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FOOD AND NUTRITION MISCONCEPTIONS, KNOWLEDGE, RELATED INTERESTS, AND INFORMATION SOURCES OF KNOXVILLE, TENNESSEE, HIGH SCHOOL STUDENTS

A Dissertation

Presented for the

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ABSTRACT

Food and nutrition misconceptions, food and nutrition-related interests, and information sources of 185, tenth through twelfth grade students from a selected sample of Knoxville, Tennessee, high schools were studied. Relevant information was obtained through the development and administration of a questionnaire designed to distinguish between level of food and nutrition knowledge and degree of subscription to misconceptions, to determine which topics within the realm of food and nutrition were of interest to the teenage population, and to ascertain sources of information for the various categories of food and nutrition knowledge.

Students of both sexes and of all grade levels were found to possess a limited knowledge of food and nutrition and to maintain a considerable subscription to misconceptions. The mean misconception score for the total population was 14.9 ± 6.2 out of a possible score of 56. The greatest proportion of misconceptions were found in the areas of Foods My Body Needs (33.5 percent misconceptions) and Diet and Weight-Watching (32.1 percent misconceptions). Significant differences ($\leq .05$) in misconception scores were observed among the four schools but differences between sexes and across grade levels were not significant.

The mean knowledge score for the population was 17.0 + 6.2 out of a possible 56. Differences were not observed between sexes nor among grade levels. Knowledge scores were positively associated with degree of training in chemistry ($\gamma = +0.37$) and biology ($\gamma = +0.38$) but were

not significantly associated with amount of training in home economics or health.

High interest in a variety of food and nutrition-related topics was observed among the teenage students. Girls, in general, found topics more interesting than did boys but the differences were slight. High interest in topics under the categories of Foods My Body Needs and Miscellaneous was positively associated with number of misconceptions in those areas (γ = +0.34 and γ = +0.20, respectively).

Information relating to food and nutrition was obtained by the teenagers from a variety of sources but most frequently mentioned sources for all but one category of information, i.e., Organic and Health Foods, were parents and medical doctors or nurses. Information sources for boys and girls and among grade levels were significantly different for several categories of information. With only one exception, misconceptions in the various categories were not significantly associated with any particular information source.

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CHAPTER I

INTRODUCTION

The food habits of teenagers are of concern to nutrition educators, teachers, school food service personnel, dietitians, physicians, and parents (Erhard, 1971; Everson, 1960; McElroy and Taylor, 1966; Schorr et al., 1972; Wyman, 1972). The tendency of the teenager to practice limited judgment in the selection of foods has been viewed as a primary determinant of the poor nutritional status of a significant number of this age group (Carruth and Foree, 1971; Everson, 1960; McElroy and Taylor, 1966; Schorr et al., 1972; Spindler and Acker, 1963). Studies wherein nutrition knowledge of teenagers has been ascertained have consistently shown a low level of knowledge among this age group (Dwyer et al., 1970; Sliepcevich, 1964; Sutton, 1962). However, poor performance on measures of nutrition knowledge does not seem to be the result of low emphasis on nutrition education. On the contrary, low nutrition knowledge scores have been found to occur in conjunction with a strong emphasis on nutrition instruction (Dowell, 1966; Kirk et al., 1975).

Teenagers in Tennessee also have been found to possess low levels of nutrition knowledge in spite of the high emphasis on nutrition education in the school systems. Emphasis on nutrition ranked fifth out of 25 health-related content areas in the health education curriculum of ninth through twelfth grade public schools in Tennessee according to Huntsinger (1971). Likewise, Tennessee school personnel consistently reported that the area of nutrition received greater emphasis than others in the health

education of elementary, junior high and senior high students in a study by Kirk et al. (1975). However, when the nutrition knowledge of these same students was measured on health behavior inventories the students scored well below national norms in the nutrition content area.

It seems plausible that the low correlation between emphasis on food and nutrition-related topics and increased nutrition knowledge of this population may be due to, at least in part, two major factors, degree of interest in food and nutrition-related topics and proliferation of misinformation on the topics, or to a combination of these factors.

According to Dwyer et al. (1970) "wrong answers on nutrition tests are often indicative of misinformation or wrong learning rather than a total lack of knowledge because of the prevalence of unfounded beliefs based on misinformation, folklore, tradition, and superstitious beliefs." The proliferation of misinformation regarding food and nutrition has been viewed as a major barrier in safeguarding the health of the population in the United States (Bruch, 1970; Henderson, 1974; New and Priest, 1967; Rynearson, 1974; Sipple, 1964) as well as in other countries (Swedish Nutr. Found., 1969). Teenagers, as well as other age groups, may jeopardize their own health and welfare as well as that of generations to follow by adhering to invalid nutritional beliefs (Dwyer et al., 1970; Harrison and Irwin, 1964). Hence, recognition of the food and nutrition misconceptions a learner holds will help the nutrition educator plan meaningful learning experiences to diminish these misconceptions and thereby increase the probability of more sound health practices.

Interest in certain food and nutrition-related topics provides incentive to learn more about the topic, and furthermore increases the individual's exposure to communications regarding it (Dwyer et al., 1970; Lantagne, 1952). Certain topics are of interest to the teenager due to their relevance to the achievement of developmental tasks (Weiner, 1971). Since relevance of the topic determines the individual's degree of interest in the topic and interest is generally considered conducive to learning, it should be determined which topics within the realm of food and nutrition inspire interest in the teenager. Capitalizing on related interests can aid in the development of effective nutrition education programs for the teenager as well as for other populations.

When interest in a topic increases the likelihood of exposure to information on a topic and the information is erroneous, nutrition education becomes increasingly difficult. It should be determined, therefore, what the teenager's major information sources are in order to work toward utilizing these same sources to counter fallacies with facts.

In this study it was hypothesized that teenagers would subscribe to a number of food and nutrition misconceptions, the greatest number of which would be in those areas in which he had most interest. It was postulated that certain food and nutrition-related topics were of more interest than others and that teenagers would obtain their information regarding these topics from sources other than recognized experts. Finally, it was believed that the teenager's level of knowledge would correlate with the extent of his formal training in this area.

CHAPTER II

REVIEW OF THE LITERATURE

I. THE ADOLESCENT

Adolescence has been defined in physiological, sociological, and behavioral terms. Thornburg (1970) refers to adolescence as a period during which the growing person makes the transition from childhood to adulthood. It is not any precise span of years but may be viewed as beginning with signs of puberty and continuing until most have achieved sexual maturity, maximum growth in height, and have approximately reached their full mental growth.

From a behavioral perspective, adolescence has been regarded by Sieg (1971) as a period of development in human beings that begins when individuals feel that adult privileges are due them which are not being accorded them, and that ends when the full power and social status of the adult are accorded to the individuals by their society. This definition eliminates certain biological factors as relevant such as puberty, universality of adolescence and age. The presence of adolescence is dependent instead on the individual's perception of his rights. The individual's attempt to attain the power and social status of the adult forms the basis for his actions during the adolescent period.

From a physiological perspective the following physical changes can be expected to occur in normal adolescents: (1) an increase in height and weight; (2) growth in different parts of the body; (3) changes in bone

structure; (4) variations in bodily proportions; (5) growth of various internal organs; (6) changes in blood pressure; and (7) external and internal pubertal alterations (Cole, 1954).

In addition to achievement of physical growth the adolescent is expected to achieve certain developmental tasks as the child evolves into an adult. These developmental tasks are defined as "skills, knowledge, and functions or attitudes which individuals should acquire within a specific period of their lives" (Thornburg, 1970). Efforts to fulfill these tasks ultimately determine the behavior of the individual (Cole, 1954).

All aspects of adolescence, physiological, sociological, and psychological, must be considered in a study of the teenager's nutrition and food behavior since they are all interrelated. Due to the rapid physical changes which occur in their bodies teenagers become particularly vulnerable to malnutrition (Gifft et al., 1972). Calorie and protein requirements closely parallel growth rate and the attainment of the menarche in girls raises the iron requirement significantly. Furthermore, inefficient use of certain important nutrients due to the frequency and magnitude of emotional problems compounds the problem of inadequate nutrition (Everson, 1960). The achievement of independence and the need for solidarity and individual expression are oftentimes expressed in the teenager's choice of words, dress, and music as well as in the choice of the foods eaten and the time and place they are eaten (Weiner, 1971).

Nutritional problems among the teenage population are similar in nature to those existing in other population groups in the United States

but they may be accentuated by the high nutritional needs of this group (Gifft et al., 1972). Problems of underweight and overweight plague a substantial proportion of this group and complications of pregnancy and a high incidence of birth defects among infants of teenage mothers is significant (Everson, 1960).

Concern over the nutritional status of the teenager is justified on the grounds of evidence obtained from several research studies. The Ten-State Nutrition Survey (Robbins, 1972) revealed that "children under the age of 17, especially teenagers, had the highest prevalence of nutritional problems."

Everson (1960) states that there is little question that the teenager practices limited judgment in the choice of total food eaten. Several studies involving determination of the nutritional status of this age group revealed shortcomings in intakes of several important nutrients. Inadequate intakes of calcium, vitamin A, and ascorbic acid were reported by both Everson (1960) and Schorr et al. (1972) who observed that 21 percent of the teenagers studied consumed less than two-thirds of the Recommended Daily Allowance for ascorbic acid, and 44 percent, 69 percent, and 51 percent received less than two-thirds of the RDA for calcium, iron, and vitamin A, respectively. Questionable provision of an amino acid mixture which will support optimal growth was noted by Everson (1960) and Hodges and Krehl (1965), and high consumption of fats and "empty calories" mentioned by Hodges and Krehl (1965). High blood cholesterol values found in a large number of teenagers has increased the concern over the diet of this group (Hodges and Krehl, 1965). Even though boys

are less prone to nutritional inadequacies due to the large volume of food ingested (Schorr et al., 1972), they also consume more fat than girls. An average of 43.5 percent of the total Calories consumed by boys in the study by Hodges and Krehl (1965) was in the form of fat, an amount higher than that recommended by the American Heart Association. Also, a significant correlation between greater height and weight and higher triglyceride concentrations in the blood found by Hodges and Krehl (1965) would prove more problematic for boys than for girls.

Frequent between-meal snacks and consumption of high carbohydrate foods such as candy, soft drinks, and pastries have also been associated with the development of dental caries among adolescents (Robbins, 1972).

II. FOOD AND NUTRITION-RELATED INTERESTS AMONG TEENAGERS

In spite of the apparent need for proper nutrition the teenager has consistently expressed little interest or desire to learn about or to improve his nutrition.

The importance of interest in subject matter as a prerequisite to learning has been stressed. Bremer and Weatherholz (1975) who studied the nutrition attitudes of 670 people in a university community found that those who indicated the greatest interest in nutrition scored best on the factual questions and expressed the greatest confidence in the relationship between diet and the maintenance of health. Likewise, Shipman and McCannon (1964) found that relevance of the topic for each individual determined the degree of interest and increased the likelihood of self-exposure to communications regarding the topic.

According to Funk and Wagnell's (1973) definition, interest is the "conscious feeling of concernment in an object, regarded especially as a stimulant and guide to the arousement and direction of attention." With the relationship between interest and learning in mind, results of several studies concerning teenage nutrition interests seem especially disconcerting.

Orr (1965) found topics in nutrition rated lowest of all other health areas in terms of expressed health interests of 250 high school seniors from nine Knoxville, Tennessee, high schools. High school students' attitudes toward nutrition education and their knowledge of nutrition were also assessed by Dwyer et al. (1970) who found a high degree of disinterest among the majority of students tested. Many students commented that nutrition education was "boring" or "old hat" and involved the memorization of useless facts rather than real understanding. Kirk et al. (1975) found nutrition ranked lowest on the ladder of Bedford County, Tennessee, students' health interests, and Lantagne (1952) found nutrition to be only of "average" interest to 10,000 secondary school students in 26 high schools of 10 different states. However, when an item analysis of the 300 health interest topics was made there were 12 topics related directly or indirectly to the area of food and nutrition which were among the 50 topics of greatest interest. The author concluded that low interest in a health area does not imply that all problems within that area were of low interest to students, rather there may be specific items of both low and high interest in each major health area. This also seemed to be the case in Orr's (1965) study. Again,

even though the area of food and nutrition ranked lowest in health interests of the students, the following topics were included among the ten most interesting topics: heart disease, effects of alcohol on the body, how a human baby develops, care of the eyes, and skin blemishes in the teen years. These topics certainly can be considered related to food and nutrition. He also found that even though general interest in the area of nutrition was low, causes of over and underweight, how glands affect the use of food by the body, disorders produced by the lack of vitamins, individual differences in food needs, and proper cooking of foods were topics within the area of nutrition rated highest by the students.

