EVALUATION OF TWO-DAY DIETARY INTAKES OF SELECTED OKLAHOMA STATE UNIVERSITY STUDENTS IN RELATION TO THEIR PHYSICAL AND ACADEMIC CHARACTERISTICS

By

Janice Rae Leno

Bachelor of Science

South Dakota State College

Brookings, South Dakota

1961

Submitted to the faculty of the Graduate School of
the Oklahoma State University
in partial fulfillment of the requirements
for the degree of
MASTER OF SCIENCE
May, 1964

EVALUATION OF TWO-DAY DIETARY INTAKES OF SELECTED OKLAHOMA STATE UNIVERSITY STUDENTS IN RELATION TO THEIR PHYSICAL AND ACADEMIC CHARACTERISTICS

Thesis Approved:

Helen F. Barbour
Thesis Adviser

Mary E. Ledlight

Dean of the Graduate School

ACKNOWLEDGMENT

The author wishes to express sincere appreciation to her thesis advisor, Dr. Helen F. Barbour for her guidance, interest, patience, understanding, and untiring assistance in conducting and writing this study.

The author also wishes to express thanks to the instructors of the course, Food, Nutrition and Institution Administration 112, Introduction to Nutrition for their co-operation and assistance in collecting the dietary records used in this study. Thanks are also extended to the many students who participated in the study.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Food is a glamourous success story in the United States since food is a far bigger bargain here than in other parts of the world. This country has the ability to feed its families with more food of higher quality and variety and with less money and labor than other countries (12).

American agriculture, technological advances and prosperity make it possible for the American consumer to have the kind of food he wants, when he wants it and in the most convenient form possible. The consumer is presented with a variety of dietary items and required to make decisions and choices regarding his food intake.

Markets present a bewildering array of foods. The supermarket complex leads to many choices, not however, choices for foods that supplement one another but for decisions concerning preference among many similar items. As pointed out by Margaret Lantis (27), the food choices are misleading and the consumer is no better off nutritionally for having three kinds of lettuce on sale at the same time in the same store.

Communication makes it possible for information about food to confront the public at every turn. Newspapers and magazines make subtle claims for food products, use captivating colored advertisements and emotional suggestions to encourage purchase and use of food. The

television screens are filled with clever witticisms and schemes about food products. Radio also transmits appetite appealing propaganda.

Enjoyment of eating is a part of the social way of life. Serving food is a friendly gesture and often results in the consumption of more food than is necessary. No one wishes to change these friendly customs, but it becomes necessary that adjustment be made for these added calories in other meals.

Many meals are eaten away from home and this increases the decisions the consumer needs to make as to what he eats. The great American novelty, the vending machine, promotes an array of poor eating habits. Vending machines encourage piecemeal eating as they are convenient, inexpensive, sanitary and available. They also limit variety available at any one time.

Americans enjoy many labor saving devices which contribute to a failure to obtain exercise and a frequent occurrence of overweight. The changing way of eating, changing physiological activity and economic status imply a concern for over weight among members of our population.

It is difficult to imagine that despite a surplus of food in the United States, nutritional problems exist. There may not be starvation or semi-starvation but poor food habits and over indulgence in empty calories prevail. These factors tend to contribute to the undermining of longevity and productivity of many Americans.

Nutritionists are concerned about the college student and his ability to select foods which will supply nutrients for optimal growth and development. Good nutrition is an inherent right of all ages. It could begin with the developing fetus in the pregnant woman and continue through infancy to old age. Good nutrition is one important means of

assuring good health. Health according to Webster (49) is defined as, "State of being hale or sound in body, mind or soul; especially, freedom from physical disease or pain." Good nutrition also contributes to intangible benefits-happiness, efficiency, and longevity. Choice of food is an important factor in helping one to be socially, psychologically and physically adequate.

The college student is experiencing some significant events in his life. He has left home and is learning to become independent. He is inclined to believe that he is free to do as he pleases. In regard to good nutriture, he feels he is free to eat as he pleases, and this may tend to lead to poor food habits.

The urge for slenderness and the compulsion to do as the group does often results in a young girl's refusal to eat nutritious foods. Milk is often sacrificed by girls as it is considered fattening. The fear of getting fat and curbing of nutrient intake occurs at a period when the need for good nutrition is important. The young student snacks frequently at the local drugstore, coffee shop or student center. This may lead to ingestion of an unbalanced diet rich in carbohydrates. Appetite for meals is destroyed as the carboyhdrate foods do not satiate, and more food is eaten which leads to overweight problems. The great expense for clothing as dictated by modern society often leaves little money for purchase of proper food (12, 33).

Although little research has been done on this age group, there is evidence that early food habits continue in adult life. Fry (17) in a study of post adolescent women found that 68 per cent were desirable weight and 12 to 15 per cent were over or under weight. Only 35 per cent had calorie and thiamine intakes of 90 per cent or more of the recommended

allowances. Their diets revealed inadequate intakes of other nutrients: 44 per cent were short in protein; 83 per cent had insufficient iron; 84 per cent lacked sufficient calcium; 25 per cent had inadequate vitamin A; 31 per cent were low in ascorbic acid; 58 per cent were low in riboflavin; and 34 per cent were low in niacin.

As the kind of food college students now eat will be reflected in their health later on, it is important that these young people establish good food habits. Since these people are assuming responsibility for their own growth and development, an important question arouses real concern -- Are the students eating the food they need in order to grow and maintain healthy bodies, keen minds and a desirable physical status?

Statement of the Problem

Educators are concerned with how to help college students develop the kind of eating habits that are essential to maximum growth and development. Nutritionists and educators feel that in order for their teaching to be of value both to students and teachers an understanding of the present food habits of students needs to be known. In this study it was evident that one could work with a selected group of students only, and that the results of such a study could serve as a starting point in efforts to determine where emphasis is needed in nutrition education.

This study is concerned with the nutritional status of a selected group of men and women students at Oklahoma State University who had an equal opportunity to select foods to satisfy the nutrients required for an adequate diet. A two-day record of food intakes was obtained. Comparisons were made of the adequacy of nutrient intakes for 128 students

according to sex, year in college, grade point average and place of eating. In addition, the percentage of food intake through between-meal feedings was determined. Age, height, actual body weight and body build were obtained from each student. Using the desirable weight charts for men and women, percentages over and under weight were calculated.

The plan for this study is based on the following assumptions:

1. Selected men and women college students are available as subjects.
2. All students have an equal opportunity to select a variety of foods which can satisfy daily dietary allowances.
3. The grade point average of all students in the population is available through the Registrar's Office.

In this study it is hypothesized that:

1. Men and women college students differ in the manner in which they satisfy their daily recommended food allowances.
2. Men and women who have a high grade point average tend to choose more adequate food intakes than those who have low grade point averages.
3. The manner in which men and women satisfy their daily food needs is related to the place of eating.
4. Men and women differ in their selection of snacks.
5. More men than women tend to be overweight as determined by height-weight-age charts.

Subjects for this study were men and women students enrolled in a beginning nutrition class at Oklahoma State University. As a part of the class requirement a two-day record of all food eaten was recorded. These records were used as a basis for calculation of food nutrients ingested by subjects in this study.

CHAPTER II

REVIEW OF LITERATURE

Nutritional Status

Food is a basic need of the human race because it contains the nutrients essential to life. The importance of a good diet can be demonstrated when one realizes that his eyes, blood, muscles, bones, teeth and every part of his body are made of food components. A good diet influences a person's vitality, health, emotional stability and enthusiasm for life. A well nourished individual can meet life with much vigor.

Nutrition as defined by Eppright, Pattison and Barbour (12, p. 312) is, "The combination of processes by which the living organisms receives and utilizes the materials necessary for the maintenance of its functions and for the growth and renewal of its components." Food as defined by the same authors (12, p. 311) is, "Any substance which may be used to yield energy; to build or renew body tissue; or to regulate body processes and internal conditions, so as to maintain a right environment for life." Therefore it is evident that nutrition begins with the variety of food ingested. People often hold the mistaken belief that if they eat any kind of food in sufficient amounts they are well nourished. It is not as simple as that. Foods are conveyors of nutrients which are necessary to the well being of the consumer. The significant role of food in nutritional activity is an aid to people in

the development of mental, emotional and physical health. The individual then is a product of his physical, emotional and mental condition. His level of nourishment is referred to as his nutritional status or his nutriture (33).

Intelligence and Mental Capacity

Intelligence, or mental capacity, is not altered by poor nutriture; however, mental performance may be measurably inferior due to lack of energy and inability to concentrate. During World War II conscientious objectors were subjects of an experiment to determine the effects on humans for long periods on substandard rations. The young men lived for six months on a 1500 calorie diet. During this period mental performance did not deteriorate, but there was a sharp decline in spontaneous mental effort and in the capacity for mental application and achievement which returned to normal when the diet was restored to adequacy (26). This study suggests that the person whose dietary needs are fully satisfied can be expected to take greater advantage of intellectual opportunities than the person who is poorly nourished. A malnourished adult can help revive his initiative to accomplish mental tasks by bringing his nutriture up to a good level.

The same group of young men in the study conducted by Keys et al. (26) showed pronounced nervous symptoms, irritability, apathy, sullenness and moodiness. These nervous symptoms are well recognized accompaniments of beri-beri and pellagra deficiencies due to lack of niacin and thiamine.

Strength, speed and endurance vary with nutritional status. Motor performance decreases as nutritional status decreases. In a study by

Tuttle et al. (47) tests were applied to several age groups in the late morning hours. Some of the subjects had and some had not eaten breakfast. All subjects did significantly more work in the later morning hours following breakfast than when the meal was omitted (47).

Nutrition and Physical Health

It is not only important that a young adult eat well day by day so that he is in good physical and mental health, but he must relaize that his nutrition today will have an influence on his health of tomorrow.

Many young men and women are married during this period and many become parents. The National Office of Vital Statistics reported that 31 per cent of all first-born children in the United States in 1955 were born to women less than twenty years old and 43 per cent were born to women under twenty-five (45). If a young woman enters the responsibilities of marriage and motherhood in a malnourished state, her condition as well as that of her baby can become precarious. Less is known about the influence of the father on the condition of the infant at birth although a relationship is believed to exist. He should be in a good physical state to assume the added responsibility of caring for a wife and child. It is wise for him to avoid illness, mental depression and lack of zest. Good nutrition contributes to an all-around wholesome individual (15, 45).

The possibility of tuberculosis at the college age level is a serious concern (14). The general trend for tuberculosis infection has been decreasing in many countries. It is distressing to note that the rate of reduction of the disease does not occur in the case of adolescents and young adults. In young women there has been an increase in tuberculosis. Many authorities have attributed this state of affairs to the

modern habit of slimming and others to the greater expenditure of money on clothes thereby leaving too little money for the purchase of proper food (14). Johnston (25) discussed the relationship of nitrogen and calcium balance in the development of tuberculosis and showed an increase in the speed of healing when the disease had been identified and the proper nutrients ingested. The full connection between the onset of tuberculosis or re-infection and malnutrition is not known. The seriousness of the problem leads one to see a need for improved nutrition education and for improved nutritional practices of this age group.

Affects of Specific Nutrients

The incidence of superficial signs of possible nutritional significance were noted in an interregional study (38, 39). The tissues studied were all external. The condition of the skin, especially the face, was examined for leisons, dryness, roughening of follicles, waxy deposits around nose and lips and acne. Crusted eyelids, thickening and inflammation of the membrance covering the eyeball and inner eyelids were studied. These symptoms were manifested by vitamin A or riboflavin deficiencies. The older subjects in the study had fewer cases of skin and eye signs than the adolescents; however, of the disorders due to lack of vitamin A or riboflavin or both, acne and inflammation of the eyeballs were the chief physical signs of deficiency. According to Fleck and Munves (15) one of the first symptoms of malnutrition is found in the skin -- pimples and acne. The eyes show failure to adjust to dark and infections are easily acquired.

