

EFFECT OF NUTRITION EDUCATION ON NUTRITION
KNOWLEDGE AND DIETARY INTAKE OF ELDERLY
RESIDENTS AT UNIVERSITY VILLAGE
RETIREMENT CENTER

By

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CHAPTER I

INTRODUCTION

With the growing number of older Americans, more attention is being placed on the adequacy of their diet. Although there are few overt nutritional deficiency diseases today, marginal intakes of many nutrients have been reported. The Nationwide Food Consumption Survey, conducted by the U.S. Department of Agriculture in 1977 and 1978, looked at the nutrient density of the food consumed by a statistically selected sample of individuals in the contiguous 48 United States. This survey reported a number of nutrients were low in the foods consumed.

The results of this study also indicate that the average concentrations of calcium, iron, magnesium, and vitamin B6 were not sufficient in the diet to meet recommended standards, implying that a large percentage of the population is at risk regarding these nutrients (Windham, 1981, p. 595).

As expected those nutrients found to be low in actual dietary intakes of individuals closely match those nutrients low in the food consumption survey. A study of persons on lower caloric levels identified that, "Foods must be carefully selected to meet the needs of iron, calcium, and especially zinc" (Harland, 1980, p. 20). In the Surgeon General's

Report, Garry, et al. reported more than one quarter of the older population consumed less than 75% of the R.D.A. for folate, vitamin B6, and vitamin B12. Htoo, et al. reported 10% of older white men were anemic (Hgb less than 14 g/dl). Heaney, et al. attributed negative calcium balance to metabolic and absorption factors as well as low calcium intake (Public Health Service, 1988). "From these data, it is apparent that Americans may be marginal in respect to adequate intakes of several micronutrients essential for optimal function" (Schroeder, 1971, p. 572).

To receive an adequate amount of several micronutrients, nutrient dense food is to be encouraged. Marginal intake of iron has been demonstrated in certain types of anemia in the elderly, and marginal intakes of calcium may be partially responsible for osteoporosis. Links to many other diseases are being discovered as a direct cause or a contributing factor to their etiology. One researcher has termed the condition "latent nutritional deficiency diseases" (Krehl, 1974, p. 69). Other researchers have reported that many of the diseases of 20th century America are due to overconsumption of certain macronutrients such as salt, cholesterol, fat and saturated fat. Connor states,

...A new spectrum of disease has emerged as important health problems over the past 50 years. These are diseases of overconsumption. Instead of too little, there is too much (Connor, 1979, p. 1975).

To a great extent the major diseases in America such as cancer, heart disease and other degenerative diseases are a phenomena found mainly in developed countries of the western hemisphere.

These diseases are rare or unknown in communities who have deviated little from their traditional way of life, and a rise in their frequency follows adoption of western customs. Available evidence suggests that all these diseases were rare or uncommon even in the western world a century ago (Burkitt, 1973, p. 274).

So the problem remains, many Americans' dietary intakes are low in certain essential micronutrients and are improperly balanced in macronutrients; those on limited dietary intakes such as the elderly may be at greatest risk.

Purpose

Nutrition education, as an answer to malnutrition, has been discussed in the literature for many years.

"Standardized curriculum guides and educational texts dealing with nutrition offer little substantial direction while the literature is replete with philosophical discussions of educational techniques; little practical information is offered" (Golaszewski, 1979, p. 37). Many that have been discussed are aimed at the school aged or young adult consumer (Dennison, 1977).

Nutrition education was implemented with success at noon congregate meal sites. Results of one study indicated that,

The program was not only effective in modifying, to a significant degree, their dietary habits immediately after the program, but also in sustaining this effect for six weeks after the program has been completed (Mitic, 1985, p. 9).

The studies that have been undertaken have not provided a nutrition education curriculum that can be used with other similar groups of older Americans. The education programs that have been conducted have not been tested as to their effectiveness.

A review of the literature on nutrition education programs for the elderly revealed many programs aimed specifically at changing only nutrition knowledge levels. This traditional form of nutrition education while valuable in that it may have supplied accurate information to those in attendance, has not been verified as to its effectiveness in modifying nutritional behavior (Mitic, 1985, p. 7).

The purpose of this study is to determine the impact of nutrition education on nutrition knowledge and nutrient intake of residents in a free living retirement center.

Objectives

- 1) To determine if the control and experimental groups are similar with respect to meal plan participation, age, and gender.
- 2) To assess the change in nutrition knowledge between the experimental and control group from pre-test to post-test.
- 3) To assess the change in nutrient intake between the experimental and control group from pre-analyses to post-analyses.

Null Hypotheses

H⁰1: There will be no significant difference between control and experimental groups regarding to meal plan participation, age, or gender.

H⁰2: There will be no significant difference between pre- and post-test nutrition knowledge scores of experimental and control groups.

H⁰3: There will be no significant difference in nutrient intake between pre- and post-analyses of the experimental and control groups.

Assumptions and Limitations

The 1989 Recommended Dietary Allowances (R.D.A.s) were used as the standard to which the diets of the participants were judged. It was assumed that 2/3 of this level of nutrient intake would prevent most deficiency diseases. The researcher is aware of the following limitations. First, the R.D.A.s for the elderly are based on data from young adults. It is only an assumption that the needs of the elderly are the same as the younger adult. One critique states, "Our knowledge of nutrient needs is supported primarily by data from relatively limited periods of life, notably the young child and the young adult. Particularly important gaps are the needs of the adolescent and of the elderly" (Hamish, 1980, p. 137). The second limitation notes that the

R.D.A.s were created for a healthy population. The elderly in the sample may have undiagnosed conditions which may modify nutritional needs. Harper, Chairman of the Committee on Recommended Dietary Allowances of the Food and Nutrition Board states:

In other words, they are recommendations for a population that is already healthy. Nutritional needs of persons suffering trauma, such as burns and fractures, may be considerably greater. Infections increase nutritional needs. A person being rehabilitated from a wasting disease needs extra amounts of nutrients if depleted tissues are to be replenished (Harper, 1974, p. 15).

Many of the elderly may not fit the criterion of healthy. It must also be remembered that the R.D.A.s were developed for population intakes rather than individual ones.

The study will also be limited by the lack of randomization. Subjects were included in the study on a volunteer basis. The results of the study may not apply to the elderly population at large as all of the subjects are living in a retirement community. As such they have ready access to a wide variety of nutrient dense foods and low fat, low sodium foods that could allow them to improve their nutrient quality more easily than the general population. Both groups have free access to nutrition information outside of the study. Thus, the control group may be receiving nutrition information from outside sources.

The researcher is also aware that the data bases are not complete with respect to certain nutrients, especially trace

minerals. It is assumed that the incomplete data bases will have little effect on the results in that both the control and experimental groups should be affected equally. In all dietary intake records there are some foods accidentally omitted, but this omission is assumed to be uniform between the control and the group receiving nutrition education.

Definitions

The following definitions are utilized in this study.

1) Change in nutrient intake will be determined using the 1989 R.D.A.s and the U.S. Dietary Goals as a standard.

"Change in nutrient intake" is defined as an increase in any nutrient up to 2/3 of the R.D.A., a decrease in cholesterol to 300 mg/day, a decrease in total fat to 30% of the calories, a decrease in saturated fat to 10% of calories, an increase in polyunsaturated fat to 10% of calories, and an increase in dietary fiber to 2 g/100 kcal, or a decrease in sodium to three grams.

2) Free living residents are those that live in their own apartments, not in a health care setting. They either prepare their meals at home or eat in the central dining area and select foods from a wide variety of menu items.

3) The U.S. Dietary Goals, composed of six guidelines, were produced by the U.S. Senate Select Subcommittee on Nutrition.

4) The 1989 Recommended Dietary Allowances (R.D.A.s) are produced by the Food and Nutrition Board of the National

Research Council (Food and Nutrition Board, 1989). The recommendations for those individuals 51 years and older may be found in Appendix G.

CHAPTER II

REVIEW OF LITERATURE

Introduction

In the literature it is well documented that the elderly, especially the low income elderly, are at risk of nutritional deficiency. Studies in the early 1900's of individuals and small groups were confirmed by the nationwide studies of the 1960's and 1970's. In 1900 only three million persons (4% of the population) were over the age of 65; in 1980, 25.5 million (11% of the population) were in this category making it the most rapidly growing segment of our society. This age group has increased eight-fold since 1900 and will double its present number by the year 2020. The sex ratio for those Americans over 75 is almost two females for every male (Schlenker, 1984).

Nutritional Assessment of the Elderly Diet

Review of Early Studies

Nutritional assessment of the elderly diet began in the early 1900's with energy requirement studies. It was well known that basal metabolic rates became reduced in old age.

The basal metabolic rate for men 60-80 years old was calculated at about 1400 calories and for women about 1100 calories. The total energy requirements for older men were 2200-2300 calories per day compared with 1700-1800 for older women (Pyke, 1947). Most of these studies used very few subjects, many only one individual and rarely more than a dozen.

The dietary calcium and phosphorus requirements of older adults were studied beginning in the 1920's. In 1921 Dalyell & Chick investigated over 100 cases of "hunger osteomalacia" and thought it to be a protein, calcium and phosphorus deficiency. In the same year Hume and Nirenstein showed the incidence of the disease was highest in winter when the diet was the poorest and the incidence increased with old age. In 1936 Meyer concluded that longstanding calcium deficiency was the main factor in the genesis of the disease (Owen, 1939). In 1938 Owen conducted calcium and phosphorus balance studies in older men and concluded equilibrium may be obtained with 520 mg of calcium and 1200 mg of phosphorus.

Nitrogen balance studies in the elderly carried out in the 1930's concluded that .8 gm of protein per kilogram of body weight would produced equilibrium just as it did in younger adults (Pyke, 1947).

With the isolation of most of the vitamins by the end of the 1930's and their subsequent synthesis by the early 1940's the stage was set for a more comprehensive look at the

elderly diet (Wilson, 1975). Up until that time most studies focused on a single nutrient or a small group of nutrients that function synergistically. In 1947 Pyke, et al. studied the nutritional value of the daily diets of four separate groups of older adults. The first group was 10 working class women ages 50-91, the second group was 18 women 65-89 living in subsidized housing, the third group was 12 active men ages 60-85 living in a small institution, and the fourth was 12 men and 12 women that were infirmed, living in a large institution. The nutrient intakes of the institutionalized subjects were higher on average, than the free living subjects for all nutrients studied. In only two of the 64 persons studied were intakes of vitamin D above 200 I.U. per day. The iron intake was acceptable in all women with exception of the women living in their homes. Seventy-eight % of the free living subjects consumed less than 2500 I.U. of vitamin A per day. The author concluded the amount of protein was undesirably low, vitamin A intake appeared to be inadequate, and vitamin C intake was seriously deficient (Pyke, 1947).

In 1955 Kaplan surveyed a group of 53 non-institutionalized persons aged 60-94 in New York City. All subjects lived at home, 68% were receiving public assistance. Three types of analysis were conducted in the study: physical exam, blood tests and diet evaluations. The results showed the following: 50 of the 53 subjects presented

clinical signs of vitamin deficiency, 50% had lower ascorbic acid content than the accepted minimum, 40% had deficient calorie intake, and 1/2 - 2/3 were deficient in essential vitamins, iron and calcium (Kaplan, 1955).

