

DIETARY HABITS AND FOOD INTAKES OF OLDER ADULTS
INTERVIEWED IN TWO OKLAHOMA COMMUNITIES

By

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CHAPTER I

INTRODUCTION

Significance of the Study

Aging can be considered a process which begins with conception and continues until death. Aging is, also, a complex process which varies with the individual and which encompasses more than an increase in years of age. Psychological, physiological, social, economical, and nutritional dimensions are further aspects of aging which are peculiar to each individual. Therefore, in order to study the aging population one must realize that older people are a diverse group each with their own needs and problems (2).

The present concern for our elder citizens is due to the increasing numbers that survive past age 65. Since 1900 the age 65 and over population has grown faster than the rest of the population and the age 75 and over segment has increased even more. In reality, then, the aged represent our nation's fastest growing minority. The age 65 and over group, which is six and one-half times as large as it was in 1900, is 20 million in number and represents every tenth American. This dramatic increase in longevity is due not to an increase in life expectancy in the later years but rather to the lowered mortality rate in infancy and childhood (7).

Like most minorities the elderly are involved in a struggle. They

are striving for economic survival, for social acceptance, for physical and mental well being. Their struggle is due mainly to the economic, medical and industrial progress which has not only increased their life span, but has also taken away their traditional roles, functions and statuses. As a consequence they have become dependent on society. Society, however, has not kept pace with the problems of the elderly. This is unfortunate since 95 per cent of the elderly live within our communities instead of in institutions as is commonly thought.

Since the 1970's there has been a growing awareness that if the needs of the elderly are to be met, the federal, state and local governments, as well as private citizens, must become involved. As a result of this awakening several areas of concern have been identified, one of which is the nutrition of the aged. According to the Federal Register (49), most elderly persons do not eat properly because they cannot afford to do so, they know little about the nutritional aspects of food, they have limited mobility which prevents them from shopping and cooking for themselves, and they suffer from loneliness and social isolation which affects their desire for food. Thus, many of the various economic, social, psychological and physiological changes that occur with aging lead to poor food habits and a consequential loss of physical and mental well being. It is for this reason that the following study deals not only with the food intake of the elderly, but also with those factors which influence the choice of diet.

Statement of the Problem

In the ensuing study the food habits of the elderly in two cities in Oklahoma were studied and were then related to the various aspects

of life which affect food intake. The research was done in conjunction with two graduate students in institutional administration who were interested in school lunch programs designed to feed the elderly. The combined theses, though not presented here, will provide the readers with an overall picture of the needs of the aged as well as the community resources and services that either were, or could, be made available to meet these needs.

The following assumptions are accepted as true in the study:

1. Since the sample that is drawn is large, the 24-hour-dietary recall gives reliable data on the food consumption of the group as a whole (34).

2. Sixty-five years of age can be used as the lower age limit for research purposes since it parallels the age associated with retirement practices (2).

3. The Recommended Dietary Allowances, Revised 1968, can be used as a guide to interpret the food consumption levels of the group and are recognized as affording, with the exception of calories, a substantial margin of safety (63).

4. Actual determination of the nutritional status of the interviewed subjects requires laboratory analysis and clinical observations not possible in this research.

5. Cross-sectional research studies can be used to provide information on the present status of the elderly in the United States.

The following hypotheses are postulated:

1. The intake of eight nutrients and calories of 113 men and women 65 years of age and above who were interviewed in Shawnee and Morrison, Oklahoma, were below the Recommended Dietary Allowances

established in 1968.

2. There are many factors which cause the elderly citizen to eat an undesirable variety and quantity of food.

3. There is a definite need for establishing community programs which will make prepared meals available to the elderly in Shawnee and Morrison, Oklahoma.

4. Nutrition education is needed as part of community programs involved in feeding the elderly.

An interview with 113 subjects, men and women aged 65 years and older, was conducted in Shawnee and Morrison, Oklahoma. A 24-hour-dietary recall was used to obtain the desired nutrition information. The section of Shawnee surveyed was composed of elderly and low income families who were located close to the Washington Elementary School. In Morrison the whole population was considered when gathering the sample. A statistically approved block sampling method was used in both towns for identifying the sample used in the research.

CHAPTER II

REVIEW OF LITERATURE

Physiological Aspects of Aging

Several theories have been advanced to explain the phenomenon of aging. One is that the DNA (deoxyribonucleic acid) in a cell becomes defective as one grows older. The DNA wears out and is unable to transmit the proper signals to the other cell parts. As a result the cell begins to malfunction and later on dies. Unfortunately, though the explanation is simple, there is no direct evidence that a cell's DNA changes with time (25,39).

Another hypothesis is that aging may be partly due to changes in the connective tissues, particularly changes in the collagen. With age the collagen fibers become denser, stiffer, thicker and less elastic. This hardening of the connective tissue is attributed to the presence of free radicals that are in the blood which supplies the collagen. It is thought that either the free radicals themselves or the products of their reactions cause the undesirable changes to take place. However, more research is needed in this area to determine the exact process involved (39).

~~Another~~ Perhaps the most prevalent, widely accepted and well understood theory is the one which suggests that aging is the result of lipid peroxidation. Although lipids or fats are usually oxidized in the

cells in a series of steps controlled by enzymes they can, also, react with oxygen in non-enzymatic free radical pathways (38). Such cells as the skin, the lining of the gastrointestinal tract, and the liver are not affected since they retain their ability to divide even into late adult life. However, the cells of other tissues such as brain, heart, muscles and kidneys do not undergo division in the adult (43). Consequently, when these cells are damaged, the cell eventually dies and the person becomes one cell older.

The free radicals which are believed to be responsible for the peroxidation of lipids are chemical compounds having an odd number of electrons. They are highly reactive and can produce irreversible chain reactions (23). The exact source of free radicals in the body can only be postulated. Perhaps they "leak out" from the electron transport system. In any case it seems probable that a steady flux of radicals exist in the cell and that radical reactions occur with critical cell components. Some of the damage produced by these reactions are probably repaired by cellular processes. However, in a human organism there seems to be either an increased rate of damage produced as one ages, or a decrease in the efficiency of repair, or both (38,43).

The parts of the cell which are most vulnerable to the attack of the free radicals are those which are high in polyunsaturates. The membrane of the cell and the cell organelles as well as the endoplasmic reticulum, are especially affected. It is assumed that these structures which contain high levels of polyunsaturated lipids are also the sites where diffusion of oxygen takes place. Changes, then, that might occur in the membranes as a result of free radical reactions might, also, greatly affect the ability of the membranes to select the substances

that ordinarily are, and are not, allowed to pass through them. Such changes in the membranes would be quite harmful to the cell (38).

The lysosomes which contain the hydrolytic enzymes that digest the waste products of the cell are also susceptible to the attack of free radicals. When a free radical penetrates a lysosome, hydrolytic enzymes are loosed into the cell proper, thus causing further destruction of the cell parts. However, even when the membrane of a lysosome is not punctured there is still a danger that the debris which collects in the cell from the lipid peroxidation will overload the lysosome causing the cell to eventually drown in its own waste (61).

The Role of Antioxidants

Based on experiments performed on mice, a hypothesis has been postulated which states that if free radical inhibitors are added to a properly selected, acceptable, natural diet there will be a ten percent or more increase in the age at death of humans; that is an increase of seven or more years. However, no studies as yet have been conducted on humans. Thus, at present we know only that there are ways of protecting cells from free radicals (23).

Various forms of antioxidants and free radical scavengers are known to prevent the peroxidation of lipids. Vitamin E, for example, is one of the main antioxidants. Other compounds such as vitamin C and ubiquinol also help by acting as synergists with vitamin E. In addition, methionine, selenoamino acids, glutathione, cysteine and sulfhydryl proteins which are free radical scavengers offer further protection against peroxidation (60,61).

The antioxidant vitamin E functions in the following way. When radiant energy penetrates a cell and strikes a polyunsaturated lipid one of two things happens. If enough vitamin E is present, nothing occurs. If there is, however, a deficiency of vitamin E, peroxidation of the polyunsaturated lipid takes place causing the formation of a free radical intermediate. The free radical, thus formed, flies about the cell striking the various molecules that are in its path. The end result is a damaged cell (61).

Unfortunately, our knowledge of vitamin E is limited. According to the Recommended Dietary Allowances for 1968, an adult needs 25-30 mg. of vitamin E per day (16). The exact amount required, however, depends on the intake of polyunsaturates. For example, in some long term experiments the amount of vitamin E needed ranged from 5 mg. to 30 mg. per day depending on the amount and type of lipids consumed. From these studies it was determined that a minimum desirable vitamin E, polyunsaturated fatty acid ratio would be .6 mg. of the vitamin per gram of polyunsaturated fat (24).

One major problem in obtaining an adequate amount of vitamin E in the diet is that the sources of the vitamin are limited. Vegetable fats and oils are the principal foods high in vitamin E. However, the actual amounts of vitamin E that are supplied by vegetable oils and shortenings depend mainly on how these products are processed and stored. Although unprocessed vegetable oils are high in vitamin E, one study has shown that the commonly consumed oils do not contain enough vitamin E to balance their polyunsaturated fatty acid content (28). Also, during freezing and at room temperature foods which have been fried in vegetable oils lose a great deal of vitamin E. The

reason is that the oxidation of the vitamin can take place at low temperatures, and at room temperature the hydroperoxides that are present can be changed into peroxides which in turn decompose to form aldehydes and ketones, the products of rancidity (9).

Of the four food groups the vegetables and fruits, meat, milk and milk products contribute very little vitamin E to the diet. Cookies and pies made from vegetable oil, however, are high in vitamin E, as are certain snack foods such as potato chips. In one study the possible amount of vitamin E consumed in eight daily menus was calculated. The results indicated that the vitamin E content of the breakfast, luncheon and dinner menus ranged from .59 to 3.68, .44 to 5.37 and 1.61 to 6.38 mg., respectively. The daily intake of the vitamin was estimated to be from 2.6 mg. to 15.4 mg. with an overall average of 7.4 mg. (9). Although this is considerably below the Recommended Dietary Allowances for 1968 it may mean that the Recommended Dietary Allowances need to be reestablished for vitamin E. Such an evaluation must be done before one can conclude that there is a relatively low intake of vitamin E in the diet of a large portion of our population.