A similar comparison of the incidences of mouth signs and tongue changes, chiefly reddening and angling of lips and gum changes, have

been associated with the low intakes of ascorbic acid. The young adults showed few signs of this condition but disorders tended to be associated with deficiencies of inflamed gums and increased susceptibility to infection (38, 39). Students who have low intakes of ascorbic acid undoubtedly suffer from subclinical or mild cases of scurvy which are hard to detect because as little as ten milligrams of ascorbic acid daily is sufficient to relieve clinical symptoms.

The body requires a source of energy which is normally supplied by food. The energy generated when food is burned is measured in calories. The body uses energy for internal activities such as breathing, heart beat and circulation; for physical activities that require effort and exertion; and for storage of energy-yielding material to permit reserves for growth during childhood, pregnancy and lactation. Problems of maintaining a balance between energy needs and food values as related to weight are a concern of the people of the twentieth century. There is a tendency to emphasize slenderness, vitamins, and minerals, and to think of calories as an evil. It should be noted that the body's energy need is basic to all others and that an individual cannot live and work without energy sources no matter how well supplied he is (33) with vitamins and minerals.

Protein provides amino acids for the body for building of new tissue and maintaining old tissue and this need continues throughout life. Protein is present in every cell of the body and needs continuous replenishment. Hair and nails continue to grow; the skin scales off and needs to be replaced. During pregnancy not only must the woman meet her own requirements, but those of the developing fetus as well. Under some circumstances an adult may need to build new tissues as following illness

and when an increase in activity includes development of muscles (52).

Riboflavin deficiency is manifested in a disease called aribo-flavinosis which has some of the general characteristics due to lack of vitamin A. The physical signs which appear are soreness of mouth and tongue, inflamed lips, rough, scaly skin, especially at folds of the nose. Other signs of riboflavin deficiency pertain to the eyes: rough eyelids, blurring of vision and sensitivity to light (33).

Niacin unites to form enzyme systems to help oxygen in the process of converting sources of energy into energy itself. Pellagra is the deficiency disease due to lack of niacin and has been called the disease of the three D's: dermatitis, diarrhea and dementia. It is characterized by skin leisons, digestive disturbances, irritated gastrointestinal tract, inflamed tongue and if the deficiency continues, death may follow (33).

Thiamine aids in carbohydrate metabolism and, therefore, has several indirect functions in the body due to its role in energy metabolism. Symptoms of moderate deficiency are: loss of appetite; nausea; psychic and personality disturbances as moodiness, irritability and depression. These are typical symptoms due to suboptimal intake which accompany sub-clinical cases and are reported to exist among people of all ages from various parts of the United States (52). Advanced deficiency of thiamine manifested as beri-beri is characterized by peripheral neuritis, a disease of nerves in the extremities. Thiamine deficiency can also cause damage to the brain and be shown by confusion, delirium and paralysis of muscles that move the eyeballs (19).

Thiamine is frequently called the morale vitamin because it can restore a healthy mental state in man following long periods of

deprivation. Williams (51) found that his subjects on restricted intakes of thiamine became irritable, quarrelsome and moody. At times they suffered long periods of depression and failed to co-operate. Thiamine is not beneficial in the treatment of mental disorders but it has been noted that dietary restriction of the vitamin in mental patients seems to intensify symptoms of their mental state (52). Suboptimal intakes of thiamine by these patients showed a decrease in talking and a slowing of body movements.

A body well nourished with calcium and other nutrients can have good bone growth, a well functioning nervous system and a high level of vigor and positive health. Calcium appears to have an added function in the atomic age. It may reduce the amount of radioactive strontium 90 that may be deposited in the body. Strontium 90 is slow to disappear and its accumulation in the body can be dangerous. Food is a carrier of strontium 90, an element which is absorbed from the food and deposited and retained in the long bones. High concentrations can possibly cause leukemia and bone cancers. However, if the body has a plentiful supply of calcium, the cells will absorb calcium and reject strontium 90 (32). An experiment was conducted in which animals of one group were fed a diet of high calcium (2 per cent) rations and those of the other a diet of low calcium (.5 per cent) rations. The animals were subjected to radioactive strontium 90 for seven days. Group one retained about one-fourth as much of the strontium as the rats that had less calcium. If people react the same way, it will be desirable that they have high intakes of calcium for protection against radioactivity (32).

Iron is best known for its combination with hemoglobin, a blood protein. Hemoglobin supplies a red color, carries oxygen to the cells

and carries carbon dioxide back to the lungs to be exhaled. Iron is located in blood, muscles and other cells. For women there are special needs that tend to make it hard to maintain the needed amount of this mineral. During the menstrual flow the loss of iron in the blood amounts to .5 milligrams to 1 milligram per day and an excessive flow can double this loss. Child bearing is a time for increased intake of the mineral as the fetus needs to have an adequate supply for proper development as does the mother (22, 37). These conditions create iron deficiences which can lead to lowered hemoglobin. This results in decreased ability to carry oxygen to the cells and to return carbon dioxide for exhalation. Due to decrease in oxygen and an increase in carbon dioxide body processes become sluggish and inefficient. A person in this condition is usually listless, dispirited and pale. The condition is known as hypochromic anemia (33).

Snacks

Snacks are part of the food pattern of practically everyone as people enjoy eating more than the traditional three times daily. Some people do this from habit, others to gain weight and still others to lose weight. Some people feel more satisfied when they eat five or six times daily and so eat less food which results in weight loss. Other people increase the total amount of food eaten if they eat five or six times a day and consequently gain weight (33, ~~71~~ 17).

The character of snacks can determine whether or not the total day's diet is nutritionally adequate. If snacks are planned and eaten to supplement the day's food, they are an asset, but if they consist of a succession of nutritionally low tidbits, the snacks contribute poorly

to the diet. Studies made on adolescents and young adults show that many snacks contribute little else than calories to the day's food intake. It is important to recognize that snacks are real meals and to see that they fit into the over-all daily dietary.

Between meal eating contributed a considerable portion to the daily diets of Iowa children studied by Eppright and Swanson (13). The snacks consisted of foods with nutrient shortages and high proportions of carbohydrate. The snacks supplied 13-17 per cent of the total caloric value; 10 per cent of protein and iron; 10 per cent of vitamins A and niacin; and 10-15 per cent of calcium, ascorbic acid, thiamine and riboflavin. Milk and vitamin C foods were deficient.

Height-Weight-Age Tables

A preoccupation of the people of the twentieth century is their concern about overweight. Newspapers, magazines, supermarkets, drugstores, health stores, reducing salons, television and radio commericals bombard the population with information about the low caloric value of many foods (14). We have changed in the last 100 years from ignoring obesity to emphasizing the ideal that "slenderness is next to godliness." Emphasis has shifted from the happy fat individual to the lean, long-lived one (1).

The result of an investigation by the Society of Actuaries, of Metropolitan Life Insurance Company known as the Build and Blood Pressure Study of 1959 (31) shows changes within the last 30 years in weight and longevity. Moderate underweight for the adult has become a highly desirable condition and overweight a major health problem, especially past mid life. As a result cardiovascular and degenerative disease

dominate the tuberculosis and infectious diseases of past years as a cause of death.

Young women in their twenties average five to six pounds lower body weight whereas young men show an increase of five pounds in their twenties and thirties. Young women have become more diet and weight conscious than ever before. Young men are better nourished than previously and tend to reduce their physical activity at an earlier age than formerly (31).

There is a direct relationship between weight gain and age. Both men and women gain weight as they grow older but the pattern is different. Men increase in weight in their twenties and thirties and remain fairly constant thereafter; whereas women increase their weight in their thirties and forties (31).

The new height-weight-age tables show desirable weight for age and are within a range between 15 and 25 pounds below former average weights. The tables are constructed using ranges of weight for each height and type of body build. The body frame is sub-divided into large, medium and small. Body frame is determined by chest breath and hip width (31).

If people kept their weight down to average in the early twenties, they would be close to their desirable weights at ages 30 according to the new tables. Only in the teens is some degree of overweight still an advantage. Overweight is more likely to be present when desirable weights are used rather than average weights, as the figures for desirable weight tables are lower than average weight tables (31).

At present children and adults in the United States are taller than children and adults of similar ages some years ago due to improved

economic conditions, better diets and advances in medical care and health services.

The earliest data for heights and weights of large groups of the population are from U. S. Army measurements. More than 500,000 Civil War soldiers were measured in 1863-1864. They were largely from old American families and averaged 67.7 inches in height. Another record is for United States Senators of 1866, who averaged 69.5 inches without shoes. The report pointed out that they were not typical as they exceeded in height the average of mankind in all parts of the world as well as the average of our own country. The average height of 1,000,000 United States soldiers in 1917-1918 was 67.5 inches. This low over-all average was due to the larger number of new Americans -- immigrants. About 100,000 Army recruits in 1943 had an average height of 68.1 inches; 85,000 recruits in 1946 averaged 68.4 inches. Smaller special groups of men in the Armed Forces measured in 1946-1953 averaged 68.4 to 70.2 inches. Over the years, average heights have gradually increased (20, 21).

In 1912 the Association of Life Insurance Medical Directors and the Actuarial Society of America compiled data from previous records of height and weights of civilians who had been accepted for life insurance. Most of the people lived in cities in the Eastern States and Canada; 216,583 men in 1885-1900 and 221,819 women in 1885-1908. Measurements were in ordinary indoor clothing with shoes.

A study of heights and weights was made in 1955 by the Department of Agriculture as part of a survey of eating habits in the United States. Data were reported for 6,340 men and 6,680 women. The men 30 to 35 years old in the life insurance study had the highest average height of

any age group, 67.6 inches. The men 25 to 29 years old in the 1955 Department of Agriculture study had the highest average height, 69.6 inches. Thus men in 1955 averaged at least two inches taller than men 55 to 70 years ago and attained that average five years earlier. Fewer than four per cent of any age group were as tall as six feet in 1885-1900. Twenty per cent of the 20-29 year-old men were at least six feet in 1955, and three per cent were at least six feet three inches tall. Women averaged about two inches taller in 1955 than 50 years earlier. Women 20 to 29 years old averaged 62.4 inches in 1900-1908 and 64.3 inches in 1955. Only four per cent of the 20-29 year-old women in 1900-1908 could be considered tall, 67 inches and over, but 18 per cent of this age group in 1955 were that tall (20, 21).

Older men measured in 1885-1900 were heavier when compared with younger men of corresponding height than those in the 1955 sample. The 1955 weights of the taller men were less at 40-49 years than those for men of the same height in 1885-1900. Women of comparable ages weighed less for their height in 1955 than in 1885-1908, but the increase in weight was slightly more from the younger to the older age groups among women studied in 1955 than among those measured in 1885-1908. Men succeed better than women in keeping their earlier weight. Women were four to eight pounds lighter at 25 to 30 years in 1955 than in 1900, but they gained weight faster in their later years than men did (20, 21).

Freshmen in two men's colleges were about three inches taller in 1957 than freshmen 75 years before. College men who were six feet and over increased from less than five per cent in the 1880's to about 30 per cent since 1955. Average weights have increased about 20 pounds.

Sixty years of consecutive records in two women's colleges show increases in the average heights of freshmen of about two inches. Changes in average weights are much less than those of men -- seven pounds (20, 21).

In 1912 life insurance tables, which are still in use, are based on the heights and weights of insured men and women of more than 50 years ago. Adults are advised to maintain in later years the weight recommended for their height at age 25 to 29 years. The Department of Agriculture has developed a table of desirable weights for height from data on 25- to 29-year-old men and 20- to 24-year-old women from 100 colleges and universities of the United States in 1948-50. The data represent nude weight-for-height values for the largest segment of the adult population for which recent data is available. The 1955 study shows that persons with education beyond high school generally maintain a more desirable weight for height than those with less education (20, 21).

