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Social-psychological factors that affect dietary fat intake behavior of independent-living elderly persons

by

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ABSTRACT

The present study was undertaken to investigate social and psychological factors that influence total and saturated dietary fat intake behavior in an elderly population. A social-psychological model, derived from several health behavior models, was proposed for study. The dependent variable in the model was dietary fat behavior, measured by adoption of 12 food behaviors recommended to reduce total and saturated dietary fat intake. The independent variables in the model were: habit, attitude, ability to perform, role beliefs, personal normative beliefs, social norms, arousal, self-concept, and gender.

The study population included 75 elderly persons aged 60 and older (51 women, 24 men), living in a midwestern urban area. The participants reported low consumption of the high-fat foods in the 12-item index used to measure the dependent variable, dietary fat behavior. Almost all respondents had completed high school degrees (97%), and the average yearly household income of the entire sample ranged from $20,000 to $29,999. The results from this study indicate that the proposed social-psychological model of health behavior is effective in predicting dietary fat behavior in this elderly population. The model with nine predictor variables significantly ($p<0.0001$) explained 50% of the variance

associated with total and saturated dietary fat intake behavior. The significant predictor variables in the model were habit ($p=0.02$), attitude ($p=0.05$), ability to perform ($p=0.01$), role beliefs ($p=0.004$), and gender ($p=0.004$). A reduced form of the model, including only the five significant predictor variables (habit, attitude, ability to perform, role beliefs, and gender) explained 49% ($p<0.0001$) of the variance, similar to that of the full model. This study provides insight into how to direct nutrition education and promotional campaigns toward members of the elderly population, using the information that habit, attitude, ability to perform, role beliefs, and gender are significant predictors of dietary fat behavior.

INTRODUCTION

The population of the United States is growing older. At the end of the nineteenth century only 4% of the total population was age 65 and older (Soldo and Agree, 1988), but it has been projected that by the year 2020 17.3% of the population will have lived 65 or more years (U.S. Bureau of the Census, 1986). Indeed, within this overall reality of the aging of our population is the phenomenon of the increasing age of our aging citizens; by the year 2000, 45% of the people over 65 years old will be 75 years old (Soldo and Agree, 1988), and one of the fastest growing segments of the population is composed of people classified as the "oldest old", those 85 or older (Rosenwaike, 1985).

Iowa's elderly population is similar to the elderly population nationwide. The total number of Iowans is increasing, and the number of oldest old is increasing most rapidly (Gosselink and Goudy, 1986). The aging of Iowa's and the rest of America's population are, however, of more than just academic interest. This increasing number of elderly citizens will affect our health care system in 1995 more than any other factor (Arthur Andersen & Co., 1987), in part because per capita health expenditures for the elderly are more than 3.5 times those for the younger population (Rice and Estes, 1984).

In 1950, 1.6% of the Gross National Product (GNP) was spent on pension and health care payments. That percentage grew to 10.5% in 1985 (Fuchs, 1990), and roughly one-third of the $425 billion spent in 1985 on health care was spent on the elderly. In 1987, 11.1% of the GNP was spent on health expenditures (Levit and Freeland, 1988) and it has been predicted (Arthur Andersen & Co., 1987) that health care's share of the GNP will rise to 11.5% in 1990 and 12.2% by 1995. A major portion of this predicted rise was attributed to increasing needs for health care to treat chronic disease in the elderly population.

The concept of keeping healthy people free of chronic disease is gaining attention throughout the world (Califano, 1987). The U.S. government has published a succession of reports (DHEW, 1979; U.S. Senate Select Committee on Nutrition and Human Needs, 1977; DHHS, 1988; 1990; NRC, 1989) that associate particular dietary practices with health. These reports make nutrition a priority in health promotion and disease prevention. The most recent reports, the Surgeon General's Report on Nutrition and Health (DHHS, 1988), the National Research Council's Diet and Health: Implications for Reducing Chronic Disease Risk (NRC, 1989), and Healthy People 2000 (DHHS, 1990), support the positive role of dietary behavior in reducing the risk of developing chronic disease. Two goals of health promotion and disease

prevention in the elderly population are to increase the number of functionally active years each elderly individual can enjoy; and to limit the social and economic burdens imposed by health care resources needed by the increasing elderly population (Schneider and Guralnik, 1990). Postponement of disease through preventive measures could lower age-specific disease prevalence, particularly in the 65-74 year old age group and possibly reduce the amount of health care resources needed for this age group.

Total dietary and saturated fat intakes are risk factors associated with elevated serum cholesterol levels, which in turn are associated with the development of atherosclerotic cardiovascular diseases (i.e., coronary heart disease, cerebrovascular disease, and peripheral arterial disease) and hypertension (NRC, 1989), common chronic diseases among the elderly and major contributors to health care costs (Levit and Freeland, 1988). Before we can implement the proposed dietary fat guidelines (U.S. Department of HHS, 1988; 1990; NRC, 1989), we must understand current food intake behavior and the social-psychological predictors of that behavior.

Objective of Study

The objective of the present study was to test the ability of a social-psychological model to predict adoption

of twelve specific food choice behaviors by an elderly population. These twelve dietary behaviors were based on specific dietary changes that have been recommended to the public (AHA, 1988) to reduce total and saturated dietary fat intake. For brevity, the term "dietary fat behavior" will be used instead of "total and saturated dietary fat intake behavior."

Model Variables and Hypotheses

A multiple predictor variable model was used to predict dietary fat behavior. The equation corresponding to the model is:

$$Y = \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + e$$

where:

Y = dietary fat behavior,

β's = the standardized partial regression coefficients,

e = the residual term, and

X's = the model variables where X_1 = habit, X_2 = attitude, X_3 = ability to perform, X_4 = role beliefs, X_5 = personal normative beliefs, X_6 = arousal, X_7 = social norms, X_8 = self-concept, and X_9 = gender.

The dependent variable in the proposed model was dietary fat behavior, which was defined by a dietary fat behavior score. The dietary fat behavior score was a measure of

self-reported adoption of twelve dietary fat behaviors, and represented a measure of adoption of specific behaviors (Terry et al., 1991), rather than an estimate of dietary fat intake. Specific recommendations to eat less often or avoid foods or groups of foods, identified as leading contributors to dietary fat behavior (Block et al., 1985; USDA, 1986), were the basis for the twelve dietary fat behaviors in the dependent variable.

The independent variables in the model included habit, attitude, ability to perform, role beliefs, personal normative beliefs, arousal, social norms, self-concept, and gender.

Habit is defined as a tendency toward an action or condition, which by repetition has become routine. Dietary behavior is habitual if it has been practiced for a long period of time. The Triandis theory (Triandis, 1977; 1980) hypothesizes that habit or previous behavior is the major predictor of routine daily behaviors. On this basis, the longer an individual has been performing a particular dietary fat behavior, the more important habit is as a predictor of dietary fat behavior. The hypothesis is:

H1: The more habitual dietary fat behavior is, then the more positive the relationship is with dietary fat behavior.

Attitude refers to the degree to which a person has a favorable or unfavorable evaluation or opinion of the behavior in question (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975). The "theory of reasoned action" (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975) states that specific overt behaviors are predictable from behavioral intentions. Behavioral intentions are predictable from the attitude toward the behavior and the social pressure to change.

The Fishbein model (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975) specifies that attitudes predict behavioral intent which in turn is directly related to behavior. Previous research indicates that personal attitudes toward high-fat foods are good predictors of intended (Shepherd and Stockley, 1985; 1987) and actual self-reported consumption of these foods (Terry et al., 1991). The hypothesis is:

H2: An individual's attitude is positively related to his/her dietary fat behavior.

Ability to perform is the individual's capacity to accomplish the behavior (Triandis, 1977). Triandis includes the ability to perform a behavior as a facilitating condition that must be present for the behavior to occur. The greater an individual's ability to perform a specific behavior, the greater the chance for a positive outcome of that behavior (Weiner et al., 1972). The hypothesis is:

H3: An individual's ability to perform the tasks involved with dietary fat behavior is related positively to his/her dietary fat behavior.

Role beliefs is defined as an individual's perceived appropriateness regarding the performance of a particular behavior (Triandis, 1977). Role beliefs is a normative component of this model. Normative means a reflection of values held by a specific group. Role beliefs in this model is a measure of how an individual sees his or her role, in accomplishing recommended dietary fat behavior, in relation to the larger society. The more appropriate it is for an individual to behave in a particular manner, the more likely it is for that individual to actually behave in that manner (Triandis, 1964, 1977). The hypothesis is:

H4: An individual's dietary fat behavior is related positively to role beliefs about his/her dietary fat behavior.

Personal normative beliefs are the degree to which the individual feels an obligation to perform the recommended dietary fat behavior. Individuals who think they should perform certain behaviors are more likely to actually perform those behaviors (Wallston and Wallston, 1984; Triandis, 1977). Feldman and Mayhew (1984) reported that personal normative beliefs are significant predictors of meat consumption behavior. The hypothesis is:

H5: An individual's personal normative beliefs are related positively to his/her dietary fat behavior.

The variable arousal is described in the Health Belief Model (Kasl, 1974; Maiman and Becker, 1974; Rosenstock, 1974) as the concern of an individual about the threat posed by a particular illness, or as simply health concern. Wallston and Wallston (1984) stated that health concern can be measured without implying the negative threat of illness. Later versions of the Health Belief Model (King, 1982; Chen and Land, 1986; and Rosenstock et al., 1988) stated that concern about health behavior is not dependent upon the threat of illness and might be related to a more general health motivation of a positive nature. Triandis (1977) states that high arousal levels will lead to an increased tendency toward performing the desired behavior. Wallston and Wallston (1984) specified that arousal is a measure of health concern. The greater the concern about dietary fat, the more likely the desired dietary fat behavior will be achieved. The hypothesis is:

H6: An individual's arousal level is related positively to his/her dietary fat behavior.