Likewise, Dowell (1966) found secondary students to be highly interested in such problems associated with nutrition as fitness, weight control, skin, and eyes, whereas they worried most about dental problems, acne, and overweight. Dwyer et al. (1970) and Spindler and Acker (1963) also found (among this age group) considerable interest expressed in the areas of weight loss and skin problems.

Since attitudes often pose blocks to better eating habits it is important to look at prevailing feelings in order to approach nutrition education from a more practical standpoint. Insight into motivating factors of adolescence, pertinent topics for nutrition education, and problem areas through which one might inspire interest in the teenager is essential to planning nutrition education programs. Obviously, programs geared toward meeting needs of a particular group will be most successful. Kirk et al. (1975), who in an earlier study found interest in a few

nutrition related topics along with a general disinterest in the overall area of nutrition, put their findings to work in a practical manner through integrating nutrition instruction into the curriculum of a comprehensive health education program with nutrition serving as the connecting threads within appropriate units. The results of that effort will be available shortly.

The need for recognition of and respect for the complexity of the needs and problems that characterize the teenager's world today were stressed by Leverton (1968). Among the reasons she gives for little success in encouraging adherence to guidelines prescribed by nutrition educators are: (1) Too often teenagers have been given the idea that nutrition means eating what you don't like because it is good for you rather than eating well because it will help you in what you want to do and become; (2) Adolescents are not experiencing the nutritional disaster that adults are telling them will result from poor food habits; (3) Food is only one component of the busy lives of the teenager and can receive only a fraction of their attention; and (4) Many persons in strategic positions to help them are not knowledgeable about practical nutrition--some are actually misinformed.

III. LEVEL OF NUTRITION KNOWLEDGE AMONG TEENAGERS

The teenager's overall lack of interest in nutrition-related topics may be responsible for the apparent low correlation between the amount of effort devoted to nutrition education and reported measurements of food and nutrition knowledge.

Few studies have been reported on the measurement of food and nutrition knowledge of teenagers. Those which have been reported are generally limited as to geographic location and/or percentage of population tested and they generally test food and nutrition knowledge along with various other health-related factors (Dwyer et al., 1970). In the study conducted by Dwyer et al. (1970), 1,338 students representing 42 percent of all students in selected grades in five urban high schools in Massachusetts had a mean score on a test of nutrition knowledge of 55.9 out of a possible score of 100.

It was found by Kirk et al. (1975) that even though students at all grade levels in Bedford County, Tennessee, received more health instruction in the field of nutrition than in any other health-related area, nutrition knowledge as measured by a standardized health behavior inventory ranked far below all other health areas. Likewise, a national survey of school health education reports that the lowest percentage of correct responses among twelfth graders was in the area of nutrition as compared with eleven other health content areas (Sliepcevich, 1964).

Using a different approach Dowell (1966) studied the incidence of neglect of nutrition instruction in the secondary schools in relation to nutrition problems encountered in the community, expecting that there would be an inverse relationship between the emphasis on nutrition education and the incidence of nutrition-related problems. However, they found instead a higher incidence of health problems related to nutrition than would be expected from the instruction given.

On a more positive note, Dwyer et al. (1970) did find an insignificant but consistent increase in the level of nutrition knowledge from grade to grade which they attributed to the gathering of additional information about nutrition, both through formal instruction in such courses as biology and chemistry and by informal education and experiences obtained outside the school.

IV. FOOD AND NUTRITION MISCONCEPTIONS

In addition to low motivation for learning due to lack of interest in food and nutrition it seems probable that low performance on nutrition knowledge tests could also be due to the prevalence of misconceptions regarding food and nutrition among teenagers.

Results of the Tennessee Health Education Project conducted by Kirk et al. (1975) in which low mean nutrition knowledge scores were found on the elementary, junior, and senior high levels in spite of a high emphasis on nutrition education prompted the authors' suggestion that the educational program was possibly effective in promoting misinformation. Few attempts have been made to distinguish between the secondary student's food and nutrition knowledge and misinformation even though wrong answers on nutrition tests are often indicative of misinformation or wrong learning rather than a total lack of knowledge because of the prevalence of unfounded beliefs based on misinformation, folklore, tradition, and superstitious beliefs (Dwyer et al., 1970).

A misconception may be defined as "a belief commonly held as true but which is not in accord with scientific evidence to date. This would

include fallacies, fads, and half-truths" (Wang, 1971). Misconceptions may arise from wrong learning or misinformation as well as inadequate learning or insufficient information (Heflin and Pangle, 1966).

According to Gifft et al. (1972) the teenager is generally psychologically and socially prone to nutrition problems. The need for expression of independence often is reflected in adoption of eating patterns calculated to test adult restrictions. Fad diets and peculiar notions about positive and negative attributes of foods are perpetuated by the all-important peer group. Fads and cults such as vegetarianism evolve out of the need for independence and identity. Concern over the rapid physiological changes occurring in the body is often cause for manipulations of the diet in an attempt to influence their physical appearance. When these manipulations of the diet are based on erroneous beliefs or misinformation they become undesirable at least, and unfortunately, sometimes dangerous.

Nutrition concepts are especially vulnerable to various interpretations and misinformation abounds. The teenager along with the vast majority of the American public is bombarded with nutrition information and misinformation from a variety of sources (Bruch, 1970; Henderson, 1974; New and Priest, 1967; Rynearson, 1974; Sipple, 1964). Kilander (1964) points out that there are possible more misconceptions and half-truths still believed by the American public in nutrition than in any other area of health. He concluded from results of a 33-item multiple choice test that nearly one half of the 5,000 subjects, a majority of which were high school graduates and 30 percent of which were

college graduates, were not knowledgeable enough to be able to choose adequate diets for themselves.

A high prevalence of misconceptions regarding food and nutrition has been found among children, junior and senior high school students, 4-H youth, university students, college graduates, and low income Negro and white urban families.

Sutton (1962) found misconceptions relating to health, especially in the area of nutrition, to be common among children and youth. Seven out of ten girls in the tenth grade believed that any food that does not smell or taste spoiled is safe to eat. Three out of four fifth and sixth grade pupils and more than half of a group of tenth grade girls believed that taking vitamin pills guaranteed good health and one-half of these girls believed vitamins in pills are better than vitamins in natural foods. The belief that hot food is more nutritious than cold was held by one out of three college students.

Williams (1956) developed an instrument to measure health misconceptions among high school students in Enfield, North Carolina, and found that they entertain a high degree of health misconceptions. The greatest of these were in the area of nutrition and personal and environmental health. In the area of nutrition, ninth graders showed a higher degree of health misconceptions than the students in the other three grades.

In a study of the prevalence of nutrition misconceptions among college freshmen prior to instruction in nutrition, Osman (1967) found the mean number of nutrition misconceptions to be 30.90 out of 144 and

the mean "don't know" score to be 33.84 resulting in a total of 64 statements out of 144 which the students could not answer correctly. Boys subscribed to more misconceptions and had more "don't know" responses than did girls although the differences were not significant.

Heflin and Pangle (1966) also found substantial misconceptions on six out of the fifteen nutrition and diet related questions upon administration of the Dearborn Health Knowledge Test to 243 Peabody College students enrolled in the required health education course.

Likewise, Adams (1959), who studied health misconceptions of college freshmen at the University of Oregon, found the greatest percentage of misconceptions in the area of foods and nutrition among males. Females believed 43 percent of the 19 nutrition misconceptions as compared to males who believed 49 percent.

First year students at a Canadian university were found to subscribe to a substantial number of nutrition misconceptions in a study by McCarthy and Sabry (1973). The mean misconception score on a 70-item true, false, don't know questionnaire was 18.6; the mean correct answer score, 37.8 and the mean don't know response, 13.6. Little difference was noted in either misconception or correct answer scores for males and females nor were misconception scores related to rural or urban background of students or to number of years the student had been in 4-H club.

On the basis of information obtained through studies of the prevalence of food and nutrition misconceptions it can be surmised that the percentage of misconceptions varies according to the various categories

of topics covered in the survey. McCarthy and Sabry (1973) found a high number of misconceptions regarding environmental factors (food additives, pesticide residues, food processing, and food enrichment) and fewer misconceptions regarding health foods. Jalso et al. (1965) found more invalid opinions regarding special "health" foods and soil depletion, chemical fertilizers, and insecticides than in other areas.

It also has been observed that for some population groups formal training in home economics or related areas may lower misconception scores and increase correct responses on tests designed to measure food and nutrition knowledge and misconceptions. Wilson and Lamb (1968) found that women with backgrounds in home economics did not accept as many food fallacies as did their peers with higher education in academic disciplines other than home economics. However, college graduates, in general, accepted more false beliefs about food than non-college graduates. The investigators concluded that education in home economics at the college level makes a positive contribution to correct food beliefs. Likewise, Bremer and Weatherholz (1975) found that adults with formal training in nutrition and biochemistry were more skeptical of the value of "organic" and "health" foods than those lacking such training.

McCarthy and Sabry (1973) found that home economics education in secondary school appeared to be related to lower misconception scores and higher correct answer scores among first-year Canadian university students. However, secondary high school home economics instruction was found to be unrelated to sound dietary practices of pregnant teenagers in a study by Singleton (1974).

Harrison and Irwin (1964) found that a large percentage of junior high students subscribed to a number of harmful health misconceptions, many in the area of food and nutrition, regardless of metropolitan area, sex, grade level, or number of semesters of health instruction. Moreover, recency of health instruction seemed to bear no relation to the number of misconceptions held or in reducing the prevalence of health misconceptions in a study conducted by Baker (1964). In this study which measured misconceptions related to food and nutrition along with ten other health areas, students with no prior health instruction tended to be no more misconceived than those with health instruction. Williams (1956) noted a slight but progressive decline, however, in health misconceptions in nutrition as the pupils moved upward from ninth to the twelfth grades.

The ability of 4-H youth to distinguish nutrition fallacies from facts was found by Wang (1971) to be similar to low-income homemakers which was poor as compared to middle-income homemakers. She attributed the differences in quality of nutrition knowledge to different levels of education with concomitant greater varieties of experiences. Similarly, according to Jalso et al. (1965) food belief questionnaire respondents who were classified as food "faddists" had less formal education and less nutrition education than did "non-faddists" and were concentrated in the older age and lower income groups. Also, in a study of 310 low-income, urban Negro household heads Cornely et al. (1963) found education to be more closely related to rejection of folk beliefs than age, prior residence, or number of children in specific age categories. It was concluded

that low-income families have insufficient information about the essentials of an adequate diet and that they retain faith in a number of erroneous folk beliefs concerning food and nutrition.

It seems that certain populations may be more open to misinformation than others. In a study conducted to determine if an association exists between food faddist beliefs and practices and age and education level, it was found that education was positively correlated with scores on both nutrition practices and opinions but a negative correlation existed between age and scores on both opinions and practice; that is, as age increased valid nutrition opinions and practices decreased. Since further analysis revealed a negative correlation existing between age and education it was determined that age is the single most important variable affecting scores for both opinions and practices (Jalso et al., 1965).

Dwyer et al. (1970) noted a surprising discrepancy between level of knowledge and areas of interest in food and nutrition as expressed by teenage girls. The areas of greater interest, as expressed on a five question open-ended questionnaire, were the very ones they know least about. The investigators attributed this inconsistency to the fact that of all the topics of nutrition, weight control and energy balance are probably those in which the most misinformation abounds and is publicized to the greatest extent. It may be that the girls absorbed more of the misinformation because they were more likely to be exposed to and interested in such topics. Exposure to more sources of information also may account for finding a higher prevalence of misconceptions among college

graduates than among non-college graduates in Wilson and Lamb's (1968) study.

