at all FHS activities, including food demonstrations, potluck dinners, etc.; maximum = 67

\(^e\) Mean number of years in which the individual attended more than half of the total clinics, small groups, and events offered.
Table 13
Husbands' Change in Diet and Plasma Lipids According to Husbands' Perceived Change in Cooking and Deciding, at Baseline and 60 Months (values expressed are means and standard deviations)

<table>
<thead>
<tr>
<th></th>
<th>Less Involved</th>
<th>Involved the Same</th>
<th>More Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>60-Month</td>
<td>Baseline</td>
</tr>
<tr>
<td>N</td>
<td>7</td>
<td>7</td>
<td>89</td>
</tr>
<tr>
<td>Age (years)</td>
<td>37.7±10.4</td>
<td>39.8±11.6</td>
<td>43.9±11.8</td>
</tr>
<tr>
<td>Plasma cholesterol (mg/dl)</td>
<td>180.8±49.1</td>
<td>175.5±34.7</td>
<td>206.3±36.9</td>
</tr>
<tr>
<td>Plasma triglyceride (mg/dl)</td>
<td>85.7±34.0</td>
<td>95.8±39.0</td>
<td>117.2±70.4</td>
</tr>
<tr>
<td>Kilocalories/day</td>
<td>3114±676</td>
<td>2651±560</td>
<td>2550±899</td>
</tr>
<tr>
<td>Protein (% Kcals)</td>
<td>14.1±2.6</td>
<td>13.8±2.7</td>
<td>15.1±4.0</td>
</tr>
<tr>
<td>Fat (% Kcals)</td>
<td>42.8±5.6</td>
<td>30.5±11.3</td>
<td>38.6±9.6</td>
</tr>
<tr>
<td>Saturated (% Kcals)</td>
<td>13.1±3.1</td>
<td>9.0±4.1</td>
<td>13.3±3.6</td>
</tr>
<tr>
<td>Polyunsaturated (% Kcals)</td>
<td>9.2±2.1</td>
<td>7.8±3.2</td>
<td>7.7±3.9</td>
</tr>
<tr>
<td>Monounsaturated (% Kcals)</td>
<td>17.1±4.3</td>
<td>11.5±6.0</td>
<td>14.4±4.6</td>
</tr>
<tr>
<td>Carbohydrate (% Kcals)</td>
<td>41.7±7.0</td>
<td>54.5±12.9</td>
<td>43.3±11.1</td>
</tr>
<tr>
<td>Alcohol (% Kcals)</td>
<td>1.4±1.6</td>
<td>1.3±2.0</td>
<td>2.6±5.6</td>
</tr>
<tr>
<td>Cholesterol (mg)</td>
<td>392±225</td>
<td>215±124</td>
<td>355±218</td>
</tr>
<tr>
<td>P/S</td>
<td>0.79</td>
<td>0.97</td>
<td>0.61</td>
</tr>
</tbody>
</table>

* Differences between baseline to 60 months significantly different, p<.05
involvement. The men who said they did more cooking and deciding increased their polyunsaturated fat from 5.8% to 9.3% of kilocalories, while the men who had no change in their involvement slightly decreased their polyunsaturated fat from 7.7% to 7.4%.

When grouped according to change in shopping behavior, the mean diet and lipid changes between groups were not significantly different, again with the exception of polyunsaturated fat (Table 14). In this case, there was a drop in reported polyunsaturated fat in the less involved group (8.5% of kilocalories to 7.4% of kilocalories) as compared to the group that did not change its involvement. Furthermore, the more involved group increased their polyunsaturated fat from 6.4% of kilocalories to 9.1% of kilocalories, a change that was significantly different from the group that did not change their involvement.

Tables 15 and 16 show the diet and lipid values of the wives of the men who became more, or less, involved in food-related tasks, remained the same at 60 months. For the wives the main effect of their husbands' increased involvement in cooking and deciding was an increase in the saturated fat consumption as compared to the wives of the men who said they did the same amount of cooking and deciding (12.4% to 12.6%, versus, 13.7% to 10.2% of kilocalories). There were no other significant differences in changes in diet or lipid between the groups. The men's shopping behavior had a different effect on the women's diets than did cooking and deciding. The total fat consumption of those women whose husbands did more shopping increased from 33.0% of kilocalories to 35.1% of kilocalories as compared to both of the other groups, which decreased their total fat consumption
Table 14

Husbands' Change in Diet and Plasma Lipids According to Husbands' Perceived Change in Shopping, at Baseline and 60 Months
(values expressed are means and standard deviations)

<table>
<thead>
<tr>
<th></th>
<th>Less Involved</th>
<th>Involved the Same</th>
<th>More Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>60-Month</td>
<td>Baseline</td>
</tr>
<tr>
<td>N</td>
<td>29</td>
<td>29</td>
<td>66</td>
</tr>
<tr>
<td>Age</td>
<td>43.2±14.2</td>
<td>38.1±10.1</td>
<td>39.7±11.8</td>
</tr>
<tr>
<td>Plasma cholesterol (mg/dl)</td>
<td>210.2±49.3</td>
<td>203.1±32.9</td>
<td>203.6±35.5</td>
</tr>
<tr>
<td>Plasma triglyceride (mg/dl)</td>
<td>109.2±61.2</td>
<td>120.7±76.0</td>
<td>121.2±68.3</td>
</tr>
<tr>
<td>N</td>
<td>29</td>
<td>29</td>
<td>66</td>
</tr>
<tr>
<td>Kilocalories</td>
<td>2482±978</td>
<td>2625±923</td>
<td>2392±744</td>
</tr>
<tr>
<td>Protein (% Kcals)</td>
<td>14.0±2.6</td>
<td>15.5±4.2</td>
<td>15.3±4.0</td>
</tr>
<tr>
<td>Fat (% Kcals)</td>
<td>40.1±11.3</td>
<td>38.5±9.2</td>
<td>34.2±9.8</td>
</tr>
<tr>
<td>Saturated (% Kcals)</td>
<td>13.4±4.1</td>
<td>13.3±3.8</td>
<td>11.3±4.3</td>
</tr>
<tr>
<td>Polyunsaturated (% Kcals)</td>
<td>8.5±4.0</td>
<td>7.5±3.5</td>
<td>7.4±3.7</td>
</tr>
<tr>
<td>Monounsaturated (% Kcals)</td>
<td>15.3±4.9</td>
<td>14.4±4.8</td>
<td>12.8±4.6</td>
</tr>
<tr>
<td>Carbohydrate (% Kcals)</td>
<td>44.8±10.9</td>
<td>42.3±11.2</td>
<td>46.7±10.</td>
</tr>
<tr>
<td>Alcohol (% Kcals)</td>
<td>1.1±2.5</td>
<td>3.2±6.1</td>
<td>3.8±6.1</td>
</tr>
<tr>
<td>Cholesterol (mg)</td>
<td>339±232</td>
<td>376±211</td>
<td>282±202</td>
</tr>
</tbody>
</table>

P/S                       | 0.69      | 0.76      | 0.59      | 0.75      | 0.45      | 0.78      |

* Differences between baseline and 60 months significantly different, p<.05
# Differences between baseline and 60 months significantly different, p<.05
Table 15

Wives' Change in Diet and Plasma Lipids According to Husbands' Perceived Change in Cooking and Deciding, at Baseline and 60 Months
(values expressed are means and standard deviations)