Social norms refer to the perceived social pressure to perform or not to perform the behavior (Ajzen and Madden, 1986). Social norms are comprised of the normative beliefs of significant others and an individual's motivation to comply with the beliefs held by those significant others.

Normative beliefs of significant others are the extent to which a person feels that significant others (referents e.g., spouse, family, friends, physician) think he/she should perform the behavior. Motivation to comply is a measure of how important the opinions of referents are to the individual. The Fishbein model (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975) specifies that the beliefs of significant others about a particular desired behavior contribute to an individual's decision about adopting or avoiding that behavior depending upon an individual's motivation to comply with the beliefs of others. Saltzer (1980) reported that the beliefs of significant others about weight loss and the motivation to comply with those beliefs were important in determining an individual's intention to lose weight. Sapp and Harrod (1989) studied the importance of referent opinion on consumer food behavior and concluded that consumer food choices may be affected by social opinion of significant others. The hypothesis is:

H7: An individual's social norms are related positively to his/her dietary fat behavior.

Self-concept is the extent to which an individual sees performing the behavior as consistent with evaluation of him/herself. An individual who is more concerned about behavior is more likely to attempt to achieve the desired behavior (Triandis, 1977). An individual who is concerned

about the dietary fat content is expected to demonstrate the desired dietary behavior. The hypothesis is:

H8: An individual's self-concept is related positively to his/her dietary fat behavior score.

Men and women practice different dietary behaviors. Data from the NHANESII study show that women of all ages (55 to 74 years) consume diets lower in fat than do men of the same ages (NCHS, 1983). When studying preventive health behavior in the elderly, Rawkowski et al. (1987) reported that women are more likely than men to eat diets lower in fat. The hypothesis is:

H9: An individual's dietary fat behavior score differs depending upon gender; women are expected to practice behavior closer to desired fat behavior than men.

The nine hypotheses are bivariate in nature and each examines the link between an independent variable in the model and the dependent variable, dietary fat behavior. In addition the proposed model may be useful as a method for studying the sum of the independent variables as a comprehensive predictor of dietary fat behavior.

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LITERATURE REVIEW

Diet, Chronic Disease, and The Elderly

The report Diet and Health by the National Research Council (1989) focused on the major diet-related chronic diseases and conditions of adulthood, which include the following: atherosclerotic cardiovascular diseases (i.e., coronary heart disease (CHD), cerebrovascular disease, and peripheral arterial diseases); hypertension and related diseases; obesity and related diseases; cancers; osteoporosis; diabetes mellitus; hepatobiliary disease; and dental caries. This report provides the most complete compilation of evidence to date that these chronic diseases are the most common diet-associated causes of morbidity and mortality among adults in the United States.

The frequency of many chronic diseases, such as cardiovascular disease and cancer, increases with advancing age and increasing loss of tissue function (Smith et al., 1988). The changes that occur with aging are progressive throughout adult life. An arbitrary definition of the elderly as those over 60 or 65 years of age obscures the fact that senior citizenship represents the terminal years of a continuum. Diminishing tissue function, development of chronic disease, and changes in nutrient intake all influence the continuum (Munro, 1989). Dietary behavior

combined with physical activity and other lifestyle practices can contribute to or improve the age-related loss of tissue substance and function (NRC, 1989).

Changes since 1900 in the diets of Northern Europeans and North Americans have led to an increase in the concentration of saturated fat in the diet (Crawford, 1986). These dietary shifts have played a significant part in the role of CHD as the leading cause of premature death in the western world (Nissinen and Stanley, 1989); indeed CHD accounts for nearly half of the total mortality in the U.S. population older than 65 years (Benfante and Reed, 1990). Scientists working in the 1950's (Keys, 1957) reported epidemiological evidence supporting the connections among dietary fat, elevated serum cholesterol and CHD. Presently, serum cholesterol is firmly established as an independent predictor of CHD (Grundy, 1986).

There is a growing body of evidence (Benfante and Reed, 1990; Castelli et al., 1989; Dayton et al., 1968, Kannel and Brand, 1985; Kannel et al., 1987) that supports the role of elevated serum cholesterol levels in the elderly as a risk factor for atherosclerotic cardiovascular diseases and hypertension. Benfante and Reed (1990) measured elevated serum cholesterol levels in 1480 elderly men (aged 65 and older) in Hawaii. They concluded that in elderly men, as in middle-aged men, elevated serum cholesterol levels should be

regarded as an indicator of CHD. Once elevated serum cholesterol is established, additional evaluation and possible intervention, including dietary changes and drugs, can possibly improve the quality of life. Similar conclusions have been drawn about elderly women in the Framingham Heart Study (Kannel and Brand, 1985; Kannel et al., 1987; Castelli et al., 1989). Researchers in Framingham concluded from data collected in 2501 adults (aged 50 to 82-years-old) over a thirty year period that the positive relationship between elevated total serum cholesterol and the incidence of CHD incidence also exists in elderly women.

Dietary Guidelines

There is a long history of public policy directed toward implementing dietary changes to improve the health of Americans. The first U.S. government publication that associated diet with health was the U.S. Senate report, Dietary Goals for the United States (U.S. Senate Select Committee on Nutrition and Human Needs, 1977). In 1978, Title IV of the Health Services and Centers Amendments (Public Law 95-626) became law. Title IV requires the Secretary of Health and Human Services to submit a national prevention profile to Congress every three years. This legislation reflected a growing public interest in health

promotion and disease prevention and the need to have continual renewal and specification of the goals that were outlined in subsequent health policy. The Public Health Service of the Department of Health and Human Services has played an active role in the area of health promotion and disease prevention, and followed the Dietary Goals for the United States (U.S. Senate Select Committee on Nutrition and Human Needs, 1977) with the publication of Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention (DHEW, 1979). This report identified specific quantifiable health promotion and disease prevention goals for various age groups of Americans; these goals were directed at reducing death rates and related measures of poor health, reducing measurable risks, increasing public and professional awareness of risk and risk-reduction possibilities, and improving services. For the first time, national objectives for the health of older adults were included. The objectives included major improvements in the health, mobility, and independence of older people, reflected by a 20% reduction in the average annual number of days of restricted activity caused by acute or chronic illness. The U.S. Department of Agriculture and the Department of Health and Human Services published Dietary Guidelines for Americans in 1980, 1985, and again in 1990 (USDA/DHHS, 1980; 1985; 1990). These guidelines included

statements about the elderly and outlined how to eat to remain healthy and again stressed the importance diet plays in achieving and maintaining good health. The recent Surgeon General's Report on Nutrition and Health (DHHS, 1988) made nutrition a priority in health promotion and disease prevention. The report summarizes where research on nutrition and aging currently is focused and where it needs to be focused to improve the health status of older persons. The report states that, "Until more is known, older Americans should consume sufficient nutrients and energy and maintain levels of physical activity that maintain desirable body weight and may prevent or delay the onset of chronic disease" (DHHS, 1988, p. 614). The National Research Council's report, Diet and Health (NRC, 1989) strengthens the argument that nutrition is a factor in the prevention of chronic diseases in the general population. Healthy People 2000 (DHHS, 1990) updates earlier guidelines (DHEW, 1979) and sets specific quantifiable goals for national health promotion and disease prevention. These reports represent a consensus by the scientific community to recommend specific guidelines for the dietary habits of all Americans. Other groups, most notably the American Heart Association (AHA, 1988) and the National Cancer Institute (NCI, 1987), have also added their recommendations to the consensus. These guidelines generally include: reductions in the consumption

of both saturated and unsaturated fatty acids; consumption of a varied diet containing fruits, vegetables, and whole-grain cereals; maintenance of appropriate body weight; consumption of a low-salt diet; use of fresh or minimally processed foods rather than cured, pickled, or smoked foods; and consumption of alcohol in moderation, if at all. Specific guidelines for dietary fat intake are to reduce total dietary fat to 30% or less of total energy intake and to reduce saturated fatty acid intake to less than 10% of total energy intake. With agreement in the scientific community, the next step is implementation of the guidelines, which involves more than simply stating them to the public.

Nutritional Status of the Elderly

There is limited information on the nutritional status of the elderly and few reports on the dietary behavior of the elderly. One difficulty in determining the effect of nutrition on the health of older Americans is that there are no recent national food consumption and nutritional status data on this group (DHHS, 1988) and such data will not be available until the National Health and Nutrition Examination Survey (NHANES) III completes data collection that began in 1988 and will continue through 1993. Current available national data include information about Americans

up to the age of 74 years and are from NHANES I (1971-1974) and NHANES II (1976-1980) that use 24-hour recall to obtain dietary information. NHANES I data (Lowenstein, 1982) indicate that mean caloric intakes of the elderly are low and the prevalence of clinical signs associated with nutritional deficiencies are also generally low except in select subgroups.

NHANES I and NHANES II data, which are concerned with dietary fat intake and related serum cholesterol levels, show that in all adults (aged 55 to 74-years-old) total fat, percent saturated fat, and serum cholesterol decreased slightly from NHANES I to NHANES II (Life Sciences Research Office, 1989). This slight decline is attributed to increasing public awareness of the association of diet and disease, specifically dietary fat and heart disease, and sodium and hypertension. Data from NHANES II (NCHS, 1983) indicate that in the majority (greater than 65%) of men and women 55 to 74-years-old, the percentage of calories from fat in the diet (34-37%) is more than the recommended 30%. The overall consumption of fat as a percentage of total energy intake declined from 37.0% to 35.5% among elderly subjects represented in 21 studies conducted between 1940 and 1985 (Stephen and Wald, 1990).