The evidence is contradictory then regarding the prevalence of misconceptions and degree of education. It seems that in one instance training in home economics decreased the entertainment of false food beliefs but that education alone and higher interest in specific topics related to food and nutrition also may result in greater exposure to information on the subject, a large proportion of which may be erroneous. It seems plausible that general characteristics of certain population groups, e.g., the aged and adolescents, may contribute to greater gullibility regarding food and nutrition misinformation.

V. THE EFFECT OF EXPOSURE TO MISINFORMATION ON NUTRITION-RELATED BEHAVIOR

It is important to consider common food and nutrition misconceptions among various population groups since it is recognized that knowledge of scientifically correct information plays a relatively minor role in the behavior of the individual. While recognizing scientific knowledge we also pay attention to symbolic relationships and emotions may override reason, rigorous logic, and science (de Garine, 1972).

The importance of gearing nutrition education programs toward values and interests of the teenager has been emphasized. However, it is equally important to recognize that means of realizing values and satisfying interests are often based on erroneous information. For instance, health ranked first in a study conducted to determine which values are operative in the teenage boy's decisions involving food

choices (McElroy and Taylor, 1966). However, the layman's notion of what is healthful or good to eat often is based on unfounded beliefs rather than on scientific evidence (Dwyer et al., 1970). Thus, Litman et al. (1964) who studied 1039 subjects between the ages of ten and twenty-two years found that preference for such foods as milk, meat, eggs, spinach, fruits, fruit juices, and so forth was based on health and nutrition related rationale. However, even though the common rationale for preferences for these foods were related to health and good nutrition, an evaluation of the nutritional accuracy of the students' responses revealed that only 60 percent of the reasons were adjudged to be nutritionally accurate. Furthermore, there seemed to be considerable reliance on erroneous or misinformation.

According to Dwyer et al. (1970)

> . . . teaching based on overcoming deeply entrenched mistaken notions about nutrition based on incorrect information and replacing it with correct concepts is a more difficult task than teaching the correct concept to a totally naive subject. Those who have misconceptions are often less responsive and attentive pupils since they believe they already possess the correct information.

VI. SOURCES OF INFORMATION ON FOOD AND NUTRITION

If misinformation is such a critical factor in determining food habits of the teenager it would seem essential to determine how and why he receives the various messages regarding food and nutrition.

A review of the available literature revealed few studies conducted to identify sources of the teenagers' nutrition information. Jalso et al. (1965) who studied nutritional opinions and practices of a subsample

of 101 subjects representing a wide range of age, income, and formal education found that those subjects classified as "faddists" read more nutrition books of questionable validity than approved books. Magazines and newspapers were the most frequent sources of nutrition information used by both faddists and non-faddists whereas radio and television were not major sources of information for either group. It is not possible to generalize the results of this study to the teenage population, however, since differences among age groups were not determined in the investigation.

In a study of nutrition knowledge, attitudes, and practices of Canadian public health nurses (Schwartz, 1975) it was found that nurses who received nutrition instruction and information from a nursing instructor during their training program achieved significantly lower scores in tests of nutrition knowledge and practices than did nurses who received nutrition instruction from a nutritionist or dietitian. The author concluded that it should not be assumed that all sources of nutrition education result in improved knowledge, attitudes, and practices of public health nurses.

A somewhat dated but nevertheless disturbing review conducted by a governmental committee in which selected public school textbooks were reviewed for their scientific accuracy of health information revealed that nutrition ranked high in the percentage of errors reported and the extent of error increased with the age of the book (Committee on Textbooks, 1953). A replication of this review would be indicated to determine sources of misinformation prior to revision of nutrition education

programs. If one were able to determine the major sources of misinformation perhaps nutrition educators could also work toward utilizing these media to counter fallacies with facts. White (1973) also suggested continued peer review of the purveyors of nutrition information to alleviate the problem of proliferation of misinformation.

The objectives of the present study were:

1. To determine the teenage student's level of knowledge regarding general food and nutrition principles.
2. To measure the prevalence of misconceptions regarding food and nutrition among teenage students.
3. To identify those sources of information the teenage student utilizes in gaining information regarding food and nutrition; e.g., medical doctor, teacher, popular books on nutrition, mail advertisements, friends, etc.
4. To determine those topics within the realm of food and nutrition which the teenage student considers interesting.
5. To determine what topics in food and nutrition are most subject to perpetuation of misinformation among teenage students.

It has been hypothesized that:

1. Tenth through twelfth grade teenage students subscribe to a number of misconceptions regarding food and nutrition.
2. The teenage student will subscribe to more misconceptions which relate to those topics in which he is most interested.
3. The teenage student obtains his information regarding food and nutrition from sources other than recognized experts.

4. The teenager's level of knowledge of food and nutrition correlates with the extent of his formal training in this area.
5. Certain topics within the area of food and nutrition are of more interest to the teenage student than other topics.

CHAPTER III

PROCEDURES

I. PRELIMINARY STUDY

Prior to instigation of the present study a pilot project was undertaken at a private Catholic coeducational Knoxville, Tennessee, high school. At the request of the school's science and home economic teachers, a questionnaire was designed to assess food and nutrition knowledge of their 153, ninth through twelfth grade students.

The questionnaire measured knowledge and misconceptions in the following areas: food additives, vegetarian diets, "health" foods, weight reduction, food labeling laws, nutrient requirements and functions, and food fads and myths. Food and nutrition textbooks, professional periodicals, newspapers, and lay literature pertinent to food and nutrition were used in the compilation of statements to be included in the questionnaire (e.g., Bruch, 1970; Buchan, 1972; Cornely et al., 1963; Cussler and de Give, 1952; de Garine, 1972; Deutsch, 1961; Harrison and Irwin, 1964; Heflin and Pangle, 1966; Kilander, 1964; Fusillo, 1974; McCarthy and Sabry, 1973; Osman, 1967).

Students were instructed to respond to forty true-false statements by circling "T" or "F" and to indicate confidence in the response by circling a number of the five-point scale of certainty which ranged from "1" ("very certain") to "5" ("very doubtful").

On the basis of results of the preliminary study and personal interviews with selected questionnaire respondents, it was determined that the true-false statement with a five-point scale of confidence was appropriate for obtaining the information necessary for the final study. Additionally, it was found that the directions and manner of responding were readily comprehended by this age group. Vocabulary proved to be problematic in some cases and was therefore simplified in statements included in the final instrument.

This preliminary investigation revealed a low level of food and nutrition knowledge and a disturbing degree of adherence to false food beliefs among this teenage population and indicated a need for a more extensive study of the high school population of Knoxville. The present study was designed to measure food and nutrition misconceptions, interest in food and nutrition-related topics, and information sources of tenth through twelfth grade Knoxville, Tennessee, students.

Approval for conducting the study was obtained from the Director of Instruction, Knoxville City Schools, Dr. Paul Kelley, as well as from the principals and teachers of the schools involved in the research project.

II. SAMPLE

With the aid of the Director of Instruction, Knoxville City Schools, four city high schools representing the north, south, east, and west sectors of the city were selected which were believed to be representative of the wide range of socio-economic strata of Knoxville and would include a balance of black to white students. Percentages of college-bound

students according to school were: School 1 (60 percent), School 2 (27 percent), School 3 (30 percent), and School 4 (38 percent). Percentages of economically disadvantaged students from each school were: School 1 (2 percent), School 2 (16 percent), School 3 (8 percent), and School 4 (5 percent) (Knoxville Sch. Admin., 1976).

Principals of each school included in the study were contacted and their cooperation enlisted. The principals and teachers involved requested that study halls and/or chorus and gym classes be used since a heterogeneous representation of tenth, eleventh, and twelfth grade students could be obtained without disruption of a number of separate classes. A total sample of 185 students composed of 91 males and 94 females were included in the study.

III. QUESTIONNAIRE DEVELOPMENT

Since a suitable instrument to test the hypotheses of the current study was not available, a questionnaire (Appendix A) was developed to determine: (a) food and nutrition knowledge and misconceptions, (b) food and nutrition-related interests, and (c) information sources of the teenage group. Selected demographic data were obtained to facilitate interpretation of the results.

Food and Nutrition Knowledge and Misconceptions

As in the preliminary study, a review of current food and nutrition textbooks and periodicals, newspapers, mail circulars, and lay literature was used in the compilation of popular invalid beliefs and notions about

food and nutrition. This served as the basis for the knowledge and misconception segment of the questionnaire.

A misconception is defined as a wrong answer in which the respondent expresses a high degree of confidence. Therefore, misconceptions may be measured by questions requiring a true-false response along with an indication of degree of certainty. Conversely, knowledge is defined as a correct response with a concomitant high level of certainty. Methods for measuring misconceptions described by Baker et al. (1964) and Heflin and Pangle (1966) were modified and adapted for use in the current study.

Fifty-six questions were included in the final instrument to which the students were instructed to answer as either "true" or "false" and to indicate on a five-point gradation of certainty their level of confidence in the response. Thus a response of either "1" or "2" was interpreted to mean considerable confidence and a "3," "4," or "5" as little confidence or a guess. The five-point gradation of certainty (Warren and Specht, 1970) was believed to be more sensitive than the three-point scale used by Heflin and Pangle (1966).

Food and Nutrition-Related Interests

Selected topics relating to food and nutrition (e.g., diet and weight watching, fad diets, health foods, and so forth) were derived from a number of food and nutrition textbooks, lay literature, and professional publications addressed to food, nutrition, and health. Twenty-eight items representing the following categories of interests: Diet and Weight Watching, "Organic" and "Health" Foods, Vegetarian Diets, Diet in Relation to Disease, Foods My Body Needs, Food Safety, Nutrition and

Pregnancy, and Miscellaneous were included in Part II of the final instrument. Questionnaire respondents were instructed to indicate their degree of interest in each item by circling one number on a five-point scale which ranged from "extremely interesting" ("1") to "not at all interesting" ("5").

Information Sources

Nine possible sources of food and nutrition information were determined and listed in Part III of the instrument. Respondents were asked to list the first, second, and third most frequently used information source for each of the following topics: Diet and Weight Watching, "Organic" and "Health" Foods, Vegetarian Diets, Diet in Relation to Disease, Foods My Body Needs, Food Safety, Nutrition and Pregnancy, and Food Preparation.

Validity

Six food and nutrition professionals representing a variety of academic ranks at the College of Home Economics, University of Tennessee, Knoxville, agreed to serve on the panel of experts to assist in establishing validity of the testing instrument. Instructions were to respond to each of 84 statements on the knowledge and misconceptions section of the preliminary instrument by circling "true" or "false" on the basis of current knowledge regarding the topic. Experts also were instructed to indicate if a definitive answer could not be given. Items which two or more experts noted could not be answered with confidence according to present knowledge were excluded from the final questionnaire.

Ambiguous or easily misinterpreted statements were either reworded or excluded on the basis of comments by the panel.

In addition to evaluating the true-false statements the panel was asked to study the topics included in the food and nutrition-related interests and information sources portions of the questionnaire and to provide suggestions for omissions or additions to these sections. These suggestions were incorporated in the final instrument.

Reliability of a validated instrument is implied (Black and Champion, 1976). Patterned responses were discerned through inspection of each questionnaire.

IV. IMPLEMENTATION OF QUESTIONNAIRE

Principals of each school were contacted and arrangements made for suitable times to administer the questionnaire. Questionnaires were numbered and divided into lots of four to be distributed among the four schools.

At the beginning of the 45 to 55 minute class periods, the researcher or a trained student assistant explained the purposes of the research project and solicited the cooperation of the students. Participation was requested but not mandatory. Directions for all sections of the questionnaire were read to the students prior to administration and assistance was offered to the students by the researcher and/or assistants as the students answered the questionnaires.

