

NUTRITION OF ELDERLY PEOPLE
AT A REHABILITATIVE
DAY CARE CENTER

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We hereby recommend that the thesis prepared under
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CHAPTER I

INTRODUCTION

The aged population in the United States now constitutes ten percent of the total population but twenty percent of the poor. According to the official poverty index, about one quarter of all older Americans live in households with total incomes below the poverty level (2).

Dietary studies have not been extensive for aged persons living at home (7); yet, over ninety-five percent of older Americans do live in the community, not in institutions (2). The food intake of older persons is of special interest because research has shown that the elderly poor are more vulnerable nutritionally than either the elderly or the poor of all other ages (10).

Many older persons are believed to ingest suboptimal nutritional diets and could benefit from improved diets (12). Nutritional adequacy has been found to be inter-related with both socioeconomic and health factors which may prevent the elderly person from receiving an adequate diet (18). Therefore, an investigation to evaluate the nutritional adequacy of a group of elderly people living on lowered incomes is justified.

Purposes

The general purpose of this study is to compare the nutritional adequacy of the diets of 21 elderly people enrolled in a rehabilitative day care program to those of a similar population receiving family care services.

Specifically, the study included the following:

- 1) A comparison of the adequacy of diets of elderly participants at a rehabilitative day care center with a similar age group of people who were enrolled in the family care program.
- 2) A comparison of the center participant's nutrient intake derived from the food intake at the center with the nutrient intake derived from food intake outside the center.
- 3) An assessment of the adequacy of diets of all subjects in relation to factors of education, number in household, eating alone, food preparation and grocery shopping, use of food stamps, self-ratings of appetite and health, and ability to chew foods.

CHAPTER II

REVIEW OF LITERATURE

Incidence of Nutritional Inadequacy Among the Aged

Research has shown that the diets of some elderly individuals often are nutritionally inadequate and that this adversely affects their nutritional status and health. In a study of aged men and women 50 to 97 years, Davidson and co-workers (6) found the intakes of essential nutrients were highly variable and below optimum in some instances.

The Ten-State Nutrition Survey (26), 1968-1970, revealed that persons 60 years of age or older were one of the age groups with evidence of increased nutritional deficiencies which were not restricted to the very poor nor to single ethnic groups. Persons 60 years of age and older consumed far less food than needed to meet the nutrient standards for their age, sex, and weight. No sub-group met the caloric adequacy standard. Other limited nutrients were protein, iron, riboflavin, and vitamin C; vitamin A intake was inadequate only in the Spanish-American population sample. Older persons had considerably higher mean nutrient intakes per 1,000 calories than did 15 to 16 year

old adolescents for most nutrients. Mean caloric values were much lower for persons 60 years of age and older, indicating that the foods they selected had a generally higher nutrient content than those selected by adolescents. Total food intake accounted for differences in intake of iron, protein, thiamine, and to some degree vitamin A, while differences in vitamin C and riboflavin intake reflected selection of foods that were high in these nutrients.

Lyons and Trulson (16), investigating the food practices of older people living at home, found that nearly one-fourth of 100 elderly people were obtaining less than 75 percent of the National Research Council's Recommended Dietary Allowances (RDA) (8) for calories, calcium, iron, thiamine, riboflavin, and ascorbic acid. Approximately one-fourth of the subjects did not meet the RDA for protein, although mean protein figures were well above the RDA. With the exception of iron intake for the women, mean figures for all nutrients met the RDA.

In a survey of an aging population (23), nutrient values of dietary records were calculated and compared with the RDA. In this study mean intakes for the various age groups by sex met the RDA except for calories for the men and calcium for women. One-fourth of the men and half of the women had less than two-thirds of the RDA for calcium.

About one-fourth of both men and women had low intakes of vitamin A and ascorbic acid. Mean thiamine and ascorbic acid intakes were generally higher than the RDA.

Nutritional adequacy of the diets of 32 healthy women, ages 65 to 85 years, was investigated by Fry et al. (9). Mean daily intakes of calories and all nutrients, except for iron, either met or exceeded the RDA. Individual nutrient intakes were also reported. None of the women had intakes of less than two-thirds of the RDA for calories, thiamine, or niacin. Ninety-seven percent of the women chose diets which furnished two-thirds or more of the RDA for protein. Only one subject had protein intake less than two-thirds of the RDA. Calcium was the only nutrient consumed in less than half of the RDA, and this low intake occurred in the diets of only two women. Eighty-two percent of the subjects had calcium intakes which exceeded two-thirds of the RDA. Sixteen percent of the women had intakes which contained less than two-thirds of the RDA for iron. Over 90 percent of the diets provided two-thirds or more of the RDA for ascorbic acid and vitamin A. Ninety-four percent of the diets met two-thirds or more of the RDA for riboflavin.

In a food consumption survey (15) of older households in Rochester, N. Y., nutrient content of each house-

hold's food was compared with the RDA. The two nutrients in shortest supply were calcium and ascorbic acid. Only 70 percent of the households had food supplies that met 100 percent of the RDA for these nutrients. Nine percent of the households fell below two-thirds of the RDA for calcium, and 15 percent failed to meet two-thirds of the RDA for ascorbic acid. About 80 percent of the households met 100 percent of the RDA for thiamine, protein, iron, vitamin A, and calories. Eighty-nine percent of the households met the RDA for riboflavin.

In the United States Health and Nutrition Examination Survey (HANES), 1971-72 (11) mean calcium, vitamin A and vitamin C intakes were limited in describing the adequacy of the diets of individuals. Although a substantial proportion of the individuals had intakes less than the standards, mean calcium, vitamin A and vitamin C intakes for the group were adequate in relation to the standard.

Socioeconomic and Health Factors

Nutritional adequacy is inter-related with both socioeconomic and health factors. The American Dietetic Association's position paper on Nutrition and Aging (25), stated that, "... adequate nutritional care must be considered in connection with the inter-related economic, social, physiologic, and psychologic changes coincidental

with aging." Some factors known to affect nutritional adequacy include, poverty, lack of transportation, lack of mobility or capacity to shop, lack of companionship or social isolation, poor dental health, and chronic invalidism (18, 22).

Social Isolation- A sociological appraisal of the aged as a group suggests that many are isolated from the activities of life (5). The lives of many older people are marked by loneliness brought on by living alone, eating alone, and separation from family (24). Social isolation may contribute to nutritional inadequacy in the older person. Because lonely people will not prepare proper meals just for themselves, they often acquire poor eating patterns (21). Loneliness is associated with poor appetite, apathy toward food, or selection of food stuffs that provide inadequate nutrients (14).