Garry et al. (1982) measured the nutritional status of 270 healthy elderly persons aged 60 and older in a New

Mexico retirement community, and reported that in general, dietary intakes in the population appear to be adequate with the possible exception of vitamin D and calcium intakes in women. Percentage of calories from dietary fat was 37% among both men and women. McGandy et al. (1986) reported similar findings in 691 healthy, non-institutionalized 60-98 year olds in Boston, with 34% of calories from fat in the diets of all age groups and both sexes. The Boston study indicated energy intakes substantially lower (although still adequate) than current recommendations but the New Mexico study reported no such low mean energy intake.

Demographic variables that affect nutritional behavior in the elderly include gender, income or socioeconomic status, living conditions, and education. Rawkowski et al. (1987) studied preventive health behaviors in 172 adults aged 62-96 years old and reported that elderly women were more likely to practice preventive dietary behavior related to consumption of red meat, salt, sugar, and fiber than were elderly men. The elderly women were also more concerned about body weight. Kline and Terry (1986) reported that men were significantly more likely than women to report a lack of belief about several major dietary and lifestyle factors recommended to the public to prevent heart disease. This study (Kline and Terry, 1986) used a sample of 114

demographically matched men and women (35% of the total sample was over 50 years old).

Davis et al. (1985) concluded from NHANESI data that income is more important than living arrangements in determining dietary patterns in older adults. Higher incomes were associated with dietary patterns closer to the accepted dietary guidelines. The same researchers also concluded that elderly men (aged 65-74 years) who lived alone were at greater risk of poor dietary quality than similarly aged elderly women who lived alone. In addition, elderly women seemed to be more resilient to the strains placed on them by living arrangements and low incomes.

O'Hanlon et al. (1983) reported that elderly individuals with the least education, from a sample of 445 elderly Missourians, were most likely to be at nutritional risk. This is consistent with data from the Baltimore longitudinal study (650 men, aged 20 to 96-years-old) that reported adequate intakes associated with higher levels of education (McGandy et al., 1966).

There is every reason to believe that future nutritional research may provide evidence that dietary fat intake behaviors complying with current dietary guidelines will decrease the morbidity associated with disease among the older age groups (Harris et al., 1989). It should be noted

that decreasing mortality is not a reasonable goal for dietary intervention in later life (Kane, 1988).

Health Behavior Theory

Before one can plan nutrition intervention programs designed to achieve preventive dietary fat behavior, one must identify the factors that predict dietary fat behavior. The model used in this study was represented by the following equation:

$$Y = \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + e.$$

The model is a multiple predictor variable model with nine predictor variables. The nine predictor variables were habit (X_1), attitude (X_2), ability to perform (X_3), role beliefs (X_4), personal normative beliefs (X_5), arousal (X_6), social norms (X_7), self-concept (X_8), and gender (X_9).

The variables proposed in this model to predict dietary fat behavior were derived from several reported theoretical behavior models (Table 1). Attitude and social norms were two variables used in the model that were previously related directly to behavior intention (Ajzen and Fishbein, 1980; Triandis, 1977; Wallston and Wallston, 1984), which in turn predicted actual behavior. According to some studies (Saltzer, 1980; Bentler and Speckart, 1979) behavior intention may not be a consistent predictor of actual

Table 1. Theoretical basis for studying health behavior

Theory	Highlights
Theory of Reasoned Action (Ajzen & Fishbein, 1980)	Specific overt behaviors are predictable from behavior intentions toward that behavior. Behavior intentions are predictable from the attitude toward the behavior and the social pressure to change the behavior.
Theory of Social Behavior (Triandis, 1977)	The probability of a specific behavior occurring depends on the strength of the habit associated with the behavior, the behavior intention to perform the behavior, and the presence or absence of conditions that facilitate performance of the behavior.
Health Belief Model (Janz & Becker, 1984)	The likelihood of an individual adopting a health behavior is determined by the perceptions about the likelihood of being susceptible to a particular illness and the severity of the consequences of getting that illness. The benefit derived from taking a certain health action is the probability that threat of an illness will be reduced.
Social Psychological Model of Health Behavior (Wallston & Wallston, 1984; Feldman & Mayhew, 1984)	Behavior is a function of one's intentions to perform the behavior, previous behavior or habit, and conditions that facilitate performance.
Proposed Social Psychological Model of Health Behavior in the Elderly	Dietary behavior may be predicted from previous habit associated with the particular behavior, attitude, role beliefs, ability to perform,personal normative beliefs, social norms, arousal, self-concept, and gender.

behavior. Saltzer (1980) used a modified version of Fishbein's model (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) to study weight loss intention in college women over a 6-week period. Although the model variables significantly explained behavior intention, weight loss measured six weeks later (actual overt behavior) did not correlate significantly with the behavior intention to lose weight. Fishbein and Ajzen (1976) stated that when behavior intentions were not significantly related to actual overt behavior, the discrepancy was because there was a lack of corresponding levels of specificity in the measures. In other words, behavior intent as a predictor of actual overt behavior lacks specificity because other factors determine its effect. Behavior intention was a poor predictor of actual behavior in the case of weight loss (Saltzer, 1980).

Habit is defined as a tendency toward an action or condition, which by repetition has become involuntary (Webster's Collegiate Dictionary, 1987). Dietary behavior, aimed at weight loss or reduced fat intake may have less to do with behavior intention than with habit. Habitual dietary behavior in the model used in the present study represented the practice of dietary behavior over a long period of time. Triandis (1964; 1977; 1980), like Fishbein and Ajzen (1976), recognized that intention is a predictor of behavior. In the Triandis model, which considered

habitual behaviors, the major predictor of behavior is habit or past behavior. The model states that the probability of an action occurring depends on three factors: the strength of the habit associated with the behavior, which is measured by the number of times or length of time the act has already occurred; the behavior intention to perform the behavior; and the presence or absence of conditions that facilitate performance of the behavior. In addition, Triandis' theory states that the more an individual has engaged in a behavior previously, the less important is behavioral intention and the more important is habit in predicting future behavior. Bentler and Speckart (1979) agreed with Triandis (1964; 1977; 1980) that the more a person has practiced a particular behavior the less important is intention in accounting for the variance in the present behavior; habit becomes the more important variable. For these reasons, the behavior intention component was not included in the model presented here. The variables that predict behavior intention in the "theory of reasoned action" (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975), namely, attitude and social norms, were proposed in the present study to also predict actual behavior.

Attitude refers to the degree to which a person has a favorable or unfavorable evaluation or opinion of the behavior in question (Ajzen and Fishbein, 1980; Fishbein and

Ajzen, 1975). Social norms represent the perceived social pressure to perform or not to perform the behavior (Ajzen and Madden, 1986). Social norms are defined as the sum of normative beliefs multiplied by the sum of an individual's motivation to comply with those beliefs (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975). Normative beliefs are the extent to which a person feels that significant others or referents (e.g., spouse, family, friends, physician) think he/she should perform the behavior. Motivation to comply is a measure of how important the opinions of referents are to the individual.

The variables role beliefs, ability to perform, personal normative beliefs, and self-concept are described in Triandis' "theory of social behavior" (1977). Role beliefs are the perceived appropriateness of the individual performing the behavior. Ability to perform is the individual's ability to accomplish the behavior. Personal normative beliefs are the degree to which the person feels an obligation to perform the behavior in question. Self-concept is the extent to which an individual perceives performing the behavior as consistent with his/her evaluation of him/herself.

The variable arousal is described in the Health Belief Model (Kasl, 1974; Maiman and Becker, 1974; Rosenstock, 1974) as the concern of an individual about the threat posed

by a particular illness, or as simply health concern. Wallston and Wallston (1984) stated that health concern can be measured without implying the negative threat of illness. For the present study arousal was defined as the level of concern an individual has about his/her dietary fat intake.

Gender was an independent variable in the present model. Men and women practice different dietary behaviors (Rawkowski et al., 1987).

Wallston and Wallston (1984) developed a "social psychological model of health behavior" (Table 1) based on health behavior theory. The model integrates the elements of the Health Belief Model with Fishbein's "theory of reasoned action" (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975), and Triandis' "theory of social behavior" (Triandis, 1964; Triandis, 1977). The model describes behavior as a function of behavior intent, previous behavior or habit, and facilitating conditions. Behavioral intent is defined by attitude, social norms, perceived consequences, and personal norms. Feldman and Mayhew (1984) operationalized and tested this model in a prospective study of two specific self-reported nutrition behaviors: the consumption of meat and the consumption of sodium. Their sample consisted of 120 undergraduate students (62 men, 58 women). Their results indicated that each of the three components of behavior (behavior intent, habit, and

facilitating conditions) made a significant and unique contribution to the prediction of behavior, with habit and intent being the most useful measures and facilitating conditions significantly improving the prediction of sodium consumption when combined with habit and intent. They concluded that the best prediction using this model occurred when all the components of the model were included because nutrition behavior was influenced by many factors.

METHODS

Sample

A volunteer had to be 60 years or older, and have no known acute medical illness, to be included in the study sample. Seventy-eight men (n=24) and women (n=54) from a midwestern city were recruited to answer the survey instrument. The survey instrument was completed and returned by 24 men and 51 women resulting in a convenience sample of 75 respondents. These respondents were members of a senior access membership program of a medical center that provides financial and service benefits to individuals 55 years old and older who live in the city area, tenants of an apartment complex primarily occupied by an independent-living elderly population (mean age 65-70 years old), or tenants of an apartment complex primarily occupied by an older (mean age 75-80 years old) independent-living elderly population. Respondents were recruited using announcements distributed to tenants living in both apartment complexes, or by announcements enclosed in the monthly newsletter of the senior access membership program.