V. ANALYSIS OF DATA

The data were analyzed according to the Statistical Package for the Social Sciences computer program (Nie et al., 1976). Questionnaires were pre-coded making possible the direct translation of data to computer cards by key punch operators.

Food and Nutrition Knowledge

Computer scoring of each questionnaire provided knowledge scores for all respondents. The score reflected a total number of correct responses with concomitant high levels of confidence; i.e., "1" or "2" on the five-point scale. Correct responses with lower levels of confidence, i.e., "3," "4," or "5," were not included in the knowledge score. Knowledge score frequencies were tabulated and the mean and standard deviation for all scores were determined.

Food and Nutrition Misconceptions

Misconception scores for all respondents along with descriptive statistics were obtained through computer scoring of questionnaires. A misconception score for an individual was construed as a wrong answer in which the respondent expressed considerable confidence, i.e., "1" or "2" on the five-point scale. Incorrect answers with lower levels of confidence, i.e., "3," "4," or "5" were not included in the misconception score.

A t test was used to determine if significant differences existed between mean misconception scores for males and females and a one-way

analysis of variance with Neuman-Keuls procedure (Champion, 1970) was performed to determine significant differences existing among grades and schools.

In order to determine whether or not significant differences existed among categories of misconceptions, the questions were grouped into the following seven categories: (1) Diet and Weight Watching, (2) "Organic" and "Health" Foods and Vegetarian Diets, (3) Diet in Relation to Disease, (4) Foods My Body Needs, (5) Food Safety, (6) Nutrition and Pregnancy, and (7) Miscellaneous. The data were divided into categories of "high" or "low" misconception scores and were subjected to comparison by chi-square analysis.

Food and Nutrition-Related Interests

Food and nutrition-related interest responses to topics were coded as follows: "extremely interesting" = 1, "very interesting" = 2, "moderately interesting" = 3, "slightly interesting" = 4 and "not at all interesting" = 5. Frequency counts were obtained for all responses to items in the interest section and mean response by sex obtained for each item. In addition, topics of interest were categorized into the following seven categories: (1) Diet and Weight Watching, (2) "Organic" and "Health" Foods and Vegetarian Diets, (3) Diet in Relation to Disease, (4) Foods My Body Needs, (5) Food Safety, (6) Nutrition and Pregnancy, and (7) Miscellaneous. This categorization was necessary for data analyses involving association of interests and misconceptions variables.

Information Sources

For each of the following eight categories of information: (1) Diet and Weight Watching, (2) "Organic" and "Health" Foods, (3) Vegetarian Diets, (4) Diet in Relation to Disease, (5) Foods My Body Needs, (6) Food Safety, (7) Nutrition and Pregnancy, and (8) Food Preparation, the first, second, and third most frequently used sources of information were obtained. Frequency counts for information sources were obtained according to grade level, sex, and total frequency. Chi-square analysis was used to determine whether or not significant differences existed among grades and schools, or between sexes.

Association Between Misconception Score and Degree of Interest

Goodman's and Kruskal's gamma test of association (Champion, 1970) measures the degree of association between two ordinal-level variables. Thus, it was possible to determine whether or not a relationship existed between high interest and high misconceptions.

CHAPTER IV

RESULTS AND DISCUSSION

I. FOOD AND NUTRITION MISCONCEPTIONS

Considerable subscription to food and nutrition misconceptions was noted across sexes and the three grade levels in the present study. The mean misconception score for the total population was 14.9 ± 6.2 (Table 1). The scores ranged from one misconception to a high of 34 out of a possible 56. Since misconceptions reflect wrong answers which the respondent is certain are correct, an average score of 14.9 out of 56, or 27 percent is substantial.

A t test performed on the mean misconception scores of males and females (Table 1) determined that the sexes were similar. Likewise, an analysis of variance performed on mean misconception scores for tenth, eleventh, and twelfth grade pupils (Table 1) indicated no significant differences among grade levels.

Williams (1956) found the highest degree of health misconceptions among a group of ninth through twelfth grade North Carolina high school students to be in the area of nutrition. In his study, ninth grade students showed a higher degree of misconceptions than the other three grades. Boys subscribed to slightly more misconceptions than girls but the difference was not significant. Health misconceptions in general declined as the pupils moved from grade to grade with the exception of the eleventh grade which showed an increase. Likewise, Wang (1971) found a group of

Maryland 4-H youth maintained a low level of nutrition knowledge and a high subscription to misconceptions. She also noted no significant differences between males and females.

Table 1. Misconception and knowledge scores for 185 teenage students

Group	Mean[a]	
	Misconceptions	Knowledge
Males N = 91	14.9 ± 6.5	16.5 ± 7.7
Females N = 94	14.8 ± 6.0	17.5 ± 6.4
Grade 10 N = 82	14.9 ± 6.1	16.0 ± 4.9
Grade 11 N = 52	15.3 ± 7.2	17.6 ± 4.0
Grade 12 N = 51	14.4 ± 5.4	18.1 ± 5.3
Total N = 185	14.9 ± 6.2	17.0 ± 7.1

[a]± standard deviation.

The mean misconception scores for the four different schools were 12.1 (School 1), 14.9 (School 2), 16.2 (School 3), and 16.2 (School 4). These differences were significantly different at the .004 level according to an analysis of variance performed on the data (Table 2). A Neuman-Keuls procedure (Champion, 1970) indicated that the significant differences were between Schools 1 and 2, 1 and 3, and 1 and 4.

Table 2. Analysis of variance for misconception scores of 185 pupils in four schools

Source of Variation	Sum of Squares	d.f.	Mean Squares	F	P
Between Groups	505.9023	3	168.6341	4.556	0.004
Within Groups	6699.4844	181	37.0137		
Total	7205.3867	184			

When responses were pooled and categorized according to area of misconceptions (Table 3) it was found that students subscribed to more misconceptions in the category of Foods My Body Needs (33.5 percent misconceptions) than in any of the other six categories. Percent misconceptions for the other categories in descending order were: Diet and Weight Watching (32.1); Miscellaneous (24.5); Diet in Relation to Disease (23.1); Organic and Health Foods and Vegetarian Diets (21.5); Nutrition and Pregnancy (19.5); and Food Safety (11.0).

In order to determine if the number of misconceptions in any category were significantly greater than misconceptions in any other category, comparison by chi-square was made of high and low misconception scores in one category against each of six other categories. It can be seen in Table 4 that several significant differences existed.

Probably more reflective of the predominance of misconceptions is the number of students misconceived on 33 percent or more of the items in each of the seven categories (Table 3). Again, more students subscribed to misconceptions in the category Foods My Body Needs than in any

Table 3. Mean number of misconceptions by category and percent of students misconceived on 33 percent or more items in each category

Category	Number of Questions in Category	Mean Misconceptions	Percent Misconceived on 33 Percent or More Items
Foods My Body Needs 2,3,19,20,21 23,26	8	2.68	60.0
Diet and Weight Watching	16	5.14	58.9
Nutrition and Pregnancy	4	.78	53.0
Diet in Relation to Disease	9	2.08	35.1
"Organic" and "Health" 1,13,33 Foods and Vegetarian Diets	6	1.29	35.1
Miscellaneous	11	2.70	28.6
Food Safety	2	.22	19.9

Table 4. Chi-square values[a] derived from comparison of number of high and low misconception scores in 7 misconception categories against each other and level of significance for each comparison

	Diet and Weight-Watching	"Organic" and "Health" Foods and Vegetarian Diets	Diet in Relation to Disease	Foods My Body Needs	Food Safety	Nutrition and Pregnancy	Miscellaneous
Diet and Weight Watching							
"Organic" and "Health" Foods and Vegetarian Diets	2.65***						
Diet in Relation to Disease	20.92*	7.72*					
Foods My Body Needs	21.22*	0.02	10.85*				
Food Safety	0.00	4.18**	0.00	0.92			
Nutrition and Pregnancy	2.03	0.41	4.02**	4.06**	2.22		
Miscellaneous	9.59*	2.79***	9.58*	11.53*	2.43	3.25***	

[a] 1 degree of freedom

*$p \leq .005$ **$p \leq .05$ ***$p \leq .10$

of the others. This is not surprising in view of the fact that misinformation regarding the positive and negative "powers" of various foods abounds (Buchan, 1972; USDA, 1964; Stevenson, 1965) and is transferred through generations (Kolasa, 1974). Likewise, teenagers along with the vast majority of other population groups are confronted with myriad fragments of information and advice from a variety of sources (Bruch, 1970; Rynearson, 1974). Thus, in this study the finding that 58.9 percent of the students were misconceived on 33 percent or more items in the category Foods My Body Needs would be expected.

Fifty percent or more students were misconceived on 33 percent or more items in the categories of Foods My Body Needs, Diet and Weight Watching, and Nutrition and Pregnancy. Moreover, 20 percent of all students were misconceived on at least 33 percent of the items in all categories.

Percentages of misconception, correct answer, and guess responses to each question on the 56-item Food and Nutrition Questionnaire are provided in Table 11, Appendix B. Students possessed limited knowledge on most items contained in the inventory and were substantially misconceived on the majority of all items (Table 11, Appendix B). When misconception responses are combined with guess responses and compared to the percentage of correct responses, the low level of knowledge becomes even more pronounced.

Some of the most commonly held misconceptions were: "Breads and potatoes are fattening foods" (subscribed to by 74.1 percent of all respondents); "A Calorie is a substance found in food which causes weight

gain" (53.0 percent); "Athletes in training require more protein than less active persons of the same sex, age, and body weight" (71.4 percent); "Sweating from physical exercise is a sign that fat is being burned off" (54.6 percent); "Any adequate diet must contain meat as a source of protein" (53.5 percent); "Grapefruit, cottage cheese, yogurt, lemon juice and protein bread have positive powers to take off weight" (49.8 percent); "Citrus fruits and tomatoes make the blood acidic" (49.2 percent); "Sweets cause adolescent acne" (48.1 percent); "Saturated fats contain more Calories than polyunsaturated fats" (48.7 percent); and "One gelatin capsule a day builds stronger fingernails and healthier hair" (41.6 percent).

Guess responses indicate that students were most uncertain about items pertaining to health foods: Question numbers 1 (53.6 percent guess responses), 18 (46.4 percent), 38 (67.0 percent); nutritive and caloric values of foods: Question numbers 5 (56.8 percent), 8 (45.4 percent), 9 (41.1 percent), 10 (47.6 percent), 14 (49.1 percent), 45 (40.6 percent), 47 (56.2 percent), 50 (43.1 percent); vitamin and nutrient requirements: Question numbers 2 (59.4 percent), 3 (60.6 percent), 19 (45.4 percent), 20 (68.7 percent), 21 (61.1 percent), 23 (48.0 percent), 26 (55.0 percent); and diet and weight watching: Question numbers 6 (62.1 percent), 30 (56.9 percent), 37 (68.1 percent), 39 (47.0 percent), 54 (59.9 percent). It would be expected that all of these topics should be covered in various science, health, or home economics courses. The degree of doubt could be due, however, to contradictions in information generated by food faddists and promoters of health foods, vitamin and mineral products, cure-alls, and diet aids (Stevenson, 1965; USDA, 1964).

A majority of students were well informed on such items as: "Two nutrients likely to be lacking in the teenage girl's diet are calcium and iron" (63.2 percent correct responses); "A teenager requires more Calories than an adult of equal weight and activity" (63.2 percent); "A peanut butter sandwich and glass of milk is a good substitute for meat" (57.3 percent); "A food additive cannot be approved for use if it is found to cause cancer when eaten by man or animals" (51.3 percent); "The greatest danger in following fad diets is that they may cause deficiencies or imbalance of one or more nutrients" (68.2 percent); "Poor diet among teenage mothers seldom affects their babies" (51.7 percent); "It is not harmful to eat milk or fish at the same time" (54.6 percent); "Tooth decay is often related to poor food habits" (74.1 percent); "Diabetes in adults can often be controlled through proper diet" (58.9 percent); "Enriched breads and cereals have some B vitamins and iron added to increase their nutritive quality" (55.7 percent); "Several research studies have indicated that heart disease and high blood pressure are diet related" (50.3 percent); "Poor nutritional status of pregnant teenagers is often the cause of complications during pregnancy (54.6 percent).