<table>
<thead>
<tr>
<th></th>
<th>Less Involved</th>
<th></th>
<th>Involved the Same</th>
<th></th>
<th>More Involved</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline 60-Month</td>
<td>Baseline 60-Month</td>
<td>Baseline 60-Month</td>
<td>Baseline 60-Month</td>
<td>Baseline 60-Month</td>
<td>Baseline 60-Month</td>
</tr>
<tr>
<td>N</td>
<td>7</td>
<td>7</td>
<td>89</td>
<td>89</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Age</td>
<td>38.2±13.4</td>
<td>37.7±10.4</td>
<td>41.3±12.0</td>
<td>180.0±30.9</td>
<td>183.5±38.9</td>
<td>180.0±30.9</td>
</tr>
<tr>
<td>Plasma cholesterol (mg/dl)</td>
<td>201.1±60.8</td>
<td>203.4±66.4</td>
<td>194.1±35.6</td>
<td>189.6±36.0</td>
<td>180.0±30.9</td>
<td>183.5±38.9</td>
</tr>
<tr>
<td>Plasma triglyceride (mg/dl)</td>
<td>84.4±63.8</td>
<td>133.1</td>
<td>87.0±54.9</td>
<td>89.6</td>
<td>81.1±34.2</td>
<td>86.3</td>
</tr>
<tr>
<td>Kilocalories</td>
<td>1983±778</td>
<td>1855±360</td>
<td>1827±742</td>
<td>1554±606</td>
<td>1720±589</td>
<td>1563±439</td>
</tr>
<tr>
<td>Protein (% Kcals)</td>
<td>19.2±7.8</td>
<td>5.8±4.4</td>
<td>16.0±5.2</td>
<td>16.0±5.3</td>
<td>15.7±4.9</td>
<td>16.6±4.5</td>
</tr>
<tr>
<td>Fat (% Kcals)</td>
<td>47.7±11.0</td>
<td>35.9±6.9</td>
<td>38.9±8.8</td>
<td>32.0±10.8</td>
<td>35.8±10.3</td>
<td>35.5±5.9</td>
</tr>
<tr>
<td>Saturated (% Kcals)</td>
<td>15.5±6.0</td>
<td>11.9±1.9</td>
<td>13.7±4.7</td>
<td>10.2±4.3 *</td>
<td>12.4±3.9</td>
<td>12.6±4.2 *</td>
</tr>
<tr>
<td>Polyunsaturated (% Kcals)</td>
<td>10.9±5.3</td>
<td>7.7±2.8</td>
<td>8.1±3.6</td>
<td>7.3±4.10</td>
<td>6.0±2.6</td>
<td>6.6±3.0</td>
</tr>
<tr>
<td>Monounsaturated (% Kcals)</td>
<td>17.1±7.4</td>
<td>13.7±3.3</td>
<td>13.9±4.2</td>
<td>11.5±5.0</td>
<td>14.9±5.5</td>
<td>13.4±3.2</td>
</tr>
<tr>
<td>Carbohydrate (% Kcals)</td>
<td>32.7±12.6</td>
<td>47.9±5.7</td>
<td>42.8±10.8</td>
<td>49.3±12.2</td>
<td>42.8±13.7</td>
<td>42.4±10.7</td>
</tr>
<tr>
<td>Alcohol (% Kcals)</td>
<td>0.4±1.0</td>
<td>0.6±1.4</td>
<td>2.0±5.1</td>
<td>2.6±5.1</td>
<td>5.7±7.1</td>
<td>5.4±7.9</td>
</tr>
<tr>
<td>Cholesterol (mg)</td>
<td>319±144</td>
<td>210±58</td>
<td>323±239</td>
<td>167±13</td>
<td>250±143</td>
<td>170±52</td>
</tr>
<tr>
<td>P/S</td>
<td>0.68</td>
<td>0.66</td>
<td>0.68</td>
<td>0.82</td>
<td>0.53</td>
<td>0.62</td>
</tr>
</tbody>
</table>

* Differences between baseline and 60 months significantly different p<.05
Table 16

Wives' Change in Diet and Plasma Lipids According to Husbands' Perceived Change in Shopping, at Baseline and 60 Months
(values expressed are means and standard deviations)

<table>
<thead>
<tr>
<th></th>
<th>Less Involved</th>
<th>Involved the Same</th>
<th>More Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>60-Month</td>
<td>Baseline</td>
</tr>
<tr>
<td>N</td>
<td>29</td>
<td>29</td>
<td>66</td>
</tr>
<tr>
<td>Age</td>
<td>41.2±12.8</td>
<td>37.0±9.6</td>
<td>37.9±10.4</td>
</tr>
<tr>
<td>Plasma cholesterol (mg/dl)</td>
<td>198.9±41.8</td>
<td>201.0±46.2</td>
<td>193.8±46.0</td>
</tr>
<tr>
<td>Plasma triglyceride (mg/dl)</td>
<td>87.0±47.8</td>
<td>104.8±82.1</td>
<td>84.0±55.6</td>
</tr>
<tr>
<td>N</td>
<td>29</td>
<td>28</td>
<td>66</td>
</tr>
<tr>
<td>Kilocalories</td>
<td>1924±714</td>
<td>1622±551</td>
<td>1807±759</td>
</tr>
<tr>
<td>Protein (% Kcals)</td>
<td>16.5±5.4</td>
<td>17.1±4.3</td>
<td>16.2±5.4</td>
</tr>
<tr>
<td>Fat (% Kcals)</td>
<td>41.6±9.8</td>
<td>32.7±9.0 *</td>
<td>39.2±8.7</td>
</tr>
<tr>
<td>Saturated (% Kcals)</td>
<td>14.6±4.8</td>
<td>10.4±3.6 *</td>
<td>13.9±4.7</td>
</tr>
<tr>
<td>Polyunsaturated (% Kcals)</td>
<td>8.5±3.5</td>
<td>7.6±3.4</td>
<td>8.0±3.6</td>
</tr>
<tr>
<td>Monounsaturated (% Kcals)</td>
<td>15.3±4.9</td>
<td>11.7±4.2</td>
<td>14.3±4.5</td>
</tr>
<tr>
<td>Carbohydrate (% Kcals)</td>
<td>40.6±11.4</td>
<td>48.4±10.9</td>
<td>41.7±11.2</td>
</tr>
<tr>
<td>Alcohol (% Kcals)</td>
<td>1.3±3.9</td>
<td>1.9±43</td>
<td>2.6±5.7</td>
</tr>
<tr>
<td>Cholesterol (mg)</td>
<td>368±242</td>
<td>184±140</td>
<td>307±224</td>
</tr>
<tr>
<td>P/S</td>
<td>0.65</td>
<td>0.80</td>
<td>0.66</td>
</tr>
</tbody>
</table>

* Differences between baseline to 60 months significantly different, p<.05
# Differences between baseline to 60 months significantly different, p<.05
from 41.6% to 32.7% of kilocalories for those whose husbands did less, and from 39.2% to 32.0% for those whose husbands did not change their shopping involvement. In addition, the women whose husbands did more shopping showed a significant increase in their saturated fat consumption, from 10.7% to 11.8% of kilocalories as compared to those whose husbands did not change their shopping behavior (13.9% to 10.3%) (p < .05). The women whose husbands did less shopping reported a drop in their saturated fat consumption from 14.6% to 10.4% as compared to those whose husbands did not change. Thus, the women whose husbands said they did more shopping showed a change in diet contrary to the suggestions made by the Family Heart Study.
DISCUSSION

Participants in the Family Heart Study are representative of white middle-class families, and the cohort of 109 couples represent a subsample of healthy, nonpregnant couples who were motivated to join a 5-year dietary intervention program. Their reported dietary intake was comparable to the reported estimates of the American diet [21]. The plasma lipids of the men and women were very similar to the levels reported by the Lipid Research Clinic's Prevalence study [77], in which it was found that the mean plasma cholesterol levels of American white men, age 35-39, was $200.6 \pm 13.7$ mg/dl and of American white women, age 35-39, was $188.3 \pm 13.8$ mg/dl. Plasma triglycerides were somewhat less than that reported by the LRC trial.

Dietary Change

Diet change was evaluated by the 24-hour recall, which has been in use since the 1950's; however, its validity and reliability have been questioned in the literature [78-81]. There is general agreement that no one method of assessing dietary intake is perfect. The major drawback of the 24-hour recall is that a single recall cannot be used to assess the usual diet of an individual. However, this method has been shown to be useful and reliable when comparing groups of individuals [71,72].

Even though every attempt was made to elicit unbiased responses the potential for bias existed. After 2 or 3 years in the study, most participants had some idea of what was considered a "good diet" and wanted to demonstrate to the dietician that they had learned what they
were supposed to. There was undoubtedly some of what Madden has called "talking a good diet" [81]. On the other hand, there were participants who seldom came to small group discussions, but regularly attended clinics where data was collected, and presumably had less of a desire to show their knowledge. Due to scheduling serendipity, the clinic dietician was often not the same individual who ran the participant's small group discussion, which may have added a measure of anonymity and helped the participant to be able to "tell all," including those foods known to be discouraged. Other methods of dietary assessment developed by the Family Heart Study staff were used in the study, but are not reported here because they are not documented in the literature at this time.