In a study of the nutrition of a group of healthy aging persons, Davidson et al. (6) studied the nutrient intake of a group of socially isolated subjects (Group I), in comparison to a group of subjects (Group II), living more gregariously. The more isolated members ate far less variety of foods than the more gregarious group. Group I reported a mean of 53 varieties compared to Group II mean of 71 varieties. For all nutrients except iron, the mean

daily intake was less in the isolated group than in the social group.

Under Title IV of the Older American Act, demonstration projects in nutrition were founded to improve the quality of life for the non-institutionalized elderly person (21). Group meals in a community setting were offered to older Americans. In the evaluation of one nutrition demonstration project, a questionnaire was administered to participants. The participants showed by their answers to the questionnaire that they gave equal importance to the food and the social aspects of the program.

In a dietary study of older persons living at home, LeBovitz (15) found that lack of appetite was a much more serious problem for those living alone than for those living with another person. Only about 10 percent of the husband-wife households reported lack of appetite; the comparable proportion for one-member households was 25 percent.

In rural Pennsylvania adequacy of nutrient intake of 109 elderly citizens (10) was assessed in relation to number in the household. Two-person households had less adequate intakes of vitamin A ($p = <.05$) than one-person households. In comparison, Brown (3) reported no significant correlation between dietary adequacy and the number of persons in the household in a study group of 303 non-institutionalized

persons over 65 years of age.

Dental Health- Poor dental health may be a serious factor in the poor eating habits of some aged people (22). By age 60, about 45 percent of people in the United States have lost all of their teeth (14).

In studying healthy aging persons, Davidson et al. (6) found that in regard to protein intake only, chewing efficiency was apparently related to nutrient intake. Twice as many of the members with "poor function" of teeth or dentures as those with "good function" had a protein intake of less than 1 gram per kilogram of body weight. Those with "excellent function" had a protein intake of 1.5 grams or more per kilogram of body weight. However, it was also noted that many subjects ate well with no teeth or ill-fitting dentures.

In comparison, LeBovit (15) found dental problems did not affect the nutritive quality of diets; three in ten households reported difficulty in chewing because of dental problems. These findings compare favorably with those of Guthrie et al. (10) who reported no correlation of nutrient intake and dental health.

Income- In 1971 the White House Conference on Aging made recommendations to improve the quality of nutrition particularly for those in the low income or poverty category.

The elderly have been identified as one of the groups particularly vulnerable to malnutrition, especially the large part of this group with low incomes (14). Howell and Loeb state, "A significant proportion of adults over the age of 65 in the United States do not have incomes adequate to purchase a diet which provides for health and well being." (12).

There is increasing evidence to relate quality of the diet to income. Studies have shown that older citizens living on lowered incomes have less adequate diets than those living on higher incomes (7, 10, 15).

Guthrie et al. (10) designed a study to evaluate the adequacy of the diets of a group of elderly citizens eligible for food assistance compared to that of a group whose income disqualified them for such a program. Nutrient intake was assessed on the basis of a 24 hour dietary recall obtained by interviewing. For purposes of analysis, intakes less than two-thirds of the RDA were considered inadequate.

When subjects were grouped on the basis of income, it was evident that the low income group had diets somewhat less adequate than those with higher incomes. In comparing nutrient intake to the RDA, the percent of persons with intakes less than two-thirds of the RDA for individual

nutrients was reported for the low income group (Group I) and the higher income group (Group II). Group I reported percentages of 55, calories; 42, protein; 70, calcium; 26, iron; 70, vitamin A; 51, thiamine; 57, riboflavin; and 51, vitamin C. In contrast, Group II reported percentages of 38, calories; 16, protein; 58, calcium; 10, iron; 63, vitamin A; 34, thiamine; 34, riboflavin; and 38, vitamin C. These differences were significant for three nutrients: protein ($p < .01$), iron ($p < .05$), and riboflavin ($p < .05$).

When the adequacy of intakes of low income subjects in the study by Guthrie et al. (10) was compared to that of another sample of low income people of all ages, it was evident that the older people had significantly less adequate intakes of calories, protein, thiamine, and riboflavin than the population of low income families of all ages. For these nutrients, 19, 11, 23, and 17 percent of 176 low income families of all ages had intakes failing to meet two-thirds of the RDA. In the low income aged population much larger percentages of the subjects, 55, 42, 51, and 57, respectively, failed to meet this standard. These findings suggest that the elderly poor are more vulnerable nutritionally than either the elderly or the poor of all ages.

In studying 283 social security recipients,

LeBovit (15) reported diets meeting 100 percent of the RDA were almost one and a half times as frequent in the high income group (54 percent) as in the low income group (38 percent). Diets falling below two-thirds of the RDA in any nutrient were 13 percent in the high income group compared to 34 percent in the low income group. Shortages of calcium were more frequent than any other nutrient.

At Syracuse, N. Y. researchers (7) found evidence of nutritional inadequacy in an older age group with limited economic resources. Iron, thiamine and riboflavin were at suboptimal levels in 43, 41, and 17 percent, respectively, of the total group.

In the HANES survey (11), income was related to adequacy of protein and caloric intakes in the subjects ages 60 years of age and older. The income group above the poverty level reported higher mean intakes of protein than the lower income group. Twenty-nine percent of the lower income group had caloric intakes of less than 1,000 calories. In comparison only 16 percent of the income group above the poverty level had caloric intakes less than 1,000 calories.

Incidence of Overweight- Nutrient allowances remain essentially the same throughout adult life, whereas the RDA for calories decreases with age. Caloric allowances for the elderly are lower on the basis that the older

individual has a lower basal metabolic rate and is less active physically (8).

The lower caloric needs pose the problem of obtaining sufficient nutrients with reduced caloric intake.

Older individuals must take greater care in selecting foods with a high yield of nutrients per calorie. The diet of the geriatric person has less room for so-called empty calories from high calorie foods with few nutrients, even though these may be inexpensive and well liked (28).

The existence of many overweight elderly individuals has been reported by several researchers (6, 7). Davidson and co-workers (6) found that over 25 percent of their study group of 104 individuals ranging from 51 to 97 years of age was more than 20 percent above their desirable weight. Underweight was not as frequent a problem as overweight.