It is evident that items on which the students scored well are not as emotionally laden or subject to dispute from faddists, quacks, or others who would exploit for purposes of material gain. The fact that the teenager is less likely to receive "mixed messages" in regard to these items may account for the expressed confidence in his responses.

II. FOOD AND NUTRITION KNOWLEDGE

The mean food and nutrition knowledge score for 185 tenth through twelfth grade students was 17.0 ± 7.1 with scores ranging from 2 to 38 out of a possible 56 points (Table 1, p. 34). The mean score for females was somewhat higher than for males and mean scores increased as the student moved upward from tenth to twelfth grades but the differences were not significant. This low level of food and nutrition knowledge among high school students is consistent with findings of Dwyer et al. (1970) who noted a grand mean score of ninth through twelfth grade students of both sexes of 55.9 ± 11.6 out of a possible 100 points. Likewise, Kirk et al. (1975) found Tennessee high school students to possess low levels of nutrition knowledge which averaged well below national norms.

It was hypothesized that training in home economics, health, biology, and chemistry would be positively associated with increased knowledge scores since students should obtain scientific knowledge in these courses to increase food and nutrition knowledge. It may be seen in Table 5, however, that training in home economics or health was not related significantly to increased knowledge scores. A gamma test of association performed on the data revealed a moderate positive association between nutrition knowledge and training in chemistry (γ = +0.37) and biology (γ = +0.38).

It is possible that the more academically oriented students do not enroll in home economics courses and those who do often are non-college bound students who would not be expected to score high on academic tests. Also, those students with more training in chemistry and biology would be

expected to possess general scientific knowledge which could be readily applied to the area of food and nutrition. The low association between training in the area of health and food and nutrition knowledge is surprising but also was noted by Kirk et al. (1975). It is possible that health teachers lack sufficient training in the scientific disciplines and could be responsible for imparting misconceptions. Reynolds (1960) found a mean subscription of 12.18 to 71 harmful health misconceptions among high school coaches and physical educators, those typically responsible for health education (Huntsinger, 1971).

Table 5. Degree of association between food and nutrition knowledge scores and number of courses in four subject matter areas

Subject Matter Area	χ^2	d.f.	P	Gamma
Home Economics	16.72	12	.16	+0.01
Chemistry	11.49	6	.07	+0.37
Biology	22.44	9	.01	+0.38
Health	12.07	12	.44	+0.17

Since significant differences were not observed in knowledge scores for each grade level, it might be concluded that food and nutrition knowledge increases with increased exposure to scientific information conveyed through such courses as chemistry and biology rather than through increased education at the high school level per se. This conclusion is further substantiated in that health education is required of

all students in the present study and the number of courses in health education would be directly related therefore to number of years in school. Future research should seek to establish whether food and nutrition knowledge of students pursuing a college-bound course of study differs from non college-bound students. Also, it should be determined whether college-bound students' nutrition knowledge increases as they progress upward through grades regardless of training in chemistry and biology.

III. FOOD AND NUTRITION-RELATED INTERESTS

Previous studies pertaining to teenage food and nutrition-related interests (Orr, 1965; Dwyer et al., 1970; Kirk et al., 1975) ;have led the authors to conclude that compared to other areas of health, nutrition is of little or no interest to this age group. Thus, the results of the present study were surprising. As was hypothesized, numerous topics within the broad area of food and nutrition were interesting to a majority of the students studied. Twenty-one out of twenty-eight topics covered in the interest inventory (Appendix A) were rated by 50 percent or more students as "extremely" or "very" interesting (Table 6). Moreover, the lowest ranking topic of interest, "vegetarian diets," was considered "extremely" or "very" interesting by 20 percent of the students. Approximately 70 to 80 percent of all students studied agreed that the topics of "exercise and food needs," "foods my body needs," "diet in relation to complexion, hair and nails," "gaining and losing weight," and "how smoking, alcohol and drugs are related to food needs and nutritional status" were "extremely" or "very interesting."

Table 6. An item analysis of food and nutrition-related interest responses in order of preference for 185 10th, 11th, and 12th grade students

Item	Number of Responses "Extremely Interesting"	Number of Responses "Very Interesting"	Percent of Total Students	Rank
Exercise and food needs	75	68	78.6	1
Foods my body needs	80	60	76.5	2
Diet in relation to complexion, hair and nails	90	47	74.5	3
Gaining or losing weight	86	44	70.7	4
How smoking, alcohol and drugs are related to food needs and nutritional status	85	42	69.8	5
Growth and development	61	59	66.7	6
Causes of overweight and underweight	68	48	64.1	7
Diet in relation to cancer	73	43	63.0	8
Nutrition and dental health	67	49	63.0	8
Safety of U.S. food supply	66	48	62.3	9
Health hazards with food preparation and handling	62	52	62.3	9
Causes of tooth decay	60	50	60.1	10
How diet during pregnancy affects offspring	75	35	60.1	10
Need for vitamins	48	59	59.1	11

Table 6 (continued)

Item	Number of Responses "Extremely Interesting"	Number of Responses "Very Interesting"	Percent of Total Students	Rank
Safest age to have a baby	69	35	57.1	12
Feeding infants and children	76	28	57.1	12
Food preparation	46	57	56.6	13
Diet in relation to heart disease	55	47	55.4	14
World food supply	42	54	52.7	15
What functions foods can and cannot perform in the body	41	54	52.2	16
Breast vs bottle feeding	65	27	50.3	17
Diet in relation to diabetes	45	43	48.1	18
Health foods	35	41	41.8	19
Reliability of food and nutrition information	25	50	41.2	20
Diet in relation to colds	29	44	40.1	21
Energy metabolism	25	38	34.6	22
Fad diets	19	29	26.1	23
Vegetarian diets	18	19	20.1	24

When mean responses were broken down according to sex (Table 7), few pronounced differences are evident. As would be expected in light of cultural norms, girls were clearly more interested in the relationship between diet and complexion, hair, and nails, gaining or losing weight, causes of overweight and underweight, how diet affects offspring, safest age to have a baby, feeding infants and children, and breast vs bottle feeding. They also were interested more in health foods and vegetarian diets. Interestingly, only a slight difference existed between boys' and girls' interest ratings for the topic of "food preparation."

Boys were slightly more interested in growth and development, safety of the U.S. food supply, need for vitamins, world food supply, reliability of food and nutrition information, and energy metabolism. With the exception of the preceding six items, girls rated all of the food and nutrition-related topics somewhat higher than boys.

Other authors have found interest among teenagers in specific food and nutrition topics. Dwyer et al. (1970) reported that responses to open-ended questionnaires indicated that teenage boys and girls were interested in weight loss and dieting, proper foods to eat for a well-balanced diet, and effects of deficiencies and excesses of nutrients on the body. The students indicated lack of interest in "Calories," nutrient composition of foods, detailed discussion of vitamins, the anatomy of digestion and absorption, and overemphasis on the Basic Four. Girls in general found nutrition more interesting than boys. Dowell (1966) found secondary students concerned about dental problems, acne, and overweight although general interest in foods and nutritional needs

Table 7. Mean responses of boys and girls to 28 food and nutrition-related interest topics

Item	Mean[a] Males N=90	Females N=94	Total N=184
Exercise and food needs	2.08	1.73	1.90
Foods my body needs	2.07	1.81	1.93
Diet in relation to complexion, hair and nails	2.39	1.55	1.96
Gaining or losing weight	2.42	1.73	2.07
How smoking, alcohol, and drugs are related to food needs and nutritional status	2.15	1.97	2.05
Growth and development	2.07	2.22	2.14
Causes of overweight and underweight	2.52	1.99	2.25
Diet in relation to cancer	2.44	2.13	2.28
Nutrition and dental health	2.33	2.08	2.21
Safety of U.S. food supply	2.18	2.31	2.24
Health hazards with food preparation and handling	2.29	2.08	2.18
Causes of tooth decay	2.36	2.22	2.29
How diet during pregnancy affects offspring	2.88	1.76	2.30
Need for vitamins	2.31	2.36	2.33
Safest age to have a baby	2.91	1.91	2.40
Feeding infants and children	3.01	1.82	2.40
Food preparation	2.51	2.38	2.44

Table 7 (continued)

Item	Mean[a] Males N=90	Females N=94	Total N=184
Diet in relation to heart disease	2.54	2.40	2.47
World food supply	2.49	2.61	2.55
What functions foods can and cannot perform in the body	2.64	2.59	2.62
Breast vs bottle feeding	3.03	2.32	2.67
Diet in relation to diabetes	2.93	2.66	2.79
Reliability of food and nutrition information	2.83	3.01	2.92
Health foods	3.16	2.62	2.88
Diet in relation to colds	3.04	2.74	2.89
Energy metabolism	2.83	3.18	3.01
Fad diets	3.82	3.52	3.67
Vegetarian diets	4.07	3.36	3.71

[a]Numerical values from which means were derived were 1 (extremely interesting), 2 (very interesting), 3 (moderately interesting), 4 (slightly interesting), 5 (not at all interesting).

was low. Girls worried more about health problems and were more interested in health than were boys. Lantagne (1952) found girls more interested in nutrition than boys, but overall interest in nutrition was low among the 10,000 secondary school students studied. Nevertheless, topics concerning problems of tooth decay, effects of tea and coffee, pregnancy and health, sweets and dental decay, breast or bottle feeding, the school lunch, health hazards with foods, food during pregnancy, heart disease, and nutrition and overweight were felt to be interesting by a majority of the students.

IV. FOOD AND NUTRITION INFORMATION SOURCES

The most frequently indicated sources of information among teenagers for the various categories of food and nutrition information are given in Table 8. For all but one category of information, i.e., Organic and Health Foods, students most frequently indicated that the information sources most often used in the past were parents and medical doctors or nurses. Information regarding the two areas in which teenagers held the greatest proportion of misconceptions, Diet and Weight-Watching and Foods My Body Needs, was most frequently oftained from parents in 46 and 40 percent of the cases, respectively. Medical doctors or nurses were most frequently mentioned as sources of information on Diet and Weight-Watching (13 percent of students responding) and Foods My Body Needs (23 percent). Dietitians and nutritionists served as most frequently used sources of information on Diet and Weight-Watching and Food Preparation for 11 percent of the students, and high school teachers were

Table 8. First, second and third most frequently indicated first-choice information sources of 185 teenagers for 8 categories of food and nutrition information

Category of Information	Total First-Choice Responses	Information Source		
Diet and Weight Watching	169	parent (78)[a]	M.D. or nurse (22)	magazines (18) dietitian or nutritionist (18)
Organic and Health Foods	164	magazines (31)	parent (26) M.D. or nurse (26)	T.V. or radio (22)
Vegetarian Diets	159	M.D. or nurse (31)	parent (28)	T.V. or radio (20)
Diet in Relation to Disease	162	M.D. or nurse (57)	parent (32)	high school teacher (22)
Foods My Body Needs	167	parent (67)	M.D. or nurse (39)	high school teacher (23)
Food Safety	164	parent (46)	M.D. or nurse (31)	high school teacher (22)
Nutrition and Pregnancy	159	M.D. or nurse (59)	parent (41)	popular books on nutrition (12)
Food Preparation	166	parent (97)	dietitian or nutritionist (19)	M.D. or nurse (13)

[a]Number of students indicating first choice information source.

indicated as most frequent sources of information on Foods My Body Needs by 14 percent of the students.

High school teachers also figured significantly as sources of information for the categories of Diet in Relation to Disease (14 percent

of total responses) and Food Safety (13 percent). Magazines were indicated by 19 percent of the students to be the most frequent information source on Organic and Health Foods and by 11 percent of the students as the most frequently used information source on Diet and Weight Watching.

Communications regarding food and nutrition through books, television, or radio were not frequently mentioned by the teenagers. Popular books on nutrition were frequently used by only 8 percent of the students to obtain information on Nutrition and Pregnancy and television and radio were used by 13 percent of the students to obtain information on Organic and Health Foods and by 12 percent for information on Vegetarian Diets.