In 1962 Davidson conducted a study of 104 elderly people at the Age Center of New England in Boston. These non-institution subjects came to the center for recreation and filled out a food recall. Results showed protein and calorie intake to be adequate and in only 7% of the subjects was the daily intake of vitamin A below 4000 I.U. Ninety-five % of the subjects' niacin intakes were below 20 mg daily and 67% showed less than a 2.0 mg daily intake of riboflavin. Thirty % took in less than .7 gm of calcium per day (Davidson, 1962).

In 1968 Davis, et al. reviewed the nutrition intake studies in the United States from 1950-1968. Dozens of studies were reviewed. Nine studies that included the elderly were reviewed, yet only two studies with subjects of 65 years of age were included in the summaries. Until this time no comprehensive studies had been conducted. Much had been written about various subunits of the population but little of the information could be generalized to the whole. The authors attempted to compile the information for this purpose. The results indicated a number of elderly were at risk with respect to a number of nutrients. The following results were stated as intake below 2/3 of the R.D.A. for the

subjects 65 years and over. In the male subjects approximately 22% were low in dietary calcium intake, only 4% in iron, 18% in vitamin A, 8% in thiamin and riboflavin, and 20% in vitamin C. In the female subjects, approximately 40% were low in calcium, 20% in iron, 22% in vitamin A, 10% in thiamin, 18% in riboflavin and niacin, and 22% vitamin C. It must be remembered that these results were compiled from data of only a few studies. The authors concluded, "A significant proportion of the population examined had intakes below 1/2 of the R.D.A. and biochemical indices in the 'deficient' range". They also stated, "Dietary habits of the American public have become worse, especially since 1960" (Davis, 1969, p. 54).

The Ten State Survey

Many individual studies have reported nutrient deficiencies in the U.S. population. These facts were dramatized during the congressional hearing in early 1967. Congress directed the Department of Health, Education, and Welfare to determine the magnitude and location of malnutrition in this country. The low income segment of the population was targeted in this study since it was there that malnutrition was expected to be most prevalent. The "National Nutrition Survey" studied the following 10 states from 1968 to 1970: Texas, Louisiana, New York, Kentucky, Michigan, California, Washington, West Virginia,

Massachusetts and South Carolina. It was the first comprehensive survey to assess the nutritional status of the United States (Schaefer, 1969). Demographic data was obtained on 24,000 families containing over 86,000 persons.

TABLE I
PERCENTAGE OF PERSONS IN LOW INCOME RATIO
STATES WITH DEFICIENT OR LOW SERUM
NUTRIENT LEVELS FROM THE
TEN STATE SURVEY

Male						
	White		Black		Spanish Amer.	
	Deficient	Low	Deficient	Low	Deficient	Low
	%	%	%	%	%	%
Serum						
Vitamin C	5.1	8.5	4.0	14.3	7.0	8.5
Hemoglobin	3.9	22.8	14.9	50.3	8.5	36.6
Serum						
Albumin	.4	5.8	3.4	18.0	1.5	16.4
Vitamin A	.0	2.6	.4	2.5	3.9	10.4
Female						
	White		Black		Spanish Amer.	
	Deficient	Low	Deficient	Low	Deficient	Low
	%	%	%	%	%	%
Serum						
Vitamin C	1.2	5.8	1.4	7.8	2.6	0.0
Hemoglobin	.9	9.5	4.8	26.7	1.1	14.9
Serum						
Albumin	.7	7.2	1.2	17.2	2.7	16.4
Vitamin A	.6	.6	.0	1.4	1.2	9.9

(U.S. Dept. H.E.W., 1972)

40,000 persons were evaluated on nutritional status. Over 50% of the persons examined were 16 years of age or less, 30% were from 17-44 years, 10% were 45-60 and 10% were over 60 years old.

TABLE II
 PERCENTAGE OF PERSONS IN LOW INCOME RATIO
 STATES WITH DEFICIENT OR LOW URINARY
 NUTRIENT LEVELS FROM THE
 TEN STATE SURVEY

	White		Black		Spanish Amer.	
	Deficient %	Low %	Deficient %	Low %	Deficient %	Low %
Male & Female						
Riboflavin	1.0	4.7	2.4	16.5	.9	11.8
Male & Female						
Thiamin	.6	4.2	.8	7.2	2.0	9.4
Iodine						
Male	1.5	4.1	.0	3.3	0.0	0.0
Female	.4	4.5	1.2	4.7	0.0	0.0

(U.S. Dept. H.E.W., 1972)

This data, though compiled from a large number of subjects, cannot be generalized to the population at large because the sample was drawn from the lower income segment. This survey showed black males to be very low in serum hemoglobin and moderately low in serum vitamin C and albumin. White and Spanish American males were moderately low in hemoglobin (DuVal, 1972).

Health And Nutrition Examination Survey

The first Health and Nutrition Examination Survey (HANES I) conducted by the National Center for Health Statistics lasted two years, 1971-1973, and examined many different strata of the population so that the results obtained could be generalized to the population at large. Approximately 30,000 people were surveyed, over 1500 were 60 years and older. The study used the following methods to determine adequate nutritional intakes and health: dietary intake, blood and urine analysis, clinical findings, and anthropometric measures (National Center for Health Statistics, 1971-1973).

The HANES I study confirmed many findings from the Ten State Survey. Tables III and IV indicate that low hemoglobin levels were recorded in both studies with blacks demonstrating the greatest risk of deficiency.

The low serum vitamin A levels in the Spanish American population reported in the Ten State Survey were not confirmed by HANES I. The Ten State Survey reported riboflavin deficiencies more prevalent than thiamin, and HANES I showed the reverse. It is noteworthy that 65% of the whites were below the R.D.A. in vitamin A yet less than 1% demonstrated low serum vitamin A levels. See Tables III and IV.

TABLE III
 RELATIONSHIPS BETWEEN DIETARY AND BIOCHEMICAL
 MEASUREMENTS IN OLDER PEOPLE*
 HANES I

	Percentage of Persons Below Established Standards	
	White %	Black %
Protein		
Dietary Protein	36	50
Total Serum Protein	10	3
Serum Albumin	2	3
Vitamin A		
Dietary vitamin A	65	64
Serum vitamin A	1	1
Thiamin		
Dietary Thiamin	60	72
Urinary Thiamin/creatinine ratio	8	20
Riboflavin		
Dietary Riboflavin	43	61
Urinary Riboflavin/creatinine ra.	2	7
Iron		
Dietary Iron	61	75
Hemoglobin	7	27
Hematocrit	15	34
Serum Iron	3	7

*Includes both men & women, age 65-74 years.

(Schlenker, 1984)

TABLE IV
 PERCENTAGE OF OLDER PERSONS WITH
 INADEQUATE DIETARY INTAKES*
 HANES I

Nutrient	Men	Women
	%	%
Calories	36	51
Protein	12	13
Vitamin A	56	58
Vitamin C	34	32
Calcium	44	56
Iron	14	35
Thiamin	21	26
Riboflavin	12	18
Niacin	25	33

*Intakes below two thirds of the RDA. (Schlenker, 1984)

The second Health and Nutrition Examination Survey (HANES II) was conducted from 1976 through 1980. The entire sample consisted of 27,801 persons ages six months through 74 years. Of these, 20,322 were interviewed and examined; 2,615 were 65-74 years of age (National Center for Health Statistics, 1982).

Results from HANES II tend to confirm findings from the previous studies. We see again that impaired iron status tended to be associated with poverty and race. "Blacks and persons below the poverty level tended to higher prevalences than whites or non-poor" (Yetley, 1987, p.453). The abnormal values for iron status in older persons may have

resulted from inflammatory disease. Black males ages 55-74 showed the lowest values for plasma vitamin C (Yetley, 1987).

Changes In The American Diet

The elderly population has witnessed a significant change in the American diet. Table V shows many of these changes. Between 1909-1913 and 1976 the consumption of poultry tripled with most of the increase noted after 1950. During the same period, total meat consumption increased only one-third. One of the most significant changes occurred in fat and oil consumption. Butter consumption dropped by over 78%. This may be looked at very favorably in light of the desire to lower saturated fat levels in the American diet.

At the same time, this positive change was countered by a 44% increase in total fat. This increase is in part due to the increase in deep fat frying of fast foods and salad oils used for dressings. Fresh fruit, excluding citrus, dropped by 50%. Vegetable consumption excluding potatoes, had remained fairly constant. Fresh potato consumption dropped by 70%. The most alarming change was the 50% drop in flour and cereal consumption. To a large degree the grains had been replaced by fats, oils and sweeteners in the American diet.

TABLE V

FOOD CONSUMPTION PER CAPITA PER YEAR BY
MAJOR FOOD GROUPS AND SELECTED PERIODS

Year	Meat	Poultry	Total				Butter	Total Fats	Fresh Fruit	Total Fruit
			Meat	Eggs	Dairy					
1909-13	141	18	172	37	177	18	41	151	176	
1925-29	129	17	159	40	191	18	48	139	188	
1935-39	120	16	149	36	202	17	49	127	199	
1947-49	141	22	176	47	236	11	46	112	208	
1957-59	144	34	192	45	239	8	49	87	182	
1965	148	41	203	40	235	6	51	77	166	
1970	165	49	228	40	226	5	56	77	178	
1975	158	49	222	35	216	5	57	74	181	
1976	165	53	233	35	222	4	59	78	188	

Year	Vegetables	White	Potato	Flour &	Sugar
	Excluding	Potato	Total	Cereal	& Other
	Potatoes	Fresh		Products	Sweeteners
1909-13	203	182	205	291	89
1925-29	217	142	162	237	119
1935-39	231	128	147	204	110
1947-49	232	111	123	171	110
1957-59	209	88	101	148	106
1965	206	68	86	144	112
1970	212	59	83	141	120
1975	217	58	84	139	114
1976	213	54	80	140	119

(Page, 1978)

In Table VI it is interesting to note that the guidelines set by the Senate Select Subcommittee on Nutrition in 1977 for fat, protein, and carbohydrate consumption of 30%, 12%, and 58% respectively, closely match the pattern in 1909-1913. It is ironic that, for the elderly population to reach the Dietary Goals for nutrients such as fat, they need only return to the diet of their youth (Page, 1978).

TABLE VI
CALORIES FROM ENERGY-YIELDING NUTRIENTS

	1909-13	1976
Carbohydrate	56%	58%
Fat	32%	30%
Protein	12%	12%

(Page, 1978)

Dietary Guidelines

Many governmental and private organizations have published guidelines for health promotion but few have made specific recommendations for the elderly. Table VII summarizes the points of agreement and disagreement of the most prominent guidelines to the general public. All agree that sodium reduction, maintenance of ideal body weight, and to some degree, controlling fat consumption are important goals for the general public. "Healthy People" is one report that identified people age 65 and over as a separate subunit and gives specific goals for them. The goals are: 1) increase the number of older adults who can function independently, 2) reduce premature death from influenza and pneumonia. Both are nutrition related, in that independent healthy adults are more able to provide nourishing food for themselves and to have socially stimulating lives.