In studying food intakes of 283 older persons living at home, LeBovitt (15) found about half of the group were within 10 percent of ideal weight for height and one-third were more than 10 percent over ideal weight. More women than men were overweight, and overweight women had a greater amount of excess poundage than overweight men.

In a study of food practices of 100 older people (16), it was revealed that 35 percent of the men and 52

percent of the women consumed more calories than the RDA even though mean figures for caloric consumption did not exceed the RDA. Forty-eight percent of the men and 59 percent of the women were 10 percent or more above their desirable weight using the Metropolitan Life Insurance Company Tables as a standard.

Body weights were reported by 54 men and 58 women completing a dietary survey (23). Thirty-one percent of the men and women were greater than 10 percent overweight, 55 percent of the men and 52 percent of the women were 10 percent overweight to 10 percent underweight, and 11 percent of the men and 17 percent of the women were greater than 10 percent underweight.

In a nutritional status evaluation of 214 elderly subjects (7), 60 percent of the females and 46 percent of the males were 10 percent or more overweight, and 9 percent of the females and 19 percent of the males were 10 percent or more underweight. In this study an increase in age beyond 70 years was associated with less overweight. In the Ten-State Nutrition survey (26), 1968-70, obesity was one of the nutritional problems identified in women over 60 years of age.

Dietary Data Methodology

Twenty-Four Hour Diet Recall- Twenty-four hour diet

recall has been in use for many years to collect dietary information. In the 1950's Kaplan et al. (13) used a 24 hour recall of food intake and a social and economic history to collect dietary data on non-institutionalized aged persons. In the Spring 1970, Guthrie et al. (10) assessed nutrient intake and dietary practices of elderly people by use of a 24 hour diet recall obtained by interviewing. In this study researchers stated the 24 hour diet recall was the most feasible method of collecting dietary data. Beginning in April 1971, 24 hour diet recall was also used in the United States Health and Nutrition Examination Survey (HANES) (11). It was reported that the 24 hour recall was effective in the apparent ability of the subjects to recall food intake.

Validity of the Twenty-Four Hour Diet Recall- Recently Madden et al. (17) conducted a study to investigate whether the 24 hour recall method of collecting data in dietary surveys does supply accurate information in food intake. The study was designed to test the validity of recalled intake data in elderly, non-institutionalized subjects, compared with actual intake as observed by trained observers. The results showed no significant difference was found between the mean recalled and the mean actual intake of nutrients, with the exception of calories.

Some researchers have suggested that a check list or the assistance of a younger family member may be required to obtain reliable data on current dietary intake of older persons. In a dietary survey using 24 hour recall, Campbell and Dodds (4) found that up to 35 percent of caloric intake may be forgotten by older men.

Dietary History- A dietary questionnaire may also be used in conjunction with the twenty-four hour diet recall. The questionnaire provides both a cross check on the completeness of the 24 hour recall and additional information on food practices (5).

Food Models- To help the subject indicate amounts of foods consumed, the interviewer may use various sized glasses, spoons, bowls, or food models such as those developed by Moore and Associates (19). These researchers used graduated food models for milk, rice, and beans to test the effectiveness of models in helping subjects report sizes of servings. Thirty couples were tested and results indicated that the use of models improved agreement on amounts of food consumed by 70 percent.

Evaluation of Diets- The National Research Councils' Recommended Dietary Allowances (8) form the basis for dietary recommendations for this present study group. The RDA are not requirements but rather guidelines for the inter-

pretation of food consumption records of groups of people (8). It should not be assumed that nutritional adequacy of an individual is insured by meeting the RDA, nor is nutritional inadequacy present whenever the recommendations are not completely met. The RDA are presently the best available standard used for determining adequacy of nutrient intake in conjunction with the 24 hour dietary intake and dietary questionnaire forms.

CHAPTER III

PROCEDURES OF INVESTIGATION

The data for this study were secured from 42 subjects, 21 of whom were enrolled in the rehabilitative day care program, hereafter referred to as the center group. Twenty-one subjects who were enrolled in the family care program served as the control group. All subjects ranged in age from 50-87 years. During the fall, 1976, the subjects attending the rehabilitative day care program were interviewed at the center; the control subjects were interviewed in their homes.

Prior to beginning the study, permission was requested and granted by the Director of the Health Maintenance Program, and the Family Care Contract Administrator. The family care supervisors provided the names of control subjects. The Texas Woman's University Human Research Review Committee received and approved the study proposal. All subjects provided informed consent (Appendix 1).

Control subjects of comparable age, sex, and ethnic group to the center group were selected. See Table 1. In general, the income of the subjects was less than \$3,000 per year. It was not possible to obtain household income

for the entire group of subjects; therefore, in a few cases household income may have exceeded \$3,000.

TABLE I

AGE, SEX, AND ETHNIC GROUP OF SUBJECTS IN THE REHABILITATIVE DAY CARE CENTER AND CONTROL GROUP SUBJECTS

AGE	Males N= 16						Females N= 26					
	Center			Control			Center			Control		
	C*	N**	LA	C*	N**	LA	C*	N**	LA	C*	N**	LA
50-54	2	-	-	1	-	-	-	2	-	-	1	-
55-59	-	1	1	-	1	1	-	-	-	-	2	-
60-64	2	-	-	2	-	-	-	3	-	-	-	-
65-69	-	-	-	1	1	-	1	2	1	-	4	-
70-74	-	2	-	-	1	-	-	1	-	1	1	-
75-79	-	-	-	-	-	-	1	1	-	1	1	1
80-87	-	-	-	-	-	-	-	1	-	-	1	-
Total	4	3	1	4	3	1	2	10	1	2	10	1

C* Caucasian 28.6%
 N** Negro 61.9%
 LA Latin American 9.5%

The medical record data was obtained from the subject's medical record at the Visiting Nurse Association. The form appears in Appendix 2.

Dietary History questionnaire form (Appendix 3) was designed by the investigator to obtain information concerning available cooking facilities, eating alone, food preparation and grocery shopping, use of food stamps, self-ratings of appetite and health, and ability to chew foods.

The dietary questionnaire was pre-tested on a group

of four participants enrolled in a maintenance program at the rehabilitative day care center. In discussing techniques of interviewing, Young (29) states that pre-testing of the questionnaire on a group similar to the study group is essential in order to obtain valid information.