In this sample of 109 couples, some dietary change was seen. While neither husbands nor wives as a group reached the goal of the alternative diet (20% fat, 100 mg cholesterol, P/S = 1.3), significant changes were made. The quantity of dietary fat decreased in the women, and the nature of fat consumed changed in both men and women, as can be seen by the increase in ratio of polyunsaturated to saturated fat. In addition, cholesterol consumption decreased significantly. These changes are consistent with Phase 1 of the alternative diet [39], in which lower fat foods are substituted for high fat foods, and margarines with high P/S ratios are used instead of butter. Eggs and organ meats are avoided, as are high fat dairy products.

There was undoubtedly underreporting of kilocalorie intake. The women's reported energy intake significantly decreased over the 5-year period, even though their average body weight did not decrease. Had
they in fact decreased their daily caloric intake as a group, their mean body weights would have decreased. The men's reported energy intake was not significantly lower at 60 months than at baseline, although the lack of statistical significance may be due to the large variability seen. The body weights of the men remained essentially the same as at baseline.

It is interesting to note that the dietary cholesterol intake changed from 316 mg to 170 mg in the women and 348 mg to 279 mg in the men. The baseline values are lower than what has been described as the mean intake for the United States population in 1977 (520 mg/day for men and 370 mg/day for women) [82], and the decrease to 170 mg and 279 mg constitutes a large drop from prior estimates of 500-700 mg per day in the late 1960's [28]. Selective reporting may have contributed to this drop; virtually every participant knew that egg consumption was discouraged, and it cannot be ruled out that some of the "missing calories" of both the men and women were made up of eggs, cheese, and butter. This was probably more true for the women than for the men, as the cholesterol content per 1,000 kilocalories decreased from 170 mg/1000 Kcals to 108 mg/1000 Kcals for women, while for the men it decreased less, from 133 mg/1000 Kcals to 119 mg/1000 Kcals.

Limitations of methodology notwithstanding, there is evidence of a movement towards the goals of the alternative diet at a rate that surpasses current changes by the U.S. population as a whole in the American diet. Recent dietary surveys have shown that from 1963 to 1981 there was an increase in consumption of vegetable fats and oils and a decrease in the use of foods that are high in saturated fat and cholesterol, such as butter, cream, and eggs [2,82].
The dietary changes seen in this study are in contrast to those seen in men in the Lipid Research Clinics Primary Prevention trial, where daily cholesterol consumption decreased from 309 mg to 255 during the first year of intervention and then increased to 284 mg/day by the seventh year [83]. It should be noted that the LRC trial attempted to alter the diets of both the drug treatment group and the placebo group, although the goals of diet change were considerably more conservative, in that dietary cholesterol was to be decreased to 400 mg per day and total fat content decreased to 38% of kilocalories [83]. The P/S ratio of the diets of men in the LRC trial were lower to begin with than those seen in this study (.48 in LRC versus .67 for women and .60 for men in the present study). In both studies, the P/S ratio increased.

Direct comparison of dietary results in this study with results in Witschi and Stare's [53] family study is difficult because of different methodology. Nonetheless, some useful comparisons can be made. Consumption of food groups that contain saturated fat and cholesterol were decreased during the 4-week study period. Polyunsaturated fat consumption increased, undoubtedly because the participants were provided with cooking oil and margarine with a P/S ratio of 4.0. In light of the return of plasma cholesterol levels to baseline levels after the diet period ended, one can conclude that the dietary changes did not persist after the 4-week intervention period. Because of the tendency towards backsliding in dietary and behavior change [44,47], the diet changes seen in the present study are significant. Although the goal was to decrease fat consumption to 20% of kilocalories and reductions to only 32% and 34% were seen, this
decrease was maintained for 5 years. Similarly, cholesterol consumption was decreased and maintained at a level considerably below the norm for the United States.

**Plasma Lipid Change**

The plasma cholesterol and triglycerides of the 109 couples as a group did not change significantly after 60 months of dietary intervention. Assessment of compliance in the Family Heart Study, and therefore prediction of actual plasma lipid change resulting from diet change, is indeed difficult, because participation in the study was entirely voluntary. That is, of the total number of couples in this study, not everyone for whom there are diet and lipid values actually came to clinics or the intervention. In effect, only a small number of individuals received the full dietary change "treatment." Lack of response in plasma cholesterol for the group as a whole is also undoubtedly due to the small changes in diet that were seen.

The extent to which plasma cholesterol changes in response to dietary manipulations can be predicted based upon a regression equation developed by Hegsted et al. [15]. Table 17 shows the theoretical calculated plasma cholesterol decrease when the diet is changed from the typical American diet to Phase 1 of the alternative diet, and the predicted reductions from reported dietary intake in plasma cholesterol in this study. The Hegsted equation overestimated the changes that were observed in this study, perhaps because the regression equations were derived from data from men with higher initial plasma cholesterol levels than the men and women in
Table 17
Comparison of Predicted and Observed Changes in Plasma Cholesterol and Diet Consumption

<table>
<thead>
<tr>
<th></th>
<th>Total Fat</th>
<th>Sat. Fat</th>
<th>Polysat. Fat</th>
<th>P/S</th>
<th>Cholesterol mg/day</th>
<th>Predicted Change in Plasma Cholesterol mg/dl</th>
<th>Actual Change mg/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>American diet</td>
<td>40</td>
<td>15</td>
<td>6</td>
<td>0.4</td>
<td>500</td>
<td>-18</td>
<td></td>
</tr>
<tr>
<td>Alternative diet</td>
<td>35</td>
<td>14</td>
<td>9</td>
<td>0.6</td>
<td>350</td>
<td></td>
<td></td>
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<tr>
<td>Phase 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>39</td>
<td>13</td>
<td>8</td>
<td>0.6</td>
<td>348</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-month</td>
<td>35</td>
<td>12</td>
<td>8</td>
<td>0.8</td>
<td>279</td>
<td>-9</td>
<td>0</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>39</td>
<td>14</td>
<td>8</td>
<td>0.7</td>
<td>316</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-month</td>
<td>33</td>
<td>11</td>
<td>7</td>
<td>0.8</td>
<td>170</td>
<td>-17</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Calculated according to formula of Hegsted, McGandy, Meyers and Stare [15] and from Connor and Connor [40].

*Percentage of kilocalories
this study. Although the women's plasma cholesterol did not change, the changes in their diet were sufficient to calculate a decrease in predicted plasma cholesterol very similar to that predicted in the change from the American diet to Phase 1 of the alternative diet. This apparent lack of change in the plasma cholesterol can be compared with the estimated increase in plasma cholesterol over the 5 years of the study.

The estimated increase, based upon cross-sectional analysis, is in the order of .9 mg/dl of plasma cholesterol per year for men, and 1.9 mg/dl per year for women. Using these estimates, the mean plasma cholesterol of the women should have risen 9.5 mg/dl and that of the men, 4.5 mg/dl after 5 years. Indeed, the mean plasma cholesterol concentrations of two control groups in the Portland area rose in the predicted manner [84]. The fact that the plasma cholesterol levels in these subjects did not show the typical rise with age may well be a result of the small but significant dietary changes seen here and is a positive finding.

Division of Labor

Participants in the Family Heart Study responded to questions regarding their perception of who usually decides what the family will have to eat, who usually does the cooking and who usually does the grocery shopping. Both husbands and wives indicated that the wives usually performed these tasks. This is consistent with other reports that have examined food-related family roles [55-64]. Women's domination of the tasks persists despite an increase in women's
participation in the workforce and a cultural shift towards more egalitarian marriages [55].

The wives in this study have most of the stated responsibility for deciding, cooking and shopping, which is in complete agreement with the literature. While these data and others indicate that the wives have most of the responsibility, Cosper and Wakefield found that among various subsets, the husbands exerted the strongest influence on the women to try a new food, followed by doctors, nurses, or nutritionists [85].

Data from this study are similar to Burt and Hertzler's findings, with 60% of the women and 67% of the men indicting that the wives do most of the shopping, and 29% and 34%, respectively, indicating that it was shared [58]. Interestingly, 3% and 5% reported that the father does the shopping, in contrast to none in Burt and Hertzler's study.