TABLE VII
NUTRITION GUIDELINES BY
VARIOUS AUTHORITIES

	Reduce Sodium	Maintain Ideal Body Weight	Reduce Total Fat	Reduce Cholest.	Reduce Satura- Fat	Increase Unsatur- rated Fat
"Dietary Goals for the U.S." (Select Sub-committee on Nutrition and Human Need, 1977)	3 gm	Yes	23-33%	250-350mg	Yes	Yes
"Diet and Cor- onary Heart Disease" (Com- mittee on Nu- trition, Amer- ican Heart As- sociation, 1985)	Yes	Yes	30-35%	300mg	Yes	Yes
"Nutrition and Your Health- Dietary Guide- lines for Americans" (U.S. Dept. of Agriculture, 1985)	Yes	Yes	Yes	Yes	Yes	Not Discussed
"Healthy People" (Public Health Service, 1979)	Yes	Yes	Not Discussed	Yes	Yes	Not Discussed
"Toward Health- ful Diets" (Food and Nutrition Board, National Research Coun- cil, 1980)	3 gm	Yes	Adjust to Calories	No	No	No
"Nutrition & Health" (Public Health Service, 1988)	Yes	Yes	Yes	Yes	Yes	Yes

Food Supplementation

In the early 1970's the HANES I Survey studied the supplement use of 11,227 individuals. Twenty-eight % of the 65-74 year old age group reported regular supplement use. This was higher than any other age group. Most of the supplements were in the multi-vitamin form (National Center for Health Statistics, 1971-1974). With such a high supplement usage it is important to determine what beliefs and attitudes would lend to this behavior. It might be suspected that these individuals believed the food they were eating was of a poor quality, thus, supplementation would be necessary.

In 1980, a survey was conducted in seven western states to determine the attitudes correlating to food supplementation. Over 70% of those taking supplements rated their food quality good or very good, only 3% rated the quality as poor or very poor (Read, 1985). Food quality does not appear to be a factor in food supplementation. Read did find one strong correlation, the belief that vitamin C can both prevent and cure a cold. Later studies concurred with these findings.

In 1988, a study of 198 residents in a senior citizen apartment complex found no correlation between the belief that "supplements insure a good diet". The only beliefs associated with food supplement use were: 1) Food

supplements improve health, and 2) They are not a waste of money (Cotugna, 1989). These findings may be the result of successful marketing practices of food supplement manufacturers that are targeting the elderly.

Factors That Influence Nutritional Status

It has been stated, "Aging is a normal stage of the life cycle. In this country, however, so much emphasis is placed on youth and physical attractiveness that it is hard to recognize that the later years of life can have both beauty and quality" (Rowe, 1978, p. 482). Yet, with this aging process comes many changes, physical, mental and social. Sorenson summarizing this situation states,

Since essential nutrients are carried in the food supply, the proper selection of foods is the key to a good diet. Many factors influence food selection: social, economic, religious, psychological and personal preferences. Senior citizens have special problems translating dietary goals into eating practices. Many have limited incomes. Limited transportation and cooking facilities also influence food selection. In addition to physiological changes and poor health, chronic depression, loneliness, monotony, or unpalatability of special diets can adversely effect proper diet (Sorenson, 1981, p. 258).

A brief review of some of these changes must be considered in a study of the elderly nutritional status.

Oral Cavity And Esophagus

Tooth loss is endemic in the elderly population. By age

65, 50% of Americans have lost all their teeth and by age 75 the percentage has increased to 66% (Albanese, 1980). This, in turn, decreases their ability to masticate foods and the variety of foods in the diet is limited. This situation has improved over the past 10 years as a result of fluoridation (Kenney, 1989). Dental carries are a cause of tooth loss in the elderly but periodontal disease is the major cause (Timiras, 1988). Periodontal disease begins when the gradual recession of the gingivae leaves a gap between it and the tooth. Plaque and bacteria begin to accumulate causing inflammation and low grade infection which results in chronic periodontitis (Timiras, 1988). Although gingivae recession is seen in all elderly, periodontal disease may be prevented with good oral hygiene.

Esophageal mobility changes with age. The inability of the lower esophageal sphincter to relax after swallowing is observed in over 50% of the elderly population. The incidence of hiatal hernia increases with age; less than 10% under 30 years of age, up to 60% beyond 60 years of age (Masoro, 1981).

Digestion and Assimilation

Digestion begins in the mouth with the enzyme ptyalin. Ptyalin content is diminished in the saliva of the elderly (Kenney, 1989). Although the number of acinar cells is 1/3 less in people age 70-80 as compared to the average, they

still produce similar levels of saliva. This is not to say the elderly do not suffer from hypofunction of the salivary gland; many do. The cause in the majority of cases is iatrogenic, notably pharmaceuticals and radiation therapy (Baum, 1989).

Atrophic gastritis, common among the elderly, is characterized by thinning of gastric glands, loss of parietal cells and goblet cell metaplasia. These changes result in decreased production of hydrochloric acid, pepsin, and gastric mucous. Gastric emptying is slower in the elderly which may contribute to the increase in transit time seen in this population (Berman, 1988).

The length and mass of the small intestine appears to remain constant with age. Surface area is significantly diminished due to a reduction in the height of villi and conversion of their finger-like shape to a broader, more flattened form (Kenney, 1989). There is an age related impairment in general digestive capacity. Protein digestion and absorption with dietary protein greater than 1.5 gm/kg of body weight is reduced. With lower levels of protein intake, digestion and absorption are similar in young and old individuals (Masoro, 1981). Many nutrients show no absorption impairment with age, other nutrients do. The reports are conflicting as to which nutrients pose a problem. Most researchers agree that calcium presents the best evidence of gradual reduction in absorption with age

(Timiras, 1988).

The liver changes profoundly with age. The liver shrinks from about 2.5% of total body weight at age 50 to 1.6% at age 70 (Berman, 1988). Liver blood flow declines at a rate of about 1.5% per year beginning in young adulthood. By the age of 65 it is about 60% that of the young (Kenney, 1989). Gallstones affect 15-20% of adults of all ages and 30-50% of elderly persons by age 75 with a ratio of 2:1 for females to males (Timiras, 1988).

Little is known about changes in pancreatic juice in relation to aging. Most reports agree that if there are any changes in function of the pancreas they are probably not significant due to the fact that only one-tenth of the pancreatic secretion is needed for normal digestion (Timiras, 1988) (Kenney, 1989).

Elimination

Constipation is prevalent among the elderly. Yet it may not be endemic as some reports have stated. One study reported 29% of the women and 30% of the men studied reported themselves as being constipated once a month or more. When the medical criterion for constipation (less than three bowel movements per week) was applied to the subjects in the study only 3% of the men and 2% of the women were found to be constipated. Dietary fiber and liquids were not found to be significantly related to self reported constipation in men or

women. The number of chronic illnesses and the number of non-laxative medications were significantly related to constipation in women but not in men (Whitehead, 1989). The increase in constipation with age may be related to decrease in muscle tone.

Incidence of diverticular disease increases with age: 9% of subjects less than 50 and 50% of the subjects over 70 years of age (Masoro, 1981). Incontinence has also been reported as a major affliction of the elderly (Timiras, 1988).

The slowing of the alimentary tract has a major impact on drug absorption and half life. The half life of some drugs such as ampicillin increases three-fold in the elderly (Berman, 1988).

The Olfactory System

This system is extremely important, with respect to nutrition, in that when most people speak of the flavor of a food, much of the sensation they are experiencing is the aroma. The number of nerve fibers in the olfactory bulbs decrease with age. By age 60 most of the sensory nerve cells may be depleted leaving only basal supporting cells in the nasal epithelium (Corso, 1981).

The Gustatory System

The tongue exhibits many changes with age. At age 70 a

person has only 30% of the original compliment of taste buds (Kenney, 1989). Another study found a slight decrease in the number of taste buds from birth until age 70 and then a large decrease by age 85. Not only do the numbers of taste buds decrease with age but sensitivity to some substances also decreased. Salt sensitivity did not change from age 4-60 years. However, decreased sensitivity was found for sweet, sour, and bitter taste in groups from 7-11 years and 48-60 years (Corso, 1981). When a group of older persons and a group of college students were asked to identify a variety of blended food while blindfolded using both taste and smell, the college students were able to identify a much greater percentage (Corso, 1981).

Socioeconomic Factors

In American culture eating is frequently a social event. Many social gatherings revolve around food. Most of our organizations, church gatherings and business meetings are in conjunction with a meal. As people grow older and their children move away or their spouse dies they may find themselves eating alone. This can greatly reduce the variety of food consumed because of a lack of desire to prepare food for just one. The social status of older persons has also changed. Williams states, "America's increasing industrialization and high technology, with subsequent changing social attitudes, have affected the position of

older persons in American society" (Williams, 1985, p. 421).

Low income may also affect the nutritional status of the elderly in a number of ways. Dr. Richmond, Surgeon General of the U.S., gives another view of the problem,

Fear of the cost of severe illness may cause older people to conserve their limited financial resources. They select cheaper foods and housing, and make more limited use of preventive health services. Too often the fear, let alone the reality, of financial straits prevents elderly people from leading the full and active lives of which they are capable (Public Health Service, 1979, p. 77).

Nutrition Education

Introduction

The fact that the elderly are at risk of developing nutritional deficiencies for a variety of nutrients has been established. Furthermore, the low income elderly are at greater risk. The solutions to these problems may be placed in two categories: 1) dispensing food or money for food to the elderly and 2) nutrition education. The need for nutrition education is evident and the avenues for accomplishing it are many. At the National Conference on Nutrition Education (Directions for the 1980's) in September, 1979, the task force on low income and elderly population proposed nine issues that should be considered in nutrition education for the elderly. They included: 1) it must be available to all Americans, 2) a national nutrition policy must be developed, 3) program must target nutritionally

vulnerable individuals, 4) a holistic, multidisciplinary approach is needed, 5) target group must be involved in the program development, 6) nutrition education must be a reimbursable component of health care, 7) preparation for nutrition educators must be strengthened, 8) mass media must be a major component, 9) thorough evaluation of nutrition education program is required (Brun, 1980).

Needs Assessment

What types of education needs do the elderly have?..the greatest need is one that precedes and exacerbates all others. It is to dispel misconceptions and change attitudes of professionals with respect to nutrition education for the elderly. Many nutrition education professionals exhibit the following attitudes: 1) uncertainty that preventive efforts will work in the elderly, 2) decline in intellectual capacities will not allow them to learn, 3) elderly are not willing to change lifelong eating habits, and 4) reluctance to become involved when the potential for change is seen as small (Smiciklas-Wright, 1981). Until those attitudes change and the misconceptions are dispelled, nutrition education for the elderly will continue at a slow pace.

Is nutrition education important to the elderly? One study of 680 elderly people found that 31% of those surveyed wanted more information on a balanced diet (Templeton, 1978).

In another study, 505 older adults with limited educational exposure were asked to rank the relative importance of 45 types of educational needs. Simultaneously, 95 nutrition site directors and 83 adult education teachers responded to the same instrument. A partial summary of the results follow in Table VIII.

It is interesting to note the elderly placed ethos above personal health care and far above reading and writing while the teachers, as expected, placed reading and writing as primarily important and ethos down the list. The most disturbing finding pertains to nutrition education. The elderly consider nutrition more important than the site directors or the teachers (Courtenay, 1983).