Twenty-four hour diet recall form (Appendix 4) was designed by the investigator to record the type and amount of food ingested by the subjects. This form was used with food models in an effort to obtain as accurate information as possible. A food frequency form (Appendix 5) served as a cross check on the recall. Frequently, the subject remembered additional items consumed on the recall day as he responded to the food frequency questions. Information on frequency of consumption is expected to be useful in analyzing the relationship of nutrient inadequacies to eating patterns (11). Twenty-four hour diet recall together with the food frequency was collected twice for each subject in order to obtain information typical of the subject's usual intake.

Each subject was asked to recall everything put into the mouth and swallowed from the time upon awakening until sleeping. In nutritional counseling, Young (28) suggested that by using this method of obtaining food intake, the subject was encouraged to report more information both

food related and otherwise about himself.

Each subject determined the amounts of foods consumed by selecting one of the appropriate food model sizes. Food models were developed by the author according to methods of Moore and associates (19). Each food model was coded with an alphabetical designation. Moore and associates (19) advised the use of code letters; otherwise, there would be confusion if the respondent said, "1/2 Cup" but pointed to the 1-Cup model. Measurements for each of the models follows.

Weights and Measurements of Food Models

ITEM	CODE	AMOUNT
Roast beef, sliced	G	2 1/2 oz.
Meat patty	B	3 oz.
Ham slice	F	2 oz.
Teaspoon	C	Tsp.
Large teaspoon	D	2 Tsp.
Tablespoon	E	Tbsp.
Small glass	S	1/2 C
Medium glass	T	1 C
Large glass	U	1 1/3 C
Rice, small portion	N	1/3 C
Rice, medium portion	O	1/2 C
Rice, large portion	P	1 C
Beans, small portion	K	1/3 C
Beans, medium portion	L	1/2 C
Beans, large portion	M	1 C
Bread, thin sliced	A	20 gms.
Bread, regular sliced	Q	25 gms.
Biscuit, small	J	.63 oz.
Biscuit, medium	I	.75 oz.
Biscuit, large	H	1.0 oz.
Cornbread	R	83 gms.

During the home interviews with the control subjects, a family member or friend who was familiar with the food intake of the subject sometimes assisted in helping the subject recall foods and amounts of foods consumed. In a dietary survey using 24 hour recall, Campbell and Dodds (4) found that assistance of a family member may be required to obtain reliable data on current dietary intake of older persons.

The center subjects dined in a group at the rehabilitative day care center. The noon meal was designed to provide one-third of the RDA. Snacks and breakfast were also served at the center. Not all subjects ate both the breakfast and snacks at the center; those on weight reduction diets were not served snacks, and some ate breakfast at home. The food served at the center including, breakfast, lunch, and snacks, was calculated to provide one-half of the RDA.

The luncheon menus at the Rehabilitative Day Care Center followed the following pattern:

Protein, 3 oz.

Starchy Vegetable, 1/2 C

Green/Yellow Vegetable, 1/2 C

Milk, 1/2 Pt.

Bread, 1 slice

Dessert, usually 1 Fruit Exchange

The subjects in the control group lived in their private residences which were located as much as possible in the same geographic area as the center. They did not attend the programs at the center. Although the control subjects lived independently, many were functionally disabled and needed assistance with activities of daily living.

Analysis of Nutrient Intake

The information received on the 24 hour diet recall was conveyed to computer cards using the values in Agriculture handbook #456 (1). An average of the two days diet recall was calculated into ten selected nutrients for each subject.

The nutrients evaluated were calories, protein, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin, and vitamin C. The mean intake levels were compared with the 1974 edition of the Recommended Daily Dietary Allowances (8). Selected nutrients were then classified according to a range of percentage of the RDA's (8). Adequacy of intake is expressed as the percentage of subjects with intakes of various nutrients less than two-thirds of the RDA. For purposes of this analysis, intakes less than two-thirds of the RDA are considered inadequate.

CHAPTER IV

PRESENTATION OF FINDINGS

The data obtained from medical records and a questionnaire are shown in Table 2. Both groups reported similar percentages in responses to factors including weight status, educational attainment, size of household, dining alone, use of food stamps, self-ratings of appetite, and problems chewing food. The center and control groups differed in their responses to grocery shopping and food preparation by self, and self-ratings of health.

The subjects were classified as normal weight, underweight, or overweight according to a suggested weights for height table (8). Overweight appeared to be a problem for elderly subjects in this study. The percent of overweight subjects was 20-30 percent higher than the percentage of overweight subjects in the studies by Davidson (6), Steinkamp (23), and LeBovit (15). The findings of Dibble et al. (7), and Lyons and Trulson (16) are similar to the findings in this study regarding percent of overweight subjects. In the Ten-State Nutrition Survey (26), obesity was one of the nutritional problems identified in females sixty years of age and over.

TABLE 2

SELECTED CHARACTERISTICS OF SUBJECTS

	Center Group		Control Group	
	Number	Percent	Number	Percent
Weight Status:				
Underweight	3	14	2	10
Overweight	13	62	11	52
Normal	5	24	8	38
Educational Attainment:				
0-8 years schooling	12	67	14	70
9-11 years schooling	1	5	1	5
12+ years schooling	5	28	5	25
Size of Household				
Subject lives:				
Alone	8	38	7	33
With spouse	5	24	4	19
With relative	7	33	8	38
With non-relative	1	5	2	10
Subject dines alone:				
Yes	12	57	13	62
No	9	43	8	38
Food Preparation by self:				
Yes	9	43	0	0
No	12	57	21	100
Use of Food Stamps:				
Yes	8	38	6	29
No	13	62	15	71
Grocery Shopping by self:				
Yes	8	38	1	5
No	13	62	20	95
Problems chewing food:				
Yes	9	43	9	43
No	12	57	12	57
Self ratings of appetite:				
Poor	0	0	2	9
Fair	7	33	6	29
Good	11	52	8	38
Too good	3	15	15	24
Self ratings of health:				
Poor	1	5	6	29
Fair	3	14	7	33
Good	10	48	7	33
Excellent	7	33	1	5

In the control group only one subject grocery shopped for himself and none of the subjects prepared food for themselves. This was, in part, due to the services of the Family Care program which provided assistance for food preparation and grocery shopping. All control subjects (100 percent) reported having outside help associated with the family care program to prepare food. One person who lived alone stated that on weekends when help was not available through the family care program, she ate mostly snacks because she was physically unable to prepare food for herself.

