To the Graduate Council:

I am submitting herewith a dissertation written by Dellmar Walker entitled "The Relationship of Loneliness and Social Isolation to Dietary Adequacy of Noninstitutionalized Elderly Individuals." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Home Economics.

Roy E. Beauchene, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Vice Provost
and Dean of The Graduate School

THE RELATIONSHIP OF LONELINESS AND SOCIAL ISOLATION TO DIETARY ADEQUACY OF NONINSTITUTIONALIZED ELDERLY INDIVIDUALS

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ABSTRACT

Characterizing older persons as being lonely and socially isolated has been widely suggested, yet it has not been substantially supported. Furthermore, loneliness and social isolation have been identified as contributing to dietary inadequacies among elderly individuals. The purposes of this study were to evaluate the dietary adequacy of elderly individuals in Rutherford County, Tennessee, and to determine whether differences could be attributed to loneliness, social isolation, physical health, functional status, and participation in Title III congregate meal programs.

Sixty-one independently living elderly individuals over the age of 60 years participated in the study. Three-day food records were used to collect dietary data, and comparisons of nutrient intake were made to the 1980 Recommended Dietary Allowances. An evaluation of nutrient intake revealed that energy and calcium were most likely to be underconsumed by all subjects regardless of race or gender. Individuals who participated in group meal programs had lower intakes of vitamin A than those who did not, but the level was in an acceptable range of the Recommended Dietary Allowances. Physical health was shown to be related to intakes of vitamin A and ascorbic acid, indicating that individuals in poor physical health are more likely to consume inadequate diets and vice versa. Loneliness was not found to be higher in older individuals but did appear to be related to the number of social contacts reported. Preliminary evidence suggested that loneliness was related to dietary adequacy based on mean adequacy ratios of the total diet and on the intakes of protein and food energy.

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CHAPTER I

INTRODUCTION

Since 1900, the proportion of the United States population over the age of 65 years has risen from 4 percent to 11 percent and is expected to increase to approximately 17 to 22 percent of the total population by the year 2030 (1, 2). By the year 2000, the population group over 65 years of age is expected to number 52 million, nearly half of whom will be 75 years of age or older (3). Posner (4) estimated that approximately 85 percent of the population over the age of 65 years suffers from some form of debilitative health condition that may be related to poor nutrition, such as heart disease, diabetes mellitus, obesity, or hypertension.

The increasing proportion of the elderly population and their disproportionate demand on the health care system has resulted in an increasing focus on age-associated biological, psychological, and sociological changes that may be related to nutrition. An understanding of the influence of social factors, economic status, health, and other lifestyle factors on nutrient intake of aged individuals is critical to assure that program and policy development is adequate for optimal nutritional status.

The results from the Ten-State Nutrition Survey, 1968-1970, were that individuals over the age of 60 years consumed less food than needed to meet nutrient standards for their age, gender, and weight. None of the subgroups identified met standards for caloric adequacy, and the nutrients consumed in inadequate amounts included protein, iron, and vitamin A (5). Low intakes of energy and iron were reported in the first Health and Nutrition Examination Survey, 1971-1974, in a representative sample of the United States population (6).

Social, economic, personal, and health-related variables are interacting factors that influence dietary adequacy (7-11). The complexity of interactions between these variables is further influenced by changes in income, household composition, living environment, and health status that accompany the aging process (12, 13).

Statement of the Problem

Section 701 of the Title VII Nutrition Program for the Elderly of the Older Americans Act of 1965 (14) contains four assumptions regarding causes of undernutrition among the elderly:

1. They cannot afford to eat adequate meals.

2. Elderly persons lack the skills to select and prepare meals that are well-balanced and nourishing.

3. Elderly persons have limited mobility that may impair their ability to shop for food and prepare meals for themselves.

4. The elderly have feelings of rejection and loneliness that impede the incentive necessary to prepare and eat a meal alone.

In 1972, the Nutrition Act under Title VII of the Older Americans Act was enacted by Congress to initiate a congregate meals program by which older Americans, especially those with lower incomes, were provided with nutritionally sound meals served in strategically located community centers (14). Scheider (15) identified personal, environmental, and programmatic barriers that impeded the effectiveness of the program in reaching a significant proportion of elderly persons who were, in fact, socially isolated. An extensive and personalized outreach program with transportation service was targeted as a necessity to assure that the

elderly with the greatest need, those with low income and isolated, would be able to participate in the nutrition program.

Psychological factors such as life satisfaction, morale, loneliness, and motivation are important factors in food-related behavior, yet few researchers have included measurement of these factors in studies of diets of the elderly. Loneliness is a subjective realization of lack of meaningful contacts with others (11). Therefore, there is limited information regarding the relationship of these variables to diet and appetite.

Most studies regarding nutrition and the elderly have been reported in terms of quantities of nutrients consumed with age, gender, and income being the only social characteristics controlled (5-10, 13, 16). Dietary adequacy is based on a comparison of nutrient intake to established dietary standards to determine the extent to which the intake meets or exceeds the standard. The standard most commonly used in studies of dietary adequacy is the Recommended Dietary Allowances (RDA), which are levels of nutrient intakes suggested by the Food and Nutrition Board of the National Research Council of the National Academy of Science to ensure good nutrition in healthy people in the United States (16).

The Technical Committee on Nutrition of the White House Conference on Aging in 1971 (17) reported that food consumption decreased with age, diets of the elderly were frequently low in vitamins and minerals, and better diets were found among individuals with higher levels of education and income. Although these findings are important, the complex interrelationships among age, sociodemographic, and sociocultural factors affecting food consumption were not assessed.

Many older persons who have consistently practiced sound eating habits adapt gradually to physiological and environmental changes and maintain an adequate food intake throughout the later years. Physical disabilities such as diminished eyesight and decreased mobility, which may interfere with meal preparation and consumption, can be overcome by gradual adaptation to the progressive disabilities resulting in improvement in functional status. Functional status is the degree to which an individual is able to perform socially allocated roles free of medically related limitations. However, drastic changes in lifestyle, such as death of a spouse or a change in living situation, may cause alterations in food-related behavior that are resistant to successful adaptation.

The Select Committee on Nutrition and Human Needs (17) has proposed that apathy and social isolation of the elderly contribute to reduced food intake, especially of those who live alone. This assumption is based on the premise that the social life of many elderly adults in our society is built around food, and therefore eating is a social and psychological event for humans as well as a biological one. After spending a lifetime internalizing the concept of food as part of a social activity, the older adult living alone may not be able to place enough personal emphasis on the nutrient content of the food to justify exerting the effort to prepare it and eat it alone. Loneliness often is associated with poor appetite and apathy toward food (18).

Social isolation, living alone, or without support and companionship of friends and family may contribute to a sense of low self-esteem among the elderly. Individuals with low self-esteem may not feel it is worth the effort to prepare a meal just for themselves. Therefore, within

groups of older persons, social isolation frequently is considered to be a contributing factor to development of a lack of interest in food and to dietary inadequacy (19, 20, 21).

Lack of social interaction is not specifically related to income, and it is equally important in the lives of the financially secure and in the lives of those in poverty (22). Apathy evolves from loneliness and is synonymous with lack of action. Without adequate food, an individual develops nutrient deficiencies that increase the apathy and depression, and eventually the result is mental confusion and the downward spiral continues (12, 22, 23).

Social isolation has been often reported to be characteristic of the aged although not substantiated. Some elderly persons who have frequent contact with others report feelings of loneliness, whereas others with few social contacts may not perceive themselves as lonely or isolated to any extent (24). The literature concerning relationships between social isolation and dietary inadequacy is also contradictory. Yearick (7) reported that elderly people living in a retirement community providing one major meal per day consumed less food than those who were completely independent, yet the two groups had similar biochemical indicators of nutritional status. Betts (12) found that social isolation and other external factors, such as inadequate economic resources, poor physical and mental health, and age, did exert an influence on dietary adequacy, yet these factors accounted for only 16 percent of the total variance.

There is little research concerned with the food changes an older person will make as a result of changing environment, such as the drastic

change from being independent and caring for one's own food needs to depending on others (23). An independently living individual is a non-institutionalized person whose major daily care, financial management, and necessities of daily living are provided by himself or herself, family members, or other persons within the individual's place of residence. There are indications of differences in the dietary status of persons living in rural, urban, and institutional residences. Some studies have emphasized the constraints placed on obtaining an adequate diet for individuals in urban versus rural places of residence (7, 11, 22, 23).

Isolation also may be related to housing that is not located conveniently to markets or food service facilities or having inadequate kitchen facilities, which may create food barriers for the elderly (19). The urban elderly may shop more often at small neighborhood grocery stores and pay higher prices for convenience, therefore reducing their overall purchasing power and variety of selection. Inadequate transportation, fear of crime, and low income also may affect the shopping patterns of elderly persons in urban environments (11, 25).

Slesinger et al. (13) found that although changes in food intake and eating patterns are associated with income, education, and living alone, the food patterns continue to differ by age when these effects are statistically controlled. Thus, they concluded that there may be some merit to the federal nutrition programs that suggest food intake is influenced by poverty, knowledge, and education level. There is a need for research on a representative sample of the aged that would examine not only food intake but eating patterns and the relationships between these behaviors and demographic-sociocultural factors.

Purposes of the Study

Characterizing older persons as being lonely and socially isolated has been widely suggested, yet it has not been substantially supported by research studies. Furthermore, loneliness and social isolation have been identified as contributing to dietary inadequacies among elderly individuals. The purposes of this study were:

1. To describe the nutrient intakes of elderly independently living individuals and determine whether the diets of these elderly individuals are adequate when compared to the 1980 Recommended Dietary Allowances,

2. To determine whether there is a relationship between loneliness or social isolation and dietary adequacy,

3. To determine whether there is a difference between loneliness and dietary adequacy of individuals who participate in group meals programs and those who do not, and

4. To identify the relationship between dietary adequacy and the life-style correlates of housing type, subjective health status, and functional status.

Assumptions of the Study

The following assumptions were made concerning this study:

1. The Recommended Dietary Allowances are appropriate standards for determining degree of dietary adequacy of elderly individuals.

2. Food choices made by independently living individuals vary according to physiological, social, cultural, and environmental factors.

3. Nutrient intake is an important determinant of nutritional and health status.

CHAPTER II

REVIEW OF THE LITERATURE

The Senate Select Committee on Nutrition and Human Needs (17) proposed that apathy and social isolation contribute to the reduced food intake of elderly people, especially those who live alone. Questions that need to be answered before attributing this as a cause of dietary inadequacy include:

1. Can nutrient intake be reliably evaluated in independently living individuals using food records?

2. Are the standards used in assessment of the adequacy of the diet accurate evaluation tools for comparison of nutrient intake and estimated requirement levels?

3. Can social isolation and loneliness be measured reliably?

4. Is there significant evidence that the elderly are really lonely and isolated as a group?

Evaluation of nturitional status in the elderly population is difficult because of major differences in economic status, social environment, and genetic background. Furthermore, there is a lack of agreement as to the methods and measurements to be used as assessment tools and the questions of which standards should be used to evaluate level of adequacy (26).

Dietary Adequacy of the Elderly

Evaluation of dietary adequacy is generally reported as a comparison of actual intake to an established dietary standard through the use of percentages, ratios, or dietary scores based on number of servings from

food groups. Guthrie (27) tested the validity of the dietary score and the assumption that it can be used as a quantitative assessment of nutritional adequacy by applying the nutrient adequacy ratio scores of selected nutrients in relation to each of the food group scores. The nutrient adequacy ratio (NAR) is a score for a specified nutrient representing an index of adequacy based on the appropriate Recommended Dietary Allowance (RDA) for that nutrient. Guthrie conducted a one-way analysis of variance that allowed for the determination of whether the mean NAR of selected nutrients for subjects consuming the recommended number of servings of a food group was different from that of subjects consuming less than that number. The nutrients selected for analysis were those that made significant contributions to the specified food group used for comparison. For all nutrients, the correlation coefficients between dietary scores and NARs were highly significant. The correlation coefficient between mean adequacy ratio (MAR) or average of all NARs and total dietary scores was found to be +.71. Therefore, ratios using the RDA as a dietary standard and the use of food group scores both appear to be appropriate methods for evaluating dietary adequacy.

Fanelli and Stevenhagen (28) developed two techniques for evaluating food consumption patterns using frequency methods. The variety index represented the total number of foods consumed in a given time period. Core food lists were described as those foods routinely consumed by a population group. The researchers indicated that although the variety index approach provided a general sense of nutrient diversity of a diet, core lists with weighted scores were more applicable when the relationship between food usage and food-related behavior was studied and changes in eating patterns were monitored.

Several problems have been associated with collecting accurate dietary data from elderly subjects (10). The use of dietary records as a means of nutritional assessment includes the advantage that more than one day's food intake is obtained. The disadvantages are that the respondent must be responsible for the food preparation or the food preparer must keep the records. The quality of dietary records is related to the education level of the respondent as adequate writing capability is necessary. The use of the record method may not be possible with elderly subjects if arthritis or other physical problems make writing difficult.

The 24-hour recall method to evaluate the diets of elderly persons is seldom advisable because collection of valid information requires an excellent memory and responsiblity of the respondent for his or her own food preparation. Madden and coworkers (29) evaluated the ability of 76 elderly participants in a congregate meal program to recall the quantity and types of foods consumed during the previous 24-hour period. The recalled intake of the congregate meal was compared to the actual intake as observed by trained personnel. The mean intake differed only for energy and the reported value was less than that observed. The individuals tended to exaggerate the level of intake when small amounts were consumed and to underestimate when large quantities were consumed. This problem becomes apparent when comparisons of nutrient intakes are made between groups. Actual differences may be greater than reported differences. The authors concluded that improvement in nutrient intake as a result of participation in the congregate meal program may not be observed when recall methods are used.

Most researchers of dietary adequacy in the elderly have reported intakes lower than established standards for protein, vitamin A, thiamin, ascorbic acid, niacin, riboflavin, calcium, and iron (5-10, 13, 16, 26). The elderly most likely to be consuming inadequate diets were those who were female, black, low income, and living in institutions (26).

Dietary and biochemical assessment of a sample of 100 apparently healthy, independently living elderly persons in Oregon indicated that the intakes of calcium, vitamin A, and thiamin were the dietary nutrients most likely to be low, particularly in women (7). Grandjean (8) reported that 93 percent of congregate meal participants in Nebraska consumed diets providing at least 70 percent of the 1980 Recommended Dietary Allowance (RDA) for 13 nutrients calculated, and none of the participants consumed diets supplying less than 54 percent of the RDA.