Nutrition of the Aged

In studying the nutrition of the aged it is surprising to discover that as a group they need the same nutrients now as when they were 25 years old and that the amounts recommended for consumption still vary with age, sex, activity, and the build of the individual (37,63). The elderly, however, have food needs that are further influenced by their physical condition. For example, physical disabilities such as poor teeth or dentures, loss of smell or taste, disorders of the esophagus

as well as a loss of motivation in preparing meals interfere with the intake of food. Likewise, interference with absorption, storage, and utilization of food as well as excess excretion of certain nutrients may lead to a decrease in the production of digestive enzymes, to poor endocrine function and to a loss of protein, respectively (29).

✓ In general, however, the basic needs of all the elderly can be met if they consume food in sufficient quantity to provide for growth, repair and energy (29). The amounts recommended for adequate nutrition of the elderly are listed by the National Research Council in their Recommended Dietary Allowances for 1968. The daily requirements which are based on reliable experimental data allow for a margin of safety for individual differences (16). For the aged the recommended amount of calories, carbohydrates, fats, proteins, minerals, vitamins, and water is based on a reference man who is over 55 years, is 67 inches tall and weighs 154 pounds and on a reference woman who is, also over 55 years, is 62 inches tall and weighs 128 pounds (16). ✓

The number of calories needed by the elderly is less than when they were young. Generally, if they attain their normal weight by age 22 they should try to maintain it throughout life. To accomplish this task most individuals need to restrict their calorie intake later in life since their physical activity as well as their basal metabolic rate has decreased with age (29,58,63). ✓

The present number of calories recommended for the 55-75 year old reference man and woman is 2400 and 1700, respectively (16). According to the Ten State Nutrition Survey 1968-1970, none of the elderly who were studied met the calorie requirements (26). In general the amount of food they consumed was less than they needed to meet the nutritional

standard for their age, sex and weight. In other studies, however, several of the 65 and over population were reported as being overweight. For example, in a survey of 100 individuals 48 per cent of the men and 59 per cent of the women were 10 per cent or more above their desirable weight (57). In another where 200 people over 65 were interviewed 68 per cent were ten per cent overweight and only eight per cent were more than ten per cent underweight (44).

There is, then, a problem of deficits and excess. The deficits may be part of the reason why many of the elderly have feelings of fatigue, lassitude and lack of interest in life. The excesses may be the result of earlier food intake habits that were followed (58). The latter problem is indeed unfortunate since in both rats and man there is evidence which indicates that obesity shortens life (40,42). In the rat experiment, as an example, for every ten per cent reduction in weight there was a 13.5 per cent gain in life expectancy and for every ten per cent gain in weight a 13.5 per cent reduction in life expectancy (40).

In the human studies of the overweight population nutritional inadequacies were also apparent. This was attributed to the eating of excess foods which contained empty calories (29). In either the case of deficit or excess, dietary counseling is needed which will bring the calorie consumption of the elderly in line with their age and activity.

Carbohydrates and fats are both providers of energy. The carbohydrates should contribute 50-55 per cent of the total calorie intake of the elderly. However, as yet no studies have been conducted to determine the relationship of carbohydrate intake with aging. It may be, however, that carbohydrate foods do comprise a great deal of the

diet of the elderly since they require little preparation and are inexpensive (29,63,72).

Fats should provide 30-35 per cent of the calories in the normal diet. Because of the high incidence of arteriosclerosis among the aged it is customary to recommend that the amount of fat in the diet be minimal and that the primary fat in the diet be unsaturated (29,63,72).

The recommended intake of protein for adults 55 and over is 65 gm. daily for men and 55 gm. daily for women (16). An adequate intake is also considered to be 0.9 gm. of protein per kilogram of desired body weight (16). It is thought that these requirements do not need to be increased even though protein is lost during periods of inactivity and prolonged bed rest. However, in the Ten State Nutrition Survey protein was listed as one of the limiting nutrients (26). In the Iowa study women fell below the Recommended Dietary Allowances for protein (58). In another survey the mean protein intake for men over 70 years and women 75 and over was low (57). Perhaps the cause of this low protein intake can be attributed to poor dentures, inactivity, decreased appetite, ingrained food habits and economic situations. The consequences may be less resistance to infection, poor healing abilities and mild types of anemia (37).

Tuttle et al., have investigated the essential amino acid requirement in older men and have concluded that there appears to be more of the essential amino acids needed at this time in life (67). However, they did not know if this applied to all the essential amino acids or only to a few. In another study Tuttle et al., tested the dietary requirements for methionine and lysine. Under their test conditions they did demonstrate that both lysine and methionine were needed in

extra amounts during the later years of life. The increased amount of methionine needed, however, was attributed to the decreased ability of the elderly men to convert methionine to cystine (68). In an experiment by DaCosta and Moorhouse the protein requirement for the elderly was not found to be greater (12). And according to Watkin the dietary protein needs of the elderly have not thus far been related to the aging process (72). Thus, a conclusive statement cannot be made regarding the need for extra protein in the later years.

The minerals which are needed for the proper functioning of the body and which might be lacking or have some special function are iron, calcium, fluorine, iodine, magnesium, sodium, and potassium. Iron has been shown to be lacking in the majority of diets for older adults (21, 26,29,42,57). The recommended amount is 10 mg. for both males and females 55 years old and over (16). The fact that the elderly are affected by iron deficiency anemia is attributed primarily to either blood loss or to diminished iron absorption as well as to low dietary intake. Iron deficiency anemia may also be coupled with a deficiency of folic acid and vitamin B₁₂, both of which will be reviewed later. In a study by Evans it was found that the number of severe cases of anemia doubled with an increase in age from 60-80 and that men were more commonly affected than were women. Moreover, the prevalence of anemia reached its peak between the age 70-74 (14).

✓ The Recommended Dietary Allowance for calcium is 800 mg. per day (16). In a number of surveys, however, calcium intake was described as low for the 65 and over population and especially lacking in the diets of women in this age group (21,29,31,42,57,58). Perhaps one reason for this deficit is that milk and milk products which are high

in calcium are considered by many as food for children only. The truth is that calcium is being constantly removed from the bones and released into the blood stream to be used by the body tissues or organs (58). Calcium is thus being used for the regulation of blood clotting, muscle contractibility, cardiac function, cell and capillary permeability as well as neuromuscular irritability. If this supply of food calcium which is stored in the bones is not replenished the result may be the development of osteoporosis.

Osteoporosis is a disease characterized by a reduction in the amount of bone and by fractures of the vertebrae, neck and femur (8,63). The disease is four times as prevalent in women than men and begins to appear in middle age. Unfortunately, osteoporosis is not identifiable through X-ray examinations until 25-50 per cent of the calcium is lost from the bone. The disease, in fact, may have its beginnings early in life when the intake in calcium is continually below the recommended amounts (32,58,72). In addition to the theory given above it is thought that there may be unidentifiable metabolic changes in the elderly which interfere with the replenishing of bone matter (72). For example, changes in the endocrine glands, in one's physical activity, or in one's ability to absorb calcium may be related to the occurrence of osteoporosis in older adults (58). The latter is substantiated in a study by Bullamore et al., where calcium absorption was found to fall after age 60 (8).

For treatment of osteoporosis a diet high in calcium, protein and vitamin D has been suggested. Both protein and vitamin D have been shown to increase the absorption of calcium (8,32,37). Furthermore, the amount of dietary fat and phosphate are known to influence calcium

absorption. If either are present in excessive or deficient amounts, the absorption of calcium is impaired (32). Also, since evidence exists that patients receiving high intakes of dietary calcium are able to retain less and less calcium, Lutwak believes that the prevention of the disease rather than the treatment is of prime importance and should involve a combined program of adequate nutrition, endocrine status and physical activity (32).

Fluoride which is normally found in soil and water has also been said to have beneficial effects in the prevention of osteoporosis (32, 63). The fluoride in the diet and drinking water contributes to the strength of tooth enamel and to the crystalline structure of the skeletal system. Studies have indicated that where only small amounts of fluoride were in the drinking water the incidence of osteoporosis, reduced bone density and collapsed vertebrae was higher, especially in women (5). In addition some researchers have suggested the use of sodium fluoride in the treatment of osteoporosis. However, this is still an experimental procedure the toxic effects of which are well known (72). At present the recommended level of fluoride in drinking water is 1 p.p.m. and the intake of 3.0-4.0 mg. per day is considered safe for adults (63).

Iodine is needed for continued functioning of the thyroid gland and the prevention of edemic goiter. The recommended allowance is 100 micrograms for men 55 years and over and 80 micrograms for women the same age (16). Usually an individual can attain adequate amounts of iodine through the use of iodized salt. However, if the use of salt is restricted as in the case of a low sodium diet then iodine containing medications must be used (63,72).

Sodium which is present in the fluid surrounding the cells may be restricted in the diet of the elderly who suffer from such problems as hypertension, cirrhosis of the liver and congestive heart disease. Since sodium occurs naturally in many foods and is added as sodium chloride during food processing and preparation it may be difficult for an elderly individual who eats in restaurants, or with others, to control his sodium intake. Also, the lowered palatability of the diet may decrease the amount of food consumed and thus the intake of other needed nutrients. The answer to this problem lies in reeducating the individual in the use of sodium substitutes and the use of foods low in sodium (63,72).

Potassium is present in cells which are sights of enzyme activities. Potassium is rarely absent in the diets of healthy individuals. In disease states, however, either hypo- or hyperkalemia may result. Hypokalemia, or the lack of potassium, is treated by the administration of potassium containing foods. Hyperkalemia, or an excess of potassium, is treated by a special diet consisting of carbohydrates and fat (63, 72).

Magnesium is an essential mineral found in the soft tissues and bones. Usually, magnesium is present in sufficient amounts. The intake of magnesium, however, is determined by the number of calories consumed. For example, a well rounded American diet contains 120 mg. per 1000 k. cal. of magnesium. The recommended allowance for magnesium is 300 mg. for women and 350 mg. for men (16). This would mean that the elderly would need to consume 2500 calories a day to meet the magnesium requirements. However, the recommended number of calories for the elderly reference man and woman is 2400 and 1700, respectively.

Thus, it is quite possible that magnesium intake may be low in the elderly, especially in women (63). It is interesting to note that in experimental animals the lack of magnesium in the diet accentuates the development of arteriosclerosis and calcification of the soft tissues (27).

Vitamins, too, are essential dietary constituents needed throughout life. Once adult age is reached the vitamin requirements remain the same (29). The fact that vitamin shortage is a problem of the aged is evidenced by the fact that many of the characteristics of old age such as fatigue, weakness and even mild paralysis may be attributed to the lack of sufficient vitamin intake (26).