The subjects in both the center and control groups reported having cooking, refrigeration, and water facilities. Both groups generally ate all meals at home. Of the group who was eligible for food stamps, but did not use them, "too expensive" or "too much trouble" were the reasons given for not using stamps. Some elderly subjects who had no teeth reported "no difficulty" in chewing foods although they avoided eating raw fruits and vegetables. According to responses to self-ratings of health, the center subjects considered themselves in better health than the control subjects.

Assessment of Selected Characteristics of Subjects in Relationship to Nutrient Intake- Selected characteristics of subjects for both groups were combined and

assessed in relationship to nutrient intake.

Nutrient intakes were not significantly affected by educational attainment or size of household. In a population sample studied by Brown (3), the same results were reported for educational level and number of persons in the household. In a study by Guthrie et al. (10), no significant relationship of dietary adequacy and educational level was reported, and size of household correlated with only one of the eight nutrients assessed.

This present study found nutrient intake was not significantly affected by eating alone or living alone. In contrast, Davidson and coworkers (6) reported the mean daily intake for all nutrients except iron, was less in an isolated group than in a social group. However, no subject in this study could be classified as isolated.

There were no statistically significant correlations between self-ratings of appetite and nutrient intakes. In comparison, LeBovitz (15) found that the nutritive quality of diets were correlated with lack of appetite.

Nutrient intakes were not significantly influenced by the ability to chew foods. These findings are comparable to those of LeBovitz (15) and Guthrie (10) who found no significant relationship between nutrient intakes and dental health.

When subjects were grouped on the basis of weight status, a statistically significant relationship was found for underweight and niacin intake ($p = .009$ at .01 level). This may be accounted for by one underweight subject who reported an extremely high niacin intake.

Those who used food stamps had significantly better intakes of vitamin C ($p = .03$). In a study by Guthrie (10) the families who participated in the food stamp program had diets more often adequate in energy, protein, and iron ($p < .10$), than did nonparticipants.

The subjects who considered themselves in better health had more adequate intakes of riboflavin ($r = .31$ at .05 level) than those subjects who rated their health as poorer. In comparison, when subjects were grouped on the basis of their ratings of health in a study by Guthrie et al. (10), no significant differences in nutrient adequacy could be demonstrated.

The subjects who reported grocery shopping by self had more adequate intakes of calcium ($p = .02$), riboflavin ($p = .05$), and vitamin C ($p = .007$). The subjects who reported food preparation by self had more adequate intakes of riboflavin ($p = .04$).

Nutrient Intakes

The calculated mean daily intakes for calories and

nine nutrients as compared to the 1974 RDA's are presented in Table 3. No statistically significant differences in nutrient intakes could be shown between the two groups using Fishers T test. However, the differences between the two groups for calcium ($p = .07$) and riboflavin ($p = .06$) intakes approached a statistically significant difference ($p = .05$).

In the center group the mean caloric and thiamine intakes fell below two-thirds of the RDA; whereas, in the control group mean intakes for calories, calcium, thiamine, riboflavin, and to a lesser extent niacin were limited. Mean nutrient intakes reported for low income persons aged 60 years and over in the HANES survey (11) are compared to the mean intakes found in this study and are shown in Table 4. All mean nutrient intakes in the center and control groups met 69 percent or more of the values reported in the HANES survey (11).

The nutrient intakes of individuals is often of more interest than average intakes since the subjects with high nutrient intakes can mask the individuals with low intakes. The percent of individuals meeting less than two-thirds of the RDA is compared to the low income group studied by Guthrie et al. (10) and is shown in Figure 1.

TABLE 3

MEAN DAILY NUTRIENT INTAKES OF ELDERLY SUBJECTS
AT A REHABILITATIVE DAY CARE CENTER
AND IN A FAMILY CARE PROGRAM
COMPARED TO THE 1974 RDA'S

	Center Group	RDA**	Control Group	Mean intakes as percent of RDA	
				Center Group	Control Group
Energy (kcal)	1126	2100	1012	54	48
S.D.*	(400)		(487)		
Protein (gms)	55	51	47	107	92
S.D.	(18)		(27)		
Calcium (mg)	632	800	402	79	50
S.D.	(441)		(342)		
Phosphorus (mg)	871	800	678	109	85
S.D.	(371)		(452)		
Iron (mg)	8.1	10	7.4	81	74
S.D.	(3.8)		(3.6)		
Vitamin A (I.U.)	4974	4500	3760	111	84
(S.D.)	(5470)		(2822)		
Thiamine (mg)	.70	1.1	.66	64	60
S.D.	(.29)		(.37)		
Riboflavin (mg)	1.24	1.3	.87	95	61
S.D.	(1.62)		(.59)		
Niacin (mg)	10.7	14	9.3	76	66
S.D.	(3.5)		(5.4)		
Vitamin C (mg)	86	45	62	191	138
S.D.	(8.0)		(5.5)		

