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College Students' Knowledge And Adherence To The Food Group Recommendations

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COLLEGE STUDENTS' KNOWLEDGE AND
ADHERENCE TO THE FOOD GROUP
RECOMMENDATIONS

GILLINS

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College Students' Knowledge and Adherence to the

Food Group Recommendations
(TITLE)

BY

Elizabeth Ann Gillins

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

Master of Science

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
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1992

YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
THIS PART OF THE GRADUATE DEGREE CITED ABOVE

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ABSTRACT

The purpose of this two-part study was to evaluate college students' knowledge of and adherence to the food group recommendations of the 1990 Dietary Guidelines for Americans. In part one a convenience sample of 192 students completed a 41-item questionnaire that assessed knowledge of food classifications and of the number and size of servings recommended in each group. Total knowledge and subtest scores were computed based on correct responses. Descriptive statistics were determined for all variables and Student's t-tests were used to examine differences between males and females.

The mean total score for the sample group was 68% with total female scores significantly higher ($p < .01$) than for males. Students scored only 37% correct on knowledge of recommended number of servings (Subtest A); 75% for food group classifications knowledge (Subtest B); 49% on knowledge of serving sizes (Subtest C). Lack of knowledge may have interfered with the application questions where students scored a mean of only 45% (Subtest D).

In part two 142 college students from an entry-level nutrition course submitted food diaries and nutrient analyses. One day of the 3-day diaries was assessed to determine compliance with food group recommendations. Each serving of food in each of the five basic food groups was awarded points up to the minimum number of servings recommended daily. Calculations were weighted to yield

maximum scores of six for each food group and maximum total diet scores of 30. Food records were classed into four "adequacy" groups based on total diet scores. Variety of food intake was determined by differentiating food diaries that indicated consumption of four or more different food groups and diaries that did not. Descriptive statistics were determined for all variables; Student's t-tests were used to compare actual food consumption, food group, and total diet scores of male and female students.

Mean servings of bread, milk, and meat consumed by men met or exceeded the minimum recommendations, but the mean servings for women for all food groups were below recommendations. Intake of bread, milk, and meat group foods and total diet and meat scores for females were significantly lower ($p < 0.001$) than for males. Fruit and vegetable group scores were especially low in comparison with other food group scores. Dietary adequacy for 76% of the sample population was rated poor; females especially rated poor (85%). Good variety ratings, consumption of ≥ 4 different food groups, was achieved by 72% of males and 58% of females.

Results of this study suggest that college students' overall knowledge of current food group recommendations is relatively low. Evaluations of dietary practices indicate that the sample college population is not compliant with recommendations as indicated by dietary intake, "poor" adequacy ratings, and variety ratings.

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INTRODUCTION

"In this land of plenty, millions of Americans aren't eating wisely, not because they haven't enough to eat, but because they eat too many of the wrong things or too little of the right" (U.S. Department of Agriculture [USDA] & U.S. Department of Health, Education and Welfare, 1976). The dietary habits of Americans typically are not consistent with daily recommendations for good health (Patterson, 1990; van den Reek & Keith, 1984; Patterson, Block, Rosenberger, Pee & Kahle, 1983; National Center for Health Statistics, 1981) and therefore may increase risks for nutritional deficiencies and diet-related illnesses.

The concept of a balanced diet was developed from efforts to prevent deficiency diseases and is based on the knowledge that an appropriate mixture of food items can provide the minimum nutritional requirements needed by the body (Nissinen & Stanley, 1989). Various guidelines have been developed to aid Americans in making sound dietary choices. The food guide developed in 1958 by the U.S. Department of Agriculture, commonly referred to as the Basic Four, has been the predominant food guidance system within the United States (1977). In 1979 a fifth group (fats, sweets, and alcohol) was added to highlight foods and food ingredients that should be eaten in moderation (USDA & Science and Education Administration, 1979). The most

recently revised system, as published in Nutrition and Your Health...Dietary Guidelines for Americans (USDA & U.S. Department of Health and Human Services [USDHHS], 1990) and The Food Guide Pyramid...Beyond the Basic 4 (USDA & Food Marketing Institute, 1992), includes recommendations for five basic food groups plus the fats, sweets, and alcohol group, and slightly revised recommendations for number and size of servings in some groups (Cronin, Shaw & Krebs-Smith, 1987).

People of all ages, including college students, do not always follow the dietary guidelines meant to aid them in making wise food choices. The college population has often been targeted for nutrition education messages because of the lifestyle of the typical college student. For the purpose of this study, a college student is defined as a person aged 17-25 and enrolled as a full-time student in a four-year college or university. The lifestyle of the traditional student can be described as a transitional period between living with parents and living independently. This is a time when food decisions become a new responsibility of the college student; therefore, many students' eating habits and food preparation skills develop during these transitional years.

Unfortunately, poor nutrition habits have been cited among university students (Beerman, 1991; Hertzler & Frary, 1989; Hoffman, 1989; Ries, Fairrow & Brown, 1989; Hernon,

Skinner, Andrews & Penfield, 1986; Marrale, Shipman & Rhodes, 1986; Vickery, Phillips & Crenshaw, 1985; Guthrie, 1984; Khan & Lipke, 1982; Driskell, Keith & Tangney, 1979; Jakobovits, Halstead, Kelley, Roe & Young, 1977; Ostrom & Labuze, 1977) Since the introduction of the most recent guidelines for food groups in 1990 (USDA & USDHHS), and publication of the Food Guide Pyramid (USDA & Food Marketing Institute, 1992), no research has been published to document college students' eating practices relative to these "new" food group guidelines.

The purpose of this two-part study was to evaluate traditional college students' knowledge of and adherence to the most recent food group recommendations. The study was designed to fulfill three specific objectives:

1. to examine college students' knowledge of food classifications, serving sizes, and recommended servings of the food groups.
2. to examine college students' consumption of foods from each of the five basic food groups.
3. to conceptually compare the knowledge and dietary practices of college students.

New education tools are needed to inform all consumers of the new food group recommendations. The college population is a target group requiring education

efforts to promote the development of sound dietary practices for a lifetime of healthful food consumption. Results of this and other studies will be useful to nutrition educators in developing effective educational programs for the college population.

REVIEW OF LITERATURE

The concept that diet can play a significant role in disease prevention and therapy has prompted many researchers to focus on the dietary habits of Americans. The "balanced diet" concept was developed from efforts to prevent deficiency diseases and was based on the knowledge that an appropriate mixture of food items can provide the minimum requirements of the body (Nissinen & Stanley, 1989). Several guidance systems (U.S. Department of Agriculture [USDA], 1977; USDA & Science and Education Administration, 1979; USDA & USDHHS, 1980; USDA & USDHHS, 1990; USDA & Food Marketing Institute, 1992) have been developed as education tools for Americans to aid in consumption of a balanced diet, but analysis of U.S. eating patterns has shown non-compliance with dietary recommendations.

Typical dietary consumption of the average U.S. citizen is not consistent with good nutrition habits (The American Dietetic Association, 1991; Patterson et al., 1990; National Center for Health Statistics, 1981). This can lead to an increased risk of nutritional deficiencies or diet-related illnesses. Assessments of diet patterns of younger Americans are critically important to more accurately predict future healthcare and diet trends.