Recommended Dietary Allowances

The Food and Nutrition Board of the National Academy of Sciences-National Research Council is the scientific group in the United States designated to set up dietary standards. A responsibility of the Board is to develop a dietary guide for the United States -- a guide that will state the amount of calories and certain nutrients needed to keep the population well nourished and that will be of help in planning adequate diets for healthy individuals and population groups (30).

The Recommended Daily Dietary Allowances were first presented in 1941 by the Food and Nutrition Board of the National Academy of Sciences-National Research Council. The allowances were based on research suitable to quantitative human needs. The Committee selected the term "Recommended"

rather than "Standard" for their allowances to indicate that the values were not set and would be revised in the future. The allowances do not represent final judgments and are expected to hold only until reconsidered in view of newer findings. The 1941 allowances were revised in 1945, 1948, 1953, 1958 and 1963 (16).

The author's discussion of the Recommended Daily Dietary Allowances pertain specifically to the subjects investigated in the research -- men and women 18-35 years of age. The Recommended Daily Dietary Allowances are also designed for other age groups in the population.

The amounts of the nine nutrients and calories that are recommended are believed to be adequate to maintain good nutriture under conditions of modern living. The allowances are higher than the minimum required for health and provide a margin of safety above the minimum for protein, minerals and vitamins, but not for calories. The allowances are the amounts that are to be consumed; not the amounts present in food before it is eaten (16, 31).

The current downward revision for calories in the 1963 revision (10) was based on the opinion that the reference man defined by the Food and Agriculture Organization exerts more energy than the average American. The Food and Agriculture Organization man is more likely to be subjected to bursts of hard labor while the American is not. The reference man in the United States does not spend as much time walking as the Food and Agriculture Organization man and probably engages in less household work and recreation. Corrections for lowered activity bring the energy expenditure of the 18-35 year old American reference man to approximately 2900 calories and the reference woman to approximately 2100 calories.

The recommended allowances for thiamine intake have been reduced from .5 mg/1000 calories to .4 mg/1000 calories in the 1963 revision. Data pertinent to the matter was taken from the Interdepartmental Committee on Nutrition for National Defense Manual which was derived from scientific appraisal of knowledge concerning acceptable ranges of thiamine intake consistent with good health (24). In a survey (10) of thiamine excretion data among 7- to 9-year-old girls, the average amount of thiamine needed to prevent clinical symptoms of deficiency was .2 mg/1000 calories. Twenty-two per cent of the individuals had intakes below .4 mg/1000 calories. However, the intake distribution was such that for only 3 per cent was the intake so low as to fall below the requirement curve. Therefore, it was logical to assume that there would be only one chance in 40 that the person receiving the lowest score was not obtaining an amount to satisfy his need (10).

The protein allowances for normal adults are made on the basis of one gram per kilogram of desirable body weight per day. The figure includes a reasonable margin of safety to meet individual variation in requirements and the difference in the quality of protein obtained from various sources. The allowance assumes that the diet is adequate in all other nutrients (16). The allowance of 58 grams of protein per day for women and 70 grams of protein per day for men was restated in the 1963 revision.

The allowance of 800 milligrams of calcium per day and the allowance for vitamin D was reaffirmed for the reference man and woman in the 1963 revision.

The allowances for iron were previously stated at 10 milligrams as a desirable level of intake for men and 12 milligrams for women. Iron

intakes of young women need to be adequate to cover menstrual as well as fecal loss. Ten milligrams of iron for men and 15 milligrams of iron for women have been proposed in the 1963 revision.

Current recommendations for vitamin A are made with reference to the fact that the average American diet affords two-thirds of its vitamin A activity as carotene and one-third as the preformed vitamin (16). The allowance of 5000 International Units for 1963 are the same as those for earlier publications.

Accordingly, as suggested in 1953, the riboflavin allowances are computed from the protein allowances, using a factor of .025 milligrams per kilogram of body weight.

Tryptophan functions as a precursor of niacin. Data obtained by Goldsmith (17) shows that the niacin requirement is related to body size, the minimal daily need being slightly greater than .1 milligrams per kilogram of body weight when the diet furnished 200 milligrams of tryptophan. The minimal amount of niacin (including that formed from tryptophan) which would prevent pellagra is 4.4 milligrams per 1000 calories. In cases where the diet supplies less than 2000 calories, 8.8 milligrams is recommended. Horwitt (23) suggested the term "niacin equivalent" for the total potential niacin value of the diet. In the 1963 revision, recommended allowances for niacin are expressed as niacin equivalents. Niacin equivalents for men are 19 milligrams and for women 14 milligrams per day, as compared with 21 milligrams and 17 milligrams respectively.

The daily dietary allowance for ascorbic acid is 70 milligrams for men and women. This represents a decrease of 5 milligrams for men and no change in the allowance for women.

The Food and Nutrition Board in its 1958 publication on dietary allowances recognized additional nutrients as essential but did not specify amounts for them. Quantitative allowances for these additional nutrients have not been recommended partly because requirements are not known and partly because deficiencies are not likely to occur. A diet of ordinary food that supplies the nine essential nutrients can supply enough of the other nutrients (16, 31).

The revised Recommended Daily Dietary Allowances for 1963 have been adopted by the Food and Nutrition Board (10). A detailed discussion of all revisions is not possible as the text accompanying the table was not available until late spring of 1964. The author only wished to draw attention to the changes and to use recent information in evaluating the research.

Dietary Studies

Data collected from 595 freshmen at Oregon State College by Young and Storvick (55) showed that 76 per cent of the students ate breakfast daily, 15 per cent ate breakfast one to six times a week and nine per cent did not eat breakfast at all. Of the 452 students who included this meal in their daily dietary only fourteen per cent had poor diets, 22 per cent had good diets and the others had fair diets. Of the students who omitted breakfast 43 per cent were classified as having poor diets and only four per cent of the students had diets classified as good. Breakfast consumption therefore showed a relationship to diet score. The authors defined good, fair and poor diets on the basis of a score of 100 for a diet which supplied the nutrients recommended by the daily dietary allowances. The necessary food items and number of

servings were determined and a numerical value given to each food serving. The diets were classified according to total score.

Brown (3) conducted a survey of the breakfast habits of 45 college women at Oklahoma State University and discovered a seriously inadequate intake of calcium for the group. The author further classified the students as those who ate breakfast and those who did not eat breakfast. They were asked to keep a detailed four-day food intake record. The nutritive value of each girl's diet for the four days was calculated for calories, protein, calcium, iron, thiamine, riboflavin, vitamin A and ascorbic acid. The intake was compared with the Recommended Daily Allowances (16). The mean daily nutrient intake of the group that ate breakfast exceeded the National Research Council's recommendations in every nutrient except calcium and iron. The mean daily nutrient intake of the group without breakfast equalled the recommended allowance only for vitamin A and was less than the allowance for all other nutrients.

Intakes of calories, proteins, fat, fatty acids, carbohydrates and cholesterol by students at Kutz Hall, Brandeis University, and Kresge Hall, Harvard University were determined by Myers, et al. (41). Dietary calcium and iron were also calculated. All foods served for one week were weighed, measured and corrected for plate waste. At Brandeis an average of 3350 calories and possible 500 more from snacks gave some evidence of a situation in which overnutrition could be a problem. The protein intake was adequate by any standard with values of 14-17 per cent of total calories compared to 10-12 per cent advised by recommended allowances. Calcium and iron intakes were favorable. The students at Brandeis received 1490 milligrams calcium and 17.5 milligrams of iron per day. Students at Harvard received 1300 milligrams of calcium and

24 milligrams of iron. Milk appeared to be an important source of all nutrients. A study of snacks was done on the various age groups at Brandeis. Eighty-five records were analyzed and it was found that 513 calories were obtained from snacks. Carbohydrate was the chief caloric contributor. The general impression was that fewer snack calories were consumed by the older age group. At Brandeis 73 per cent of the meals were served to men and 27 per cent to women. The Harvard population included five per cent women and 45 per cent men.

Young and LaFortunate (58) 1957 studied 81 Cornell University freshmen women and discovered that calcium, iron and thiamine were the nutrients which were below 70 per cent of the recommended allowances. The girls kept dietary records for one week and calories and nutrients were calculated by the Babcock method. The rejection of milk, eggs, breads and cereals led to a decreased consumption of calcium, iron and thiamine.

The Department of Health of Pennsylvania sponsored a number of studies on the effects of nutrition. A report in 1955 on the nutritional status of 2,536 young people 12 to 20 years old indicated that the diets of the girls were much less satisfactory than those of the boys in providing recommended amounts of nutrients. Diets of the youngest and the oldest of the girls among them rated higher than the diets of the girls 13-15 years old (39).

The 12-year-olds were retaining some previously established good food habits. The 13- to 15-year old girls had the poorest nutrient intake levels of any group. Some improvement was noted among those who were 16 to 20 years old (39).

The percentage of boys whose meals contained recommended amounts of nutrients was higher generally than the percentage of girls. The boys

had much more milk, meat and eggs. Both young men and women had low intakes of fruit and vegetables, especially citrus fruit and yellow and leafy, green vegetables (39).

Fewer of the 16- to 17-year-old girls met or exceeded the recommended allowances for nutrients than did girls less than 13 years old. Usually fewer than half as many girls over 16 as well as under 13 had diets that provided the recommended levels of some nutrients (39).

Records of dietary intakes of college students in several parts of the country indicate some continuation of the dietary patterns that have been noted among children 13 to 15 years old (39).

Some general improvement in intakes among the college women seems apparent, although low amounts of several nutrients, particularly iron, calcium and ascorbic acid, are reported frequently (39).

Nutrient intakes of the college age men were generally higher in relation to recommended amounts than were the intakes of college women. Low intakes of ascorbic acid, calcium and calories were reported often among college men (39).

The first of a number of regional cooperative studies of nutritional status by State Agricultural Experiment Stations began in 1936 and continued for ten years. The study concerned the nutritional status of college women in north central states. The outstanding faults found with the typical self-selected diets of these young women were scarcity of citrus fruit, tomatoes, other green and yellow vegetables and fruit and milk. Whole-grain cereal products were low or lacking in these diets. The bread-and-cereal-enrichment program of the past decade has very likely overcome the deficiencies caused by refined grain products (38, 39).

New impetus was given to regional cooperative researches on nutritional status under the Research and Marketing Act of 1946. One of the endeavors of this research was to determine the nutritional status and dietary needs of selected populations. The writer is primarily concerned with the nutriture of subjects 16-20 and young adults as reported by the Interregional Research Study.

A total of 4141 adolescents ranging from the ages 13 to 20 years were examined in Maine, New York, Rhode Island, West Virginia, Iowa, Illinois, Arizona, Colorado, Idaho, Montana, New Mexico, Oregon, Utah and Washington. Young adults numbering 4210 were studied in California, Colorado, New Jersey, Massachusetts, Virginia, Illinois, Iowa, Michigan, Minnesota, Nebraska, Texas, and South Dakota. In general the surveys were made by the seven-day food diary method. The nutritionists discovered that the college students ate less over the weekends than on the other days of the week. The records of adults showed little difference between weekend and other days (38, 39).

The Recommended Daily Dietary Allowances (16) were used as a guide in evaluating nutrient intakes. One of the vitamins, vitamin D, was not appraised in the dietary study because of uncertainties as to the actual requirements and because of the role of sunlight in meeting any need for it. Assessed in all the dietaries of the study were the amounts of vitamin A (or its vegetable provitamin carotene); vitamin C (ascorbic acid); and three B vitamins -- thiamine, riboflavin and niacin. Besides vitamins, calories, protein and two mineral elements, calcium and iron were assessed (38, 39).