* Standard Deviation

** Mean RDA for persons age 51 years and over

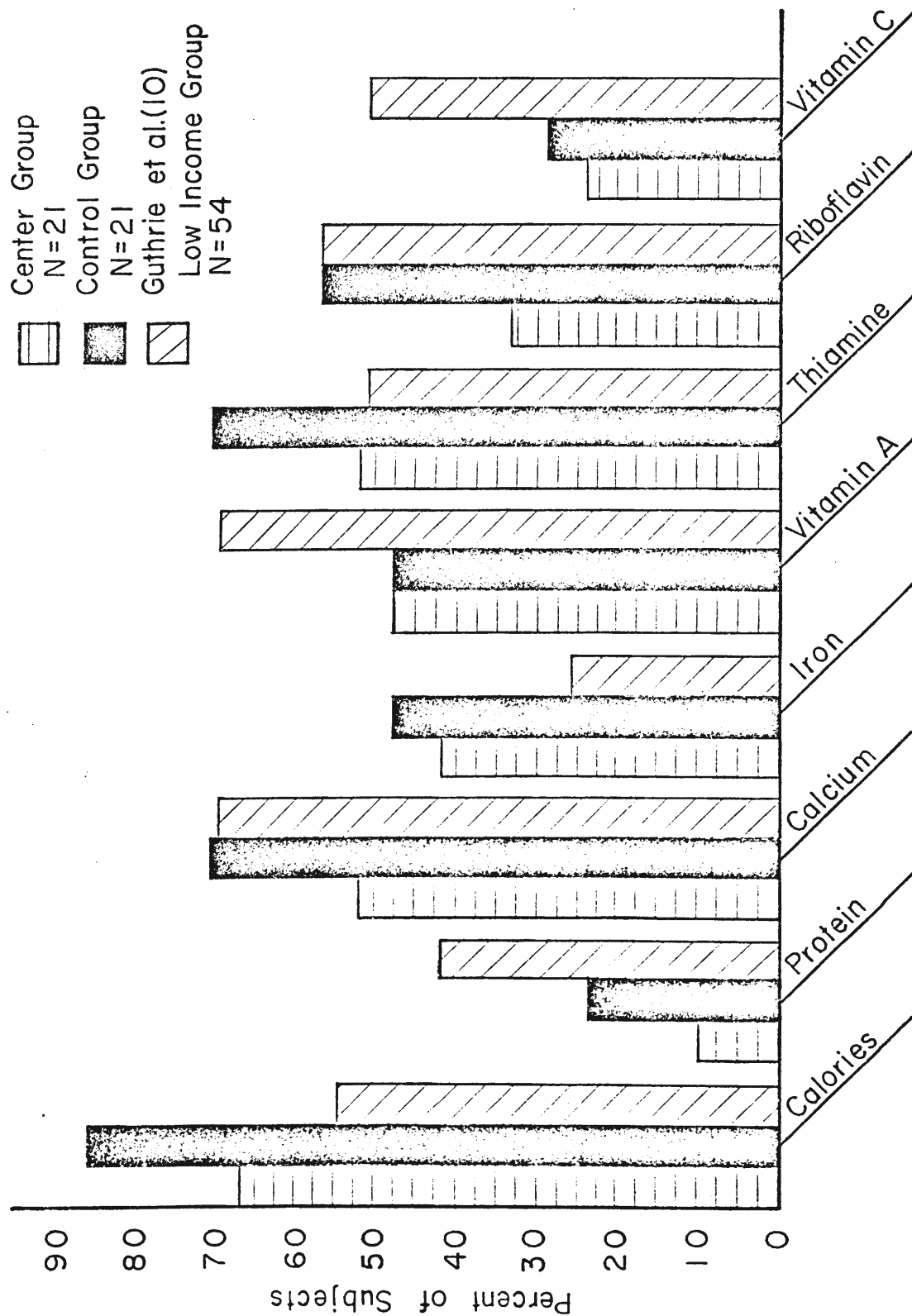
TABLE 4

MEAN DAILY NUTRIENT INTAKES OF ELDERLY SUBJECTS
COMPARED WITH HANES SURVEY (11)

	Center Group	Control Group	HANES
Energy (kcal)	1126	1012	1434
Protein (gms)	55	47	57.7
Calcium (mg)	632	402	583
Iron (mg)	8.1	7.4	9.6
Vitamin A (I.U.)	4974	3760	4216
Vitamin C (mg)	86	62	71

The percent of subjects meeting less than two-thirds of the RDA for calories, protein, calcium, thiamine, and riboflavin was 14 to 24 percent higher in the control group than in the center group. Seventy-one to 90 percent of all subjects met 67 percent or more of the RDA of protein and vitamin C. The percent of persons with inadequate intakes of protein and vitamin C was higher in the study by Guthrie et al. (10) than in this study. Fifty-two percent of the subjects in the center group had less than good intakes of calcium and thiamine, the two nutrients most poorly consumed. In the control group the nutrients most poorly consumed were calcium, thiamine, and riboflavin.

Figure 1. PERCENT OF SUBJECTS WITH INTAKES LESS THAN TWO-THIRDS OF RDA



Inadequate calcium intakes have been reported in studies of elderly people of both high and low income groups (3, 10). Forty-two to 48 percent of all subjects had less than good intakes of iron and vitamin A. Iron, vitamin A, thiamine, and riboflavin intakes have been reported by other researchers (7, 11, 26) as limited in the diets of elderly people. Sixty-seven to 86 percent of all subjects consumed less than adequate calories; however, researchers (3) have stated that individuals who believe they are consuming too high a calorie intake tend to underestimate caloric intakes.

Nutrient Intakes from Center

Mean percent of daily nutrient intakes and RDA consumed by subjects at the Rehabilitative day care center are shown in Table 5. The food consumed at the center contributed between 43 and 59 percent of the total daily intakes for calories and nine nutrients, and an average of 42 percent of the RDA for the same nutrients. These findings are similar to those reported by O'Hanlon et al. (20) in a study of nutritional status of participants in a Title VII nutrition program during the fall, 1974; the meal from the program contributed over 40 percent of the RDA for nine nutrients and between 40 and 60 percent of the total daily intake of the same nutrients.

TABLE 5

MEAN PERCENT OF DAILY NUTRIENT INTAKES AND RDA CONSUMED
BY SUBJECTS AT A REHABILITATIVE DAY CARE CENTER

Energy and Selected Nutrients	Mean Percent of Nutrient Intakes*	Percent Range of Nutrient Intakes	Percent RDA
Energy			
Kcal	47	16-75	24
Protein			
Gms	51	16-94	53
Calcium			
Mg	59	15-92	42
Phosphorus			
Mg	51	17-85	52
Iron			
Mg	43	15-90	31
Vitamin A			
I.U.	51	8-95	47
Thiamine			
Mg	48	13-96	29
Riboflavin			
Mg	55	22-94	53
Niacin			
Mg	49	13-94	37
Vitamin C			
Mg	43	2-100	55

*Percent of intake for each subject was obtained by dividing the intake from the center by the total daily intake.

The nutrient intakes at the center were expressed as a percentage of total nutrient intakes. The center subjects exhibited a wide range in percentage of nutrient intakes consumed at the center. (Table 5). The subjects who derived a high percentage of nutrient intakes from the center had lower total nutrient intakes than the subjects

who derived a lesser percentage of nutrient intakes from the center. Because the food at the center was designed to provide $1/3$ to $1/2$ of the RDA, the center subjects who supplemented their intakes with other foods consumed outside the center had higher total nutrient intakes.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study was to compare the nutritional adequacy of the diets of 21 elderly people at a rehabilitative day care center (Center Group) to a similar population receiving family care services (Control Group).