THE COLLEGE POPULATION

The lifestyle of typical college or university students subjects them to developing poor eating habits (Melby, Sabry & Woolcott, 1986; Khan & Lipke, 1982; Marrale et al., 1986). The traditional college student is defined for this review as a person between the ages of 17 and 25, who is enrolled as a part-time or full-time student. For many of these students, the college or university years are a transitional period between living with parents and living independently. Food decisions become a new responsibility and many eating habits and food preparation skills develop during these transitional years (Marrale et al., 1986; Khan & Lipke, 1982).

College students are not unique in their non-compliance with dietary recommendations. What defines them as unique is that the college years are characterized by the development of knowledge, beliefs, and behaviors that may remain with students for many years and therefore strongly influence future health status (Marrale et al., 1986; van den Reek & Keith, 1984).

KNOWLEDGE

Despite the efforts of government, community, and private agencies to educate them about dietary recommendations, college students hold numerous misconceptions in their interpretation of "good nutrition".

These misconceptions are evidenced by poor dietary habits (Mitchell, 1990; Chery, Sabry & Woolcott, 1987; Novascone & Hertzler, 1986; Marrale et al., 1986; National Center for Statistics, 1981, Schwartz, 1975).

College students who rely upon the media as their primary source of nutrition information may be receiving incorrect or incomplete messages that can negatively affect knowledge and dietary behaviors. Novascone and Hertzler (1986) suggested from their research of information links of college students, that media-related sources instead of nutrition or health professionals were utilized predominantly by students for nutrition information. A correlation found ($r=.22$) between low scores on a nutrient-density knowledge quiz and the number of media sources used for nutrition information was statistically significant, but not indicative of any definite relationship (Novascone & Hertzler, 1986).

Regardless of their origin, misconceptions about nutrition and health can distort or impede knowledge of dietary recommendations. Results of a study comparing university students between 1971 and 1984 indicated relatively little change in nutrition knowledge and misconceptions in those years (Chery et al., 1987). The poor level of nutrition knowledge had improved slightly, but there was no significant difference in the level of misconceptions. Students had become more knowledgeable

about misconceptions concerning acidic foods and the gastrointestinal tract function. Compared to students in 1971, fewer students in 1984 held misconceptions about bran cereals and natural sugars versus refined sugars.

The belief that one's knowledge is correct when in fact it is incorrect (a misconception) may result in failure to seek accurate information. A questionnaire designed to define the needs of a university health service audience revealed that only 38 percent of surveyed students could correctly identify foods high in complex carbohydrates (Melby et al., 1986). Fifty-three percent of students correctly identified fat as the richest calorie source, 35 percent incorrectly identified carbohydrate and 12 percent incorrectly identified protein. The results of this study indicated that university undergraduate students had an understanding of some basic health related concepts, but those concepts were distorted by several misconceptions (Melby et al., 1986).

Misconceptions, inaccurate knowledge, or lack of motivation may influence dietary behavior of college students (Ries et al., 1989; Chery et al., 1987; Stasch, Johnson & Spangler, 1970). Students and university employees between the ages of 18 and 30 were requested to select portions that they considered to be a single serving of food (Guthrie, 1984). Findings suggested that participants' concepts of an average serving size varied

significantly from accepted serving sizes used in the Diabetic Exchange Lists (1976). Serving size amounts selected by participants deviated by at least 25% from the standard portion sizes in 14-98% of the observations. Male participants selected larger portions of food than did females. The relationship between the amount of food selected and the amount reported showed errors greater than 25% for under- and over-reporting (Guthrie, 1984).

Mitchell (1990) proposed that knowledge gained after completion of a nutrition course could have positive effects on the dietary behavior of college students. Knowledge and behavior were assessed using a pre- and post-course questionnaire. Forty-five percent of students reported that the gained knowledge had helped them make improved dietary changes. College students indicated that the greatest advantage of an improved diet was better health in the future, but, as the author pointed out, healthy young people may not be motivated to make dietary changes for such a distant outcome (Mitchell, 1990).

BEHAVIOR

Life-long inappropriate consumption patterns can develop from the poor dietary habits of the college years. These inadequate dietary patterns can result in serious health consequences that can be further aggravated by physical stress and emotional demands (Marralle et al.,

1986; Khan & Lipke, 1982). Therefore factors that can act as barriers to adequate nutrition must be addressed for each individual in order to promote more appropriate food habits.

Many factors have been reported to contribute to the food intake patterns of adolescents including 1) lack of time due to activity involvement, 2) priority of peer activities over eating, 3) lack of guidance in selection of meals away from home, 4) eating many foods away from home, 5) concern that certain foods aggravate acne, 6) fear of obesity, 7) fear of underweight or lack of muscle, 8) desire to excel in athletics, 9) exclusion of certain foods from the diet on a regular basis, 10) skipping meals, and 11) lack of knowledge of nutrition needs (Alford & Bogle, 1982).

Assessment of the dietary patterns of the college population provides some insight to areas which need improvement. As with the U.S. adult population, fruit and vegetable consumption by the young adult is generally inadequate (Patterson et al., 1990; Melby et al., 1986). Melby and colleagues (1986) developed and implemented a questionnaire to evaluate university student dietary and exercise-related behaviors. Results indicated a failure to consume adequate quantities of fruits and vegetables. Sixty-nine percent of the students reported they eat fruit less than once per day, and 43% indicated they eat vegetables less than once per day. Reported infrequency of fruit and vegetable consumption was especially high among

students living off-campus (Melby et al., 1986).

Some nutritionists suggest that where people obtain and eat their food can influence dietary consumption patterns (Sneed & Holdt, 1991; Beerman, 1991; Ries, Kline & Weaver, 1987; Crocetti & Guthrie, 1981; Aljadir, Biggs & Misko, 1981). Haines and colleagues (1990) proposed that individuals may behave differently when eating out than when eating at home with regard to the quantity, kinds, or type of food selected. Results of their study indicated a strong rationale to base assumptions on the total diet and not only on sections of the diet. Haines and colleagues felt that in other studies, total diet was not considered when determining if location of food consumption was a factor that influenced intake.

In an analysis of eating out practices of college students, Hertzler and Frary (1992) found that more than half of the dietary guideline practices were followed occasionally or frequently when students ate meals outside of the home. College women were more likely to follow practices consistent with the dietary guidelines and weight control than were men, while men were more likely to eat at fast-food restaurants.

Weight concern could also be considered as a determinant of a college student's dietary intake. Maintaining normal weight levels with adequate nutritional status is a difficult task for college age adults who face

many conflicting food intake obstacles such as time, money, or food-preparation skills. The college years have been reported to be a life cycle stage when people display increased concern with weight gain (Hernon et al., 1986; Crockett & Littrell, 1985; Vickery, Phillips & Crenshaw, 1985; Pyle, Mitchell, Eckert, Halvorson, Neuman & Goff, 1983; Miller, Coffman & Linke, 1980).