The perception of who does what task was measured in this study, that is, the husbands and wives related to the interviewer what they thought was the division of labor; the actual division of labor can only be inferred from an examination of both spouses' responses, in terms of their agreement. When asked a question that forced a choice of six possible answers, the spouses responded in the same way, i.e., that it was mostly the mother who did the cooking, deciding and grocery shopping. However, when asked the open-ended question "Who usually does the cooking?" (and deciding and shopping), there was a discrepancy between the husbands' and wives' responses. The husbands consistently thought they did more than their wives thought they did, and the wives consistently thought that they did more than their husbands gave them credit for. This was especially true as far as
dishwashing was concerned, where the discrepancy between husbands' and wives' responses was the greatest. Lovingood and Firebaugh [57] had similar results when they correlated the degree of sharing of household tasks: the wives perceived more responsibilities for themselves than their husbands acknowledged. Their findings differed from those of Heer [86] who found that each spouse tended to minimize their own influence in decision making.

The discrepancy between the responses to the two questions may be due to a methodological problem--both spouses may agree that the mother usually does the task, but their definition of "usually" may differ.

Unique to this study is the 5-year contact with the entire families. Although the intervention was not aimed at changing the division of household labor per se, active involvement of the family in the study provided the opportunity for family members to become involved with food-related tasks. Specifically, the intervention focused on trying to raise the consciousness of all the participants with respect to what they eat. It was hypothesized that heightened awareness would result in more involvement in the menu planning, food purchasing and preparation by those family members not usually involved, i.e., the husbands.

Family influences on food behavior and dietary quality have been examined in the literature. Findings suggest that the immediate family has the greatest influence on foods eaten [87]. Women make most of the decisions and carry out the tasks, but, by their own admission, they make their decisions based upon what their husbands desired [58]. In the Family Heart Study, both spouses (and children)
were invited to the small group discussions where menu planning, recipes, and grocery shopping were discussed. Over the 5-year period many men who had had virtually no experience with food-related tasks attended these groups.

From baseline to 60 months the overall distribution of the division of labor did not change significantly, indicating that the women at the end of the study still had overall responsibility for these tasks. While there was an increase in the number of husbands who increased their involvement, the general trend was for the women to continue to have main responsibility. While not statistically significant, according to both the husbands and the wives, the number of fathers usually responsible for the cooking and deciding increased over the course of the study. At the same time, fewer men and women reported that cooking was a family affair. The lack of overall statistical significance between the husbands' and wives' responses could be a result of the general agreement that the mothers were responsible for the cooking and deciding. The same situation may have occurred in the comparison of baseline to 60 months, since the women continued to do most of the tasks. Changes in fathers' responses were not great enough to significantly alter the overall pattern of task allocation.

In contrast, there was a change in shopping behavior over time. The husbands' and wives' responses were significantly different and, in fact, changed in opposite directions, with more wives indicating that they usually did the shopping and fewer husbands indicating that the wives usually shopped. Of course, it cannot be determined who
actually did this task, only the perception of who was doing what. According to the husbands, shopping became more of a family affair after 60 months, while according to the wives, shopping was something that they did more often, with less involvement of other family members. It is unknown in this study who decides what food will actually be purchased by the shopper or what constitutes a shopping trip. The husbands might have thought that frequent trips to neighborhood stores for milk or bread constitute "usually shopping," while the wives might have interpreted the question to relate to major shopping trips where a large amount of food is purchased at a time. This ambiguity was also present in the studies of Burt and Hertzler, Lampkin et al., and Schaefer [58,59,87].

Change in Involvement in Food-Related Tasks and Dietary Change

Although it was not a stated goal of the Family Heart Study to try to alter the division of labor in the families, it was anticipated that increased family members' participation in food-related activities would result in the whole family's involvement in the study. If the men participated to a greater extent in cooking, shopping and deciding what the family would have to eat it might help the families to change their dietary patterns. Investigators have hypothesized that women are the "gatekeepers" to the health habits of the family [65] but respond to their husbands' wishes [58,59,87]. The fact that the woman is the sole food provider may actually be an obstruction to dietary change. It is risky for a wife to present new foods to a spouse who is distant from the whole process of deciding
what to eat, shopping for food, and cooking, and therefore there may be an underlying pressure to not change food-related habits. In addition, wives may not want their husbands to impinge upon their sphere of influence, i.e., the kitchen.

In this study, most of the men did not change their involvement in cooking, deciding, or shopping. Apparently the wife remains the primary menu planner, cook, and grocery procurer in typical American families, even when husbands are exposed to a nutrition intervention program. Nevertheless, the men and women in this study were divided into groups that were delineated according to whether the men indicated they had increased, decreased, or maintained their involvement in three food-related tasks, when asked at baseline and at 60 months. Only a small percentage of the men changed their involvement at 60 months.

Post hoc Newman Keuls analysis carried out on the analysis of variance of differences indicated no great difference existed among the three groups. It is difficult to interpret the results of this analysis since the number of individuals in each group is so diverse. Several statistically significant differences were found but do not necessarily imply that real dietary differences were present among the three groups. However, some interesting relationships were found. Based upon these groupings, there were no differences in the changes in plasma lipids between the groups of men or their wives. In terms of diet, significant differences were seen in the men and their wives who said they were more involved in shopping.

Contrary to the hypothesis that an increase in husbands' involvement would favorably affect the wives' diets, the women whose
husbands said they did more shopping at 60 months increased their consumption of calories derived from fat, and increased their saturated fat consumption. This occurred in spite of the significant decrease in dietary fat, and saturated fat of the group of women taken as a whole. The men, however, who reported an increase in shopping did not show a statistically different level of fat intake.

These results are surprising and do not support the original hypothesis. It is possible that husbands who increased their shopping became more involved in food-related tasks but made food choices that were not based upon information gathered from the Family Heart Study. Perhaps the act of shopping brings some nutritional awareness to the shoppers, but those not shopping do not receive the benefits of the heightened awareness and continue to eat in their usual way.

**Summary and Conclusions**

The division of household food-related labor was assessed in 109 couples who participated in the Family Heart Study. At baseline, the majority of men and women indicated that the women did the most of the cooking, shopping and deciding what the family will have to eat. After 5 years of participation in a dietary intervention program, small but statistically significant dietary changes were seen. Both spouses reported consuming diets that had higher ratios of polyunsaturated to saturated fat, and less cholesterol at 60 months than at baseline. These dietary changes were not sufficient to produce a plasma lipid lowering effect. However, the plasma lipids
did not show the rise with age that is typical in United States populations.

The division of labor did not change substantially after 60 months of dietary intervention. Both men and women indicated that the wives continued to do most of the cooking, deciding and shopping, although there was less unanimity concerning the shopping. The group of husbands that increased their involvement in cooking and deciding did not have lipid or diet changes that substantially differed from those that did not change or lessen their involvement. Neither did the wives of the men in these groups show large differences in their diets. The wives of the men who said that they did more shopping increased their fat and saturated fat consumption as compared to the rest of the wives. Although both spouses indicated that the mother did most of the tasks, there was a trend towards more involvement by the men that did not achieve statistical significance.

The literature concerning family food choices indicates that women are the gatekeepers of the family's nutritional habits, although, paradoxically they are most likely to respond to their husbands' desires. The results of this study indicate that women maintain their role of menu planners, cook and grocery shopper despite the participation of the entire family in a nutrition intervention program.
REFERENCES


### Appendix 1

#### Nutrient Composition of the American Diet and the Alternative Diet*

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Appendix 2

Plasma Lipids and Lipoproteins

Fasting venous blood samples were collected into tubes containing dry ethylene-diamene tetracetic acid (EDTA). After the plasma was separated from the red cells by centrifugation, the samples were stored at 4°C until analyzed. Analyses were initiated within 24 hours of sample collection. The blood specimens were analyzed in the Lipid-Atherosclerosis Laboratory at the Oregon Health Sciences University. The laboratory procedures for the plasma lipid and lipoprotein determinations are in compliance with the standardization and surveillance programs of the Center for Disease Control laboratory in Atlanta, Georgia. Values were measured according to procedures established by the Lipid Research Clinics of the National Heart, Lung, and Blood Institute.* Plasma total cholesterol and triglyceride concentrations were measured fluorometrically with the AAII Autoanalyzer (Technicon Instruments Corporation).