Exton-Smith and coworkers (9) found that differences in nutrient intake reflected variations in total food-energy consumption of independently living elderly over the age of 65 living in England. Of the 3 percent diagnosed as malnourished of the population of 879, most cases of malnutrition were associated with disease. However, in the remainder of the population diagnosed as malnourished, no obvious medical cause was found nor could the malnutrition be attributed to dietary inadequacy on the basis of poverty.

Templeton (30) reported that 71 percent of 600 elderly individuals surveyed had diets that were inadequate in one or more nutrients when compared to the RDA. Calcium was inadequate in the diets of 57 percent of those surveyed, ascorbic acid was inadequate in 22 percent, and vitamin A was inadequate in 34 percent. In a study of elderly persons with low

or moderate incomes in rural Pennsylvania, intakes of less than two-thirds of the Recommended Dietary Allowance for calcium and vitamin A were found in 63 percent of subjects surveyed (31).

Other studies have included measures of sociodemographic variables to determine whether dietary inadequacy was related to type of housing and source of meals. Newman (32) found that a substantial subgroup of the elderly population who were the most likely targets of long-term home care services lived in housing units and environments that either impeded the efficient delivery of these services or precluded their delivery. Approximately 20 percent of the elderly population may have a sensory, motor, intellectual, or other health impairment that renders inadequate a living environment that would be usable by the functionally unimpaired (33).

O'Hanlon and coworkers (34) surveyed 445 elderly people and found a relationship between housing and consumption of four nutrients and five food groups. Differences in the proportion of individuals having inadequate intakes appeared to be related to whether subjects resided in public or private housing rather than to living alone. Of persons living alone in high-rise apartments for the elderly, 47 percent had poor ratings as compared with 30 percent of those living alone in private housing and 28 percent of those living with someone in private housing. A poor rating indicated that one or more nutrients were consumed in amounts less than 67 percent of the RDA. Todhunter (16) found no differences in dietary ratings of individuals who lived alone or with others.

O'Hanlon (34) hypothesized that because individuals tend to remain in their own homes as long as health and income allow, a possible explanation for differences in dietary adequacy could be that nutrient intakes of high-rise housing residents were affected by poorer health and lower incomes. The elderly individuals most likely to be at nutritional risk included women, persons with the least education, and persons who had experienced a drastic change in life-style either because of moving from private housing into high-rise apartments for the elderly or because they had recently stopped working. The categories of nutrition services that may be required by homebound elderly individuals include home-delivered meals, assistance in obtaining food stamps and emergency food supplies, medical nutrition intervention, and nutrition counseling (35).

Clarke and Wakefield (23) compared the previous eating behavior, current eating habits, and factors responsible for changes in food patterns of 102 Kansas residents age 70 years or older living at home with similar groups residing in nursing homes. Individual intakes were found to vary widely among both groups. Fewer than one-half of each group met at least 67 percent of the RDA for eight nutrients calculated, and 35 percent met at least 67 percent of the RDA for six nutrients calculated. The intakes did not differ on the basis of place of residence (nursing home versus own home), age, or gender.

Title III of the Older Americans Act as amended in 1978 is targeted toward providing nutritious meals, social interaction, counseling, referral to supportive programs and agencies, and access to transportation for the elderly. Researchers in central Maine examined nutrient intakes, dietary practices, and nutrition knowledge of the recipients

and nonrecipients of a congregate meals program (36). Mean intakes of energy and all nutrients did not differ for participants in the program when compared to nonparticipants. Neither the number of meals eaten alone nor living arrangements were related to patterns of intake of nutrients studied.

Clarke and Wakefield (23) found a change in the food habits of individuals after entering long term health care facilities. The nursing home residents had a greater number and degree of changes in food choices that did those who lived independently. Among nursing home respondents, changes in food habits were correlated negatively with nutritional adequacy scores. Respondents 80 years old or above with poor nutritional scores had made the greatest number of food habit changes. Among independently living participants, nutrient intakes apparently were not affected by food habit changes, possibly because the majority of independents had made few changes in their food habits.

Axelson and Penfield (37) studied the relationship of socioeconomic, personal, and social characteristics to predicted food expenditures of elderly persons living alone and found that age as an independent variable was related positively to total food expenditure. This finding is contrary to the general belief that interest in eating declines with age. In addition, none of the elderly surveyed was inclined to eliminate any foods from his or her present diet because of increases in price of the food items.

Baird and Schultz (38) related food attitudes and behavior to biochemical indicators of nutritional status. Inferences drawn about four emotional patterns (depression, loneliness, immaturity, and anxiety)

were that these patterns can have an overall negative effect on nutritional status. Below-average serum levels and dietary intake of many nutrients as well as elevated blood pressure and serum cholesterol were associated with attitudes and behavior, suggesting emotional dependence on food and the projection of negative emotional states into food habits.

Axelson and Penfield (39) identified food- and nutrition-related attitudes of elderly persons living alone. These attitudes were related to food use, cost, convenience, health, social status, aesthetic-sensory perceptions, and quality. Of the 66 elderly individuals surveyed, 83 percent agreed with the nutritious-healthful attitude, 75 percent with social-adventuresome, 50 percent with qualitative-pleasurable, and 14 percent with the frugal-utilitarian attitude. Implications of this study are that nutrition education programs for the elderly should be targeted toward these attitudes for optimal effectiveness. The findings of this study did not support the general perceptions that most elderly individuals are socially isolated, undereducated, and have food- and nutrition-related attitudes that differ from those of younger people.

Nutrient Requirements and Aging

A major limitation in studies dealing with nutritional needs of the elderly is the lack of extensive data regarding the changes in nutrient requirements that occur in conjunction with the aging process. Aging is accompanied by deterioration of renal, gastrointestinal, cardiovascular, muscular, skeletal, and mental function. Individuals differ greatly in the rate at which deterioration occurs because of differences in heredity and exposure to environmental insults (40). In addition, the elderly as a group are the single largest consumers of medications (3). Many

older persons receive medications for chronic conditions for extended periods of time and frequently receive several drugs concurrently. Therefore, many elderly people may be susceptible to adverse drug effects and particularly to drug-food interactions.

Dental problems have been cited often as a consequence of aging that contributes to decreased nutrient intake. However, the percentage of edentulous adults over the age of 65 years has decreased from 55 percent in 1960-1962 to 45 percent in 1971-1974. Tooth loss is no longer considered to be a natural consequence of aging. Niessen and Jones (41) suggest that all oral changes such as atrophy or oral mucosa and musculature and diminished taste acuity are not the result of the normal aging process. Rather, they reflect systemic disease, use of medications, inadequate nutrition, or lack of preventive care.

Recommended Dietary Allowances

Harper (40) indicated that the Recommended Dietary Allowances (RDA) for adults age 51 or older seem quite appropriate as guidelines for nutrient intake for the elderly in good health. The problem is that the elderly are not a population of completely healthy, active individuals who can be considered as a homogeneous group. In fact, a major hindrance in establishing dietary guidelines for the elderly is the great variability in characteristics of the elderly. Close to one-half of the elderly have some degree of limitation of activity and over 15 percent are unable to carry on any major activity (42, 43).

The Committee on Dietary Allowances (44) has stated that energy allowances for persons between 51 and 75 years of age should be reduced to about 90 percent of the amount required as a young adult and for persons

beyond 75 years to reduce allowances by 75-80 percent. This recommendation was based on studies of the adult population in which it has been shown that changes in body composition occur throughout life as the percentage of body fat increases with age and lean muscle mass decreases. Physical activity also shows age-associated decrements (44, 45, 46). With the exception of the energy requirement, aging in itself does not alter nutritional needs appreciably (40). However, special care must be taken to assure that nutrient needs are met when energy intake is decreased.

Restriction of caloric intake may have an influence on survival rates. The results of research on the independent effects of caloric and protein restriction were that calorically restricted rats (fed 67 percent of ad libitum fed controls) had increased survival rates even when both groups consumed the same amount of protein (47). Dietary protein restriction improved renal function but, unlike caloric restriction, decreased survival time. The authors concluded that caloric restriction was more effective than protein restriction in altering mature body weight, renal function, and survival of rats.

The Food and Nutrition Board emphasizes that protein intake in excess of the RDA may be desirable because many high protein foods are excellent sources of trace elements, especially iron (40, 44). However, renal function tends to deteriorate with age. When protein intake is high, large amounts of nitrogenous end products must be excreted, and thus the work of the kidney is increased. A practical solution is to increase the protein content of the diet minimally to ensure that individuals with low energy needs will have adequate protein intakes.

The evaluation of dietary adequacy in the elderly must involve a determination of actual intake and comparison to a standard that is based on changes in nutrient requirements that occur during the aging process. However, in order to deal with the problem of dietary inadequacy in the elderly, consideration must be given to the social, environmental, physical, and psychological factors such as loneliness that may influence the food choices made by the elderly population.

Loneliness and Isolation in the Elderly

After illness, crime, and financial insecurity, elderly Americans rate loneliness as the next major concern of old age (1). However, there is much disagreement as to which factors contribute most to loneliness in the elderly, the extent of the elderly population that is affected, and the degree of influence that loneliness and social isolation have on dietary adequacy.

There is a tendency in the literature to imply that an increase in social interaction and social enhancement at mealtimes for the older individuals will improve dietary adequacy whether the person is living independently, in special housing, in a hospital, or other care center (48). Learner (11) reported that the extent of satisfaction with frequency of visits with relatives and friends was an important influence on dietary intake in the aged. The number of reported dietary problems diminished when visiting frequency was perceived as adequate. The difficulty arises in determining whether an individual is indeed "lonely."

Heltsley and Powers (24) noted that feelings of loneliness often are expressed by elderly individuals who have substantial contacts with

others, whereas those with minimal contacts do not perceive themselves as lonely or isolated. Residents in retirement communities have been reported to have higher levels of social integration (as reflected in lower levels of loneliness, boredom, friendlessness, and feeling unneeded) and to regard themselves in more positive terms than those who lived independently (49). However, Liang and coworkers (50) cautioned that objective social integration is only indirectly related to morale. Subjective perception of integration is a critical intervening variable between objective social integration and morale. A person may surround himself or herself with many people but may still label himself or herself as lonely.

The concept of loneliness may be defined as a feeling and realization of lack of meaningful contacts with others and an unwelcome feeling of lack or loss of companionship (51). Living alone does not always entail loneliness. Never-married older persons have been found to be more isolated but similar to the married with regard to loneliness and life satisfaction (52). Loneliness is a subjective state that is distinguished from the objective states of social isolation and aloneness. Social isolation may contribute to loneliness by reducing opportunities for maintaining pleasurable relationships or developing new ones, and old age is potentially a time of increased risk of social isolation (53).

Contrary to popular belief, it does not appear that elderly people as a group experience loneliness in a greater degree than do other age groups, although there are differences among subgroups of the elderly (54). Researchers have found 27 percent of the elderly surveyed reported loneliness, whereas 46-68 percent of widows and widowers (55), 42 percent of

those living alone, 43 percent of handicapped elderly, and 53 percent of those over the age of 75 years felt very lonely (56). Feelings of loneliness (57) have been found to correlate significantly with psychological health, depression, and physical health. Negative correlations were found between feelings of loneliness and purpose in life and education. According to a representative study of American adults, 60 percent of those under 65 years of age considered loneliness to be a very serious problem of the elderly, whereas only 21 percent of the individuals over the age of 65 years said it really was (1).

As reported by Berg (51), a longitudinal study conducted in Denmark determined that the feeling of loneliness increased from 12 percent of the subjects at age 62 to 23 percent at age 72 years. Similar findings were reported in a national Swedish study in which 20 percent of persons ages 60-65 years felt lonely, and this proportion was 70 percent of those age 80 years or older.

Loneliness was found to be an important problem in 24 percent of women and 12 percent of men in a study of 1,007 persons age 70 years in Goteborg, Sweden (51). The most important factors related to feelings of loneliness were loss of spouse, depression of mood, and lack of friends. The lonely elderly individuals had negative self-assessment of health and required more outpatient care, social welfare help, and sedatives. The higher consumption of medical service and/or social care was not associated with a higher prevalence of definable somatic disease or handicaps. The results of this study indicated that loss of spouse is the single most important factor contributing to loneliness.

Feelings of loneliness among the elderly are quite complex and confounded by many physical and environmental variables. Kivett (58)

provided evidence that rural elderly adults generally can be classified as either high or low "risks" for loneliness according to a combination of physical and social losses that they have incurred. Frequent loneliness was associated with loss of mate, decreased vision and self-perceived health limitations, problems of transportation, being female, and having low participation in organized social activities.

A major hindrance to research on loneliness has been the lack of a simple and reliable method of assessment that would detect variations in loneliness that occur in everyday life. Russell and coworkers (59) developed the UCLA Loneliness Scale to provide a short (20-item) general measure of loneliness. The instrument was found to have a high internal consistency (coefficient alpha of .96) and a test-retest correlation of .73 over a two-month period. Several potential problems, however, were found with the scale, although it was considered to be reasonably accurate (60). All items on the scale were worded in the same direction and this systematic bias toward high scores influenced the total score. A second potential problem concerned the discriminant validity of the scale to demonstrate that loneliness is distinct from related constructs, such as depression and low self-esteem. A third concern was that individuals might not report all experiences of loneliness since loneliness scores might potentially be confounded with social desirability. A revised scale was shown to have a high internal consistency (coefficient alpha of .94) and discriminant validity for the scale was indicated by evidence that scores were not affected by social desirability.

The Belcher Scale (61) is a multidimentional measure including 59 items and four subscales to identify eight factors: alienation, anomie,

estrangement, existential loneliness, loneliness anxiety, loneliness depression, pathological loneliness, and separation. Of these eight Belcher factor scores, pathological loneliness (r = +.76) and estrangement (r = +.71) were most closely associated with the UCLA Loneliness Scale. The UCLA Loneliness Scale score appears to identify a subjective lack of social companionship, which is defined as social isolation and is less related to depression and anxiety than the Belcher Scale.

One error in equating living alone with loneliness is in assuming that people who live alone are socially isolated. Revenson and Johnson (53) surveyed 2,026 individuals of ages 18-89 years using the New York University Loneliness Scale, which directly addresses intensity of current loneliness. They concluded that the expressed dissatisfaction with available relationships was a more powerful indicator of loneliness than the number of social contacts. Correlations between loneliness and variables measuring satisfaction with social relationships were much stronger than those between loneliness and variables that described numbers of people in the social network of the respondent. The social network variables taken together as a set accounted for 49 percent of the variance in loneliness among older persons. The more social ties an individual reported, the more satisfied he or she tended to be with them.

Heltsley and Powers (24) used two measures to reflect degree of social interaction: a "contact/interaction score," which is the total number of contacts with others during a seven-day period and a "perceived adequacy of interaction scale," which measured the perceived fulfillment of personal relationships with family, friends, and neighbors by the aged.