In the research of Bailey and Goldberg (1985), female college students termed "concerned eaters" reacted to their dissatisfaction with their comparative ideal weight by often skipping meals. Students termed as "regular eaters", "morning eaters," and "lunch avoiders" (based on their typical food intake patterns) did not display any relationships between meal behavior and either food intake or concern with being overweight. The researchers suggested that those college students who were more concerned with their weight were more likely to participate in dietary patterns that were not consistent with recommended behaviors for good nutrition.

The frequency of skipped meals among traditional college students is perceived as another barrier to healthful dietary practices. The study conducted by Khan and Lipke (1982) indicated that breakfast was the most often skipped meal; 23.6% of students skipped breakfast while 12.4% skipped lunch. Skipped meals, whether in response to time or financial constraints, weight or other concern, can

be related to possible nutrient deficiencies, loss of energy, loss of appetite, or symptoms of depression (Marralle et al., 1986).

Khan and Lipke (1982) also assessed snacking and its contribution to the nutrient intake of both nutrition and non-nutrition majors. The majority of students (89% nutrition majors and 77% non-nutrition majors) snacked after the evening meal; the most often consumed snack was a beverage, especially one that was carbonated. Snacks contributed from 3.5 to 34.8% of the Recommended Daily Allowances (RDAs) (National Research Council, 1989) for different nutrients in the college students' diets. Nutrition majors consumed 12.2 percent of the RDA for energy through snacks while non-nutrition majors consumed 25.3 percent of energy from snacking (Khan & Lipke, 1982).

Another study of college students snacking consumption indicated that 20% of snacks consumed by students come from vending machines (Aljadir et al., 1981). When presented with an equal number of non-nutritious and nutritious snack foods, students selected equally between the two types of items with most of the foods selected as coffee and carbonated beverages (Aljadir et al., 1981).

KNOWLEDGE-ATTITUDES-BEHAVIOR

Associations between nutrition knowledge, attitude, and behavior have been difficult to describe and evaluate,

yet the relationships among the three are of substantial importance. Ideally, increased nutrition knowledge should enable students to apply information to dietary behavior, but several studies have found that nutrition knowledge is not always predictive of dietary practices in college students (Shepherd & Stockley, 1987; Perron & Endres, 1985; Boren, Dixon & Reed, 1983; Schwartz, 1975). Methods used to modify behavior to comply with recommended dietary guidelines must be based on either teaching nutrition knowledge or shaping attitudes toward nutrition or both.

In the field of nutrition education, one popular causal model posits that knowledge leads to attitudes which in turn lead to behaviors (Allard & Mongeon, 1982; Foley, Hertzler & Anderson, 1979). A survey of a junior college population was conducted to test the relationships between knowledge, attitudes, and behaviors (Allard & Mongeon, 1982). Results of the survey suggested that knowledge of nutrition is associated with favorable attitudes toward nutrition and that favorable attitudes are associated with good nutritional intake which supports the causal model.

Compliance with dietary guidelines may inadvertently occur even without measurable knowledge of the guidelines. One hundred male and female students 18-22 years were surveyed (van den Reek & Keith, 1984) to determine any efforts made to change their diets towards meeting the United States Dietary Goals (Select Committee on Nutrition

and Human Needs & United States Senate, 1977) and the Dietary Guidelines for Americans (USDA & USDHHS, 1980). Only 19% of these students said they had ever read or heard about the guidelines. Even so, 75% said they were making efforts to decrease consumption of refined sugar, 50% said they were decreasing consumption of fat and of salt, and 24% said they were trying to increase complex carbohydrates. These college students were unable to identify the actual source of the recommendations for moderate consumption of those food ingredients, yet compliance efforts were reported by 24-75% of the students.

SUMMARY

In the literature on the dietary lifestyles of the traditional college student, very little information can be found concerning compliance with current dietary guidelines or food group recommendations. Research describing the knowledge level of students is often dated and does not examine knowledge of dietary guidelines. Literature describing the dietary practices of the college student population often is focused on only one aspect of intake (i.e. snacking, meal frequency, meal location, etc.) instead of the whole diet and its significance to nutrition status.

College students are often misled by misconceptions or media misinformation especially when relying on the media as the primary source of nutrition information. While the

college population has knowledge of some basic nutrition concepts, it is evident that knowledge is incomplete. The traditional college student's dietary behavior is often erratic and influenced by meal location, snacking, skipping meals, weight control methods, and other factors characteristic of the lifestyle. Behavior patterns often are inadequate to meet nutrient needs or other standards of good nutrition.

In order to further promote the development of sound dietary practices throughout the college and adult years, more research is required to describe dietary intake, level of knowledge, eating patterns, and general acceptance of the Dietary Guidelines for Americans (USDA & USDHHS, 1990). Further research will aid nutrition educators to translate the dietary guidelines information into meaningful consumer messages that may help shape food choices (Guthrie, 1987).

PART ONE

COLLEGE STUDENTS' KNOWLEDGE OF FOOD CLASSIFICATIONS,
SERVING SIZES, AND RECOMMENDED SERVINGS OF FOOD GROUPS

The college years are often a transitional period between dependence on primary caregivers and independent living. For many, food decisions are a new responsibility and eating habits develop during these transitional years (1,2,3). Therefore this life cycle stage is often targeted for nutrition education programs.

Food guides can help college students as well as other consumers choose the kinds and amounts of foods to eat each day for a nutritious diet (4). Compliance with such recommendations is facilitated by knowledge of how foods are grouped, how many servings are recommended in each group, and how much of a particular food constitutes a serving.

An evaluation of college students' knowledge of serving sizes reveals a wide discrepancy between what are thought to be appropriate serving sizes and what are actually recommended (5). Other research (2,6,7) suggests that university students have an understanding of some basic nutrition concepts, but also have several misconceptions which may interfere with healthful dietary behaviors.

Unfortunately, Americans do not have a history of adherence to dietary recommendations. Patterson, et al. (8) reported from the NHANES II Survey that the adult U.S. population eats less than one serving of vegetable or fruit

on any given day. Only 24 percent of 100 college students surveyed in 1984 were making efforts to increase consumption of complex carbohydrates, while almost one-third were trying to reduce consumption of these foods (9). In the 1991 American Dietetic Association Survey of American Eating Habits, only 28% of the population surveyed rated themselves knowledgeable about basic food guidelines (10).

The food guide developed by the U.S. Department of Agriculture, commonly referred to as the Basic Four (11), has been the predominant food guidance system used in the United States. In 1979 a fifth group (fats, sweets, and alcohol) was added to highlight foods and food ingredients that should be eaten in moderation (12). The most recently revised system, as published in Nutrition and Your Health...Dietary Guidelines for Americans (4), and The Food Guide Pyramid...Beyond the Basic Four (13) includes five basic food groups plus the fats, sweets, and alcohol group. This new system has slightly revised recommendations for the number and size of servings in some groups (14). Basic food groups along with suggested servings and serving sizes are presented in Table 1.

The purpose of this research was to investigate college students' knowledge of current food group recommendations. This information will be useful in the development of nutrition education programs that promote good dietary practices for this population.

METHODS

Instrument development. A self-report questionnaire that consisted of a knowledge test and several demographic questions was developed for use in this study. Questions assessing students' age, gender, major, activity level, housing status, and the primary preparer of students' food were included in order to describe the study sample.