Appendix 3

19. How often do you eat breakfast during the week? (19) 

A. Tell me about your meal schedule at home during the week? . . . on weekends?

20. On Weekdays, how many days do you usually eat breakfast together as a family?
   1 = never  2 = 1 or 2 times  3 = 3 or 4 times  4 = 5 or more  8 = NA/DK  9 = REF. (20) 

21. How often do you eat lunch during the week? (21) 

22. On weekdays, how many days do you usually eat Lunch together? (22) 

23. How often do you eat dinner during the week? (23) 

24. On weekdays, how many days do you usually eat Dinner together? (24) 

25. On Weekends, do you usually eat Breakfast together or separately?
   1 = never  3 = Sunday only  8 = NA/DK
   2 = Saturday only  4 = Saturday and Sunday  9 = REF. (25) 

26. On weekends, do you usually eat Lunch together or separately? (26) 

27. On weekends, do you usually eat Dinner together or separately? (27) 

B. 28. Who usually decides what the family will have to eat?
   1 = mother  2 = father  3 = children  4 = other household member
   5 = mother and father  6 = parents and children  8 = NA/DK  9 = REF. (28) 

What percentage of the time do these individuals decide what the family will eat?

29. Mother? (29) 

31. Father? (31) 

33. Children? (33) 

35. Other? (35) 

C. 37. Who usually does the family grocery shopping?
   1 = mother  2 = father  3 = children  4 = other household member
   5 = mother and father  6 = parents and children  8 = NA/DK  9 = REF. (37) 

38. How often is a shopping list used?
   1 = always  2 = usually  3 = occasionally  4 = never
   8 = NA/DK  9 = REF. (38) 

What percentage of the time do these individuals do the family grocery shopping?

39. Mother? (39) 

41. Father? (41) 

43. Children? (43) 

45. Other? (45)
How many times per month do these individuals usually shop?
1 = daily  2 = 4–6 times per week  3 = 3 times per week
4 = 2 times per week  6 = less than weekly  8 = NA/DK  9 = REF.
47. Mother? □ (47)
48. Father? □ (48)
49. Children? □ (49)
50. Other? □ (50)

D. 51. Who usually cooks the meals at home?
What percentage of the time do these individuals cook the family meals?
52. Mother? □ (52)
54. Father? □ (54)
55. Children? □ (55)
58. Other? □ (58)

E. 60. Who usually does the dishes after meals?
What percentage of the time do these individuals do the dishes?
61. Mother? □ (61)
62. Father? □ (62)
65. Children? □ (65)
67. Other? □ (67)

F. 69. Approximately how many times in the past month have you eaten out at a friend's home? (number of times in past month)
71. How many times in the past month have you eaten out at restaurants as a family? (number of times in past month)
73. Where do the children generally eat their lunch?
1 = take lunch to school  2 = eat at home  3 = eat at school cafeteria
4 = both 1 and 3  5 = other  8 = NA/DK
74. Where does husband eat lunch?
1 = eats out  2 = at home  3 = takes lunch
4 = both 1 and 3  5 = other
75. Where does wife eat lunch?
1 = eats out  2 = at home  3 = takes lunch  4 = both 1 and 3
5 = other
Appendix 4

Specific Intervention Modalities: Education Component

Small Group Discussions

The format of each evening small discussion group involves, as does the entire project, a blend of nutrition and psychology. While the subject matter for each group discussion is developed by the entire staff, each meeting is conducted under the joint leadership of a dietitian and a psychologist.

Originally, the families were divided into 23 groups of 8 to 10 families per group. At the end of two years the families were consolidated into 18 groups to provide a base of 8 to 10 families for each group who attend on a regular basis.

The discussion groups for each of the five years of intervention will now be described in detail.

Intervention Year 1: During the first year the content of the group discussions was designed to provide a great deal of food information. As the members became better acquainted and more comfortable in sharing their experiences, the focus of the discussion was shifted more to the members. The leader's role shifted towards that of a facilitator. The goal was to stimulate the participants to think about their food habits and to encourage self-evaluation. The families were always reminded that any food habit changes were strictly their choice. Near the final months of Year 1 some groups began to contract with the leaders on their choice of a behavior change to try for the next month and then to report on successes or failures. The group discussion topics are outlined as follows.

1) Meat and egg yolk - The purposes were to introduce families to two concentrated sources of cholesterol in the diet and to discuss how they might eat less of these foods. We provided the families with samples of foods prepared without egg yolk: egg salad sandwiches and oatmeal crisps. A fully redeemable coupon for an egg substitute was given to each family.

2) Breakfast without eggs - The purposes were to discuss what the families were eating for breakfast, the choices for breakfast other than bacon and eggs, and to suggest that the families try something new for breakfast. A breakfast item was served: fruit bran muffins. Each family received a free sample of a blueberry muffin mix with modified recipe directions.

3) Fats and oils - The purposes were to make the participants aware of the more polyunsaturated fats, to suggest that they eat and cook with a more polyunsaturated fat, to try lower fat salad dressings, to use less spread on bread products and to bake with cocoa instead of chocolate. The families were served foods lower in fat: selected salad dressings and baked tortilla chips. Each family was given a free sample of Puritan Oil.

4) Margarines and dairy products - The purposes were to suggest that the families use a margarine with a P/S value greater than 1, to use a lower fat milk in cooking and drinking, to try lower saturated fat creamers, to try a mock sour cream and lower fat frozen desserts. Selected low fat dairy products were served: frozen yogurt parfaits and mock sour cream. A coupon for Pedigree evaporated skim milk was given to each family.
5) **Cheese** - The purposes were to make the families aware of the lower fat cheese choices available in Portland and to suggest that the families cook with and eat lower fat cheeses. Products made with lower fat cheeses as well as selected lower fat cheeses were tasted: cheese bread, cheese cake and low fat cheeses. A partially redeemable coupon for Countdown was given as well as a box of no-bake cheesecake with recipe modifications.

6) **Meat** - The purposes were to make the families aware of the cholesterol, fat and calorie content of meats, fish and poultry, to suggest that they try a lower fat meat, fish and poultry, to trim their meat well, to try poultry without skin and to purchase a lower fat ground beef. A dish using lower-fat meat was served: cashew chicken. Egg substitute coupons were given to each family.

7) **Grains and beans** - The purposes were to discuss the incorporation of more whole grains and beans into the diet by trying whole wheat bread, whole grain cereals, side dishes of bulghur, barley or rice, bean soup, etc., and to talk about the caloric, lipid and economic benefits of using grains and beans. Pizza rice casserole, black bean soup or hummus were served. A box of oatmeal and a coupon for Old El Paso Refried Beans were given to each family.

8) **Fruits and vegetables** - The purpose was to encourage the families to use more fruits and vegetables. Suggestions included using fruit for dessert, serving one and possibly two vegetables at the main meal and including fruit and vegetables in the lunch. Gazpacho was served and Fleischmann's margarine coupons were distributed.

9) **Spices** - The purposes of this session were to make the families aware of the sources of empty calories or additives in their diet: sugar, fat and salt, to suggest that they be more selective in their use of these items--to think of them as spices to enhance the flavor of other foods, and to put the role of other food additives in proper perspective in relationship to disease prevention. Low-fat carrot cake was served and angel food cake mix was given to each family.

10) **Eating out** - The purpose was to discuss eating out: what choices are available, what demands one might make, how to cope with eating out when attempting to eat differently from the majority, etc. Pizza was sampled and margarine coupons were given out.

11) **Potluck** - The final yearly meeting was a potluck dinner held in a participant's home and was simply a social event. Families contributed food dishes of their own choosing.

**Intervention Year 2**

A major focus of the discussion groups in year 2 was on methods of habit change and on the factors that support or hinder habit change, specifically with regard to the alternative diet. Dietary change was viewed not simply as
eating different types of foods, but rather in the broader context of the whole family system. Who buys the food, who influences what is bought, what main dishes are prepared and who or what influences such preparation were questions we asked of the families. This heightened awareness of the meaning and function of "food behaviors" was fostered to give the families more understanding of and control over the kinds of foods purchased and consumed within the home.

The effect of stress and family support on habit change provoked meaningful interchanges designed to help group members identify obstacles to change and to explore new means to facilitate progress toward their dietary goals. Specific behavioral contracts to try new behaviors and to record the frequency at which they occurred over the course of the month were implemented by the groups. Careful use of group dynamics helped to encourage personal disclosures about behavior change problems among participants. A strong sense of group support appeared to develop within the groups such that families offered helpful suggestions to each other and shared recipe ideas.