The girls at all ages had about 200 calories less than the recommended amount. Both men and women over 20 years old consumed 100 to

400 fewer calories than the recommended amounts. The protein eaten by the boys and men of all ages averaged 15 to 20 grams a day more than the recommended amounts. The girls up to 12 years had high protein intakes, but after that age their intake fell off to 6 to 10 grams below the dietary allowances. From age 20 to 55, the women also had high intakes of protein, but after 55 the amount taken dropped to as low as 50 grams a day. Boys and men at all ages exceeded the recommended amounts of calcium, but girls and women had a wide gap in intake, nearly two-tenths of a gram below the recommended amount. Intakes of iron showed that men and boys had well above the recommended amounts at all ages. Girls and women at all ages after 12 years had less iron than the recommended amount. The allowance for women was 12 milligrams, while that for men was 10 milligrams. The argument for the increased amount for women is that more iron is required for blood regeneration due to loss of iron in menstruation and pregnancy. Vitamin A was consumed at all ages by both the males and females in ample amounts. Thiamine intakes by the boys up to age 14 and the girls to age 10 met the recommended criteria but the males after age 14 ate consistently less. The females likewise had too little thiamine. These deficits correlate fairly well with the lower intakes of calories. Thiamine need is proportional to calorie intake. Riboflavin was obtained by boys and men in amounts well over the recommended allowance at all ages, but the girls after age 14 had increasingly low intakes. Niacin was present in adequate amounts in nearly all diets. The intake of ascorbic acid of boys and girls up to 12 years was excellent, but after that in both sexes the intakes were 5 to 15 grams lower than the recommended allowances (38, 39).

College students 16 to 20 years of age and older had the same distribution of low intakes as the adolescents, mostly in calcium and ascorbic acid (38, 39). Obviously, the same nutrient deficits occur repeatedly in all parts of the country in vitamin C, calcium, iron and vitamin A.

Young (54) 1946 studied the dietary habits of 50 students living under five different circumstances; sorority house, private homes, campus controlled cottages; dormitory and a graduate house. Each student kept a food intake record for seven consecutive days. The records were analyzed for a weekly average intake of specific nutrients, for frequency of occurrence of certain foods and for eating habits. On the whole, calories, protein, iron, and thiamine values were low. The sorority group had the lowest intake of all nutrients followed by the graduate house, which had freely chosen meals. Every student did some between-meal eating. The room and board group ate more often between meals; the cottage group and graduate house were next probably due to the habit of munching in lieu of breakfast. Comparatively little sandwich, cracker or cheese type lunching was done. In all groups the highest consumption of snacks was the "sweets" category.

In another study by Young et al. (57) 1957 the nutrient intakes from 229 seven-day dietary records of male students at Cornell University and Cooper Union were determined. The majority were freshmen students ranging between the ages of 16 to 41 years. In general three-fourths of each sample had dietary intakes which met 70 per cent or more of the allowances for all nutrients. The average intake of all age groups was especially below the two-thirds allowance for thiamine and calories. Of the Cooper Union students 28.4 per cent were not meeting the 70 per

cent allowances for calories and 17.5 per cent were not meeting the allowances for thiamine. Of the Cornell University students, 27.9 per cent were falling below the 70 per cent allowance for calories and 21.4 per cent were below the thiamine intake.

Blewett and Schuck (2) used the revised Basic Seven and the Recommended Daily Dietary Allowances (16) as criteria for judging seven-day dietaries of 164 freshmen men and 164 women at Purdue University. The diets were evaluated as a whole, and the breakfasts separately, to determine if a relationship existed between breakfast and the adequacy of the diet. All groups were deficient in the recommended number of servings of citrus fruits and vegetables other than green and yellow. The men consumed considerably more milk and eggs than the women. The women ate the recommended servings of fruits other than citrus as did the men. The study indicated a direct relationship between the adequacy of breakfast and that of the diet as a whole. The men as a whole had better diets than the women.

Eppright (11) studied the food habits and preferences of two groups of Iowa people: the 17-19 and the 46-58 year old men and women. The information was obtained through personal interviews and a questionnaire. A total of 1311 people were included in the study. The dietary values were compared with the Basic Seven Food Groups. Protein was consumed in adequate to liberal amounts; 58 per cent of the younger people and only 20 per cent of the older people drank enough milk. Because of this a large proportion of people must have had diets inadequate in calcium and marginal in riboflavin since milk is the main source of these nutrients. The subjects failed to use an adequate amount of yellow and green vegetables. This raises the question of dietary adequacy of

vitamin A which is found in such vegetables. Proportionately more women than men had diets satisfactory in citrus foods. The diets of men were somewhat better than women in protein, calcium and riboflavin. The author concluded that the dietary practices of Iowans need to be improved in the use of green and yellow vegetables, milk, and high vitamin C foods.

During the academic year of 1941-42, McKay and Patton (35) conducted a study of seven-day food intakes of male college students at Ohio State University. Fifty subjects lived in Hall A and selected foods in a cafeteria. In Hall B, the 67 subjects were served meals family style and had little choice in selecting food. The diets were assessed by a master food plan which classified food into 11 groups and the approximate measure to be used in each group, and by computing nutrients as recommended by the National Research Council (16). Of the 282 records the percentages showing the use of as much as or more than the recommended allowances for one week were: milk, 93; meat, 73; eggs, citrus fruits, tomatoes, leafy green and yellow vegetables, 60-66; cereal products and sugar, 52-55; fat, 38; and potatoes, 28. This shows that the use of milk was high. The use of citrus foods and tomatoes was lower than desirable. Less than one-half the men in Hall B were using recommended amounts of leafy green and yellow vegetables and potatoes, but well over one-half were using recommended amounts of other fruits and vegetables. Only about three-fourths were using adequate amounts of protein. A downward trend was noted in the consumption of the bread and cereal group. Results of computation of the nutritive value of the diets of every fifth man from Hall A and B showed liberal provision for protein, calcium, and iron; inadequate caloric provision for 23 per cent of the cases in Hall A and 55 per cent of the cases from Hall B.

Reynolds (43) et al. conducted a survey of dietary habits of women of college age from 1936 to 1940. The records of 3432 students were analyzed for the frequency of occurrence of the food groups which appear in the Basic Seven. Data were tabulated according to classification in college (under and upper classmen) and place of eating: residence halls, organized houses, at home, commercial establishments and in light housekeeping rooms. Meat was chosen most frequently by a large number of students while whole grain products were least often selected. Next in selection was milk, followed by green and yellow vegetables and citrus fruits. Eighteen per cent more of the upperclass students than the freshmen reported the use of green and yellow vegetables. The same increase was evident in the use of tea, coffee, and cola drinks. Students doing light housekeeping led in the consumption of milk, followed by the group in the residence halls. The use of citrus fuits was low throughout. Groups eating in commercial places ate fewer meals per week and made poorer choices of food.

Lautz et al. (28) observed the dietary habits of 2531 women and 833 men eating in a cafeteria. The diets of the women were compared to the men in respect to meat, sea food, eggs and milk as the main sources of protein; in respect to meat, sea food and eggs as the main sources of iron; and in respect to milk as the principal source of calcium. The study definitely showed the tendency of the men to select larger amounts of meat, sea food, eggs and milk than women thus providing the men with a higher quality protein. As the foods listed above stand high in sources of iron, the diet selected by men in this aspect was better than for women. Twice as many servings of eggs were eaten by men; therefore, the diets of men were richer in the minerals and vitamins of the egg

yolk. As the women selected much less milk than men they ingested smaller amounts of calcium.

McCann (34) determined the relationship of academic achievement to the quality of diets of 104 students in grades 7-12. Students were grouped as follows: those who brought lunches from home always, group I; those who brought lunches from home and bought lunches in the lunchroom alternately, group II; and those students who bought their lunches prepared daily in the school lunchroom, group III. The dietary rating of group III was higher than group II and that of group II higher than that of group I. Those students who ate daily in the school lunchroom had a superior over-all academic rating, while those who brought lunches from home and ate in the lunchroom alternately were second in achievement and students who brought lunches from home were third in achievement. The author found that diet was related to academic average at the 5 per cent level of significance. Each individual's dietary intake was calculated in terms of nutrients as classified by the National Research Council's Recommended Daily Dietary Allowances (16). Group I was deficient in the following nutrients (listed in order of severity): vitamin C, calcium, iron, calories, riboflavin, niacin and thiamine; group II: iron, calcium, calories, vitamin C, thiamine, niacin, vitamin A and riboflavin; group III: calcium, iron, calories, thiamine, riboflavin. Group III exceeded the Recommended Daily Allowances in vitamin C, niacin, protein and vitamin A.

The mean daily intakes of 11 nutrients for 421 adolescent boys and girls were evaluated by Wharton in Illinois (50). The boy's diets were significantly higher than the girl's for protein, calcium, phosphorus, iron, and riboflavin. The girls consumed a greater proportion

of the Recommended Daily Dietary Allowances for calories, niacin and ascorbic acid. The older adolescents had a higher intake of vitamin A. The girls ate more snacks than the boys. In the groups where snacks provided 20 per cent or more of the energy value of the dietary, intake tended to be more adequate in all nutrients except vitamin A and ascorbic acid.

Summary of Findings in Dietary Studies

Certain general patterns of food selection characterize the diets of college students. Protein and niacin are the nutrients more generously supplied than any of the others, reflecting an adequate use of foods in the meat, fish and poultry group. Calcium, ascorbic acid, and vitamin A usually met the Recommended Daily Dietary Allowances least well. These shortcomings indicate that the students are using less than the desirable amounts of milk and milk products, foods of high ascorbic acid content and leafy green and yellow vegetables. Thiamine intake is influenced to a large extent by the caloric value of the diet; students whose diets contain less than recommended energy intakes generally have less than the recommended thiamine intakes.

College men tend to eat better diets than college women in terms of meeting the Recommended Dietary Allowances. Men use more milk and milk products and as a result have more satisfactory calcium and riboflavin intakes than women. Ascorbic acid is less well supplied in the diets of women than men. Most men have an acceptable intake of iron; many women do not.

Breakfast skipping or the consumption of an incomplete breakfast is reflected in the total nutrient intake for the day. Observations of

students at Montana State College who omitted breakfast or ate one that failed to meet a desirable meal pattern had a less adequate total nutrient content than those who ate the complete breakfast (12).

Methods of Calculating Nutrients

The short method of dietary analysis summarizes the intake record in various food groups. The nutritive content is computed by multiplying values of each food group in the table by the number of servings. The short method is based on the use of representative mean values for composition of food groups. Tabulated values in the long method represent an approximation of the actual nutrient content. This variability in food composition justifies the use of food groups in the short method. The method is satisfactory when applied to a varied diet (29).

Clark and Cofer's (6) method is employed to determine the nutritive value of food issues. The table is based on the use of average values for groups of food multiplied by the total quantity of food used in each group. The foods are grouped according to nutritive value and function.

Mozar (40) employs a device which uses a graphic method of calculation. The device, known as "Rapidiet Calculator" consists of a rectangular transparent Plexiglass tray which supports 10 movable strips of the same material arranged in parallel position. With the use of cards on which appear bar graphs, the values of calories and 9 specific nutrients can be added for any combination of foods selected. After each card is placed into position, the Plexiglass strips are advanced for distances which equal the lengths of the corresponding graphic bars. A summation effect is achieved as the strips are progressively advanced

card after card. A scaled card is placed in position at the beginning of the operation which, after reading and marking, becomes the permanent record. The graphic values are based primarily on the nutritive values published by the United States Department of Agriculture, Agriculture Handbook No. 8 (48).

Agriculture Handbook No. 8 (48) was prepared to meet the growing demand for information on the proximate composition and mineral and vitamin content of foods. The publication presents three tables of data: Table 1 -- composition of foods, 100 grams, edible portion; Table 2 -- composition of foods, one pound as purchased; Table 3 -- composition of foods, common household units. The data appearing in the tables were compiled over a period of years from published and unpublished literature. The tables represent average values of foods.