Variables found to be related to the perceived adequacy of interaction score included marital status, age, income, housing quality, perceived health score, and rated health score. Housing quality and income were correlated also with the contact/interaction score and the perceived adequacy of interaction score.

Satisfaction with the interaction of the elderly with others may not be achieved regardless of the amount of interaction experienced. Heltsley and Powers (24) proposed that one level of social interaction may be necessary to provide for basic safety and well-being, and a higher level may be needed to provide for the desired quality of interaction.

Loneliness and isolation of the elderly may influence their food choices in conjunction with the living environment and proximity of friends, acquaintances, and family members. However, other factors such as physical health and functional status may limit further their ability to obtain and prepare meals and thereby influence the adequate intake of nutrients.

Physical Health and Functional Status

Physical health is a multidimensional variable, and the definition of health-illness status must be made with reference to two criteria. First, it should be in terms of departure from normal role functioning of the individual. Second, the dysfunction should have some relevance to health in a physical or medical sense (62, 63). Physical health may be measured as the number and types of illness experienced within a specified time interval with length of illness and degree of confinement

as indicators. Functional status refers to the individual's ability to function independently and focuses upon self-care activities and mobility limitations (63).

Rosencranz and Philblad (64) developed a health index to describe the physical health and other related characteristics of 1,700 independently living individuals 65 years of age and older in Missouri. Twenty-five percent of males and 20 percent of females were in excellent health and approximately 20 percent of both genders reported poor health, demonstrating wide variability of perceived health status in the elderly population.

The health index (64) was designed as a self-reported measure of physical health that would be more objective than a statement of health status. Type of illness, length of confinement, and type of confinement are weighted in the calculation of index scores. The authors caution that the health index is designed solely for the classification of individuals into broad health classes and specifically disclaim its appropriateness as a diagnostic tool or device for health counseling (63, 64).

The objection may be made that assignment of weights to types of illness is arbitrary and that some forms of illness labeled as minor may be far more disabling than those evaluated as major. The authors attempted to label conditions as major or minor according to the degree to which, on the average, they are the most disabling. Validation studies showed that persons who made the best scores on the index were the least handicapped functionally and also assessed their health more favorably than did those with scores reflecting a higher incidence of disease (64).

Functional status is defined as the degree to which an individual is able to perform socially allocated roles free of medically related limitations (62). The Guttman Health Scale for the Aged, as developed by Roscow and Breslau (65), was used to determine the degree to which elderly individuals were restricted in their activities because of their physical condition or capacity.

The Guttman Health Scale was developed to determine functional health of 1,200 individuals over the age of 62 years in Cleveland, Ohio (65). The response patterns produced a Guttman Scale meeting all formal criteria for this instrument. Guttman scales must be unidimensional and cummulative. A cummulative scale implies that the component items can be ordered and that respondents who reply positively to a difficult item will always respond positively to less difficult items and vice versa (66). Item error for the six responses varied between 4 and 12 percent. For the total scale, the coefficient of reproducibility was .91; this 9 percent level of error is very low for a Guttman scale based on six items. Roscow and Breslau (65) found that 53 percent of those elderly persons surveyed were not limited in any of their activities and 86 percent were healthy enough to engage in social activities outside of their homes.

Summary of the Literature

Much of the literature in reference to dietary adequacy in the elderly is descriptive with comparisons made between actual intake and the RDA. Many of the researchers have reported intakes lower than the acceptable standards for vitamin A, thiamin, ascorbic acid, niacin,

riboflavin, calcium, and iron. Researchers that have included socio-demographic factors have found sources of dietary inadequacy to be related to housing type, low income, living alone, and entering a long-term care facility.

Loneliness is considered by many to be a major concern affecting the elderly population, yet there is much disagreement as to the extent of the problem and how to deal with it. The elderly as a group may not experience loneliness in greater degree than other age groups although old age is potentially a time of increased risk of social isolation that may contribute to loneliness.

There is a tendency in the literature to imply that an increase in social interaction will improve dietary adequacy, although there is very limited evidence to substantiate this theory. Feelings of loneliness among the elderly are complex and confounded by many physical and environmental barriers. The purpose of this study was to investigate factors that may contribute to dietary inadequacy and determine if loneliness and isolation are related to nutrient intake in elderly individuals.

CHAPTER III

METHODOLOGY

Hypotheses

The following hypotheses were tested to investigate whether loneliness, social isolation, and selected sociocultural factors were related to nutrient intake:

1. There is no difference in the energy and nutrient intakes of elderly male and female individuals.

2. There is no difference in energy and nutrient intakes of elderly black and elderly white individuals.

3. There is no difference in energy and nutrient intakes of elderly individuals who participate in group meals programs and those who do not.

4. There is no relationship between loneliness or social isolation and dietary adequacy.

5. There are no differences in dietary adequacy of elderly individuals who live in private single family housing, high-rise apartments for the elderly, unrestricted apartments, duplexes, or public housing.

6. There is no relationship between physical health and nutrient intake or dietary adequacy.

Subjects

Independently living individuals (n = 61) ages 60 years and over living in Rutherford County, Tennessee, were participants in this study. A number of subjects were recruited from housing centers and agencies located in Murfreesboro, the largest town (population 33,000) and county seat of Rutherford County. The goal was to include individuals in a

wide range of housing situations, income ranges, and social strata. The following community resources were selected in an attempt to reach this goal: Patterson Community Center, Murfreesboro (located in low-income neighborhood); Westbrook Towers (high-rise apartments for the elderly); Murfreesboro Senior Citizens Center (low-middle income individuals, activity center including congregate meals program); National Health Corporation Home Health Services (isolated, home-bound individuals); University of Tennessee Agricultural Extension Service, Extension Homemakers Club (all income levels, active individuals); Senior Citizens Club (middle-upper income, private club); Mid-Cumberland Human Resources Agency (isolated, low-income individuals); Seasoned Citizens of St. Rose (middle-upper income, active individuals); and various other church groups.

Leaders and/or directors at each group location or agency were identified and contacted by the researcher to explain the purposes of the study. Group meetings were arranged to explain the study and recruit volunteers to participate. Approximately 425 individuals were contacted through the group meetings. Of the total number of persons contacted, 77 individuals agreed to participate in the study and 61 completed all phases.

The sociodemographic characteristics of the subjects are described in Table 1. Additional tables containing descriptive data about the subjects regarding total household income, sources of income, food expenditures, housing type and adequacy, reported dietary restrictions, and use of nutrient supplements are located in Appendix A.

TABLE 1

Sociodemographic Characteristics of the Subjects (n = 61)

Characteristic	n
Age in years	
60 - 69	22
70 - 79	27
80 - 89	10
90 and over	2
Gender	
Female	54
Male	7
Marital status	
Never married	3
Currently married	16
Divorced	6
Widowed	36
Race	
Black	12
White	49
Other	0
Education level [1]	
0 - 4 years	6
5 - 8 years	19
9 - 12 years	16
13 - 16 years	12
17 years or more	6

[1] n = 59; 2 subjects did not report education level.

Instruments

Five instruments (Appendix B) were used to collect pertinent data. These were the Food Record, the Revised UCLA Loneliness Questionnaire, the Social Contact Diary, the Sociodemographic Data Questionnaire, and the Physical Health Questionnaire.

Food Record

During the initial interview session, directions were given for completion of the 3-day Food Record. Participants were requested to record all intake for three consecutive days during the following week, including one weekend day. Food models, measuring equipment, and other visuals were used to advise participants as to how to accurately record food items, portion sizes, preparation methods, and time of the eating occasion. These instructions were repeated on an instruction sheet, which was adapted from the Western Regional Nutrition and Food Acceptance Project of Oregon State University, and given to the participants. Participants were instructed to record intake by time of day instead of meals and to include all snacks. A second interview with each subject was held one week later to collect and review dietary records and clarify any discrepancies in information listed.

The food record method for collecting dietary data was chosen over the 24-hour recall method. The recall method is reliable for determining mean nutrient intake in samples of sufficient size and has been found to be valid when used to compare dietary intake of different groups (29, 67). However, the recall method has the disadvantage of relying on memory and cannot be used to measure daily variation in intake (68).

Establishment of the validity of food records is a difficult problem, as dietary records give no direct measurement of nutritional status, only presumptive evidence (69). Further limitations in interpreting results of dietary intake are encountered because of individual variation, lack of knowledge regarding precise nutrient requirements, and degree of influence that slight differences in nutrient intake may have on the health of an individual. The problem of content or representative validity is apparent when the method is presumed to give information regarding the individual's usual diet. The results of concurrent and predictive validity studies in food records were that agreement between methods is much higher for group analysis than on the individual level of analysis (70).

Errors of reliability in use of food records are related to the accuracy of reporting actual food intake and errors in the use of food tables for calculating nutrient content. Sources of possible error include missing nutrient data within the tables or coding errors resulting for the use of inappropriate substitutions for food items not in the tables. To reduce error in the present study, records were checked for completeness and clarity with each participant by using a modified recall for the 3-day period. Food models were used again to clarify portion size and method of preparation for each food item.

The Revised UCLA Loneliness Questionnaire

The loneliness index was computed from the Revised UCLA Loneliness Scale (60), which consists of 20 items rated on a 4-point scale (Appendix B). Half of the items reflect satisfaction with social relationships and half dissatisfaction. The item values relating satisfaction

are reversed when scoring so the sum of all items is the total score, which reflects degree of loneliness.

Face validity was established for the scale by Russel, Peplau, and Ferguson (59) through content analysis of the individual items. Concurrent validity was shown by the relationship of scores to subjective evaluation of current loneliness and willingness to volunteer for a "loneliness clinic." The researchers demonstrated construct validity by correlating scores on the scale that supported theoretical views linking loneliness to emotional states such as depression, anxiety, feelings of boredom, and emptiness.

Previous researchers (59) have shown the scale to have a high internal consistency for a scale of only 20 items. Test-retest correlations over a period of two months have shown stability in the measure over time. In the current study, internal consistency for the scale was found with a coefficient alpha of .90 ($p < .001$).

Social Contact Diary

The Social Contact Diary (Appendix B) was adapted from the contact/interaction score developed by Heltsley and Powers (24). The diary was given to participants to list all contacts made with others who were outside the living unit for three days. The social contact score is the sum of telephone calls made and received daily; participation in group activities; and visits to and by friends, neighbors, relatives, and significant others. The participants were instructed not to list names of individuals visited but to use terms to describe relationship with the individuals. An instruction sheet and sample completed form were given to each participant.

Heltsley and Powers (24) established content and construct validity for the contact/interaction score through subjective evaluation of factors related to reported frequency of social contact by the aged and correlation with a "perceived adequacy of interaction" scale. In the present study, validity was established through correlation of the score with an external criterion. The social contact score was correlated with three statements regarding degree of isolation measured on a 4-point scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often). The statements were: "I feel isolated from others" (reversed); "I can find companionship when I want it"; and "There are people I can talk to." Correlations with each statement were +.41, +.35, and +.38 (n = 58), with all being significant at the .01 level. Correlation of the social contact score (n = 58) with the sum of scores on the three statements was +.46, with a significance level of .001. Therefore, the social contact score was considered to be a valid measure of social isolation.

Sociodemographic Data Questionnaire

Data for age, level of education, gender, marital status, income, and housing were collected from the Sociodemographic Questionnaire. Age was listed as exact age in years as of interview date. Marital status categories included currently married, never married, and length of time widowed or divorced. Income was reported as total gross income per household. Economic resources included for descriptive purposes were sources of financial assistance such as food stamps, amount spent on food per month, and a subjective evaluation of income adequacy.

All subjects were independently living (noninstitutionalized) but varied according to type of dwelling (house or apartment), length of

time in the present dwelling, and number of others living with the respondent. Determination was made as to whether the subject lived alone in private housing, with others in private housing, alone in high-rise apartments for the elderly, or with others in high-rise apartments for the elderly.

Physical Health Questionnaire

The Physical Health Questionnaire was designed to measure number and severity of disease states and functional status, the two dimensions of physical health. The health index, developed by Rosecrans and Philblad (64) was used to obtain information concerning the degree and type of illness experienced by subjects in conjunction with quantitative indicators of extent, based on length of time the illness was experienced, and place of confinement. The health index consists of an inventory of diseases categorized as major or minor and a measure of degree of confinement that results from the disease.

Content and construct validity was established for the health index by relating the index to extent of physical impairment or degree of physical mobility and to the individual's self-perception of health. The developers of the scale found all measures to be related to the health index beyond the .01 level of significance. Results of other construct validation studies were that persons with the best scores on a health index are least handicapped functionally and also assess their health more favorably than those with scores reflecting a higher incidence of disease. In the present study, a correlation of -.54 ($p < .001$) was found between the health index and subjective evaluation of physical health indicators for the 61 subjects.

A Guttman health scale for the aged, as developed by Roscow and Breslau (65) was used as a measure of functional health of elderly individuals, or the degree to which they claim they can manage adequately or are restricted in their activities because of their physical condition or capacity. Functional status is indicated by number of increasingly difficult physical activities that the elderly individual is able to perform.

The functional status score is based on a Guttman scale analysis of six items related to the ability to perform physical tasks of increasing difficulty. To determine the reliability of the score, the items were listed in order of increasing difficulty and an error scored for each time a response was recorded out of order of sequence. The coefficient of reproducibility of the scale in this study was .93, indicating a high reliability of the scale as a measure of subjective functional status.

Pilot Study

The survey questionnaires were pretested with five subjects, four females and one male. As a result of the pilot testing, the food record instruction sheet was simplified to exclude repetitive explanations of portion size, and the Social Contact Diary instruction form was revised to include a handwritten example of a completed form. The Social Contact Diary was reduced from the 7-day original form to a 3-day record to correpond with the length of the food record. Of the five subjects participating in the pilot study, two had recorded only three days of activity (the same length as the food record) and one had recorded seven days of food intake (the same as the contact diary).

No problems were found with the Sociodemographic Questionnaire or the Loneliness Questionnaire. In order to simplify the Physical Health Questionnaire, the extensive categories of physical disorders were listed on a card for the subject to follow while the list was being read. This resulted in less confusion and distraction when completing this checklist, as subjects tended to go into more detail than needed during this portion of the interview.

Data Collection

Group meetings were held initially at each community location to recruit subjects. Approval to conduct the study was granted by the Committee on Research Participation and consent forms were signed by participants at the initial interview session (Appendix C). As an incentive to participate, subjects were told that dietary analyses would be discussed with them individually at the end of the study. Volunteers for the study were asked to sign a participant list with their names and telephone numbers. Code numbers were assigned to those who agreed to participate and were entered on questionnaires. Arrangements were made to schedule individual interviews during the following week.