The knowledge test was designed to investigate what and how much college students know about current food group recommendations based on the food guidance information included in Nutrition and Your Health...Dietary Guidelines for Americans (3). Multiple-choice items were constructed to assess knowledge of 1) the number of servings recommended in each food group, 2) to which group a specific food belonged, and 3) how much of a particular food would be equivalent to one serving. Specific foods chosen for inclusion in the test were simple, familiar foods, not combination foods. Additional items were designed to assess students' ability to apply food classification and serving size knowledge to a given menu.

Test items were reviewed and refined by a panel of nine faculty and graduate students in nutrition and dietetics and one graduate faculty member from a business discipline. Panelists agreed that the final 41-item test was a valid measure of college students' knowledge of current food group recommendations. The Kuder-Richardson Formula 20

coefficient (15) calculated from study participant responses was 0.64 indicating a reasonable degree of internal consistency. The questionnaire was pilot-tested with ten college students who were not part of the study sample and revised as necessary for clarity.

Data collection. The questionnaire was administered by the investigator to a total of 192 students in two entry-level business classes required of all business majors and minors and one general education sociology class. These classes were chosen in order to obtain a convenience sample of female and male students from all class levels who represented a variety of majors. At the beginning of the class the investigator explained the purpose of the study and gave brief directions; students completed the questionnaire in 25 minutes or less. After all students had returned the questionnaire, the investigator concisely explained the food group guidance system and answered students' questions.

Data analyses. Total knowledge scores were computed by assigning one point for each correct response on the knowledge test and then summing the correct responses for a maximum possible score of 41. In addition, subtest scores were computed for knowledge of recommended number of servings in the basic food groups (Subtest A, 5 items),

ability to classify specific foods into appropriate food groups (Subtest B, 22 items), knowledge of amounts of various foods equivalent to one serving (Subtest C, 9 items), and ability to apply food group knowledge (Subtest D, 5 items).

The Statistical Analysis System (SAS) (16) was used for all statistical analyses. Descriptive statistics were determined on all variables. Student's t-tests were used to compare total knowledge and subtest scores of female and male students.

RESULTS AND DISCUSSION

Study participants. Of the approximately 204 students present in class on the day of questionnaire administration, 192 (94%) returned completed questionnaires. Slightly more than half (60%) were female; the mean age of the participants was 19.9 years. Almost one-third (32%) were business majors, the rest represented a wide variety of major fields. Most students (69%) indicated they lived in either a residence hall or Greek housing, the rest lived in a house or apartment (26%), with parents (3%), or had other living arrangements (2%).

About two-thirds of the students (65%) said most of the food they ate was prepared by a food service. Slightly less than one-third (29%) said they prepared most of their food themselves. The remaining few said they eat out most of the

time (5%) or that a parent or roommate prepared their food (1%).

Students' activity level was most often self-described as moderately active (54%), lightly active (29%), or very active (16%) while only a few students described themselves as either exceptionally active (2%) or sedentary (1%).

Total scores. Total scores on the 41-item test ranged from 10 to 37 (24-90% correct) with a mean score of 25.0 ± 4.4 (68% correct). Mean scores for both genders indicated a relatively low level of knowledge of food group recommendations for this sample group. Total scores and subtest scores are presented in Table 2.

The mean score for females (63% correct) was significantly higher ($p < .01$) than that for males (59% correct). Similar results were reported by Ries, et al. (17) who found that females' scores (61%) were significantly higher ($p \leq 0.05$) than males' scores (57%) on a test to assess knowledge of 15 current dietary recommendations.

Recommended number of servings (Subtest A). Students scored the lowest on this section of the knowledge test with a mean score of two correct (37%) from the five items (Table 3). Mean scores between males and females were not significantly different. The low scores are similar to those reported by van den Reek and Keith (9) who found that only 19% of the

college students in the study had ever read or heard of the United States Dietary Goals.

This very low knowledge of the current recommended number of servings may be attributed at least partly to participants answering on the basis of outdated information. Responses to questions in Subtest A often corresponded correctly to the Basic Four guidelines (11), but were incorrect for current recommendation standards. For example, the Basic Four (11) recommends 4 servings of the fruit and vegetable group. Many university students (46%) incorrectly indicated that 1-2 servings of vegetables was recommended and 35% indicated that 1-2 fruit servings was the recommendation. Eighty-seven percent of students selected 1-4 daily bread group servings as the recommendation which is most similar to the Basic Four (11) recommendation for bread servings.

Food classifications (Subtest B). Students scored the highest on this section of the knowledge test with a mean score of 16.6 ± 2.9 (75% correct). Foods classified correctly most often ($\geq 90\%$) were orange, spinach, cheese, ice cream, chicken and cereal. Foods incorrectly classified most often were eggs, bacon, and nuts (Table 3).

Although the directions stated clearly to classify foods on the basis of their nutritional content, perhaps students did not always do so. A number of students

incorrectly placed eggs in the milk group (26%) or into none of the food groups (21%). Some students (30%) thought that nuts did not belong in any of the basic food groups and some (16%) placed them in the bread group. When asked to select which food (beef, fish, chicken, bacon) did not belong with the others, most students (51%) chose fish instead of bacon.

Serving sizes (Subtest C). Students were also not very knowledgeable about how much of specific foods constituted one serving. Scores on this section ranged from 16% to 72% with a mean of only 49% correct. Knowledge of serving sizes for specific foods is presented in Table 3. Incorrect selections made often by students were one cup of cooked cereal (37%), one cup of fruit juice (67%), three-fourths cup (23%) and one cup (26%) of cooked vegetables, one cup of pasta (40%), and 5-6 ounces of meat (43%).

Several different guidelines are used in nutrition education (3,11,14,18) that emphasize different serving sizes for some food items. Perhaps college students may have been confused by previous learning of conflicting serving size values. Another possible reason may be that students' ideas were based on serving sizes typically eaten at one time as demonstrated by amounts most often selected by students in this study. Serving sizes chosen by students and university employees surveyed in another study also deviated by more than 25% from the generally accepted

serving sizes (5).

Application (Subtest D). Results of student ability to apply food group knowledge are presented in Table 3. Incorrect selections made most often were a hamburger bun as one serving of the bread group (50%), one cup of green beans as one serving of vegetables (67%), and a 3 ounce hamburger patty as either one-half (27%) or three-fourths of a serving (24%) of meat.

Lack of knowledge or test fatigue may have influenced poor results on the application subtest. Students' acceptable scores for food classifications but poor scores on serving size knowledge likely compounded student errors in application questions.

CONCLUSIONS AND IMPLICATIONS

Results of this study suggest that 1) college students' overall knowledge of current food group recommendations is relatively low especially in the areas of serving sizes, recommended number of servings, and application of knowledge and 2) lack of knowledge is consistent in both the male and female populations. While this population displayed knowledge of some basic nutrition concepts, there were several deficient areas of knowledge that need to be improved before application of food group knowledge to dietary practices can be expected.

Nutrition educators can use this information to focus research and education efforts on increasing knowledge of recommended number of servings, foods belonging in each food group, and appropriate serving sizes of foods. This knowledge can then be used by university students to improve dietary practices by following the food group recommendations of the Dietary Guidelines for Americans (4).