The total sample included 42 people who had limited economic resources. The subjects ranged in age from 50 through 87 years. Nutrient intakes were assessed in relationship to factors of educational level, number in household, dining alone, food preparation and grocery shopping by self, use of food stamps, self-ratings of appetite and health, and ability to chew foods.

The diets did not correlate with educational level, size of household, dining alone, self-ratings of appetite, and ability to chew foods. The subjects who used food stamps had significantly better intakes of vitamin C ($p = .03$); the subjects who considered themselves in better health had more adequate intakes of riboflavin ($r = .31$); the subjects who grocery shopped for themselves had more adequate intakes of calcium ($p = .02$), riboflavin ($p = .05$), and vitamin C ($p = .007$); and the subjects who reported food

preparation by themselves had more adequate intakes of riboflavin ($p = .04$).

No statistically significant differences in nutrient intakes could be shown between the two groups using Fisher's T test. However, the differences between the two groups for calcium ($p = .07$) and riboflavin ($p = .06$) intakes approached a statistically significant difference ($p = .05$). In the center group mean caloric and thiamine intakes were inadequate (less than 67 percent of RDA's); whereas, in the control group mean intakes for calories, calcium, thiamine, riboflavin, and to a lesser extent niacin were limited.

The percent of subjects meeting less than two-thirds of the RDA for calories, protein, calcium, thiamine, and riboflavin was 14 to 24 percent higher in the control group than in the center group. Seventy-one to 90 percent of all subjects met 67 percent or more of the RDA of protein and vitamin C. Fifty-two percent of the center subjects had less than good intakes (less than 67 percent of the RDA's) of calcium, and thiamine, the two nutrients most poorly consumed. In the control group the nutrients most poorly consumed were calcium, thiamine, and riboflavin; the percent of control subjects who had less than good intakes for these nutrients were 71, 71, and 57 percent, respectively. In the center group less than good intakes of

other nutrients were as follows: calories, 67 percent; iron, 42 percent; vitamin A, 48 percent; and riboflavin, 33 percent. In the control group less than good intakes for other nutrients were as follows: calories, 86 percent; iron, 48 percent; and vitamin A, 48 percent. The food consumed at the center contributed between 43 and 59 percent of the total daily intakes for calories and nine nutrients, and an average of 42 percent of the RDA for the same nutrients.

APPENDIX 1

CONSENT FORM

Human Nutrition Research
Texas Woman's University
Denton, Texas 76204

I understand that I have been selected for a special study related to nutrition and health status of adults, and I am willing to participate. It is my understanding that dietary records will be needed, and that I will receive a full report of the findings, together with advice on the food needs as shown by the study. No medication or treatment is part of this study. I understand that I am free to withdraw my consent and to discontinue participation in this project at any time.

Signature	_____
Date	_____
Location	_____
Subject Number	_____

APPENDIX 2

M E D I C A L R E C O R D D A T A

Subject Code # _____

Date _____

1. Age _____

2. Sex _____

3. Race _____

4. Height _____

5. weight _____

6. Income _____

6.a. Household Income _____

7. Educational attainment _____

8. Client:

- () Lives alone
- () Lives with spouse
- () Lives with relatives
- () Lives with non-relatives

APPENDIX 3

DIETARY HISTORY QUESTIONNAIRE

Subject Code # _____

Date of Interview _____

1. Do you have the following items in your home?

<input type="checkbox"/> Stove	<input type="checkbox"/> Hot plate or
<input type="checkbox"/> Refrigerator	portable appliance
<input type="checkbox"/> Oven	<input type="checkbox"/> Hot running water
2. Do you generally eat at home?

<input type="checkbox"/> Yes
<input type="checkbox"/> No

 If answer is "no", where? _____
3. Do you usually eat alone?

<input type="checkbox"/> Yes
<input type="checkbox"/> No
9. Do you have any problems chewing your food?

<input type="checkbox"/> Yes	<input type="checkbox"/> No
------------------------------	-----------------------------

 If yes, specify _____
4. Do you do the cooking?

<input type="checkbox"/> Yes
<input type="checkbox"/> No

 If answer is "no", who does? _____
5. Do you use food stamps?

<input type="checkbox"/> Yes
<input type="checkbox"/> No
10. How, in general, would you rate your health?

<input type="checkbox"/> Excellent	<input type="checkbox"/> Good
<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
6. Why don't you use food stamps?

<input type="checkbox"/> Not eligible	<input type="checkbox"/> Don't know how to apply
<input type="checkbox"/> Cannot get transportation to pick them up	
<input type="checkbox"/> Undesirable (pride)	
<input type="checkbox"/> Other (specify) _____	
7. How do you go to and from the grocery store to buy food?

<input type="checkbox"/> Walk	<input type="checkbox"/> Call order in and it is delivered
<input type="checkbox"/> Drive own car	<input type="checkbox"/> Friend or relative takes me
<input type="checkbox"/> Do not go myself; friend or relative goes	
<input type="checkbox"/> Bus	<input type="checkbox"/> Other (Specify) _____
8. Would you say your appetite is poor, fair, good, too good?

<input type="checkbox"/> Poor	<input type="checkbox"/> Fair	<input type="checkbox"/> Good
<input type="checkbox"/> Too good		

FOOD INTAKE

Subject Code# _____

Date of Recall

Date & Time of Interview

Day of Week of Recall 1-M 2-T 3-W 4-Th 5-F

[illegible]

1. Did you have anything to eat or drink during the night?
2. Is this the kind of food you usually eat? () Yes () No, specify

APPENDIX 5

F R E Q U E N C Y O F D I E T A R Y I N T A K E

Subject Code # _____ Date _____

How many times per week do you eat the following foods?