Table 2 shows the distribution of this population by gender, age, marital status, education, income, living conditions (number in household), and employment. Almost all respondents had completed high school degrees (97%) compared with 49% of their state cohort (U.S. Bureau of the

Table 2. Description of study participants

	Men (n=24)	Women (n=51)
Age (years)		
60-64	12 (50.0)[a]	13 (25.5)[b]
65-69	3 (12.5)	13 (25.5)
70-74	6 (25.0)	13 (25.5)
75-79	2 (8.3)	2 (3.9)
80 +	1 (4.2)	10 (19.6)
Marital Status		
Single	0 (0.0)	2 (3.9)
Married	19 (79.2)	22 (43.1)
Widowed	5 (20.8)	24 (47.1)
Separated	0 (0.0)	2 (3.9)
Divorced	0 (0.0)	1 (2.0)
Education - highest achieved		
< 12 years	0 (0.0)	2 (3.9)
High school diploma	7 (29.2)	27 (52.9)
Associate degree	2 (8.3)	6 (11.8)
Bachelor's degree	9 (37.5)	12 (23.5)
Advanced degree	6 (25.0)	4 (7.8)
Household Income (dollars)		
under 5,000	1 (4.2)	0 (0.0)
5,000- 9,999	0 (0.0)	4 (7.9)
10,000-19,999	1 (4.2)	12 (23.5)
20,000-29,999	3 (12.5)	8 (15.7)
30,000-39,999	4 (16.7)	4 (7.8)
40,000 and above	14 (58.3)	16 (31.4)
refused to answer or unknown	1 (4.1)	7 (13.7)
Number in household		
1	1 (4.2)	22 (43.1)
2 or more	23 (95.8)	29 (56.9)
Employment		
Employed	10 (41.7)	20 (39.2)
Unemployed	0 (0.0)	0 (0.0)
Retired	14 (58.3)	31 (60.8)

Values in parentheses represent:
[a] Percentage of all men in study.
[b] Percentage of all women in study.

Census, 1983), and 52% of all respondents had some formal education beyond high school compared with 10% of their national cohort (U.S. Bureau of the Census, 1989). The average yearly household income of the entire sample was in the range of $20,000 to $29,999, which is slightly higher than the average for the state cohort ($19,700; U.S. Bureau of the Census, 1983). Marital status was similar to the state cohort (U.S. Bureau of the Census, 1983), and 22 of the 24 widows lived alone. In summary, this was an elderly, non-institutionalized, educated (through high school), Caucasian population.

Research Model

An additive multiple variable predictor model for dietary behavior as described by the structural equation:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e ,$$

provided the framework for this study. The model used proposed that nine variables predict dietary behavior: habit (X_1), attitude (X_2), ability to perform (X_3), role beliefs (X_4), personal normative beliefs (X_5), arousal (X_6), social norms (X_7), self-concept (X_8), and gender (X_9).

Survey Instrument

The research instrument (Appendix I) included three sections. The first section of the instrument was developed by Terry et al. (1991), and it measured self-reported adoption of twelve dietary fat behaviors. Ten of these twelve behaviors were intake frequencies for ten foods or types of food, which have been identified (Block et al., 1985; 1989; U.S. Department of Agriculture, 1986) as foods that contribute to dietary fat intake in the United States. This section of the instrument's frequency response scale consisted of four possible choices: less than once a week, about once a week, several times a week, and daily. The remaining two food behaviors surveyed were the choices of cooking and table fats used most often in the home. Respondents answered by naming the brand name of table and cooking fats used in the home. The present investigator then coded those responses by the name of fat listed on the brand label. The response scale was based on the label and the percent of unsaturated fats in the brand: 85%+ unsaturated, which includes safflower oil, corn oil, canola oil, sunflower oil, and olive oil; 75-85% unsaturated, which includes peanut oil and soybean oil; 60-75% unsaturated, which includes cottonseed oil, vegetable shortening, and chicken fat; and less than 60% unsaturated, which includes butter and lard. The twelve items were scored individually,

these scores were summed, and then the totals were divided by twelve for an average dietary fat behavior score. The dietary behavior score represented a measure of adoption of twelve specific behaviors rather than an estimate of total and saturated dietary fat intake. Because regional dietary differences affect the foods contained in an index (Hankin, 1989), Terry et al. (1991) developed this index using foods commonly eaten in Iowa.

The second section of the survey instrument measured the social-psychological variables of the model using a series of five-point Likert-type scales. Items in this section were adapted from a previous study that successfully used these variables (Feldman and Mayhew, 1984). The predictor variables of the model and the response scales used in this second section of the present study are listed in Appendix II. Reliability coefficients support the scales. Gender was coded as a dummy variable with 0=women and 1=men. Items in the second section of the instrument required respondents to make decisions about high- and low-fat foods, so a list of the fat content of foods (Appendix III) was furnished to supply similar knowledge about the fat content of foods to all respondents. This list was compiled from a table of the fat content of foods (Brody, 1982), and was modified based on information in Handbook 8 (USDA, 1976-1989).

The last section of the survey instrument was used to collect data on the demographic and lifestyle characteristics of the subjects. Data were collected for gender, age, race, marital status, occupation, occupation of spouse, education level, household size and income, habits of smoking and exercise, self-reported presence of chronic diseases, and sources used for nutrition information.

The survey instrument was reviewed by ten gerontology staff members who have experience relevant to this study. These individuals critically reviewed the survey's length, appropriateness of wording for the elderly population, content validity, and readability of print size. The reviewer's suggestions were used to modify the instrument before it was pretested on a group of ten women who met the subject criteria but were not included in the study. The study was approved by the Iowa State University Human Subjects in Research Committee. Informed consent was obtained from each respondent.

Data Collection and Analysis

The survey instrument was administered by the present investigator to groups of five to eight respondents in October 1989. Respondents were seated comfortably at tables in a well-lighted room. Instructions were verbally given to each group about how to answer each section of the survey

instrument, and each respondent completed the questionnaire individually. It took respondents between 25 and 35 minutes to complete the survey.

The Statistical Analysis System (SAS, 1985) was used for all statistical procedures except reliabilities, which used SPSSx Information Analysis System (SPSS Inc., 1986). Frequency distributions and measures of means were determined on all items. For the dependent variable, dietary fat behavior, the 12 food behaviors were each scored from 0 to 3, with 0 representing the most desirable food frequency or food choice. Similarly, the independent predictor variables were scored from 1 to 5, with 1 representing the most positive response. Multi-item scales with Cronbach's (1951) alpha of 0.70 or greater are acceptable (Nunnally, 1978) and were combined (Appendix II). Correlations between variables were determined by computing Pearson's product-moment correlation coefficients and the pair-wise correlation matrix of all the predictor variables. The model was tested by multiple regression analysis with the food behavior score as the dependent variable and the nine model variables (habit, attitude, ability to perform, role beliefs, personal normative beliefs, arousal, social norms, self-concept, and gender) as the independent variables. The model was reduced by stepwise regression. Statistical level of significance was set at $p<0.05$.

RESULTS

Demographic Characteristics

Table 2 shows the distribution of the sample population by gender, age, marital status, education, income, living conditions (number in household), and employment. Other demographic data obtained included occupation, smoking habits, exercise habits, chronic disease incidence, and sources consulted for nutrition information. A summary of this information is found in Appendix IV.

Dietary Behavior

The survey subjects' dietary fat behavior was described by a composite score representing twelve food practices related to fat consumption. The reported consumption of ten groups of foods high in total and/or saturated fat, which make up part of the behavior score, is shown in Table 3 (men) and Table 4 (women). The first three groups of foods included in the survey were meat or meat-related products. Ground beef or foods containing ground beef were consumed by 37.5% of the men several times a week and 37.2% of the women several times a week or daily. Of greater interest is the number of subjects who reported eating ground beef-containing foods once a week or less (men 62.5%; women 62.7%). For frankfurters, sausages, and related meats 79.1% of the men and 86.2% of the women reported consuming these

Table 3. Percentages of consumption responses of 10 high-fat foods or food groups by men (n=24)

FOODS	PERCENTAGE OF RESPONSES			
	LESS THAN WEEKLY	ABOUT ONCE A WEEK	SEVERAL TIMES A WEEK	DAILY
Ground beef or foods containing ground beef	12.5	50.0	37.5	0.0
Frankfurters, sausage, bacon, or high fat luncheon meats	45.8	33.3	20.8	0.0
Fat on meat or skin on chicken	66.7	29.2	4.2	0.0
Whole-fat milk	66.7	8.3	8.3	16.7
Cream or ice cream	45.8	16.7	29.2	8.3
Natural and processed cheeses such as American, Swiss, or cheddar	20.8	33.3	41.7	4.2
Margarine, butter, or sour cream	16.7	4.2	29.2	52.9
Sweets such as cakes, pies, cookies, doughnuts, sweet rolls, and candy bars	25.0	20.8	29.2	25.0
Snack crackers or chips	20.8	33.3	41.7	4.2
Fried foods	54.2	29.2	16.7	0.0

Table 4. Percentages of consumption responses of 10 high-fat foods or food groups by women (n=51)

	PERCENTAGE OF RESPONSES			
FOODS	**LESS THAN WEEKLY**	**ABOUT ONCE A WEEK**	**SEVERAL TIMES A WEEK**	**DAILY**
Ground beef or foods containing ground beef	19.6	43.1	33.3	3.9
Frankfurters, sausage, bacon, or high fat luncheon meats	68.6	17.6	11.8	2.0
Fat on meat or skin on chicken	94.1	5.9	0.0	0.0
Whole-fat milk	76.5	5.9	11.8	5.9
Cream or ice cream	52.9	15.7	25.5	5.9
Natural and processed cheeses such as American, Swiss, or cheddar	29.4	45.1	19.6	5.9
Margarine, butter, or sour cream	13.7	7.8	25.5	52.9
Sweets such as cakes, pies, cookies, doughnuts, sweet rolls, and candy bars	23.5	35.3	23.5	17.6
Snack crackers or chips	49.0	27.5	19.6	3.9
Fried foods	66.7	21.6	11.8	0.0

foods once a week or less. For fat on meat and the skin on chicken 95.9% of the men and 100% of the women reported eating these items once a week or less often.