Table 1. Basic food groups and suggested servings and serving sizes¹

<u>Food group</u>	<u>Suggested servings</u>	<u>Count as a serving:</u>
Vegetables	3 - 5	1 cup of raw leafy greens 1/2 cup other kinds
Fruits	2 - 4	1 medium apple, orange, or banana; 1/2 cup of small or diced fruit; 3/4 cup of juice
Breads, cereals rice, and pasta	6 - 11	1 slice of bread; 1/2 bun, bagel, or English muffin; 1 ounce of dry ready-to-eat cereal; 1/2 cup of cooked cereal, rice, or pasta
Milk, yogurt, and cheese	2 - 3	1 cup of milk or yogurt; about 1-1/2 ounces of cheese
Meats, poultry, fish, dry beans and peas, eggs	2 - 3	2-3 ounces of lean meat (daily total of 6 ounces); count 1/2 cup

Continued

Table 1 continued

of nuts or cooked dry
beans or peas as 1 ounce
of meat

' Information from Nutrition and Your Health: Dietary
Guidelines for Americans (3), pp. 6, 17, 20.

Table 2. Mean total knowledge and subtest scores¹ of female and male college students

Test/Subtest	Total Sample	Females	Males
Total score: (41 items)	61 ± 11%	63 ± 11%*	59 ± 11%*
Subtest A: Knowledge of recommended number of servings (5 items)	37 ± 22	38 ± 23	34 ± 22
Subtest B: Ability to classify specific foods (22 items)	75 ± 13	77 ± 13	73 ± 13
Subtest C: Knowledge of serving sizes (9 items)	49 ± 18	51 ± 17	45 ± 20
Subtest D: Ability to apply food group knowledge ² (5 items)	45 ± 23	47 ± 24	44 ± 21

¹ Mean scores presented as mean percentage (± standard

continued

Table 2 continued

deviation) with asterisks indicating significant differences ($p < .01$) between gender according to Student's t-test analysis.

² Students asked to judge the number of servings eaten in a meal of 3 oz. cooked hamburger, 1 bun, 1 cup green beans, 1 apple, 1 cup skim milk, and 1 chocolate brownie.

Table 3. Percentage of correct responses to specific test items^{1,2}

Food Group/ Specific Food	Knowledge of recommended number of servings (Subtest A)	Ability to classify specific foods (Subtest B)	Knowledge of serving sizes (Subtest C)	Ability to apply food group knowledge (Subtest D)
Fruit	57%			80%
Orange juice		98%		
Orange ³		76		
Grape juice		82		
Fresh fruit			72%	
Fruit juice			16	
Vegetables	48			17
Spinach		98		
Tomatoes ³		62		
Cooked			51	
Raw leafy			42	
Milk	46		63	64
Cheese		95		
Ice Cream		93		
Yogurt		88		
Yogurt ³		71		

continued

Table 3 continued

Meat	33	47	45
Chicken		90	
Fish		70	
Eggs		50	
Bacon ³		41	
Nuts		38	
Breads/Cereals 1			23
Cereal		90	
Oatmeal		84	
Pasta		66	
Rice		64	
Bread			63
Cooked cereal			52
Pasta			32
Other			
Salad dressing		88	
Beer		84	
Potato chips		69	
Butter ³		61	

¹ Total number of respondents = 192.

² Correct answers to test items based on information in

Nutrition and Your Health: Dietary Guidelines for

Americans (4).

Continued

Table 3 continued

3 Questions asking which food nutritionally does not belong with others. Orange was presented with cucumbers, green beans, tomato; yogurt with dry beans, hamburger, pork chop; bacon with beef, chicken, fish; butter with milk, ice cream, yogurt.

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COLLEGE STUDENTS' COMPLIANCE WITH
CURRENT FOOD GROUP RECOMMENDATIONS AS
MEASURED BY DIETARY INTAKE

The concept of a balanced diet was developed from efforts to prevent deficiency diseases and is based on the knowledge that an appropriate mixture of food items can provide the minimum nutritional requirements needed by the body (1).

Food guides have been developed as tools for consumers to help them choose the kinds and amounts of foods to eat each day for a nutritious diet. The food guide developed by the U.S. Department of Agriculture, commonly referred to as the Basic Four (2), has been the predominant food guidance system used in the United States since its introduction in 1958. The most recently revised system, as published in Nutrition and Your Health...Dietary Guidelines for Americans (3) and the Food Guide Pyramid...Beyond the Basic Four (4) recommends that persons consume a variety of foods from five basic food groups in order to achieve a more healthy, nutritious diet.

Food guides were intended as education tools, but can also be used as simplified tools to assess food intake of individuals or populations. The prevalence of college students' inappropriate eating behaviors has been discussed and documented by researchers (5-16). The college years are often a transitional period between dependence on primary caregivers and independent living. For many, food decisions

are a new responsibility and eating habits develop during these transitional years (15,16,17). Further empirical data on food intake of college students is needed to benefit nutrition educators, health and foodservice personnel, and students themselves.

The purpose of this study was to compare college students' intake of bread and cereals, fruits, vegetables, milk, and meats with current recommendations for intake from these groups. This information will be useful in the development of nutrition education programs to promote good dietary practices for this population and will serve as baseline data for the evaluation of those programs.

METHODS

Data Collection

Data used in this study were from nutrient analysis computer printouts submitted by 142 university students enrolled in an entry-level nutrition course. As part of the course requirements, each student was required to complete a three-day food diary (two week days and one weekend day) and a nutrient analysis using a simple computer program (18). Food diaries and nutrient analyses were completed during the first few weeks of the semester. In addition to nutrient and food information, computer printouts documented the age, sex, and self-reported activity level of each student. Class instructors collected the diaries and computer

printouts, removed students' names, and added information from class rosters about each student's major.

Data Tabulations and Analyses

Food group and total diet scores were calculated from one day of each student's food record using an adaptation of the method reported by Guthrie and Scheer (19). In order to get a variety of recorded days, one-third of the days chosen for review was the first recorded day, one-third was the second day, and one-third was the third day.

Each serving of food in each of the five basic food groups was awarded points up to the minimum number of daily recommended servings for that group (Table 1). This calculation method yielded maximum scores of six for each food group and a maximum total diet score of thirty. The minimum number of suggested servings was used as the ceiling in each food group to eliminate the possibility of high intake in one group compensating for less than recommended intake in another food group. Food classification and serving sizes for food groups and maximum diet scores are presented in Table 1.

Food records were arbitrarily classed into four "adequacy" groups (excellent, good, fair, and poor) based on the total diet scores (Table 2). Variety of food intake was determined by differentiating between food diaries that indicated at least one serving from four or more different food groups and those that indicated consumption from three

or fewer groups (Table 2).

The Statistical Analysis System (SAS) was used for all statistical analyses (20). Descriptive statistics were determined on all variables. Student's t-tests were used to compare actual number of servings consumed from each food group, food group scores, and total diet scores of male and female students.

RESULTS AND DISCUSSION

Study Participants

Students from the three nutrition classes submitted 142 diaries and nutrition analyses for evaluation. Almost two-thirds of the students were female (66%). Age was reported in ranges of 15-18 (11%), 19-24 (88%), and 25-50 (2%). Activity level was self-described by students as sedentary (1%), light (30%), moderate (54%), very active (13%), and exceptionally active (2%). More than half (53%) of the students were home economics majors, but only 15% of these were specializing in dietetics or nutrition. Seventeen percent of students were physical education majors, 13% were business majors and the rest (17%) represented a variety of majors.