TABLE VIII
RELATIVE IMPORTANCE OF EDUCATIONAL NEEDS

Adults 60 Yrs. & Older	Nutrition Site Directors	A.B.E. Teachers
1. Ethos	1. Social Security	1. Learn to Read
2. Medicare	3. Medicare	1. Learn to Write
2. Personal Health Care	7. Personal Health Care	3. Social Security
5. Social Security	13. Recreation and Leisure	7. Medicare
9. Nutrition	14. Travel	10. Personal Health Care
15. Travel	18. Nutrition	16. Nutrition
21. Recreation and Leisure	18. Ethos	18. Recreation and Leisure
28. Learn to Read	33. Learn to Read	20. Ethos
32. Learn to Write	34. Learn to Write	31. Travel

(Courtenay, 1983)

The site directors placed leisure, recreation and travel above nutrition education. This corroborates the findings of Smiciklas-Wright; misconceptions of professionals tend to make them place nutrition education as a relatively low priority.

Education Programs For The Elderly

The Wallingford Wellness Program (WWP) was a three-year study conducted by the Administration on Aging that began in 1979. The study was conducted at the Wallingford Senior Center in Seattle, Washington and offered classes on health related subjects including nutrition, exercise, stress management, and environmental assertiveness. The study included one group over 75 years of age, one 60-74 and the final group under 60. The participatory learning model was used in the 21-week program. Each session consisted of formal education, lecturing, group interaction, discussion and the participants practicing group communication skills. Participants individually assessed their own behaviors in a variety of ways and used it as a baseline from which they could build and improve their skills in health promotion. Each filled out an affirmation of health form which contained the goals they wished to accomplish. These were tracked through the course. The experimental and control groups participated in a pre-test, immediate post-test, six-month

follow-up and two-year follow-up. Results showed long term improvements in lifestyle habits and increase in health information for the experimental group (Fallcreek, 1982).

Nutrition education has been tested in nursing homes with limited success. One study was conducted in two nursing homes with 30 control and 28 experimental subjects. Both groups were eating from a non-select menu approved by a Registered Dietitian. Average age of the participants was 80+ years. Dietary evaluations were completed pre-study, during the four week program and two weeks following the conclusion of the education program. Nutrients studied included protein, calcium, iron, vitamins A, B1, B2, Niacin, and C.

Mean intakes for all nutrients in both groups were above 2/3 of the R.D.A. for age 51+ in the pre-test analysis. During the experiment the experimental group showed significant ($p \leq 0.05$) increase in thiamin and energy intake. Increases were shown in all nutrients but were not statistically significant. Significant increases were not sustained post treatment. Positive results during treatment during the experiment could be the result of increased attention rather than nutrition education (Sooja, 1981).

Individual counseling was found to increase nutrition knowledge and improve quality of food selection in a study of 234 elderly people conducted by the Nutrition Division of the Nova Scotia Dept. of Health. The initial average knowledge

score of 8.0 for the group receiving counseling increased to 14.6 during the period of the study. Adequacy of food selection increased from 48% to 76% of the subjects selecting an adequate diet in the experimental group (Rae, 1978).

The only citation in the literature of a nutrition education program at a retirement community involved the Goodwin House, a life care community for 370 adults. An average of 88 people attended the classes which constituted 30% of the apartment dwellers. An unspecified number of 25-minute classes was held monthly on a variety of health topics such as vision, brain changes, nutrition, exercise, sleeping, cataracts, colds, and taking medicine wisely. Much information was given on how the classes were conducted as to lighting, set-up, chart size, and general atmosphere but little detail was presented on the actual program curriculum. A questionnaire was filled out by participants voluntarily stating how they felt about the class and if they thought their behavior would change. Eighty-five % of those responding to the questionnaire indicated they would make behavioral change based on their new knowledge. No attempt was made to assess actual knowledge gained or change in dietary habits (Barbaro, 1984).

Creative Approaches To Nutrition Education

One of the greatest hindrances to nutrition education is the lack of teaching personnel. Peer education is one

creative way of reaching more elderly with valid nutrition information. In the late 1970's a number of studies were conducted to determine the feasibility of peer education (Cox, 1979) (Lasswell, 1979). One program conducted at the South Miami Beach Activities Center trained 25 seniors between 60-85 years of age. These in turn taught a group of elderly students which showed a significant ($p \leq 0.01$) increase in nutrition knowledge from pre- to post-test. A similar study conducted by the Cooperative Extension Specialists at Pennsylvania State University corroborated the findings of Lasswell. Twenty-two peer educators attended two two-day training sessions. They, in turn, conducted 95 sessions in senior centers. Evaluation questionnaires were completed by 933 participants. Responses on the questionnaires were decidedly positive (Shannon, 1983).

To further extend the health educators knowledge peer educators were instructed in recruiting and training a second generation of peer educators in a pilot study at the University of Arizona. Forty-six participants with an age range from 58-81 years, were recruited for the study. The training module curriculum contained four hours of material on dietary fiber and two hours on peer leadership training. The effectiveness of the program was assessed using pre- and post- nutrition knowledge tests, food frequency and dietary recall records, health behavior questionnaires, meal plans and personal interviews. No control groups were used in the

study. Nutrition knowledge increased 53.2% and behavior change was apparent in the 24-hour recall. There appeared to be no appreciable difference in the quality of learning of those participants taught by professional educators or by the health peer (Ho, 1987).

In the most recent study published, 29 elderly participants (age 60-88 years) in a New York City Housing Authority Project were studied to determine the effect of nutrition education on nutrition knowledge and eating behavior. Volunteers were randomly assigned to experimental (n=15) or control (n=14) group. Eighty-three % of the subjects were white, 13% black, and 4% hispanic. Forty-one % had an annual income \$5,000 or below, 49% reported \$5,001-\$10,000 per annum and 5% had an income of \$10,001-\$15,000. The experimental group received four 45-minute class sessions on the following topics: basic four food groups, nutrients, food and the aging process, and consumer issues.

The researchers used a comprehensive nutrition mini-course called "Script Kits" developed by the Dairy Council of metropolitan New York. Prior to any intervention, all subjects completed a true/false questionnaire and a 24-hour recall. The experimental group then attended classes over a two-week period. Following the intervention, both groups completed a true/false questionnaire and a 24-hour food recall. No significant differences were found between the two groups. Possible weaknesses in the experimental design

mentioned by the authors included: 1) weaknesses in the use of the 24-hour recall, 2) limited flexibility of curriculum content using "Script Kits", 3) little time was given to specific medical problems that would impact the diet of the elderly, and 4) small number of class sessions (Bedell, 1989).

This research is a similar study using elderly subjects from a higher income bracket. A three-day food record replaced the 24-hour recall, curriculum was developed considering input from the subjects, specific medical topics were included and 12 sessions were held over a 2-1/2 month period.

Photography was successfully used in a four-month nutrition education program for the elderly at a New York City congregate meal site. It was used to stimulate interest and learning in elderly from African, Spanish, Italian and Jewish descent. In this study graduate students formed focus groups on consumer and nutrition related subjects. The groups were to identify high priority nutrition related problems common to the members. Students developed slide shows to heighten interest and stimulate involvement.

This non-traditional program also involved a "show and tell" approach featuring participant photographers narrating personal experiences with food. No statistical analyses were performed but the participants enjoyed the use of cameras and the groups problem solving techniques (Light, 1976).

Mini-nutrition education sessions using a slide presentation and humor were used at senior nutrition sites in central California. Slogans such as, "Eat it today, wear it tomorrow" were received well by the elderly (Fee, 1982). Once again, there were no statistical analyses performed but it opens another avenue for future study.

Similarly, cartoon slide lectures coupled with leaflets were found to be effective among the elderly. The Gerontology Nutrition Unit at Queen Elizabeth College in London prepared a series of nutrition education slide kits. They reasoned that the flexibility of a slide lecture, combining entertainment with nutrition information would prove to be an effective tool for nutrition education. Leaflets were given to the participants to take with them to increase retention of the nutrition information that was presented (Holdsworth, 1982).

In Cincinnati, Ohio, one nutrition program for the elderly experimented with informal education in small groups of six to eight people. Two teams were formed and the participants planned and evaluated meals for a day using cardboard food models. Evaluation included budget considerations as well as other factors of good menu making (Knauer, 1971).

Efforts have also been made to reach the elderly that do not attend the senior nutrition sites. In one case, home health aides were trained to teach nutrition to aged and

chronically ill who were homebound. As with the peer counselor, this program extends the nutritional expertise of the dietitian to elderly that would otherwise not be reached (Leong, 1970).

The program on gerontology at Oregon State University used health fairs to provide health education to the elderly. Once each quarter a team of health educators would hold a health fair in a different rural or minority community. An average of 50 older adults attended each fair and received health screening services and education in many areas including nutrition education. "The intergenerational health fairs project benefited the university, older persons and students" (Petty, 1983, p. 43).

As has been shown, the peer education approach to nutrition education has been proven to be successful in the elderly population. One training program using the peer educator added drama to improve this training approach. Twenty-two peer educators, age 60 and over, participated in a 10-minute play "Meals on Wheels". Many positive comments were received and the students expressed points such as, "People get tired of hearing someone talk but people can see themselves in the characters of the play". No statistical analysis was performed (Davis, 1983).

Programs/Services For The Elderly

Nutrition education is being used with success at the congregate meal sites which were established by the Older Americans Act. The Older Americans Act (OAA) passed by Congress in 1965 contained 10 objectives; none were food related. The 1972 revision authorized the establishment of congregate meal sites that would provide one hot meal per day to those over 60 years of age. The Administration on Aging (AoA) was then formed to carry out the provision of the OAA. These nutrition projects became the most popular and well received program of the 1970's. The AoA set up 32 demonstration sites which by 1982 had expanded into almost 13,000 sites. The 1978 amendment also allowed for up to 10% of the meals to be served at home. The 10% ceiling was later eliminated and 15-20% of the meals are now served at home.

The 1978 amendment allowed the Area Agency on Aging to award grants to organizations that provided only home delivered meals. Both programs are allowed to charge for services based on income (Gelfand, 1984).

Nutrition Education Curriculum Development

Many factors must be considered when planning a nutrition education program for the elderly. "Poor diets are a result of interrelated cultural, physiologic, and economic factors as well as lack of nutrition knowledge" (Shannon,

1979, p. 85). Programs should take into account lifelong food habits and cater to individual needs and limitations. Physiological changes including: impaired vision, hearing loss, psychomotor skills, and memory loss can affect learning (Natow, 1981). Nutrition education and the possibility of optimal lifespan should be available to those at greatest risk. One author suggests increased use of behavior modification techniques (Razzarre, 1978).

A number of nutrition education curriculum models for the elderly have been proposed. One study lists seven aspects necessary for curriculum development including psychology, social aspects, education, economics, psychiatric, recreation and physiologic. Each aspect except physiology would include a number of health topics such as speech, hearing, and sight (McPherson-Turner, 1980).