Four of the ten groups of foods in the survey included dairy products and margarine. Margarine, butter, and/or sour cream were consumed daily or several times weekly by 82% of the men and 78% of the women. Consumption of natural and processed cheeses once a week or less was reported by 74.5% of the women respondents and 54.1% of the men. Over 50% of both men (53.4%) and women (61.2%) consumed cream or ice cream once a week or less often, and whole-fat milk consumption was low in both men and women.

Women reported less frequent consumption of snack crackers or chips than did men, with 76.5% of women eating from this group once a week or less compared with 54.1% of the men. Men (54.5%) reported that they ate high-fat sweets such as baked goods and candy bars more often than once a week, and women (58.8%) reported consumption of foods in this group once a week or less.

In addition to frequency of consumption for the ten food groups, two other food practices that affect saturated fat intake were part of the behavior score (Table 5). These were related to the type of table fat and cooking fat used most often. The brand of margarine used by women was more

Table 5. Percentage of responses of other dietary behavior practices related to fat intake

TYPE OF FAT USED	PERCENTAGE OF RESPONSES % Unsaturated			
	85%+[a]	75-85%[b]	60-75%[c]	<60%[d]
Men (n=24)				
Table fat	41.7	0.0	45.8	12.5
Cooking fat	62.5	8.3	20.8	8.3
Women (n=51)				
Table fat	66.7	21.6	11.8	0.0
Cooking fat	68.6	23.5	5.6	2.0

[a] Includes safflower oil, corn oil, canola oil, sunflower oil, and olive oil.
[b] Includes peanut oil and soybean oil.
[c] Includes cottonseed oil, vegetable shortening, and chicken fat.
[d] Includes butter and lard.

unsaturated than the brand used by men. Women also reported greater use of unsaturated cooking fat than did men.

In summary, this specific elderly population reported infrequent consumption of the high-fat foods in the 12-item index and had adopted desired fat consumption behavior. The twelve food behaviors were used to calculate a score for dietary behavior associated with total and saturated fat consumption. A low score indicated a higher degree of adoption of the desired fat consumption behavior, and a high score indicated that recommended fat behavior had not been adopted (Table 6). The mean score for men was 1.08 and the mean score for women was 0.83.

Table 6. Dietary behavior scores

	Dietary Behavior Scores	
	Mean	Range
Potential		0.0-3.00
Actual	0.91	0.17-2.08
Men	1.08	0.42-2.08
Women	0.83	0.17-1.67

Dietary Behavior and Selected Demographic Characteristics

The demographic variables examined were gender, education, and income. These three variables have frequently

been associated with differences in health behaviors (Abramson et al., 1982). Gender was the only demographic variable that significantly affected behavior ($t=2.4$; $p<0.02$; Table 6) when the relationship between dietary behavior scores and demographic variables were tested. Education ($p=0.25$) and income ($p=0.19$) were not significant. Reported studies support the observed gender difference in dietary fat behavior (Rawkowski et al., 1987; NCHS, 1983). The gender difference observed in the present study, however, has little practical significance because both men and women reported desirable fat intake behaviors at the time of the interview.

Education and income did not modify behavior scores as expected (Davis et al., 1985; 1988; O'Hanlon et al., 1983; Ryan and Gates, 1989). The mean income of the present study sample was slightly higher than the state average (U.S. Bureau of the Census, 1983), and higher incomes have been correlated with dietary patterns that approach the recommended dietary guidelines (Davis et al., 1985; 1988). The majority (97%) of the participants in this study completed high school. This is far greater than the average for this age group in the Iowa population (Gosselink and Goudy, 1986).

Model

The correlations between each of the variables and dietary fat behavior score are given in Table 7. The dietary fat behavior scores were significantly correlated ($p<0.05$) with seven of the nine variables: habit ($r=0.29$), attitude ($r=0.36$), ability to perform ($r=0.34$), role beliefs ($r=-0.47$), social norms ($r=0.32$), self-concept ($r=0.39$), and gender ($r=0.27$). These correlations uphold bivariate hypotheses 1, 2, 3, 5, 8, and 9. Hypothesis 4 was not upheld because of the negative correlation.

The regression analysis of the model is shown in Table 8. The variables in the model together explained 50% ($p<0.0001$) of the variance. The parameter estimates provide a more conservative test of the bivariate hypotheses than simple correlation with behavior scores. Gender was a highly significant predictor ($p=0.004$) meaning that gender made a difference in describing dietary fat behavior. The other significant predictors in the model were habit ($p=0.02$), attitude ($p=0.05$), ability to perform ($p=0.01$) and role beliefs ($p=0.0001$). The remaining four variables in the model were not significant predictors.

Habit is expected to be a significant predictor of dietary behavior because of the habitual nature of eating (Triandis, 1977) and it was in the present study. The survey respondents indicated that they had been practicing

Table 7. Correlation matrix for predictor variables and dietary behavior

	X_1[a]	X_2[b]	X_3[c]	X_4[d]	X_5[e]	X_6[f]	X_7[g]	X_8[h]	X_9[i]	Y[j]
X_1	1.00									
X_2	0.09	1.00								
X_3	0.03	0.33*	1.00							
X_4	0.12	0.18	0.05	1.00						
X_5	0.07	0.03	0.06	0.09	1.00					
X_6	0.23*	0.35*	0.17	0.36*	0.24*	1.00				
X_7	0.03	0.52*	0.32*	0.21	0.09	0.18	1.00			
X_8	0.27*	0.28*	0.29*	0.38*	0.02	0.30*	0.32*	1.00		
X_9	0.13	0.13	0.02	0.00	0.00	0.05	0.02	0.19	1.00	
Y	0.29*	0.36*	0.34*	-0.47*	0.04	0.22	0.32*	0.39*	0.27*	1.00

[a] Habit
[b] Attitude
[c] Ability to perform
[d] Role beliefs
[e] Personal normative beliefs
[f] Arousal
[g] Social norms
[h] Self-concept
[i] Gender
[j] Dietary fat behavior score
* Significant at 0.05.

Table 8. Regression analysis of dietary behavior score (dependent variable); independent variables: habit, attitude, ability to perform, role beliefs, personal normative beliefs, arousal, social norms, self-concept, and gender

Analysis of Variance

Source	d.f.	MS	F-value	Prob>F
Model	8	0.849	7.218	.0001
Error	66	0.118		
Total	74			

$R^2 = 0.50$

Parameter Estimates

Predictor Variables	Standardized Regression Coefficient	t-value	Prob > t
Habit	.22	2.32	.02
Attitude	.22	2.01	.05
Ability to perform	.26	2.64	.01
Role beliefs	-.42	4.17	.0001
Personal normative beliefs	.02	0.24	.81
Arousal	.11	1.05	.30
Social norms	.05	0.51	.61
Self-concept	.002	0.02	.98
Gender	.27	2.96	.004

their reported dietary fat behavior for the last eleven to fifteen years.

Attitude was a significant predictor of dietary fat behavior in the present study (Table 8). It has been firmly established (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975) that attitude is a predictor variable of behavior. Favorable attitudes toward a behavior increase the likelihood of the behavior occurring. Respondents in this study reported that high-fat foods were "bad" for them but were also "pleasing"; the subjects avoided "pleasing" high-fat foods because these foods were perceived as "bad."

The positive relationship between the variable ability to perform and the dietary behavior score indicated that respondents judged themselves able to prepare and eat low-fat foods, and also that they practiced the desired behavior. This observation is consistent with Triandis' theory (1977), and Weiner et al.'s (1972) study of achievement-oriented outcomes: the greater the individual's ability to perform a particular behavior, the greater the chances are for a positive outcome of that behavior.

Role beliefs was a highly significant predictor variable ($p=0.0001$). The negative correlation was interpreted to suggest that the elderly group studied viewed adoption of recommended dietary fat behavior to be appropriate (low scores), but that additional changes of current behavior

were not appropriate (high scores). This is consistent with theory (Triandis, 1977; 1980), which states that if individuals view a behavior as appropriate, they are more likely to behave in the desired manner. In the present study the low behavior scores indicated adoption of the recommended dietary fat behavior.

The present results (Table 8) also show that personal normative beliefs was not a significant predictor of dietary fat behavior. This result is inconsistent with behavior theory (Wallston and Wallston, 1984; Triandis, 1977). Triandis' behavior theory states that how an individual thinks about a behavior, in terms of what should or should not be done, is a predictor of behavior. In a study of meat consumption in 120 college students (Feldman and Mayhew, 1984), personal normative beliefs were significant predictors of meat consumption. In the present study, respondents were already practicing the desired behavior, and therefore habit may have overridden any new processing of information about the behavior.

Arousal also was not a significant predictor of dietary fat behavior (Table 8). Arousal is used in health belief models as a measure of health concern or fear of contracting an illness (Kasl, 1974; Janz and Becker, 1984; Maiman and Becker, 1974; Rosenstock, 1974). Arousal is important when there is an interest or need to change current behavior.

Because respondents of the present study reported current practice of desired dietary fat behavior, arousal did not make a significant contribution to the prediction of dietary fat behavior.

Social norms was not a significant predictor of dietary fat behavior (Table 8). Fishbein's theory (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975) specifies that the beliefs of significant others, and one's motivation to comply with those beliefs, contribute to behavior. Here again, habit may have masked the importance of the opinions of significant others in regard to dietary fat behavior.

Self-concept was not a significant predictor of dietary fat behavior (Table 8). Triandis (1977) stated that if an individual is more likely to be the type of person to be concerned about his/her behavior, then he/she will attempt to practice desirable behavior. The desired behavior was once again already a strong habit so additional cognitive processing of information was not necessary for action.