The essential vitamins known to man are vitamin A, D, E, K, thiamin, riboflavin, niacin, vitamin B₆, vitamin B₁₂, ascorbic acid (vitamin C), folic acid, pantothenic acid and biotin. Although no requirements have yet been set for vitamin K or biotin they are still considered essential (29). Of the fat soluble vitamins A, D, E, and K, vitamin E has previously been discussed and will not be covered here.

✓ Vitamin A requirements call for 5000 I.U. daily with no special recommendations for the elderly (16). However, according to the Ten State Nutrition Survey vitamin A was one of the nutrients lacking in the diets of the aged. Almost 40 per cent consumed less than half the amount of vitamin A considered as adequate (26). Other studies further confirm that the elderly are many times lacking in their intake of vitamin A (37).α

Vitamin D, which has previously been mentioned in relation to calcium absorption, is important both in infancy and in adult life. Adequate intakes are thus vital for the elderly. The recommended level

of intake is 400 I.U. daily (16). Those elderly confined to their homes are especially susceptible to the lack of vitamin D. However, it takes 10-20 months for the body to lose its stores of fat soluble vitamins and thus a long time for a vitamin deficiency to manifest itself. This fact may be one reason why vitamin deficiencies may not be readily recognized (29).

Of the water soluble vitamins vitamin C, or ascorbic acid, is often reported as inadequate in the diets of the elderly (31,63). The amount recommended for daily intake is 55 mg. for adult women and 60 mg. for men (16). Some experimenters advocate greater ascorbic acid intakes for the elderly and claim that such an increase has led to more vitality and vigor in the aged who were studied (72).

The B-complex vitamins are thiamin, riboflavin, and niacin. The National Research Council recommends the daily intake of 1.3 mg. of thiamin for men 55 years and over and 1.0 mg. for women this age. The daily intake of riboflavin is set at 1.7 mg. for adult men and 1.5 mg. for adult women (16). Both of these B-complex vitamins are often reported to be in inadequate amounts in diet surveys of the elderly (63). As yet, however, there is no indication that the recommended amount of thiamin and riboflavin needs to be increased for the aged (72).

The third B vitamin, niacin equivalents or nicotinic acid, has also been reported to be below recommended allowances (57). The daily dietary allowance is 14 mg. equivalents for the reference man and 13 mg. equivalents for the reference woman (16). Niacin, however, is further influenced by the amount of tryptophan, an essential amino acid found in protein foods, that is in the diet. Tryptophan can be converted to nicotinic acid in a metabolic process with 1 mg. of niacin

being formed for every 60 mg. of tryptophan. Thus, the amount of niacin present in the diet is influenced by the amount of dietary protein that is ingested. Since protein is often consumed in small amounts by the elderly, this may be one reason why niacin is also reported to be lacking in their diets. Furthermore, the lack of niacin may be the cause of loss of appetite, mild digestive disturbances, anxiety, irritability, depression and in severe cases delusional states (63).

The recommendations for vitamin B₆ are 2.0 mg. for both men and women 55 and over (16). There is some indication that the metabolism of vitamin B₆ is altered in the older adult but more research is needed to understand why vitamin B₆ is reduced and to pinpoint the consequences (22).

Vitamin B₁₂ has many functions in the body. However, in order to be absorbed, gastric mucoprotein, or the intrinsic factor, needs to be present. If B₁₂ is not absorbed then pernicious anemia may result. According to Clifford, pernicious anemia is found almost exclusively in older people. His theory is that in the elderly the presence of gastritis may eliminate hydrochloric acid secretion and in turn the intrinsic factor (33). At present the Recommended Dietary Allowance for vitamin B₁₂ is 6 mg. per day for the elderly (16).

Folacin, or folic acid, is one of the vitamins which is commonly lacking in man. One form of nutritional anemia which is somewhat widespread is due to a lack of folic acid. Also, anemia of this type is often accompanied by an ascorbic acid deficiency since both folic acid and vitamin C are found in fresh fruits and vegetables (33). Such a deficiency may be caused by an inadequate diet, poor absorption and

utilization, or increased excretion. Most deficiencies of folic acid occur in those who are past the age of 65 (63). Yet the amount of folic acid recommended for the elderly, 0.4 mg. per day, is the same as for young adults (16).

Pantothenic acid is another essential vitamin which is widely distributed in foods. If the diet provides adequate amounts of the other B-vitamins then this vitamin requirement should be met. Pantothenic acid functions as a coenzyme in the metabolism of carbohydrates and fats (63).

Vitamin and Mineral Supplements

Many of the elderly take vitamin and mineral supplements. In the United States Department of Agriculture study in 1969 those who were 75 and over were more prone to take supplements. In the 18-54 age group more women were using supplements than were men (63). In a study conducted by Le Bovit over 37 per cent of those interviewed were taking supplements. The supplements generally were of the multi-vitamin type with only a few containing iron or calcium. The most striking fact was that even with the inclusions of the supplements only 4 per cent of the diets were improved to the point where they could be considered good. Furthermore, only two in ten took vitamin and mineral preparations which fulfilled their needs (31). In a study by Steinkamp and co-workers 37 per cent of the elderly who had good diets were taking supplements in addition to their already adequate intake of nutrients. In cases where the food intake was two-thirds or below the Recommended Dietary Allowances, 1968, few were taking the vitamins or minerals they needed. For example, only 12 of 63 low in vitamin A, 11 of 43 low in

vitamin C, eight of 45 low in calcium, four of 29 low in riboflavin and three of 11 low in thiamin were taking a preparation which supplied them with the vitamin they were lacking (57).

As for mineral supplements only three of 89 were taking the calcium supplements they needed and none of the 23 who were low in iron were taking supplements containing iron. It can be concluded, then, that few elderly are taking the supplement they need to replace their vitamin or mineral deficiencies (57).

Additional Factors Affecting the Nutrition of the Aged

Several factors other than physiology govern an elderly persons selection of food. Income, social and psychological status, as well as education and culture are all involved (35,59).

As of 1968 older families averaged just under half of the income of younger families and 30 per cent of the aged had incomes under \$3,000. Older adults who are living alone or with non-relatives averaged only two-fifths of the income of their younger counterparts. Also, 40 per cent of the elderly in 1968 had incomes below the poverty line (48). The largest percentage of the income of the older adult came from retirement benefits such as social security, private pensions, railroad retirement and government employees. Income from assets provided the next highest percentage followed by earnings from employment, public assets and veterans benefits (48). Social security benefits in 1968 averaged \$98.90 a month for retired workers, \$51.20 a month for a spouse and \$86.50 a month for an aged widow. According the the United States Bureau of Labor Statistics a moderate income for a retired

elderly couple should be about \$370 per month. It is obvious then that those receiving retirement benefits are far below the amount recommended. Furthermore, many of the elderly are not eligible for social security benefits (29).

When comparing the diets and food expenditures of the elderly who had low incomes to those who had high incomes it was found that the percentage of households with good diets increased markedly with an increase in income (42). Of those who had less to spend for food, 60 per cent had poor diets whereas only 2 per cent of the high income group had poor diets (29). In another survey of healthy older adults the ten worst diets were found among those whose incomes were around \$1,450 (13). However, in the food consumption survey conducted by the United States Department of Agriculture over one-third of the households with incomes over \$10,000 had diets that fell below the allowances for one or more nutrients (1).

The fact is that many of the elderly of both high and low incomes need some guidance on how to spend their money wisely so that they will purchase and prepare foods that are nutritionally beneficial (31). What generally happens is that the elderly turn toward the cheaper buys at the supermarket which are usually carbohydrates. The meat, fish, poultry, milk and eggs which they need for a good diet are too expensive (41). Consequently the elderly buy snack-type foods, starches and sweets in an effort to appease their appetite and at the same time save money (29,59).

Another factor which influences the type of grocery shopping done by the elderly is transportation. Most retired couples have cars and are able to drive to the supermarkets. However, the single elderly,

composed mainly of women with low incomes, are less likely to have their own car and thus must rely on friends or relatives to take them, or they must walk to the nearest grocery store. Both of these situations present limitations. In the first instance the elderly cannot go to the store when they need to and in the latter case they can carry only a small amount of groceries since they are on foot (29). This fact alone does not enable the elderly to shop around for the best buys.

Educational background is also related to nutritional deficiencies (42). One-half of the elderly people have only an elementary education or less. Of every 100 people 65 and over, eight men and eight women have had from zero to five years of formal education (48). In general the more education the elderly have had the more likely they are to have good diets providing that their education has included some information on food selection and preparation (63).

Many nutritionists and social scientists believe that there is a relationship between companionship and the digestive processes. Thus, loneliness which often plagues the elderly may have a negative effect on the nutritional status of the older adult (37,41,58). In one study done in Kansas City it was found that those who stayed the most active in their community and the most involved in society were the most satisfied with their lives and had the highest morale (64). In another study of healthy, active older women the diets of these women provided two-thirds or more of the Recommended Dietary Allowances, 1958, for all nutrients with only two women out of 35 lacking in sufficient calcium (21).

✓ One form of social activity is eating. Throughout life eating has involved many social and family get-togethers and has been associated

with enjoyment. As a person ages he is faced with the loss of many friends and relatives and with this loss comes a reduction in his eating companions (64). In 1968 seven of every ten older adults lived in families and about one-fourth lived alone or with non-relatives. Fortunately, only one in 20 lived in an institution. Three times as many older women than men lived alone or with non-relatives (48). Thus, most lived on their own and not with their relatives. As a result they tended to shop and eat quite separately from their families (29).

Usually older people follow the dietary patterns of the area in which they live as well as the dietary patterns they formed as children. Many men and women, however, who are not equipped to handle the changes that retirement brings alter their food habits. Some elderly women, for example, who no longer have a specific job in life are not motivated to plan and prepare as carefully for meals as perhaps they formerly did. Also, losses through death and mobility may have a definite psychological effect on the elderly (29).

To compensate some may select food which is familiar and remembered by them and which may be reminiscent of things past. The choice and manner of eating thus becomes highly personalized for the older individual. For some, the new life they face is one of loneliness and isolation. As a result they may eat an inadequate amount of food. According to psychologists this is a plea for attention and caring (29). Others become more concerned with their health during the later years and are willing to buy any food which promises them relief from illness or pain. Thus, they are likely victims for health foods, vitamin supplements and other food fads (29,63).