The first edition of Bowes and Church's Food Values of Portions Commonly Used appeared 25 years ago. Since the book was first published many new foods and prepared food products have appeared. The greatest change in the ninth edition is in the tabular form in which 26 nutrients are presented. This change was made necessary by the increase in the number of nutrients from the original 14. It is no longer sufficient to list merely the protein content of foods, but the nutritive efficiency or the pattern of essential amino acids should be indicated. Therefore, the 8 essential amino acids have been included in the data heading, and the values given in milligrams. The increasing reference to magnesium values and magnesium deficiency has set the stage for the inclusion of magnesium under the minerals heading. The continuing interest in polyunsaturated fatty acids resulted in the inclusion of FAP values (5).

CHAPTER III

METHOD OF PROCEDURE

The approach for obtaining facts concerning eating habits of college students was through calculation and analysis of two-day dietary records obtained in the fall of 1963 from students in classes titled Food, Nutrition, and Institution Administration 112, Introduction to Nutrition. The two-day dietary records of these students were relatively accurate as classroom assistance was given by the instructors in recording data.

Individual quantitative records of all foods eaten for two typical weekdays by men and women students enrolled in beginning nutrition classes were obtained. In this study Saturday and Sunday were not considered to be typical days (56). The subject's records included the following information: sex, age, place of eating, height, actual weight and body build. This information was transferred to the author's data sheet which is exhibited in the Appendix. In addition to the information listed above, the cumulative grade point average for each individual was secured from the Registrar's Office; and the desirable weight of each student was determined from the table illustrated in the Appendix.

One hundred and twenty-eight students kept records which included sufficient descriptions of the kind and amount of food eaten to permit nutritive evaluation for the two-day period. Twenty-six of the students were men and one hundred and two were women. The nutritive value of each student's food intake for the two days was calculated for calories, protein, calcium, iron and vitamins A, ascorbic acid, thiamine, riboflavin

and niacin.

All the food in the two-day dietary of each individual was summarized according to the food groups of the short method of dietary analysis (30). The nutritive value of the foods for each two-day dietary period was obtained from the Agriculture Handbook Number 8 (48), Church and Church (5), and Leichsenring and Wilson's table (29). The total nutritive value was determined by use of a Rapidiet Calculator (40). The two-day total nutritive intakes were added together and divided by two in order to obtain one day's mean intake of food for each subject. The total mean daily intake of each nutrient for men and women was compared with the 1963 revised National Research Council's Recommended Daily Dietary Allowances and expressed as a percentage of these recommended allowances.

The contribution that snacks made to the total daily food intake of men and women was calculated separately and expressed as a percentage of the total daily food intake of subjects participating in between meal feedings.

The adequacy of diets of men and women were compared with the Recommended Daily Dietary Allowances in relation to their classes in college, that is; freshman, sophomore, junior, senior and special students. The mean nutrient value of the daily food intake of the men and women by classification was calculated and expressed as a percentage of the recommended allowances for 1963.

In this study, cumulative grade point average is used as an index of intelligence. Men and women subjects were classified according to

the following cumulative grade point averages:[1]

4.000--3.600
3.500--3.100
3.000--2.600
2.500--2.100
2.000--1.600
1.600--below

The mean daily nutritive intake of all men in each classification was determined by adding their total mean daily nutritive intakes together and dividing by the number of subjects. The same procedure was used to determine the mean daily nutritive intakes of women in each grade point classification. Comparison of the mean daily nutritive intakes of men and women in each classification was made to the Recommended Daily Dietary Allowances as given in the 1963 revision. Mean intakes were recorded as percentages of the recommended allowances for each classification and sex.

By using the age, sex, actual body weight and body build recorded on each subject's dietary record, desirable body weight was determined by use of height-weight-age tables of the Metropolitan Life Insurance Company issued in 1959 (31). This table is included in the Appendix. The chart displays desirable body weight in relation to body build and height and presents a range from low to high weights which are acceptable for a specific height and body frame. In defining desirable weights for girls 18-25 years of age, one pound was subtracted for each year under 25. In order to compute the percentage of over and under weight, the average desirable weight in each division was identified. The difference

[1] At Oklahoma State University the following grade point system is used with grades as a gauge of scholastic standing: Grade A - 4.000, Grade B - 3.000, Grade C - 2.000, Grade D - 1.000, Grades E, F, I, W, WF, P and WX - 0.000.

between this figure and actual body weight was determined. To calculate the percentage over or under desirable body weight, the difference was divided by the desirable weight. Deviations of body weight of men and women from desirable body weight were classified as follows:

10 % above or below desirable weight
11-15 % above or below desirable weight
16-20 % above or below desirable weight
21 % above or below desirable weight

Men and women within each body-weight group were further classified according to freshman, sophomore, junior, senior and special students. The subjects were not considered overweight until the calculated percentage deviations exceeded 10 per cent above or below desirable weight.

The dietary records of the subjects indicated five types of eating places: home - which in this study includes apartments; fraternity and sorority houses; contract dining halls; cafeterias; and other restaurants, drive-ins, and boarding houses. Mean daily dietary intakes of all men and women were grouped separately according to place of eating. All mean dietary intakes of subjects within each group were added together and divided by the number in the group to determine the mean daily dietary intake of men and women subjects within each group. The mean nutritive intakes of men and women in each group were compared to the Recommended Daily Dietary Allowances for 1963 and the percentage of the nutritive values meeting these amounts were determined separately for each sex.

CHAPTER IV

RESULTS AND DISCUSSION

Comparison of Men and Women Students

The mean average intakes of nine specific nutrients based on two-day dietary records for all men and all women students is illustrated in Table I. An examination of mean averages for women showed that the intakes for all nutrients except iron were within two-thirds of the Recommended Daily Dietary Allowances. The diets of these women appear to be adequate rather than deficient. Calories, ascorbic acid, and niacin do not meet 100 per cent of the recommended allowances for women. The nutritive intakes of men met 100 per cent of the recommended allowances for all nutrients except ascorbic acid which was 86 per cent and 88 per cent for niacin. Since the standards contain a margin of safety, there is little need for alarm.

The nutritive value for iron for women students was below two-thirds of the recommended amount. This is of concern. Young women need adequate supplies of iron to take care of the amount lost in menstruation. Caloric value for women was low and may not be a true deficit since errors tend to occur in the under estimation of fat used for cooking and in determination of serving portions. When caloric values are reduced, niacin equivalents also tend to fall below required amounts. Nearly one-fourth of the niacin was supplied by flour and cereal products. Since women prefer to be slim and slender quality carbohydrate sources are frequently

TABLE I

MEAN AND PERCENTAGE OF RECOMMENDED DAILY DIETARY ALLOWANCES OBTAINED IN AVERAGE DAILY FOOD INTAKE OF MEN AND WOMEN COLLEGE STUDENTS

	No.	Calories	Protein Gm.	Calcium Gm.	Iron Mg.	Vitamin A IU	Ascorbic Acid Mg.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.
Nutritive Intakes										
Men	26	2915	107	1.21	15	6730	60	1.49	2.78	16.73
RDDA		2900	70	.80	10	5000	70	1.20	1.70	19.00
% RDDA*		100+	100+	100+	100+	100+	86	100+	100+	88
Women	102	1922	75	.80	10	5579	56	.96	14.47	11.37
RDDA		2100	58	.80	15	5000	70	.80	1.30	14.00
% RDDA*		91	100+	100+	65	100+	80	100+	100+	78

*RDDA - Recommended Daily Dietary Allowance.

eliminated from the daily diet in an attempt at self-prescribed weight reduction.

The calculated intakes of all students for protein and thiamine may indicate that a considerable portion of the diet was associated with the intake of protein-rich foods such as eggs and meat.

For men students the intakes of calories, protein, iron, thiamine and niacin would indicate that these nutrients tended to be consumed in greater amounts as the energy value of the diet increased. The adequacy of intakes for calcium and riboflavin, riboflavin and protein, and protein and calories tends to be typical of diets containing generous quantities of dairy products (18).

Neither vitamin A nor ascorbic acid are closely related to intakes of other nutrients (18, 50). Women students met 80 per cent of the Recommended Daily Dietary Allowances for ascorbic acid and men students showed intakes which met 85.7 per cent of the required allowance. Vitamin A met 100 per cent of the allowances for both men and women students. As a rule, men eat more than women. Consequently, their diets usually show fewer nutrient inadequacies than do those of girls.

Comparison According to Class in College

In Table II is presented a comparison of the mean daily intakes of men and women students according to class in college. The mean daily nutritive intakes for each class were compared with the Recommended Daily Dietary Allowances and percentages of these allowances were calculated. Freshmen women had mean daily intakes which met two-thirds of the recommended allowances for all nutrients and showed a better intake value for all nutrients except vitamins A and C than the other classes

TABLE II

MEAN DAILY NUTRIENT INTAKE OF COLLEGE MEN AND WOMEN ACCORDING TO CLASSIFICATION

	No.	Calories	Protein Gm.	Calcium Gm.	Iron Mg.	Vitamin A IU	Ascorbic Acid Mg.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.
Men										
Freshmen	5	2518	86	.84	13	3153	54	1.24	2.09	15.48
% RDDA*		87	100+	100+	100+	63	77	100+	100+	79
Sophomores	9	3477	125	1.69	15	7800	64	1.77	3.28	18.18
% RDDA*		100+	100+	100+	100+	100+	91	100+	100+	95
Juniors	4	2555	105	1.28	14	5944	41	1.36	2.90	15.60
% RDDA*		88	100+	100+	100+	100+	60	100+	100+	84
Seniors	8	3109	110	1.05	17	10025	81	1.59	2.93	17.67
% RDDA*		100+	100+	100+	100+	100+	100+	100+	100+	93
Recommended Daily Dietary Allowances		2900	70	.80	10	5000	70	1.20	1.70	19.00
Women										
Freshmen	28	2045	77	.93	10	42	48	.97	1.47	12.56
% RDDA*		99	100+	100+	66	84	69	100+	100+	93
Sophomores	48	1922	73	.89	10	55	57	1.03	1.63	11.75
% RDDA*		91	100+	100+	66	100+	81	100+	100+	85
Juniors	15	1901	71	.80	10	4991	62	.92	1.39	11.57
% RDDA*		91	100+	100+	66	97	88	100+	100+	78

TABLE II (Continued)

	No.	Calories	Protein Gm.	Calcium Gm.	Iron Mg.	Vitamin A IU	Ascorbic Acid Mg.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.
Seniors	9	1941	69	.78	10	8036	58	1.02	1.45	10.71
% RDDA*		92	100+	98	66	100+	81	100+	100+	78
Other	2	1761	58	.62	9	5149	55	.84	1.29	10.23
% RDDA*		83	100	78	57	100+	78	100+	98	71
Recommended Daily Dietary Allowances		2100	58	.80	15	5000	70	.80	1.30	14.00

*RDDA - Recommended Daily Dietary Allowance, 1963.

of women students. As compared with freshmen women, the freshmen men showed lower intakes of calories, vitamins A and niacin; however, the calculated values were within two-thirds of the recommended allowances except for vitamin A which was 63 per cent.

The sophomore and senior men appeared to have the best nutritive intakes of all classes. The computed intakes of sophomore and senior men for all nutrients met 91-100 per cent of the recommended allowances. The junior men had intakes which met 100 per cent of the recommended allowances for protein, calcium, iron, vitamins A, thiamine and riboflavin; 88 per cent of the recommended allowances for calories; 84 per cent of the required amounts for niacin and 60 per cent for ascorbic acid. Their intake of ascorbic acid was below the two-thirds requirement and also the lowest intake of ascorbic acid as compared with the other classes.

The sophomore, junior, and senior women had comparable intakes for all nutrients and met 90 per cent and above of the recommended allowances for calories, protein, calcium, vitamin A, thiamine and riboflavin. The women in these three classes had intakes of ascorbic acid which met 80 per cent and above of the required amount. Niacin was supplied in lower amounts than the other nutrients except iron. Iron was ingested at values which approximated two-thirds of the Recommended Daily Dietary Allowances.