A special effort was made in year 2 to learn from participants what aspects of group experience they had found to be most helpful. Their reports often suggested the demonstration of different recipes during the meetings had been the greatest stimulus to get them to try these same new recipes at home. Thus, we added more cooking demonstrations to our evening meetings. Other important feedback from the families concerned the frequency of group meetings. Originally we had decided to meet every other month in the second year, with a potluck concluding the year's events. Feedback from the members suggested that the long gaps between meetings had decreased motivation and resulted in some backsliding. Since most families felt that monthly meetings were more helpful in providing support for their behavior change goals, we returned to a more regular schedule.

Group discussion topics for Year 2 were:

**Group Discussion #1: FOOD BUYING**

Behavior Goal: Buy a new product to have available for home preparation.

Food Goal: Make a lower-fat food purchase (for specific goals).

Food Served: Tabouli. Optional: Demonstration of falafel.

Handout: "What's in your cupboard?"

Free food: Puritan O11% Planter's Unsalted Peanuts

**Group Discussion #2: MAIN DISHES**

Behavior Goal: Have each family member define specific food-habit goals to accomplish over the next 2 months.

Food served:
Choice of:
1) Demonstration of easy fish dish, i.e. "Fish a la Mistral" or fish soup
2) Demonstration of tostadas as a quick main dish
3) Demonstration of bean sprout tuna chow mein

Handout:
"Poultry, fish, and meatless dishes"

Free food:
Margarine coupon

Family Heart Study goals for Years 1 and 2 were mailed out before Discussion #3 or were handed out at Discussion #2.

Group Discussion #3: STRESS

Behavior Goal: Individualized for each family member's needs after reviewing Family Heart Study Years 1 and 2 goals

Food Goal: Optional: Extra session can be planned for further discussion if enough interest

Food served: Cookies and juice/or seasonal fruit

Handout: Handout showing results of Baseline SCL-90 Data "Seven days of menu ideas for a busy week"

Free food: Old El Paso® Refried Beans coupon and Royale® Cheesecake mix

Group Discussion #4: CHANGING HABITS - AN OVERVIEW

Behavior Goal: Have each person select a behavior and decide to modify it over the next month using steps as described during discussion.

Food Goal: Year 2 goal for grains, beans, fruits, and vegetables
Grains - 1 serving at every meal
Beans - 1-2 cups per week
Fruits - 2-3 servings every day
Vegetables - 1-2 cups per day

Food served: Beef and bean ragout
Beef barley casserole
Acapulco bean casserole or Mexican bean pot (meatless)

Handout: 1. "Tips on setting yourself up for success"
2. "Grains, beans, fruits, and vegetables"

Free food: Puritan Oil® and Ragu Sauce® coupon

Group Discussion #5: FAMILY SUPPORT IN CHANGING HABITS

Behavior Goal: Individualized and selected by each family member

Food Goal: Eggs, dairy, and cheese

Handout: Steps to enlist family support

Free food: Margarine and egg sub coupons
Group Discussion #6: F.M.S. GROUP SUPPORT SYSTEMS WHILE CHANGING HABITS

Behavior Goal: Individualized and selected by each family member
Food Goal: Sugar, salt, and fat
Handouts: Group support systems
Free food: Oatmeal, Lite Salt

Optional: Extra session can be planned with enough interest for a review session on coronary heart disease.

End of Year 2 potluck for each group.

Intervention Year 3

The topics for Year 3 are best described as a blend of specific nutritional/health information and behavioral techniques aimed at helping families implement the nutritional suggestions. Previously, the groups tended to be either behavioral or didactic. Year 3 was a major transition period in our intervention in that the aim was to clearly outline the more demanding dietary changes necessary to attain the endpoint alternative diet goals at the completion of the project. Specific behavioral goals, involving group self-assessment exercises and a variety of behavior techniques were developed to help families integrate the new guidelines into their lifestyles. The increased cohesiveness of the groups provided a more open and comfortable climate where the families could voice specific problems with dietary goals. Our method and goal as staff members was to encourage a group atmosphere that allowed for such an exchange of feelings and ideas regarding behavior change in the direction of the alternative diet.

Year 3 discussion groups emphasized either motivational issues (e.g., the variety of health, economic and weight loss benefits of the alternative diet) or the specific categories of food changes that were suggested (e.g., fat in the diet). The groups, directed toward specific food changes, generally involved the following elements: 1) self-assessment (what am I doing now?); 2) specific guidelines (what is recommended and what does it mean in terms of the way I eat?); 3) planning for change (e.g., setting goals, overcoming obstacles and deciding on specific steps to implement new behaviors). The group discussion topics for year 3 were:

1. Cardiovascular risk factors and other reasons for eating the alternative diet
   a. Goals: to help individuals clarify their reasons for working toward a lower fat, lower cholesterol diet by estimating their risk for coronary disease as well as other diseases associated with the overconsumption of fat and cholesterol.
   b. Handout on risk factors and other diseases filled out within the group
   c. Food freebie: margarine coupon, Puritan Oil
   d. Food sampled: Far-East Chicken
2. The Fats of Life
   a. Goals: To have participants become more aware of what food sources have fat—both hidden and visible; have each member assess what food changes they've made in their diets; reiterate the FHS endpoint goal of 20% fat and 5% saturated fat.
   b. Group includes behavioral demonstration of the visible and hidden fat in a daily diet accompanied by discussion of realistic alternatives.
   d. Food sampled: potato salad with FNS Tangy Dressing or Skinny French Fries

3. Cholesterol Counts
   a. Goals: Define the alternative diet cholesterol goal of 100 mg per day and describe it in terms of food; demonstrate the three ounces of meat, fish and poultry and cheese (1 oz.) which will use up most of a day's allowance of cholesterol; have group members think of meals as being cholesterol free (breakfast, lunch) and have them practice identification of cholesterol-containing foods at home.
   b. Review the cholesterol content in foods.
   d. Food sampled: Chicken Cacciatore

4. Overcoming Obstacles
   a. Goals: To have participants react to previous classes on fat and cholesterol, to explore whether participants are content with changes they've made or do they desire to make more, and develop some specific behavioral plans within their families to help further their progress toward the FHS goals for fat and cholesterol.
   b. Group discussion and demonstration of food dish.
   c. Food freebie: Salt-free peanut butter.
   d. Food sampled: Three meatless sandwiches.

5. Green Light on Grains, Beans, Fruit and Vegetables
   a. Goals: To encourage increased consumption of complex carbohydrates to attain a 20% fat diet while maintaining current weight; to make participants aware of their current eating habits regarding grains, beans, fruit and vegetables; to provide clear understanding of Alternative Diet goals regarding these food groups.
   b. Group Activity: Discussion revolves around a display of actual foods and quantities which could be served on a typical 2500 Calorie high carbohydrate diet.
   c. Food freebie: Uncle Ben's brown rice.
   d. Food sampled: Broccoli-Rice Casserole

6. Grains, Beans, Barriers
   a. Goals: To elicit from participants the many barriers that keep their family from eating a high complex carbohydrate diet; to then provide a forum for dealing with these barriers.
   b. Group Activity: Group members participate in preparation of quick, easily prepared dish, i.e., "Chili Bean Rice", as an example of dealing with "time barriers".
   c. Food freebie: Progresso canned lentil soup.
   d. Food sampled: Bean Lasagna/Lentil Soup.
7. Moving on with Fiber
   a. Goals: To gradually increase daily intake of dietary fiber; to address scientific merits of high fiber diet; to increase awareness of foods high in dietary fiber.
   b. Group activity: A tape and slide show is shown which discusses the topic; display is shown to compare good and poor sources of dietary fiber.
   c. Food freebie: Whole wheat master mix (baking mix with less salt, more fiber) with recipes for pancakes and biscuits.
   d. Food sampled: Crazy Whole Wheat Spice Cake.

8. Reducing Salt - The Pressure's On
   a. Goals: To decrease salt intake in FHS population; to create awareness of large amount of salt present in commercial food products in American supermarkets; to promote purchases of foods which are lower in sodium; to discuss ways to prepare foods with less salt.
   b. Group activity: Large display of commercial products comparing their salt content.
   c. Food freebie: Lite salt, salt-free margarine coupons.
   d. Food sampled: Plain popcorn with Lite salt and seasoned salt substitutes.