Summary

Some notations from the aforementioned studies and experiments are as follows:

- 1) The elderly are at risk for many nutrients.
- 2) Dietary Guidelines have been produced by many organizations but none have been specific to the elderly.
- 3) There are many physiological changes that happen with age that affect nutrition status in the elderly.
- 4) Many innovative techniques of nutrition education have

been tested with varying amounts of success.

5) Most of the studies, both nutritional intake and educational, were performed with low income elderly that were institutionalized. Few studies have focused on free living elderly with higher incomes.

CHAPTER III

RESEARCH PROCEDURES

Introduction

This chapter describes the procedures used in the study including type of research design, population and sample, instrumentation, procedures in collecting data, nutrition education sessions and statistical analyses. The purpose of this study is to determine the effect of nutrition education on nutrition knowledge and dietary intake of the elderly. The objectives of the study are: 1) To determine if the control and experimental groups are similar with respect to age, gender, and meal plan participation, 2) To assess the change in nutrition knowledge between the experimental and control groups from pre-test to post-test, and 3) To assess the change in nutrient intake from pre-analyses to post-analyses in the control and experimental groups.

Research Design

A quasi-experimental design was chosen for this study because of the appropriateness for nonequivalent control groups (Campbell, Stanley, 1960, p. 40).

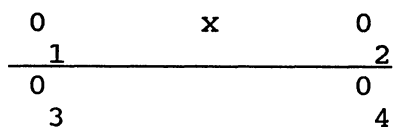


Figure 1. Research Design

Residents were given the opportunity to sign up for either the experimental or control group. Both groups completed a pre-test (Appendix A), and submitted a three-day food record for analysis (Appendix B). The experimental group then attended one 30-minute class each week for 12 weeks. Class outlines may be found in Appendix C. Both groups then completed a post-test and submitted a second three-day food intake record for analyses.

Population and Sample

The population consisted of free living residents of University Village Retirement Center. University Village is a retirement community with 50 residents in a 60-bed skilled nursing care facility and 300 free living residents dwelling in apartments and cottages. Approximately 66% dine in the main dining room where they choose from a wide variety of menu items in a waited table service. Social status varies greatly. The economic levels vary although most residents are mid- to upper middle income as they pay an entrance fee of \$19,000- \$40,000 to reside there. Over 98% of the

residents are white, 75% are female. The average age for both groups was 81 years. Educational levels vary from no formal education through M.D. and Ph.D. Participation in the study was solicited by telephone using the format in Appendix D. Those who were included in the study were instructed in the study format and in their rights as contained in the Informed Consent (Appendix E).

All the residents in the study were ambulatory and mentally alert. Some of the subjects used vitamin and mineral supplements but they were not included in the dietary analyses.

Instrumentation

Instrument Selection

Instruments were selected, validated and administered to collect data on nutrient intake and nutrition knowledge. The pre- and post- nutrition knowledge test consisted of 50 True/False items. One point was designated for each correct answer. A three-day food intake record was received and analyzed using the computer software, Nutrition Design Nutrient Analysis program (Pisias, 1983). The food record was chosen over the food recall because many of the elderly in this population were not able to recall the previous days' food intake.

Validity And Reliability

Validity and reliability of the three-day dietary food record has been shown by Gersowitz, Madden, and Wright (1978). The food record was compared to the 24-hour recall and found to provide consistent results. The computer program uses the 1989 Recommended Dietary Allowances (R.D.A.) as a standard for adequate nutrient intake. The R.D.A.'s were used as the standard in the studies such as the Ten State Nutrition Survey (U.S. Dept. of Health, Education, & Welfare, 1972) and found to be valid.

The nutrition knowledge test is a replica of the test developed by Hermann at Oklahoma State University. The test reliability was assessed by presenting the test to a group of elderly for review. The questions found not to be reliable were eliminated.

Procedures In Collecting Data

During the spring of 1988 participants were instructed in recording their three-day food record at a group meeting. The three-day food records were collected from both control and experimental groups and were checked each day for completeness. Each food record consisted of three consecutive days. The subjects were free to choose weekdays or weekends considering that most of them were on the meal plan and eating patterns are similar from day to day in this

setting. Food records from both experimental and control groups were collected in advance of, and again, following nutrition education classes presented to the experimental group.

The nutrition knowledge examination was likewise administered to both groups in advance of and again following the education classes presented to the experimental group. The exam was not timed. Residents completed the examination in their own rooms. There were four residents whose eyesight or manual dexterity would not allow them to fill out the instrument. A staff volunteer read them the questions and filled in their responses. They had been instructed to contact the researcher if they were unable to read the examination or did not understand a question. Three residents called for further clarification on several questions on the examination. Post-test contained identical questions presented in the same order as the pre-test (Table IX). To maintain anonymity each participant was given a number. Names were used only in data collection to be certain all necessary information was received. Data were then entered by number into the computer for analysis and the original documents were destroyed.

TABLE IX
COLLECTION OF RESEARCH DATA

	Control	Experimental
Knowledge Test and Dietary Analysis	Pre	Pre
Challenge	None	Nutrition Education
Knowledge Test and Dietary Analysis	Post	Post

Nutrition Education Sessions

Each 30-minute session consisted of 20 minutes of lecture using overhead transparencies, then 10 minutes of questions and answers. The transparencies included charts, graphs, some written text and a number of comical sayings and cartoons. The curriculum was developed by Hermann, State Nutrition Specialist for Cooperative Extension at Oklahoma State University (Hermann). The classes were taught by the researcher at 3:00pm on 12 consecutive Tuesdays (Appendix C). Twelve subjects were covered in the education classes (Table X). Handouts on each class were distributed when the class dismissed.

TABLE X
NUTRITION EDUCATION CLASSES PRESENTED
BY SUBJECT AREA

-
1. Introduction to Nutrition, Medications
 2. Basic Nutrition
 3. Fiber
 4. Hypertension and Sodium
 5. Osteoporosis and Calcium
 6. Exercise
 7. Weight Reduction
 8. Cancer
 9. Vitamins and Minerals
 10. Diabetes
 11. Heart Disease
 12. Summary
-

Statistical Analyses

A paired t-test was used to determine if there was a significant difference between the means of the pre- and post tests of the experimental group and the means of the pre- and post tests of the control group (Weinberg, 1981). A paired t-test was used in the same way on each of the nutrients being tested to determine if there was a significant difference between the means of the pre- and post analyses of the experimental group and the means of the pre- and post analyses of the control group. Criteria for significance of the test was $p \leq 0.05$.

The control and experimental groups were also analyzed

with respect to average age of subjects, percentage of meal plan participation, and gender. A chi-square test was used to determine the level of association between the control and experimental groups (Weinberg, 1981). Criteria for significance of the test was $p \leq 0.05$. Dr. Bill Warde performed all of the analyses using the Statistical Analysis System (S.A.S.) at Oklahoma State University.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

The purpose of the study is to determine the effect of nutrition education on nutrition knowledge and nutrient intake. The objectives of the study are 1) to determine if the control and experimental groups are similar with respect to age, gender, and meal plan participation, 2) to assess the change in nutrition knowledge between the control and experimental groups from pre-test to post-test, and 3) to assess the change in nutrient intake between the control and experimental groups from pre-analyses to post-analyses.

Description of Sample

The research sample began with 17 control and 16 experimental subjects who volunteered from the free living population. Eleven of the control and 12 of the experimental subjects submitted all of the information required and are included in the data. Six of the control and four of the experimental group dropped out of the study. Two moved away from University Village, one moved to the nursing center,

three stated they were not physically able to finish, and the remaining four gave no explanation. The experimental group included 10 females and two males, the average age was 80.8 years and 10 (83%) were on the meal plan. The control group included 10 females and one male, the average age was 81.2 years, and nine (82%) were on the meal plan. Age range in the experimental group was 65-96 years and the control group, 72-93 years (Table XI).

TABLE XI
DESCRIPTION OF SAMPLE

	Control N = 11		Experimental N = 12	
	No. of Subjects	% of Subjects	No. of Subjects	% of Subjects
Age				
65-75	5	46	5	42
76-85	4	36	5	42
86 +	2	18	2	16
Gender				
Male	1	9	2	17
Female	10	91	10	83
Meal Plan Participation				
On	9	82	10	83
Off	2	18	2	17

Comparison of Control and Experimental Groups
By Meal Plan Participation, Age,
and Gender

Hypothesis #1 states: There will be no significant difference between control and experimental groups regarding meal plan participation, age or gender. A chi-square analysis was performed between experimental and control groups with respect to meal plan participation, age, and gender. No significant differences at the .05 level were found (Tables XI and XII). H^0_1 : The null hypothesis is accepted. No significant differences were observed between control and experimental groups for these variables.

TABLE XII

CHI-SQUARE ANALYSES OF INDEPENDENCE BETWEEN
CONTROL AND EXPERIMENTAL GROUPS FOR
MEAL PLAN PARTICIPATION,
AGE, AND GENDER

Parameter	Degrees of Freedom	Probability
Meal Plan Participation	1	0.924
Age	2	0.967
Gender	1	0.590

Nutrition Knowledge Exam

Hypothesis #2 states: There will be no significant difference between pre- and post-test nutrition knowledge scores of control and experimental groups. The nutrition knowledge examination was administered to both control and experimental groups pre- and post- nutrition education of the experimental group. See Appendix H for test results for each item on the exam. Results appear in Table XIII.

When comparing the variance in test scores using a paired t-test from pre- to post- between the control and experimental group there was a significant difference at the .05 level (Table XIII). H_0 : The null hypothesis is rejected. The experimental group showed a significant improvement in test score when compared to the control group.

When looking at the test by subject area the greatest increase in nutrition knowledge in the experimental group was on the subject of cancer. This was followed by increase in knowledge of hypertension, fiber, and osteoporosis (Table XIV). These results are expected, noting that these four areas are of great concern to the elderly. To find which questions on the exam were included in each subject area, refer to Appendix F.

There was a decrease in test scores in medication knowledge. This subject was discussed only briefly in the introductory class which may explain the poor results.

TABLE XIII

ANALYSIS OF VARIANCE FOR TEST SCORE CHANGE
FROM PRE- TO POST-TEST BETWEEN
CONTROL & EXPERIMENTAL GROUPS

	Control	Experimental
Number	11	12
Standard Deviation	3.859	5.348
Standard Error	1.163	1.544
Minimum Change	-7.0	-3.0
Maximum Change	5.0	13.0
Mean Change	-1.091	3.333
*Pre-test (Score +/- s.d.)	35.27 +/- s.d.	29.92 +/- s.d.
*Post-test (Score +/- s.d.)	34.18 +/- s.d.	33.27 +/- s.d.

Probability = .033

*Maximum Score = 50

TABLE XIV

PERCENT INCREASE IN TEST SCORES FROM PRE- TO POST-
IN EXPERIMENTAL GROUP AS COMPARED TO CONTROL
GROUP BY SUBJECT AREA

Subject Area	Percent Increase
Cancer	22.3
Hypertension	16.7
Fiber	15.5
Osteoporosis	11.6
Exercise	7.2
Vitamins and Minerals	5.2
Diabetes	2.3
Weight Reduction	1.8
Heart Disease	1.5
General Nutrition	0.0
Medications	-2.0

The results showed no increase in knowledge in the General Nutrition category. This may be explained by the fact that two of the four questions in this category were answered correctly on every exam. It is also interesting to note that the subjects not only learned more about nutrition and cancer than the other subjects, they also knew more about it than any other subject before the education sessions were performed (Table XV). On the other hand, hypertension, the subject area with the second greatest increase in test scores, was the area in which the subjects in the study knew the least.