Gender was a significant variable in the prediction of dietary fat behavior (Table 8). This is consistent with previous research (Rawkowski et al., 1987; NCHS, 1983) that reports different dietary fat intake behavior in men than in women.

In summary, the significant predictor variables of the model, when accounting for all the other variables in the

model, were habit, attitude, ability to perform, role beliefs, and gender.

The correlation matrix of the predictor variables is shown in Table 7. Many of the variables were significantly correlated ($p<0.05$) with each other. Thus, the isolation of the specific influence of each predictor variable becomes complex. The multicollinearity of the variables with each other accounts for the loss of predictive power of social norms and self-concept from simple correlation with behavior scores to the more conservative parameter estimates associated with regression analysis. Self-concept was significantly correlated with habit, attitude, ability to perform, role beliefs, arousal, and social norms. Social norms was significantly correlated with attitude, ability to perform, and arousal. Arousal was significantly correlated with habit, attitude, role belief, personal beliefs, and self-concept, but arousal was never a significant predictor variable in the present model. The parameter estimates in regression analysis (Table 8) correct for multicollinearity.

When the proposed model was analyzed by stepwise regression, the reduced model with the five significant variables explained 49% ($p<0.0001$) of the variance, similar to when all variables are included in the complete model (50%; $p<0.0001$). Table 9 shows the regression analysis for the model when only the significant regression variables

Table 9. Regression analysis of dietary behavior score (dependent variable); independent variables: habit, attitude, role beliefs, ability to perform, and gender. Reduced model.

Analysis of Variance

Source	d.f.	MS	F-value	Prob>F
Model	4	1.494	13.18	.0001
Error	70	0.113		
Total	74			

$R^2 = 0.49$

Parameter Estimates

Predictor Variables	Standardized Regression Coefficient	t-value	Prob > t
Habit	.20	2.24	.03
Attitude	.22	2.37	.02
Ability to perform	.26	2.82	.006
Role beliefs	-.39	4.47	.0001
Gender	.28	3.18	.002

were included as predictor variables. The standardized regression coefficients of the variables did not change significantly when only the significant variables were part of the model. Other factors need to be identified to account for the remaining 50% of the variance.

In summary, the proposed multiple predictor variable model tested in the present study provides empirical support for use of the reduced form of the model to describe total dietary and saturated fat intake in this elderly population. In addition, these findings provide empirical support for the following hypotheses: a) an individual's habitual dietary behavior is related positively to dietary fat behavior (Hypothesis 1); b) an individual's attitude was a significant predictor of dietary fat behavior (Hypothesis 2); c) an individual's evaluation of his/her own ability to perform the behavior was a predictor of dietary fat behavior (Hypothesis 3); and d) gender was a significant variable in dietary fat behavior (Hypothesis 9). Personal normative beliefs (Hypothesis 5), arousal (Hypothesis 6), social norms (Hypothesis 7), and self-concept (Hypothesis 8) were not significant variables in predicting dietary fat behavior. Role beliefs, though significant, were not positively correlated with behavior, so Hypothesis 4 was not upheld.

DISCUSSION

The Proposed Model

Dietary guidelines such as those proposed by the U.S. Department of Agriculture (USDA, 1990), the American Heart Association (AHA, 1988), and the National Cancer Institute (NCI, 1987), call on the American public to make many specific dietary changes. In the present study, twelve dietary fat behaviors represented behavior. These twelve dietary fat behaviors were the measures of the dependent variable dietary fat behavior. These twelve dietary fat behaviors, however, were concerned with only one of the proposed dietary guidelines, reduction of total and saturated fat intake. The complete model explained 50% ($p<0.0001$) of the variance, and the five significant predictor variables in the model (habit, attitude, ability to perform, role beliefs, and gender) are supported by previous research as predictors of behavior (Wallston and Wallston, 1984; Terry et al., 1991; Sapp and Harrod, 1989; Weiner et al., 1972; Triandis, 1977; 1980; NCHS, 1986; Rawkowski, 1987). It has been suggested that the many dietary changes needed before America's eating habits comply with proposed dietary guidelines mean that more than one model is needed to explain how to achieve dietary change (Contento and Murphy, 1990). Additional research with

models and dietary behavior will provide a more complete explanation of the variability of dietary behavior.

Gender was a significant variable in the present model. In this study, survey data from male and female subjects were combined to form one sample. Post-menopausal women have cholesterol levels and blood pressures that surpass those of men in the same age group (Stephen and Wald, 1990), but risk factors for circulatory disease are similar for both genders, so combining data obtained from elderly men and women is acceptable. Similar dietary fat behavior does not mean, however, that similar social-psychological variables influence dietary fat behavior in men and women, and possible gender differences should be anticipated.

Triandis (1977; 1980) based his theory of planned behavior on the premise that habit becomes the most important predictor of repetitive behaviors. Wallston and Wallston (1984) measured dental health behavior and reported that significant past dental health behavior of six months is a strong predictor of current behavior. Habit (several months to a year) made a significant contribution to the prediction of behavior in regard to sodium consumption of young adults (Feldman and Mayhew, 1984). The elderly participants in the present study voluntarily changed their dietary behavior in the direction of their current dietary

intake approximately 11-15 years ago. The 11-15 year time span represents a strong dietary fat behavior habit.

Efforts to get Americans to decrease their total dietary and saturated fat intake began in the late 1950's when Keys (1957) reported epidemiological evidence supporting the concept that diet, especially dietary fat, was associated with elevated serum cholesterol concentrations and with CHD. Key's research triggered the long history of public policy directed toward implementing dietary changes to improve the health of Americans. The participants in the present study have been subjected to information about dietary fat intake behavior changes for about 30 years.

Attitudes about food have long been determinants of eating behavior and include a wide variety of feelings toward food and food behavior. In a recent study that measured attitudes and milk consumption behavior (Lewis et al., 1989), 457 middle aged adults avoided whole milk because of the negative association with calories and saturated fat/cholesterol content even though they reported enjoyment of the taste. In another study (Fischer et al., 1991), 60 to 70-year-olds (n=480) had positive attitudes about the connection between eating habits and positive health outcomes, and 75 to 80-year-olds (n=480) had attitudes that reflected the idea that at their advanced ages positive health outcomes were not easily attained by

dietary changes. In another study (Denmark-Wahnefried and Bowering, 1991) persons aged 20 to 65 had positive attitudes toward the addition of low-fat food products rather than fiber supplements to lower serum cholesterol. Terry et al. (1991) used a dietary fat behavior index similar to the one herein described to discover that 35 to 55-year-old men (n=300) were more likely to adopt desired dietary fat behavior when they had positive attitudes about the desired dietary fat behavior.

In the present study individuals responded that it was pleasing to eat high-fat foods, but they did not eat them because high-fat foods were considered bad for them. Their positive health concerns about high-fat foods influenced their feelings toward high-fat foods and they reported desirable fat consumption behavior.

The research of Weiner et al. (1972) supports ability as a determinant of a behavior. Barnes (1990) studied 24 men under cardiac care, and reported that compliance with cardiac dietary guidelines was positively correlated with attitudes about the ability to perform the specific dietary activities involved with compliance. It is logical that subjects in the present study ate particular foods because they were comfortable in the preparation of those foods and in their ability to change their consumption of those foods.

Triandis's theory (1977; 1980) supports the variable role beliefs as a significant predictor variable for behavior. The results of the present study indicated that the respondents did not think it was appropriate to change their dietary fat intake behavior. The respondents answered that changes to additionally reduce their dietary fat intake were not appropriate behavior. Role beliefs were highly significant predictors in the present study and were negatively correlated with dietary fat behavior. Questionnaire items for role beliefs need to be reworded to include items that measure role beliefs in persons already practicing desired dietary behavior.

Previous use of similar social-psychological (Feldman and Mayhew, 1984) and other health behavior models (Becker and Maiman 1975: Becker et al, 1977) has indicated that for the best prediction of behavior, the total model must be tested. The results of the present study indicate that the reduced model is as effective as the full model in predicting dietary fat behavior. When an elderly population is being studied, it is a positive feature for a survey instrument to be short.

There are several reasons the reduced model may perform as well as the whole model. First, dietary behavior is a habitual behavior and habits facilitate consistent resultant behavior. In the present study, respondents averaged eleven

to fifteen years of practicing reported behaviors. This is significant past behavior and it may have eliminated the need to have the variables in the model that were not significant predictors of dietary behavior (personal normative beliefs, arousal, social norms, and self-concept). Arousal or level of concern about dietary fat behavior was not a significant predictor variable and arousal becomes less important the stronger the habit (Triandis, 1977). Arousal is a measure of motivation, and if a person is already practicing the desired behavior there is not a great need to motivate him/her to continue the same behavior.

The variables personal normative beliefs, social norms, and self-concept are similar to arousal. If an individual has a habitual behavior that is the desired behavior, it becomes less important what others believe about the behavior. An individual's self-concept is strongly influenced by what others think of him/her (Eisen, 1972; Triandis, 1977) and again, if the desired behavior is already practiced, self-concept as a predictor of behavior becomes less important.

There is reason to examine the predictive power of the complete model with other elderly populations. For example, social norms may be a significant predictor in other ethnic groups. The significance of all the variables in the model

may change with different elderly populations and different dietary habits.