After food records and social contact diary forms coded with subject number were distributed, the sociodemographic data were collected at the initial interview session. One follow-up contact was made with each participant during the succeeding week to answer questions about the record and as a reminder to record accurately. The food records and social contact diaries were collected from participants one week after the initial interview and were verified for completeness and accuracy.

The Loneliness Questionnaire and Physical Health Questionnaire were administered at the second interview and records were collected and checked. Subjects were given a target date for receiving information about their individual diet analyses. These analyses were prepared using the Nutritionist II Interactive Graphics Diet Analysis Program (71) and were returned to them and discussed approximately one week after the food record was completed.

Treatment of the Data

Food items from the intake record were coded using USDA Handbook 8, Revised, sections 1 - 9 (73), and USDA Handbook 456 (74) for item number and description. Portion sizes were converted from household measurements using conversion factors in these manuals.

The data were coded for computer entry directly from the questionnaires for the loneliness index, sociodemographic data, and physical health and functional status indexes. The index scores were then calculated from the raw data using the Statistical Package for the Social Sciences (SPSSX) (72).

Dietary Data

After all dietary data were coded and checked for accuracy, computer data entry was completed and the data list generated to recheck for accuracy in data entry. Item names and portion sizes per subject for each meal for the 3-day period were printed and compared to the original code sheets for accuracy of data entry and accuracy of the analysis program. Items that had been omitted were added and incorrect portion sizes were corrected.

For the purposes of this study, energy and the intakes of the following nutrients were analyzed: protein, fat, carbohydrate, crude fiber, calcium, iron, phosphorus, potassium, sodium, vitamin A, thiamin, riboflavin, niacin, ascorbic acid, cholesterol, saturated fatty acids, oleic acid, and linoleic acid. Energy intake per eating occasion was also calculated for each subject and 3-day mean intakes computed using the Statistical Analysis System (75).

An average daily nutrient intake for each subject was computed. The nutrient intake was calculated by hand for two randomly selected subjects using original food records and handbooks to check the accuracy of the data analysis program. Nutrient values for each item, mean intake for each meal, and the 3-day means were manually calculated and compared to the computer-generated means to check for accuracy of the program and were found to be acceptable.

Using the method developed by Guthrie (27), nutrient adequacy ratios (NAR) and mean adequacy ratios (MAR) were calculated for those nutrients having a Recommended Dietary Allowance, 1980 edition. A maximum value of 1.0 for each NAR was allowed to prevent intakes in excess of the RDA for one nutrient from compensating mathematically for low intakes of others for which they cannot substitute nutritionally. The computational procedures for the NAR and the MAR are as follows:

$$\text{NAR} = \frac{\text{subject's 3-day mean intake of a nutrient;}}{\text{RDA of that nutrient}}$$

$$\text{MAR} = \frac{\text{sum of the NAR for 9 nutrients.}}{9}$$

Loneliness Index

The loneliness index was calculated from the total score of items 1 - 20 on the Loneliness Questionnaire. Ten items that were worded negatively (items 1, 4, 5, 6, 9, 10, 15, 16, 19, 20) were reversed when computed so that the sum of all items represented degree of loneliness. A score of 20 indicated the lowest degree of perceived loneliness, and a score of 80 reflected the highest degree.

Social Contact

The social contact score consists of the sum of contact with persons outside of the living unit as recorded by a 3-day diary. The participants recorded the number of contacts with others daily in the Social Contact Diary for three days. Number of contacts via telephone, visits, and group meetings were tabulated. Total minutes of interaction were also tabulated and a social contact index was calculated from total minutes divided by number of contacts. The social contact score and social contact index were both used independently in statistical analyses to determine whether the two indicators gave similar results.

Health Index

Questions for determining the health index are items 1 - 3 on the Physical Health Questionnaire. A weighting scheme was used in determining the health "score" for each respondent. A value of four points was assigned for each major illness the respondent indicated, and an additional value of four points was assigned for each major illness responsible for confining the subject during the past month. Illnesses were classified as major or minor based on the degree of functional impairment resulting from the condition.

In addition, weight was given for duration and severity of confinement. A score of one was assigned for an illness of less than one week's duration; two for more than a week, but less than two; three for more than two but less than three weeks; and four for more than three weeks' confinement. These scores were weighted to take into consideration the place and assumed severity of the illness. They were multiplied by 1.5 if the confinement was to a hospital, 1.0 if at home and in bed, and 0.5 if at home but not in bed. A summary of the computational procedure is contained in Appendix D. The score range is zero to 148, with the higher scores indicating a higher number and degree of physical illness.

Functional Status

Interview questions for determing the functional status score are items 4 - 6 on the Physical Health Questionnaire. "Healthy responses" are item 4 (no); items 5a, 5c, 5d, 5e, (yes); and item 6c (yes). These six response categories yield seven groups whose scores range from zero to six "healthy" replies. A score of zero indicates the highest degree of functional impairment and a score of six indicates the lowest degree.

Statistical Procedures

Frequencies were computed for descriptive variables including age, gender, race, education, and income. Housing factors were described as to type of housing, ownership, years of occupancy, and adequacy. New variables for health index, functional status, loneliness index, and measures of social interaction were calculated and descriptive statistics computed. Descriptive statistics of dietary data computed included mean

intakes for all nutrients, energy distribution by meal, nutrient adequacy ratios and mean adequacy ratios.

Pearson's Product-Moment correlations and one-way analyses of variance were used to identify significant univariate relationships. Means and standard deviations were computed for descriptive data.

A multivariate model was computed using the General Linear Model procedure of SAS (75). Because of unbalanced group sizes, least squares means were computed for comparison of nutrient intake between groups. The main effects model included four classification variables. Because of the small number of subjects, age was divided into three levels (60-69, 70-79, 80-95 years), income into three levels ($3,000-$11,999, $12,000-$26,999, $27,000 and over), and whether the subject lived alone or with others into two levels. Because only seven males were included in the study (two black and five white), data for only white females, black females, and white males were used to control for race and gender. The independent continuous variables in the model included loneliness score, physical health index, functional status, and social contact score. The dependent variables were individual nutrients. The independent variables were individual nutrients. The independent variables were entered into the main effects model for each dependent variable to test their relationship to the nutrient intake. F values were calculated to test for significance, and the level of significance established for all tests was .05.

CHAPTER IV

RESULTS AND DISCUSSION

Nutrient Intake and Dietary Adequacy

The mean nutrient intakes of independently living elderly individuals were calculated from 3-day food records and evaluated for adequacy. In Table 2, mean and median nutrient adequacy ratios (NAR) are listed. A value of 1.000 indicates that the intake of the nutrient met or exceeded the 1980 edition of the Recommended Dietary Allowance (RDA) for that nutrient. All NAR values indicated that the mean intake of nutrients listed was not less than 80 percent of the RDA for that nutrient. The highest mean NAR for all subjects was for protein with an NAR of .964, and the lowest was for calcium with an NAR of .802. Eight of the nine NAR values had a median score of 1.000, indicating that at least half of the subjects met or exceeded the RDA for those nutrients.

TABLE 2

Nutrient Adequacy Ratios (NAR)[1] for All Subjects (n = 61)

Nutrient	Mean NAR[2]	Median NAR
Protein	.964 ± .104	1.000
Calcium	.802 ± .226	.895
Iron	.908 ± .173	1.000
Phosphorus	.953 ± .115	1.000
Vitamin A	.874 ± .223	1.000
Thiamin	.909 ± .146	1.000
Riboflavin	.944 ± .122	1.000
Niacin	.887 ± .195	1.000
Ascorbic acid	.932 ± .166	1.000

[1]The NAR is the ratio of actual nutrient intake and RDA for the nutrient.

[2]The values are mean ± SD.

The relationship between MAR and each NAR is shown in Table 3. All NAR values were highly related to the MAR. Therefore, it can be inferred that a relationship existing with the MAR may be similar for each NAR.

TABLE 3

Pearson's Product-Moment Correlations of Mean Adequacy Ratio (MAR) with Nutrient Adequacy Ratios (NAR)[1] (n = 61)

Nutrient	Correlation[2]
Protein	+.78
Calcium	+.64
Iron	+.77
Phosphorus	+.86
Vitamin A	+.74
Thiamin	+.76
Riboflavin	+.82
Niacin	+.58
Ascorbic acid	+.57

[1]The NAR is the ratio of actual nutrient intake and RDA for that nutrient. The MAR is the average of all NAR values per subject.

[2]All values are significant at the .001 level.

A comparison of the distribution of subjects consuming varying amounts of the nutrients as reflected by categories of NAR is displayed in Figure 1 and Figure 2. An NAR of 1.000 was found for 87 percent of all individuals for protein, 31 percent for calcium, 79 percent for phosphorus, 57 percent for iron, 69 percent for vitamin A, 59 percent for thiamin, 74 percent for riboflavin, 61 percent for niacin, and 77 percent for ascorbic acid. The calcium NAR was in the range of 0.667 - 0.999 for 41 percent of all individuals.

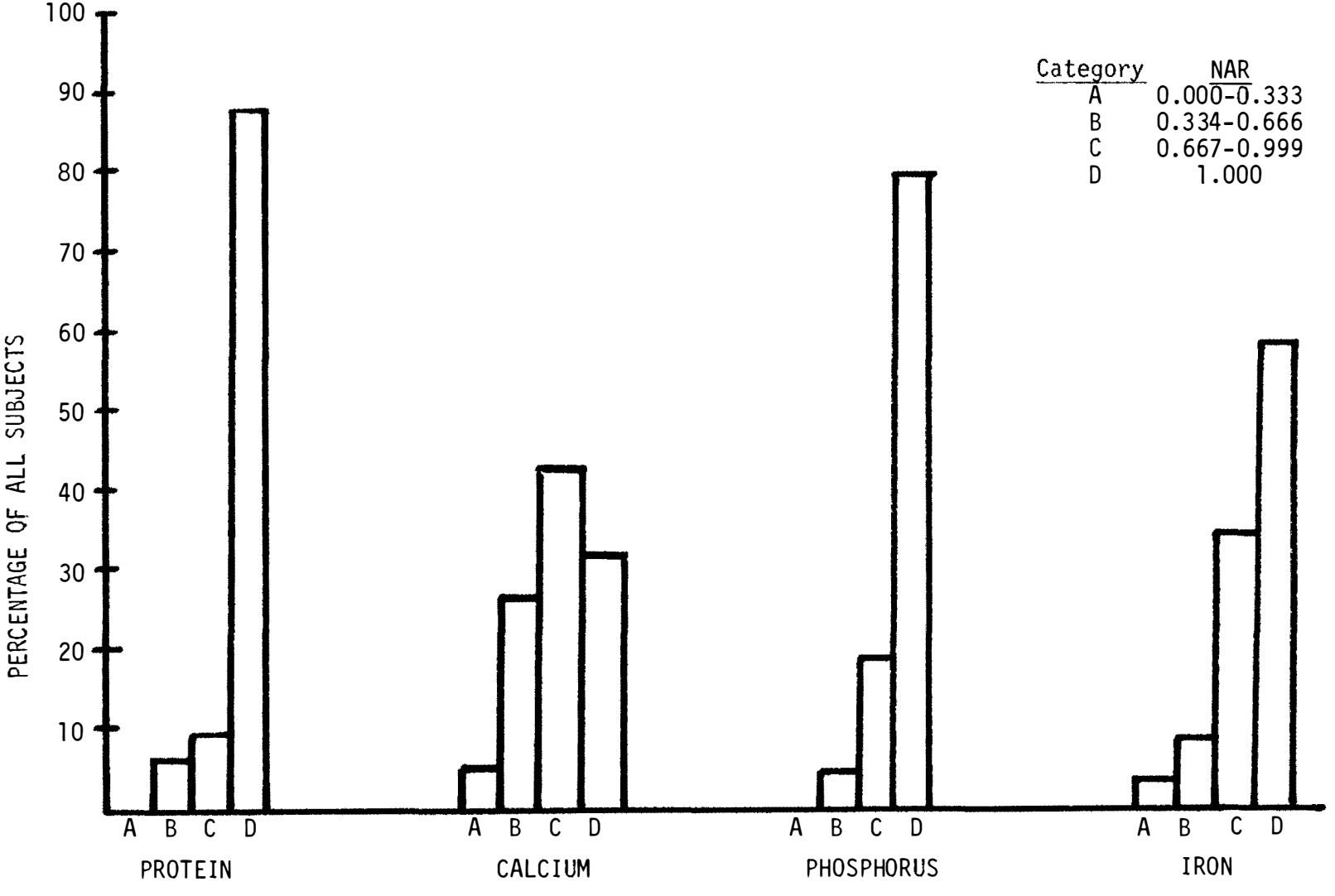

Figure 1. Distribution of subjects by category of nutrient adequacy ratio (NAR) for protein, calcium, phosphorus, and iron. The NAR is the ratio of actual nutrient intake and RDA for the nutrient.