TABLE XV

PERCENTAGE OF CORRECT ANSWERS IN DESCENDING ORDER
ON PRE-TESTS OF BOTH EXPERIMENTAL AND
CONTROL GROUPS BY CATEGORY

<u>Subject Area</u>	<u>Percent Correct</u>
Cancer	80
General Nutrition	77
Diabetes	73
Fiber	72
Osteoporosis	67
Exercise	64
Heart Disease	64
Vitamins & Minerals	60
Medications	57
Weight	56
Hypertension	48

There were four questions that were answered correctly by all subjects pre- and post-test. All subjects knew that high blood cholesterol, high blood pressure and smoking were risk factors in heart disease that individuals could do something about. This is encouraging for nutrition education professionals, because it shows that the message which the American Heart Association and other groups have been attempting to convey for years has been extremely effective with this group of elderly people. This fact also tends to dispel the misconception that the elderly cannot learn. This is further confirmed by the 100% correct response to the question which states that diets high in fat and cholesterol are considered a risk factor for heart disease. Not only does this population know that high blood levels of cholesterol are a risk factor, they know that the action of eating high fat and cholesterol diets is also a risk factor over which they have some control.

The other two questions receiving 100% correct responses were: "adults should drink six to eight glasses of fluid per day", and, "exercise and diet are important factors in a healthy lifestyle."

At the other end of the scale, the questions receiving the fewest correct responses may point to areas where further nutrition education is needed. One question stated that some weight loss diets work more quickly because they contain certain combinations of foods. Only two of the 46 responses

answered this statement correctly. This idea has long been a misconception in the minds of many and is probably a cause of the many fad weight loss diets on the market today. It is obviously a misconception of almost all participants in this study of elderly people.

The next most frequently missed question stated that extremely active individuals require a great deal more protein, vitamins, and minerals than inactive individuals. Only 8% of the participants answered this question correctly. In fact, active individuals need a great deal more calories, not vitamins, minerals, and protein. This mind set is partly responsible for the widespread use of supplementation among the elderly. This shows another area of need for nutrition education with older persons.

Dietary Intake Analyses

Hypothesis #3 states: There will be no significant difference in nutrient intake between pre- and post-analyses of the experimental and control groups. Dietary intakes were collected from all subjects for 18 nutrients (Tables XVI and XVII). The mean intake for most nutrients was above the R.D.A. even though a relatively small number of calories was consumed. The residents in this study chose nutrient dense foods. Twelve of the 18 nutrients analyzed in this study are included in the 1989 R.D.A.s. Nutrition adequacy was designated as 2/3 or more of the R.D.A. (Table XVIII).

TABLE XVI
PRE-DIETARY INTAKES ACCORDING TO
MEAN AND RANGE

Nutrien	R.D.A.*		Control N = 11		Experimental N = 12	
			Mean	Range	Mean	Range
Calories	1800	kcal	1475	719 - 2098	1417	1025 - 1817
Fat		gm	45.4	16 - 64	48.4	17 - 76
Carb.		gm	217	118 - 309	193	146 - 249
Chol.		mg	158	14 - 335	248	79 - 532
SFA		mg	10.5	3 - 18	14.5	4 - 27
PUFA		mg	8.2	1 - 16	8.3	2 - 17
Sodium		mg	2069	1166 - 4344	2328	841 - 4202
Fiber		gm	5.5	4 - 9	4.7	2 - 7
Protein		gm	60	34 - 80	66.6	34 - 82
Vit. A	4000	IU	7699	1998 - 9999	7059	3533 - 9999
Vit. D	200	IU	106	1 - 225	120	32 - 252
Vit. C	60	mg	133	89 - 225	94.4	41 - 153
Vit. B1	1.0	mg	1.44	.5 - 5.5	1.21	.7 - 1.7
Vit. B2	1.2	mg	2.04	1.3 - 6.4	1.65	1.1 - 2.4
Niacin	13	mg	16.2	6 - 24	16.1	11 - 24
Vit. B6	1.6	mg	1.5	.5 - 2.1	1.97	1.1 - 4
Calcium	800	mg	655	279 - 928	688	266 - 1004
Magnesium	280	mg	225	128 - 365	248	174 - 343
Iron	10	mg	15.3	5 - 33	13.2	11 - 20
Zinc	12	mg	9.7	5 - 25	8.7	7 - 11

*For Females age 51+

TABLE XVII
 POST-DIETARY INTAKES ACCORDING TO
 MEAN AND RANGE

Nutrient	R.D.A.*		Control N = 11		Experimental N = 12	
			Mean	Range	Mean	Range
Calories	1800	kcal	1461	1173 - 1789	1499	1081 - 2787
Fat		gm	44.3	37 - 57	51.7	19 - 93
Carb.		gm	209	146 - 276	195	130 - 409
Chol.		mg	137	73 - 266	221	24 - 460
SFA		mg	11.2	9 - 18	13.6	4 - 25
PUFA		mg	8	4 - 14	9.3	4 - 23
Sodium		mg	1864	1013 - 2358	2125	618 - 4347
Fiber		gm	6.0	4 - 11	4.8	3 - 6
Protein		gm	67.8	55 - 85	71.9	29 - 107
Vit. A	4000	IU	8401	5064 - 9999	7434	3048 - 9999
Vit. D	200	IU	151	4 - 381	119	0 - 316
Vit. C	60	mg	156	52 - 288	148	44 - 290
Vit. B1	1.0	mg	1.24	.9 - 1.5	1.2	.7 - 1.9
Vit. B2	1.2	mg	1.8	1.4 - 2.4	1.8	.9 - 2.7
Niacin	13	mg	18	8 - 25	19	8 - 27
Vit. B6	1.6	mg	1.5	.5 - 3	1.7	.7 - 3
Calcium	800	mg	736	374 - 1410	748	233 - 1448
Magnesium	280	mg	242	124 - 429	222	149 - 286
Iron	10	mg	16	8 - 33	15	10 - 26
Zinc	12	mg	11	6 - 28	8	5 - 12

*For Females age 51+

TABLE XVIII
 NUMBER AND PERCENTAGE OF SUBJECTS WITH NUTRIENT
 INTAKES BELOW 2/3 OF THE R.D.A. BEFORE
 NUTRITION EDUCATION

Nutrient	Control Subjects 11 Persons		Experimental Subjects 12 Persons	
	No. of Subjects	% of Subjects	No. of Subjects	% of Subjects
Protein	0	0	0	0
Vitamin A	1	9.1	0	0
Vitamin D	6	55	7	58
Vitamin C	0	0	0	0
Vitamin B1	1	9.1	0	0
Vitamin B2	0	0	0	0
Niacin	1	9.1	0	0
Vitamin B6	3	27	0	0
Calcium	3	27	4	33.3
Magnesium	3	27	2	16.6
Iron	1	9.1	0	0
Zinc	5	45.5	5	41.7

For eight of the 12 nutrients listed there were either no subjects, or not enough subjects below 2/3 of the R.D.A. to perform statistical analysis. The four nutrients that showed values below 2/3 of the R.D.A. in both control and experimental groups are nutrients that previous studies have found to be low in the diet of older persons. The nutrient in this study with the greatest percentage of subjects below 2/3 of the R.D.A. was vitamin D. This is a nutrient not commonly found to be deficient in the diet of older persons, yet one study found only two of 64 people had vitamin D

intakes above the R.D.A. (Pyke, 1947).

Low dietary intake of calcium, zinc, and magnesium have been reported in a number of studies (Kaplan, 1955) (National Center for Health Statistics, 1971-1973) (Windham, 1981) (Harland, 1980). Conversely, inadequate intakes of vitamin A, iron, vitamin C and the B vitamins reported in many studies of the elderly including HANES I, were not found in this study. This may be due to the higher relative incomes and the institutional setting of the subjects in this study. The low dietary intakes for zinc found in this study may be due to the fact that the data base is not complete for this nutrient. In over half of the analyses performed at least three foods did not have values for zinc.

Looking at the remaining six nutrients studied, there were not enough subjects with excessive intakes of sodium, cholesterol, or saturated fats to statistically analyze (Table XIX).

Each nutrient was analyzed individually using a paired t-test to determine if any significant difference could be found between pre- and post- mean intake when comparing experimental and control groups. No significant differences were found at the .05 level. H^0 : The null hypothesis is accepted (Table XX).

TABLE XIX
 NUMBER AND PERCENTAGE OF SUBJECTS WITH PRE-
 ANALYSIS BELOW ESTABLISHED STANDARDS

Established Standards	N = 12 Experimental		N = 11 Control	
	No. of Subjects	% of Subjects	No. of Subjects	% of Subjects
Fat > 30% of Calories	6	50	4	36
Cholesterol > 300 mg	4	33.3	1	9.1
Saturated Fat > 10% of Calories	4	33.3	0	0
Polyunsaturated Fat < 10% of Calories	12	100	10	9.1
Sodium > 3,000 mg	2	16.6	1	9.1
Fiber < 2 gm/100 kcal	12	100	11	100

It is noteworthy that, although all subjects were low in fiber intake there was no significant increase after nutrition education. The increase in test scores (15.5%) on the subject of fiber did not translate into a significant change in fiber consumption.

TABLE XX
ANALYSES OF VARIANCE FOR THE CHANGE IN
NUTRIENT INTAKE BETWEEN CONTROL
AND EXPERIMENTAL GROUPS

Nutrient	*Group	No. of Subjects	Mean Change	Standard Deviation	Probability
	C or E				
Total Fat /gm	C	4	-33.4	26.0	1.54
	E	6	- 4.13	32.0	
Polyunsat. Fat /gm	C	10	.495	6.35	.798
	E	12	-.260	7.31	
Fiber /gm	C	11	.514	1.75	.525
	E	12	.069	1.52	
Vitamin D /ug	C	6	28.7	87.2	.302
	E	7	- 7.9	77.8	
Calcium /mg	C	3	114.0	176.0	.498
	E	4	27.0	91.8	
Magnesium /mg	C	3	44.6	44.7	.257
	E	2	4.0	9.8	
Zinc /mg	C	5	1.54	2.29	.062
	E	5	-1.10	1.24	

*C = Control Group E = Experimental Group

Although all subjects knew that high fat diets are a risk factor for heart disease, this knowledge did not affect the fat intake in the 50% of the experimental group with high fat diets. The fact that nearly all subjects were not receiving 10% of their calories from polyunsaturated fat may point to an area for nutrition education.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of Findings

The purpose of this study was to examine the effect of nutrition education on nutrition knowledge and dietary intake. The following objectives were met: 1) to determine if the control and experimental groups were similar with respect to meal plan participation, age and gender, 2) to assess the change in nutrition knowledge between the experimental and control groups from pre-test to post-test, 3) to assess the change in nutrient intake between the control and experimental groups from pre-analyses to post-analyses.