Women graduate and special students had lower intakes for calories, calcium, iron and niacin than the other classes. These nutrients met 83 per cent, 77.5 per cent, 56.8 per cent and 71 per cent respectively of the recommended amounts. The decreased intake of iron for women graduate and special students exhibits an area of special concern. These young women are wives and mothers of today. Iron is an important mineral

during periods of added stress such as reproduction.

In general the diets of men and women students grouped according to classes was adequate. Concern for nutritional improvement needs to be directed to women and their failure to obtain sufficient intakes of iron. Men students generally evidenced better intakes of all nutrients than did women. The nutritive values obtained for the graduate and special students indicated an area meriting further investigation.

Comparison According to Grade Point Averages

In Table III is indicated the mean daily intakes of nine specific nutrients for men grouped according to their grade point averages. The same information is presented for women. These mean daily intakes of nutrients were compared with the Recommended Daily Dietary Allowances for the men and for the women and the percentages of the Recommended Daily Dietary Allowances obtained by each grade point classification were calculated.

Women students in the 4.000-3.600 grade point classification met two-thirds and more of the recommended allowances for all nutrients but iron. The evaluated intake of iron for these young women did not approach one-half of the Recommended Daily Dietary Allowances. This 50 per cent deviation from the recommended allowance indicates need for concern. There were no men students in this category with whom comparison could be made.

Men and women students within the 3.500-3.100 grade point average classification exhibited nutritive intakes meeting two-thirds or more of the Recommended Daily Dietary Allowances for all nutrients. Women students in this grade point group received two-thirds of the recommended

TABLE III

MEAN DAILY NUTRIENT INTAKE OF COLLEGE MEN AND WOMEN
ACCORDING TO CUMULATIVE GRADE POINT AVERAGE

	No.	Calories	Protein Gm.	Calcium Gm.	Iron Mg.	Vitamin A IU	Ascorbic Acid Mg.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.
Men										
3.500-3.100	1	3196	97	.69	18	8150	83	1.55	3.54	15.65
% RDDA*		100+	100+	86	100+	100+	100+	100+	100+	84
3.000-2.600	4	3092	122	2.17	13	6044	82	1.68	3.30	15.97
% RDDA*		100+	100+	100+	100+	100+	100+	100+	100+	84
2.500-2.100	8	3176	123	1.63	17	10798	61	1.60	2.94	19.18
% RDDA*		100+	100+	100+	100+	100+	87	100+	100+	100
2.000-1.600	9	2770	103	1.47	14	5671	47	1.43	2.25	18.33
% RDDA*		96	100+	100+	100+	100+	67	100+	100+	95
1.500-Below	4	2339	89	1.18	13	2987	28	1.29	1.90	14.62
% RDDA*		81	100+	100+	100+	60	40	100+	100+	76
Recommended Daily Dietary Allowances		2900	70	.80	10	5000	70	1.20	1.70	19.00
Women										
4.000-3.600	5	2019	73	.78	7	5298	49	1.12	1.33	10.26
% RDDA*		96	100+	97	45	100+	70	100+	100+	71
3.500-3.100	7	2208	82	1.02	11	5073	60	1.06	1.74	11.27
% RDDA*		100+	100+	100+	66	100+	85	100+	100+	79

TABLE III (Continued)

	No.	Calories	Protein Gm.	Calcium Gm.	Iron Mg.	Vitamin A IU	Ascorbic Acid Mg.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.
3.000-2.6000	33	1913	74	.82	11	5395	55	1.00	1.41	11.11
% RDDA*		91	100+	100+	73	100+	79	100+	100+	78
2.500-2.100	37	1796	66	.70	10	5266	52	.92	1.17	11.13
% RDDA*		86	100+	87	66	100+	74	100+	90	78
2.100-1.600	17	1781	74	.73	11	5235	60	.98	1.27	13.85
% RDDA*		85	100+	91	66	100+	85	100+	97.6	98.9
1.500-Below	3	1816	82	.80	9	7208	58	.91	1.76	10.57
% RDDA*		86	100+	100	60	100+	82	100+	100+	75
Recommended Daily Dietary Allowances		2100	58	.80	15	5000	70	.80	1.30	14.00

*RDDA Recommended Daily Dietary Allowances, 1963.

allowances for iron but they had lower intakes than the men. Men and women both had lowered intakes of niacin. Men students did less well in providing for calcium than did the women.

Men students with grade point averages of 3.000-2.600 met 100 per cent of the recommended allowances except for niacin which was 84 per cent. The women students in this classification met 100 per cent of recommended allowances for protein, calcium, vitamin A, thiamine and riboflavin; they received 78 per cent of niacin and ascorbic acid; for iron they received 73 per cent of the requirement. This computed amount for iron was better than the amounts calculated for women in the previously mentioned classification.

Women students within the grade point classifications of 2.500-2.100 and 2.000-1.600 met two-thirds of the recommended allowances but had lower intakes of calories, calcium, thiamine, and riboflavin than students in grade point classifications of 4.000-2.600. Women with grade point averages of 2.500-2.100 had protein intakes which met two-thirds of the recommended allowances but the calculated value was lower than for other grade point classifications. The women students with grade point averages of 2.100-1.600 met 98 per cent of the recommended allowances for niacin which was the best intake of this nutrient in all classifications of women students. Men students with grade points of 2.500-2.100 and 2.000-1.600 met 95-100 per cent of the allowances for calories, protein, calcium, iron, vitamin A, thiamine and riboflavin. Intakes for ascorbic acid were computed as 87 per cent of recommended allowances for men in 2.500-2.100 classification and 67 per cent in the 2.000-1.600 classification.

Women with a 1.500 and below grade point average had better nutritive

intakes for some nutrients than did women students with higher grade point averages. Nutritive values were least well supplied for iron but exceeded intakes of the 2.500-1.600 classification for calories, calcium, vitamin A and riboflavin. Nutritive intakes of this classification were better for protein than the group with 4.000-3.600 and 3.000-2.600. Men students with 1.500 and below grade points did less well than did women students. Men had lower intakes of calories, vitamin A and ascorbic acid than did women. Men in this grade point classification met two-thirds of the recommended allowances for all nutrients except vitamin A which was 60 per cent and ascorbic acid which was 40 per cent of the requirements. The calcium intake was somewhat higher than for the men in the 3.500-3.100 classification.

Women students within the 3.00-2.100 grouping provided lowest intakes for ascorbic acid. Women students who had 2.100-1.600 grade points provided lowest intakes for niacin. Men tended to do better in maintaining nutritive intakes at two-thirds of the recommended allowances except for students within the 1.500 and below classification who had 60 and 40 per cent respectively of the Recommended Daily Dietary Allowances for vitamin A and ascorbic acid.

Comparison According to Place of Eating

In Table IV is presented the average mean intakes of nine specific nutrients based on two-day dietary records for men and women students grouped according to place of eating. The mean daily intakes of nutrients were compared with the Recommended Daily Dietary Allowances for men and women and the percentages of the Recommended Daily Dietary Allowances obtained by each grouping were calculated.

TABLE IV

MEAN DAILY NUTRIENT INTAKE OF COLLEGE MEN AND WOMEN ACCORDING TO PLACE OF EATING

	No.	Calories	Protein Gm.	Calcium Gm.	Iron Mg.	Vitamin A IU	Ascorbic Acid Mg.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.
Men										
Home	9	2972	109	1.12	13	6268	54	1.64	2.78	16.16
% RDDA*		100	100	100	100	100	77	100	100	85
Fraternity	5	3052	105	1.10	16	8276	35	1.63	2.31	17.34
% RDDA*		100	100	100	100	100	50	100	100	89
Contract	3	2523	84	1.11	12	5398	62	1.39	2.68	13.75
% RDDA*		87	100	100	100	100	88	100	100	73
Cafeteria	7	2394	87	.96	11	3002	43	1.11	1.94	14.07
% RDDA*		82	100	100	100	60	61	92	100	74
Other	2	3632	149	1.77	22	10708	88	1.69	4.21	22.33
% RDDA*		100	100	100	100	100	100	100	100	100
Recommended Daily Dietary Allowances		2900	70	.80	10	5000	70	1.20	1.70	19.00
Women										
Home	29	1879	76	.86	10	6614	61	.98	1.62	10.82
% RDDA*		89	100	100	65	100	87	100	100	78
Sorority	31	1731	60	.58	10	4345	68	.89	1.00	10.13
% RDDA*		83	100	73	64	86	97	100	77	73

TABLE IV (Continued)

	No.	Calories	Protein Gm.	Calcium Gm.	Iron Mg.	Vitamin A IU	Ascorbic Acid Mg.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.
Contract	33	2130	84	.95	10	6636	48	1.05	1.66	12.62
% RDDA*		100	100	100	66	100	69	100	100	92
Cafeteria	9	1948	80	.813	9	4721	47	.92	1.51	11.90
% RDDA*		92	100	100	60	94	67	100	100	91
Recommended Daily Dietary Allowances		2100	58	.80	15	5000	70	.80	1.30	14.00

*RDDA - Recommended Daily Dietary Allowance

The average figures for the two university supervised groups of women students, contract and cafeteria feeding, showed satisfactory intakes of all nutrients except iron and ascorbic acid. The students eating in the cafeterias received six milligrams of iron per day less than the students eating on the contract feeding plan. Ascorbic acid intake for students eating at university supervised establishments was less than the nutritive value calculated for students eating at home and at sororities. The writer suggests that further investigation be made to determine the reason or reasons for the lowered intakes of ascorbic acid and iron evidenced by the university supervised groups.

The sorority grouping represented in this study met two-thirds of the recommended allowances for all nutrients except iron which was 64 per cent. Calories, calcium, vitamin A, riboflavin, niacin and ascorbic acid intakes were slightly lower than 100 per cent of the Recommended Daily Dietary Allowances. The calculated intakes for protein, calories, calcium, vitamin A, riboflavin and niacin were lower than the computed values for other groups.

Average nutritive value of food intakes for women students eating at home met 100 per cent of the allowances for protein, calcium, vitamin A, thiamine and riboflavin. Calorie, vitamin C and niacin intakes were slightly below 100 per cent. The value for iron was one milligram below two-thirds of the recommended allowances. In general women students eating on the contract feeding plan had better intake of nutrients than students on other plans. The sorority group tended to have slightly lower nutritive intakes than students on other plans. The factor of free selection of food especially by women students eating at home and in cafeterias indicates that the opportunity to be well fed was

available to these groups and that in the majority of cases this opportunity was well used.

The average mean nutritive intake for all men students indicated adequacy of dietaries rather than deficiency. Ascorbic acid and niacin values tended to be slightly low. The men students eating at other establishments (boarding houses, restaurants, drive-ins) had the best intake of all nutrients as compared with the men students of all other groups. The writer suspects that this may not be a true appraisal since mistakes often occur in judging servings and there were a limited number of subjects. Average intakes for the two university-supervised men's groups showed satisfactory intakes for all nutrients except vitamins A and ascorbic acid. The men eating at cafeterias received 60 per cent of the recommended allowances for ascorbic acid and 61 per cent of the recommended allowances for vitamin A. The computed values were slightly low for calories, vitamin A and niacin for men students eating on contract feeding plans. The students eating at cafeterias did not receive 100 per cent of the allowances for calories, vitamins A, thiamine, niacin, and ascorbic acid. When compared to the nutritive intakes of women students eating at university supervised locations, men students did less well in meeting caloric and niacin requirements. It appears that when the freedom of choice is given to students in selecting food at cafeterias, men do less well than women in providing for their daily nutritive requirements.

Men students eating at home met 100 per cent of the recommended allowances for all nutrients except ascorbic acid which was 77 per cent and niacin which was 85 per cent; however, these figures are within two-thirds of the allowances and are no cause for alarm. Men students

eating at home met the Recommended Daily Dietary Allowances better than did women students.