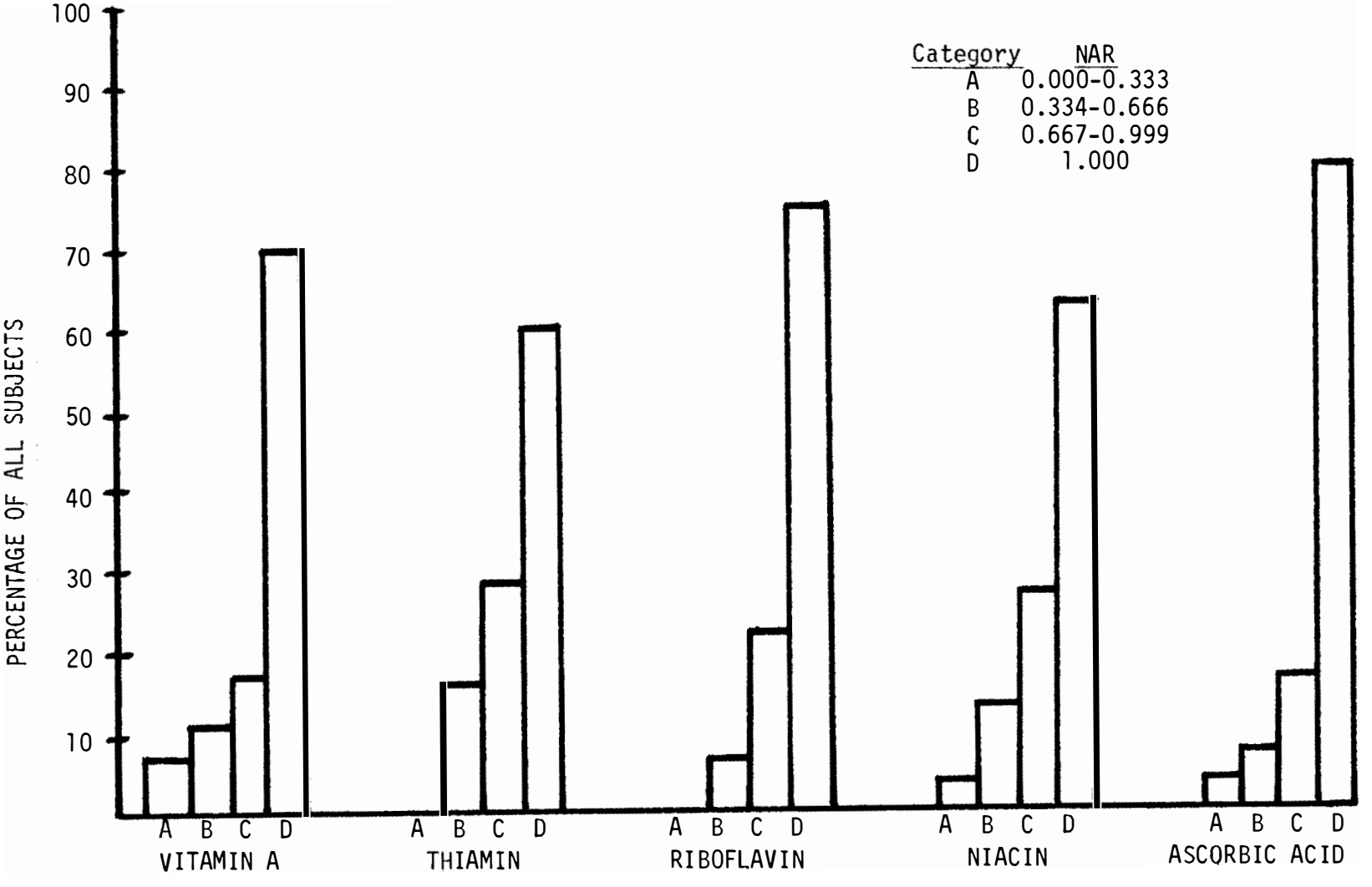

Figure 2. Distribution of subjects by category of nutrient adequacy ratio (NAR) for vitamin A, thiamin, riboflavin, niacin, and ascorbic acid. The NAR is the ratio of actual nutrient intake and the RDA for the nutrient.

The Food and Nutrition Board of the National Research Council (40, 44) suggested that protein intake in excess of the RDA may be advantageous because many high protein foods are excellent sources of trace elements, including iron. This benefit must be weighed with the possibile risk of impaired renal function that may limit the ability to filter and excrete large amounts of nitrogenous end products resulting from excessive protein intake. The NAR for protein was 1.000 for 87 percent of all persons, which indicates that protein needs were met or exceeded by the majority of all individuals.

Similar to the findings of Yearick et al. (7), Templeton (30), and Guthrie et al. (31), two nutrients generally considered to be problem nutrients for this age group, calcium and vitamin A, had NAR values of 0.802 and 0.874, respectively. Templeton reported that calcium intake was inadequate in 57 percent and vitamin A intake was low in 34 percent of the subjects. Guthrie et al. found that 63 percent of all subjects surveyed had diets that contained less than two-thirds of the RDA for these nutrients.

Less than 33 percent of the RDA for calcium was consumed by 3 percent of subjects, 25 percent consumed 34 to 66 percent of the RDA, 41 percent of subjects had intakes of 67 to 99 percent of the calcium RDA, and 31 percent of persons consumed 100 percent or more of the RDA for calcium. As there is current emphasis on maintenance of calcium balance in elderly individuals as a preventive measure against the development of osteoporosis, the intake may be even less adequate when compared to the estimated 1,500 milligrams of calcium that may be needed to maintain calcium balance in post-menopausal women (76).

Nutrient Intake by Gender

Hypothesis 1: There is no difference in the energy and nutrient intake of elderly male and female individuals.

Differences in mean nutrient intakes by gender for the 3-day averages are shown in Table 4. Race, gender, and whether the subject participated in a congregate meal program were included in the main effects model. Males reported higher intakes of total fat, cholesterol, saturated fatty acids, and oleic acid than did females; therefore, this hypothesis was rejected.

The reported energy intake was substantially lower for both males and females than the range recommended in the 1980 revision of the RDA (Appendix E). The RDA for men ages 51-75 years is 2,400 (2,000-2,800) kilocalories and 2,050 (1,650-2,450) kilocalories for men ages 76 years and over. The mean energy intake reported by males in the present study was 1,511 $\pm$ 133 kilocalories. The RDA for women ages 51-75 years is 1,800 (1,400-2,200) kilocalories and 1,600 (1,200-2,000) kilocalories for women 76 years and over. The average energy intake of women in the present study was 1,290 $\pm$ 55 kilocalories.

As energy requirements may vary extensively among individuals because of individual variations in basal metabolism and physical activities, comparison to average allowances does not yield satisfactory inferences about the adequacy of energy intake. Because all participants in the study lived independently, energy requirements for most individuals were probably above sedentary levels.

The differences by gender in nutrient consumption appeared to be slight, with the exception of the higher consumption of fat and related

TABLE 4

Mean Daily Energy and Nutrient Intakes by Gender[1, 2]

Nutrient	Male (n = 7)	Female (n = 54)
Energy, kcal	1511 ± 133	1290 ± 55
Protein, g	59.9 ± 5.1	51.6 ± 2.1
Fat, g	67.0 ± 6.7	48.5 ± 2.8[3]
Carbohydrate, g	172 ± 20	170 ± 8
Crude fiber, g	3.1 ± 0.6	3.3 ± 0.2
Calcium, mg	556 ± 97	661 ± 40
Iron, mg	9.5 ± 1.7	10.2 ± 0.7
Phosphorus, mg	881 ± 98	884 ± 40
Potassium, mg	1863 ± 241	2066 ± 99
Vitamin A, IU	5522 ± 1872	6435 ± 766
Thiamin, mg	0.92 ± 0.14	1.08 ± 0.06
Riboflavin, mg	1.28 ± 0.24	1.51 ± 0.10
Niacin, mg	13.13 ± 2.32	14.16 ± 0.95
Ascorbic acid, mg	84.3 ± 21.5	113.0 ± 8.8
Cholesterol, mg	450.8 ± 66.9	300.9 ± 27.4[3]
Saturated fatty acids, g	24.6 ± 2.8	18.0 ± 1.1[3]
Oleic acid, g	24.9 ± 2.3	16.2 ± 0.9[3]
Linoleic acid, g	9.2 ± 1.6	7.5 ± 0.7

[1]Nutrient intake is the average of a 3-day food record. The main effects model included race, gender, and whether or not the subject participated in a congregate meals program.

[2]Amounts are expressed as least squares means ± SEM because of unbalanced group sizes.

[3]The *t* values for the means are different at the .05 level.

nutrients by males. Because of the small number of males surveyed, no realistic conclusions could be drawn regarding the implications of these findings.

Nutrient Intake by Race

Hypothesis 2: There is no difference in energy and nutrient intake of elderly black and elderly white individuals.

Mean energy and nutrient intakes for the 3-day food records are compared by race in Table 5. The main effects model included race, gender, and whether or not the subject participated in a congregate meal program. Because of the small number of male subjects, comparisons by race were based on females. No differences were found by race for black and white females; therefore, this hypothesis was accepted. However, energy and calcium intakes were below the RDA for both groups. Iron intake was inadequate for elderly black females.

Race representation in the study was typical of the population distribution in Rutherford County, with 80.3 percent of the sample white and 19.7 percent black. The majority (83 percent) of the black individuals who participated in the study were participants in the Title III congregate meal programs, representing three different sites within the county. Only one black individual was in the high income, upper level of education group. Therefore, the data reported by race also may be related to income level.

Congregate Meal Programs

Hypothesis 3: There is no difference in energy and nutrient intakes of individuals who participate in group meal programs and those who do not.

TABLE 5

Comparison of Mean Daily Energy and Nutrient Intakes by Race of Females[1, 2]

Nutrient	Black (n = 10)	White (n = 44)
Energy, kcal	1374 ± 146	1395 ± 88
Protein, g	51.8 ± 5.1	53.9 ± 3.1
Fat, g	52.8 ± 7.4	54.5 ± 4.4
Carbohydrate, g	187 ± 22	179 ± 13
Crude fiber, g	4.3 ± 0.6	4.0 ± 0.3
Calcium, mg	598 ± 84	641 ± 50
Iron, mg	9.9 ± 1.9	12.9 ± 1.1
Phosphorus, mg	847 ± 91	954 ± 55
Potassium, mg	2121 ± 244	2118 ± 147
Vitamin A, IU	8490 ± 1994	6436 ± 1201
Thiamin, mg	1.04 ± 0.17	1.17 ± 0.10
Riboflavin, mg	1.44 ± 0.26	1.66 ± 0.15
Niacin, mg	15.04 ± 2.46	16.13 ± 1.48
Ascorbic acid, mg	112.7 ± 19.3	111.6 ± 11.6
Cholesterol, mg	270.2 ± 67.5	381.0 ± 40.7
Saturated fatty acids, g	17.6 ± 3.0	21.1 ± 1.8
Oleic acid, g	18.1 ± 2.6	18.8 ± 1.6
Linoleic acid, g	9.4 ± 1.8	7.0 ± 1.1

[1]Nutrient intake is the average of a 3-day food record. The main effects model included race, gender, and whether or not the subject participated in a congregate meal program.

[2]Amounts are expressed as least squares means ± SEM because of unbalanced group sizes.

Energy intake at the noon meal was higher for participants in group meal programs than for nonparticipants (Table 6). Mid-afternoon energy intake was higher for nonparticipants than participants.

TABLE 6

Mean Daily Energy Distribution by Participation in Title III Congregate Meal Programs[1]

Eating occasion	Participants (n = 21)	Nonparticipants (n = 40)
	kcal[2]	kcal[2]
Breakfast	318 ± 131	349 ± 128
Mid-morning	5 ± 12	47 ± 145
Lunch	633 ± 162	481 ± 229[3]
Mid-afternoon	13 ± 25	58 ± 106[3]
Dinner	414 ± 271	476 ± 201
Evening	16 ± 53	33 ± 55

[1]Energy intake is the average of a 3-day food record. The main effects model included race, gender, and whether or not the individual participated in a congregate meal program.

[2]Values are least squares means ± SEM.

[3]The *t* values for the means are different at the .05 level.

The intake of only one nutrient was different between participants and nonparticipants in the Title III congregate meal program (Table 7). Vitamin A consumption for the 3-day average was found to be lower for participants than for nonparticipants; therefore, this hypothesis was rejected. Vitamin A intakes ranged from a minimum of 956 IU to a maximum

TABLE 7

Mean Daily Energy and Nutrient Intakes by Participation in Title III Congregate Meal Programs[1], [2]

Nutrient	Participants (n = 21)	Nonparticipants (n = 40)
Energy, kcal	1357 ± 101	1445 ± 84
Protein, g	53.1 ± 3.8	58.5 ± 3.2
Fat, g	56.7 ± 5.1	58.8 ± 4.2
Carbohydrate, g	164 ± 15	178 ± 12
Crude fiber, g	3.2 ± 0.4	3.3 ± 0.4
Calcium, mg	599 ± 74	618 ± 61
Iron, mg	9.8 ± 1.3	9.8 ± 1.0
Phosphorus, mg	867 ± 75	898 ± 61
Potassium, mg	1889 ± 182	2041 ± 150
Vitamin A, IU	4364 ± 1417	7593 ± 1170[3]
Thiamin, mg	0.99 ± 0.11	1.01 ± 0.09
Riboflavin, mg	1.42 ± 0.18	1.37 ± 0.15
Niacin, mg	13.23 ± 1.75	14.06 ± 1.45
Ascorbic acid, mg	102.5 ± 16.3	97.8 ± 13.4
Cholesterol, mg	390.9 ± 50.6	360.8 ± 41.8
Saturated fatty acids, g	29.9 ± 2.1	20.6 ± 1.7
Oleic acid, g	19.9 ± 1.7	21.2 ± 1.4
Linoleic acid, g	7.3 ± 1.2	9.5 ± 1.0

[1]Energy and nutrient intake is the average of a 3-day food record. The main effects model included race, gender, and whether the subject participated in a congregate meal program.

[2]Values are least squares means ± SEM.

[3]The *t* value for the means is different at the .05 level.

of 22,028 IU for the 3-day averages. Because of the wide range of the values, the general pattern may have been skewed by the intake of a few individuals.

Despite the higher energy intake at the noon meal of participants as compared to nonparticipants, the overall evaluation of dietary adequacy of the two groups did not differ for most nutrients, although calcium and iron were underconsumed by both groups. Nonparticipants had higher intakes of vitamin A. However, the participants averaged an intake of 4,364 IU, and the RDA for the nutrient is 4,000-5,000 IU (Appendix E). According to both the Ten-State Nutrition Survey and the HANES study (5, 6), vitamin A was a nutrient often underconsumed by this age group.

Grandjean (8) found evidence of dietary adequacy in studies of the nutrient intake of those who participated in the congregate meal programs. She reported that 93 percent of congregate meal participants consumed at least 70 percent of the RDA for 11 nutrients evaluated and none consumed less than 54 percent of any single nutrient. LeClerc (36) indicated that participants in congregate meal programs consumed levels similar to those of nonparticipants for all nutrients evaluated with the exception of niacin and ascorbic acid.

Comparisons of mean adequacy ratios (MARs) by race, gender, and participation in Title III congregate meal programs are displayed in Table 8. There was no difference in MAR by gender nor by participation in a meal program. However, the MAR difference between black and white subjects was significant, with black subjects having an MAR of .822 and white subjects an MAR of .929.

Low income could be a factor that motivates individuals to take advantage of the congregate meal program, whereas nonparticipants might have higher incomes and more access to independent food choices. However, in the individuals surveyed, an effort was made to include individuals of all income and education levels regardless of participation in the congregate meal programs. According to the results of a one-way analysis of variance, there was no difference in income levels of participants and nonparticipants in the congregate meal programs (F = 2.08, df = 59).

TABLE 8

Comparison of Mean Adequacy Ratios (MARs) by Race, Gender, and Participation in Title III Congregate Meal Programs[1]

Variable	n	MAR[2]
Race		
White	49	.929 ± .081[3]
Black	12	.822 ± .201[3]
Gender		
Female	54	.914 ± .118
Male	7	.861 ± .142
Title III program		
Participants	20	.891 ± .140
Nonparticipants	40	.914 ± .111

[1]Ratios were calculated from average nutrient values of 3-day food records.