9. End of the Year Potluck

Intervention Year 4

Year 4 groups provided some of the most critical intervention in our project to date. Having the experience of three previous years of intervention, through group discussion we were able to incorporate into our planning feedback from participants as well as our own insights. Our thinking and planning has centered on three important concepts: 1) the need for more personal and active participation by members in the groups; 2) more visual and "hands-on" experiences; 3) a more direct problem-solving approach for influencing family motivation and decision-making processes.

To address the first issue, we planned many of the groups to have families actively participate and share from their own eating experiences. Decisions about specific changes were then planned around these experiences. For example, modifying each family's favorite dinner menu to contain less fat (Fat Rap) and finding lunches to fit their own lifestyle (What's For Lunch?) are two examples of how we set the stage for more personal and active participation.

Participant feedback has indicated that those foods which were prepared and tasted at meetings were more likely to be served at home. Hence, several FHS group meetings were planned to include actual food preparation by the participants. Emphasis was placed upon cooking in Cook It Quick and What's For Lunch? groups. Visual demonstrations were used in Hidden Ingredients, and Limit the Meat and Cheese (the amount of fat in the foods was shown by chunks of beef fat or vials of oil). A Tour of Coro's, a local grocery that specializes in bulk grains, beans, fresh fruits and vegetables, emphasized the availability and economy of buying lower-fat foods.

The third factor of addressing family motivation and decision making was a theme that underscored all of our classes. Families are most likely to make changes that are convenient (fit into their lifestyles), reduce their food costs, or have some other immediate value for them. As a result, we tried to show our participants
ways in which changing to the Alternative Diet will easily fit into their daily schedules, save them money, help them lose or control weight (e.g. Weigh to Go group) and appeal to their children (Parent-Tot Group). The Feast or Famine group focused on the frequency and quantity of eating higher-fat foods.

Year 4 Group Discussions

1. Weigh-to-Go
a. Goals: To dispel fear that a high carbohydrate diet means weight gain; to create awareness about the value of the Alternative Diet in controlling one's weight (losing weight for the overweight and maintaining in a healthy fashion for others).
   b. Group activity: To illustrate the differences in kinds and quantities of foods between a high protein and a high complex carbohydrate, low-fat diet; display is shown of 1600 Calorie sample diets: high protein versus high carbohydrate.
   c. Food freebie: Frozen yogurt coupons.
   d. Food sampled: Baked apples with sweetened low-fat yogurt.

2. Limit the Meat and Cheese
a. Goals: To continue to reaffirm the Alternative Diet daily goal of three ounces of meat, shellfish, poultry or low-fat cheese or six ounces of fish; to eat fish more often on a weekly basis; to encourage use of ground turkey or textured vegetable protein in place of ground beef.
   b. Group activity: A display which shows eight items with their hard and soft fat content represented by lard and oil. Better choices are designated.
   c. Food freebie: Textured Vegetable Protein (TVP).
   d. Food sampled: Spaghetti sauces with ground turkey and TVP.

3. Fat Rap
a. Goals: To continue to increase awareness of fat in food preparation; to develop in participants the skill to modify favorite family recipes to lower-fat versions and to encourage this practice to become habitual.
   b. Group activity: Return individual 24-hour dietary recall data showing teaspoons of fat consumed; to have each family work on lowering fat content of a favorite family recipe and produce a version with a high probability of family acceptance—one which they will try in the coming month.
   c. Food freebie: Nabisco® shredded wheat coupon.
   d. Food sampled: Pumpkin Harvest Loaf.

4. Cook it Quick
a. Goals: To have participants become more skilled at serving “quick” Alternative Diet main dishes; to encourage sharing of similar recipes from each participant’s present repertoire.
   b. Group activity: A “hands-on” experience in which the group prepares three to four main dishes during the evening’s session.
   c. Food freebie: Fisher’s® bulgur.
   d. Food sampled: Main dishes, dishes prepared in session.
5. **What's for Lunch?**
   a. **Goals:** To compare and contrast the Alternative Diet goals of seven meatless/cheeseless lunches per week with current consumption; to define and model meatless/cheeseless lunches; to urge preplanning.
   b. **Group activities:** Three actual "model lunches" are examined; participants are invited to prepare basics for next day's sack lunch from an assortment provided.
   c. **Food freebie:** Food-making for lunches.
   d. **Foods sampled:** Assorted whole grain breads, tortillas, bagels; sandwich fillings (egg salad, fruit-nut cottage cheese, hummus, refried beans) and samples of low-fat cookies.

6. **Hidden Ingredients**
   a. **Goals:** To continue to raise awareness of the cholesterol, fat and salt contents of "popular" commercial foods commonly reported on 24-hour dietary recalls; to have participants assess current use of these foods; to model better choices; to learn to become comfortable with "new" food choices.
   b. **Group activity:** View and discuss a display of commercial foods showing their fat, cholesterol and salt contents.
   c. **Food freebie:** NabiscoR shredded wheat coupon and Egg BeaterR coupon.
   d. **Food sampled:** Pancakes from whole wheat master mix.

7. **Corno's Tour**
   a. **Goal:** To show participants a market in their general area where a large assortment of unusual and bulk foods is available.
   b. **Group activity:** A tour of the store with time for shopping if the family desires.
   c. **Food freebie:** Corno's coupon for bulk purchase.

8. **Feast or Famine**
   a. **Goals:** To urge participants to limit "feast days" to once per month when the principles of the Alternative Diet are put aside; to learn about the concept of "trade-offs" or "fat budgeting".
   b. **Group activity:** Role-playing of behaviors during entertaining or restaurant situations.
   c. **Food freebie:** MazolaR oil coupon.
   d. **Food sampled:** Acapulco Enchiladas, Zucchini Boats.

9. **Potluck or Group Dinner in Restaurant**
   a. **Goals:** To encourage group cohesiveness and promote neighborhood support system for the future; to practice newly-developed skills in a supportive setting.

**Intervention Year 5**

Our final year of intervention is a year of further strengthening the families' commitment to the Alternative Diet goals, and preparing them for the difficult task of long-term maintenance. In preparing for the termination of the study, their support systems become very important. We hope to build their sense of community involvement and promote contacts and friendships among the participants. Greater use of low-fat recipes and foods are emphasized through recipe sampling sessions.
and continual reminders of new low-fat products available locally. Recipes from the FHS cookbook are prepared in several participant cooking sessions and their opinions of the finished products sought. Future planning will help foster maintenance of the dietary changes already achieved.

As a staff, we realize that long-term maintenance involves both individual planning and problem solving and the broader support of the family, friends and the community. We have consequently made several efforts to promote significant community change. One effort is the Sharing the FHS Message group, which is designed to teach members in the study to give talks and demonstrations to their friends in the community (churches, schools, businesses, etc.). This actively involves participants as "experts" and develops pride and commitment. It also utilizes them as resource people to encourage peers to make changes and become part of a larger support group. We have also formed small task groups to work with the grocery stores and local schools (see description of these intervention modalities). We are vigorously encouraging greater community visibility for the FHS in whatever economical ways are available.

Finally, we appreciated that five years is a long time and that "fun" plays an important role in intervention by encouraging attendance and promoting friendships. We have combined the need for active participation by members with some "hands-on" experiences to provide several fun evening get-togethers. Families are invited to attend a Pasta Party in which they cooperate in preparing and eating a variety of low-fat pasta dishes. A Mexican Fiesta night with a similar format is also scheduled. The specific plans for intervention in year five are outlined as follows:

1. Launching Year Five
   a. Goals: To create enthusiasm and interest among participants for their final year of the Family Heart Study; to enable the participants to become better acquainted with more people in the study outside their small discussion groups so as to develop a broader support network when the study terminates; to encourage the use of more low-fat recipes.
   b. Group activities: Small groups will be combined for this session, which is held three times during the year. Each evening begins with a discussion of activities planned for the coming year. The primary aim of the evening is to motivate people for the coming, and final, year of the study. Each discussion is led by William Connor, M.D., with emphasis placed on avoiding the "diseases of overconsumption," and a question-and-answer session follows each meeting's discussions.
   c. Food sampled: Six different foods are sampled and evaluated by the families. The recipes are from the FHS cookbook (The Best From the Family Heart Kitchens) and include: Red Root Soup, Sunshine Spinach Salad, Chicken and Vegetables Provencale, Mushroom and Barley Pilaf, Super Stuffed Potatoes, and Apricot Meringue Bars.