Food Intake

A summary of the actual number of servings consumed from each food group is presented in Table 3. Mean servings consumed by men met or exceeded the minimum recommendations

for the bread, milk, and meat groups, but the mean servings consumed by women for all food groups were below the minimum number of servings recommended. Actual intake of bread, milk, and meat group foods was significantly higher ($p < 0.01$) for men than for women.

Sixty-one percent of men and 52% of women recorded less than 1/3 servings of milk products, vegetables, or fruits. The milk product reported most often was cheese that was part of other high-fat foods (pizza, hamburgers, grilled cheese, tacos, macaroni and cheese). This low consumption of milk products is consistent with other reports (8,9,13). Hoffman (9) found that 59% of college women in central Michigan did not meet recommendations for calcium intake.

Mean consumption of vegetables was also below the minimum recommendations by slightly more than one serving for men and almost two servings for women. Food sources especially contributing to vegetable servings were from student consumption of lasagna (1 vegetable), spaghetti (1/2 vegetable), and french fries (10 = 1 vegetable) (Appendix B). The proportion of students meeting the minimum recommendation for vegetable servings (25%) was consistent with that of the NHANES II Survey (21) of young people age 19-29. Forty-three percent of university students in another study indicated eating vegetables less than once per day (14).

The most often reported fruit consumed was orange juice

followed by other types of juices and canned fruits, but rarely whole, fresh fruit. Twenty-nine percent of students met the minimum guideline for fruit servings as compared to 22% of 19-29 year old persons in the NHANES II Survey (21). Failure to eat at least one serving of fruit per day was also reported by 69% of university students in a previous study designed to assess dietary and exercise-related behaviors, knowledge, and beliefs (14).

Mean intake of breads for both men and women was similar to recommendations for servings of food groups (Table 3). Intake of the bread group was counted often from the consumption of pizza (1 slice = 1.5 bread). Bread servings were also consumed in combination foods such as sandwiches, tacos, lasagna, noodle dishes and pot pies. Popular bread group snack foods that contributed to bread servings included nachos, crackers, and popcorn. Very few whole grain bread items were consumed by these college students.

The four most often reported meat servings consumed by students were zero (12%), one (21%), two (17%), three (10%) and four (9%) servings of meat. Recommendations of the Dietary Guidelines for Americans (3) and the Food Guide Pyramid (4) encourage 2-3 daily servings of meat with a total amount of six ounces. Consumption of more than six ounces of meat and meat products is not consistent with the current dietary guidelines (3,4) or the National Cholesterol

Education Program (22) recommendations to choose a diet low in fat, saturated fat, and cholesterol. For this study, three ounces of meat were considered one serving which college students consumed mostly in hamburger, sausage, fried meats (chicken and fish) and processed meats (hot dog, lunch meat, soups).

Diet Scores

Food group and total diet scores are presented in Table 4. The maximum score possible for each food group was six with a maximum possible overall diet score of 30. Scores achieved by women were significantly lower than the men's scores for the meat group and for the overall diet. No other significant differences between sexes were found for consumption of the food groups.

Student scores for the fruit and vegetable groups were especially low in comparison with other food group scores. These findings are similar to those of Patterson, et al. (21), discussed previously, and Melby, et al. (16). Melby reported less than recommended intake of fruits and vegetables for a substantial number of students. Sixty-nine percent of students reported failure to eat any fruit at least once per day, and 43% indicated eating vegetables less than once per day (16).

Dietary Variety and Adequacy

Table 2 presents the distribution of students who consumed "adequate" diets based upon total diet scores

achieved. Dietary adequacy for both men and women was very poor with the majority (>76%) of the total group achieving poor scores (<21 points) illustrating poor compliance with the minimum recommendation for servings of each food group.

Females especially were non-compliant with the recommendations as almost 85% were assigned a "poor" diet adequacy score. These findings were similar to another study of 437 college students where 75% of their 24 hour recalls were rated by researchers as "fair to poor" (15). These researchers felt the implication of such inadequate eating patterns was that even though sound dietary habits may have been established during childhood, many good habits may be lost when an individual is left on his/her own.

Because of the relatively unique nutritional composition of each of the food groups, eating a variety of foods from all five food groups is one way to help assure the nutrient contribution to the diet (1,3,19). Most of the males (72%) and more than half of the females (58%) in the sample group were consuming at least one serving from at least four different food groups as assessed by the variety score (Table 2). Food groups omitted most often by men were the fruit (61%), vegetable (33%), milk (20%), and the meat groups (.02%). Substantial numbers of women did not consume any food from the fruit (52%), vegetable (34%), milk (24%) and meat (14%) groups.

A tendency of under-reporting consumption has been

previously reported (14,23) and could have been a factor distorting this analysis.

CONCLUSIONS

This study did not attempt to address all of the dietary concerns of college students (fat intake, meal skipping, vitamin/mineral supplementation, etc.), but did address behavior in accordance to new food group guidelines.

Although the one day reported by students of this study in their food records may not be typical for all college students, the food record analysis was considered to be an appropriate and convenient method to assess this sample population's typical food patterns.

Results of this study suggest that diets of many college students are poor as measured by lack of compliance with current food group recommendations (3,4). Observation of students' low consumption of dairy foods and fruits and vegetables along with high consumption of high-fat entrees and snack foods suggests poor food selection practices. University students' achievement of only a "fair" or "poor" dietary adequacy rating suggests that the majority of students may be consuming nutritionally inadequate diets. Students' reported consumption from fewer than four different food groups may also increase risks of nutritional deficiencies.

IMPLICATIONS

The results of this study illustrate that there is an increased need to educate university students in encouraging better choices in food consumption, decreasing the risks of nutritional deficiencies, and helping to establish good eating habits for a lifetime. Continued research is needed to determine specific baseline data of food consumption practices and changes in behavior in order to determine how well diet messages are received and translated into actions. Knowing what personal characteristics influence food behaviors also should be utilized to improve targeting and message design of nutrition education programs.

Table 1
Food classifications, serving sizes¹, and points assigned²
to each food group

Food group	Foods Included	Minimum number of servings recommended	Points assigned per serving ³	Maximum points
Bread	1 slice, 1 ounce dry cereal, 1/2 c. cooked cereal, rice, pasta, 1/2 bun, bagel or English muffin	3	2	6
Milk	1 cup milk or yogurt, 1 1/2 oz. cheese	2	3	6
Vegetable	1 cup raw, leafy or 1/2 cup other kinds	3	2	6
Fruit	1 medium fresh fruit, 1/2 cup small or diced, 3/4 cup juice	2	3	6
Meat	2-3 oz. of lean meat or poultry (daily total of 6 oz.), count 1/2 cup cooked dry beans or peas as 1 ounce meat	2	3	6

¹ From Nutrition and your health: dietary guidelines for Americans (3).

² An adaptation of the method described by Guthrie and Scheer (19).

³ Points assigned up to the minimum number of servings.