[2]The MAR is the average of 9 nutrient adequacy ratios that compare actual nutrient intake to the RDA for the daily average. Values are expressed as mean ± SD.

[3]The t value is different at the .05 level.

Loneliness and Social Isolation

Hypothesis 4: There is no relationship between loneliness or social isolation and dietary adequacy.

A major thrust of this study was to determine whether loneliness and/or social isolation are factors in predicting dietary adequacy. The mean loneliness index scores for all subjects (n = 58) was 37.3 $\pm$ 9.8, with scores ranging from 21 to 66. The possible range of scores for the loneliness index is 20-80. The higher score represents a higher degree of perceived loneliness. The social contact score represents the total number of contacts made with others in three days, and the minutes of contact is the total length of time spent with others in the 3-day period. The average number of social contacts was 17.7 $\pm$ 10.4 (n = 47) and ranged from a low of 3 to a high of 48. The minutes of contact for the 3-day period ranged from 60 to 2,880 and the mean was 669 $\pm$ 447. The social index score is the number of minutes per social contact and ranged from 7.5 to 720 with a mean of 56.1 $\pm$ 103.0.

Relationships between the loneliness index and selected independent variables are shown in Table 9. Neither age nor physical health as independent variables was found to be related to degree of loneliness. Individuals (n = 47) who reported a higher number of social contacts were less lonely (r = -.35). However, the length of time spent in contact with others was unrelated to degree of loneliness (r = -.11).

Loneliness scores also were examined in relation to race and whether or not the individual participated in a congregate meal program. A one-way analysis of variance showed race to be related to loneliness with black individuals (n = 12) reporting a higher degree of loneliness than

did white individuals (n = 49) with a F value of 3.82 (df = 57). No difference (F = 2.15, df = 48) was found in loneliness index (n = 58) of participants and nonparticipants in congregate meal programs.

TABLE 9

Pearson's Product-Moment Correlations between the Loneliness Index and Selected Independent Variables

Variable correlated	n	r
Age	58	-.02
Health index[1]	58	+.05
Functional status score[1]	58	+.05
Social contact score[2]	47	-.35[3]
Minutes of contact[2]	47	-.11
Social index score[2]	47	+.07

[1]The health index is a measure of number and severity of physical illnesses. The functional status score indicates the degree to which physical mobility is unimpaired.

[2]The social contacts score indicates number of contacts with others in a 3-day period and minutes of contact represents total length of time with others in the 3-day period. The social index score is the average amount of time per contact.

[3]The correlation is significant at the .05 level.

Even though no difference was found in loneliness of participants and nonparticipants in Title III meal programs, the relationship between loneliness and number of social contacts in this study may indicate a bias in recruiting subjects from group programs where individuals were voluntarily attending. Those who attended more frequently were perhaps more

socially involved with other participants in the program and therefore more satisfied with the relationships they established with others than those who attended infrequently.

A major finding was that dietary adequacy as determined by mean adequacy ratio was related negatively to degree of loneliness (r = -.28, n = 58), with subjects having less adequate diets perceiving themselves as more lonely than those with more adequate diets and vice versa. Correlations were calculated for each nutrient adequacy ratio (NAR) and the loneliness index (Table 10). There was a negative correlation between

TABLE 10

Pearson's Product-Moment Correlations between Nutrient Adequacy Ratio (NAR) and Loneliness Index (n = 58)

Nutrient adequacy ratio[1]	Correlation
Protein	-.27[2]
Calcium	-.17
Iron	-.26[2]
Phosphorus	-.24[2]
Vitamin A	-.14
Thiamin	-.13
Riboflavin	-.23[2]
Niacin	-.25[2]
Ascorbic acid	-.27[2]

[1]The NAR is the ratio of actual intake of each nutrient to the RDA.

[2]The correlation is significant at the .05 level.

the loneliness index and the NAR for protein, iron, phosphorus, riboflavin, niacin, and ascorbic acid. The relationship between the loneliness index and the NAR for calcium, vitamin A, and thiamin was not significant.

A general linear model was constructed for the daily mean intake of each nutrient (dependent variable) to test the effects of the independent variables, which included loneliness index, health index, social contact score, functional status score, whether the individual lived alone or with others, gender, race, income, and age. Those independent variables that had a Type I sum of squares with a significance level of .25 or greater were eliminated from the model to avoid confounding the Type III sum of squares and to prevent the problem of multicollinearity.

Results of the general linear model equations for each nutrient are shown in Table 11. Loneliness index, health index, race, and gender were the independent variables included in the energy model. These four variables accounted for 25 percent of the total variance in the model. The independent variables included in the protein model were loneliness index, health index, functional status, whether the individual lived alone or with others, race, gender, and age. These variables explained 36 percent of the total variance in the model. Loneliness index, functional status, and age were included in the phosphorus model, but these variables accounted for only 16 percent of the total variance. For each of these three models, the loneliness index had an influence on the intake level that was significant beyond the effects of the other variables in the model. Under the sensitivity of the present study, evidence exists that there is a relationship between loneliness and nutrient intake, but the magnitude is not great.

TABLE 11

Relationship of Energy and Nutrient Intake to the Loneliness Index[1]

	Loneliness index		Total model		
	F value	p level	F value	p level	R Square
Energy	4.20[2]	.046	4.26	.005	.2468
Protein	5.51[2]	.023	3.34	.004	.3578
Fat	2.61	.148	5.56	.001	.2997
Carbohydrate	3.44	.069	1.45	.239	.0745
Crude fiber	1.35	.251	4.72	.003	.2626
Calcium	2.69	.107	0.60	.730	.0658
Iron	3.05	.086	2.85	.046	.1367
Phosphorus	5.99[2]	.018	2.49	.054	.1584
Vitamin A	0.29	.592	1.83	.109	.2470
Thiamin	1.82	.183	1.34	.272	.0692
Riboflavin	0.61	.437	1.35	.264	.0925
Niacin	1.47	.231	2.27	.090	.1122
Ascorbic acid	0.09	.761	2.23	.069	.2140

[1]A general linear model was created for each dependent variable (energy and nutrients) and the independent variables for which the Type I sum of squares had a significance level of $p < .25$.

[2]The F value of the Type III sum of squares indicates a significant contribution to the total model beyond the effects of other independent variables in the equation at a significance level of .05.

Andersson (54) reported that loneliness was not representative of the elderly population; however, 53 percent of individuals over the age of 75 years felt very lonely. In the present study, there was no relationship between age and degree of loneliness.

The number of social contacts made with others was the single most important independent variable (r = -.35) predictive of degree of loneliness, and the relationship was an inverse one. This result did not support the findings of Heltsley and Powers (24), who reported that loneliness was a problem of elderly individuals despite frequent contacts with others and those with minimal social contacts did not perceive themselves as lonely. Revenson (53) concluded that dissatisfaction with available relationships may be a more powerful indicator of loneliness than number of contacts and this was not measured in the present study.

Social interaction was found to be related to perceived loneliness in the elderly individual. Furthermore, there is preliminary evidence that loneliness is related to nutrient intake and dietary adequacy. Therefore, this hypothesis was rejected.

Dietary Adequacy and Housing Type

Hypothesis 5: There are no differences in dietary adequacy of elderly individuals who live in private single family housing, high-rise apartments for the elderly, unrestricted apartments, duplexes, or public housing.

A comparison of mean adequacy ratios (MAR) by housing type is shown in Table 12. The majority of subjects (56 percent) lived in single-family houses, whereas 25 percent lived in a high-rise apartment complex for the elderly. The lowest dietary adequacy scores were found for those individuals who lived in rented duplex or triplex housing.

TABLE 12

Mean Adequacy Ratio (MAR) Scores by Housing Type (n = 60)

Type of housing	n	MAR[1]
Private single-family house	34	0.914 ± 0.10
Condominium or apartment (unrestricted)	3	0.945 ± 0.04
High-rise apartment for the elderly	15	0.928 ± 0.10
Duplex or triplex (unrestricted)	4	0.746 ± 0.27
Public housing	4	0.911 ± 0.13

[1]MAR is the average of 9 nutrient adequacy ratios that compare actual nutrient intake to the RDA. Values are mean ± SD.

No difference was found in dietary adequacy of the individuals based on housing type as an independent variable. Respondents living in high-rise apartments for the elderly consumed diets with an MAR representing 93 percent of the RDA for the nutrients evaluated. Of those residing in private, single-family houses, 9 percent consumed diets representing less than 67 percent of the RDA, and 9 percent consumed diets representing 100 percent of the RDA for the nine nutrients. A one-way analysis of variance indicated no relationship between housing type and dietary adequacy (F = 1.71, df = 58). Therefore, the hypothesis was accepted. This finding might be attributed to a lack of substantial evidence that housing type has any relationship to food choices.

The lack of a relationship may be explained by changes in living situation that occurred as a result of aging or changes in health necessitating a change in type of housing. Of all respondents, 82 percent had

lived in their present housing less than 20 years and 62 percent less than 10 years. Of those subjects living in apartments, 30 percent had lived in the present residence for less than 10 years. A move to multi-unit housing increases the opportunity for social contacts because of the increased proximity of others even if mobility or functional status is limited. Therefore, type of housing reported in this study may be more of an indicator of lifestyle changes made as one ages or changes in health necessitating a change in type of housing rather than any measure of social isolation.

O'Hanlon (34) found that dietary adequacy differed on the basis of housing and living environment. The author reported that 47 percent of those consuming less than 67 percent of the recommended number of food groups resided in high-rise apartments for the elderly and only 28 percent of those living in private housing consumed inadequate diets. Todhunter (16, 17) found no differences in dietary adequacy based on housing situation.

Nutrient Intake and Physical Health

Hypothesis 6: There is no relationship between physical health and nutrient intake or dietary adequacy.

The mean adequacy ratio (MAR) for dietary intake was significantly correlated with health index and functional status score (n = 61). A negative correlation was found between MAR and health index (r = -.35) and a positive correlation between MAR and functional status (r = +.28). Individuals with higher numbers and severities of physical illnesses have less adequate diets and those with fewer functional impairments have more adequate diets.

Results of the general linear model analysis of the relationship of physical health to nutrient intake are reported in Table 13. Vitamin A and ascorbic acid intakes were found to be related to the health index beyond the effects of the other independent variables in the model (loneliness index, social contacts, income, and age); therefore, this hypothesis was rejected. The strongest relationship was found between health index and crude fiber intake. For each model, the independent variables accounted for 11-36 percent of the total variance in the nutrient intake.

TABLE 13

Relationship of Energy and Nutrient Intake to the Health Index[1]

	Health index		Total model		
Nutrient	F value	p level	F value	p level	R Square
Energy	0.83	.365	4.26	.005	.2468
Protein	0.08	.776	3.34	.004	.3578
Fat	2.08	.155	5.56	.001	.2997
Crude fiber	13.92[2]	.001	4.72	.003	.2626
Iron	0.83	.365	2.85	.046	.1367
Vitamin A	5.99[2]	.019	1.83	.109	.2470
Niacin	1.35	.250	2.27	.090	.1122
Ascorbic acid	7.90[2]	.008	2.23	.069	.2140

[1]A general linear model was created for each dependent variable (energy and nutrients) and the independent variables for which the Type I sum of squares had a significance level of $p \leq .25$.

[2]The F value of the Type III sum of squares indicated a significant contribution to the total model beyond the effects of the other independent variables in the equation at a significance level of .05.

Several researchers (51, 57) have indicated that loneliness is associated with poor health status. Although the health index was highly related to functional status (r = -.54), a relationship between loneliness and either the degree of subjective health impairment (r = +.05) or functional status (r = -.05) was not shown in this study. Part of this lack of relationship between health status and loneliness may be explained by the fact that those in poorest health generally did not live alone.

A relationship was found between physical health and nutrient intake. Individuals in poor health may have difficulty obtaining and preparing an adequate diet because of impaired mobility or physical conditions necessitating changes in food patterns that limit or alter nutrient intake.

CHAPTER V

SUMMARY

Limitations of the Study

The major limitations of the study were the relatively small sample size, low participation rate, and the distribution of groups by race and gender. Many factors may influence food choices and therefore nutrient intake and a larger number of respondents would have allowed for better statistical control of these factors. The conclusions based on gender and race differences may not be relevant to the larger population.

Nutritional assessment via clinical and biochemical measurements was not a part of the study; therefore, the results can only be attributed to differences in nutrient intake. There is no evidence that the observed variations in nutrient intake has any relationship to current health status of these individuals.

Conclusions

An evaluation of nutrient intake reveals that energy and calcium are most likely to be underconsumed by all subjects regardless of race or gender. No differences were found by race in nutrient intake; however, iron intake was below the RDA for both groups. The differences by gender were related only to fat consumption. Individuals who participated in group meal programs had a lower mean intake of vitamin A than did those who did not participate, but the intake was in an acceptable range of the RDA.

Loneliness was not found to be greater in older individuals but did appear to be related to the number of social contacts made with others.

Black individuals reported a higher degree of loneliness than did white individuals. No difference in loneliness scores was found solely on the basis of participation in group meal programs. Participation in other senior citizens programs was not evaluated; therefore, no conclusions can be made on this basis. Loneliness was related to dietary adequacy based on mean adequacy ratios, but the influence on individual nutrient intake controlled for other factors was less conclusive.

Previous researchers have found dietary adequacy of individuals to differ on the basis of housing. This was not substantiated by the present study. Physical health was shown to be related to the intakes of vitamin A and ascorbic acid, indicating that individuals in poor physical health are more likely to consume inadequate diets. Crude fiber intake was lower for individuals in poor physical health than for those reporting fewer illnesses.

Implications

Social gerontologists have developed theories of aging that attempt to predict how one might respond to old age. Activity theory implies that social activity is important for elderly individuals to maintain health and that positive personal development correlates highly with activity. Furthermore, activity theory predicts that those individuals who are able to remain socially active will be more likely to achieve a positive self-image and social integration and therefore adapt more readily to the aging process.

Disengagement theory contends that there is a mutual withdrawal of the aged from society and society from the elderly. Therefore, it is

both normal and inevitable that people will decrease their activity and seek more passive roles as they age.

Continuity theory implies that personality formed early in life continues through the life-span with no basic changes. Therefore, adjustment is dependent upon past ability to adjust to life situations and on the ability to continue the life patterns of former years (77).

In the present study, persons who were more socially active reported lower degrees of loneliness, and vice versa, and this appeared to be related to their nutrient intake. Within the framework of activity theory, an increase in desired social activities may be related to a lesser degree of loneliness. The trend toward incorporating congregate meals programs with senior citizens centers programs appears to be a positive one to provide adequate diets as well as opportunities for social involvement. However, number of social contacts per se had no relationship to dietary adequacy in this study. As previous researchers have indicated, perhaps degree of satisfaction with social relationships may be the determining influence on degree of loneliness and further research is needed in this area.