Statistical comparison by chi-square of first-choice information sources of boys and girls revealed significant differences for several categories of information (Table 9). Differences were significant for the categories of Diet and Weight-Watching ($P \leq .02$), Organic and Health Foods ($P \leq .01$), and Vegetarian Diets ($P \leq .08$). Inspection of Tables 12-19, Appendix B, wherein the frequencies of first-choice information sources are given, reveals that for the category of Diet and Weight-Watching girls relied on friends to a far greater extent than did boys (Table 12). For the category of Organic and Health Foods (Table 13) boys more frequently used parents and girls relied more on medical doctors or nurses. Girls also read more popular books on nutrition to obtain information in this area.

In the area of Vegetarian Diets girls relied on popular books on nutrition and dietitians and nutritionists more so than did boys whereas

boys more frequently mentioned medical doctors or nurses (Table 14, Appendix B).

Table 9. Comparison by sex and grade of first choice information sources for 8 categories of food and nutrition information

Category of Information	Sex[a]		Grade[b]	
	χ^2	P	χ^2	P
Diet and Weight Watching	17.45	.02	24.91	.07
Organic and Health Foods	20.05	.01	15.80	.47
Vegetarian Diets	13.85	.08	28.13	.03
Diet in Relation to Disease	7.68	.46	17.53	.35
Foods My Body Needs	8.87	.35	15.28	.50
Food Safety	8.18	.41	13.95	.60
Nutrition and Pregnancy	12.90	.11	26.93	.04
Food Preparation	11.27	.19	13.06	.66

[a] d.f. equals 8.

[b] d.f. equals 16.

Chi-square values for the comparison of information sources for the various categories among grade levels also are shown in Table 9. Differences were significant at the .07 level for Diet and Weight Watching, .03 level for Vegetarian Diets, and .04 level for Nutrition and Pregnancy. Responses are tallied for each category of information and tabled in Appendix B, Tables 12-19.

For the category of Diet and Weight Watching (Table 12, Appendix B) tenth grade pupils more frequently relied on parents (50 percent of total

responses), medical doctors or nurses (16 percent) and friends (12 percent); eleventh grade pupils relied on parents (39 percent), medical doctors or nurses (17 percent), and magazines (13 percent); and twelfth grade students relied most frequently on parents (47 percent), magazines (18 percent), and dietitians or nutritionists (14 percent).

For the category of Vegetarian Diets (Table 14, Appendix B) tenth grade pupils most frequently listed medical doctors or nurses (30 percent of total responses), television or radio advertisements (17 percent) and parents (13 percent) as compared to eleventh grade pupils who reported parents (18 percent), medical doctors or nurses (15 percent), television or radio advertisements (15 percent), and magazines (15 percent) and twelfth grade pupils who reported parents (24 percent), dietitians or nutritionists (18 percent) and friends (16 percent).

Most frequently mentioned information sources for the category of Nutrition and Pregnancy (Table 18, Appendix B) were medical doctors or nurses (39 percent), parents (14 percent), and television or radio advertisements (13 percent) for tenth grade pupils; medical doctors or nurses (41 percent), parents (32 percent), and popular books on nutrition (9 percent) for eleventh grade students; and parents (36 percent), medical doctors or nurses (29 percent), and high school teachers (11 percent) for twelfth grade pupils.

V. ASSOCIATION BETWEEN MISCONCEPTION SCORE AND INFORMATION SOURCE

In order to explore the possibility that misconceptions were associated with a particular information source, two comparisons by

chi-square were made. Since the only significant differences in misconception scores for the population tested existed among schools, it was hypothesized that if misconceptions were related to information source then information sources for the various categories of food and nutrition information also would differ among schools. However, when the variables, information source and schools, were cross-tabulated and the data subjected to chi-square no significant relationships were observed. Furthermore, when total misconception scores were cross-tabulated with information sources results of a chi-square test revealed that, with the exception of the category Diet and Weight Watching, total misconception scores were not different from what would be expected by chance for any particular information source.

VI. ASSOCIATION BETWEEN MISCONCEPTION SCORE AND DEGREE OF INTEREST

Several authors have noted the relationship between degree of interest and learning (Bremer and Weatherholz, 1975; Orr, 1965; Shipman and McCannon, 1964). Dwyer et al. (1970), however, found that the topics relating to food and nutrition in which the students expressed the most interest were the ones they knew least about. It was believed that this inconsistency might be due to the prevalence of misconceptions rather than to total lack of knowledge. Hence, in the present study it was hypothesized that high interest in a topic would increase exposure to communications regarding that topic and would therefore lead to increased learning. Thus, if the information gained were erroneous there should theoretically

be a positive association between number of misconceptions and degree of interest.

For two categories of misconceptions and interests, Foods My Body Needs and Miscellaneous, it was found that high misconceptions were moderately associated with high interest as indicated by a gamma test of association (Table 10).

Table 10. Degree of association between misconception score and degree of interest by category

Category of Misconception and Interest	χ^2	d.f.	P	Gamma
Diet and Weight Watching	0.27	2	0.88	+0.04
Organic and Health Foods and Vegetarian Diets	0.05	1	0.83	+0.06
Diet in Relation to Disease	3.04	3	0.38	+0.14
Foods My Body Needs	9.27	3	0.02	+0.34
Food Safety	0.27	3	0.96	+0.01
Nutrition and Pregnancy	1.01	3	0.80	-0.06
Miscellaneous	7.23	3	0.06	+0.20

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

I. CONCLUSIONS

As was hypothesized, misconceptions relating to food and nutrition were prevalent among teenagers in this study. Degree of subscription to misconceptions was not significantly different for boys and girls, nor for the various grade levels. Not only were the students substantially misconceived on a number of items but they also possessed a high level of uncertainty and a low level of food and nutrition knowledge. It was found that the teenager's level of knowledge of food and nutrition did not necessarily correlate with the extent of his formal training in the area, as was hypothesized. Knowledge scores did increase with increased instruction in chemistry and biology; however, students apparently did not receive sufficient facts in home economics and health education courses to significantly increase knowledge scores.

As hypothesized, certain topics within the area of food and nutrition were of more interest to teenagers than were other topics, but teenagers expressed considerable interest in most food and nutrition-related topics covered in this study. Girls generally were more interested in the topics than boys, but the differences were slight. High interest in miscellaneous topics and items pertaining to foods needed by the body were associated positively with high misconceptions in these categories.

Sources of information other than recognized experts were utilized by the teenagers in this study. Parents most frequently supplied information

on the topics in which the students were substantially more misconceived, i.e., Diet and Weight-Watching and Foods My Body Needs. In fact, information on all of the various food and nutrition categories was most frequently obtained from parents and medical doctors and nurses. Peers and the media played a less significant role than the other information sources for all categories of information. Boys and girls differed significantly in their information sources for topics dealing with Diet and Weight-Watching, Organic and Health Foods, and Vegetarian Diets, and significant differences were observed among grade levels for the categories of Diet and Weight-Watching, Vegetarian Diets, and Nutrition and Pregnancy. No differences were observed, however, among schools. The only category for which a particular information source was associated with number of misconceptions in that category was Diet and Weight-Watching.

It was hypothesized that the teenage student would subscribe to more misconceptions relating to those topics in which he is most interested. For two categories of misconceptions, i.e., Miscellaneous and Foods My Body Needs, this was found to be true. High interest did, in fact, lead to more misconceptions in these categories.

II. IMPLICATIONS

Critical deficiencies in the nutrition education of teenagers are suggested by results of this study and others (Kirk et al., 1975; Dwyer et al., 1970). Not only are teenagers not knowledgeable in regard to food and nutrition but their reliance on misinformation is substantial. Teenagers must be provided with empirically grounded information on

which to base decisions regarding their nutrition. The proliferation of misinformation and contradiction of scientific facts from a variety of sources compounds the problem of educating this age group as well as others.

It is important to ascertain those topics on which the teenager is misinformed in order to counter fallacies with facts. Recognition of the types of food and nutrition misconceptions held by the teenager should enable educators to plan learning experiences to diminish these misconceptions. Hence, an assessment of the students' current knowledge and areas of high misconceptions should precede the instigation of any nutrition education program.

Likewise, it is important to recognize what aspects of food and nutrition are of interest or concern to the teenager. Individuals are more likely to seek out and learn about those topics in which they are interested. In the present study, interest was found to be a factor in the acquisition of erroneous information. Faddists and quacks have continually captured the attention of their audiences through preying on concerns and capitalizing on interests. Thus it is the responsibility of the nutrition educator to see that valid information on these topics is proffered by reliable sources in order that all population groups might be capable of assessing their present beliefs. The development of programs which inspire interest in teenagers, are relevant to their needs and concerns, and incorporate the realities of teenage dietary patterns should improve the environment for constructive change, the ultimate goal of nutrition education.

Ideally, nutrition education should begin early in life in the home, but at this point in time it also is important to begin providing information through a mechanism which will benefit all students, not just those pursuing scientific fields of study.

Teenagers in this study reported that they most often obtained information on topics of food and nutrition from parents and those in the medical professions. A study of 3,600 homemakers across the United States revealed that 25 percent of the respondents learned about nutrition from their mothers or grandmothers. Thirty percent of the homemakers obtained their information from newspapers or magazine articles (Walker, 1975), the majority of which no doubt were written by self-proclaimed experts on nutrition many of whom are members of the medical profession and through the nature of their title symbolize authority. The fact that little association was observed in this study between any particular information source and number of misconceptions leads to the conclusion that no one information source may be particularly good or bad but that the quality of information obtained from the various sources depends on the knowledgeability of the individual source.

It seems feasible that nutrition education should be approached from two fronts, the home and the schools. Nutrition education must reach today's homemaker as well as those of tomorrow. In the words of Dwyer et al. (1970) "nutritionally illiterate adolescents soon become nutritionally illiterate adults and the improvement of nutrition education in the schools seems to be a most sensible and economical means of intervening in the cycle."

Furthermore, it behooves the profession to campaign vigorously against those responsible for proliferating false nutritional and health claims and to initiate regulatory programs to protect consumers of all ages.

Nutrition education programs must provide not only reliable information but, most importantly, they must lead to improved food related behavior. It has been shown that increased knowledge does not lead necessarily to behavioral change (Schwartz, 1976). Walker (1975) also found that homemakers possessed a fair knowledge of food and nutrition facts but they did not use their knowledge in selecting foods for a desirable food intake. Future research should be directed toward development of means whereby knowledge of food and nutrition increases in conjunction with the application of the knowledge to the improvement of dietary habits, not a small order for nutrition educators.

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APPENDICES

APPENDIX A

Lois Ann Wodarski
Ann Bass
Fall, 1975

Food Science, Nutrition, and Food Systems Administration
College of Home Economics
University of Tennessee, Knoxville

Directions: Please mark the correct response by putting an "X" [X] in the appropriate box. Ignore the numbers in parentheses; their purpose is for computer coding only.

Questionnaire number ☐☐☐☐ (1-4)

LW BASS (5-10)

Grade Level ☐☐☐ (12-13)

10 11 12

Sex (mark "M" for male, "F" for female) ☐☐ (14)

M (1) F (2)

Would you like to lose weight? ☐☐ (15)

yes (1) no (2)

Would you like to gain weight? ☐☐ (16)

yes (1) no (2)

How many courses in high school home economics have you had? (please count those presently enrolled in) ☐ (17-18)

How many high school chemistry courses have you had? (please count those presently enrolled in) ☐ (19-20)

How many high school biology courses have you had? (please count those presently enrolled in) ☐ (21-22)

How many high school health education courses have you had? (please count those presently enrolled in) ☐ (23-24)

The following are statements about food and nutrition. Read each statement. Circle "T" (true) if you believe the statement is true. Circle "F" (false) if you believe the statement is false. Once you have made this decision, indicate your degree of certainty by circling one of the numbers which appears to the right of each statement. If you are very strongly certain about your answer, circle "1". If you are very doubtful about your answer, circle "5". For some statements, the numbers 2, 3, or 4 may better describe the certainty of your answer to the statement. When this is the case, circle the appropriate number.