The sample in this study was composed of elderly volunteers from the free living residents of University Village Retirement Center. Control (N = 11) and experimental (N = 12) groups were formed. Pre-nutrition knowledge test and three-day food records were administered to both groups. The experimental group received 12 (30-minute) weekly nutrition education classes. Both groups then submitted post-nutrition knowledge tests and three-day food records.

Statistical analysis revealed no significant differences in meal plan participation, age or gender between the control and the experimental groups. There was a significant improvement in nutrition knowledge in the experimental group receiving the nutrition education. The improvement was not distributed evenly among subject areas. Test scores improved 22.3% on the topic of cancer but did not improve in the area of general nutrition.

The dietary intakes were analyzed using a t-test. Each of 18 nutrients was analyzed individually. No significant improvements were seen in the experimental group. Most notable in this analysis was the lack of data to analyze. There was not enough data below the nutrient intake standards in 11 of the 18 nutrients for an analysis to be performed.

Conclusions

Since the control and experimental groups are not significantly different in meal plan participation, age, or gender hence should be dismissed as confounding variables in Hypothesis #2 and #3. The variation in increase in nutrition knowledge across subject areas may be accounted for by teacher bias, level of ability, or knowledge in different areas. Subjects level of interest in each area, or the subject's perception of the pertinence of the information to their situation may also effect the variation in level of learning.

The significant improvement seen in nutrition knowledge of the experimental group was not reflected in nutrient intake of that group. Not finding a significant increase in any of the 18 nutrients studied may be due in part to the fact that the population was relatively well-nourished before the education was given. Over 80% of the participants were on the meal plan. This group, being so well nourished, may indicate an advantage for older persons to eat in a congregate setting where they may select from a wide variety of foods that are planned and provided under the guidance of a Registered Dietitian. It may be a mistake to consider all older populations at risk just because earlier studies of low income elderly showed major deficiencies. The lack of improvement in dietary intake may indicate how difficult it is to change lifelong eating habits. Assuming that there were no other variables that were not controlled for, nutrition education did affect the nutrition knowledge in this population of elderly.

Recommendations for Further Study

- 1) Data bases need to be completed by including values for the micronutrients for all foods commonly eaten.
- 2) In some areas, the elderly have adequate knowledge. Studies need to be conducted to determine the most effective way to modify their behavior to be able to follow the principles of good nutrition that they already know.

3) Further nutrition education is needed in many areas including:

(a) Correcting myths about reduction dieting (such as certain foods helping people reduce weight more quickly);

(b) Increasing intake of polyunsaturated fat to 10% of calories while reducing total fat to 30% of calories;

(c) Need for and affect of vitamin and mineral supplements on health; and

(d) How to enable older adults to change eating patterns so as to correspond with the knowledge they possess on good nutrition.

4) Although this population appears to be relatively well nourished, they live in an institutional setting with the greatest majority on the meal plan. Methods need to be developed to assess the nutrition needs of elderly living alone, or who prepare food for one or two people, who do not have access to a meal plan developed by a Registered Dietitian.

5) Biochemical data on each nutrient should be obtained in addition to the dietary intake data in order to provide a more complete assessment of the nutritional status of the subjects.

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APPENDICES

APPENDIX A

NUTRITION QUESTIONNAIRE

NUTRITION QUESTIONNAIRE

Name _____ Pre _____ Post _____

Directions: This is not a test. We are asking you to help us by giving your opinion to the following statements. If you think the statement is true, circle the "T"; if false, circle the "F".

T F 1. Three important heart disease risk factors that you can do something about are: high blood pressure, smoking, and high blood cholesterol.

T F 2. Regular exercise does not lower blood cholesterol.

T F 3. Inactivity can contribute to osteoporosis.

T F 4. Regular exercise can help decrease one's need for insulin.

T F 5. Extremely active individuals require a great deal more protein, vitamins, and minerals than inactive persons.

T F 6. The best exercise program would consist of 30 minutes of intense exercise daily.

T F 7. Someone over the age of 80 should not engage in an intense exercise program.

T F 8. Warming up is not necessary when walking for exercise.

T F 9. Running is better exercise than walking.

T F 10. As people grow older, their nutritional needs for vitamins, minerals, and protein decrease.

T F 11. Adults over 65 should restrict their use of spices.

T F 12. Vitamin E and zinc slow down the aging process.

T F 13. Adults over 65 have diets that provide low levels of trace minerals (ie: copper, zinc, magnesium, and selenium).

T F 14. A serving of raw fruit or vegetable is 1/2 cup.

T F 15. A serving of meat is 2-3 ounces.

- T F 16. Two servings of bread and cereals are recommended each day for adults over 65.
- T F 17. Adults over 65 should drink six to eight glasses of fluid or beverages each day.
- T F 18. One orange provides 100% of the Recommended Dietary Allowance (R.D.A.) for vitamin C.
- T F 19. All older adults should take vitamin/mineral supplements.
- T F 20. Physical, biological, and psychological changes that occur as people grow older often result in poor eating habits.
- T F 21. As people grow older, their calorie needs decreases.
- T F 22. Carbohydrates, fats, protein, and alcohol all contain the same number of calories per ounce.
- T F 23. If you cut 1,000 calories per day from your diet, you could lose about 2 pounds per week.
- T F 24. "Lite" or "Light" foods are always good choices for someone on a reducing diet.
- T F 25. Some weight-loss diets work more quickly because they use certain combinations of foods.
- T F 26. All vegetable oils are high in polyunsaturated fats, while all animal fats are high in saturated fat.
- T F 27. All fats contain cholesterol.
- T F 28. Diets high in fat and cholesterol are considered a risk factor for heart disease.
- T F 29. All yogurt is low in fat.
- T F 30. One cup of bran cereal will meet the National Cancer Institute's recommendation of 28 grams dietary fiber daily.
- T F 31. Fiber is beneficial for diverticular disease, constipation, and diarrhea.
- T F 32. Dried beans are a good source of fiber.
- T F 33. Fiber may have a role in lowering colon cancer.

- T F 34. Sugar causes diabetes.
- T F 35. Honey is more nutritious than table sugar.
- T F 36. Being overweight is a risk for diabetes.
- T F 37. Low calcium intake may be related to high blood pressure.
- T F 38. Many medications contain sodium.
- T F 39. Cutting back on the salt in your diet will help you lose weight.
- T F 40. Being overweight increases your risk of cancer.
- T F 41. Diets high in fat may increase your risk of cancer.
- T F 42. It has been proven conclusively that what you eat can affect your risk of getting cancer.
- T F 43. Getting the Recommended Dietary Allowances (R.D.A.) for calcium will prevent osteoporosis.
- T F 44. Antacids, such as Tums, are a good source of calcium.
- T F 45. The body needs vitamin D to absorb calcium.
- T F 46. If you take a calcium supplement it should also contain vitamin D.
- T F 47. Medications should always be taken with meals to avoid stomach irritation.
- T F 48. Orange juice should not be used to take medications.
- T F 49. Prolonged use of over-the-counter medications like aspirin or antacids interferes with nutrients.
- T F 50. Exercise and diet are important factors in a healthy life.

APPENDIX B

DAILY FOOD INTAKE RECORD

DAILY FOOD RECORD

NAME _____ SEX _____ AGE _____

BREAKFAST LUNCH DINNER

DAY #1 DATE _____
ITEM AMOUNT ITEM AMOUNT ITEM AMOUNT

--	--	--	--	--	--

DAY #2 DATE _____
ITEM AMOUNT ITEM AMOUNT ITEM AMOUNT

--	--	--	--	--	--

DAY #3 DATE _____
ITEM AMOUNT ITEM AMOUNT ITEM AMOUNT

--	--	--	--	--	--

APPENDIX C

NUTRITION EDUCATION CLASS OUTLINES

NUTRITION EDUCATION CLASSES OUTLINES

Class #1

INTRODUCTION TO NUTRITION

1. Review purpose of the study.
2. Review Informed Consent form; make sure all have been filled out.

Transparency

3. Introduction to nutrition:
 - A. Elements of Health 1
 - B. Prevalence of Disease in other countries compared with United States 2
 - C. Potential Health Benefits with Diet Change 3
 - D. Changes in the American diet over the last 70 years 4 & 5
 - Fat Changes 6
 - E. Nutrition individuality 7
 - F. Dietary Guidelines:
 - 1) U.S. Dietary Goals "Where we are/Where we need to be" 8
 - Guidelines 9
 - 2) U.S. Dietary Guidelines U.S.D.A. 10
 - G. Food and drug interactions 11
4. Brief overview of class topics to come.
5. Answer questions.

Class #2

BASIC NUTRITION

	Transparency
1. Nutrition Considerations	1
A. Calories	2
B. Tips on cutting back	3
C. Protein	4
D. Fat	5
E. Carbohydrate	6
F. Vitamins	7
G. Water	8
H. Fiber	9
I. Nutritional supplements	10
2. Recommended Dietary Allowances	11
3. Basic Four food groups	
A. Meat	12
B. Milk	13
C. Fruits and vegetables	14
D. Breads and cereals	15
4. Fats and sweets	16

Class #3

FIBER

Transparency

1. Introduction
 - A. History Hippocrates and Kellogg
 - B. Current Dr. Burkitt
 - C. What is Fiber? 1
 - D. Definitions:
 - Crude Fiber, Dietary Fiber 2
 - E. Benefits, Constipation 3
 - F. Function of Alimentary Track
 1. Peristolisis 4
 2. Bulk allows Muscles to Exercise 5
 3. If Muscles weak and internal pressure high, pockets can form: Diverticulosis! 6
 4. Hiatus Hernia: possible cause: increase in inner abdominal pressure 7
 - G. Types of Fiber 8
2. Food Sources 9 & 10
 - A. Bread (Good Source)
 - B. Fruit (Good Source)
 - C. Cereal (Good Source)
 - D. Vegetables (Good Source)
 - E. Meat (Poor Source)
 - F. Meat Alternatives (Good Source)
3. How Much? 25-35 grams dietary fiber
4. Handouts
 - A. Eat foods with adequate fiber
 - B. Types of Fiber
 - C. How to add fiber to your diet

Class #4

HYPERTENSION

	Transparency
1. Incidence	1
2. What is it?	2
3. How do you know you have it?	3
4. Contributing Factors	4
5. Specific Dietary Factors that Contribute	5
A. Role of Sodium	6
B. How much is Enough?	7
C. Things to watch for	8
D. How to Reduce Dietary Sodium	9
6. Where is Sodium Found?	
A. In a Teaspoon	10
B. In Various Foods	11-16
C. Shaking the Salt Habit	17-18
D. Painless Ways to Reduce	19
7. Calcium in Hypertension	20

Class #5

OSTEOPOROSIS AND CALCIUM

	Transparency
1. Role of Calcium in the Body	1
2. What is Osteoporosis	2
3. Who is at Greatest Risk?	3
4. How can you Tell if You Have It?	4
5. Bones Most Affected by Osteoporosis	5
Changes in the Skeleton	6
6. Calcium Nutrition	7
A. Food Sources	8
B. Food Supplements	9
7. Studies on Exercise & Osteoporosis	10-13
8. Treatment of Osteoporosis	14