2. Taking Stock
   a. Goals: Clarification of participants' personal values regarding foods and health while encouraging them to realistically consider what, if anything, they wish to accomplish before the program ends; encouragement of realistic and specific goal setting for the remaining year; encouragement of the attitude that each person is ultimately responsible for his/her own decisions regarding lifestyle and health.
b. Group activity:

A motivational movie is shown, Live or Die, which is designed to get people to think about the choices they make about how they live. Participants are asked to identify the attitudes and rationalizations shown which can set the stage for later illness. Discussion after the movie centers around personalizing the messages and their implications for our own health.

A handout distributed to participants includes a "Dietary Yardstick" to help participants pinpoint where their diets stood (particularly the fat content) at Baseline, in relation to those of the typical American, how far they have come, and what goals yet remain. We encourage realistic goal setting to help participants achieve what they want by the end of the study. Leaders urge that goals be rewritten to have a 90% probability of success.

c. Food sampled: New products available locally, which we have found to be appropriate to the Alternative Diet, are displayed and sampled: Borden's Lite-Line cheeses, Safeway's salt-free breads, Darigold's Dar-Lite yogurts (non-fat), Campbell's salt-free canned soups, and Laughing Cow's calorie-reduced cheese on Ak-Mak crackers.

3. Sharing the FHS Message -- a two-part workshop

a. Goals: To encourage and prepare participants to become "resource persons" for their communities; to have the resource materials available for their needs; to develop pride in their participation in a heart disease prevention project.

b. Group activity: A variety of materials helpful for presentations about heart disease prevention have been assembled. These include a thirty-minute slide show with accompanying script, projector, and materials for two demonstrations: "The Fats of Life" and "Are Starchy Foods the Real Culprit in Obesity?". Handouts, resource lists for further reading, and "25 Questions and Answers" common to this topic are organized. Session 1: Slide and script program is shown to the interested volunteers who attend; smaller groups form to discuss the series of questions and answers which may arise during their future presentations; projector and slides are made available to check out to practice at home. Session 2: Further suggestions are made regarding speaking to groups. The "how to's" of each demonstration are given. Speaking opportunities can be sought, or the staff will refer participants when speaking requests arrive.

Outcome: In the month following the first of these sessions, three FHS participants gave presentations to their community groups: Two were presented to evening church gatherings and one was given to a corporation meeting during the noon hour. Our materials were used and speakers appeared confident and pleased.
4. **Pasta Party**
   a. **Goals:** To promote low-fat cooking skills; to help participants discover the wide variety and low cost of pastas; to demonstrate how to serve them in new ways; to further strengthen support groups among FHS families.
   
   b. **Group activities:** A ravioli demonstration is followed by a "hands-on" session with participants preparing seven dishes themselves. A variety of hot and cold tasty entrees have been selected to show the versatility of pastas. The group then is invited to eat the foods and discuss their evening's adventure. Twenty-five types of pasta available locally are displayed and the inexpensive costs of each are noted. Cooking tasks and a meal together are planned to promote friendships and further strengthen cohesiveness. Leftovers are sent home with families. Two dishes (manicotti and lasagne) are given as door prizes for families to take home.
   
   c. **Food sampled:** Raviolis (chicken filling, Red Marinara Sauce); Pasta Primavera (stir-fried vegetables with spaghetti); Pasta Salad with Green Sauce (cold, with vegetables, basil seasoning); Alphabet Seafood Salad (alphabets with tuna); Easy Oven Lasagna (prepared with uncooked pasta, ground turkey); Cheese Manicotti (meatless filling, uncooked pasta); Linguine with Clam Sauce (easy white sauce); Linguine with Mushrooms (meatless, white sauce); Delphina's Bread (delicious commercial Italian bread); Pineapple Ice (low-fat dessert made in local ice cream store).

5. **Taking Charge**
   a. **Goals:** To explore the concept of maintenance of lifestyle and dietary changes and to increase awareness of the need for maintenance. Identification of the various support mechanisms that need to be developed to build successful maintenance; to teach steps in problem solving for the purpose of dealing with problematic eating situations; for the participants to leave with their own plans for dealing with the specific situations that make adherence difficult for each individual; to encourage participants to think and act assertively regarding their food choices.

   b. **Group activity:** The difficulties of maintaining any health habit are first discussed by referring to what we call the "Maintenance Puzzle". This tool helps direct attention to the many factors which influence the likelihood of maintaining new eating behaviors and helps individuals realistically plan for the future. Some months earlier, our participants will have completed the Eating Confidence Questionnaire, which was designed to assess problematic social and emotional situations in which individuals are likely to have difficulties adhering to their eating plan. In this session, participants will identify their "high risk" situations (e.g., celebrations, boredom, anxiety), assess the frequency and severity of the problems, develop preferred coping strategies along with the group, and finally, through role playing, practice more effective ways of handling the situations.

   c. **Food sampled:** Hearty Red Snapper Soup.

6. **Mexican Fiesta**
   a. **Goals:** To further emphasize cooking and eating grains, beans, fruits and vegetables; to acquaint participants with ethnic recipes which
are quick and easy to prepare as well as some that are fancy enough for entertaining.

b. **Group activities**: Groups of fifteen adults plus children will prepare and eat a Mexican dinner. Staff members will demonstrate preparation of homemade tortillas, tostados and refried beans using a pressure cooker. A display will be arranged of seasonings and sauces appropriate for Mexican cookery. Two entrees (Tepehuana Chicken with tortillas, Tamale Pie) will be given as door prizes.

c. **Food sampled**: Appetizers--Chow Chow, Guacamole, Bean Dip with low-fat chips, jicama and other vegetables; Soup--Gazpacho; Entrees--Acapulco Enchiladas with Mock Sour Cream, Five Foot Burrito, Tepehuana Chicken with Tortillas, Spanish Rice, Tamale Pie, Tostadas; Dessert--Fresh fruit or Ice.

7. **Fish Night**
   a. **Goals**: To encourage the participants to cook and enjoy more meals with fish; to give participants an opportunity to learn more about fish, see the many varieties, and further develop cooking skills using fish.

   b. **Group activities**: Many types of fish will be on hand and a representative from the Oregon Trawl Commission will demonstrate a variety of cooking methods. Participants will prepare and eat several seafood dishes. Time will be allowed for discussion and questions. A tour of a local Fish Market will be an option for the group.

8. **Last Gasp**
   a. **Goals**: To set the stage for participants to view their time in the Family Heart Study as a positive learning time and to use this experience as a beginning for further change to healthier habits; to give a clear, concise picture of the remaining events for their families in the study (large meetings, newsletters, survey, etc.).

   b. **Group activities**: Give calendar of remaining events. Return Individual 56-month Diet-Habit Surveys and have participants compare their answers to the Alternative Diet goals. To show them that future change should be directed to include more cereals, breads, grains into the diet. The “Fear of Bread” demonstration is presented to show that bread does not make one gain weight.

c. **Food sampled**: Spud Sampling Soiree--Potato Salad; Potato Souffle; and Twice-Baked Potatoes.

d. **Food freebie**: Eggless noodles.

9. **Goodbye Potluck**
   a. **Goals**: To celebrate our time together, the things we have learned, and the healthy changes we have accomplished together; to provide a time for summing up, saying goodbye, and coming to terms with the end of five years' participation in the Family Heart Study.

   b. **Group activity**: Groups will plan their own evenings. Choices of traditional potlucks, ethnic meals, or eating out in a restaurant could be options. Leaders encourage members to recall memorable, humorous, and difficult times they have known in the program and to share their feelings about the program's ending. This will be a time for acknowledging friendships formed, goals achieved, expectations unmet, and the inevitable sadness and loss that comes with the ending of such an important part of one's life. Most of all, this will be a celebration of each family's demonstrated commitment to a healthier way of life.
Appendix 5

Comparison of Excluded Couples and Families, and Primary M-F couples in this Substudy
(values expressed are means and standard deviations)

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<th>Number of couples</th>
<th>Pregnant at BL or 60-month</th>
<th>Medical Exclusion</th>
<th>Divorced</th>
<th>Moved Out of Town</th>
<th>Primary Group (Substudy)</th>
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Dietary Intake/day

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NOTE: Total families joined, 233; data incomplete or couples not M-F, 31.