For example, consider the statement:
"The flag of the U.S. is red, white, and blue." T F 1 2 3 4 5

Is the statement True (False)? Circle "T" ("F"). How certain are you of this answer? Circle the appropriate number. Please be sure to circle both a letter and a number after each statement. Ignore numbers in parentheses; their purpose is for computer coding only.

		very certain				very doubtful	
1.	Organically grown vegetables are richer in vitamins than those grown by conventional means.	T F	1	2	3	4	5 (26-27)
2.	Since vitamins are nutrients which our bodies must have, it cannot be harmful to take vitamin supplements just to make certain we get enough.	T F	1	2	3	4	5 (28-29)
3.	Vitamin E deficiency produces symptoms of muscular dystrophy in rats so it is safe to assume that the same would apply to humans.	T F	1	2	3	4	5 (30-31)
4.	Two nutrients likely to be lacking in the teenage girl's diet are calcium and iron.	T F	1	2	3	4	5 (32-33)
5.	Vegetable protein is not of as high quality as animal protein.	T F	1	2	3	4	5 (34-35)

			very certain				very doubtful	
6. The Stillman, Atkins, and Mayo Clinic Diets are completely safe ways to lose weight quickly and permanently.	T	F	1	2	3	4	5	(36-37)
7. Grapefruit, cottage cheese, yogurt, lemon juice, and protein bread have positive powers to take off weight.	T	F	1	2	3	4	5	(38-39)
8. Honey is less fattening than sugar.	T	F	1	2	3	4	5	(40-41)
9. A slice of toast is lower in Calories than a slice of bread.	T	F	1	2	3	4	5	(42-43)
10. A medium sized baked potato has fewer Calories than a 4 oz. portion of beef.	T	F	1	2	3	4	5	(44-45)
11. A teenager requires more Calories than an adult of equal weight and activity.	T	F	1	2	3	4	5	(46-47)
12. A peanut butter sandwich and a glass of milk is a good substitute for meat.	T	F	1	2	3	4	5	(48-49)
13. Bread and potatoes are fattening foods.	T	F	1	2	3	4	5	(50-51)
14. A serving of Jello is higher in protein and more nutritious than the same size portion of ice milk.	T	F	1	2	3	4	5	(52-53)
15. Citrus fruits and tomatoes make the blood acidic.	T	F	1	2	3	4	5	(54-55)
16. Sweets cause adolescent acne.	T	F	1	2	3	4	5	(56-57)
17. One gelatin capsule a day builds stronger fingernails and healthier hair.	T	F	1	2	3	4	5	(58-59)

				very certain				very doubtful	
18.	Organically grown foods are not necessarily free from pesticides.	T	F	1	2	3	4	5	(60-61)
19.	The bulk of the U.S. population does not require vitamin pills.	T	F	1	2	3	4	5	(62-63)
20.	Vitamin E and Vitamin B complex capsules have little therapeutic value for health persons.	T	F	1	2	3	4	5	(64-65)
21.	Excess Vitamin A and Vitamin D can be toxic.	T	F	1	2	3	4	5	(66-67)
22.	The only way to lose weight is to eat fewer Calories than the body uses.	T	F	1	2	3	4	5	(68-69)
23.	Supplementing an already adequate diet through use of vitamin pills can result in super vitality, greater endurance, freedom from illness and resistance to infection.	T	F	1	2	3	4	5	(70-71)
24.	A food additive cannot be approved for use if it is found to cause cancer when eaten by man or animals.	T	F	1	2	3	4	5	(72-73)
25.	Cyanide and arsenic occur naturally in some foods.	T	F	1	2	3	4	5	(74-75)
26.	The U.S. RDA (recommended daily allowance) represents the amount of nutrients needed every day by healthy people plus an excess of 30-50% to allow for individual differences.	T	F	1	2	3	4	5	(76-77)
27.	The greatest danger in following fad diets is that they may cause deficiency or imbalance of one or more nutrients.	T	F	1	2	3	4	5	(78-79)

									(1-4)
									(5-10)

LW BASS

		very certain				very doubtful	
28.	The only disease in man known to be associated with eating foods from poor quality soil is simple goiter.	T F	1	2	3	4	5	(12-13)
29.	A Calorie is a substance found in food which causes weight gain.	T F	1	2	3	4	5	(14-15)
30.	You must eat 3500 Calories more than your body uses to put on one pound of body weight.	T F	1	2	3	4	5	(16-17)
31.	Vitamins and minerals do not have any Calories.	T F	1	2	3	4	5	(18-19)
32.	Most diseases are related to improper diet.	T F	1	2	3	4	5	(20-21)
33.	Poor diet among teenager mothers seldom affects their babies.	T F	1	2	3	4	5	(22-23)
34.	Some foods a nursing mother eats can cause digestive problems in her infant.	T F	1	2	3	4	5	(24-25)
35.	A teenage mother should "eat for two" during pregnancy.	T F	1	2	3	4	5	(26-27)
36.	Acne in teenagers is related to the condition of the blood.	T F	1	2	3	4	5	(28-29)
37.	A combination of lecithin, vinegar, and kelp helps burn fat.	T F	1	2	3	4	5	(30-31)

				very certain				very doubtful	
38.	Unbleached flour is nutritionally superior to bleached flour.	T	F	1	2	3	4	5	(32-33)
39.	Mental work significantly increases your body's need for Calories.	T	F	1	2	3	4	5	(34-35)
40.	It is not harmful to eat milk and fish at the same time.	T	F	1	2	3	4	5	(36-37)
41.	Fish builds brain cells.	T	F	1	2	3	4	5	(38-39)
42.	Tooth decay is often related to poor food habits.	T	F	1	2	3	4	5	(40-41)
43.	Pizza has little nutritive value.	T	F	1	2	3	4	5	(42-43)
44.	Athletes in training require more protein than less active persons of the same sex, age, and body weight.	T	F	1	2	3	4	5	(44-45)
45.	Enriched breads and cereals have some B vitamins and iron added to them to increase their nutritive quality.	T	F	1	2	3	4	5	(46-47)
46.	A person tends to crave those foods his body needs.	T	F	1	2	3	4	5	(48-49)
47.	Reconstituted dry skim milk is nutritionally inferior to fresh skim milk.	T	F	1	2	3	4	5	(50-51)
48.	Sweating from physical exercise is a sign that fat is being burned off.	T	F	1	2	3	4	5	(52-53)
49.	Diabetes in adults often can be controlled through proper diet.	T	F	1	2	3	4	5	(54-55)

			very certain				very doubtful	
50.	Saturated fats contain more Calories than polyunsaturated fats.	T F	1	2	3	4	5	(56-57)
51.	It is possible to obtain all the nutrients we need by eating a wide variety of foods.	T F	1	2	3	4	5	(58-59)
52.	Any adequate diet must contain meat as a source of protein.	T F	1	2	3	4	5	(60-61)
53.	Several research studies have indicated that heart disease and high blood pressure are diet related.	T F	1	2	3	4	5	(62-63)
54.	Obesity is usually related to improper gland functioning.	T F	1	2	3	4	5	(64-65)
55.	Poor nutrition is seldom a problem among middle class and upper class families.	T F	1	2	3	4	5	(66-67)
56.	Poor nutritional status of pregnant teenagers is often the cause of complications during pregnancy.	T F	1	2	3	4	5	(68-69)

				(1-4)

LW BASS (5-10)

Part II

How do you rate the following topics relating to food and nutrition according to your interests? If you find the topic extremely interesting circle (1); very interesting (2); moderately interesting (3); slightly interesting (4); and not at all interesting (5).

gaining or losing weight	1	2	3	4	5	(12)
health foods	1	2	3	4	5	(13)
vegetarian diets	1	2	3	4	5	(14)
diet in relation to heart disease	1	2	3	4	5	(15)
diet in relation to diabetes	1	2	3	4	5	(16)
diet in relation to colds	1	2	3	4	5	(17)
diet in relation to cancer	1	2	3	4	5	(18)
foods my body needs	1	2	3	4	5	(19)
fad diets	1	2	3	4	5	(20)
safety of the U.S. food supply	1	2	3	4	5	(21)
energy metabolism	1	2	3	4	5	(22)
nutrition and dental health	1	2	3	4	5	(23)

diet in relation to my complexion, hair, and nails	1	2	3	4	5	(24)
causes of tooth decay	1	2	3	4	5	(25)
health hazards with food preparation and handling	1	2	3	4	5	(26)
how smoking, alcohol, and drugs are related to foods my body needs and my nutritional status	1	2	3	4	5	(27)
how diet during pregnancy affects offspring	1	2	3	4	5	(28)
world food supply	1	2	3	4	5	(29)
safest age to have a baby	1	2	3	4	5	(30)
breast vs bottle feeding	1	2	3	4	5	(31)
food preparation	1	2	3	4	5	(32)
exercise and food needs	1	2	3	4	5	(33)
need for vitamins	1	2	3	4	5	(34)
reliability of food and nutrition information	1	2	3	4	5	(35)
causes of overweight and underweight	1	2	3	4	5	(36)
what functions foods can and cannot perform in the body	1	2	3	4	5	(37)
growth and development	1	2	3	4	5	(38)
feeding infants and children	1	2	3	4	5	(39)

Part III

For each of the topics listed in Column I choose which ones of the sources in Column II you have most often used in the past to obtain your information about the topic. List the most frequent information source 1st, the second most frequent 2nd, and the third most frequent source 3

	1st	2nd	3rd	Column I
(42-44)	___	___	___	diet and weight-watching
(45-47)	___	___	___	organic and health foods
(48-50)	___	___	___	vegetarian diets
(51-53)	___	___	___	diet in relation to disease
(54-56)	___	___	___	foods my body needs
(57-59)	___	___	___	food safety
(60-62)	___	___	___	nutrition and pregnancy
(63-65)	___	___	___	food preparation

Column II

1. parent
2. medical doctor or nurse
3. friend
4. high school teacher
5. popular books on nutrition
6. T.V. or radio advertisements
7. newspaper and mail advertisements
8. dietitian or nutritionist
9. magazines

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APPENDIX B

Table 11. Percentage of misconception (MC), correct answer, and guess responses[a] to 56-item food and nutrition questionnaire

Question	Percent of Total Responses[b]			
	MC	Guess	MC+Guess	Correct
1. Organically grown vegetables are richer in vitamins than those grown by conventional means. (F)	36.7	53.6	90.3	9.7
2. Since vitamins are nutrients which our bodies must have, it cannot be harmful to take vitamin supplements just to make certain we get enough. (F)	40.5	39.5	80.0	20.0
3. Vitamin E deficiency produces symptoms of muscular dystrophy in rats so it is safe to assume that the same would apply to humans. (F)	23.2	60.6	83.8	16.2
4. Two nutrients likely to be lacking in the teenage girl's diet are calcium and iron. (T)	4.3	32.5	36.8	63.2
5. Vegetable protein is not of as high quality as animal protein. (T)	14.6	56.8	71.4	28.6
6. The Stillman, Atkins, and Mayo Clinic Diets are completely safe ways to lose weight quickly and permanently. (F)	15.1	62.1	77.2	22.8
7. Grapefruit, cottage cheese, yogurt, lemon juice, and protein bread have positive powers to take off weight. (F)	49.8	33.0	82.8	17.2
8. Honey is less fattening than sugar. (F)	22.2	45.4	67.6	32.4

Table 11 (continued)