Class #6

EXERCISE AND DIET

	Transparency
1. Introduction	1
2. Benefits	2-3
A. Exercise increases	4
B. Exercise decreases	5
3. What is Fitness?	6
4. How to Begin an Exercise Program	7
5. Guidelines to Safe Exercising	8
6. Intensity (How much is enough?)	9
A. Aerobic Exercise	10
B. Frequency and Duration	11
C. General Program	12
7. Stretching	

Class #7

WEIGHT CONTROL

	Transparency
1. Introduction	1
2. Fad Diets	2
A. Problems - Lack of Variety	3
B. Not a Permanent Fix	
C. Risk of Nutrient Deficiencies	
3. Proper Dieting Considerations	
A. Eat low calorie Foods	4
1. Avoid High Fat	
2. Satiety Value of Food	5
3. Eat Adequate Starch	
B. Have a Support Group	6
Effect of a Cooperative Spouse	
C. It Must be a Change in Lifestyle	7
D. Get Adequate Exercise	8
4. Conclusion	9

Class #8

CANCER

	Transparency
1. Introduction	1
2. Types of Cancer	2
A. In the United States	3
B. Types by Site	4
3. Causes of Cancer	
Diet is Important	5
4. Nutrition - Cancer Links	6
A. Fat	
1) Epidemiology	7
2) In Which Types of Cancer	8
3) Linked to Colon, Breast, and Prostate	9
B. Fiber - Link to Colon Cancer	10
C. Vitamin C	11
D. Vitamin A	12
E. Selenium, Calcium, Coffee, Alcohol	13
F. Cuciferous Vegetables	14
G. Sweeteners	15
5. Dietary Recommendations	16

Class #9

VITAMIN SUPPLEMENTS

Transparency

- | | |
|--|----|
| 1. Why People feel the need for
Supplementation | 1 |
| 2. Quality of Food | 2 |
| 3. Beliefs that lead to Supplementation | 3 |
| 4. The Recommended Dietary Allowances | 4 |
| 5. Problems with excessive Amounts of
Nutrients | 5 |
| A. Vitamin A | 6 |
| B. Vitamin D | 7 |
| C. Trace Minerals | |
| 1) Selenium | 8 |
| 2) Zinc | |
| 3) Iron | |
| 6. Comparison of Types of Supplements | 9 |
| A. Multi-Vitamin | |
| B. Single Dose | |
| C. Mega Vitamins | |
| 7. Cost Comparison of Types and Brands | 10 |

Class #10

DIABETES

	Transparency
1. Causes of Diabetes	1
2. Types of Diabetes	2
A. Adult	
B. Juvenile	
3. Treatment	
A. Adult	3
1) Weight Loss	
2) Oral/Diet	
3) Insulin/Diet	
B. Juvenile	4
1) Insulin	
2) Diet	
3) Exercise	
4. Diet Plan Exchange List	
A. Meat Group	5
B. Starch Group	6
C. Fruit Group	7
D. Vegetable Group	8
E. Milk Group	9
F. Fat Group	10

Class #11

HEART DISEASE

	Transparency
1. Causes of Heart Disease	1
A. Clogging of Arteries	2
B. Forming of Plaque	3
2. Contents of Plaque	4
A. Fat	
B. Cholesterol	
C. Minerals	
3. Cholesterol in the Diet	5
Sources of Cholesterol	6
4. Fat in the Diet	7
A. Sources of Fat	8
B. Fast Food Fat Content	9
C. Fat Content of T.V. Dinners	10
D. Fat Content of Meats	11
5. Ways to Reduce Fat in the Diet	12

Class #12

SUMMARY

	Transparency
1. Fiber Benefits	1
Sources of Fiber	2 - 6
2. Hypertension Causes	7
Sources of Sodium	8
3. Calcium in Osteoporosis	9
Sources of Calcium	10
4. Exercise Aerobics	11
Intensity	12
5. Weight Reduction	
A. Change in Lifestyle	13
B. Lower Calories	14
6. Cancer	
Dietary Recommendations	15
7. Vitamin Supplements	
A. Danger of Overdose	16
B. Types	17
8. Diabetes	
Exchange List	18 - 23
9. Heart Disease	24
Sources of Fat	25

APPENDIX D

TELEPHONE SOLICITATION

TELEPHONE SOLICITATION

Hello, Mr./Mrs./Miss _____ . My name is Jim Painter and as you know I am the Director of the Food Service here at University Village. I am also working toward a Master's degree at Oklahoma State University.

Part of my schooling is to conduct a study of the nutrition knowledge between two groups of people living here at the Village.

Both groups will complete a nutrition questionnaire and a three-day food record at the beginning of the study. Then one group will attend a half-hour class each week for 12 weeks and the class will be taught by me. The second group will not be required to attend any nutrition classes.

At the end of the 12 week session both groups will again complete a nutrition questionnaire and another three-day food record. There will be complete anonymity in the results of the tests, so there will be no way for others to know your score.

Would you care to help me by becoming a part of this study?

_____ No. Thank you very much. Goodbye.

_____ Yes. Thank you very much. Would you care to be a part of the group that will attend classes or the group that does not?

_____ Control _____ Experimental

I appreciate you taking time for this project. I will be contacting you regarding the time and days of the food record and questionnaires (exp: and the dates and time of the classes). Again, thank you. Goodbye.

APPENDIX E

INFORMED CONSENT FORM

OKLAHOMA STATE UNIVERSITY

Nutrition and Fitness Education Program
For Older Persons

INFORMED CONSENT

Subject's Name _____ Date _____

I hereby authorize Jim Painter, R.D. and/or such assistants as may be selected by him to perform the following procedure(s) and investigation(s) for research purposes:

- 12 30-minute nutrition education programs
- Nutrition knowledge exams
- Dietary intake records.

I understand that I was asked to participate in this study because I am an older adult living in a retirement home setting. I understand that the procedure(s) and investigation(s) involve the following possible risks or discomfort:

- all tests are resting tests and involve no unusual risk or discomfort.

I understand that Jim Painter, R.D., Phone #(918)298-3381 will be available to answer questions about the investigation(s) and procedure(s). Questions about my rights as a subject may be directed to Terry Maciula (405)744-5700. I understand that I am free to terminate the test at any time at my own discretion without penalty. I also understand that all test records will be kept confidential and will not be released to anyone without my permission. Tests results will be tabulated for research purposes as group data and in no case will a subject's personal identity be associated with his test results without his expressed permission.

I understand that the potential benefits of the investigation are as follows: The results of the battery of tests will give the subject an in-depth view of his current dietary intake and nutritional status. Test results will be explained and interpreted to the subject. Guidance concerning nutritional status, dietary intake, meal planning, food preparation methods and physical activity will be given to produce favorable changes in test scores. I understand that I will receive a copy of this consent form.

Investigator _____

Subject's Signature _____

Witness Signature _____

APPENDIX F

TEST RESULTS BY SUBJECT AREA

NUTRITION TEST RESULTS BY SUBJECT AREA

Subject Area	Test Questions Included
1. Heart Disease/Fat	1, 2, 26, 27, 28, 29
2. Exercise	4, 5, 6, 7, 8, 9
3. Osteoporosis/Calcium	3, 43, 44, 45, 46
4. General Nutrition	11, 17, 20, 50
5. Weight Control	21, 22, 23, 24, 25
6. Fiber	30, 31, 32, 33
7. Diabetes	14, 15, 16, 34, 35, 36
8. Hypertension/Sodium	37, 38, 39
9. Cancer	40, 41, 42
10. Vitamins/Minerals	10, 12, 13, 18, 19
11. Medications	47, 48, 49

APPENDIX G

1989 RECOMMENDED DIETARY ALLOWANCES
FOR PERSONS AGE 51 AND OVER

1989 RECOMMENDED DIETARY ALLOWANCES
FOR PERSONS AGED 51 AND OVER

<u>Vitamin</u>	<u>Unit</u>	<u>Male</u>	<u>Female</u>
A	ug	1000	800
B1	mg	1.2	1.0
B2	mg	1.4	1.2
B6	mg	2.0	1.6
Niacin	mg	15	13
C	mg	60	60
D	ug	5	5
E	mg	10	8
<u>Mineral</u>	<u>Unit</u>	<u>Male</u>	<u>Female</u>
Calcium	mg	800	800
Magnesium	mg	350	280
Iron	mg	10	10
Zinc	mg	15	12

(Food & Nutrition Board, 1989)

APPENDIX H
PRE- AND POST NUTRITION KNOWLEDGE
TEST SCORES

PRE- AND POST NUTRITION KNOWLEDGE
TEST SCORES

Question Number	Number of Correct Responses			
	Experimental N = 12		Control N = 11	
	Pre	Post	Pre	Post
1	12	12	11	11
2	8	8	6	7
3	11	11	11	10
4	9	9	9	9
5	1	3	0	0
6	10	10	7	6
7	12	12	10	9
8	4	5	4	5
9	11	12	11	11
10	8	8	11	11
11	1	2	2	1
12	4	4	3	3
13	7	9	8	7
14	10	10	10	10
15	10	10	11	7
16	2	4	1	4
17	12	12	11	11
18	6	9	5	7
19	8	9	9	9
20	11	11	11	11
21	10	10	10	10
22	8	9	10	9
23	3	9	10	7
24	3	5	3	8
25	2	0	0	0
26	3	3	3	3
27	3	5	5	6
28	12	12	11	11
29	8	6	6	3
30	3	1	4	1

APPENDIX H (Continued)

31	11	11	9	8
32	7	11	10	9
33	11	11	11	11
34	7	7	9	9
35	8	8	8	8
36	10	11	11	11
37	3	6	5	5
38	9	11	10	8
39	3	2	2	1
40	5	9	9	7
41	10	11	11	10
42	8	11	10	11
43	2	4	2	4
44	6	10	7	10
45	8	9	11	9
46	6	8	11	9
47	5	5	4	3
48	4	7	6	7
49	8	7	11	11
50	11	12	11	11

VITA

James Erwin Painter

Candidate for the Degree of
Master of Science

Thesis: EFFECT OF NUTRITION EDUCATION ON NUTRITION KNOWLEDGE
AND DIETARY INTAKE OF ELDERLY RESIDENTS AT
UNIVERSITY VILLAGE RETIREMENT CENTER

Major Field: Food, Nutrition and Institution Administration

Biographical:

Personal Data: Born in Waltham, Massachusetts, April
9, 1955, the son of John H. and Ruby E. Painter.

Education: Bachelor of Science Degree in Food and
Nutrition from Southern Illinois University,
Carbondale, Illinois, 1977.

Professional Experience: Supervisor of Food Service,
His Way, Inc., San Francisco, California, March
1978 - March 1979. Dietetic Trainee, McQuin
Consortium, W.I.U., Macomb, Illinois, September
1979 - September 1980. Director of Food Service,
Bryan Memorial Hospital, Durant, Oklahoma,
September 1980 - July 1981. Clinical Dietitian,
Saga Corporation at City of Faith Hospital, Tulsa,
Oklahoma, July 1981 - July 1982. Director of
Food Service, Marriott Corporation at University
Village, Tulsa, Oklahoma, July 1982 - Present.

Professional Organizations: Registered Dietitian with
the American Dietetic Association. Licensed
Dietitian with the State of Oklahoma Board of
Medical Licensure and Supervision. Member of
the Oklahoma Dietetic Association. Member of
the Tulsa Dietetic Association.