How the Community Can Aid the Elderly

Since food habits are so deeply ingrained in each individual, the job of changing these habits is indeed a challenge. Yet in many cases it is up to the nutritionists, physicians, public health nurses and social workers to try to improve the dietary intake of the older adult (29). It becomes the duty of the professional to convince the elderly that food is important to health, that they need to budget their money and spend it on the foods which will be beneficial to them, that they need to watch their caloric intake and that they need to discriminate between food facts and fallacies (31,71).

Several studies have been conducted to determine the most effective way of changing food habits. The results of these studies indicate that the best approach is through group discussion and decision making procedures. In order to maximize learning the learner should participate in discussions and demonstrations. They should have practice in the subjects that are being covered and they should be given time to assimilate the information. Of importance also is that the person knows how he is doing, is successful in his endeavors and receives some acknowledgment. Once an individual has learned a task he should overlearn it and be able to make appropriate responses to similar situations in the future (29).

In addition to the professionals several communities have taken an interest in the needs of the elderly and have established programs to help provide them with useful services. Most of the programs that have been developed include five basic elements: (a) locating and reaching the elderly in need; (b) serving meals; (c) building nutrition

education; (d) providing other necessary services; and (e) establishing a means of continuing evaluation (35). The three basic forms which these programs take are those involving group dining, in-resident food service and educational and consultative services (29).

Group dining enables the individual to share a meal with others and thus fulfills his need for social interaction. In addition the meals in all projects are designed to meet one-third of all the day's nutrient needs of the elderly. Meals are usually prepared in community action centers, schools, churches, or senior centers (11,30,47). The choice of sites should be in walking distance or should be close to public transportation. When this is not possible then transportation can be provided by volunteers, local businesses or organizations (51, 53,54,55). Where appropriate facilities are not available for providing meals then caterers may be used (50). In most cases there is some charge for the meal. However, there may be several individuals who are unable or unwilling to pay the price. Some form of subsidy then is essential for widespread participation.

Some forms of recreation and education can be incorporated into the feeding programs (46,50,52). Likewise nutrition education, if used effectively, can involve the elderly by letting them actively participate in the planning, serving, and preparing of meals (29,35,47).

In-residence food service is designed to provide meals for the elderly who cannot care for themselves because of physical or mental illness. The "Meals on Wheels" project is a program which falls into this category. Food is prepared in centrally located kitchens and is delivered once or twice a day five days a week to those confined to their homes. A nominal fee is usually charged. The success of the

program rests on recruiting and maintaining an adequate staff of volunteers who are responsible for delivery (15,45,74).

Educational and consultant services can be of great assistance to the older adult. For example, many elderly are eligible for food stamps and commodities. Several, however, do not understand either program. Food stamps which are available to low income families are purchased prior to shopping. In return for the money spent the individual receives coupons which are valued at more than the original amount. The Federal Government pays the difference. The coupons are used to purchase human food at any retail store. In addition to not understanding the procedure many cannot obligate their small income in advance. Others have no means of getting to the store in order to purchase food or stamps (29). In one instance stamps are being mailed to the elderly who qualify for them (20). Also, recent Food Stamp regulations from the United States Department of Agriculture state,

...elderly participants who are disabled or feeble so that they cannot adequately prepare all of their meals, may use food stamps to pay for meals delivered to them by a non-profit, meal delivery service if available (11,76).

Commodity foods which are processed and packaged by the United States Department of Agriculture are, also, for those in need of food assistance. However, problems do exist with the program. For many the pick-up locations may be inaccessible, for others the pick-up time may be limited. In some cases the elderly are not familiar with the commodities and thus do not know how to use them. Fortunately, many communities are alleviating one area of concern by delivering the much needed foods to the homes of the older adults (17,18). Others are giving classes where the elderly can learn how to cook with the donated foods (19).

Another educational service would be helping the elderly to become better consumers. In one program in Phoenix, Arizona, nutritionists accompany the elderly to the grocery store to assist them in buying food (29). Many older adults are also in need of therapeutic and nutritional counseling. Such services are being provided in several areas across the nation.

In addition to local communities the federal government is placing new emphasis on the nutrition of the elderly. During the White House Conference on Aging the following recommendations were made:

- Action programs should provide funds for rehabilitation of the malnourished aged and to prevent malnutrition among those approaching old age; but adequate funds should be provided for research evaluation of program results and techniques.
- High standards for food and nutrition services should be required in all federally-assisted institutional care; and all health programs, including Medicare and Medicaid, should have nutrition service and nutrition counseling components.
- Needs of the poor should have priority attention, but a significant portion of funds should be designated for nutrition education of all consumers.
- All meal delivery systems should stress the favorable psychological values and "economics inherent in group feeding".
- Improvements should be made in the Food Stamp and Food Commodities programs (56,p. 55).

The committee also expressed concern over food and its relationship to an individuals well being in later years.

Food is more than a source of essential nutrients--it can be an enjoyable interlude in an otherwise drab existence. Thus, provision should be made to meet the social as well as the nutritional needs of older people, a factor that adds dignity and significance to the life of the aged is the feeling that they too are useful and important. Assistance should be provided to make possible preparation of meals for themselves and others. Community meals, however, should be an alternative. Volunteer groups can be involved in such services as transportation, shopping, and distribution of hot meals. Young people should be encouraged to participate in these services.

All nutrition programs should be supplemented by appropriate educational measures. Older people should be

protected from food quackery and unfounded nutritional claims. Lack of research, evaluation and communication lead to failure of otherwise good programs and to the perpetuation of poor programs. The search for more efficient and better means of providing for good nutrition, health and happiness of older people should be a continuous process (56,p. 54).

In summary then although no single approach in bettering the nutrition of the aged is the total answer, each service can aid in accomplishing a major goal. That goal is to make the individual as independent as possible (35). By preventing malnutrition the elderly person can avoid being institutionalized and can remain at home. In this way he can become an asset to his community rather than a liability.

Methods for Conducting Dietary Surveys

Three methods that have been studied and compared in detail are the seven-day record, the dietary interview and the twenty-four-hour recall. The method used depends on such factors as the type of data to be collected (individual or group), the amount of information that is needed, the scope of the problem and the competence and number of the staff.

For individual studies the dietary history, which requires an experienced interviewer, is preferred since it reveals previous and present food practices and can be compared to clinical and laboratory findings. For a group the twenty-four-hour recall can be of infinite value if a large enough sample is used. However, when the dietary history and the twenty-four-hour recall are compared to the seven-day, and the seven-day to the twenty-four-hour the following data results.

In group studies using grade school and high school children,

college graduates and pregnant women as subjects, the dietary history gave higher values for grade school and pregnant women than did the twenty-four-hour recall. However, the two methods yielded the same results for the college age population. In the seven-day and the twenty-four-hour recall there was a high correlation for most nutrients. Thus, where time is a factor, the twenty-four-hour method could be substituted for the seven-day in group studies. In individual surveys the twenty-four-hour recall did not give the same estimate of intake as the two other methods and thus, one could not be used for the other (75).

Trulson further studied the three methods to determine if they could be interchanged. She devised an experiment where the subjects weighed and recorded their food for one week. These same subjects were then interviewed and a pattern for usual dietary practices was established and correlated with the family food purchases. Finally, the group related three or more twenty-four-hour recalls of food intake which were viewed in conjunction with their activities. When the means for protein, milk, eggs, carotene and ascorbic acid were compared the correlation coefficient for the seven-day record and the interview method were similar. However, the mean values of foods and nutrients in the three methods were not constant. Trulson concluded then that only one method should be used when conducting a study, or when using two methods, the researcher should correct for variables (65).

According to Dr. Beal none of the techniques used to determine dietary intakes are totally satisfactory. Each has its limitations (3,4). The perfect method would be to weigh or measure all food consumed over a period of time and to analyze each food sample. However,

the amount of time, money and personnel that would be required for such a project would not make this method feasible (3). The dietary history which covers the frequency and amounts of foods eaten over a period of time is of value only if the interviewer is skilled, if the history itself is detailed enough and if the subject is cooperative and intelligent (4). The twenty-four-hour recall, though not time consuming, is limited in use. The method does not give information on the long term intake of nutrients. Thus, the twenty-four-hour recall cannot be expected to coincide with biochemical and physical findings since such results indicate the long time diet of an individual. Also, a person's diet may change with the season, with his physical state, with illness, or for no reason at all. The one-day recall is profitable, however, when a large sample is used and when the diet is fairly monotonous (4).

Food Composition Tables

There are several food tables that can be used for the assessment of diets. One is Bowes and Church Food Values of Portions Commonly Used (10). Food values have been calculated for standard portions. Also, each food is listed according to the nutrients it contains. There are 26 possible nutrients included in the table.

Another table, the Composition of Foods-Raw, Processed, and Prepared, is published by the United States Department of Agriculture and covers 2,500 food items (73). The data is presented in two tables, one of which is the amount of nutrients for 100 grams of edible portion of food, and the other the amount of nutrient in the edible portion of one pound of food "as purchased".

The different breeds, varieties, stages

of maturity and seasonal and geographic differences have been considered when testing the various foods. Also, production, storage, trimming, manufacturing and other processes have been taken into account. The information on the nutrient content of foods has been derived chiefly from chemical analysis of the different food items.

The United States Department of Agriculture has also published a pamphlet called the Nutritive Value of Foods. Common household measurements are used. The food values for 615 foods are represented (70). The foods are listed according to food groups with additional columns for sugars and miscellaneous items. The pamphlet is currently being used as the basis for a computer program at Oklahoma State University.

Recommended Dietary Allowances, Revised 1968

Once data has been collected, and analyzed or calculated, the next step is to evaluate the dietary intakes. Often the Recommended Dietary Allowances, 1968, are used to assess an individual's state of nutrition. The Food and Nutrition Board cautions, however, that to judge a person's diet as poor based on comparison with the Recommended Dietary Allowances is not valid. Clinical, physical, or biochemical evidence of malnutrition must be obtained before declaring an individual to be nutritionally deficient (4).

The Recommended Dietary Allowances, 1968, are designed as a guide for the general population. Every four to five years the Recommended Dietary Allowance is revised in accordance with new knowledge of nutritional needs. Various age groups are listed according to sex with pregnant and lactating mothers treated separately. Since the Recommended Dietary Allowances allow for a margin of safety over the average

physiological requirements, an individual's diet is not considered inadequate unless it fails to meet approximately two-thirds of the requirements for one or several nutrients. x <

The Recommended Dietary Allowances should not be confused with the Minimum Daily Requirements which have been set by the Food and Drug Administration. The Minimum Daily Requirements are the lowest amounts required for the prevention of deficiency diseases. They are generally considerably less than the Recommended Dietary Allowances and apply to standards established for labeling foods and pharmaceutical preparations for special dietary uses (70).