Table 2
Adequacy of college students' diets based on total diet and
variety scores

	Male (n=49)	Female (n=93)	Total (n=142)
Diet Scores			
Excellent 27-30 points	10.2 %	2.2 %	4.9 %
Good 24-26 points	8.2	7.5	7.7
Fair 21-23 points	20.4	5.4	10.5
Poor < 21 points	61.2	84.9	76.7
Variety Scores			
≥ 4 food groups	71.5%	58.1%	62.6%
≤ 3 food groups	28.5	41.9	37.3
* Values may not total 100% due to rounding.			

Table 3
Range and mean number of servings of food groups by
university students¹

	Recommended servings	Male (n=49)	Female (n=93)	Total n=142)
Bread				
Range	6-11	2-16	0-15	0-16
Servings ²		6.8 ± 3.6*	4.9 ± 2.7	5.6 ± 3.1
Milk				
Range	2-3	0-10 2/3	0-6	0-10 2/3
Servings ²		2.8 ± 2.3*	1.6 ± 1.5	2.0 ± 1.9
Vegetable				
Range	3-5	0-10	0-9.5	0-10
Servings ²		1.9 ± 2.2	1.2 ± 1.2	1.4 ± 1.6
Fruit				
Range	2-4	0-13	0-7	0-13
Servings ²		1.3 ± 2.6	1.0 ± 1.5	1.1 ± 1.9
Meat				
Range	2-3	0-8	0-4.5	0-8
Servings ²		3.5 ± 1.8*	1.6 ± 1.2	2.2 ± 1.7

¹ One day of three-day self-reported food records.

² Mean ± standard deviation.

* Significantly higher $p < 0.01$.

Table 4
 Food group and total diet scores¹, of male and female
 college students

	Males (n=49)	Females (n=93)	Total (n=142)
Food group			
Bread	5.1 ± 1.3	4.4 ± 1.7	4.6 ± 1.6
Milk	4.7 ± 2.4	3.6 ± 2.4	4.0 ± 2.5
Vegetable	2.8 ± 2.4	2.3 ± 2.1	2.5 ± 2.2
Fruit	1.9 ± 2.5	2.2 ± 2.5	2.1 ± 2.5
Meat	5.5 ± 1.3***	3.9 ± 2.2	4.5 ± 2.1
Total diet	20.0 ± 5.5***	16.3 ± 5.2	17.6 ± 5.6

¹ Means ± standard deviation.
 ***Significantly higher. p<0.001.

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SUMMARY AND CONCLUSIONS

Traditional college students face a multitude of lifestyle changes when they begin to live independently of their primary caregivers. With new opportunities, however, come new responsibilities of finances, education, social and physical pressures, and food consumption. Eating habits, which can last a lifetime, develop during these transitional years. Therefore, this life cycle stage is often targeted to promote the development of sound dietary behaviors.

Food guides have been developed to aid college students and other consumers to understand and adhere to the basic nutrition concepts promoted for good health. Literature review indicated that few nutrition education efforts have been developed nor evaluated for use in promoting the newest food group recommendations (U.S. Department of Agriculture, and U.S. Department of Health and Human Services, 1990; U.S. Department of Agriculture, and Human Nutrition Information Service, 1992).

Part one of this research utilized a questionnaire designed to assess college students' knowledge of the number of servings recommended in each food group, to which group a specific food belonged, and how much of a particular food would be equivalent to one serving. Results, as measured by student performance on the test, revealed that both male and female college students displayed a limited knowledge

about food group recommendations. The total sample group achieved a mean percentage of only 61% correct. This lack of knowledge could greatly interfere with compliance to the food group recommendations.

Part two of the research was designed to determine how well college students adhered to recommendations as assessed by examination of self-reported food diaries and nutrient analyses. Men in the study consumed at least the minimum recommended number of servings for the bread, milk, and meat groups, but the mean servings for women for all food groups were below the minimum number of servings recommended. The college students in this study often chose foods that were refined (breads, pasta dishes, cereals), high in fat (french fries, combination dishes, pizza, fried meats), and low in essential vitamins and minerals. In general, the diet pattern of these college students was low in foods rich in calcium and fiber and high in foods high in fat.

Food diaries and nutrient analyses of college students were assessed to determine dietary scores and variety scores based on the servings of food consumed from each of the five basic food groups. Each reported serving of food was awarded points up to the minimum recommended number of daily servings, then calculations were weighted to yield total diet scores. Variety scores were determined by differentiating food diaries that included four or more different food groups from diaries that did not.

Results illustrate clearly that college students are not consuming a diet composed of all five food groups. Diets scores of only 12.6% of the total sample group rated "excellent" or "good." "Poor" ratings were assigned to 76.7% of students. Only 62.6% of the college students consumed at least one serving from four or more different food groups (variety score).

Because these co-studies were analyzing knowledge and dietary behavior of two different sample groups of college students, no direct correlations can be made between the variables. One might propose, however, that since the two population samples were similar in characteristics, that conceptual comparisons might be made in relating the two groups.

From the data presented, it appears that lack of knowledge of appropriate food group recommendations may contribute to poor dietary intake of college students. Since college students' attitudes concerning food group recommendations were not assessed in this research, placement of attitude in the causal model remains undetermined. Further study is needed to validate this conceptual comparison and the effect that knowledge or attitude have on behavior.

Results of these separate studies illustrate that college students in this sample were not knowledgeable about aspects of the food group guidelines that experts believe

are important. Also illustrated was the inadequate dietary intake of these college students in meeting the guidelines for good health. It may be speculated that these poor results may be attributed to either one or a multiple of the following reasons:

- 1) No nutrition education efforts are reaching college students.
- 2) Existing nutrition education efforts are inappropriate or ineffective for college students.
- 3) College students are indifferent to food group guidelines and/or education efforts to clarify those guidelines.

While college students do face many barriers to consumption of a nutritious diet (Beerman, 1991; Hernon, 1986; Marrale, 1986; Khan and Lipke, 1982), establishing good diet habits in the transitional college years is imperative to promote future health. Results of this study clearly substantiate the need to educate traditional college students about the newest food group recommendations. Improved levels of knowledge would then ideally lead to better food selection and overall improved dietary patterns. Effective nutrition education efforts conducted now could help college students establish good eating habits for a lifetime.

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New Recommendations for the Food Groups

Thank you for your time and help in this research project. The purpose of this research is to determine what college students think about some basic nutrition concepts. This evaluation is a way to assess what you think are the current recommendations for a healthy diet. Please answer based on your knowledge of good eating practices.

Directions:

For each item fill in the circle on the answer sheet for the one answer that you choose.

1. I am...

- a) Female b) Male

2. My age is...

- a) 17 f) 22
b) 18 g) 23
c) 19 h) 24
d) 20 i) 25
e) 21 j) 26 or older

3. I live...

- a) in a residence hall or in greek housing.
b) in an apartment/house by myself or with roommates
c) with parents
d) other, please specify _____

4. While I am here at EIU, most of the food I eat is prepared...

- a) by me
b) by someone else--parent or roommate

- c) by a food service
- d) I eat out most of the time

5. I consider my activity level to be

- a) Sedentary (Inactive)
- b) Lightly Active (Typical of most professionals, many students, office workers, shop workers, etc.)
- c) Moderately Active (Active students, most persons in light industry, building workers, department store workers, etc.)
NOTE: The majority of people fall into category b or c.
- d) Very Active (Full-time athletes, dancers, unskilled laborers, some agricultural workers, forestry workers, etc.)
- e) Exceptionally Active (Heavy construction workers or other rigorous vocations.)