	Question	Percent of Total Responses[b] MC	Guess	MC+Guess	Correct
9.	A slice of toast is lower in Calories than a slice of bread. (F)	30.8	41.1	71.9	28.1
10.	A medium sized baked potato has fewer Calories than a 4 oz. portion of beef. (T)	25.4	47.6	73.0	27.0
11.	A teenager requires more Calories than an adult of equal weight and activity. (T)	12.4	23.8	36.2	63.2
12.	A peanut butter sandwich and a glass of milk is a good substitute for meat. (T)	17.9	23.3	41.1	57.3
13.	Bread and potatoes are fattening foods. (F)	74.1	16.3	90.4	8.1
14.	A serving of Jello is higher in protein and more nutritious than the same size portion of ice milk. (F)	20.0	49.1	69.1	29.2
15.	Citrus fruits and tomatoes make the blood acidic. (F)	49.2	43.2	92.4	7.5
16.	Sweets cause adolescent acne. (F)	48.1	35.5	83.6	15.1
17.	One gelatin capsule a day builds stronger fingernails and healthier hair. (F)	41.6	48.1	89.7	9.7
18.	Organically grown foods are not necessarily free from pesticides. (T)	10.8	46.4	57.2	42.7
19.	The bulk of the U.S. population does not require vitamin pills. (T)	31.3	45.4	76.7	23.3

Table 11 (continued)

Question	Percent of Total Responses[b]			
	MC	Guess	MC+Guess	Correct
20. Vitamin E and Vitamin B complex capsules have little therapeutic value for healthy persons. (T)	16.8	68.7	85.5	13.5
21. Excess Vitamin A and Vitamin D can be toxic. (T)	17.8	61.1	78.9	18.9
22. The only way to lose weight is to eat fewer Calories than the body uses. (T)	31.9	27.0	58.9	39.5
23. Supplementing an already adequate diet through use of vitamin pills can result in super vitality, greater endurance, freedom from illness and resistance to infection. (F)	22.2	48.0	70.2	28.7
24. A food additive cannot be approved for use if it is found to cause cancer when eaten by man or animals. (T)	8.1	39.4	47.5	51.3
25. Cyanide and arsenic occur naturally in some foods. (T)	13.5	63.3	76.8	22.7
26. The U.S. RDA (recommended daily allowance) represents the amount of nutrients needed every day by healthy people plus an excess of 30-50% to allow for individual differences. (T)	7.6	55.0	62.6	36.8
27. The greatest danger in following fad diets is that they may cause deficiency or imbalance of one or more nutrients. (T)	4.4	25.9	30.3	68.2
28. The only disease in man known to be associated with eating foods from poor quality soil is simple goiter. (T)	28.1	59.4	87.5	11.8

Table 11 (continued)

Question	Percent of Total Responses[b] MC	Guess	MC+Guess	Correct
29. A Calorie is a substance found in food which causes weight gain. (F)	53.0	22.2	75.2	24.3
30. You must eat 3500 Calories more than your body uses to put on one pound of body weight. (T)	17.3	56.9	74.2	22.7
31. Vitamins and minerals do not have any Calories. (T)	40.6	35.7	76.3	22.7
32. Most diseases are related to improper diet. (F)	39.5	44.3	83.8	14.1
33. Poor diet among teenager mothers seldom affects their babies. (F)	24.3	23.2	47.5	51.9
34. Some foods a nursing mother eats can cause digestive problems in her infant. (T)	11.8	51.4	63.2	36.8
35. A teenage mother should "eat for two" during pregnancy. (F)	34.6	31.8	66.4	33.6
36. Acne in teenagers is related to the condition of the blood. (F)	21.6	48.1	69.7	29.8
37. A combination of lecithin, vinegar, and kelp helps burn fat. (F)	22.1	68.1	90.2	8.1
38. Unbleached flour is nutritionally superior to bleached flour. (F)	20.6	67.0	87.6	11.9
39. Mental work significantly increases your body's need for Calories. (F)	38.4	47.0	85.4	14.1

Table 11 (continued)

Question	Percent of Total Responses[b]			
	MC	Guess	MC+Guess	Correct
40. It is not harmful to eat milk and fish at the same time. (T)	15.6	28.6	44.2	54.6
41. Fish builds brain cells. (F)	23.2	53.5	76.7	22.2
42. Tooth decay is often related to poor food habits. (T)	7.5	17.9	25.4	74.1
43. Pizza has little nutritive value. (F)	24.3	38.8	63.1	34.1
44. Athletes in training require more protein than less active persons of the same sex, age, and body weight. (F)	71.4	21.6	93.0	6.4
45. Enriched breads and cereals have some B vitamins and iron added to them to increase their nutritive quality. (T)	3.3	40.6	43.9	55.7
46. A person tends to crave those foods his body needs. (F)	32.9	32.4	65.3	34.1
47. Reconstituted dry skim milk is nutritionally inferior to fresh skim milk. (F)	24.3	56.2	80.5	18.9
48. Sweating from physical exercise is a sign that fat is being burned off. (F)	54.6	29.7	84.3	15.6
49. Diabetes in adults often can be controlled through proper diet. (T)	8.6	31.9	40.5	58.9
50. Saturated fats contain more Calories than polyunsaturated fats. (F)	48.7	43.1	91.8	7.6

Table 11 (continued)

Question	Percent of Total Responses[b] MC	Guess	MC+Guess	Correct
51. It is possible to obtain all the nutrients we need by eating a wide variety of foods. (T)	14.5	37.8	52.3	47.6
52. Any adequate diet must contain meat as a source of protein. (F)	53.5	22.1	75.6	24.3
53. Several research studies have indicated that heart disease and high blood pressure are diet related. (T)	10.8	38.4	49.2	50.3
54. Obesity is usually related to improper gland functioning. (F)	22.1	59.9	82.0	17.3
55. Poor nutrition is seldom a problem among middle class and upper class families. (F)	23.2	32.6	55.8	44.3
56. Poor nutritional status of pregnant teenagers is often the cause of complications during pregnancy. (T)	7.0	37.8	44.8	54.6

[a]Misconception responses were incorrect answers with high degrees of confidence, i.e., "1" or "2"; guess responses were correct or incorrect answers with low levels of confidence, i.e., "3," "4," or "5"; correct responses were correct answers with high levels of confidence, i.e., "1" or "2."

[b]Misconception, guess and correct answer responses do not total 100 percent due to missing cases.

Table 12. First choice information sources by sex and grade for the category of diet and weight-watching

Information Source	First Choice Responses				
	Males	Females	Grade 10	Grade 11	Grade 12
1. parent	37	41	37	18	23
2. medical doctor or nurse	10	12	12	8	2
3. friend	3	13	9	5	2
4. high school teacher	3	1	0	1	3
5. popular books on nutrition	1	4	3	2	0
6. T.V. or radio advertisements	6	0	4	0	2
7. newspaper and mail advertisements	2	0	0	1	1
8. dietitian or nutritionist	10	8	6	5	7
9. magazines	8	10	3	6	9
Total	80	89	74	46	49

Table 13. First choice information sources by sex and grade for the category of organic and health foods

Information Source	First Choice Responses				
	Males	Females	Grade 10	Grade 11	Grade 12
1. parent	19	7	12	8	6
2. medical doctor or nurse	8	18	17	5	4
3. friend	7	7	4	6	4
4. high school teacher	6	4	5	3	2
5. popular books on nutrition	1	12	5	6	2
6. T.V. or radio advertisements	13	9	11	4	7
7. newspaper and mail advertisements	2	2	1	1	2
8. dietitian or nutritionist	10	8	7	4	7
9. magazines	15	16	11	7	13
Total	81	83	73	44	47

Table 14. First choice information sources by sex and grade for the category of vegetarian diets

Information Source	First Choice Responses				
	Males	Females	Grade 10	Grade 11	Grade 12
1. parent	14	14	9	7	12
2. medical doctor or nurse	20	11	21	6	4
3. friend	7	7	2	4	8
4. high school teacher	5	2	5	1	1
5. popular books on nutrition	2	10	4	4	4
6. T.V. or radio advertisements	12	8	12	6	2
7. newspaper and mail advertisements	5	6	4	2	5
8. dietitian or nutritionist	5	13	5	4	9
9. magazines	8	10	8	6	4
Total	78	81	70	40	49

Table 15. First choice information sources by sex and grade for the category of diet in relation to disease

Information Source	First Choice Responses				
	Males	Females	Grade 10	Grade 11	Grade 12
1. parent	15	17	15	7	10
2. medical doctor or nurse	27	30	28	18	11
3. friend	2	0	1	0	1
4. high school teacher	12	10	6	8	8
5. popular books on nutrition	5	4	4	1	4
6. T.V. or radio advertisements	7	3	3	4	3
7. newspaper and mail advertisements	2	7	5	1	3
8. dietitian or nutritionist	5	5	2	2	6
9. magazines	4	7	7	3	1
Total	79	83	71	44	47

Table 16. First choice information sources by sex and grade for the category of foods my body needs

Information Source	First Choice Responses				
	Males	Females	Grade 10	Grade 11	Grade 12
1. parent	32	35	30	15	22
2. medical doctor or nurse	17	22	19	10	10
3. friend	2	1	2	0	1
4. high school teacher	13	10	9	8	6
5. popular books on nutrition	2	4	0	4	2
6. T.V. or radio advertisements	5	2	3	1	3
7. newspaper and mail advertisements	2	0	1	1	0
8. dietitian or nutritionist	5	10	7	6	2
9. magazines	4	1	3	0	2
Total	82	85	74	45	48

Table 17. First choice information sources by sex and grade for the category of food safety

Information Source	First Choice Responses				
	Males	Females	Grade 10	Grade 11	Grade 12
1. parent	21	25	19	12	15
2. medical doctor or nurse	18	13	17	10	4
3. friend	3	1	2	1	1
4. high school teacher	8	14	9	6	7
5. popular books on nutrition	2	6	5	2	1
6. T.V. or radio advertisements	12	9	9	3	9
7. newspaper and mail advertisements	5	3	1	4	3
8. dietitian or nutritionist	7	11	8	5	5
9. magazines	4	2	1	2	3
Total	80	84	71	45	48

Table 18. First choice information sources by sex and grade for the category of nutrition and pregnancy

Information Source	First Choice Responses				
	Males	Females	Grade 10	Grade 11	Grade 12
1. parent	20	21	10	14	17
2. medical doctor or nurse	21	38	27	18	14
3. friend	4	1	1	1	3
4. high school teacher	5	6	5	1	5
5. popular books on nutrition	5	7	4	4	4
6. T.V. or radio advertisements	8	2	9	1	0
7. newspaper and mail advertisements	1	2	3	0	0
8. dietitian or nutritionist	5	3	5	2	1
9. magazines	7	3	5	2	3
Total	76	83	69	43	47

Table 19. First choice information sources by sex and grade for the category of food preparation

Information Source	First Choice Responses				
	Males	Females	Grade 10	Grade 11	Grade 12
1. parent	48	49	36	29	32
2. medical doctor or nurse	7	6	8	2	3
3. friend	2	0	1	1	0
4. high school teacher	3	6	3	3	3
5. popular books on nutrition	0	7	3	3	1
6. T.V. or radio advertisements	5	3	6	2	0
7. newspaper and mail advertisements	1	2	1	1	1
8. dietitian or nutritionist	9	10	11	3	5
9. magazines	5	3	4	1	3
Total	80	86	73	45	48

VITA

Lois Ann Wodarski, daughter of William and Lois Moon, was born on November 8, 1943. She graduated from Stuttgart American High School in Stuttgart, Germany, in 1961. In April 1965 she graduated magna cum laude from Florida State University with a Bachelor of Science degree in Home Economics Education. She received a Master of Science degree in Food Science and Institution Management from the University of Tennessee, Knoxville, in April 1967.

From 1967 to 1974 she taught high school and adult vocational home economics in Tennessee and Missouri. While attending the Graduate School of Home Economics at the University of Tennessee, Knoxville, from 1974 to 1976 she served as a graduate teaching assistant and graduate research assistant. Currently she is Assistant Professor of Food Science in the College of Human Ecology, University of Maryland at College Park.

She is a past president of the Florida State University Chapter of Omicron Nu and is a member of the Society of the Sigma Xi, Society for Nutrition Education, Phi Kappa Phi, and Kappa Delta Pi. In 1964 she was the recipient of the Borden Home Economics Scholarship Award and received the American Home Economics Association Research Award in 1967.

She is the wife of John S. Wodarski and the mother of Anne Christine Wodarski of Columbia, Maryland.