Bacon-----0 1 2 3 4 5 6 7 7+, specify _____
 Luncheon Meats-----0 1 2 3 4 5 6 7 7+, specify _____
 Liver-----0 1 2 3 4 5 6 7 7+, specify _____
 Fowl; chicken, turkey-----0 1 2 3 4 5 6 7 7+, specify _____
 Pork or Ham-----0 1 2 3 4 5 6 7 7+, specify _____
 Bones, Hog Malls-----0 1 2 3 4 5 6 7 7+, specify _____
 Beef or Veal-----0 1 2 3 4 5 6 7 7+, specify _____
 Other Meat-----0 1 2 3 4 5 6 7 7+, specify _____
 Fish-----0 1 2 3 4 5 6 7 7+, specify _____
 Milk-----0 1 2 3 4 5 6 7 7+, specify _____
 Fruit Juice-----0 1 2 3 4 5 6 7 7+, specify _____
 Fruit-----0 1 2 3 4 5 6 7 7+, specify _____
 Cereal-----0 1 2 3 4 5 6 7 7+, specify _____
 Eggs-----0 1 2 3 4 5 6 7 7+, specify _____
 Breads or crackers-----0 1 2 3 4 5 6 7 7+, specify _____
 Cheese-----0 1 2 3 4 5 6 7 7+, specify _____
 Potato-----0 1 2 3 4 5 6 7 7+, specify _____
 Other cooked vegetables-----0 1 2 3 4 5 6 7 7+, specify _____
 Raw vegetables-----0 1 2 3 4 5 6 7 7+, specify _____
 Dried beans or peas-----0 1 2 3 4 5 6 7 7+, specify _____
 Macaroni, spaghetti, rice-----0 1 2 3 4 5 6 7 7+, specify _____
 Ice cream, Mellorine, Ice Milk, pudding
 or cream soup-----0 1 2 3 4 5 6 7 7+, specify _____
 Peanut butter or nuts-----0 1 2 3 4 5 6 7 7+, specify _____
 Pie, cake, brownies, sweet rolls,
 donuts, cookies-----0 1 2 3 4 5 6 7 7+, specify _____
 Potato chips or corn chips-----0 1 2 3 4 5 6 7 7+, specify _____
 Candy-----0 1 2 3 4 5 6 7 7+, specify _____
 Soft drinks-----0 1 2 3 4 5 6 7 7+, specify _____

What specific kinds of the following foods do you eat most often?

Fruit juices _____
 Fruit _____
 Vegetables _____
 Cheese _____
 Cereal _____
 Milk _____
 Meat _____

LIST OF REFERENCES

1. Adams, C. "Nutritive Value of American Foods." USDA Handbook No. 456. Washington, D.C.: United States Department of Agriculture, 1975.
2. Brotman, H. B. "The Fastest Growing Minority: The Aging." American Journal of Public Health 64: 249 (March 1974).
3. Brown, E. L. "Factors Influencing Food Choices and Intake." Geriatrics 31: 89 (September 1976).
4. Campbell, V., and M. Dodds. "Collecting Dietary Information from Groups of Older People." Journal of the American Dietetic Association 29: (July 1967).
5. Christakis, G., ed.: "Nutritional Assessment in Health Programs - Supplement." American Journal of Public Health 63: 1 (November 1973).
6. Davidson, C. S., J. Livermore, P. Anderson, and S. Kaufman. "The Nutrition of a Group of Apparently Healthy Aging Persons." American Journal of Clinical Nutrition 10: 181 (March 1962).
7. Dibble, M. V., M. Brin, V. F. Thiele, A. Peel, N. Chen, and E. McMullen. "Evaluation of the Nutritional Status of Elderly Subjects with a Comparison between Fall and Spring." Journal of the American Geriatrics Society 15: 1031 (November 1962).
8. Food and Nutrition Board. "Recommended Dietary Allowances." 8th revision. National Academy of Science-National Research Council. Washington, D.C.: Publ. 2216, 1974.
9. Fry, P. C., H. M. Fox, and H. Linkswiler. "Nutrient Intakes of Healthy Older Women." Journal of the American Dietetic Association 42: 218 (March 1963).

10. Guthrie, H. A., K. Black, and J. P. Madden. "Nutritional Practices of Elderly Citizens in Rural Pennsylvania." The Gerontologist 12: 330 (Winter 1972).
11. Health and Nutrition Examination Survey, United States, 1971-1972. "Dietary Intake and Biochemical Findings." Department of Health, Education and Welfare Publication No. (HRA) 74-1219-1 January 1974: National Center for Health Statistics.
12. Howell, S. C., and M. B. Loeb. "Nutrition and Aging: A Monograph for Practitioners." Gerontologist 9: No. 3 (Autumn 1969).
13. Kaplan, L., J. Landes, and J. Pincus. "The Nutritional Status of Non-Institutionalized Aged Persons." Geriatrics: 287: (June 1955).
14. Krehl, W. "The Influence of Nutritional Environment on Aging." Geriatrics 29: 65 (May 1974).
15. LeBovitz, C. "The Food of Older Persons Living at Home." Journal of the American Dietetic Association 46: 285 (April 1965).
16. Lyons, J. S., and M. F. Trulson. "Food Practices of Older People Living at Home." Journal of Gerontology 11:66 (May 1956).
17. Madden, J., S. Goodman, and H. Guthrie. "Validity of the 24-Hour Recall." Journal of the American Dietetic Association 68: 143 (February 1976).
18. Mayer, J. "Aging and Nutrition." Geriatrics 29: 57 (May 1974).
19. Moore, M., B. Judlin, and C. Kennemur. "Using Graded Food Models in Taking Dietary Histories." Journal of the American Dietetic Association 51: 447 (November 1967).
20. O'Hanlon, P., M. B. Kohrs, E. Lorah, and D. Eklund. "Nutritional Status of Participants in Older Americans Program." Federation Proceedings 36: 1155 (March 1977).

21. Pelcovits, J. "Nutrition to Meet the Needs of Older Americans." Journal of the American Dietetic Association 60: 297 (April 1972).
22. Rao, D. B. "Problems of Nutrition in the Aged." Journal of the American Geriatrics Society 21: 362 (August 1973).
23. Steinkamp, R. C., N. L. Cohen, and H. E. Walsh. "Re-survey of an Aging Population-Fourteen-Year Follow-Up." Journal of the American Dietetic Association 46: 103 (February 1965).
24. Swanson, P. "Adequacy in Old Age. Part 1: Role of Nutrition." Journal of Home Economics 56: 651 (June 1964).
25. The American Dietetic Association. The American Dietetic Association Position Paper on Nutrition and Aging. Journal of the American Dietetic Association 61: 623 (December 1972).
26. U. S. Department of Health, Education, and Welfare, Center for Disease Control. Ten State Nutrition Survey 1968-1970. 1-5 Highlights. Atlanta, Ga.
27. Youland, D., and A. Engle. "Practices and Problems in HANES." Journal of the American Dietetic Association 68: 22 (January 1976).
28. Young, C. M. "Nutritional Counseling for Better Health." Geriatrics 29:83 (May 1974).
29. Young, C. "The Interview Itself." Journal of the American Dietetic Association 35: 677 (July 1959).