The fraternity groups represented in this sample had better intakes for all nutrients except vitamin C than did the contract and cafeteria groups of men students. The calculated intake of vitamin C for the fraternity group met 50 per cent of the recommended allowances. The writer suspects that the area had lower intakes of ascorbic acid as men tend to use less fruit, especially of the citrus variety than do women. This indicates an area of concern. The fraternity groups had better intakes than did the sorority groups except for ascorbic acid. Ordinarily men students eating in cafeterias had lower intakes of all nutrients as compared to women students who usually showed higher nutritive intakes.

Comparison of Men and Women Participating in Between Meal Feedings

Snacks were eaten by a representative sampling of the students. Ninety per cent of the women and ninety-six per cent of the men recorded food intakes other than those eaten at meal times.

In Table V findings illustrate that between-meal eating contributed substantially to the caloric intake of students. For men who ate snacks their intakes averaged 447 calories a day accounting for 15 per cent of total calories. Women students eating snacks averaged 254 calories a day, accounting for 13 per cent of total calories supplied by snacks. These snacks provided 9-15 per cent of the total nutrient intake for men except for vitamin A and ascorbic acid which were 4 and 15 per cent respectively. For women, snacks provided 9-15 per cent of total nutrient intakes for calcium, ascorbic acid and calories. The nutrient intake

TABLE V

PERCENTAGE OF DAILY FOOD INTAKE OBTAINED FROM
SNACKS OF COLLEGE MEN AND WOMEN

	No.	Calories	Protein Gm.	Calcium Gm.	Iron Mg.	Vitamin A IU	Ascorbic Acid Mg.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.
Men	25									
3 meals		2956	108	1.23	14.97	6922	61	1.50	2.83	16.79
Snack intake		447	12	.15	1.62	318	3.32	.14	.29	1.77
% of total		15	11	12	11	5	5	9	10	11
Women	92									
3 meals		1930	76	.82	9.83	5664	56	.97	1.47	11.88
Snack intake		255	5	.08	.75	208	7	.05	.11	.56
% of total		13	6	9	8	4	13	5	8	5

for protein, iron, vitamin A, thiamine, riboflavin and niacin furnished 4 to 8 per cent of the total day's intake. The amount of snacking is not inconsistent with figures disclosed by Myers (41).

When the group of men who ate snacks was compared with the total group, the group eating snacks received somewhat more total calories, protein, iron, and vitamin A. There was slight improvement in the intake of all other nutrients except thiamine. Women who ate snacks showed improved intakes, although less than those for men, for all nutrients other than ascorbic acid, which remained approximately the same.

In this study the men who ate snacks as compared to those who did not tended to improve the intake of all nutrients. The women who participated in between meal feedings showed slight improvement in all nutrients except ascorbic acid. It is valuable to recognize that snacks play an important part in the diets of college students. The college student needs help in realizing that snacks should complement the day's meals, thereby increasing the intake of essential nutrients.

Comparison According to Weight Deviations

In Table VI is presented the percentage of men and women students over and under desirable weight. Eighty-eight per cent of all the men and seventy-six per cent of all the women were within 10 per cent of desirable weight. Twelve per cent of the men and 17 per cent of the women were within 11-15 per cent of desirable weight. Five per cent of the women were 16 to 20 per cent overweight and two per cent were more than 20 per cent overweight. According to the findings in this study, more women tended to be overweight than men.

TABLE VI

DEVIATIONS OF BODY WEIGHT OF MEN AND WOMEN COLLEGE STUDENTS

	No.	10% of Desirable Weight				11-15% of Desirable Weight				16-20% of Desirable Weight			20% of Desirable Weight		
		%	+	%	-	%	+	%	-	%	+	-	%	+	-
			above 10%		below 10%										
Freshmen															
Men	5	40.0	2	40.0	2	20.0	1	-	-	-	-	-	-	-	-
Women	29	62.0	18	17.0	5	21.0	6	-	-	-	-	-	-	-	-
Sophomore															
Men	9	66.6	6	33.3	3	-	-	-	-	-	-	-	-	-	-
Women	44	63.6	28	15.9	7	6.8	3	4.5	2	4.5	2	-	4.5	2	-
Junior															
Men	4	50.0	2	25.0	1	25.0	1	-	-	-	-	-	-	-	-
Women	15	46.6	7	6.6	1	20.0	3	6.6	1	20	3	-	-	-	-
Senior															
Men	8	62.5	5	25.0	2	12.5	1	-	-	-	-	-	-	-	-
Women	12	41.6	5	50.0	6	8.3	1	-	-	-	-	-	-	-	-
Special															
Women	2	50.0	1	-	-	50.0	1	-	-	-	-	-	-	-	-
Total															
Men	26	58	15	30	8	12	3	-	-	-	-	-	-	-	-
Women	102	58	59	18	19	14	4	3	3	5	5	-	2	2	-
Grand Total	128	58	74	21	27	13	17	2	3	4	5	-	2	2	-

Forty per cent of the junior women and 15.8 per cent of the sophomore women were 11-20 per cent overweight. Six per cent of the junior women and 4.5 per cent of the sophomore women were 11-15 per cent underweight. The percentage of junior women who deviated above or below desirable weight was more than the percentage of men and women students in all other classes.

Eighty per cent of the freshmen men and 79 per cent of the women were within 10 per cent of desirable weight. Twenty per cent of the freshmen men and 20 per cent of the women were 11-15 per cent of desirable weight. As compared with the seniors, 87.5 per cent of the senior men were within 10 per cent of desirable weight and 91.6 per cent of the women. It was interesting to note that 50 per cent of the senior women as compared to 17 per cent of the freshmen women were considered underweight but still within 10 per cent of desirable weight. The per cent of senior men and women who were within 11-15 per cent of desirable weight was less than for the freshmen students. A larger percentage of the junior women were overweight than the other groups.

CHAPTER V

SUMMARY AND CONCLUSIONS

The mean daily intakes of nine nutrients were evaluated for twenty-six men and 102 women students at Oklahoma State University. Two-day dietary records kept by the subjects provided most of the data.

In relation to the hypotheses, the following findings are:

1. When considered together, men's calculated dietary intakes were higher than those of women for all nutrients. Both men and women students met two-thirds of the Recommended Daily Dietary Allowances except for iron. The iron intake of women students was 65 per cent of the Recommended Daily Dietary Allowances.
2. Men students with grade point averages of 3.500-2.100 had better calculated intakes of all nutrients except calcium which was low for the 3.500-3.100 group and niacin which was highest for students with 2.000-1.600 grade points. Women students with grade point averages of 3.500-3.100 tended to have higher intakes of all nutrients except vitamin A than women students in other grade classifications. Vitamin A values were highest for women with 1.500 and below averages.
3. Women students eating in cafeterias and on contract feeding had higher calculated intakes for all nutrients except iron and ascorbic acid than women eating on other plans. Men students eating at randomly chosen establishments had the highest intakes

of all nutrients. Men eating at home and at fraternities had better intakes of nutrients than men eating at cafeterias and on contract plans.

4. The men ate more snacks than the women. Snacks provided 9-15 per cent of the energy value of the diet of all subjects. Snacks tended to provide somewhat improved intakes for all nutrients except ascorbic acid for both men and women.
5. More women than men tended to be overweight. The junior women tended to be more overweight than were other classes of men and women students.

Recommendations

From the findings in this study, the author elects to make the following recommendations for further investigation concerning the dietary habits of college students:

1. to determine the influence of attitudes and values on the selection of food to satisfy the daily requirements of students
2. to identify the reason or reasons for the low intakes of ascorbic acid as evidenced by students eating at cafeterias and on contract feeding plans
3. to determine factors underlying the low intakes of iron as indicated by women students and especially of women students eating in cafeterias and of special students
4. to identify the reasons for low nutrient intakes of men students eating at university-supervised establishments as compared to women students eating in comparable places who had better intakes of nutrients

5. to find the basis for the higher occurrence of overweight among junior women than among any other men and women students
6. to devise a score card to evaluate qualitative differences for groups of individuals and to compare the degree of accuracy of scores with calculated values

The kinds and amounts of food eaten by individuals or groups can be determined by dietary studies. The use to be made of the findings dictates the methods to be used in collecting information. The data serve many interests. For effective nutrition education programs a knowledge of food habits of the persons for whom the plans are made is necessary. In collecting data for this study the food record procedure was used. This presented the problem of finding available competent subjects who would make accurate records of all foods eaten for two days.

The nutritive value of food intakes may be ascertained by numerous methods, varying from approximations to laboratory analysis. Food composition tables and the Rapidiet Calculator were used in this study. The calculator is a time saver but it is necessary to spend some effort in becoming proficient in its use. The operator must have ability to add accurately and quickly as totals for each nutrient had to be added as each new diet item was calculated. The author feels there is room for improvement of the Rapidiet Calculator as error could be easily introduced in reading the subtotals and adding them together. It is suggested that dietary studies of large size be calculated by setting up food values on International Business Machine punch cards.

The development of a score card based on the Daily Food Guide which could be used when the objective was to determine qualitative differences for groups of people rather than individuals is suggested.

If a comparative study of the score card and calculated nutrient values revealed sufficient accuracy the score card would permit more rapid evaluation of dietary intakes of large groups.

In this study snacks were not calculated with the other meals eaten by students. This procedure lengthens the time envolved in calculating nutrient intakes. However, since snacks play a major role in the diets of college students the author believes it is important to know what students are doing in regard to snack habits in order to help them select snacks that supplement the regular dietary pattern.

The Recommended Daily Dietary Allowances are referred to as optimal and are set high enough to care for those people having needs higher than average. Diets supplying less than the recommended allowances do not always mean nutritional deficiencies. Intakes of two-thirds of the allowance are believed to be the minimum allowance which will maintain a person in optimal health. When the calculated intakes fall below the two-thirds level, action should be taken to correct the deviation. Findings in this study indicated that as a group, college students are well fed. Only one nutrient, iron for women fell below the two-thirds level of recommendation.

SELECTED BIBLIOGRAPHY

1. Ayers, W. M.: Changing attitudes toward overweight and reducing. J. Am. Dietet. A. 34:23, 1958.

2. Blewett, G. W. and Schuck, C.: A comparison of the food consumption of men and women college students. J. Am. Dietet. A. 26:525, 1950.

3. Brown, A. R.: The value of breakfast in meeting the nutritive needs of college girls. pp. 33-34. Unpublished Master's Thesis. Stillwater, Oklahoma: Oklahoma Agricultural and Mechanical College, 1957.

4. Bureau of Home Economics: Planning Diets by the Yardstick of Good Nutrition. Washington, D. C., USDA, 1941.

5. Church, F. F. and Church, H. N.: Food Values of Portions Commonly Used. 9th ed. Philadelphia: J. B. Lippincott Company, 1963, 130 pp.

6. Clark, F. and Cofer, E.: A short method of calculating nutrient value of food issues. J. Am. Dietet. A. 40:301, 1962.

7. Chon, C.: Meal-eating, nibbling, and body metabolism. J. Am. Dietet. A. 38:433, 1961.

8. Consumer and Food Economics Research Division: Food for Fitness, A Daily Food Guide. Agr. Res. Serv. Leaflet No. 424. Washington, D. C.: U. S. Govt. Print. Off., 1963.

9. Dubach, R., Moore, C. V. and Callender, S.: Studies in transfer and metabolism. IX. The excretion of iron as measured by the isotope technique. J. Lab. Clin. Med. 45:599, 1955.

10. Engel, R. W.: 1963 Recommended Dietary Allowances. J. Am. Dietet. A. 44:91, 1964.

11. Eppright, E. S.: Food habits and preferences. A study of Iowa people of two age groups. p. 873. Agr. Exp. Sta. Bul. 376. Iowa State College, Ames, 1950.