6. My major is in ...

- a) home economics—foods and nutrition or dietetics
- b) home economics—areas other than (a)
- c) communication disciplines (ex. speech, communication disorders, languages)
- d) social science (ex. political science, psychology, sociology)
- e) business (ex. accounting, finance, management, marketing, economics, data processing, business education)
- f) fine arts and humanities (ex. art, music, theatre arts, English, history)
- g) physical education, health, recreation
- h) science (ex. botany, chemistry, physics, zoology)
- i) education
- j) other, please specify _____

How many servings in each of the following food groups do you think are currently recommended for good health?

7. Vegetable group...

a) 0 servings b) 1-2 servings c) 3-5 servings d) 5-7 servings

8. Fruit group...

a) 0 servings b) 1-2 servings c) 2-4 servings d) 4-6 servings

9. Bread group...

a) 0 servings b) 1-4 servings c) 4-8 servings d) 6-11 servings

10. Milk group...

a) 0 servings b) 1-2 servings c) 2-3 servings d) 3-6 servings

11. Meat group...

a) 0 servings b) 1-2 servings c) 2-3 servings d) 3-4 servings

Considering the nutrient content of foods, in which food group do you think each of the following foods belongs?

Answer: a Vegetable Group

 b Fruit Group

 c Bread Group

 d Milk Group

 e Meat Group

 f Does not belong in any of these groups

12. Rice

18. Potato Chips

24. Beer

13. Orange

19. Yogurt

25. Tomato

14. Chicken

20. Eggs

26. Oatmeal

15. Cereal

21. Nuts

27. Spinach

16. Pasta

22. Grape Juice

28. Fish

17. Ice Cream

23. Cheese

29. Salad Dressing

In each of the following groups of foods, one food nutritionally does not belong with the others. Which one do you think is the food that does not belong?

30. a) pork chop b) dry beans c) yogurt d) hamburger
31. a) tomato b) orange c) green beans d) cucumber
32. a) milk b) ice cream c) butter d) yogurt
33. a) beef b) fish c) chicken d) bacon

In making recommendations about food intake some generally accepted measures and amounts of food are used. For each of the following questions, what amount do you think is the accepted measure for "1 serving" of the food given.

34. Raw leafy green vegetables
a) 1/2 cup b) 3/4 cup c) 1 cup
35. Cooked cereal, like oatmeal
a) 1/4 cup b) 1/2 cup c) 1 cup
36. Fruit juice
a) 1/2 cup b) 3/4 cup c) 1 cup
37. Cooked vegetables, like carrots
a) 1/2 cup b) 3/4 cup c) 1 cup
38. Sliced bread
a) 1/2 slice b) 1 slice c) 2 slices
39. Fresh Fruit, like apples, oranges, bananas
a) 1/2 medium size b) 1 medium size c) 1 large size
40. Cooked Pasta, like macaroni or spaghetti
a) 1/2 cup b) 3/4 cup c) 1 cup

41. Milk or Yogurt
a) 1/2 cup b) 3/4 cup c) 1 cup
42. Red meat, like beef or pork
a) 2-3 oz. b) 5-6 oz. (1/3 lb) c) 8-10 oz. (1/2 lb)

How many servings of each food group were eaten in the following meal?

Hamburger
(3 oz. cooked hamburger, 1 bun)
Green Beans (1 cup)
Apple (1)
Skim Milk (1 cup)
Chocolate Brownie (1)

43. Breads and Cereals Group
a) 0 servings b) 1/2 serving c) 1 serving d) 2 servings
44. Vegetable Group
a) 0 servings b) 1/2 serving c) 1 serving d) 2 servings
45. Fruit Group
a) 0 servings b) 1/2 serving c) 1 serving d) 2 servings
46. Meat Group
a) 0 servings b) 1/2 serving c) 3/4 serving d) 1 servings
47. Milk Group
a) 0 servings b) 1/2 serving c) 1 serving d) 2 servings

THANKS AGAIN FOR YOUR HELP, YOU'VE BEEN GREAT!!

Food group classifications for foods reported on student 3-day food records.

<u>Amount</u>	<u>Food</u>	<u>Food Group Classification</u>
1 cup	Chili	1 meat, 1/2 vegetable
1 cup	Macaroni & cheese	2 starch, 1 milk
1 cup	Beef & macaroni	1 starch, 1 meat, 1/2 vegetable
1	Cheeseburger	2 starch, 1 meat, 1 milk
1	Grilled cheese sandwich	2 starch, 1 milk
1 slice	Cheese pizza	1-1/2 starch, 2/3 milk
1 cup	Spaghetti vegetable	2 bread, 1 meat, 1/2
1	Taco	1 bread, 1/2 meat, 1/2 milk
1 piece	Lasagna	2 starch, 2 meat, 1 vegetable
1	Beef & bean burrito	1 bread, 1 meat, 1 vegetable
1 cup	Chicken Chow Mein vegetable	1 starch, 1 meat, 1
1 cup	Vegetable-Beef soup	1/2 meat, 1/2 vegetable
1 piece	French toast	1 bread, 1/3 meat
1 cup	Cream of chicken	1/4 starch, 1 milk
1	Chicken pot pie commercial-type	1 bread, 1/2 meat
1 cup	Beef stew	1 meat, 1/2 vegetable
1 slice	Bread products	1 bread
1 oz.	Dry cereal	1 bread
1/2 cup	Cooked cereal, rice, pasta	1 bread

Continued...

1/2 Bun, bagel, or English muffin	1 bread
1 oz. Tortilla chips	1 bread
6 Round-type Crackers	1 bread
1 Pita bread	1 bread
1 Toaster pastry	1 bread
1 cup Chicken noodle soup	1 bread
1 cup Popcorn	1/3 bread
2-3 oz. Lean meat or poultry	1 meat
1/2 cup Cooked dry beans/peas	1/3 meat
1/2 c. Corned beef hash	1 meat
5 Fish sticks	1-2/3 meat
3 (1 oz.) Chicken nuggets	1 meat
1 cup Raw or leafy vegetables	1 vegetable
1/2 cup Other vegetables	1 vegetable
10 French fries	1 vegetable
Regular Fast food french size fries	2 vegetable
1 cup Vegetable soup	1/2 vegetable
1 cup Minestrone soup	1/2 vegetable
1 cup Milk or yogurt	1 milk
1-1/2 oz. Cheese	1 milk
1 cup Pudding	1 milk
1 cup Frozen yogurt	1 milk
1 piece Fresh fruit	1 fruit

Continued...

1/2 cup Small or diced fruit	1 fruit
3/4 cup Fruit juice	1 fruit

Based on U.S. Department of Agriculture, U.S. Department of Health and Human Services. Nutrition and Your Health: Dietary Guidelines for Americans. Home and Garden Bull. No. 232. Washington, D.C.: Government Printing Office. 1990, 27 pp.