The Use of the Computer in Calculating Dietary Intakes

Hand calculating the nutrients in foods is a time-consuming process that is subject to human error. With the development of data processing techniques and the use of computers, the nutritive values of foods can be determined quickly and accurately (6). In several instances the computer has been used in hospitals, in nutrition clinics and in dietary surveys with quite satisfactory results (6,36,62,66). Although the initial cost of card punching is relatively high, the cards can be used over and over again. Also, when compared to the cost and time involved in hand calculating nutrients the savings gained by using the computer are great (62,66).

CHAPTER III

METHODS AND PROCEDURES

Research Design

This project on aging was begun in June, 1972, at Oklahoma State University. Three graduate students in Foods, Nutrition, and Institution Administration worked together to compose an interview that could be used with men and women 65 years of age and older. The interview that resulted was divided into two parts. The first four pages were for the twenty-four-hour recall. The second part was to ascertain the interviewees interest in feeding programs for the elderly and to assess personal information on each subject. The purpose of the interview and the survey was to determine the dietary intakes of the elderly, as well as what influenced their food habits and whether or not they would be interested in eating a meal prepared and served at a school lunchroom.

The interview was tested in a presurvey at the Glencoe Senior Citizens Club. Ten out of the group were interviewed. The only major change that resulted from the pretest was a coding device at the top of the page which enabled the interviewer to discreetly note the individual's build, ethnic group, physical and mental state. The letter C was used to denote the subject's number, and P, M, E, and B, were used to represent physical condition, mental well being, ethnic

group and build, respectively.

Two communities, Shawnee and Morrison, Oklahoma, were chosen for the survey. Shawnee has a population of 25,075, of which 4,157 are 65 and over (69). Since the school lunch director had expressed an interest in school lunch meals for the elderly, the research team was especially interested in determining the number of older adults in the area who would participate in such a program. Permission to interview in Shawnee was secured from the local Chamber of Commerce. The survey was conducted on six separate days during the four week period of July 26 to August 26, 1972.

The section chosen for the survey was located in the older part of town where many of the aged and low income groups lived. The area was also the site of the Washington Elementary School where lunches could be served to the elderly. A boundary was drawn from the O.C.A.A. (Oklahoma City, Ada, and Atoka) and A.T.S.F. (Atchison, Topeka and Santa Fe) railroad tracks on the East, to Tennessee Street on the West and from Oakland Street on the North to Bentley Street on the South. The statistical procedure used was the block sampling type. On every other block running north and south, and on Hayes and Forrest Streets running east and west men and women 65 years and older were interviewed until 100 questionnaires were completed. The interviewers knocked on every door on each block. They introduced themselves as home economics students from Oklahoma State University who were interested in talking to people 65 and older about their food habits. Once inside the subjects were told more about the interview including the possibility of having a feeding program for the elderly at the Washington Elementary School. The interviewers went in pairs so that one could do the

questioning while the other recorded the information.

The twenty-four-hour recall involved asking the interviewee what they ate from the time they got up in the morning until ten a.m., from ten a.m. to three p.m., from three p.m. to eight p.m., and from eight p.m. to bedtime. This was done in an effort to eliminate the breakfast, lunch and dinner syndrome. The types of food and the servings were recorded. Space was provided on the left side of the interview for the code number of each food.

Morrison which is a town numbering 421 people, 35 of whom are 65 and over, was chosen because there is no hospital or nursing home in the area which could care for or feed the elderly (69). The school was the only public facility that could furnish food. The same interview and block sampling method used in Shawnee was used to survey the community of Morrison. Thirteen older adults were interviewed on September 12, 1972.

After collecting the data each member of the research team studied one particular area of interest. Thus, the only information contained in this thesis is that which relates to nutrition.

Computer Program

The information from the dietary recall was placed on 80 column computer cards using the Nutritive Value of Foods as a reference (70). The number of food code and servings were governed by the variety of foods eaten. The breakdown of foods into calories and nutrients were the items of interest in this study. The eight nutrients considered were protein, calcium, iron, vitamin A, thiamin, riboflavin, niacin, and ascorbic acid. The program was also designed to give information

on desirable weight and intake of calories for the amount of exercise. However, the original program was set up for college students. Thus, the latter material could not be used.

A second bank of cards was made which divided the subjects into 13 categories. See Appendix B. They were listed according to the city they were living in, as well as to age, sex, physical and mental condition, build, social, economical and educational status. The elderly were further categorized as to their use or non-use of supplements, and special diets. Their access to food other than the store as well as their ability to get to the grocery store were recorded on the cards. The age groups were divided into the 65 to 75 year-olds and the 75 year-olds and older. Their physical and mental conditions were simply noted by the interviewer and were considered to be excellent, good, fair, or poor. Their build was, also, determined by the researcher and was listed as thin, average, stout, or obese. Their dining habits were divided into those who ate alone and those who ate with others. Although the many types of mineral and vitamin supplements and special diets were not considered, they were listed as either a part of the daily regimen of the elderly or not. The economic level and the level of education were divided into the categories that were listed in the questionnaire. The last two areas which referred to the grocery store were treated as "yes" or "no" answers. All 13 categories and the divisions under them were assigned numbers which could be used as a code on the computer cards.

A statistical analysis system from North Carolina State University¹

¹Statistical Analysis System (Copyright Institute of State, Raleigh Division, 1972).

was used for computing the final program. With this method the calories and nutrients consumed were also calculated for each of the 13 categories. The nine variables were again calories, protein, calcium, iron, vitamin A, thiamin, riboflavin, niacin, and ascorbic acid. In the analysis of the results the Recommended Dietary Allowances, Revised 1968, were used as a standard of comparison. J <

CHAPTER IV

RESULTS AND DISCUSSION

Two elderly populations in Oklahoma were surveyed using the block sampling method. Only men and women 65 years old and over were interviewed. There were 113 subjects in all. All interviewees were given a 24-hour dietary recall and were asked questions pertaining to their personal lives as well as to their interest in a meal provided by the school lunch. The interview used is in Appendix A.

The Recommended Daily Dietary Allowances, Revised 1968 (16), for age group 55 to 74+ years for male and female were used as the standard of nutrient allowances. The value given for each nutrient studied was considered to be 100 per cent of the amount recommended for an individual per day. See Table I. The values obtained for the nutrients consumed by all subjects were expressed as a per cent of the Recommended Daily Allowances. The mean standard deviation of Recommended Dietary Allowances for each nutrient consumed are presented in Table II.

Nutrient Intake Compared to the Recommended Dietary Allowances, Revised 1968

When compared to the recommended allowances there is a definite indication that the calorie and nutrient intake of the elderly subjects in this study are below the amounts given in Table I. In only one case, ascorbic acid, does the amount consumed surpass that recommended.

TABLE I
RECOMMENDED DAILY DIETARY ALLOWANCES, REVISED 1968

Sex	Calories	Protein mg.	Calcium mg.	Iron mg.	Vitamin A I.U.	Thiamin mg.	Ribo- flavin mg.	Niacin mg.	Ascorbic Acid mg.
Male, 55-75+ years	2400	65	0.8	10	5000	1.2	1.7	14	60
Female, 55-75+ years	1700	55	0.8	10	5000	1.0	1.5	13	55

TABLE II
THE MEAN AND STANDARD DEVIATION OF RECOMMENDED DIETARY
ALLOWANCES CONSUMED BY ELDERLY SUBJECTS

Nutrient	Mean %	Standard Deviation %
Calories	64.93	24.93
Protein	91.64	36.82
Calcium	64.37	35.37
Iron	89.21	75.15
Vitamin A	69.00	60.75
Thiamin	76.37	35.71
Riboflavin	70.26	30.77
Niacin	83.30	44.29
Ascorbic Acid	121.17	119.20

Perhaps the reason for the excess amount of vitamin C is that the interview was conducted during the summer when tomatoes were grown in many home gardens of the subjects. ~~X~~If one considers that two-thirds of the recommended allowances are adequate for normal nutrition then it is obvious that the elderly subjects studied here were below the minimum of 66.66 per cent in calories and calcium. In addition the mean consumption of vitamin A was only 2.34 per cent above the recommended 66.66 per cent minimum. The intake of thiamin, riboflavin and niacin was 76, 70, and 83 per cent, respectively. Surprisingly, the intake of iron and protein were quite high at 89 and 91 per cent.

Correlation Coefficients of Nutrients

Table III contains the correlation coefficients and the level of significance for the nutrients consumed by all of the elderly subjects interviewed. There were only three cases where the intake of one nutrient was not related to the intake of another at the level of significance of 0.05. The consumption of vitamin A was not related to the intake of protein or niacin, nor was the intake of iron related to that of calcium.

Table IV shows the correlation between nutrients consumed adjusted for sex. Again vitamin A was not related to the amount of protein or niacin consumed nor was it dependent upon the number of calories in a diet. Iron and calcium intake were not correlated at the 0.05 level of significance. The correlations indicated in Table IV are true for all 13 categories studied with the following exceptions. When sources of food other than the grocery store were considered, the intake of calcium was not related to the intake of niacin at the 0.05 level of

TABLE III

PERCENTAGE OF CORRELATION BETWEEN THE NUTRIENTS CONSUMED BY BOTH SEXES

Nutrients	Calories	Protein	Calcium	Iron	Vitamin A	Thiamin	Ribo-flavin	Niacin	Ascorbic Acid
Calories	100 .0000	71.83 .0001	54.48 .0001	31.82 .0009	17.56 .0594	69.93 .0001	69.26 .0001	41.74 .0001	36.51 .0002
Protein	71.83 .0001	100 .0000	58.57 .0001	26.79 .0044	12.81* .1726	63.79 .0001	76.28 .0001	67.39 .0001	33.82 .0005
Calcium	54.48 .0001	58.57 .0001	100 .0000	15.17* .1046	31.25 .0011	42.00 .0001	91.52 .0001	20.73 .0259	41.20 .0001
Iron	31.82 .0009	26.79 .0044	15.17* .1046	100 .0000	28.48 .0026	39.18 .0001	25.03 .0075	21.45 .0212	27.31 .0037
Vitamin A	17.56 .0594	12.81* .1726	31.25 .0011	28.48 .0026	100 .0000	22.99 .0136	28.93 .0023	08.54* .6283	45.23 .0001
Thiamin	69.93 .0001	63.79 .0001	42.00 .0001	39.18 .0001	22.99 .0136	100 .0000	59.50 .0001	42.73 .0001	55.54 .0001
Riboflavin	69.26 .0001	76.28 .0001	91.52 .0001	25.03 .0075	28.93 .0023	59.50 .0001	100 .0000	36.94 .0002	42.18 .0001
Niacin	41.74 .0001	67.39 .0001	20.73 .0259	21.45 .0212	08.54* .6283	42.75 .0001	36.94 .0002	100 .0000	28.37 .0027
Ascorbic Acid	36.51 .0002	33.82 .0005	41.20 .0001	27.31 .0037	45.23 .0001	55.54 .0001	42.18 .0001	28.37 .0027	100 .0000