12. Eppright, E. S., Pattison, M. and Barbour, H. F.: Teaching Nutrition. Ames, Iowa: The Iowa State University Press, 1963, 345 pp.

13. Eppright, E. S. and Swanson, P. P.: Distribution of nutrients among meals and snacks of Iowa School Children. J. Am. Dietet. A. 31:256, 1955.

14. Everson, G.: Bases for concern about teenager's diets. J. Am. Dietet. A. 36:17, 1960.

15. Fleck, H. and Munves, E.: Introduction to Nutrition. Chapters 22-23. New York: The MacMillan Company, 1962, 656 pp.

16. Food and Nutrition Board: Recommended Dietary Allowances. Revised 1958. Washington, D. C.: Nat. Res. Coun., Nat. Acad. of Sci. Pub. 589, 1958, 36 pp.

17. Fry, P. C.: Diets of post adolescent young women. J. Am. Dietet. A. 35:387, 1959.

18. Goldsmith, G. A.: Experimental niacin deficiency. J. Am. Dietet. A. 32:312, 1956.

19. Goldsmith, G. A.: Vitamins of the B complex. p. 139. In Food-Yearbook of Agriculture. Washington, D. C.: U. S. Govt. Print. Off., 1959, 736 pp.

20. Hathaway, M.: Trends in heights and weight. p. 181. In Food-Yearbook of Agriculture. Washington, D. C.: U. S. Govt. Print. Off., 1959, 736 pp.

21. Hathaway, M. and Foard, E. D.: Heights and Weights of Adults in in the United States. Home Econ. Res. Report No. 10. Washington, D. C.: Human Nutrition Res. Div., Agr. Res. Serv. USDA, U. S. Govt. Print. Off., 1960, 111 pp.

22. Heinz Handbook of Nutrition. Chapter 12. New York: McGraw-Hill Book Company, Inc., 1959.

23. Horwitt, M. K., Liebert, E., Kreisler, O. and Wittman, O.: Investigations of human requirements for B-complex vitamins. Bul. 116, Washington, D. C.: Nat. Res. Coun. 1948, 106 pp.

24. Interdepartmental Committee on Nutrition for National Defense: Manual for Nutrition Surveys. Washington, D. C.: U. S. Govt. Print. Off., 1957.

25. Johnston, J. A.: Nutrition Studies in Adolescent Girls and Their Relation to Tuberculosis. Springfield, Illinois: Charles C. Thomas, 1953.

26. Keys, A. B., Henschel, A., Mickelsen, O. and Taylor, H. L.: The Biology of Human Starvation. Vols. I and II. Minneapolis: University of Minnesota Press, 1950.

27. Lantis, M.: The child consumer. Jour. Home Econ. 54:370, 1962.

28. Lautz, A., Carter, C. and Ferguson, S.: Meat, sea food, eggs, and milk in the self-selected diets of college men and women. Jour. Home Econ. 32:615, 1940.

29. Leichsenring, J. M. and Wilson, E. D.: Food composition table for short method of dietary analysis (2nd revision). J. Am. Dietet. A. 27:386, 1951.

30. Leverton, R. M.: Recommended Allowances. p. 227. In Food-Yearbook of Agriculture. Washington, D. C.: U. S. Govt. Print. Off., 1959, 736 pp.

31. Lew, E. A.: New data on underweight and overweight persons. J. Am. Dietet. A. 38:323, 1961.

32. Lough, A. S.: Fallout and our food supply. Jour. Home Econ. 54: 747, 1962.

33. Martin, E. A.: Nutrition in Action. New York: Holt, Rinehart and Winston, 1963, 298 pp.

34. McCann, V. M. P.: Relationship of academic achievement to the quality of dietary intake of children at the Phyliss Wheatley High School, Childersburg, Alabama. pp. 1, 28, 40. Unpublished Master's Thesis. Tuskegee, Alabama: Tuskegee Institute, 1955.

35. McKay, H. and Patton, M. B.: Food consumption of college men. Ohio Ag. Exp. Sta. Bul. 646. Wooster, Ohio, 1943.

36. Mixed Comm. for Study of Problems of Nutrition: Nutrition, Vol. 1, League of Nations Pub. 11, Economic and Financial 1936. In Johnston, J. A.: Nutritional Studies in Adolescent Girls and Their Relation to Tuberculosis. Springfield, Ill.: Charles C. Thomas, 1953.

37. Moore, C. V.: The importance of nutrient factors in the pathogensis of iron deficiency anemia. Am. J. Clin. Nutr. 3:3, 1955.

38. Morgan, A. F.: Nutritional Status USA. An Interrgional Research Publication. California Agr. Exp. Sta. Bul. 769. (Berkeley), 1959, 131 pp.

39. Morgan, A. F. and Odland, L. M.: The nutriture of people. p. 186. In Food-Yearbook of Agriculture. Washington, D. C.: U. S. Govt. Print. Off., 1959, 736 pp.

40. Mozar, H. N.: A device for graphic dietary calculation. J. Am. Dietet. A. 43:566, 1963.

41. Myers, M. S., Sullivan, E. M. and Stare, F. J.: Foods consumed by university students. J. Am. Dietet. A. 43:336, 1963.

42. Odland, L. M., Page, L. and Guild, L. P.: Nutrient intakes and food habits of Montana students. J. Am. Dietet. A. 31:1134, 1955.

43. Reynolds, M. S., Ohlson, M. A., Pittman, M. S., McKay, H., Patton, M. B., Donelson, E., Leverton, R., Meiller, E. J. and Bitting, M. H.: The dietary habits of college students. Jour. of Home Econ. 34:379, 1942.

44. Shank, R. E.: The 1958 revision of recommended dietary allowances. Am. J. Publ. Health 49:1001, 1959.

45. Storvick, C. and Fincke, M. L.: Adolescents and young adults. p. 303. In Food-Yearbook of Agriculture. Washington, D. C.: U. S. Govt. Print. Off., 1959, 736 pp.

46. Thompson, E. M. and Tucker, H.: Computer in dietary studies. J. Am. Dietet. A. 40:308, 1962.

47. Tuttle, W. W., Daum, K., Larsen, R., Salzano, J. and Roloff, L.: Effect on school boys of omitting breakfast: Physiologic responses, attitudes and scholastic attainments. J. Am. Dietet. A. 30:674, 1954.

48. Watt, B. K. and Merrill, A. L.: Composition of Foods--Raw, Processed, Prepared. USDA Agr. Handb. No. 8, 1950, 147 pp.

49. Webster's New Collegiate Dictionary: Based on Webster's New International Dictionary, 2nd ed. p. 380. Springfield, Massachusetts: G. and C. Merriam Company, Pub. 1956.

50. Wharton, M. A.: Nutritive intake of adolescents. J. Am. Dietet. A. 42:306, 1963.

51. Williams, R. D., Mason, H. B., Smith, B. F. and Wilder, R. M.: Induced thiamine (vitamin B_1) deficiency and the thiamine requirement of man. A. M. A. Arch. Int. Med. 69:721.

52. Wilson, E. D., Fisher, K. H. and Fuqua, M. E.: Principles of Nutrition. New York: John Wiley and Sons, Inc., 1959, 483 pp.

53. Wohl, M. G. and Goodhart, R. S.: Modern Nutrition in Health and Disease. Chapter 10. 2nd ed. Philadelphia: Lea and Febiger, 1960.

54. Young, C. M.: Dietary study of Cornell University women. J. Am. Dietet. A. 22:25, 1946.

55. Young, C. B. and Storvick, C. A.: Food habits of freshmen at Oregon State College. J. Am. Dietet. A. 25:318, 1949.

56. Young, C. M., Chalmers, F. W., Church, H. N., Clayton, M. M., Gates, L. O., Hagan, G. C., Steele, B. F., Tucker, R. E., Wertz, A. W. and Foster, W. D.: Cooperative Nutritional Status Studies in Northeast Region 3. Dietary Methodology Studies. Northeast Region Pub. No. 10. Mass. Agr. Exp. Sta. Bul. 469, 1952, 95 pp.

57. Young, C. M., Einest, B. M., Empey, E. L. and Serraon, V. U.: Nutrient intake of college men. J. Am. Dietet. A. 33:374, 1957.

58. Young, C. M. and LaFortunate, T. D.: Effect of food preferences on nutritional intake. J. Am. Dietet. A. 33:98, 1957.

59. Young, C. M. and Trulson, M. F.: Methodology for dietary studies in epidemiological surveys. II. Strengths and weakness of existing methods. Am. J. Pub. Health 50:824, 1960.

APPENDIX

Desirable weights for men and women

Weight in Pounds According to Frame (in indoor clothing)

DESIRABLE WEIGHTS FOR MEN of ages 25 and over

HEIGHT (with shoes on) 1-in. heels Feet	Inches	SMALL FRAME	MEDIUM FRAME	LARGE FRAME
5	2	112–120	118–129	126–141
5	3	115–123	121–133	129–144
5	4	118–126	124–136	132–148
5	5	121–129	127–139	135–152
5	6	124–133	130–143	138–156
5	7	128–137	134–147	142–161
5	8	132–141	138–152	147–166
5	9	136–145	142–156	151–170
5	10	140–150	146–160	155–174
5	11	144–154	150–165	159–179
6	0	148–158	154–170	164–184
6	1	152–162	158–175	168–189
6	2	156–167	162–180	173–194
6	3	160–171	167–185	178–199
6	4	164–175	172–190	182–204

DESIRABLE WEIGHTS FOR WOMEN of ages 25 and over

HEIGHT (with shoes on) 2-in. heels Feet	Inches	SMALL FRAME	MEDIUM FRAME	LARGE FRAME
4	10	92– 98	96–107	104–119
4	11	94–101	98–110	106–122
5	0	96–104	101-113	109–125
5	1	99–107	104–116	112–128
5	2	102–110	107–119	115–131
5	3	105–113	110–122	118–134
5	4	108–116	113–126	121–138
5	5	111–119	116–130	125–142
5	6	114–123	120–135	129–146
5	7	118–127	124–139	133–150
5	8	122–131	128–143	137–154
5	9	126–135	132–147	141–158
5	10	130–140	136–151	145–163
5	11	134–144	140–155	149–168
6	0	138–148	144–159	153–173

For girls 18–25, subtract 1 lb for each year under 25.

METROPOLITAN LIFE INSURANCE COMPANY

HEIGHT_____ NAME_____

BODY BUILD_____ AGE_____

ACTUAL WEIGHT_____ CLASSIFICATION_____

DESIRABLE WEIGHT_____ PLACE OF EATING_____

% DEVIATION_____ GRADE POINT AVERAGE_____

BREAKFAST	
LUNCH	
DINNER	
SNACKS	

VITA

Janice Rae Leno

Candidate for the Degree of

Master of Science

Thesis: EVALUATION OF TWO-DAY DIETARY INTAKES OF SELECTED OKLAHOMA STATE UNIVERSITY STUDENTS IN RELATION TO THEIR PHYSICAL AND ACADEMIC CHARACTERISTICS

Major Field: Food, Nutrition and Institution Administration

Biographical:

Personal Data: Born at Bowdle, South Dakota, February 3, 1939, the daughter of Mr. and Mrs. Helmer Leno.

Education: Attended grade school in Spokane, Washington, Bemidji, Minnesota, and Bowdle, South Dakota; graduated from Bowdle High School in 1957; received the Bachelor of Science degree from South Dakota State College, with a major in Home Economics Education, May, 1961; received advanced work at the University of Nebraska, summer 1963.

Professional expreience: Instructor at Lemmon High School, Lemmon, South Dakota from 1961-1963; resident advisor in the Home Management House, University of Nebraska, Lincoln, Nebraska, summer 1963.

Professional membership: Member of Phi Upsilon Omicron, Kappa Delta Pi, Sigma Lambda Sigma, South Dakota Education Association, and South Dakota Homemaking Teachers Association.