Dietary Behavior

The goal of national reports (Department of Health and Human Services, 1988; 1990; National Research Council, 1989) is to have the population as a whole achieve a fat intake of less than 30% of total caloric intake. Available dietary intake data (NCHS, 1983) suggest that the diet of the elderly population (up to age 74) is 34% and 37% fat. When these data are compared with recommendations, it is apparent that there is still much change that needs to be achieved in the older population. Dietary behavior scores of participants in the present study were interpreted to mean desired dietary fat behavior was achieved. Without actual dietary intake records, and accounting for the national data (NCHS, 1983), it is possible that dietary fat intakes in the studied population are greater than the recommendations. If this is indeed true, then the significance of the predictor variables provides direction for programs to further decrease dietary fat consumption in the study population. A recent study (n=117, age range 18-75 years) reported that older subjects were more likely to be changers of dietary behavior than younger subjects (Contento and Murphy, 1990),

therefore it is realistic to think that with thoughtful programs, changes can still be made in late life.

The present study examined actual self-reported behavior, rather than behavioral intention that has frequently been studied. The ability to predict one population's desired behavior, such as total dietary and saturated fat intake behavior, provides a starting place for attempting dietary change in other populations. Educational programs or nutrition-related advertisements directed toward making desired fat-intake behavior habitual in elderly consumers may benefit from addressing predictor variables of that age group. Information or advertisements need to focus on activities that are consistent with an elderly person's ability to perform the desired behavior, role beliefs about the desired behavior, and attitudes about the desired behavior.

Implications

The present study has valuable practical implications. For example, this study provides empirical support for an abbreviated survey that is more attractive to a population that does not tolerate tedious survey instruments. The dietary behavior measure makes the model appropriate for the nutrition discipline, to improve understanding of the social and psychological factors that affect dietary behavior. As

a consequence, nutrition educators can focus their efforts toward effectively implementing the dietary recommendations that the scientific community has agreed upon.

In addition, the usefulness of this model with a population made up of other than the typical college-aged experimental subjects is important. There has been little work done with elderly in regard to promoting preventive dietary behavior.

The present study provides some insight into how to direct nutrition education and promotional campaigns toward members of the elderly population who do not practice desired dietary fat behavior. The information that habit is a significant predictor variable may encourage innovative nutrition implementation and intervention programs.

Gender makes a difference in dietary fat behavior. Educational and promotional programs aimed at implementing changes in dietary fat behavior must address the gender difference. Unlimited research budgets may allow for studying large segments of the elderly population that include both genders. If, however, budgets are limited, concentrating on post-menopausal women when studying preventive dietary behavior in the elderly may provide information for implementing dietary guidelines that will produce big gains in terms of increasing the number of years of functional activity. Post-menopausal women have similar

risks as men of circulatory diseases, and they also make up the majority of the elderly population.

The significance of the ability to perform variable provides cues for designing dietary intervention programs. Programs like the current grocery store educational tours increase consumers' abilities to feel comfortable in a shopping situation. Other education possibilities include recipe exchanges and actual cooking classes. This information can be directed toward both men and women with the potential for the biggest change in the individuals who have spent the least time involved in meal planning and preparation.

Results of the present study indicate that role beliefs are strong predictors of dietary fat behavior. This information could be used to design advertising campaigns that show the elderly population being active members of society with the capacity to change behavior throughout life; these positive role models could be used to strengthen the role belief that preventive behavior is acceptable regardless of age. Also, if the target group has already achieved the desired dietary behavior, or their self-perception is so, confirmation of the appropriateness of preventive dietary behavior by suitable role models in the advertising media may reaffirm the target group's dietary role beliefs and maintain recommended behavior.

The public in general, and the elderly in particular, should not have unrealistic expectations about what can be accomplished by changing dietary behavior. Present nutrition knowledge does not endow dietary manipulations with the ability to reverse the aging process, guarantee against disease, or give greatly improved energy levels or exceptional health. The most that one can now realistically hope for is that the practice of preventive dietary behavior, in combination with other measures, will increase the number of years of functional well-being and delay the emergence of specific chronic diseases (Rivlin, 1981).

To achieve adoption of desired dietary fat behavior in the elderly (DHHS, 1988; 1990; NRC, 1989), it is important to determine what social-psychological factors predict dietary behavior. Knowledge of factors that predict dietary fat behavior provides information about how to best accomplish changes that will allow our longer living population to reap the benefits of longer functional existence and delayed emergence of chronic disease.

Nutritional adequacy has been the traditional concern when discussing diet and the elderly, but the phenomenon of increasing life expectancy brings added concerns about loss of functional activity during the additional years of life. Recent evidence is available that documents the wisdom of dietary intervention as a preventive health measure in the

elderly population. Researchers who conducted the Framingham Study (Kannel and Brand, 1985; Kannel et al., 1987; Castelli et al., 1989) and the Honolulu Heart Study (Benfante and Reed, 1990) provided evidence that elevated serum cholesterol levels in the elderly should be treated with the same vigor as in younger populations to work toward the prevention of coronary heart disease. One of the prescriptions for intervention is changing dietary habits by lowering the consumption of total and saturated dietary fat, the behavior that the present study has addressed.

Limitations of Study

There are limitations to any research project, and the present study is no exception. One problem always encountered in gerontological research is that the elderly population is a very heterogeneous group, which makes generalization from a sample group to the total elderly population difficult. To generalize results to a larger population than the one studied, the demographic characteristics of the sample must be known. The sample studied here is demographically similar to its cohort in the state of Iowa with one exception, education level. It is important to comment on and account for education level in generalizing the results of this study to the larger population. Education did not modify the model in the

present study, but it may in studies that include subjects with different educational backgrounds.

The second limitation is in the measure of dietary behavior. As with any health behavior, subjects tend to report embellished behavior in the direction of perceived desired behavior. This is a problem with all types of dietary behavior data.

Areas For Future Research

Ideally, future research projects should be longitudinal in nature. Original measures of predictor variables would provide direction for implementation programs. Continued study would measure actual compliance when implementation programs were in place.

SUMMARY AND CONCLUSIONS

The present study was undertaken to investigate social and psychological factors that influence total and saturated dietary fat intake behavior in an elderly population. A social-psychological model, derived from several health behavior models, was proposed for study. The multiple predictor variable model is as follows:

$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e$,

where Y is the dependent variable, dietary fat behavior; the β's are the standardized regression coefficients; and the X's are the independent predictor variables habit (X_1), attitude (X_2), ability to perform (X_3), role beliefs (X_4), personal normative beliefs (X_5), arousal (X_6), social norms (X_7), self-concept (X_8), and gender (X_9). The demographic variables education and income were also considered.

The study population included 75 elderly persons aged 60 and older (51 women, 24 men), in a midwestern urban area. Almost all respondents had completed high school degrees (97%), and the average yearly household income of the entire sample ranged from $20,000 to $29,999. The participants reported low consumption of the high-fat foods in the 12-item index used to measure the dependent variable, dietary fat behavior. The twelve food behaviors were used to calculate a score (range 0.00-3.00) for dietary behavior

associated with total and saturated fat consumption. A low score indicated a higher degree of adoption of the desired fat consumption behavior, and a high score indicated that recommended fat behavior had not been adopted. The mean score for men was 1.08 and the mean score for women was 0.83, indicating adoption of desired dietary fat behavior.

The results from the present study show that the proposed social-psychological model of health behavior is effective in predicting dietary fat behavior in an elderly population. The model with nine predictor variables significantly ($p<0.0001$) explained 50% of the variance associated with total and saturated dietary fat intake behavior. The model specified the variables habit ($p=0.02$), attitude ($p=0.05$), ability to perform ($p=0.01$), role beliefs ($p=0.004$), and gender ($p=0.004$) as the significant predictor variables in the model. The demographic variables education and income did not modify the model. A reduced form of the model, including only the five significant predictor variables (habit, attitude, ability to perform, role beliefs, and gender) explained 49% ($p<0.0001$) of the variance, similar to that of the full model. A reduced model may be effective for explaining dietary fat behavior with groups similar to the population studied.

The present study has important implications for nutrition educators when addressing an elderly population.

Educational and promotional programs aimed at implementing changes in dietary fat behavior must address the gender difference. The significance of the ability to perform variable provides cues for designing dietary intervention programs. For example, programs like the current grocery store educational tours increase the consumers' ability to feel adequately informed in a shopping situation. Other education possibilities include recipe exchanges and actual cooking classes. The promotional and educational information can be directed toward both men and women with the potential for the biggest change in the individuals who have spent the least time involved in meal planning and preparation.

There has been little work done with the elderly in regard to encouraging preventive dietary behavior. The potential for increasing the number of functionally active years by making dietary changes is attractive and there should to be more research focused on the elderly.

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APPENDIX I

Survey Instrument

Please answer all of the following questions. Your answers will be held in the strictest confidence.

This section asks you to describe how often you may eat certain foods. For each food or group of foods, please put a check in the column that best answers how often you eat it (daily, several times per week, about once a week or less than weekly).

FOODS	DAILY	SEVERAL TIMES A WEEK	ABOUT ONCE A WEEK	LESS THAN WEEKLY
Ground beef or foods containing ground beef				
Frankfurters, sausage, bacon, or high fat luncheon meats such as bologna and salami (does not include sliced ham, chicken, or turkey)				
Whole-fat milk to drink or on cereal (does not include skim or low-fat milk)				
Cream or ice cream				
Natural and processed cheeses such as American, Swiss, or cheddar (includes cheese in cooked foods, on sandwiches, or by itself)				
Margarine, butter, or sour cream				
Sweets such as cakes, pies, cookies, doughnuts, sweet rolls, and candy bars (not angelfood cake)				
Snack crackers or chips				
Fat on meat or skin on chicken				
Fried foods				

1. What brand of margarine or butter do you usually use in your home? _____

2. If margarine, is it regular or diet? (circle) Regular Diet

3. What type of fat do you <u>usually</u> use for cooking in your home? (circle type)

vegetable oil lard butter margarine shortening

4. Are your eating habits the same today as they have been all your life? (Circle yes or no)

yes no

If you answered yes to question #4, please go on to question #8.