The present study did not indicate any difference in the dietary adequacy of those who participated in congregate meal programs and those who did not. This possibly represents a bias in subject recruitment, as agency referral was a primary resource for reaching the elderly population. The methodology may have resulted in exclusion of individuals in the study who were in greatest need of participation in the congregate meal program. Participation in other group programs, which may have included a meal component, was not evaluated. Therefore, nonparticipants in the congregate

meal programs may have had access to other resources that were not identified and their participation in multiple meal programs may have influenced their nutrient intake. Additional research is needed to determine if nutrient intake of isolated individuals improves after participation in a meal program is initiated.

With the increasing size of the population group over the age of 65 years, concern needs to be addressed toward improved quality of life and to meeting the nutrient needs of this group to maximize their health status and ability to live independently. Improved nutritional status may or may not be directly related to an individual's longevity or health status, but improved quality of existing health status can be realized. The study indicated that physical health is related to nutrient intake. With the growing industry of home health services to provide health care for homebound individuals in poor health, there is an increasing need for the provision of nutrition services to deal with the problem of inadequate nutrient intake as a result of poor health. Nutritional counseling and a home-delivered meal program need to be an available component of home health services.

This study has been valuable in determing that perceived loneliness may be related to dietary adequacy in the elderly. More study needs to be directed toward the question of whether there is a difference in nutrient intake when meals are eaten alone versus with others. Additional research is needed to determine if programs directed toward increasing social interaction in the elderly are effective in decreasing degree of loneliness. Furthermore, research is needed to determine if changes in degree of loneliness are positively related to resultant changes in nutrient

intake and therefore the dietary adequacy of these individuals. The increasing number of elderly individuals in the population has directed attention toward the needs of this group and further study of the nutrient requirements and factors affecting nutrient intake should be a major component of these studies.

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LITERATURE CITED

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APPENDIXES

APPENDIX A

CHARACTERISTICS OF SUBJECTS

TABLE 14

Total Household Income, Sources of Income, and Monthly Food Expenditures per Household (n=61)

Variable	n
Annual income	
Less than $3,000	0
$3,000 - $5,999	36
$6,000 - $8,999	9
$9,000 - $11,999	4
$12,000 - $14,999	2
$15,000 - $17,999	0
$18,000 - $20,999	3
$21,000 - $23,999	0
$24,000 - $26,999	2
$27,000 - $29,999	1
$30,000 or more	4
Sources of income [1]	
Wages of self or spouse	6
Social security	56
Pension or retirement	20
Insurance or annuities	7
Contributions of family members	3
Savings or investments	17
Other sources	15
Monthly food expenditures per household [2]	
$0 - $25	0
$26 - $50	5
$51 - $75	7
$76 - $100	7
$101 - $125	10
$126 - $150	6
$151 - $175	8
$176 - $200	3
More than $200	1

[1] Some subjects reported multiple sources of income.

[2] 14 subjects could not estimate food expenditures.

TABLE 15

Reported Dietary Restrictions Prescribed by Physician

Type of diet	n
Weight control	4
Diabetic	8
Low fiber	5
Low fat or low cholesterol	9
Bland	7
Low protein	0
High protein or high calorie	2
Low sodium or no added salt	13
Other	1

TABLE 16

Use of Nutrient Supplements Reported by Subjects

Type of supplement	n
Multivitamin with 100% of USRDA	6
Multivitamin plus minerals	4
High potency multivitamin	0
High potency multivitamin plus minerals	12
Single nutrient--iron	2
Single nutrient--ascorbic acid	6
Single nutrient--calcium	2
Other	6

TABLE 17

Type and Adequacy of Present Housing Reported by Subjects

Housing factor	n
Housing type	
Private single family house	35
Condominium or apartment	4
High-rise apartment for the elderly	14
Duplex or triplex	4
Public housing	4
Housing ownership	
Own	38
Rent	23
Years in present housing	
0-10	37
11-20	12
21-30	6
31-40	2
41-50	1
51 or more	2
Subjective rating of housing adequacy	
Not adequate	1
Somewhat adequate	7
Meets most of my needs	25
Very adequate	24

APPENDIX B

INSTRUMENTS

FOOD RECORD

Directions: For the next three days, please list the exact amount of all foods you eat and the beverages you drink, except water. Record the time that you eat the food, the amount eaten and the way it was prepared. Use a different page for each day. Listed below are some helpful hints and directions for recording specific food items:

1. Be sure and record all foods eaten and all beverages. Record the time and food immediately after eating and include all snacks.

2. The amount of milk you drink should be recorded in ounces (cups) or by carton size. The kind of milk should also be recorded as whole milk, 2% low fat milk, skim milk. Give brand names.

3. The amount of fruit juice you drink should be recorded in ounces (cups) or by glass size. List the kind of juice as orange, grape, and so on. List whether sweetened or unsweetened.

4. Fruits should be listed by name and amounts. Describe whether fresh, canned or frozen. Record by number and size (small, medium, large) and be sure to indicate if they were packed in syrup.

5. Vegetables should be listed by name and how prepared such as baked, stewed, fried, and so on. Record amounts in cups or list the number of pieces such as one tomato or three medium raw carrots.

6. Cereals should be listed by brand name or type of cereal such as Cherrios, oatmeal and so on. List amounts in cups, half cups, etc.

7. Breads should be listed as wheat, white, cornbread, biscuits, and so on. Describe the portion size and number of servings eaten.

8. Meats, Poultry, Fish should be listed by kind and how prepared as baked, broiled, boiled or fried. Describe the cut of the meat such as "chuck roast" or "lean ground beef" and type of piece of chicken as "half chicken breast" or "chicken thigh." Give the approximate portion size.

9. Cheeses should be listed by kind and amount in cups or size of piece in inches. Include yogurt and cottage cheese and describe whether "creamed" or "fruit added" and so on.

10. Fats should also be listed. Record in level teaspoons or tablespoons and include those used in cooking. Be sure to list butter, margarine, oil, sour cream or any other fats used.

11. Desserts should be described as to size of portion in cups and list the descriptive name such as "apple pie" or "chocolate brownies."

12. Mixed dishes such as stews, soups, casseroles and so on should be listed as amount of ingredients and type of ingredients in the portion eaten.

13. Don't forget to list all sugar which was added to cereal, coffee, tea or used on other foods.

14. Beverages should be recorded by name such as coffee, tea, coca-cola, beer, wine and so on. List the amount in ounces or cup portions and be sure to include sugar and cream, cream substitutes and lemon.

15. Eggs should be listed by size (small, medium, large) and how they were prepared (fried, scrambled, and so on).

---

16. Miscellaneous - Include syrups, toppings, jams, jellies, snacks such as potato chips, tomato sauce, ketchup, mustard and so on. List amounts.

---

17. Include number and brand name of vitamin, mineral supplements taken daily. Also include other supplements such as wheat germ, bran, and so on.

Subject code:___ ___ ___ ___ ___

FOOD RECORD

DAY_____

TIME	FOOD ITEM AND HOW PREPARED	AMOUNT EATEN	OFFICE USE ONLY CODE	OFFICE USE ONLY PORTION

REVISED UCLA LONELINESS INDEX

Directions: I have given you a card that has four answers on it. These are "never," "rarely," "sometimes," and "often." I will read you a statement and you reply with one of these answers to describe how often you feel this way.

(cc 61) 1D. I feel in tune with the people around me.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 62) 2D. I lack companionship.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 63) 3D. There is no one I can turn to.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 64) 4D. I do not feel alone.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 65) 5D. I feel part of a group of friends.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 66) 6D. I have a lot in common with the people around me.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 67) 7D. I am no longer close to anyone.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 68) 8D. My interests and ideas are not shared by those around me.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 69) 9D. I am an outgoing person.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 70) 10D. There are people I feel close to.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 71) 11D. I feel left out.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 72) 12D. My social relationships are shallow.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 73) 13D. No one really knows me well.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 74) 14D. I feel isolated from others.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 75) 15D. I can find companionship when I want it.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 76) 16D. There are people who really understand me.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 77) 17D. I am unhappy being so withdrawn.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 78) 18D. People are around me but not with me.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 79) 19D. There are people I can talk to.
1 = never
2 = rarely
3 = sometimes
4 = often

(cc 80) 20D. There are people I can turn to.
1 = never
2 = rarely
3 = sometimes
4 = often

SOCIAL CONTACT DIARY

For the next 3 days, please keep a record of visits with others, telephone calls made or received and group activities attended. You do not need to list names, just term to describe the individuals such as "friend" or "sister" or "minister" or "neighbor" and so on. Please record the length of the visit or telephone call. Be sure and list each separate contact that you made with other people. Use a separate page for each day.

THIS PAGE IS AN EXAMPLE OF HOW TO KEEP THE DIARY

Day Monday

Visits to my home or visits I made to others	Telephone calls made or received	Group meetings or get-togethers I attended	Length of visit
Neighbor came by			30 min.
	sister called		10 min.
		Senior Citizen's Center	1 hr.

SOCIAL CONTACT DIARY

DAY _____

VISITS TO MY HOME OR VISITS I MADE TO OTHERS	TELEPHONE CALLS MADE OR RECEIVED	GROUP MEETINGS OR GET-TOGETHERS I ATTENDED	LENGTH OF THE CALL OR VISIT

DEMOGRAPHIC DATA QUESTIONNAIRE

(cc 1-2) 0 1 Card 1

(cc 3-4) ___ ___ Location code

(cc 5-6) ___ ___ ID

1A. Gender
(cc 7) 1 = male
2 = female

(cc 8) 2A. Race of subject
1 = white (Caucasian)
2 = black (Negro)
3 = Oriental
4 = Spanish American
5 = American Indian
6 = Other (Specify:_____)

3A. What is your age?

(cc 9-10) ___ ___

What is your birthdate?

(cc 11-16) ___ ___ ___ ___ ___ ___
month day year

4A. What is the highest grade in school that you finished and got credit for?

(cc 17-18) ___ ___

5A. Are you currently married, single, widowed, or divorced?

(cc 19) 1 = never married
2 = currently married
3 = divorced
4 = widowed
5 = separated

How many years have you been married, widowed, or divorced?

(cc 20-21) ___ ___

6A. How many people live in your household, including yourself?

(cc 22-23) ___ ___

What is the relationship of these individuals to yourself?

	No	Yes	
(cc 24)	1	2	spouse
(cc 25)	1	2	children
(cc 26)	1	2	grandchildren
(cc 27)	1	2	parent(s)
(cc 28)	1	2	brother(s)/sister(s)
(cc 29)	1	2	other relatives (not in-laws covered above)
(cc 30)	1	2	friend(s) or other nonrelated person
(cc 31)	1	2	nonrelated paid helper
(cc 32)	1	2	other (specify:_____)

7A. Are you currently employed?

(cc 33)
1 = no
2 = yes

If yes, how many hours per week do you work?

(cc 34-35) ___ ___

What is your job title?

(cc 36-37)
00 = not applicable
01 =
02 =
03 =
04 =
05 =
06 =
07 =
08 =
09 =
10 =

8A. Are you presently doing any volunteer work on a regular basis?

(cc 38)
1 = no
2 = yes

If yes, how many hours per week?

(cc 39-40) ___ ___

If yes, what type of volunteer work do you do?

(cc 41)
0 = not applicable
1 = hospital/health care
2 = senior citizens programs
3 = church-related programs
4 = day care centers
5 = other (specify:_____)

Now, I'd like to ask you some questions about where you live.
9A. Do you own or rent your home?

(cc 42) 1 = own
2 = rent

In what type of housing do you live?
(cc 43) 0 = no answer
1 = private single family house
2 = condominium or apartment (unrestricted)
3 = high-rise apartment for the elderly
4 = mobile home
5 = duplex or triplex (unrestricted)
6 = public housing

How many years have you lived in this present dwelling?
(cc 44-45) ___ ___

How adequate do you consider this present dwelling to be?
(cc 46) 0 = no response
1 = totally inadequate
2 = not very adequate
3 = somewhat adequate
4 = meets most of my needs
5 = very adequate

Now I'd like to ask you some questions about income.
10A. Please look at this income card and tell me which of these groups represents the monthly or yearly income of your household including earnings, social security, pensions, etc.

	yearly	monthly
(cc 47-48) 01 =	under $1,000	less than $83
02 =	$1,000-$2,999	$83-$249
03 =	$3,000-$5,999	$250-$583
04 =	$6,000-$8,999	$584-$749
05 =	$9,000-$11,999	$750-$999
06 =	$12,000-$14,999	$1,000-$1,249
07 =	$15,000-$17,999	$1,250-$1,499
08 =	$18,000-$20,999	$1,500-$1,749
09 =	$21,000-$23,999	$1,750-$1,999
10 =	$24,000-$26,999	$2,000-$2,249
11 =	$27,000-$29,999	$2,250-$2,499
12 =	$30,000 or more	$2,500 or more

00 = don't know or no response

How many people live on this income? (It provides at least one-half of their income)

(cc 49-50) ___ ___

11A. What are the major sources of the present income of your household?

	No response	No	Yes	
(cc 51)	0	1	2	wages of self or spouse
(cc 52)	0	1	2	social security
(cc 53)	0	1	2	pension or retirement
(cc 54)	0	1	2	insurance or annuities
(cc 55)	0	1	2	savings or investments
(cc 56)	0	1	2	contributions of family members
(cc 57)	0	1	2	gifts
(cc 58)	0	1	2	other (specify:_____)

12A. How much per month do you and others in your household spend for food?

(cc 59)
0 = don't know or no response
1 = $0 - $25
2 = $26 - $50
3 = $51 - $75
4 = $76 - $100
5 = $101 - $125
6 = $126 - $150
7 = $151 - $175
8 = $176 - $200
9 = more than $200

13A. Do you receive food stamps or any other type of assistance with food purchases?

	No	Yes	
(cc 60)	1	2	food stamps
(cc 61)	1	2	commodities
(cc 62)	1	2	other (specify:_____)

What is the dollar amount of food stamps received each month?

(cc 63-65) ___ ___ ___

14A. How do you feel you (your family) are (is) now doing financially as compared to other people your age--better than most, about the same, or worse?

(cc 66)
1 = worse
2 = about the same
3 = better

15A. How well does the amount of money you have take care of your needs--very well, fairly well, or poorly?

(cc 67)
1 = poorly
2 = fairly well
3 = very well

16A. How often do you have enough to buy those little "extras" or those small luxuries?