* Not significant at 0.05 level

TABLE IV

PERCENTAGE OF CORRELATION BETWEEN NUTRIENTS CONSUMED ADJUSTED FOR SEX

Nutrient	Calories %	Protein %	Calcium %	Iron %	Vitamin A %	Thiamin %	Ribofla- vin %	Niacin %	Ascorbic Acid %
Calories	100 .0000	72 .0001	54 .0001	31 .0012	16 .0834*	69 .0001	69 .0001	47 .0001	32 .0010
Protein	72 .0001	100 .0000	58 .0001	26 .0055	12 .2031*	63 .0001	76 .0001	69 .0001	32 .0009
Calcium	54 .0001	58 .0001	100 .0000	15 .1203*	31 .0013	41 .0001	91 .0001	22 .0196	26 .0050
Iron	31 .0012	26 .0055	15 .1203*	100 .0000	28 .0030	39 .0001	24 .0095	22 .0171	26 .0050
Vitamin A	16 .0834*	12 .2031*	31 .0013	28 .0030	100 .0000	22 .0175	28 .0029	9 .6682*	45 .0001
Thiamin	69 .0001	76 .0001	91 .0001	24 .0095	28 .0029	59 .0001	100 .0000	39 .0001	40 .0001
Riboflavin	69 .0001	76 .0001	91 .0001	24 .0095	28 .0029	59 .0001	100 .0000	39 .0001	40 .0001
Niacin	47 .0001	69 .0001	22 .0196	22 .0171	9 .6682	45 .0001	39 .0001	100 .0000	31 .0011
Ascorbic Acid	32 .0010	32 .0009	40 .0001	26 .0050	45 .0001	54 .0001	40 .0001	31 .0011	100 .0000

*Not significant at the 0.05 level

significance. When compared to the mental condition of the subjects, their level of education, their use or nonuse of a special diet and their habit of eating alone or with others, vitamin A and calorie intake were significant at the 0.05 level.

Mean Nutrient Intake for the 13 Categories Studied

Presented in Table V are the mean percentages of Recommended Dietary Allowances consumed according to the 13 categories studied. There were 43 males and 70 females interviewed. The women consumed a higher percentage of nutrients with the exception of niacin than did the men. The males were far below 66.66 per cent of the Recommended Dietary Allowances in calories, calcium, vitamin A and riboflavin. The females were on the borderline for the amount of calcium recommended with a mean per cent of 66.96 per cent. The females consumed well over the 55 grams of vitamin C that was recommended for them. Calorie, vitamin A and riboflavin intakes were relatively low for women while protein and iron consumption was quite high.

In the next category, age, where there were 54 who were between 65-75 years and 59 who were 75+ years, there was little if any difference between the age groups and their nutrient intake. When the nutrient intakes of users and non-users of supplements were compared there was no indication that the users were consuming the nutrients they needed. The category dealing with the ability to obtain food from sources other than the grocery store showed that the 73 people who had additional food sources had higher percentage intakes of nutrients than did the 40 who had to rely solely on the grocery store.

TABLE V
MEAN PERCENTAGES OF RECOMMENDED DIETARY ALLOWANCES CONSUMED ACCORDING
TO THE 13 CATEGORIES STUDIED

Class	Number %	Calories %	Protein %	Calcium %	Iron %	Vitamin A %	Thiamin %	Riboflavin %	Niacin %	Ascorbic Acid %
Sex										
Male	43	55.11	85.62	60.18	82.42	63.60	69.36	64.75	88.71	86.94
Female	70	70.97	95.35	66.96	93.39	72.33	80.69	73.65	79.98	142.21
Age										
65-75 years	54	68.36	96.68	64.78	87.57	78.17	76.26	70.27	86.99	127.65
75+ years	59	61.80	87.04	64.01	90.71	60.62	76.49	70.25	79.92	115.25
Supplements										
Users	52	63.07	92.73	65.35	80.04	66.57	72.75	69.31	90.83	119.72
Non-users	61	66.53	90.73	65.55	97.03	71.08	79.47	71.07	76.89	122.42
Additional Food Sources										
Yes	73	68.79	100.13	70.33	97.49	70.82	80.35	76.78	89.39	127.50
No	40	57.90	76.16	53.51	74.10	65.69	69.12	58.35	72.19	109.64
Income Source										
Social Security	37	63.38	90.72	62.42	82.22	59.78	75.44	67.98	79.67	117.23
Retirement	11	81.90	102.45	72.67	101.18	73.61	92.26	82.98	99.65	103.80
Welfare	12	58.87	85.15	77.45	63.08	81.68	59.01	75.77	75.83	117.53
Private	2	79.71	130.91	122.25	79.00	86.75	124.50	107.33	93.85	375.45
Social Security + Welfare	16	56.80	81.91	54.86	119.50	72.79	72.25	64.85	75.48	139.63
Social Security + Retirement	13	78.87	107.39	86.95	107.92	92.93	98.62	89.49	83.02	108.57
Social Security + Private	10	68.18	94.66	53.54	80.70	46.41	66.07	56.24	95.46	118.89
Other	12	48.94	77.14	36.81	74.00	70.36	63.97	52.20	87.62	105.94
Special Diets										
Yes	25	60.62	91.95	69.39	79.12	89.28	71.59	73.75	81.11	143.40
No	86	66.16	91.56	62.95	92.08	63.25	77.73	69.27	83.92	114.86
Physical State										
Excellent	80	67.54	97.45	66.04	98.27	69.21	81.79	72.71	87.93	122.50
Good	23	59.79	76.99	58.41	69.48	78.47	63.22	64.48	76.82	114.93
Fair	7	64.28	91.21	70.07	77.14	46.74	71.02	71.27	75.60	110.41
Poor	3	36.47	50.30	52.46	27.00	42.93	45.33	46.89	27.44	158.79
Mental State										
Excellent	99	66.33	95.29	66.73	92.58	71.17	78.06	72.74	84.41	120.24
Good	11	59.67	70.81	51.40	69.18	49.22	70.82	57.98	84.55	148.77
Fair	2	30.24	39.09	37.88	46.00	103.00	34.00	34.33	36.54	75.45
Poor	1	53.82	65.45	27.13	63.00	04.50	56.00	32.00	53.85	01.82
Body Build										
Thin	22	69.07	90.06	66.27	82.86	58.15	70.37	73.18	87.59	102.84
Average	58	67.15	97.20	66.85	86.14	61.39	78.52	72.11	86.58	120.68
Stout	21	60.28	91.06	63.76	82.17	68.69	75.41	70.59	81.68	115.35
Obese	12	54.81	68.76	50.06	127.08	126.28	78.72	55.38	62.44	167.36
Education										
Less than 4th grade	26	59.69	86.00	63.63	77.92	69.96	72.49	70.06	92.10	123.25
4th-8th grade	67	63.83	91.78	63.00	91.27	71.49	78.08	69.25	82.24	129.22
9th-12th grade	12	80.06	98.58	74.12	89.42	54.74	72.53	76.27	60.13	98.80
High School graduate	6	65.32	97.67	58.52	115.50	74.40	69.69	66.76	93.21	49.04
Attended college	2	78.21	100.91	79.12	87.00	42.80	113.00	81.33	113.85	175.45
College graduate	0									
Access to Store										
Yes	80	64.97	91.95	64.85	84.31	70.61	75.32	69.79	87.31	105.71
No	33	64.84	90.92	63.23	101.09	65.11	78.94	71.41	73.59	158.67
Social										
Eat alone	44	63.54	88.44	67.03	94.95	83.53	75.61	72.98	78.86	147.95
Eat with others	69	65.83	93.69	62.69	85.55	59.75	76.87	68.53	86.13	104.10
City										
Shawnee	100	65.60	92.26	65.55	91.61	70.98	76.00	71.36	86.07	117.62
Morrison	13	59.81	86.92	55.33	70.77	53.81	79.27	61.79	62.01	148.57

The source of income greatly affected the number of calories and the amount of calcium, thiamin and riboflavin consumed. Most of the people were living on social security alone or in combination with welfare, retirement benefits, or private sources of income. The calories consumed by those on social security, welfare or both, as well as the group classified as "other", did not meet 66.66 per cent of the recommended allowances. Calcium was low for the social security, social security and welfare, social security and private, and "other" group. The welfare, social security and private, and "other" group had low intakes of thiamin. Riboflavin was less than two-thirds of the recommended allowances in the social security and welfare, social security and private and "other" group. Iron intake was low for those on welfare, and vitamin A was low for those on social security and social security with private incomes.

The subjects who were on special diets had a higher intake of vitamin A than those who were not on a special diet. Protein and thiamin seemed to be the two categories most related to physical condition. Since thiamin affects the appetite and protein the growth and maintenance of tissue this may be why the subjects seemed to be physically unfit. Ninety-nine of those interviewed appeared to be mentally alert.

There seemed to be no major difference between the grade in school completed and the amount of nutrients consumed. Since nutrition is a young science it is quite possible that the study of the nutrients was not a part of the school curriculum in the early 1900's. Actually very little work was done on the vitamins until 1920. Thus, it is evident that well over half of those interviewed would have been

through school by 1920.

The accessibility of the grocery store affected only the amount of ascorbic acid consumed. The 33 who were unable to get to the store had a higher intake of vitamin C. They were perhaps the ones who relied on their gardens. The subjects who ate alone consumed more ascorbic acid and vitamin A than did those who ate with others. When the two cities were compared there was little difference between the calories and nutrients consumed.

Correlation Between the 13 Categories and the Calories and Nutrients Consumed

Given in Table VI are the correlations between the 13 categories and the calories and nutrients consumed. The relationship between sex, calories and vitamin C; additional food sources, protein, calcium, and riboflavin; income and calcium; and body build and vitamin A; were all significant at 0.01 level or greater. The correlation between additional food sources, calories and niacin; income, thiamin and riboflavin; physical state, protein and thiamin; mental state and protein; education and vitamin C; and social, vitamin A and vitamin C; were all significant at 0.05 level.