5. If you answered no to question #4, how long have you been eating the way you do now?

_____

6. If you answered no to question #4, what made you change your eating habits? (explain)

_____

7. If you answered no to question #4, how did your eating habits change? (explain)

_____

8. How many people live in your household? _____

9. How often do you cook meals or assist in cooking meals in your home? (circle best answer)

almost always | about 1/2 the time | seldom | never

10. How often do you shop for food or assist with the grocery shopping? (circle best answer)

almost always	about 1/2 the time	seldom	never

11. How many meals do you eat away from home in a week? _____

Answer questions 12 through 30 by circling the best answer unless otherwise instructed.

12) I could eat high fat foods less often.

very easy	easy	neither easy nor difficult	difficult	almost impossible

13) I think that preparing low fat meals for myself would be:

very easy	easy	neither easy nor difficult	difficult	almost impossible

14) I worry about how much fat is in my diet.

not at all worried	a little worried	worried	very worried	extremely worried

15) It is appropriate for me to eat fewer high fat foods.

strongly agree	agree	neither agree nor disagree	disagree	strongly disagree

16) I think I should eat fewer high fat foods.

strongly agree	agree	neither agree nor disagree	disagree	strongly disagree

17) For me, eating high fat foods is:
(Check the space that best describes your feelings.)

a. disgusting __: __: __: __: __ pleasing

b. good __: __: __: __: __ bad

18) My family thinks I should eat high fat foods.

very unlikely	unlikely	neither likely nor unlikely	likely	very likely

19) I want to do what my family thinks I should do.

strongly agree	agree	neither agree nor disagree	disagree	strongly disagree

20) My spouse thinks I should eat high fat foods.

very unlikely	unlikely	neither likely nor unlikely	likely	very likely

21) I want to do what my spouse thinks I should do.

strongly agree	agree	neither agree nor disagree	disagree	strongly disagree

22) My friends think I should eat high fat foods.

very unlikely	unlikely	neither likely nor unlikely	likely	very likely

23) I want to do what my friends think I should do.

strongly agree	agree	neither agree nor disagree	disagree	strongly disagree

24) My doctor thinks I should eat high fat foods.

very unlikely	unlikely	neither likely nor unlikely	likely	very likely

25) I want to do what my doctor thinks I should do.

strongly agree	agree	neither agree nor disagree	disagree	strongly disagree

26) It is appropriate for me to eat more low fat foods.

strongly agree	agree	neither agree nor disagree	disagree	strongly disagree

27) I think I should eat more low fat foods.

strongly agree	agree	neither agree nor disagree	disagree	strongly disagree

28) I am the kind of person who is concerned about what I eat.

strongly agree	agree	neither agree nor disagree	disagree	strongly disagree

29) How old are you?_____(If you would rather not say please circle the range.)

60-64 65-69 70-74 75-79 80-84 85 or older

30) Sex (circle): Male Female

31) Race (circle):

White	Black	American Indian	Asian or Pacific Islander	Other

32) Ethnicity (circle one): Hispanic Not Hispanic

33) What is your marital status? (circle)

Single Married Widowed Separated Divorced

34) What is your estimated current annual household income? (circle)

less than $5000	$5000-$9,999	$10,000-$14,999	$15,000-$19,000	$20,000-$29,999	$30,000-$39,999	$40,000 or more

35) Please circle the description that best describes your current employment status:

Employed Unemployed Retired

36) What is your occupation? _____
(if unemployed, usual occupation; if retired, former occupation)

37) Please circle the description that best describes the occupation listed above:

Unskilled worker	Skilled worker	Office, Sales, Clerical	Mana-gerial	Pro-fessional	Self-employed

38) What is your spouse's occupation _____
(if unemployed, usual occupation; if retired, former occupation)

39) Please circle description that best describes the occupation listed above for your spouse:

Unskilled worker	Skilled worker	Office, Sales, Clerical	Mana-gerial	Pro-fessional	Self-employed

40) Check if you have any of the following:

_____ Heart disease
_____ Hypertension
_____ Cancer
_____ Obesity
_____ Osteoporosis
_____ Arthritis
_____ Peridontal disease
_____ Liver disease
_____ Kidney disease
_____ Diverticulosis and/or diverticulitis

41) Check any of the following you trust as sources for nutrition information.

_____ Newspaper or magazine
_____ Book, newsletter, or phamphlet
_____ Television or radio
_____ Family or friends
_____ Doctor or nurse
_____ Dietitian or nutritionist
_____ Food labels

42) How many years of schooling have you completed?

0-8 9-12 13-16 17-18 19-20 21 or more

43) What is the highest degree you hold?

Eighth Grade	High School Degree	Associate Degree	Bachelor Degree	Master or Law degree	Doctorate or Ph.D.

44) Do you smoke cigarettes? (circle) yes no

45) If you smoke cigarettes, how much do you smoke each day?

less than a pack | a pack | 1-2 packs | 2 packs | more than 2 packs

46) Do you use any other kind of tobacco? (circle) yes no

47) If yes, what type? (circle) cigar pipe tobacco chewing tobacco

48) How often do you exercise? (circle)

daily | several times per week | about once per week | less than weekly | never

APPENDIX II

Reliability Measures for Questionnaire Items

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Reliability Measures For Questionnaire Items

Predictor Variables	Number of items	Cronbach's[a] alpha	Questionnaire items (Appendix I)
Habit	1	-[b]	How long have you been eating the way you do now? Response scale that reflected the number of years of practice of reported dietary behavior; 1 = 20 or more years, 2 = 16-20 years, 3 = 11-15 years, 4 = 6-10 years, 5 = 0-5 years.
Attitude	2	.70	1. Eating high fat foods is: disgusting to pleasing. 2. Eating high fat foods is: good to bad. Lower score means high fat foods are bad and pleasing to eat.
Ability to Perform	2	.82	1. I could eat high fat foods less often. 2. I think that preparing low fat meals for myself would be: Both questions coded from "very easy" to "very difficult." Lower score means able to eat fewer high-fat foods and prepare low-fat foods.
Role Beliefs	2	.76	1. It is appropriate for me to eat more low fat foods. 2. It is appropriate for me to eat fewer high fat foods. Both questions coded from "strongly agree" to "strongly disagree." Lower score means appropriate to eat more low-fat and fewer high-fat foods.

Personal Normative Beliefs	2	.75	1. I think I should eat more low- fat foods. 2. I think I should eat fewer high-fat foods. Both questions coded from "strongly agree" to "strongly disagree." Lower score means respondent thinks s/he should eat fewer high-fat foods or more low-fat foods.
Arousal	1	-[b]	I worry about how much fat is in my diet. Coded from "extremely worried" to "not at all worried." Lower score means more worried.
SOCIAL NORMS: Normative beliefs X Motivation to comply			
Normative Beliefs	4	.70	1-4. My (family, spouse, friends, doctor) think(s) I should eat high-fat foods. All questions coded from "very unlikely" to "very likely." Lower score means referent doesn't think high-fat foods should be eaten.
Motivation to comply	4	.71	1-4. I want to do what my (family, spouse, friends, doctor) think(s) I should do. All questions coded from "strongly agree" to "strongly disagree." Lower score means respondent wants to do what referent wants me to do.
Self-concept	1	-[b]	I am the kind of person who is concerned about what I eat. Coded from "strongly agree" to "strongly disagree." Lower score means type of person who is concerned about his/her diet.

[a] Cronbach, 1951
[b] Variables with only one measure

APPENDIX III

Fat Content Of Foods

High-fat Foods	Low-fat Foods
Avocado	Beans, peas, lentils
Bacon	Bread
Beef-choice grade of chuck rib, sirloin, and loin untrimmed, hamburger (regular)	Buttermilk
Butter, margarine, fat	Cabbage, boiled
Cheese - natural and processed	Cakes - angelfood and sponge
Chips and some snack crackers	Cereals, breakfast - except granola
Coconut	Cottage cheese, uncreamed
Cold cuts - bologna, salami, Braunschweiger	Fish - ocean perch (broiled)
Coleslaw	Frozen yogurt
Cream - heavy, light, 1/2 & 1/2, sour, rich ice cream	Fruits and fruit juices
Cream cheese	Grains
Frankfurters	Milk, skim
Fried foods	Seafood - scallops & shrimp (steamed or boiled
Headcheese	Soups - split pea, bouillon, consomme
Nuts - walnuts, peanuts, cashews, almonds, etc.	Tuna in water
Olives	Turkey, roasted white meat
Pastries - cakes, pies, cookies, doughnuts, sweet rolls	Vegetables and vegetable juices
Peanut butter	
Pork - sausage, spareribs, butt, loin, and ham untrimmed	
Seeds - pumpkin, sesame, sunflower	

Adapted from Brody (1982) and USDA (1976-1989).

APPENDIX IV

Additional description of participants in study

	Percentage of population studied
Occupation 73.3% retired	
Unskilled	9.3%
Skilled	26.7%
Office, Sales, Clerical	21.3%
Managerial	13.3%
Professional	24%
Self-employed	4.0%
Missing data	1.3%
Smoking	
Yes	14.7%
Frequency	
< 1 pack/day	55%
1 pack/day	36%
> 1 pack/day	9%
No	85.3%
Exercise	
Daily	28.0%
Several times/week	37.3%
Once a week	16.0%
< weekly	5.3%
never	13.3%
Chronic diseases present	
0	32.0%
1	42.7%
2	17.3%
3	7.9%
(Heart disease, hypertension, cancer, obesity, osteoporosis, arthritis, peridontal disease, diverticulosis/diverticulitis)	
Sources of Nutrition Information	
Newspaper or magazine	37%
Book, newsletter, phamplet	44%
Television or radio	36%
Family or friends	31%
Doctors or Nurses	69%
Dietitians/Nutritionists	51%
Food labels	48%
None	11%