(cc 68) 1 = never
2 = sometimes
3 = usually

17A. Do you feel that you will have enough money to take care of your needs in the future?

(cc 69) 1 = no
2 = probably so
3 = yes

Now I'd like to ask you some questions about what you eat.
18A. Are you currently on any type of special diet?

	No	Yes	
(cc 70)	1	2	weight control
(cc 71)	1	2	diabetic
(cc 72)	1	2	low fiber or low residue
(cc 73)	1	2	low fat or low cholesterol
(cc 74)	1	2	bland
(cc 75)	1	2	low protein
(cc 76)	1	2	high protein or high calorie
(cc 77)	1	2	low sodium or no added salt
(cc 78)	1	2	other (specify:_____)

(cc 1-2)	0	2	Card 2
(cc 3-4)	___	___	Location code
(cc 5-6)	___	___	ID

19A. Do you take a vitamin or mineral supplement?

(cc 7) 1 = no
2 = yes

What kind(s)?

	No	Yes	
(cc 8)	1	2	Type 1 - Multivitamin (100% USRDA)
(cc 9)	1	2	Type 2 - Multivitamin with minerals
(cc 10)	1	2	Type 3 - High potency multivitamin
(cc 11)	1	2	Type 4 - High potency vitamin/mineral
(cc 12)	1	2	Type 5 - Single nutrient - iron
(cc 13)	1	2	Type 6 - Single nutrient - vitamin C
(cc 14)	1	2	Type 7 - Other (specify:_____)
(cc 15)	1	2	Type 8 - Other (specify:_____)

How many times per week do you take this (these)?

	Type	Times per week	
(cc 16-18)	___	___	___
(cc 19-21)	___	___	___
(cc 22-24)	___	___	___

20A. Do you take any regular medications?

(cc 25) 1 = no
2 = yes

If so, what kind(s)? Names:_____

_____

	No	Yes	
(cc 26)	1	2	diuretic
(cc 27)	1	2	anti-hypertensive
(cc 28)	1	2	cardiac medications
(cc 29)	1	2	insulin/oral hypoglycemic
(cc 30)	1	2	tranquilizer
(cc 31)	1	2	anti-convulsant
(cc 32)	1	2	antacid/gastrin inhibitor
(cc 33)	1	2	other (specify:_____)
(cc 34)	1	2	other (specify:_____)

21A. Some people have trouble with chewing as they get older. Do you have any problems with your teeth that interfere with eating?

(cc 35) 1 = no problems at all
2 = minor problems causing some discomfort
3 = must eliminate 1-2 specific foods
4 = several specific foods must be eliminated
5 = entire food groups eliminated (all meats, etc.)
6 = multiple problems resulting in severe limitations in food choices

22A. Do you ever attend the congregate meal program (nutrition site) in Murfreesboro or Smyrna?

(cc 36) 1 = no
2 = yes

If yes, how often do you attend?

(cc 37) 0 = not applicable
1 = infrequently (once a month or less)
2 = 2-3 times a month
3 = once a week
4 = 2-3 times a week
5 = 4-5 times a week

23A. Do you currently participate in a home-delivered meals program (Meals-on-wheels)?

(cc 38) 1 = no
2 = yes

24A. Almost everyone could use more money. If you had all the money you wanted, what changes, if any, would you make in the food you buy?

	No	Yes	
(cc 39)	1	2	buy more coffee, tea, beverages
(cc 40)	1	2	buy more alcohol, tobacco
(cc 41)	1	2	buy more food of all kinds
(cc 42)	1	2	buy more commercially prepared food
(cc 43)	1	2	buy more milk and dairy products
(cc 44)	1	2	buy more meat, fish, seafood, poultry
(cc 45)	1	2	buy more eggs
(cc 46)	1	2	buy more legumes
(cc 47)	1	2	buy more cereal products, starches
(cc 48)	1	2	buy more vegetables
(cc 49)	1	2	buy more fruit
(cc 50)	1	2	buy more sweets, fats, snack foods
(cc 51)	1	2	other (specify:_____)

25A. If you had less money than you have now, what foods would you cut out?

	No	Yes	
(cc 52)	1	2	buy cheaper cuts of meats
(cc 53)	1	2	no change in food buying patterns
(cc 54)	1	2	buy less foods of all kinds
(cc 55)	1	2	buy fewer commercially prepared foods
(cc 56)	1	2	buy less milk and dairy products
(cc 57)	1	2	buy less meat, seafood, poultry, fish
(cc 58)	1	2	buy fewer eggs
(cc 59)	1	2	buy less legumes
(cc 60)	1	2	buy fewer cereal products, starches
(cc 61)	1	2	buy fewer vegetables
(cc 62)	1	2	buy fewer fruits
(cc 63)	1	2	buy fewer sweets, fats, snack foods
(cc 64)	1	2	buy less coffee, tea, beverages
(cc 65)	1	2	buy less alcohol, tobacco
(cc 66)	1	2	other (specify:_____)

1B. Number of social contacts in three days from Social Contact Diary:

(cc 67-69) ___ ___ ___

2B. Total number of minutes of contact from Social Contact Diary:

(cc 70-74) ___ ___ ___ ___ ___

PHYSICAL HEALTH QUESTIONNAIRE

Now I'd like to ask you some questions about your health. These questions all refer to your health as of today.

1C. Do you presently have any of the listed conditions?

2C. If so, about what year were you first aware that you had this condition or ailment?

(cc 1) 3 Card 3

(cc 2-3) ___ ___ Location Code

(cc 4-6) ___ ___ ___ ID

	No	Yes	Onset	
(cc 7)	1	2		high blood pressure
(cc 8)	1	2		hardening of the arteries
(cc 9)	1	2		stroke
(cc 10)	1	2		tumor, cyst or growth
(cc 11)	1	2		cancer or leukemia
(cc 12)	1	2		paralysis
(cc 13)	1	2		diabetes mellitus
(cc 14)	1	2		cirrhosis
(cc 15)	1	2		broken hip
(cc 16)	1	2		peptic ulcer disease
(cc 17)	1	2		chronic renal failure
(cc 18)	1	2		emphysema or chronic bronchitis
(cc 19)	1	2		tuberculosis
(cc 20)	1	2		urinary tract disorders
(cc 21)	1	2		Parkinson's disease
(cc 22)	1	2		eiplepsy
(cc 23)	1	2		major bone fracture
(cc 24)	1	2		crippling arthritis
(cc 25)	1	2		other (specify:_____)
(cc 26)	1	2		heart trouble
(cc 27)	1	2		arthritis and rhematism
(cc 28)	1	2		sinus trouble
(cc 29)	1	2		defects of vision (not corrected)
(cc 30)	1	2		impairment of hearing
(cc 31)	1	2		chronic nervous condition
(cc 32)	1	2		back or spine trouble
(cc 33)	1	2		chronic constipation
(cc 34)	1	2		asthma, hay fever or other allergy
(cc 35)	1	2		minor bone fracture
(cc 36)	1	2		hiatal hernia
(cc 37)	1	2		chronic gallbladder or liver problem
(cc 38)	1	2		obesity
(cc 39)	1	2		anemia
(cc 40)	1	2		other (specify:_____)

3C. Has any sickness, injury or health problem bothered you in the past four weeks? List number of specific conditions) Maximum of four

(cc 41) ____

If so, how many days were you confined to bed at home? Confined to the house, but not to bed? Hospitalized?

(cc 42) Condition 1:_____
0 = not applicable
1 = major problem (based on categories in 2C)
2 = minor problem

(cc 43) length of confinement
0 = not applicable
1 = 7 days or less
2 = 8-14 days
3 = 15-21 days
4 = 22 or more days

(cc 44) degree of severity
0 = not applicable
1 = hospitalized
2 = confined to the house but not to bed
3 = confined to bed at home

(cc 45) Condition 2:_____
0 = not applicable
1 = major problem
2 = minor problem

(cc 46) length of confinement
0 = not applicable
1 = 7 days or less
2 = 8-14 days
3 = 15-21 days
4 = 22 or more days

(cc 47) degree of severity
0 = not applicable
1 = hospitalized
2 = confined to the house but not to bed
3 = confined to bed at home

(cc 48) Condition 3:_____
0 = not applicable
1 = major problem
2 = minor problem

(cc 49) length of confinement
0 = not applicable
1 = 7 days or less
2 = 8-14 days
3 = 15-21 days
4 = 22 or more days

(cc 50) degree of severity
0 = not applicable
1 = hospitalized
2 = confined to the house but not to bed
3 = confined to bed at home

(cc 51) Condition 4:_____
0 = not applicable
1 = major problem
2 = minor problem

(cc 52) length of confinement
0 = not applicable
1 = 7 days or less
2 = 8-14 days
3 = 15-21 days
4 = 22 or more days

(cc 53) degree of severity
0 = not applicable
1 = hospitalized
2 = confined to the house but not to bed
3 = confined to bed at home

4C. Is there any physical condition, illness or health problem that bothers you now?
(cc 54) 1 = no
2 = yes

5C. Which of these things are you healthy enough to do without help?
a. Heavy work around the house like shoveling snow, washing windows or moving furniture?
(cc 55) 1 = no
2 = yes

b. Work at a full time job or do ordinary activities around the house yourself
(cc 56) 1 = no
2 = yes

c. Walk half a mile (about eight ordinary blocks).
(cc 57) 1 = no
2 = yes

d. Go out to a movie, shopping, to church, or a meeting, or to visit friends.

(cc 58) 1 = no
2 = yes

e. Walk up and down stairs to the second floor.

(cc 59) 1 = no
2 = yes

(cc 60) 6C. Which of these statements fits you best?

1 = I cannot work or keep house at all now because of my health.
2 = I have to limit some of the work or other things that I do.
3 = I am not limited in any of my activities.

APPENDIX C

SUMMARY OF ORAL PRESENTATION

AND CONSENT FORM

SUMMARY OF ORAL PRESENTATION TO SUBJECT

As a part of my Ph.D. program, I am studying factors which influence the diets of people your age. These factors include your housing situation, physical health, financial status and social activities. Your participation in this study will make a tremendous contribution to helping us learn more about ways we can help to improve the nutrition of our senior citizens.

I will be asking you to keep two sets of records. The first set will be a record of all your food intake for three days. I will explain to you in detail how to do this so we can get the best estimate possible of your nutrient intake. The second set of records will be a diary of your contacts with others for three days. I'll give you more information later on how to do this.

Also, I'll be asking you some questions about your health, income, food budget, and housing. To accomplish the objectives of the study, I need to have information that is as complete as possible, but it you do not want to answer a question, you may just tell me that. All of the information from all the people who participate will be grouped together and there will be no way to identify the results of the study with any individual once the project is completed.

The information that you give me will be strictly confidential. I have given you a number and I am the only person who can identify the number with your name. The only reason I need to identify you is so I can give you your dietary analysis. This is an example of the computer diet analysis that I will give you after the study is completed. It will

help you understand how complete your diet is and will give you specific suggestions for improvement.

I hope you will be willing to participate in this study. Do you have any questions? (If no) To show your willingness to participate, you need to read and sign this consent form which summarizes the information about the project.

CONSENT FOR PARTICIPATION

I consent to participating in a research study entitled "The relationship of loneliness and social isolation to dietary adequacy of noninstitutionalized elderly individuals." The purpose of the study and procedures to be followed have been explained to me.

I understand that I will be asked to answer certain questions about my life-style and living environment. Furthermore, I understand that I will be asked to keep a record of my food intake for three days and a record of all social contacts and visits for three days.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and any questions I asked have been answered to my satisfaction. I also understand that I am free to withdraw from participation in the study at any time without penalty or loss of benefits. The information obtained from me will remain confidential and anonymous unless I agree otherwise.

I have read and fully understand this consent form. I have signed it voluntarily and understand that a copy is available upon request.

Signed:_____ Date:_____

Participant

Signed:_____ Date:_____

Dellmar Walker, Project Director
Department of Home Economics
Middle Tennessee State University
Murfreesboro, Tennessee 37132
Phone: 898-2091

APPENDIX D

COMPUTATIONAL PROCEDURE FOR HEALTH INDEX

Computational Procedure for Health Index

I. Total points for illness/confinement inventory

Weight	Characteristic
4.0	For each major illness ever had
2.0	For each minor illness ever had
4.0	For each major illness causing confinement in last month
2.0	For each minor ailment causing confinement in last month

II. Weighted value for degree of recent illness

Length of confinement	Weight	(times)	Value	Location
7 days or less	1.0		1.5	in hospital
8 - 14 days	2.0		1.0	in bed at home
15 - 21 days	3.0		0.5	at home
22 or more days	4.0	(X)		

III. Sum totals from I and II

APPENDIX E

RECOMMENDED DIETARY ALLOWANCES

RECOMMENDED DIETARY ALLOWANCES[1]
1980 Revision

Nutrient	Females	Males
Protein, g	44	56
Calcium, mg	800	800
Phosphorus, mg	800	800
Iron, mg	10	10
Vitamin A, IU	4,000	5,000
Ascorbic acid, mg	60	60
Thiamin, mg	1.0	1.2
Riboflavin, mg	1.2	1.4
Niacin, mg	13	16
Energy, kcal[2]	1,800 (1,400-2,200)	2,400 (2,000-2,800)
Energy, kcal[3]	1,600 (1,200-2,000)	2,050 (1,650-2,450)

[1]Nutrient allowances for females and males ages 51 years and older.

[2]Energy allowances for females and males ages 51-75 years.

[3]Energy allowances for females and males ages 76 years and older.

VITA

Dellmar Walker was born in Nashville, Tennessee, on December 9, 1950. She attended elementary schools in that city and was graduated from John Overton High School in June 1968. The following September she entered Middle Tennessee State University, and in August 1972 she received a Bachelor of Science degree with a double major in Foods and Nutrition (Dietetics emphasis) and Home Economics Education. In the fall of 1972 she entered the dietetic internship program with an emphasis in clinical nutrition at The University of Kentucky Medical Center. She completed the internship in June 1973 and received the Master of Science in Clinical Nutrition, University of Kentucky School of Allied Health Professions, in June 1974. She wrote the American Dietetic Association Commission on Dietetic Registration examination in October 1973 to become a Registered Dietitian.

The author has held positions with the University of Kentucky Medical Center as a Clinical Dietitian with the hemodialysis unit and outpatient clinics, Mary Immaculate Hospital in Lebanon, Kentucky, and various consultant positions. She is currently an Assistant Professor at Middle Tennessee State University and consultant to the National Health Corporation Dietetic Internship program.

Professional memberships include the American Dietetic Association, American Home Economics Association, affiliated state and local associations, Delta Kappa Gamma, and Kappa Omicron Phi. She will continue employment at Middle Tennessee State University after graduation.