Level of Significance for Each Category as Judged From the Nutrient Intake

The results of the Hotelling-Lawley's Trace and Pillai's Trace test are presented in Table VII. Both tests indicate the level of significance for each of the 13 categories as judged from total nutrient intake. The two sexes are shown to be significantly different at the

TABLE VI

CORRELATION BETWEEN THE 13 CATEGORIES AND THE CALORIES AND NUTRIENTS CONSUMED

Categories	Calories	Protein	Calcium	Iron	Vitamin A	Thiamin	Ribo- flavin	Niacin	Ascorbic Acid
Sex	.0012**	.1701	.6742	.5396	.5320	.0979	.1322	.3119	.0152**
Age	.1595	.1615	.9038	.8204	.1215	.9716	.9932	.5963	.5901
Supplements	.5284	.7719	.7842	.2305	.6984	.6782	.7607	.0916	.9008
Additional Food Sources	.0242*	.0011**	.0142**	.1100	.6733	.1062	.0024*	.0452*	.5449
Income	.0225*	.3541	.0030**	.6491	.6652	.0331*	.0220*	.8913	.2340
Special Diet	.6703	.9620	.5703	.5444	.0552*	.5431	.5297	.7772	.2930
Physical State	.1209	.0218*	.7259	.1714	.5709	.0572*	.3880	.0928	.9354
Mental State	.1801	.0257*	.2462	.6329	.3898	.3069	.0801	.5599	.6046
Build	.2888	.1089	.5176	.3292	.0056**	.8317	.3638	.3641	.5069
Education	.1785	.8623	.8272	.8545	.8823	.5819	.9303	.2309	.5097
Access to Store	.9782	.8883	.8213	.2822	.6675	.6320	.7956	.1312	.0292*
Social	.6420	.5311	.5347	.5262	.0394*	.8500	.5377	.5979	.0531*
City	.5607	.6305	.6698	.6485	.6583	.7559	.2935	.0618	.6153

*Significant at 0.05 level

**Significant at 0.01 level or less

TABLE VII

MULTIVARIATE ANALYSIS OF VARIANCE USING TWO DIFFERENT BUT SIMILAR F TESTS

Criteria	Sex	Age	Supple- ments	Food Sources	Income Source	Special Diets	Phys- ical	Mental	Build	Educa- tion	Access to Store	Social	City
Hotelling- Lawley's Trace	.0009*	.0915	.3240	.1279	.0104*	.3336	.3881	.6085	.0301*	.1107	.0157*	.1380	.1080
Pillai's Trace	.0009*	.0915	.3240	.1279	.0180*	.3336	.4077	.6080	.0591*	.1666	.0157*	.1380	.1080

* Significant at 0.05 level or greater

.0009 level of significance, The source of income influenced the nutrient intake of the subjects and was significant at the 0.01 level. The body builds in relation to nutrient intake were significantly different at the .0301 and .0591 level. And accessibility of the grocery store was significant at the .0157 level. The two age groups were significantly different at the 0.10 level as were the two cities. The other seven categories were not significantly related to nutrient intake at either the .05 or 0.10 level,

CHAPTER V

SUMMARY AND CONCLUSIONS

Men and women 65 years and older were interviewed in two communities in Oklahoma during July and August, 1972. In Shawnee 100 subjects and in Morrison 13 subjects were asked to give a 24-hour-dietary recall and to answer questions pertaining to their personal lives and to their interest in feeding programs for the elderly. The block sampling method was used.

After the data was collected it was analyzed using a statistical analysis system from North Carolina. The means which resulted from the comparison of the Recommended Dietary Allowances to actual intake showed that only in the case of vitamin C did the subjects consume over 100 per cent of that recommended. The mean intake of all other nutrients and calories was not equal to that recommended. The intake of calories was less than two-thirds of the allowances and the consumption of vitamin A was quite low. Iron and protein intake were high.

The correlation coefficient tables indicated that the consumption of vitamin A was not related to the intake of protein or niacin, nor was the intake of iron related to that of calcium. However, vitamin A and calorie intake were related at the 0.05 level of significance when the mental condition of the subjects, their level of education, their use or non-use of a special diet, and their habit of eating alone or with others were considered. Niacin and calcium were not related at

the 0,05 level of significance when the category, additional sources of food, was considered.

The mean nutrient intakes for the 13 categories showed that the females consumed more than did the males. Both males and females, however, had especially low intakes of calories, calcium, vitamin A and riboflavin. Vitamin C and calorie intake was significantly lower for the males than for the females.

The source of income affected the amount of calories, calcium, thiamin and riboflavin consumed. The latter three nutrients were significantly related to income. The intake of calcium was below two-thirds of the recommended amount for the social security, social security and welfare, social security and private and "other" group. Thiamin was low for the welfare, social security and private, and "other" group. Riboflavin was significantly low for the social security and welfare, social security and private and "other" group.

Access to additional food sources significantly increased the consumption of protein, calcium, riboflavin, calories and niacin. Those who ate alone and those who ate with others appeared to have similar diets. However, the intake of vitamin A and vitamin C was significantly higher for those eating alone. Although the physical state and the intake of protein and thiamin; the mental state and the intake of protein; and the body build and the intake of vitamin A were significantly related, little emphasis should be placed on these results since no clinical, biochemical or anthropometric tests were run. When the age groups, adherence to special diets or not, accessibility to the store or not, use or non-use of supplements, level of education and the two cities were compared there was no evidence to indicate any

difference between calories, and nutrients consumed.

The two sexes, the various sources of income, the different body builds and the convenience or non-convenience of the grocery store were significantly related to the intake of all the nutrients at the 0.05 or greater level. At the 0.10 level the two age groups and the two cities were significantly related to total nutrient intake. At the 0.13 level eating alone or with others and having or not having additional food sources as judged by nutrient intake were significant. None of the other categories were highly related to the intake of all the nutrients.

If this study of nutrition were to be conducted again, the researcher feels that part II of the interview could be omitted so that other questions pertaining to the social and psychological aspects of aging could be added. Examples of such questions are presented in *The Gerontologist* pages 101-109 (29). It would be advisable also to use plastic food models to determine the size of servings consumed by the subjects interviewed.

In addition, the researcher would like to see clinical, biochemical, and anthropometric tests run on the subjects in this study. Then if a feeding program were started in these two communities, after a year's time the same 24-hour-dietary recall and the same tests could be administered to the two populations to determine if the prepared meals were or were not benefiting the participants.

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APPENDIX A

INTERVIEW -- PART I

C P M E B

NAME: _____ CITY: _____ PHONE: _____

ADDRESS: _____ F: _____ M: _____

1. Do you eat most of your meals:

1. Alone
2. With spouse
3. With friends
4. With relatives

2. What foods do you usually eat between 5 a.m. and 10 a.m.?

NO.	FOODS	SERVINGS			
_____	Fruit juices (_____)	1	2	3	4
_____	Fruit (_____)	1	2	3	4
_____	Cooked Vegetables (_____)	1	2	3	4
_____	Raw Veg.-Salads (_____)	1	2	3	4
_____	Potatoes (_____)	1	2	3	4
_____	Meat (_____)	1	2	3	4
_____	Poultry (_____)	1	2	3	4
_____	Fish - shellfish (_____)	1	2	3	4
_____	Eggs (_____)	1	2	3	4
_____	Dry Beans or peas (_____)	1	2	3	4
_____	Peanut Butter or nuts (_____)	1	2	3	4
_____	Milk (_____)	1	2	3	4
_____	Cream (_____)	1	2	3	4
_____	Cheese (_____)	1	2	3	4
_____	Ice Cream (_____)	1	2	3	4
_____	Milk Desserts (_____)	1	2	3	4
_____	Bread (_____)	1	2	3	4
_____	Pastas (_____)	1	2	3	4
_____	Cereal (_____)	1	2	3	4
_____	Pies (_____)	1	2	3	4
_____	Cakes (_____)	1	2	3	4
_____	Cookies (_____)	1	2	3	4
_____	Crackers (_____)	1	2	3	4
_____	Rolls (_____)	1	2	3	4
_____	Butter or margarine (_____)	1	2	3	4
_____	Cooking fats or oils (_____)	1	2	3	4
_____	Salad Dressing (_____)	1	2	3	4
_____	Jam, jellies, candy (_____)	1	2	3	4
_____	Syrup, honey, molasses, sugar (_____)	1	2	3	4
_____	Beverages (_____)	1	2	3	4
_____	Flavored gelatin (_____)	1	2	3	4
_____	Soup (_____)	1	2	3	4
_____	Bacon (_____)	1	2	3	4
_____	Nothing Eaten				

CODE _____

3. What foods do you usually eat between _____ and _____

NO.	FOODS	SERVINGS			
		1	2	3	4
_____	Fruit Juices (_____)	1	2	3	4
_____	Fruit (_____)	1	2	3	4
_____	Cooked vegetables (_____)	1	2	3	4
_____	Raw veg.-salads (_____)	1	2	3	4
_____	Potatoes (_____)	1	2	3	4
_____	Meat (_____)	1	2	3	4
_____	Poultry (_____)	1	2	3	4
_____	Fish-shellfish (_____)	1	2	3	4
_____	Eggs (_____)	1	2	3	4
_____	Dry Beans or peas (_____)	1	2	3	4
_____	Peanut butter or nuts (_____)	1	2	3	4
_____	Milk (_____)	1	2	3	4
_____	Cream (_____)	1	2	3	4
_____	Cheese (_____)	1	2	3	4
_____	Ice Cream (_____)	1	2	3	4
_____	Milk desserts (_____)	1	2	3	4
_____	Bread (_____)	1	2	3	4
_____	Pastas (_____)	1	2	3	4
_____	Cereals (_____)	1	2	3	4
_____	Pies (_____)	1	2	3	4
_____	Cakes (_____)	1	2	3	4
_____	Cookies (_____)	1	2	3	4
_____	Crackers (_____)	1	2	3	4
_____	Rolls (_____)	1	2	3	4
_____	Butter or margarine (_____)	1	2	3	4
_____	Cooking Fats or oils (_____)	1	2	3	4
_____	Salad dressing (_____)	1	2	3	4
_____	Jams, jellies, candy (_____)	1	2	3	4
_____	Syrup, honey, molasses, sugar (_____)	1	2	3	4
_____	Beverages (_____)	1	2	3	4
_____	Flavored gelatin (_____)	1	2	3	4
_____	Soup (_____)	1	2	3	4
_____	Bacon (_____)	1	2	3	4
_____	Nothing Eaten				

CODE _____

4. What foods do you usually eat between _____ and _____

NO.	FOODS	SERVINGS			
_____	Fruit Juices (_____)	1	2	3	4
_____	Fruit (_____)	1	2	3	4
_____	Cooked vegetables (_____)	1	2	3	4
_____	Raw veg.-salads (_____)	1	2	3	4
_____	Potatoes (_____)	1	2	3	4
_____	Meat (_____)	1	2	3	4
_____	Poultry (_____)	1	2	3	4
_____	Fish-shellfish (_____)	1	2	3	4
_____	Eggs (_____)	1	2	3	4
_____	Dry Beans or peas (_____)	1	2	3	4
_____	Peanut butter or nuts (_____)	1	2	3	4
_____	Milk (_____)	1	2	3	4
_____	Cream (_____)	1	2	3	4
_____	Cheese (_____)	1	2	3	4
_____	Ice Cream (_____)	1	2	3	4
_____	Milk desserts (_____)	1	2	3	4
_____	Bread (_____)	1	2	3	4
_____	Pastas (_____)	1	2	3	4
_____	Cereals (_____)	1	2	3	4
_____	Pies (_____)	1	2	3	4
_____	Cakes (_____)	1	2	3	4
_____	Cookies (_____)	1	2	3	4
_____	Crackers (_____)	1	2	3	4
_____	Rolls (_____)	1	2	3	4
_____	Butter or margarine (_____)	1	2	3	4
_____	Cooking Fats or oils (_____)	1	2	3	4
_____	Salad dressing (_____)	1	2	3	4
_____	Jams, jellies, candy (_____)	1	2	3	4
_____	Syrup, honey, molasses, sugar (_____)	1	2	3	4
_____	Beverages (_____)	1	2	3	4
_____	Flavored gelatin (_____)	1	2	3	4
_____	Soup (_____)	1	2	3	4
_____	Bacon (_____)	1	2	3	4
_____	Nothing Eaten				

CODE _____

5. What foods do you usually eat between _____ and _____

<u>NO.</u>	<u>FOODS</u>	<u>SERVINGS</u>			
_____	Fruit Juices (_____)	1	2	3	4
_____	Fruit (_____)	1	2	3	4
_____	Cooked vegetables (_____)	1	2	3	4
_____	Raw veg.-salads (_____)	1	2	3	4
_____	Potatoes (_____)	1	2	3	4
_____	Meat (_____)	1	2	3	4
_____	Poultry (_____)	1	2	3	4
_____	Fish-shellfish (_____)	1	2	3	4
_____	Eggs (_____)	1	2	3	4
_____	Dry Beans or peas (_____)	1	2	3	4
_____	Peanut butter or nuts (_____)	1	2	3	4
_____	Milk (_____)	1	2	3	4
_____	Cream (_____)	1	2	3	4
_____	Cheese (_____)	1	2	3	4
_____	Ice Cream (_____)	1	2	3	4
_____	Milk desserts (_____)	1	2	3	4
_____	Bread (_____)	1	2	3	4
_____	Pastas (_____)	1	2	3	4
_____	Cereals (_____)	1	2	3	4
_____	Pies (_____)	1	2	3	4
_____	Cakes (_____)	1	2	3	4
_____	Cookies (_____)	1	2	3	4
_____	Crackers (_____)	1	2	3	4
_____	Rolls (_____)	1	2	3	4
_____	Butter or margarine (_____)	1	2	3	4
_____	Cooking Fats or oils (_____)	1	2	3	4
_____	Salad dressing (_____)	1	2	3	4
_____	Jams, jellies, candy (_____)	1	2	3	4
_____	Syrup, honey, molasses, sugar (_____)	1	2	3	4
_____	Beverages (_____)	1	2	3	4
_____	Flavored gelatin (_____)	1	2	3	4
_____	Soup (_____)	1	2	3	4
_____	Bacon (_____)	1	2	3	4
_____	Nothing Eaten				

CODE _____

- ___ 6. Would you say that the preceding comments about food represents your usual eating pattern?
1. Yes
 2. No
- ___ 7. Do your food habits change on the weekends?
1. Yes
 2. No.
- ___ 8. If your answer to number 7 is yes, then in what ways do your eating patterns change? _____
- ___ 9. Would you say your appetite is:
1. Poor
 2. Fair
 3. Good
 4. Too good
- ___ 10. Do you have trouble eating any foods? e.g., corn on the cob
1. Yes
 2. No
- ___ 11. If your answer to number 10 is yes, then what is it that causes the eating problem?
1. Dentures
 2. Poor digestion
 3. No teeth
 4. Teeth in poor repair
 5. _____
- ___ 12. When was the last time you saw a doctor?
1. Last week
 2. Last month
 3. Six months ago
 4. One year ago
 5. Over one year ago
- ___ 13. Are you now on a special diet prescribed by a doctor?
1. Yes
 2. No
- ___ 14. What type diet are you on? _____
- ___ 15. Are you taking medication now?
1. Yes
 2. No
- ___ 16. What type medication are you taking? _____
- ___ 17. Are you taking vitamin or mineral supplements?
1. Yes
 2. No
- ___ 18. What kind of supplements are you taking? _____
- ___ 19. Is it easy for you to get to the grocery store?
1. Yes
 2. No
- ___ 20. How do you get to the grocery store?
- | | |
|----------------|-------------------------------|
| 1. Walk | 4. Call for delivery |
| 2. Drive | 5. Go with relatives |
| 3. Take a taxi | ç. Go with friend or neighbor |

CODE _____

- ___ 21. Do you have a source of food other than the grocery store?
 1. Garden 4. Commodities
 2. Friends 5. _____
 3. Family
- ___ 22. How often do you exercise?
 1. Daily 3. Weekly
 2. Every other day 4. _____
- ___ 23. What are your present activities?
 1. Housework 4. Babysit
 2. Gardening 5. Hobbies _____
 3. Walking 6. _____

INTERVIEW -- PART II

- ___ 1. Do you know anyone who has eaten at school lunch?
 1. Yes
 2. No
- ___ 2. What is your impression of school lunch?
 1. It is convenient 4. No opinion
 2. It is expensive 5. _____
 3. The food is appealing
- ___ 3. Have you heard of school lunch programs that served meals to people your age at a special time each day?
 1. Yes
 2. No
- ___ 4. A program such as this could be offered at no charge or at a minimal charge. Which would you prefer?
 1. No charge
 2. Minimal charge
- ___ 5. If there was a minimal charge, when would it be most convenient for you to pay the charge?
 1. Daily
 2. Weekly
 3. Monthly
- ___ 6. If available, how often would you be interested in eating a noon meal at a school cafeteria?
 1. Five days a week 3. Less than three days a week
 2. Three days a week 4. Not at all
- ___ 7. If not at all interested, why?
 1. Prefer to cook 4. Too expensive
 2. On a special diet 5. _____
 3. No transportation
- ___ 8. Would it be easy for you to reach _____ school which is _____ blocks away?
 1. Yes
 2. No
- ___ 9. How would you get to a noon meal at the school lunch?
 1. Walk 3. Take a taxi
 2. Drive 4. Ride with a friend

CODE _____

- ___ 10. Would a meal at the school lunch be useful to you at a later date?
 1. Yes
 2. No
- ___ 11. Have you heard of a hot noon meal being delivered to people confined to their homes?
 1. Yes
 2. No
- ___ 12. Do you think that such a delivered meal would help you?
 1. Yes
 2. No

INTERVIEW -- PART III

- ___ 1. What is your source of income?
 1. Social security
 2. Retirement
 3. Welfare
 4. Private source of income
 5. Social Security and welfare
 6. Retirement and social security
 7. Private source of income and social security
 8. _____
- ___ 2. Approximately how much of your income do you spend on food?
 1. Monthly _____
 2. Weekly _____
- ___ 3. What year were you born? _____
- ___ 4. Where were you born?
 1. Oklahoma
 2. _____
- ___ 5. How long have you lived in this town?
 1. Less than 5 years 3. 10-15 years
 2. 5-10 years 4. Over 15 years
- ___ 6. Are you now:
 1. Married 4. Divorced
 2. Single 5. Separated
 3. Widowed
- ___ 7. Which most nearly describes the number of school years you completed?
 1. Less than 4th grade 4. High school graduate
 2. Fourth - eighth 5. Attended college
 3. Ninth - twelfth 6. College graduate
- ___ 8. Is there any way you can be reached by phone?
 1. Yes How? _____
 2. No
- ___ 9. Do you have neighbors over 65?
 1. Yes 2. No
- ___ 10. Would you mind if we came again and visited with you?
 1. Yes 2. No

APPENDIX B

Computer Plan for Determining Correlations Between
Nutrient Intake and the 13 Categories

Initial Column	Final Column	No. of Columns	Categories	Levels	Values
2	6	5	Riggs		
8	10	3	Subject No.		
12	12	1	City	2	Shawnee-1 Morrison-2
14	14	1	Sex	2	Females-1 Males-2
16	16	1	Age Group	2	65-75 yrs-1 75+ yrs-2
18	18	1	Physical Condition	4	Excellent-1 Good-2 Fair-3 Poor-4
20	20	4	Mental Condition	4	Excellent-1 Good-2 Fair-3 Poor-4
22	22	1	Body Build	4	Thin-1 Average-2 Stout-3 Obese-4
24	24	1	Social	2	Eat Alone-1 Eat with others-2
26	26	1	Supplements	2	Take supplements-1 Do not take supplements-2
28	28	1	Special Diet	2	Yes-1 No-2
30	30	1	Economic Level	8	Social Security-1 Retirement-2 Welfare-3 Private-4 SS & Welfare-5 SS & Retirement-6 SS & Private-7 Other-8
32	32	1	Education	6	4th grade-1 4th-8th-2 9th-12th-3 High School graduate-4 Attended college-5 College grad-6

Initial Column	Final Column	No. of Columns	Categories	Levels	Values
33	33	1	Convenience to grocery store	2	Yes-1 No-2
35	35	1	Source other than store	2	Yes-1 No-2
36	39	4	Calories		
41	42	2	Protein		
44	47	4	Calcium		
49	51	3	Iron		
52	56	5	Vitamin A		
58	60	3	Thiamin		
62	64	3	Riboflavin		
66	68	3	Niacin		
70	72	e	Ascorbic Acid		
74	77	4	FNIA		

VITA⁸

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